THE STATUS OF WILDLIFE IN ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

1977

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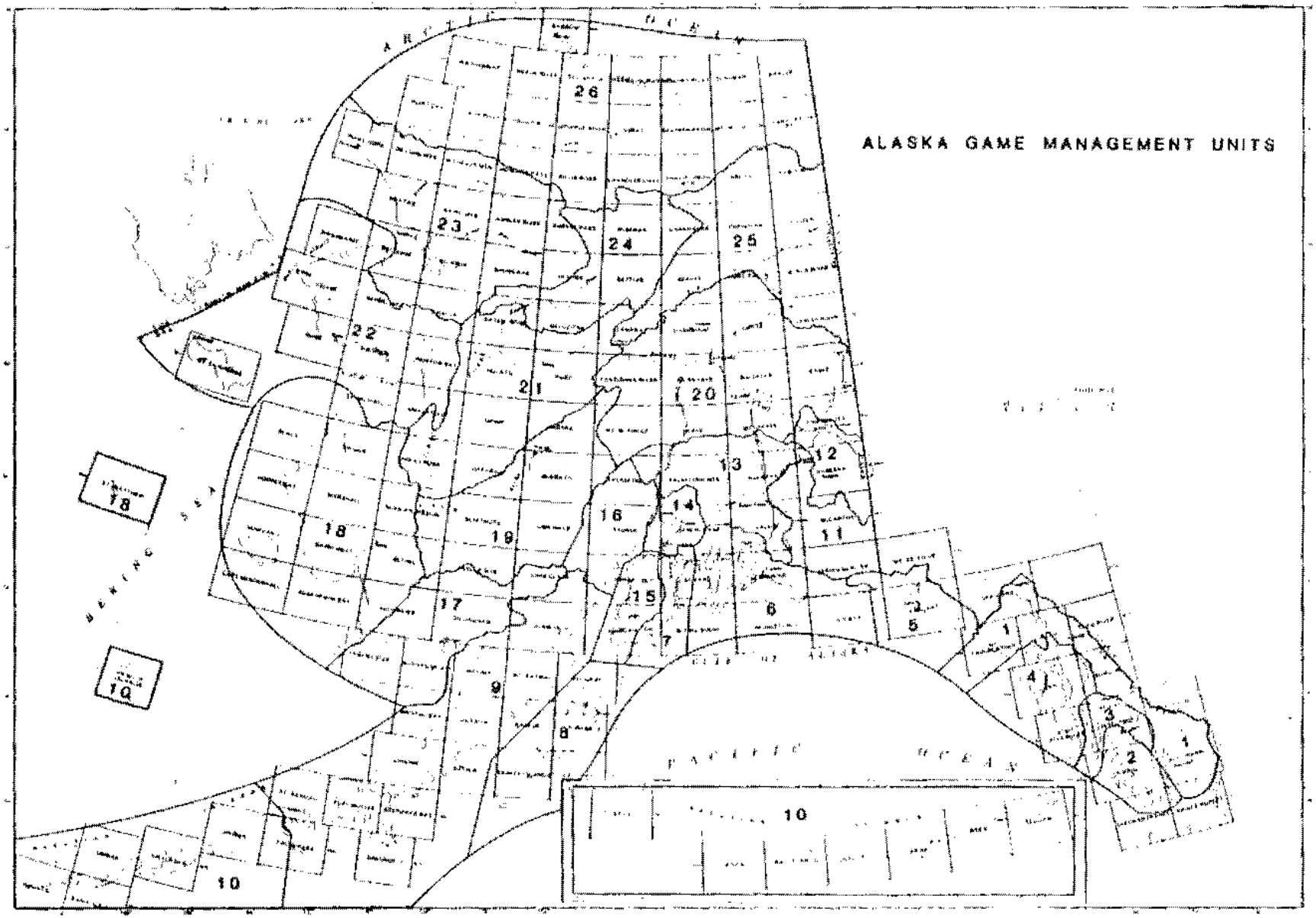
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MANAGEMENT BACKGROUND

THE LEGAL BASIS FOR WILDLIFE MANAGEMENT IN ALASKA

Wildlife management in Alaska was formally established in 1925 when Congress created the Alaska Game Commission "to protect game animals, land furbearing animals, and birds in Alaska, and for other purposes." Prior to 1925 protection of wildlife had been undertaken by the Departments of Treasury, Commerce, and Agriculture, and by the territorial governor.

The five-member Alaska Game Commission, appointed by the governor, represented each of four Judicial Divisions of the state and the U. S. Bureau of Biological Survey, later to become the U. S. Fish and Wildlife Service. This commission set hunting seasons and bag limits subject to approval by the Secretary of Interior. Emphasis of management was on establishment of wildlife refuges and on enforcement and predator control activities until the 1950's when research of game populations was increased.

With the attainment of statehood in 1959 a formal framework for State management of Alaska's wildlife resources was established. In addressing natural resources, Article VIII of the Constitution of the State of Alaska states:

> Section 1. Statement of Policy. It is the policy of the State to encourage the settlement of its land and the development of its resources by making them available for maximum use consistent with the public interest.
>
> Section 2. General Authority. The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people.
>
> Section 3. Common Use. Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use.
>
> Section 4. Sustained Yield. Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

In accordance with these mandates, the Alaska Legislature established by statute a Department of Fish and Game, provided for a Commissioner as the principal executive officer of the Department, and created a Board of Fish and Game. The Division of Game was one of several divisions created to carry out the responsibilities of the Department.

Since statehood the role of the Legislature and the functions, structure, and interrelationships of the Board of Fish and Game, its advisory committees, and the Department have undergone changes in response to

public concerns over increased use of wildlife, increased conflicts between users, growing public involvement in government and increased public environmental concern.

Legislature

The Legislature, by virtue of its broad constitutional authority, has been a dominant force in establishing the character and direction of Alaska's management of wildlife. At statehood the Legislature enacted the Fish and Game Code of Alaska (Title 16) which established the Commissioner and Department of Fish and Game and a Board of Fish and Game, and defined the powers, duties and functions of each. In addition, this act, or amendments and additions to it, provided for: the authority to enforce laws and regulations, licensing of hunting and trapping, including specification of licenses and tags required and their fees; protection of fish and game from human activities; establishment of state game refuges and sanctuaries, and designation of critical habitat areas; suppression of and bounties for predatory animals; commercial use of fish and game; and the specification of unlawful acts, violations, and penalties therefor. Among the powers specifically reserved to the Legislature were those of regulatory and administrative legislative review, approval of areas set apart as fish and game reserves, refuges, and sanctuaries by the Board, the authority to change the amount of fees or licenses, and budgetary controls. This legislation, in essence, formed the basic framework for the entire scope of activities carried on by the Department and the Board.

Since statehood, the Legislature has variously added to, amended or repealed portions of the original State fish and game statutes, reflecting increased complexities of resource management, and increased demands on the Legislature by the people. In general, revisions of the statutes have served to clarify or expand legislative intent and to increase provisions for management, protection, regulation and use of wildlife. Although many of the revisions have affected the scope of activities of the Commissioner, the Department, and the Board, most have had little substantive effect on the interrelationships between these principals. Some recent state legislation however, has affected the traditional structure of Commissioner and Board authorities. The general effect of these recent legislative actions has been a diminution of Commissioner and Board authorities in favor of increased parochial advisory committee roles and increased public participation. Included in such acts are those relating to:

- Boards of Fisheries and Game. This 1975 act restructured the 12 member Board of Fish and Game into two, 7-member boards, one for fisheries and one for game; repealed the status of the Commissioner of Fish and Game as an ex-officio member of the Board; redefined the regulatory powers of the Boards; amended the provision establishing advisory committees to concurrently expand advisory committee authority to close seasons and limit the Commissioner's authority to overrule closures established by advisory committees.

- Taking of antlerless moose. This 1975 act expanded the authority of advisory committees and the Department while limiting the regulatory authority of the Board of Game by prohibiting the taking of antlerless moose except under regulations adopted by the Board after requisite recommendations for open seasons are made by the Department and by a majority of active local advisory committees for the game management unit or units affected.

Although it is important to recognize that the Legislature has delegated broad regulatory authority to the Board of Game, it is also important to understand that the Legislature has the authority to affect that delegation at any time. For example, seasons and bag limits, normally set by the Board, could legally be established by the Legislature. However, the Legislature has generally restricted its activities to more general and enabling legislation.

Governor

The Governor, as chief executive of the State, is responsible for the conduct of the Department of Fish and Game in serving the people of Alaska. All actions of the Department are subject to review and concurrence by the Governor. In addition, the Governor may invoke independent executive actions. Under his strong constitutional authority, the Governor has brought about major reorganization of the Department in the past. In 1962 most of the functions and powers of the Department relative to the collection, accountability, and custody of fish and game revenues was transferred to the Department of Revenue by executive order. Similarly, the Division of Protection, with primary responsibility for enforcement of all fish and game laws and regulations for the Department, was transferred to the Department of Public Safety in 1972.

Commissioner of the Department of Fish and Game

The Commissioner is the principal executive officer of the Department of Fish and Game. He is appointed by the Governor for a term of 5 years, subject to confirmation by the Legislature, and serves at the pleasure of the Governor. The Commissioner functions to "manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state" (AS 16.05.020). To that end, he supervises and controls the Department, including appointments of personnel and assistants necessary for the general administration of the Department and he may delegate his authority to subordinate officers.

Among the powers and duties of the Commissioner are administrative, budgeting and fiscal powers; the collection, classification and dissemination of statistics, data and information; the emergency opening or closure of seasons or areas; and the capture, propagation, transport, purchase, sale, or exchange of fish or game or eggs for scientific or stocking purposes.

In addition to that authority specifically provided to the Commissioner by statute, the Board may delegate to the Commissioner authority to make

regulations. However, such delegation in the past has been limited and specific in nature.

Division of Game

The Division of Game was established in 1959 under provisions of the act creating the Department of Fish and Game. As one of several divisions of the Department, the Division of Game functions in meeting the legislative charge to the Commissioner to "manage, protect, maintain, improve and extend the.....game.....resources of the state....." as well as in providing such assistance to the Board of Game as it requires in the performance of its functions. In each of these areas, the Division attempts to maintain a public posture by disseminating information and encouraging public involvement in the management of Alaska's wildlife.

The Division of Game conducts many activities to meet its responsibilities including:

* Assessment of game population status involving biological research, surveys and inventories of game populations, and compilation and analysis of harvest statistics.

* Identification and protection of important wildlife habitats. The Division provides information and recommendations to federal, state and local agencies which plan for, manage, regulate, or otherwise affect lands in Alaska or their use, to minimize detrimental impacts of land and water uses upon wildlife habitat in Alaska.

* Preparation of reports on the status, management and use of Alaska's wildlife resources, for public information, scientific publication and use, and to provide the Board of Game with information it requires to promulgate regulations.

* Recommending appropriate regulations for consideration by the Board of Game.

* Enforcement of regulations. Although primary responsibility for enforcement of fish and game regulations falls to the Division of Wildlife Protection in the Department of Public Safety, Game Biologists are authorized as enforcement officers and maintain an active profile in the enforcement of regulations.

* Providing the public with information, assistance and other services. The Division disseminates reports of Division activities to the public, contributes to Departmental information and education activities including television and radio programs, a Fish and Game magazine and newspaper articles, distributes regulation pamphlets to the public, and provides personal assistance and explanation on an individual inquiry basis.

At present, the Division of Game is staffed with approximately 110 full-time positions. About 75 positions are filled by professional biologists, all of whom possess at least a Bachelor's degree in wildlife management or other biological sciences. Many possess Master's degrees or higher. The remainder comprise the support staff of clerical, technical, and statistical positions. In addition to the Division headquarters in Juneau, regional offices are maintained in Fairbanks, Anchorage and Juneau. A total of 21 area field offices are maintained in major communities throughout the state.

Activities of the Division of Game are largely funded by a federal-state matching funds arrangement, made possible through a "Fish and Game Fund" and the Federal Aid in Wildlife Restoration Act of 1937.

Under the Federal Aid in Wildlife Restoration Act and its amendments, funds from an excise tax on sporting arms and ammunition, including pistols, revolvers, bows and arrows, and parts and accessories are made available to the various states on a matching basis for use in wildlife restoration work, including land acquisition, research, development and management projects, and for use in hunter safety programs. Monies are made available on a maximum share basis of 3 federal to 1 state dollar basis. Provisions in the act require the various participating states to maintain funds obligated to fish and wildlife restoration work as defined by the act.

The Alaska Legislature established the Fish and Game Fund at the same time the Department was established. Most of the money comprising the Fish and Game Fund derives from the sale of state sport fishing and hunting licenses and special permits, although funds from other sources are possible. Funds gained from license sales or permit fees cannot be used for other than the protection, propagation, investigation and restoration of sport fish and game resources and the expenses of administering the Sport Fish and Game Divisions of the Department.

Board of Game

The Board of Game, as presently constituted, was established in 1975. Originally established in 1959 as an eight-member Board of Fish and Game, the Board was subsequently enlarged by statute to 10 and then 12 members before being divided into two Boards, one for fisheries and one for game. The Board of Game now has seven members, appointed by the Governor and subject to confirmation by the Legislature. The staggered term of office for members is four years. Members serve at the pleasure of the Governor.

The primary functions of the Board of Game in conserving and developing the game resources of the state are the promulgation of regulations affecting use of wildlife and the establishment and conduct of advisory committees.

The Board of Game is empowered to make regulations for:

(1) setting apart game reserve areas, refuges and sanctuaries in the waters or on the lands of the state over which it has jurisdiction, subject to the approval of the Legislature;

(2) establishment of open and closed seasons and areas for the taking of game;

(3) establishment of the means and methods employed in the pursuit, capture and transport of game;

(4) setting quotas and bag limits on the taking of game;

(5) classifying game as game birds, song birds, big game animals, furbearing animals, predators or other categories;

(6) investigating and determining the extent and effect of predation and competition among game in the state, exercising control measures considered necessary to the resources of the state and designating game management units or parts of game management units in which bounties for predatory animals shall be paid;

(7) engaging in biological research, watershed and habitat improvement, and game management, protection, propagation and stocking;

(8) entering into cooperative agreements with educational institutions and state, federal, or other agencies to promote game research, management, education, and information and to train men for game management;

(9) prohibiting the live capture, possession, transport, or release of native or exotic game or their eggs; and

(10) establishing the times and dates during which the issuance of game licenses, permits and registrations and the transfer of permits and registrations between registration areas and game management units or subunits is allowed. (AS 16.05.255)

In addition, the Board of Game may adopt regulations upon the recommendation of the Department, by the majority vote of affected local advisory committees, or by written petition by interested residents of an area as regards the establishment of subsistence hunting areas, the control of transportation methods and means within subsistence hunting areas, and the establishment of open and closed seasons and areas to protect subsistence hunting. (AS 16.05.257)

Promulgation of regulations by the Board must be in accordance with Alaska's Administrative Procedure Act (AS 44.62) which requires among other things that:

1. Meetings of the Board be open to the public and that reasonable public notice be given for such meetings.

2. A procedure be used for adopting regulations which includes:

   a. prior public notification of proposed actions,

   b. opportunity for any interested person to present statements, arguments, or contentions in reference to a proposed action, and,

c. opportunity for an interested person to petition the Board for the adoption, amendment, or repeal of a regulation.

3. Regulations be codified and published.

The Boards of Fisheries and Game are empowered to establish advisory committees in various parts of the state for the purpose of providing the Boards with recommendations on fish and game in their areas of jurisdiction. The Boards set the number and terms of the members of advisory committees, delegate one member of each committee as chairman and give him authority to hold public hearings on fish or game matters. Advisory committees have the authority to declare emergency closures during established seasons under procedures established by the Board. Furthermore, advisory committees must recommend openings of antlerless moose seasons in their respective areas, in conjunction with Department recommendations for open seasons, before the Board of Game may adopt regulations for the taking of antlerless moose.

The Board of Game meets at least once each year, but may meet more often as it considers necessary. Special Board meetings may be called at any time by the Commissioner or at the request of two Board members.

Public

Alaska's people are the ultimate managers of their wildlife resources. Through the electoral process and other mechanisms of government responsiveness, the public can and does effect the management of wildlife in Alaska.

Wildlife management in Alaska is an exceptionally public process. Aside from the economic interest in resource utilization, few other resources elicit public attention to the extent that fish and wildlife do because an intimate association with wildlife has been an important part of the Alaskan lifestyle. There is a traditional sense of personal ownership of wildlife that doesn't exist to the same degree with other natural resources. Other contributing factors are the increasing importance of outdoor recreational activities and the widespread public association with "ecological awareness."

Alaska's constitution reserves the state's wildlife to the people for common use consistent with the public interest. In order to assume an active and productive role in the management and use of wildlife, the public must be cognizant of the responsibilities demanded by such a role. The public has a responsibility to be informed about the status of wildlife resources and the options for their use. The public should also be informed about the governmental management framework - which agencies are involved, what their responsibilities are, how their functions and authority are interrelated, and what legal, budgetary, and administrative constraints limit their actions. Citizens should be aware of the opportunities to express their concerns as provided by statute, directive and policy: the legislative stage, the public forum provided by the Board of Game, public hearings and meetings, petitions,

and personal contact. The public should participate in the regulatory process and should actively support current regulations. Finally, all wildlife users should bear their share of costs of conservation. Although many people who do not hunt or fish derive substantial benefits from fish and wildlife, in Alaska almost all costs of wildlife management by the Department of Fish and Game are borne not by the general public, but by those individuals who purchase hunting and fishing licenses, guns and ammunition, and fishing tackle.

BIOLOGICAL CONSIDERATIONS

Wildlife Habitat

The dependency of wildlife on its habitat is of fundamental importance, yet many people are unaware of the relationships involved. Habitat is a combination of many interrelated factors which provide living space for a species. Food and cover are general terms for basic necessities that are often complicated and variable according to season and circumstance. Suitable and often different areas are needed for breeding, nesting, rearing young, resting, escaping and feeding. Not only must all these essential components be present in a habitat to make it "habitable" for a species, but they must be accessible to the animals. Some migratory birds satisfy their habitat needs by depending on habitat components over the breadth of two continents while some small mammals live their entire lives in the space of a backyard. But the "backyard" must have the necessary variety of areas to be good habitat. For many species, the more "edge effect" created by interspersion of vegetative types, the better the habitat. The suitability of a habitat is the first concern in any effort to establish, maintain, or enhance populations of a species.

There is a limit to the number of animals supported by a unit of habitat, and this limit varies from season to season and from year to year as the adequacy of the essential habitat factors vary. When expressed as an average density of animals that can be supported this limit is called the carrying capacity. When carrying capacity is exceeded by a population, habitat can be damaged, and the result is often a reduction in the carrying capacity followed by a decline in the wildlife population.

A species usually relies on more than one specific habitat area or factor for the essentials of life. The area or factor in shortest supply determines the maximum number of animals that a habitat can support. This is known as a limiting factor. If food is the limiting factor, and the supply is increased, the carrying capacity for that species will increase until it becomes limited by the shortage of another factor, such as a place to escape from predators. Specific habitat areas of great importance to a wildlife population are called critical areas or critical habitat. Such areas are critical because they are limiting, and their loss or reduction would result in elimination or reduction of the population.

Habitat changes are continuously occurring naturally. Vegetation associations succeed one another as each successional stage, through its occupancy, makes conditions more favorable for its successor until a climax vegetation stage is established. Climax communities remain in tenuous balance with the long-term forces of climate and geological change. There are reversals in the process as well, and these normally are sudden and drastic in comparison to the subtle progress of succession. Fire is perhaps the most spectacular, but there are many others, such as deposition of material by rivers and glaciers, effects of windstorms, insect infestations, and man-made clearings. Wildlife populations change in response to changes in habitat, as it becomes more or less favorable for the species.

Manipulation of habitat (including protection when necessary) is therefore a prime tool in managing for desired populations of wildlife. With the proper techniques the successional stages most favorable to a species can be maintained on a long-term basis, variety of desired vegetation can be improved beyond natural occurrence, and special habitat necessities can sometimes be artificially provided. Response of wildlife to habitat improvements can be dramatic.

Some qualifications on the benefits of habitat improvement should be noted. Habitat improvement programs are directed at increasing or maintaining numbers of desired wildlife populations. Since a habitat favorable for some species may be less favorable for others, manipulation of habitat will mean reductions of some species populations as well as gains to others. Also, manipulation of habitat does not always result in increases of wildlife because the effectiveness of habitat improvements may be limited by the influence of uncontrolled factors such as climate and soil quality. There also are a number of species which are dependent upon climax vegetation associations. Because their populations cannot be benefitted through short-term vegetation changes management must be directed to other factors which are alterable.

Population dynamics

Maintenance of populations at carrying capacity, however useful as a management concept, is rarely achieved under natural, unmanaged conditions. How many individuals of a species there actually are in an area at any time is a result of the interplay of the population with the allowance of its living area. Wildlife is often "out of phase" with its habitat in a never-ending see-saw of adjustments to the excesses and shortages of its environment. The processes of adjustment by which a population's size is balanced with its habitat are termed population dynamics. Essentially, these are the opposing forces of reproduction and mortality.

Reproduction is the main way new individuals are recruited into a population (migration may add animals, too). The increase of a population, excluding the effects of movement or mortality, is limited by the reproductive potential of that species. The number of young each female can produce in a year, the minimum and maximum ages at which breeding may occur, the sex ratio of breeding adults, and longevity of individuals, all together determine the maximum rate of increase that a population may exhibit.

Wildlife populations, however, rarely increase at their maximum rate. Mortality is the main reason, of course, but other factors may depress reproductive success. For example, not all females capable of breeding find males; or younger animals capable of breeding may be inhibited in attempting to breed because of dominance exerted by older individuals; and many species give birth to fewer young in times of adversity. Such depressants on reproduction are commonly self-regulating mechanisms, through which animals respond to conditions of overcrowding, food shortages, or poor nutrition.

Mortality operates against population growth by removing animals. Starvation, predation, hunting, inclement weather, diseases and parasites, accidents, and strife between animals all contribute to losses of wildlife. The relative importance of any one factor is generally dependent on two things: the effects of other mortality factors, and the density of the population. Animals injured by accident or strife may have difficulty obtaining food and may starve. Others, weakened by starvation or debilitated by disease, may fall easy prey to predators. In the absence of predation and hunting, populations can outgrow their food supply and starvation will be the major cause of mortality. Some factors, such as predation, starvation, and disease, increase in their importance as the density of the population rises and these are known as density-dependent mortality factors. Success of predators increases as their prey becomes more abundant. Starvation is more common as competition for food increases. Transmission of disease is facilitated by crowding of animals. The reverse situation is also true. As a population is reduced, relatively fewer losses occur to these factors. Also, greater losses to one cause will result in reduced losses due to other factors. To some extent, change in one kind of loss is compensated for by change in another kind of loss.

These direct and indirect compensatory relationships between reproductive performance, various mortality factors, and population density make it possible to some extent for human use of wildlife to replace other kinds of mortality.

Losses to wildlife populations are replaced by reproduction. If everything is working right and habitat quality is reasonably good, animals characteristically produce more young than are needed for replacement. This creates a "surplus" of individuals, both young and old, that is trimmed off by the various mortality factors. The surplus may be small if the new individuals are accommodated by excellent habitat, or it may be large as the population exceeds the capacity of the habitat. Wildlife management seeks to take advantage of compensatory relationships to make some of the surplus available for human use.

Removal of animals lowers population density. Fewer animals are then lost to density-dependent mortality factors. Lowered density results in reduced competition for food, which in turn increases survival of young, for it is the young (and the very old) which suffer the greatest losses to starvation. Within limits, increasing the removal of adult animals continues to boost the survival of young. Furthermore, lower population density makes more food available, more animals breed successfully as a result of being in good physical condition, and more young are produced and raised by each female.

The productivity of a species in terms of its use by humans is called "yield." Normally, yield applies to consumptive use, but it can also include so-called "nonconsumptive" use as well. Management of wildlife is aimed at producing a sustained yield, that is, utilizing a wildlife population at such a level that the capability of the population to continue to provide such use is not impaired. Sustained yield is the central concept in the management of any renewable resource.

There is usually a range in intensity of use that wildlife populations will sustain, from no use to that which is the maximum allowable. Human use is another force acting on a population, affecting, and in turn being affected by, the compensatory relationships of the various natural reproductive and mortality factors. Consequently, a wildlife population will establish an equilibrium with the forces acting upon it, as long as the minimal species requirements are met.

PROBLEMS OF MANAGEMENT

Management of wildlife has its share of problems. Although many problems can be foreseen and avoided by giving careful thought to the future, dealing with wildlife and with people is full of surprises and the wildlife manager must be "ready for anything."

The difficulties faced by wild animals in their daily lives become part of the problems faced by wildlife managers. Many of the crucial problems faced by wildlife in obtaining enough good food, having a chance to reproduce, and avoiding an untimely death are known. Many remain nature's secrets. A large part of the wildlife manager's job consists of learning to recognize these crucial problems, and trying to either minimize or make allowance for them.

Perhaps a larger part of the manager's job involves regulating man's use of wildlife and its habitat. There are two broad problem areas involved. The most difficult is attempting to insure that use and development of resources other than wildlife cause the least difficulties for wildlife and its habitat. The second broad problem area involves developing a system of wildlife use that enriches the lives of the public in various ways without impairing the welfare of wildlife species, their habitat, or their relations with other species. The latter problem is the wildlifer's "first love," but more often than not he's "married" to the former!

Taken together, these two broad problem areas include a whole spectrum of potential difficulties for wildlife, wildlife managers, and the public who wishes to enjoy wildlife. Problems range in importance from critical to mere nuisances, depending on their nature, location, duration, season and magnitude. The most important problem affecting the well-being of wildlife in Alaska and indeed, in most parts of the world, is loss of suitable living space, or habitat. Alaska is fortunate in that the wildlife habitat that has been lost or significantly damaged is small at this time, but the trend toward increasing losses is clear.

Many other problems exist, and the following review may give readers a feeling for the variety and importance of problems encountered in

wildlife management. For convenience, problems are grouped according to these circumstances: natural factors, land use, use of wildlife, and management limitations.

Natural Factors

Loss of habitat occurs through nature's processes, sometimes suddenly but more often slowly enough for animals to adjust. Given time, meadows may become brushlands, and brushlands become forests. For example, the great 1947 Kenai burn, a huge wildfire on the Kenai Peninsula, allowed thousands of acres of young willow, aspen and birch to replace mature forests with prime food, and stimulated a boom in moose numbers. But after 30 years the prime food plants have grown out of reach or have been eaten up; the prime moose habitat is gradually being lost, and the number of moose the area can support has declined. Similar situations have occurred throughout much of Southcentral and Interior Alaska, as modern, efficient fire suppression techniques have reduced the frequency and extent of burning. On the other hand, natural and man-caused fires have affected wildlife populations, such as caribou, red squirrels, and spruce grouse, that are dependent on long-established (climax) vegetation.

There are other examples: ponds or sloughs used by beavers may gradually fill in with silt and dead plant remains, and either become too shallow or develop a wide "beach" of sedges and grasses that makes food gathering a dangerous proposition, and the beavers quit using the ponds.

Sometimes the animals cause their own problem. The Nelchina caribou herd grew so large that it decreased its own food supply by eating and trampling more than the plants could produce. An important part of the caribou habitat was lost, and will not recover for many years. But, to repeat, these are all examples of relatively long-term changes, and while great changes may occur in numbers of the species affected, the change each year may be moderate.

In a few cases, change may be rapid and catastrophic. A much earlier fire on the Kenai Peninsula apparently destroyed the caribou habitat then available. Caribou disappeared from the Kenai, and did not return until transplanted by man 60 to 70 years later. The 1912 eruption of Katmai was a catastrophe that quickly eliminated much wildlife habitat on the Alaska Peninsula, and the 1964 earthquake caused the ocean floor to rise several feet in some areas of southcentral Alaska, dramatically affecting all marine life, including marine mammals and waterfowl.

Another major, natural limiting factor, or problem, for wildlife is weather. Alaska's climate is often harsh and there are numerous examples of the limiting effects of weather on wildlife. In the winters of 1971, 1972 and 1974 unusually cold weather caused sea ice in the Bering Sea to extend hundreds of miles south of its usual limit; sea otters were trapped, unable to feed and float as they normally do, and many died. Winters of prolonged, unusually deep snow have caused major die-offs of moose at Yakutat, and in Southcentral and Interior Alaska. In some cases 50 percent or more of the moose may have died, mainly because it became too difficult to get around in search of food.

Hard snow crusts formed by unusual winter rain have caused grouse to die from freezing, because the birds were unable to burrow in the snow at night to sleep. Similar crusts caused by the bright spring sun have at times aided wolves in pursuit of moose. In some years, frozen or wind-blown snow crusts may prevent caribou from feeding on parts of their winter range; crusts or deep snow may affect sheep similarly.

Mid-winter flooding or unusually great depths of overflow ice have driven beavers from their houses, much to the benefit of passing wolves or wolverines which find beavers easy prey on land. Severe spring floods may drown beaver kits, calf moose, and other young-of-the-year. Of course, the effect of any of these events depends on their severity, how long they last, and whether or not they strike an especially vulnerable spot in the species' annual cycle of living.

There may be times when weather is so severe that animals (especially young ones) die outright from exposure, but usually, as in the examples above, bad weather makes it so hard for animals to use some critical part of their habitat that they die from starvation, with a little extra "push" from a combination of various lesser factors such as disease or parasites, predators, and accidents.

Food supply, or nutrition, is a crucial factor not only during hard winters, but at other times as well. Ample food of good quality is especially important to pregnant and nursing females, whose food needs are greatly increased. A lack of proper food may result in weak offspring which may be susceptible to disease, or be caught by a predator. Some young may not even be born, or may be born dead. In fact, if the female has been undernourished prior to breeding season, she may not conceive when she mates, or perhaps she will have fewer offspring than normal.

Moose, deer, and caribou depend on "fattening-up" during the summer in preparation for a rugged rutting season and a long winter. Males lose most of their fat during the rut, and are actually in only fair condition when winter comes. If winter weather is particularly severe, or winter food is scarce, males are more likely to die than females. Calves and very old animals are even more susceptible.

As more is learned about wildlife nutrition, it becomes evident that food quality is as important as quantity. Some species of food plants are more nutritious than others, some parts of plants are more nutritious than other parts, and in general younger plants are more nutritious than older plants. A bunch of brush is not necessarily a bunch of good wildlife food!

Predation. If the moose, caribou, sheep, grouse or other species have managed to survive all the other natural hazards of life so far discussed, there is no time to be smug, because there may be a bear, wolf, weasel, hawk or some other predator looking for its next meal! When prey species (those normally eaten by another species) are at low numbers, in poor condition, or have trouble escaping because of deep snow or lack of

suitable habitat, predators can eat enough prey to reduce or hold down numbers of their prey. The effects may be short-term, or they may extend over several decades, depending on the species involved and the circumstances. There usually is little doubt that prey numbers will eventually recover, but in the meantime few of the prey species may be available for the remaining predators, scavengers, or for various uses by people. For example, in recent years, severe winter weather has been an important cause of declining moose numbers in Interior Alaska. In the Tanana Flats, near Fairbanks, hunting and predation contributed to this decline. Hunting has been almost completely eliminated to encourage the recovery of the moose population, but so far no recovery is in sight. Wolves have been one of the major factors preventing moose numbers from rapidly recovering, and in the Tanana Flats, their depredations may accelerate and deepen the moose decline to very low numbers. The situation prompted wolf control programs in an effort to allow moose to recover more rapidly. Predators are rarely the sole reason for declines of wildlife populations, but under certain circumstances they can be a primary cause for depression of prey numbers.

There are additional natural hazards for wildlife. Accidents and disease sometimes kill wildlife, but often these hazards are either caused or promoted by other hazards. For example, a hard winter or late break-up may cause more accidents, because animals are in poor condition and more accident-prone.

In summary, a variety of natural mortality factors affect wildlife populations; these factors usually are interrelated, and their impact varies from negligible to considerable. Wildlife managers must know what these factors, or problems, are, and either devise ways of reducing them, or tailor management to allow for effects of these hazards.

Land Use

Land ownership was pretty simple before Alaska became a state. There were a few military reservations, and a large petroleum reserve. A handful of large National Parks, Monuments and extensive Wildlife Refuges existed, plus large National Forest holdings in Southeastern Alaska and smaller ones in Southcentral Alaska. Most of Alaska, though, was public domain, uncommitted to any special uses.

Times changed, the State of Alaska was given the right to select 104 million acres as part of its dowry from the federal government, and before long the question of Alaska Native Land Claims arose. In 1971 the Alaska Native Claims Settlement Act gave Alaskan Natives the right to select approximately 40 million acres of land in Alaska, and also provided for inclusion of up to 80 million acres in National Parks, Refuges, Forests and Wild and Scenic Rivers. Native selections were recently completed and are awaiting certification. Various proposals have been made for how the 80 million acres, called "d2" lands, should be assigned to the government agencies involved, and Congress has to make the final decisions by December 1978.

However those final decisions turn out, lands in Alaska will be in a crazy-quilt pattern of private, state, and (several) federal agency

ownerships. The rights, regulations and rules of the various owners will make resource use of all kinds much more complex, and generally more restrictive than ever before. For wildlife management to contribute effectively to the well-being of wildlife species, and to provide for continued use of wildlife in various ways, some major problems must be addressed.

Perhaps the most basic problem is that even as demands for use of wildlife increase, the amount of land available for public use will decline, simply because the amount of land in private ownership will increase. Land granted to native groups will be private land. Like any landowner, native groups will place their own interests first, and the lands granted to them are their main resource in becoming economically self-sufficient. Self-sufficiency may be based on resource development, subsistence use, or both, but whatever combination develops, public access to wildlife on those lands will no longer be a right, and opportunities to use wildlife will decrease.

Some state-owned lands may go into private control, too, through sale or lease. This would also decrease opportunity for public access to wildlife. By statute, one Alaskan has as much right to use wildlife as another, but, also by law, the landowner can regulate trespass on his own land as he sees fit.

The dilemma of increasing demand for wildlife use is only a little less complicated on public lands where constraints of private ownership are not in effect. In substantial portions of the 80 million acres of d2 lands under consideration by Congress, wildlife uses such as hunting, trapping, observing, or otherwise enjoying wildlife may be severely restricted or prohibited. Loss or severe restriction of these uses in large areas of federal domain is in itself a problem for those desiring to hunt and trap, or use wildlife in other ways, but the problem is compounded because the demand for these uses is not likely to go away. Rather, it will shift to other areas still available for these uses. Wildlife management programs then must cope with this concentrated demand and the stress it places on resources of a reduced land area.

With the many future owners of Alaska's lands and their diverse interests, a great challenge will be to achieve agreement on management that will benefit wildlife no matter whose land they're standing on. Many species will regularly cross property boundaries, and it will be very important that habitat preservation or manipulation and other management measures undertaken for the benefit of wildlife are a truly cooperative venture among landowners.

Development of Alaska's natural resources has spurred interest in Alaska ever since the first Russian ship groped its way through the storms and fog to find and claim "The Great Land." The history of development in Alaska is really more a chronicle of exploitation, crammed with a thousand shaky schemes to make men rich and sprinkled with a few that succeeded. Alaska survived, more by its vastness, remoteness, and by chance than by the enlightenment of men. Alaska is still vast but it is no longer remote, and its future condition as an unique environment for wildlife and for people depends upon the attitudes and actions of society much more than in the past.

Resource development, such has logging, mining, oil extraction, dam construction, and other activities are often viewed as the beginning of the end for wildlife. This is not always the case, but such resource uses do present potential problems to wildlife, wildlife habitat, and wildlife management because they often involve rapid and substantial habitat changes that persist for long periods of time. To most people, the change most immediately obvious when development occurs is a loss in aesthetic quality. Development involves change, and with few exceptions people view such change as an aesthetic loss. Although it is not mentioned in the following discussion, the degradation of aesthetic quality is a problem common to all forms of development.

Logging practices in Southeastern Alaska have been a source of concern to wildlife (and fisheries) biologists for years, and recently became national news when a court decision banned clear-cutting. Modern logging in Southeastern Alaska usually involves clear-cutting of mature forests because that is the most economical method in areas of even-aged trees where few or no roads exist, the country is rugged, and forests are a kind of jungle. "Clear-cutting" means cutting all timber on a selected piece of ground. The ground cover vegetation is pretty well cleared also, by heavy equipment used in logging.

Although shrubs of various kinds grow up in clear-cuts, there is some question of how beneficial they may be to deer, particularly in large clear-cuts, where deer may be reluctant to go far from the edge of timber, or deep snow prevents them from doing so. Clear-cuts provide new deer browse (primarily in snow-free periods) for 15 to 20 years, but after that little food is available. Effects of clear-cuts on other species are even less well known. Where logging occurs next to salmon streams, siltation, stream blockage, and higher water temperatures may reduce or eliminate the stream's suitability for spawning or for young salmon and for other aquatic life, and may indirectly affect brown bears, black bears, and numerous furbearers that feed along these streams. Bald eagles nest in trees along the beaches, and they apparently require virgin timber for nesting. Even in very old clear-cuts that now have trees, eagles apparently do not nest.

Logs are usually stored in floating rafts which are held in sheltered bays, or estuaries, where freshwater streams mingle with the ocean. Estuaries are prime "nurseries" for many marine invertebrates and fishes, and pollution from logs and bark that is soaked or worn off can seriously affect the marine life of estuaries. Log rafts often scrape around the shallow bottom in response to tide or wind, and this too damages the habitat so important to young marine life. Thus, various birds and mammals that feed on the marine life of estuaries can be affected by what seem at first glance to be remote and unrelated events.

Logging in other parts of Alaska has not been extensive since the gold-rush days, but it is increasing in response to both domestic and foreign demand. Not much is known about effects of logging in these areas. Although logging was intensive in many places in the early days, no one paid much attention to its effects on wildlife. It may be that logging in Interior and Southcentral Alaska, can, with careful planning, benefit certain wildlife species without doing great harm to others.

Mining for many years has been synonymous with habitat destruction in parts of the U.S. where open-pit mines were developed. Alaska has had little of such methods, although scores of creek bottoms have been turned upside down by placer mining and dredging for gold. Now, 10 to 60 years after most gold mining shut down, it's hard to say what the impact has been or what it will amount to when another 50 years have passed. Much silt in numerous streams may have taken its toll on salmon and grayling, but impacts on wildlife are not well known. If extensive gold mining began once more, certainly habitat losses would result, but the importance of the losses is hard to predict.

In some cases roads or trails opened to reach mineral claims or mines have created erosion, thawing of permafrost and slumping, or other damage to habitat. Although some individual cases may do minimal damage, the accumulated damage may become significant, particularly if a great increase in mining should occur.

In the past, roads and trails built by and for miners provided access for commerce of the day. Some of these routes became roads which today allow thousands of wildlife users to reach new or different areas. The results have been both good and bad. Wildlife users were able to disperse to enjoy different areas and perhaps less crowding, but in certain areas the added hunting pressure was undesirable and proved detrimental to some big game species. Should new access be created by a future surge in mining, wildlife managers will have to be prepared to cope with the possibility of too much access by highly mobile hunters and other recreationists.

Impoundments, or lakes created by man-made dams are another form of development that creates wildlife management problems. In general, the greatest problem caused by dams and their lakes is simply loss of the wildlife habitat to flooding. Few dams have been built in Alaska thus far, and relatively little habitat damage has occurred. Two proposed dams, however, illustrate the potential.

The Rampart Dam proposal was made in the early 1960's. With a dam near Rampart, on the Yukon River, the Yukon Flats would have been flooded, with the impoundment reaching nearly to the Canadian border. Ft. Yukon and several smaller villages would have been displaced along with several million acres of prime waterfowl, furbearer and big game habitat. Electric power was the purpose of the dam, and it was finally decided that the dam was not a good investment considering the returns it would bring. For wildlife resources of the state (and the nation), it was a fortunate decision. There is no way that production of wildlife in other areas could have been increased enough to make up for the losses that would have resulted from such a massive loss of prime habitat.

The "Devil's Canyon", or Susitna Dam, is a project currently being seriously considered. Its purpose is also the generation of electric power. A pair of dams would be built on the upper Susitna River where the river flows through a deep, relatively narrow valley. Habitat loss would be small compared to the Rampart Dam proposal, yet valuable wintering areas for moose and migration routes of caribou would be flooded, and increased human access would probably result. The effects of flood

control on wildlife habitat below the dam are poorly understood, but it is known that periodic flooding is one of the main events that keeps river bottoms fertile and productive.

"Transportation corridor" is a currently-used phrase for a place to put roads, pipelines, electric lines or other systems for moving people, material or energy. Numerous transportation corridors for various anticipated uses have been proposed in Alaska. The best known such corridor in Alaska today is the Trans-Alaska Pipeline corridor, with its roads, camps, pipes and storage tanks.

For wildlife management, the problems of transportation corridors include habitat loss and disturbance of wildlife at critical times, but probably of more importance is how to regulate access and resource use next to the corridor, and how to insure that the pipeline, road or whatever may be built, interferes as little as possible with normal animal movements and behavior. While a single corridor through an area may have limited impact on wildlife, multiple corridors would very likely create much more serious problems by compounding the smaller influences of individual corridors.

Urbanization and related effects of an increasing human population, such as sprawling suburbs, private recreation property, roads, and fences, probably create more problems for wildlife and wildlife management than is commonly appreciated. Loss of wildlife habitat to urban expansion is often not very obvious, until comparisons are made with 5, 10 or 20 years past.

The amount of habitat lost in the Anchorage area over the last 10 years is startling, and can be appreciated only by comparing aerial photographs from 10 years ago and now. The same is true of the Fairbanks area, and to a lesser extent it is true of many smaller communities and roadside areas as well. In addition to habitat loss, disturbance by increased vehicle traffic, additional people, and more dogs and cats, places greater difficulties before wildlife as they attempt to find and use habitat once available to them but now gone or surrounded by "barriers." Conflicts between wild animals and people in urban and suburban areas often result in the elimination of the animals. Under such circumstances, wildlife numbers cannot help but decline.

A second impact of urban growth is the effect upon adjacent recreation areas. Urban dwellers characteristically look longingly to the country, and if possible they will buy recreation property somewhere near their homes. Again, the Anchorage area is a good example; many privately owned recreation lots have sprung up in the Matanuska Valley. Where formerly old homesteads and random fires created clearings that produced abundant winter food for moose, now private owners carefully guard their quota of maturing forest which they understandably treasure. The resulting reduction in winter range may have strong and long-term negative impact on the number of moose in the Matanuska Valley. Although it is a wildlife management problem, there may be no solution, at least within the choices presently available to the manager.

Pollution has only recently become a household word, even though it has long been a common problem. Alaskans are fortunate in having few serious pollution problems, but they do occur. Perhaps the most important source of pollution with respect to wildlife is oil development and transportation.

The effects of oil (or its by-products) may be direct, as when oil products spilled on lakes, rivers or oceans immobilize birds, ruin their waterproofing, or poison them. Oil spills are now infamous for the problems they have created for waterfowl and marine birds.

Indirect effects are more subtle, and in the long run they may be more important. Oil products can upset natural systems by killing or crippling small organisms upon which larger forms feed, or by similarly affecting young stages of larger forms. Either way, there's potential for impacts on game or food fishes, shellfish, waterfowl, sea birds and marine mammals. The indirect impacts of just a single spill are poorly understood, yet the potential for repeated spills exists and is probably increasing. Although more is being learned about the effects of oil spills, and more effort is now made to clean them up, the chief problem seems to be how to avoid them in the first place.

Use of Wildlife

Of all the problems of wildlife management, none are more perplexing to the wildlife manager, nor stir the emotions of the public like wildlife uses. People who would not blink an eye if Hoover Dam were plunked in the middle of Alaska, reservoir and all, are ready to fight if cow moose hunting is suggested! And how many years has it been since the "wolf controversy" didn't warm up the Alaskan winter and save a thousand souls from cabin fever? The list of wildlife issues that bring out the best, or the worst, in people seems endless. Alaskans have a personal and proprietary interest in wildlife, and as many views on wildlife uses as there are feathers on a falcon.

Is that a problem? No, and, yes. No - the public has the last word on how wildlife should be managed and their interest and input is essential if management is to turn out as they want it. But, yes - not everyone can be satisfied. Then, too, there are some people whose views are strictly self-serving, and who contribute more to the problems than to solutions.

Before a manager can think about how wildlife will be used and who will use it, he has to consider whether use can occur in the first place. For use to occur, wildlife populations must be maintained at levels where they can provide use; losses to natural factors must be considered and habitat must be maintained (land use).

To be used, wildlife must also be accessible. In many parts of Alaska little use occurs simply because people can't get to the animals. An increase in private land and some federal lands, discussed earlier, will make wildlife even less available to the public. Everyone will feel more restricted as the human population and demands on wildlife grow, while wildlife populations and the lands where they can be used remain the same or shrink. What can be done?

There are a number of alternatives being used by other states where these kinds of problems are much more advanced than in Alaska: 1) increase access to remote areas; 2) make the public pay for access to private lands; 3) increase the number of animals in high use areas by means of habitat manipulation techniques; 4) accept more crowded conditions

on public lands and at the same time reduce the success of the consumptive users; 5) limit the number of people who can use public lands to maintain satisfactory use experiences; and 6) rotate user groups on the same area (called "time and area zoning"). Most likely all of these alternatives eventually will be used in various combinations in Alaska. Increased restrictions on use seem inevitable.

The biggest problem of use is that of allocation or "who gets what." The public is made up of many interest groups who wish to use and enjoy wildlife in their own way; all have pretty much the same rights to do so, but there isn't enough wildlife to go around. There are many examples of user groups: the "locals" and the "outsiders," consumptive users and nonconsumptive users, recreational, "subsistence" and commercial users, residents and nonresidents, hunters and anti-hunters, majorities and minorities, and let's not forget the "haves" and the "have-nots."

One of the first questions to be settled is "who is which?" Is the man that kills a walrus and sells its ivory a subsistence user or a commercial user? Is a city dweller who hunts moose for meat a recreational hunter or a subsistence user? Is a hunter who photographs wildlife more a consumptive or nonconsumptive user?

If and when you can tell one user from another, the next point to consider is what each user's level of need is and how much use is adequate to satisfy it. Where should the priorities be? Physical need? Economic survival? Recreational enjoyment? There are few easy answers.

Although there are many instances of conflicting demands, one major problem which has befuddled nearly everyone is how to identify and fairly and adequately allocate resource uses between recreational and subsistence users. The State Constitution says that wildlife is "reserved to the people for common use," which means all Alaska residents have equal rights to use wildlife. However, many people living in the bush on low cash incomes depend more on wildlife (and other resources) for part of their livelihood than do urban-oriented people with regular jobs. The supply of wildlife is limited, so when the number of hunters increases, or when numbers of wildlife decline, somebody is going to return from the hunt empty-handed. The subsistence users are most severely affected, so it seems reasonable to give them some preference in use of wildlife. This has been done to some extent by adjusting seasons and bag limits to favor residents of a particular area, by a reduced fee (25¢) for hunting, fishing and trapping licenses for families with an income of less than $3,600, by regulating use of airplanes or vehicles, and various other techniques. Recently the Board of Game was given the power to establish subsistence use areas if it is shown that recreational hunting will prevent subsistence needs from being met. In such areas regulations specifically favoring subsistence users (but not legally barring others from use) could be adopted.

Economic conditions in the state are changing, and more rural residents are earning substantial incomes which enable them to purchase more of their needs. The distinction between a subsistence user and a recreational

user is often very fuzzy and is becoming more so. There is actually a broad spectrum of what is called subsistence use, that ranges from nearly total dependence on natural resources to very little use. Just where to draw the line establishing what combination of resource use and wage earning qualifies as subsistence use and what does not is difficult. Then, too, many Native groups as well as other Alaskan residents have expressed the view that subsistence is not simply an economic matter, but a lifestyle and cultural necessity also, even though they have willingly abandoned many traditional means (a cultural element) of obtaining such subsistence.

This has complicated the problem further in that while the subsistence user's dependency on the resource is still very real, the impact of his use on wildlife has changed markedly from what it once was. Instead of spears and bone fishhooks, he now uses high-powered rifles and gillnets, and he now travels by powerboat, snow machine and aircraft. In short, he now has much the same impact on wildlife populations that his "recreational" counterpart does, and in some cases, a much greater impact. The result has been harvests of some species in certain areas which have been in excess of people's needs, too large for the species to support on a continued basis, or both.

Conflicts between other user groups at times assume major proportions. Take the wolf controversy as an example. There are some who feel "the only good wolf is a dead wolf." Others blindly extoll the virtues of wolves under any circumstance while ignoring their "faults." Surely there is a balanced approach possible, a middle ground, but sometimes it seems it is a "no man's land" and the wildlife manager is square in the middle! The result: costly, time-consuming court suits at the expense of the resources involved and the public.

The general problem of hunters versus anti-hunters is not likely to be solved overnight. Because both groups share an enthusiasm for wildlife and a basic concern for its welfare, as well as similar rights to enjoy their preferred wildlife use, the wasted energies of unproductive confrontations could be far better used to benefit both interest groups and the wildlife resource. Certainly this is one more area to pursue "detente."

What does the future hold? Increased demands and more conflicts, certainly. It will be a challenge to avoid the unfortunate polarization of Alaskans that seems to accompany conflicting interests. As competition increases, parochialism will become even more obvious in the attempt to retain local jurisdiction. Overlaps in advisory committee, borough, village council and state and federal agency jurisdictions may create chaos unless some integrated workable system for allocation is developed.

From past experience, it is clear that whatever uses or combinations of uses are provided for, actions are necessary to ensure that overuse is avoided. There are many technical considerations. Should hunting of females be allowed, and if so, under what circumstances? Should predator control be used, and under what circumstances? What measures must be taken to avoid overhunting? Should vehicles be restricted? Should hunter numbers be limited? Seasons closed? How can illegal hunting best be detected and controlled?

Under some circumstances, illegal hunting or trapping can be an especially critical problem. In an area with intensive legal hunting, a large illegal kill can force curtailment of legal uses, and in situations where wildlife populations are at low levels, illegal kills can tip the balance and cause the populations to decline.

Enforcement of hunting, trapping, and fishing regulations is primarily the responsibility of the Division of Fish and Wildlife Protection, in the Department of Public Safety. However, most Fish and Game biologists are also deputized. Even so, the total number of enforcement officers is relatively small and consequently enforcement coverage of the state is thin because of the state's size and because of the seasonal need to concentrate enforcement efforts on crucial problem areas.

Additional factors complicate the problem. Over such a large area it is extremely difficult to keep track of thinly scattered, highly mobile hunters. Also, many hunters are from out of state and are able to avoid prosecution by leaving Alaska before the violation is discovered or before a "hard" case can be put together. Contributing importantly to indifferent disregard for game regulations is the lack of meaningful penalties for convicted violators. The Alaska court records show a long history of suspended sentences and "slap on the wrist" penalties that have had little effect, except perhaps to encourage continued violations. Recently there has been some improvement in sentencing of violators and a continuation of this trend is most desirable.

Management Limitations

One final category of problems, here called management limitations, is perhaps the most important of all because it affects the capabilities of the Department of Fish and Game in solving all those other problems heretofore discussed, and hence its ability to meet its responsibilities to the resource and to the public. These limitations have to do with the Department's relationship to other agencies, the Legislature, and the public.

Both the state and federal governments have wildlife resource management responsibilities, but the objectives of each are not always in concert. Federal agencies such as the National Park Service, the Fish and Wildlife Service, the Forest Service and the Bureau of Land Management have been around for a long time. Their actions are sometimes ponderous, slowed by massive bureacracies, governed by long-standing policies and inflexible guidelines, administered by officials far removed from Alaska, and influenced by a national public with concerns which sometimes differ markedly from those of Alaskans.

To be sure, there are advantages to such a slow-but-steady system, the chief of which is perhaps that it is less subject to fickle or irresponsible management actions or local political influences. But there are as many instances where inaction is as damaging as the wrong action, and in Alaska, where changes are occurring at breakneck speed and where unique situations demand special considerations, innovative approaches to resource management are needed.

Alaska, as other states, has traditionally exercised jurisdiction over its resident wildlife species, including those on most federal lands within the state. Wildlife within national parks, however, is managed by the federal government in that national parks are traditionally closed to hunting and trapping. Federal wildlife refuges are generally open to hunting, but various regulations control use of airplanes, all-terrain vehicles and snow machines, and otherwise influence the distribution, numbers, and access of recreationists. Thus these regulations essentially become part of the State regulations affecting wildlife use. As more federal reserves are dedicated by Congress, additional rules and regulations will undoubtedly come into effect.

In addition, State jurisdiction over most species of birds, marine mammals and endangered species has been superseded by federal regulations made pursuant to national legislation and international treaties. Use of any species so affected is allowed only under the guidelines established by the federal government. Waterfowl hunting regulations must fit the general framework of federal regulations and be approved by the Secretary of the Interior. Management of marine mammals was withdrawn from the State by the Marine Mammals Protection Act of 1972, but under provisions of that act walrus management (subject to federal approval) was returned to the State. Management of other marine mammals may follow the same costly and circuitous route. Federal laws protecting endangered species and some groups of birds also set some restrictions on State wildlife management.

Land use policies of federal and state agencies and of private landowners strongly affect management of wildlife. The Department of Fish and Game owns very little land. As a result, it is most often only advisory to other agencies on matters such as land use planning, habitat protection or manipulation, land disposal, and access regulation. In some cases this arrangement has been a stumbling block to various management efforts.

Funding largely determines what and how much the Division of Game can accomplish, not only by limiting the amount of work that can be conducted, but also by limiting the number of biologists on the staff (and therefore the time each man can devote to different tasks). Everyone knows a dollar doesn't go far in Alaska, and for the Game Division the mileage has been getting worse. Why? Because budgets have not kept pace with inflation or need. Each year more and more money goes to pay for "fixed costs" (salaries, rents, and equipment) and less and less is left for "operations" - (transportation, supplies, and contractual services).

One important problem arising from the small staff available is that not all parts of the state receive the attention they should. Although field offices are maintained in many of the state's larger communities, additional field staffing is required in various areas where the mushrooming need for more and better quality information on wildlife has become apparent.

In addition, unprecedented demands on the staff have resulted from the interaction between State and federal agencies on such matters as "d2" lands, marine mammal management, Outer Continental Shelf oil leasing, Coastal Zone Management, oil pipeline impacts and various other matters, all of tremendous importance to the future welfare of wildlife in Alaska.

Because there is so much to do, some things can be done well and others don't get done at all. One of the casualties of the "crunch" has been activities directed at keeping the public fully informed as to the status of wildlife, the reasons behind certain regulations, and, in general, what the Game Division is up to. The result? A serious credibility gap which has had far-reaching impacts on many Department programs.

Information and education activities aren't the only ones to suffer. Research activities needed to acquire badly needed information on wildlife have been cut back, and many survey and inventory programs are reduced to the "bare bones." Inadequate information is available about some species such as furbearers and unclassified wildlife because all the attention is focused on "problem" species such as caribou, moose, wolves and bears.

The cry for money is a chronic complaint among government agencies and it rarely catches a sympathetic ear. Nevertheless, the problems of funding are acute for the Game Division and they impose serious limitations on the Division's capability to meet its responsibilities.

Control of the Department's budget is only one of several ways the Legislature affects wildlife programs. Each year, legislation is passed which affects wildlife and its use either directly by governing use, or indirectly by influencing other land uses which in turn impact wildlife.

Because legislation is generally relatively inflexible and permanent (unlike fish and game regulations which are annually reviewed and revised, or policies which can be changed on short notice), legislation directly affecting wildlife is valuable and necessary to long-term direction and continuity in wildlife programs <u>if</u> it is carefully considered, addresses matters of broad scope and provides a framework within which regulations may be promulgated and management can remain flexible. In contrast, detailed and specific legislation directed at regulation of individual programs removes the "elbow room" needed by managers to cope with dynamic wildlife situations. Once enacted, laws are infrequently repealed and by their very existence become traditional. Such "fixtures," if undesirable, reduce options and therefore the effectiveness of managers.

Legislation not directed at wildlife also can have significant secondary impacts on wildlife. Legislation affecting classification of lands for agriculture, private ownership, or state parks can be a detriment or sometimes may benefit wildlife through changes in, or protection of, habitat. Also, such measures, and others which influence settlement and transportation, affect utilization of wildlife by changing its accessibility.

The Division of Game operates within the general set of administrative operating rules and regulations, and legislative and fiscal schedules common to all State agencies. These assorted processes of State government all affect wildlife management programs to various degrees.

Finally, the public affects the things wildlife managers do by influencing actions of elected and appointed government officials including legislators, governors, commissioners, and members of the Board of Game. It is the actions of such officials which set the bounds on what professional managers can do.

Because wildlife managers act in the public interest as custodians of the public's resource, they welcome and encourage public interest and involvement in management decisions. There are times, however, when public sentiment can impede sound management, sometimes threatening the resource itself, but more often reducing or eliminating reasonable utilization. Popularity is not always synonymous with public interest.

We have already said something about the problem of identifying the various "publics." Everyone knows that with most issues there is a vocal minority and a silent majority, and the perceived public desire may not necessarily be the real broad-based public opinion. Yet it is the perceived public opinion that sways elected and appointed government officials, whose actions have the dual motivations of seeing to the public interest and of staying in office. Also, the public, or segments of it, are sometimes subject to emotionalism and rapid polarization over issues, and government officials sometimes react with corresponding brevity. The result: actions of the moment, in response to limited, special, and/or short-lived interests, having long-term consequences on the entire public body.

With wildlife management, as with politics, everyone seems to be an expert on the subject. However, while use and enjoyment of wildlife are common to all, the expertise required to manage wildlife is not. The problem comes in balancing scientific professionalism with public involvement. The public should understand that wildlife management must be based on biological and ecological principles and that it should be conducted with the highest standards of professional scientific expertise. Wildlife managers in turn should be responsive to changing public attitudes concerning wildlife and its use, and managers should be more cognizant of their custodial role. Essentially it is a problem of communication, in both directions. It is hoped that the information and proposals contained in these Alaska Wildlife Management Plans will be the basis of an improved mutual understanding and effective communication.

MT. MCKINLEY NATIONAL PARK WILDLIFE

LOCATION

Mt. McKinley National Park is located in the central Alaska Range about 180 miles north of Anchorage and 140 miles southwest of Fairbanks. The Park occupies portions of Game Management Units 13E, 16B, 19 and 20C.

THE SPECIES

The park contains a relatively high diversity and abundance of wildlife species of Interior Alaska. These include Dall sheep, caribou, moose, black and grizzly bears, lynx, foxes, marten, wolverine, beaver, wolves, snowshoe hares, muskrats, ptarmigan, ground squirrels, pikas, marmots, loons and numerous waterfowl, including trumpeter swans.

Dall sheep in Mt. McKinley Park have a recorded history of population fluctuations. The park population experienced drastic reductions in 1929 and 1932 as a result of unusually severe winters. Since then the population appears to have fluctuated about an average of 1,000 sheep.

The McKinley caribou herd ranges primarily on the north side of the Alaska Range in the vicinity of McKinley Park. The herd declined from about 20,000 to 30,000 in 1941 to approximately 10,000 by the early 1960's. Since 1966 a rapid decline has occurred and currently 1,000 to 1,500 caribou remain. The reasons for these declines are not known.

Moose were considered scarce in Mt. McKinley Park in the early 1920's. Moose populations gradually increased for the next 40 years, reaching greatest abundance in the early 1960's. Moose numbers have since gradually declined, but reasons for the decline are not known. A National Park survey in Mt. McKinley Park in 1975 indicated a minimum of 641 moose.

Mt. McKinley National Park was established in 1917. The Alaska Railroad made travel to the Park possible during the early 1920's. In 1922 only seven persons visited the Park. By 1956, 5,300 visitors logged, with most arriving by the Alaska Railroad and small aircraft. In 1957 the Denali Highway was opened making it possible to drive to the park, and 10,700 visitors were recorded. The Parks Highway was completed during 1971, greatly increasing park accessibility. Tourist activity occurs primarily during May through September.

Hiking, fishing, viewing and photographing wildlife and scenery are the primary human uses of the park. Although it is illegal to hunt within the park, a small but unknown amount of poaching occurs.

GLACIER BAY NATIONAL MONUMENT WILDLIFE

LOCATION

Glacier Bay National Monument is located approximately 55 miles northwest of Juneau. The Monument occupies portions of Game Management Units 1C, 1D, and 5.

THE SPECIES

Wildlife in the area include brown bears, black bears, (including the "glacier" or blue color phase of the black bear), lynx, wolves, coyotes, wolverines, mountain goats, Sitka deer, moose, hair seals, sea lions, killer and humpback whales and porpoises. The amount of habitat for big game species is limited. Eighty-five percent of the monument now consists of either glaciers or geological features which were left by retreating glaciers.

Large numbers of waterfowl frequent the inlets and islands including geese, cormorants, loons, gulls and terns, murrelets, guillemots, puffins and many ducks. Large flocks of sandhill cranes migrate through the monument in late spring. Shorelands are inhabited by a multitude of birds. Bald eagles, ptarmigan, grouse, crows and ravens are common residents.

Glacier Bay National Monument was established in 1925 by Presidential Proclamation to reserve its scientific and scenic values. Of special interest are accessible tidewater glaciers in a setting of lofty peaks, a variety of ecological stages showing vegetation development related to glacial retreat and opportunities for study of paleoecology and history. Visitors come to Glacier Bay National Monument between May and September. Half of them belong to tour groups sightseeing in Southeastern Alaska; a third are commercial fishermen, prospectors, and researchers; and the rest are local residents and yacht travelers from the "Lower 48." In 1966, there were 4900 visitors. In 1970, 37,000. These numbers will probably grow by at least 10 percent per year in the future.

KATMAI NATIONAL MONUMENT WILDLIFE

LOCATION

Katmai National Monument is located on the Alaska Peninsula in Game Management Unit 9 approximately 290 airmiles southwest of Anchorage.

THE SPECIES

An abundant brown bear population occurs within the Monument boundaries. Data are lacking on numbers present, but a denning survey conducted in May, 1974, located 107 dens within the Monument. There is free interchange of bears between the Monument and public lands outside its boundaries. Bears captured in Naknek have been observed travelling through Brooks Camp. Bears are subject to legal sport hunting when they travel outside the Monument. Except for the "defense of life and property" kills in the Naknek-King Salmon area, the level of harvest has been low.

Moose are locally abundant within the park, particularly in the headwaters of the King Salmon River and around Naknek Lake-Savonski River. A mid-winter survey in 1975 identified 1,097 moose in the Monument area. The moose population within the monument has been experiencing poor calf production, and is declining in numbers. Moose that spend a portion of their lives inside Katmai are important in providing the domestic needs of residents of Naknek, King Salmon and South Naknek. Prior to the 1964 extension of the Monument boundaries around the western end of Naknek Lake, this area provided the majority of the moose hunting for local residents.

Caribou occasionally range inside the Monument boundaries in the winter. Concentrations of up to 1,000 animals have been observed, but use to date has been only temporary. No resident animals exist and caribou are dependent upon the habitat outside the Monument.

Wolves are commonly observed in the Monument, but data on numbers are lacking. Moose provide the primary big game prey species for wolves. Other mammals present in the Monument are red foxes, lynx, wolverines, river otters, mink, weasels, beavers, arctic hares, and snowshoe hares. Several species of squirrels and small rodents are also present. Coastal waters abound with marine life. Sea lions, harbor seals and sea otters are often observed, as well as various species of whales and porpoises.

Whistling swans, ducks, loons, grebes, gulls, terns and shorebirds nest on the lakes and in marshes. Spruce grouse and ptarmigan occur in the upland areas. More than 40 species of song birds spend their summers at Katmai. Along the coast seabirds are abundant with several substantial rookeries of cormorants, murres, kittiwakes and puffins. Bald eagles nest in nearly all areas of the Monument except the rugged Aleutian Range itself. Surveys conducted in summer 1974 identified 57 active eagle nests in the Katmai area. Ospreys, falcons, hawks, and several species of owls also occur in the area.

Major eruptions have deposited ash in the Katmai area 10 times during the past 7,000 years. Today most volcanoes of Katmai are dormant;

however, the area may exhibit further volcanic activity as evidenced by the Augustine Island eruption in February, 1976. Plumes of smoke rising from Mt. Mageik, Mt. Martin, and Mt. Trident indicate the potential for new eruptions. An eruption bringing major change to Katmai could occur any time.

The resident wildlife species are used primarily as a nonhunted population for the enjoyment of tourists. Tourists are attracted to the region largely through package tours of the Monument offered by the concessionaire. As a result, nearly all visitor use occurs in the area of Brooks Camp - the Valley of Ten Thousand Smokes. Tourism presently contributes only a small part to the regional economy, especially in years of large salmon runs. Most tourist activity occurs between June 1 and September 15. Total visitation to the Monument has varied somewhat from year to year; however, from 1970 through 1973 about 10,000 tourists visited the Monument annually. The National Park Service projects an annual visitation to Katmai of 20-25,000 people by 1981.

Weather imposes certain constraints on access. Strong winds and sudden rain storms frequently sweep the area. The sky is clear only about 20 percent of the summer. Winter weather is more severe. Winter use of the Monument is low. Access by users is by amphibious or float aircraft during the summer. A concessionaire bus travels the road from Brooks River to the Valley of Ten Thousand Smokes. Foot trails and small boats are also available. Local residents of the area primarily enter the monument on the road from King Salmon and utilize small boats for transportation within the area. Recreational opportunities include sport fishing, camping, animal observation, and berry picking.

In the past the area at the western end of Naknek Lake was important to local residents as an area they hunted and trapped, but with the 1964 extension of Monument boundaries such use has been curtailed.

EKLUTNA LAKE WILDLIFE

LOCATION

In Game Management Unit 14C, the drainages into the Eklutna River and Eklutna Lake within Chugach State Park except for Thunderbird Creek and those drainages flowing into the East Fork of the Eklutna River upstream from the bridge above Eklutna Lake.

THE SPECIES

Moose, Dall sheep, black bear, mountain goat, brown bear, wolf, wolverine, coyote, fox, ptarmigan, grouse, snowshoe hare, lynx, and several other furbearers and unclassified game occur in the Eklutna area. Species population estimates are known only for moose, sheep and mountain goat. Approximately 150 moose, 150-200 sheep and 10-20 goats are presently found in the area. Small game, especially snowshoe hare during the high points in their population cycles, are very abundant. All other species are uncommon to rare excepting black bear and coyote which are commonly observed in the area.

Little is known of natural mortality factors of the various species although several reports of "winter killed" moose and predation of sheep by wolves have been received. Habitat conditions are excellent for sheep and hare and fair to good for other species. Very little habitat loss has occurred within the area. Several old homestead sites exist; however, these have enhanced habitat for such species as moose and snowshoe hare.

Prior to 1973, the area was open to hunting and trapping. Sheep and moose were the most popularly hunted big game species with an average of 10-12 of each species being harvested annually. Black bears, brown bears and mountain goats were also taken, but in small numbers. Small game hunting, especially for hare and grouse, was extremely popular. Trapping for wolverine, lynx, coyote, and other furbearers also occurred.

Since 1973 when the area was closed to all hunting and trapping the primary use has been viewing and photography of wildlife. Access for viewers is provided by the Eklutna road which extends over 20 miles up the valley. Many sheep and an occasional mountain goat can be seen from the road from late spring through early autumn. Moose can be seen throughout the year and black bears are occasionally observed during the summer and fall. Coyotes are frequently seen as are several small game species. Other species are rarely seen.

Motorized access within the area is permitted only on the Eklutna Road and by motorized boat on Eklutna Lake. Snowmachine use is also permitted on and in the vicinity of Eklutna Lake.

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparitively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Birdlife in Southeastern Alaska is diverse due to a variety of habitats available in the spruce-hemlock and alpine forests of the northern Pacific coast. Habitat variety is enhanced by the proximity of inshore and offshore waters and by the presence of a major mountain system. Upland passerine species common to the spruce-hemlock and associated shrub habitat include corvids, robins and thrushes, kinglets, warblers, siskins, juncos and sparrows. Typical alpine tundra breeders are savannah sparrows, lapland longspurs and water pipits. Coastal tidelands, bogs and marshes and numerous lakes and streams support herons, grebes, loons, kingfishers and swallows. Plovers, sandpipers, phalaropes and a variety of other shorebirds occupy the freshwater marshes, marine beaches and tidal flats. Though most species migrate south in fall, tens of thousands of shorebirds persist through the winter frequenting the rocky shores of the tidal areas. Several species of passerines frequent upland areas in winter, but some, most notably pine siskins, crossbills and redpolls, vary greatly in abundance from year to year. Permanent year-round residents include ravens, gray and Stellar's jays, crossbills, chickadees, juncos, gray-crowned rosy finches, pine grosbeaks, dippers and woodpeckers.

Besides those species which breed or reside there, Southeastern Alaska is visited annually by great numbers of migrants. The northward spring migration is most striking, resulting in the concentration of millions of birds along the north Pacific coast. Concentrations are enhanced because the migration period is telescoped in northern latitudes, with most birds passing through in five weeks or less. Many thousands of waterbirds frequent the Southeastern coastal waters as an extension of the Pacific Coast Flyway enroute to or returning from coastal or Arctic breeding grounds.

The major human uses of nongame birds are nonconsumptive. Birdwatching is a popular recreational activity enjoyed by thousands of Alaskans. Observation and photography of birds occurs primarily along roads and trails and near major communities. Travelers on the marine highway

system or on sea tours cruising the Southeastern Alaska coast have excellent opportunities to view many of the species associated with the coastal environment. In addition to direct use, many outdoor activities are enriched by the sight and song of birds. Scientific study of birds has provided much fascinating and valuable information on animal migrations, ecological relationships and evolutionary mechanisms.

SEABIRDS

Documented information on seabirds in Southeastern Alaska is scarce. Nesting colonies have been identified on Willoughby, Marble, Drake, St. Lazaria, Hazy, and Forrester Islands. Forrester Island has a nesting population of 350,000 birds including petrels, cormorants, murres, murrelets, guillemots, auklets, puffins, and gulls. Other known rookeries range in size from less than 1000 to 20,000 birds and each contains several of the above species. Additional seabird colonies on the western side of the Alexander Archipelago and up the coast to Icy Cape have not been surveyed. Leach's petrels are the most common known breeders, followed by horned puffins, common murres, ancient murrelets and rhinocerous auklets.

Some alcids, cormorants and many gulls winter in sheltered inside waters and on Continental Shelf waters. Birds that winter on off-shore waters include fulmars, petrels, murres, guillemots, puffins, murrelets, and auklets. Winter pelagic bird numbers are considerably lower than summer. Seabird numbers traditionally fluctuate. No data is available to indicate population trends of most seabirds in Southeastern Alaska; however, gull numbers appear to be increasing. During spring and fall migrations, millions of seabirds pass by Southeastern Alaska. Chief migrants are short-tailed and sooty shearwaters whose summer populations in the subarctic north Pacific approximate 50 million birds.

Nesting habits and habitat vary with species. Common murres and cormorants nest in colonies on steep rocky cliffs. Auklets, puffins, and storm petrels make nesting burrows in steep banks or hillsides. Guillemots and murrelets lay eggs in crevices and crannys among loose boulders, or in relatively open rocky situations close to shore. Gulls utilize a variety of nest sites including steep cliffs, and flat, open areas.

Most seabirds rely on the ocean for sustenance. In some instances seabirds compete directly with man for the fisheries resource. Some, such as scavenging gulls and fulmars, benefit from fisheries waste products. Seabirds are a dynamic part of marine food systems. Hundreds of thousands of tons of biological material are cycled through seabirds each year. Some of the smaller seabird species such as auklets or murrelets are important prey for the peregrine falcon which is often associated with seabird colonies. Many species fall prey to land based predators such as foxes and mustelids. Gulls are scavengers as well as predators on eggs and young of other marine birds, and are found in conjunction with most seabird colonies. Cassin's auklets consume a

soupy mixture of macroplanktonic euphasids and fish larvae. Pigeon guillemots prefer large blennies. Murres, murrelets, puffins and rhinocerous auklets all feed on small fish such as anchovy, sandlance, smelt, sea-bass, etc. Pigeon guillemots and marbled murrelets fish within a few hundred meters of shore, followed seaward by common murres, tufted puffins, rhinocerous auklets, and Cassin's auklet. Birds that feed farthest out at sea tend to be burrow nesters that return to their nest at twilight or after dark. Storm petrels are burrow nesters and nocturnal feeders on plankton, crustaceans and small fish.

Human consumptive use of seabirds has been minimal in Southeastern Alaska. Nonconsumptive use in the form of viewing and photography is increasing. Some of the known pelagic bird colonies in the region are administered as refuges by the U.S. Fish and Wildlife Service. Visitor access to refuges is not limited, but the areas must be maintained in an undisturbed state.

Access to as yet uncatalogued colonies on the Gulf of Alaska side of the Alexander Archipelago is restricted by weather and hazardous sea conditions. Use of these colonies will probably remain minimal. Ultimately seabirds may provide valuable data as biological indicators of marine habitat degradation.

RAPTORS

Raptors* which occur in Southeastern Alaska include bald and golden eagles, osprey, red-tailed, and rough-legged hawks, marsh hawk, goshawk, and sharp-shinned hawk, peregrine falcon, merlin, and kestrel, and the great-horned, great-grey, snowy, hawk, boreal, pygmy, saw-whet, screech, long-eared and short-eared owls. With the exception of eagles and goshawks the diurnal birds of prey are only summer residents of the region. With two exceptions, owls are Southeastern residents throughout the year. The snowy owl infrequently winters in the region, while the short-eared owl is a summer resident. The long-eared owl only occurs as a rare visitor to this region. Migration times vary among species and seasonal weather patterns, but summer residents generally arrive in early April and leave during September or October.

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. These variations are thought to occur in response to changes in prey abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the peregrine falcon, migratory species occurring in Southeastern Alaska are currently at moderate levels of abundance.

Breeding populations of bald eagles and ospreys, endangered or threatened in eastern and southern North America, do not appear reduced in Southeastern Alaska at this time. The abundance of two subspecies of peregrine falcon has declined in much of its Alaska range over the last 20 years. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of marked declines in other portions of the continent, any habitat supporting a breeding population is critical.

* A list of raptor species considered in these plans follows this regional account.

All habitat types in the region are utilized by raptors during the breeding season. Raptors range widely in hunting activity, using a combination of vegetation types as foraging habitat during the nesting season. Nevertheless, the various species display marked preferences for particular types of nest sites. Ospreys and bald eagles select lowland old growth forests along rivers or lakes and along coastal waters as nesting habitat. Golden eagles, and rough-legged hawks prefer to nest on cliffs. The other buteos, the accipiters, merlins, kestrels and owls (with the exception of the short-eared owl), are principally tree-nesters, and are found throughout Southeastern forests. The peregrine falcon nests on cliffs typically in the vicinity of seabird colonies. The marsh hawk and short-eared owl are the only consistent ground-nesters in the Southeastern Region. Both of these species select open areas for nesting. Resident raptors range widely over all major habitat types during the winter in search of food.

The habitat changes that have occured to date in Southeastern Alaska apparently have not significantly influenced raptor abundance. Raptors do not have high reproductive potentials and, like other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance depends primarily on the abundance and condition of the prey populations. The diet of raptors as a group in Southeastern Alaska varies seasonally and encompasses a wide array of species including birds, mammals, fish and insects. Not only are the abundance and distribution of these prey species important, but diseases or harmful residues carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmittable to raptors. Residues from pesticides have been cited as the primary factor responsible for declines in peregrine falcon numbers, not only in Alaska, but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have affected populations of these species. Findings presently available indicate that residues are not significantly affecting resident populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included Alaska residents, nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase in the future.

SMALL MAMMALS

Small mammal*** populations are found throughout Southeastern Alaska; however, distribution of certain species is disjunct, reflecting the insular nature of much of this region. About 20 species are found including the introduced house mouse and rat, both associated with human habitation. Of the indigenous species, common and dusky shrews, deer

*** A list of small mammal species considered in these plans follows this regional account.

mouse, and long-tailed vole are distributed most widely in the region. Four additional species of vole occur in the region but are limited primarily to the mainland. One species, the Coronation Island vole, is found only on several small islands in this area.

The masked, vagrant, water, and Glacier Bay water shrews inhabit portions of the Southeastern Region in varied patterns of distribution. Other small mammals include six species of bats, pikas, and the meadow jumping mouse. Bats and deer mice are found over most of the region while pikas and meadow jumping mice are found only in the northern mainland portions of the region. The northern bog lemming is the only lemming occuring in Southeastern Alaska. Its range includes Admiralty Island and the mainland south of Juneau.

Habitat requirements are as varied as the number of species found in this group. Species such as the pika, which require higher altitude rock and talus slopes, or the northern bog lemming, which is limited to wet tundra and sphagnum bogs, are rather narrow in their habitat requirements. Others such as the common shrew or meadow jumping mouse are adapted to a variety of habitats such as marshy, grassy, or forested areas.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. The voles and in particular are noted for the rhythmic fluctuations in numbers, generally with 3 to 4 years between peaks.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers and many raptors utilize rodents as food and when populations of these small mammals are high they form a significiant part of the summer diet of wolves and bears.

LIST OF RAPTOR SPECIES IN SOUTHEASTERN ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharpshinned Hawk	*Accipiter striatus*
	Redtailed Hawk	*Buteo jamaicensus*
	Harlan's Hawk	*Buteo harlani*
	Roughlegged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*
Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
	Kestrel (Sparrow Hawk)	*Falco sparverius*

Owls	Screech Owl	*Otus asio*
	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Pygmy Owl	*Glaucidium gnoma*
	Great Gray Owl	*Strix nebulosa*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*
	Saw-whet Owl	*Aegolius acadica*

LIST OF SMALL MAMMALS IN SOUTHEASTERN ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Dusky Shrew	*Sorex obscurus*
	Northern Water Shrew	*Sorex palustris*
	Pygmy Shrew	*Microsorex hoyi*
Bats	Keen's Bat	*Myotis keeni*
	Big Brown Bat	*Eptesicus fuscus*
Pikas	Pika	*Ochotona collaris*
Rodents	Deer Mouse	*Peromyscus maniculatus*
	Bog Lemming	*Synaptomys borealis*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Long-tailed Vole	*Microtus longicaudis*
	Tundra Vole	*Microtus oeconomus*
	House Mouse	*Mus musculus*
	Meadow Jumping Mouse	*Zapus hudsonius*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparitively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Southcentral Alaska shares many nongame bird species with Southeastern Alaska but is somewhat less diverse, perhaps because the climate in Southcentral is not as subject to maritime infulences. Most bird use in the area is seasonal, with 60 to 70 species recorded as resident breeders. About 25 species are winter residents, including 20 that reside year-round in the region. Common summer birds typical of upland spruce-birch forests and associated shrub thickets include yellow, Wilson's and myrtle warblers; golden-crowned, Lincoln's, Savannah, white-crowned and fox sparrows; and robins and thrushes. Alpine tundra in the interior and at higher elevations along the coast support longspurs, horned larks, upland and golden plovers, gray-crowned rosy finches and savannah sparrows. Three species of swallows, kingfishers, dippers, sandpipers and other shorebirds, and loons and grebes nest and feed in association with the thousands of ponds, lakes, marshes and streams found in Southcentral Alaska. The most common permanent residents are ravens, gray jays, redpolls and woodpeckers.

In addition to the resident species, millions of migrants pass through the region and adjacent waters in spring and fall moving to and from Arctic and Western Alaska breeding areas. Many thousands of birds utilize the Copper and Susitna River systems as northward extensions of the Pacific Flyway. During May, thrushes, warblers and sparrows are especially abundant and occur in such numbers during migration that they are common in a wide variety of habitats, from alpine to seacoasts. The Northern Gulf of Alaska and Prince William Sound is a staging area for tremendous numbers of migrating waterbirds. Densities in excess of 250,000 shorebirds per square mile were counted in the tidal flats of the Copper River Delta in May, 1964.

The major human uses of nongame birds in Southcentral Alaska are viewing and photography, often in association with other recreational pursuits. Birdwatching is growing in popularity and there is an increasing membership in organizations devoted primarily to such interests in the Anchorage

area. The number of people erecting winter bird feeders and bird houses also seems to be on the rise. Observation and photography of birds takes place primarily along established roads and trails and near or within major communities of the area. In addition to direct use, practically all outdoor activities are enhanced by the sight and song of small nongame birds. Scientific study of birds has provided much fascinating and valuable information, for lay people as well as scientists, on animal migrations, ecological relationships and evolutionary mechanisms.

SEABIRDS

The Southcentral coastal and marine environments provide a diversity of habitats which support a variety of seabird species. The numerous islands and fjord lands of the southern and eastern coasts of the Kenai Peninsula and similar areas of Prince William Sound contain the major nesting colonies of seabirds in this region. The alcid family is represented by several species of auklets, murrelets, murres, puffins and one species of guillemot. Several species of gulls and terns and one species of kittiwake, members of the family Laridae, are present in suitable habitat. Double-crested and pelagic cormorants are less numerous but are distributed throughout the region. Glaucous-winged gulls, arctic terns and marbled murrelets are the most abundant species nesting in the region. Gulls and terns number in the hundreds of thousands while the marbled murrelet may exceed one million birds. Breeding and non-breeding populations of murres probably number in the hundreds of thousands, while several million shearwaters use outer continental shelf waters in summer months. An occassional endangered short-tailed albatross appears in offshore waters in the summer.

Nesting habitat requirements vary between species, ranging from burrow nests in fine loam soil to rock ledges on sea cliffs. Burrow nesters include auklets and puffins of the alcid family. Nesting by these species is limited to areas of suitable soil conditions, generally on less steep slopes and flat ground. Such nest site locations, being readily accessible, predispose these species to potential disturbance and predation. Therefore, burrow nesting colonies have developed on areas, such as islands, not subject to these factors. However, various human activities have introduced predators to some islands in the region and reduction or elimination of burrow nesting species on these islands has resulted. Other species such as the guillemot are crevice and hole nesters while the common murre and several species of cormorant are conspicuous inhabitants of precipitous cliffs. Many of the gulls and several alcids utilize a variety of nesting sites from gravel beaches to bare rock.

The bulk of seabirds rely on the ocean for sustenance. Food items range from euphasids, fish larvae and other plankton to squids, smelt, capelin, cod, blennies, and immature salmonids. Gulls are scavengers and also prey on eggs and nestlings of other seabirds and on small mammals. In many instances seabirds compete directly with man for fisheries resources. Some, such as scavenging gulls and fulmars, benefit from fisheries waste products. Seabirds are a dynamic part of marine food systems. Hundreds

of thousands of tons of biological material are cycled through seabirds each year. Some of the smaller seabird species such as auklets or murrelets are important prey for the peregrine falcon which is often associated with seabird colonies. Many species fall prey to land based predators such as foxes and mustelids.

Historically seabirds in Southcentral Alaska have not been subjected to extensive consumptive use. Current nonconsumptive use by viewers and photographers appears to be on the increase as Alaska's human population grows and access improves. Ultimately seabirds may provide valuable data as biological indicators of marine habitat degradation.

RAPTORS

Raptors* which occur in Southcentral Alaska include the bald and golden eagles, osprey, red-tailed, Harlan's, rough-legged and Swainson's hawks, marsh hawk, goshawk, sharp-shinned hawk, peregrine falcon, merlin, kestrel, and the great-horned, great-grey, snowy, hawk, boreal and short-eared owls. Except for goshawks and gyrfalcons, and some eagles the diurnal birds of prey are only summer residents of Southcentral Alaska. With two exceptions, the owls are residents in the region throughout the year. The snowy owl infrequently winters in the region, while the short-eared owl is a summer resident of this region. Migration times vary among species and with seasonal weather patterns, but summer residents generally arrive in April and leave during September.

Resident raptor populations currently appear to be at moderate densities, although marked fluctuations in abundance occur over time. These variations are thought to occur in response to changes in prey abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered peregrine falcon, migratory species occurring in Southcentral are at moderate levels of abundance. Breeding populations of bald eagles and ospreys, endangered or threatened in eastern and southern North America, do not appear seriously low at this time in Southcentral Alaska. Important bald eagle nesting populations occur in Prince William Sound with smaller concentrations found on several of the major river systems of the region. Numbers of two subspecies of peregrine falcons have declined in much of Alaska over the last 20 years. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of world-wide declines in peregrine populations any favorable nesting habitat supporting a breeding population is critical even if such habitats are not extensive.

Most habitat types in the region are utilized by raptors during the breeding season. As a group, raptors range widely in hunting activity, using a combination of vegetation types as foraging habitat during the nesting season. Nevertheless, the various species display marked preferences for particular types of nesting sites. Ospreys and bald eagles select lowland forests along river or lake systems or along the coast as nesting habitat. Golden eagles, gyrfalcons and rough-legged hawks prefer to nest on cliffs. The other buteos, the accipiters, merlins, kestrels and

* A list of raptor species considered in these plans follows this regional account.

owls, except for the short-eared owl, are principally tree-nesters, and are found throughout forested regions. Of these species, goshawks display marked preference for hardwood forests, while kestrels utilize cavities in trees as nest sites. The peregrine falcon nests on cliffs along major river systems or in coastal areas usually associated with seabird nesting colonies. The marsh hawk and short-eared owl are the only consistent ground-nesters in the Southcentral Region. Both of these species select open areas for nesting, but unlike marsh hawks, nesting short-eared owls occur in tundra and forested habitats. Except for gyrfalcons which remain in alpine areas throughout the year, resident raptors range widely over most major habitat types during the winter in search of food. To date, human-caused habitat changes that have occurred in Southcentral have not significantly influenced raptor abundance.

Raptors do not have high reproductive potentials and, like many other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance hinges primarily on the abundance and condition of the prey populations. The diet of raptors as a group in Southcentral Alaska varies seasonally and encompasses a wide array of species including birds, mammals, fish and insects. The abundance and distribution of these prey species are important, and diseases or harmful residues carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmissible to raptors. Pesticide residues have been cited as the primary factor responsible for declines in peregrine falcon numbers throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have seriously depressed populations of these species. Findings presently available indicate that residues are not significantly affecting resident populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included Alaska residents, nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase.

SMALL MAMMALS

About 16 species of small mammals*** are found in Southcentral Alaska. The house mouse and rat are both introduced species associated with human habitations. A relatively large percentage of the indigenous species including the common shrew, dusky shrew, brown lemming, red-backed vole, tundra vole and meadow jumping mouse are distributed throughout the region. The northern bog lemming and the little brown bat have extensive though not complete distributions in this area. Water, arctic and pygmy shrews are found in the region, but their ranges are restricted. The Alaska vole and meadow vole also occur in Southcentral Alaska. The meadow vole occupies a wide range of habitats while the Alaska vole is

*** A list of small mammal species considered in these plans follows this regional account.

limited to tundra areas above timberline. Other species include the silver-haired bat and the collared pika. Ranges of these species are restricted, the former being found only in some areas of Prince William Sound. The collared pika is found in mountain habitats.

Habitat requirements are as varied as the number of species found in this group. Species such as the pika, which requires high altitude rock and talus slopes, or the northern bog lemming, which is limited to wet tundra and sphagnum bogs, are rather narrow in their habitat requirements. Others such as the common shrew or meadow jumping mouse are adapted to a variety of habitats such as marshy, grassy, or forested areas.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. Voles and lemmings in particular are noted for rhythmic fluctuations in numbers generally with 3 to 4 years between peaks. Slow-growing vegetation in alpine habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents for food and when populations of these small mammals are high they form a significant part of the summer diet of foxes, coyotes, wolves, and bears. Avian predators such as jaegers and many raptors utilize rodents.

LIST OF RAPTOR SPECIES IN SOUTHCENTRAL ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharp-shinned Hawk	*Accipiter striatus*
	Redtailed Hawk	*Buteo jamaicensus*
	Swainson's Hawk	*Buteo swainsoni*
	Rough-legged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*
Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
	Kestrel (Sparrow Hawk)	*Falco sparverius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*

LIST OF SMALL MAMMALS IN SOUTHCENTRAL ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Tundra Shrew	*Sorex tundrensis*
	Dusky Shrew	*Sorex obscurus*
	Northern Water Shrew	*Sorex palustris*
	Pygmy Shrew	*Microsorex hoyi*
Bats	Little Brown Bat	*Myotis lucifugus*
Pikas	Pika	*Ochotona collaris*
Rodents	Bog Lemming	*Synaptomys borealis*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Long-tailed Vole	*Microtus longicaudis*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Meadow Jumping Mouse	*Zapus hudsonius*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparitively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in the state.

Southwestern Alaska consists of a vegetational mosaic of bird habitats composed of markedly different plant communities with abrupt transitions into neighboring types. The Alaska Peninsula and the Aleutians are particularly distinctive for it is here that the rich, moist, spruce-hemlock and spruce-birch forests of Southcentral and Southeastern Alaska end. The generally low elevation of the Aleutian Range on the Alaska Peninsula permits an intrusion of plant species which attract some associated birds typical of interior Alaska, but the base of the Peninsula remains an abrupt transition area in bird distribution. Many abundant "mainland" species, particularly the smaller passerines, extend their range only a short distance onto the Peninsula. Although the interior portion of the region shares many species with Southcentral and even Southeastern Alaska, the Alaska Peninsula has relatively few species in common and also supports few distinctive nongame bird species of its own.

As with the rest of coastal Alaska, bird species diversity and abundance show dramatic increases during the spring and fall migration periods; many waterbirds heading for the Kuskokwim and Yukon River Deltas traverse Southwestern Alaska. Of the estimated 60 nongame bird species that occur in Southwestern Alaska, about 40 are summer residents and 20 are present year-round. The diverse wetlands habitat on the Alaska Peninsula is used heavily by breeding shorebirds, especially greater yellowlegs, least sandpipers and semipalmated plovers. Winter residents of the Peninsula that do not venture inland are mainly waterbirds such as oystercatchers and rock sandpipers. Magpies, gray jays, crossbills, pine grosbeaks, chickadees and woodpeckers are fairly common in the Lake Clark region in winter but are rare south of Lake Iliamna. Species common in winter to both the Peninsula and the interior of Southwestern Alaska are limited to snow buntings, two species of redpolls, ravens, dippers and northern shrikes.

Human uses of nongame birds in Southwestern Alaska are limited, partly because the human population is sparse, and because the most avid bird

viewers and photographers generally come from distant urban areas. There are no large communities in Southwestern Alaska. Local residents derive considerable enjoyment from the presence of nongame birds.

SEABIRDS

The Aleutians, Pribilofs, Semidis, and other island groups together with the long coastline of mainland Southwestern Alaska support seabird populations of greater variety and abundance than any location of comparable area in North America. Approximately 40 species of seabirds representing the families Diomedeidae, Procellariidae, Hydrobatidae, Phalacrocoracidae, Stercorariidae, Laridae, and Alcidae occur as breeding residents, seasonal residents, or migrants in Southwestern Alaska during the course of a year. Representatives of six of the seven families breed in the region; the exception, Diomedeidae, including the rare short-tailed albatross, summer in Alaskan waters but breed on islands in the mid-Pacific.

The Aleutians harbor enormous colonies of common and thick-billed murres, tufted and horned puffins, and pelagic cormorants. This area is the primary breeding ground for two species of kittiwakes, Pacific fulmars, and red-faced cormorants. Eight species of auklets and murrelets occur in the Aleutians with five species limited to or reaching their greatest abundance in this area.

The Pacific side of the Alaska Peninsula harbors seabird colonies along its entire extent. A colony on Aghiyak Island in the Semidi group contains approximately 1,000,000 murres, kittiwakes, and fulmars. The Barren Islands, midway between the tip of the Kenai Peninsula and the Kodiak Archipelago, support an estimated 500,000 breeding seabirds annually.

Although much of the north side of the Alaska Peninsula is not generally suitable for nesting seabirds, rookeries are present on Amak and Unimak Islands and Cape Seniavin. The cliffs of Cape Newenham, with major colonies of murres, kittiwakes, puffins and cormorants, is one of the largest rookeries in the North Pacific and Bering Sea region. Other large rookeries are present on the nearby Walrus Islands.

The rugged coasts and numerous islands and islets of Southwestern Alaska provide a variety of nesting habitats. Most seabirds are colonial nesters, with colony size apparently related to inaccessibility of the site. Steep cliffs and isolated islets devoid of mammalian predators generally support the largest and most conspicuous colonies. Colony size and location may also be a function of the distance that adults have to forage. Species that are pelagic feeders generally have larger colonies and place their eggs in burrows or crevices. Inshore foragers have smaller and more ubiquitous colonies in more exposed sites. Cliff-nesting species include the cormorants, kittiwakes, glaucous-winged gulls, fulmars, guillemots, and some alcids. Petrels, puffins, and some murrelets and auklets nest in burrows on relatively open terrain or in crevices or fissures on cliff faces. Common murres generally nest on cliff ledges but also form colonies on exposed ground on islands.

Seabirds can be grouped into two broad categories, pelagic (offshore) and neritic (nearshore), depending on the distance from land they forage. Both groups feed primarily on animal foods, especially small fish, crustaceans, and mollusks.

Seabird species diversity is maintained by variations in food preferences, nesting habitat requirements, timing of breeding seasons, and foraging zones at sea. Most pelagic and some neritic species feed on organisms near or at the water surface. Other neritic species may forage at the sea floor. Gulls, petrels, and fulmars are also scavengers. Some gulls and particularly jaegers specialize in robbing other species of their prey, and are also predators on eggs and nestlings of other seabirds. Albatrosses, most procellarids, storm petrels, and alcids are typically pelagic feeders. Cormorants, jaegers, some petrels, and the larids concentrate in the nearshore environment.

RAPTORS

Raptors* which occur in Southwestern Alaska include the bald and golden eagles, osprey, rough-legged and red-tailed hawks, marsh hawk, goshawk, sharpshinned hawk, gyrfalcon, peregrine falcon, merlin, kestrel, and the great horned, snowy, hawk, short-eared and boreal owls. Goshawks and sharpshinned hawks are not widely distributed in this region. The Steller's and white-tailed sea eagles have been recorded in this region but are rare visitors. The diurnal birds of prey are principally summer residents with the exception of the gyrfalcon and goshawk. The owls of Southwestern Alaska are resident except for the short-eared owl and, in some years, the snowy owl. Migration times vary among species and seasonal weather patterns, but summer residents generally arrive in the region in April and leave in early fall.

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. These variations are thought to occur in response to changes in prey abundance. Although comparative data from earlier periods are not available, general observations suggest that in the mid 1970's migratory species were at moderate levels of abundance. Breeding populations of bald eagles, peregrine falcons, and ospreys, endangered or threatened in eastern and southern North America, do not appear seriously low at this time in Southwestern Alaska. The Aleutian Islands provide one of the highest concentrations of peregrine falcons in North America.

Most habitat types in Southwestern Alaska are used by raptors during the breeding season. As a group, raptors range widely in hunting activity, using a combination of vegetation types as foraging habitat during the nesting season. Nevertheless, the various species display marked preferences for particular types of nesting sites. Ospreys and bald eagles select lowland forests along river or lake systems as nesting habitat although some eagles nest on sea cliffs and rock outcrops on the Alaska Peninsula and Aleutian Islands. Golden eagles, gyrfalcons and rough-legged hawks prefer to nest on cliffs. Other buteos, accipters, merlins, kestrels

* A list of raptor species considered in these plans follows this regional account.

and owls, except for the short-eared owl, are principally tree-nesters, and are found throughout forested areas. Of these species, goshawks display a marked preference for hardwood stands, while kestrels utilize cavities in trees as nest sites. The peregrine falcon is commonly associated with sea bird colonies in this region and can be found nesting on adjacent cliffs. The marsh hawk and short-eared owl are the only consistent ground-nesters in the region. Both of these species select open areas for nesting, but unlike marsh hawks, nesting short-eared owls occur in tundra and forested habitats. Except for gyrfalcons which remain in alpine areas throughout the year, resident raptors range widely over all major habitat types during the winter in search of food. The minor human-caused habitat changes that have occurred to date in the Southwestern Region have not significantly influenced raptor abundance.

Raptors do not have high reproductive potentials and, like many other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance hinges primarily on the abundance and condition of the prey populations. The diet of raptors in Southwestern Alaska varies seasonally and encompasses a wide array of species of birds, mammals, fish and insects. The abundance and distribution of these prey species are important, and diseases or harmful chemical residues carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmissible to raptors. Pesticide residues have been cited as the primary factor responsible for declines in peregrine falcon numbers not only in Alaska but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have seriously depressed populations of these species. Findings presently available indicate that residues are not significantly affecting resident populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks, gyrfalcons and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past, and has included Alaska residents, nonresidents, and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase.

SMALL MAMMALS

About 18 species of small mammals*** are found in Southwestern Alaska. The house mouse and rat are both introduced species associated with human habitations. Of the indigenous species, the common and dusky shrew, brown lemming, red-backed and tundra voles and the meadow jumping mouse are distributed throughout the mainland portion of this region. Of these species only the tundra vole is found on Kodiak Island. Five additional species of shrews are found in this region but are very limited in distribution. The Unalaska shrew is found only on Unalaska Island; the Pribilof Island shrew is found only on the Pribilof Islands; the tundra shrew occurs in the drainages of Bristol Bay; the pygmy shrew

*** A list of small mammal species considered in these plans follows this regional account.

is known only from the upper drainages of the Nushagak River; and the northern water shrew is known only from the vicinity of Lake Iliamna.

Three species of lemmings inhabit mainland Southwestern Alaska: the brown, northern bog and collared lemmings. The brown lemming occurs in all mainland areas of the region. The collared lemming is found on the Alaskan Peninsula and lower basin of Bristol Bay while the northern bog lemming is found in the upper drainages of Bristol Bay north of Lake Iliamna. Their distributions overlap little in this region. A fourth species, the black-footed lemming, is found only on St. George Island of the Pribilof group.

Other small mammals include the little brown bat, the only bat occurring in this region, the meadow vole, found only in the Nushagak River drainage, and the collared pika, found in suitable alpine habitat in the southern extension of the Alaska Range.

Habitat requirements are as varied as the number of species found in this group. Species such as the pika, which requires higher altitude rock and talus slopes, or the northern bog lemming, which is limited to wet tundra and sphagnum bogs are rather narrow in their habitat requirements. Others such as the common shrew or meadow jumping mouse are adapted to a variety of habitats such as marshy, grassy, or forested areas.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. Voles and lemmings in particular are noted for rhythmic fluctuations in numbers, generally with 3 to 4 years between peaks. Slow-growing vegetation in alpine or tundra habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents for food and when populations of these small mammals are high they form a significant part of the summer diet of foxes, wolves, and bears. Avian predators such as jaegers and many raptors utilize rodents.

LIST OF RAPTOR SPECIES IN SOUTHWESTERN ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharpshinned Hawk	*Accipiter striatus*
	Redtailed Hawk	*Buteo jamaicensus*
	Rough-legged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*

Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*

LIST OF SMALL MAMMALS IN SOUTHWESTERN ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Dusky Shrew	*Sorex obscurus*
	Pygmy Shrew	*Microsorex hoyi*
Bats	Little Brown Bat	*Myotis lucifugus*
Pikas	Pika	*Ochotona collaris*
Rodents	Collared Lemming	*Dicrostonyx groenlandicus*
	Bog Lemming	*Synaptomys borealis*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Meadow Jumping Mouse	*Zapus hudsonius*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparatively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Western Alaska can be divided into two general physiographic regions: the spruce-birch forest of the interior and the sedge dominated wetlands of the Yukon-Kuskokwim Delta. Between 55 and 60 species of nongame birds breed in the region, of which about 12 are year-round residents. More than 25 species of shorebirds, dippers, swallows, loons and grebes breed along the coastline and in the lakes, streams and marshes of the Yukon-Kuskokwim Delta. Passerines associated with deciduous, streamside thickets (primarily willow and alder) include the tree sparrow, Wilson's and yellow warblers and yellow wagtail. The interior spruce-birch forests and forest edges support a variety of sparrows and warblers. Typical species are the fox sparrow, slate-colored junco and black-polled and myrtle warblers. Common bird species of the Western Alaska tundra are the snow bunting, savannah sparrow, lapland longspur, common snipe and upland and golden plovers. The most conspicuous year-round residents are ravens, gray jays, redpolls, pine grosbeaks and three species of woodpeckers, most of these are associated with the spruce-birch forest or its margins.

In addition to the resident nongame bird species, thousands of migrating birds annually visit Western Alaska. Great flocks of waterfowl originating from the Central, Mississippi and Atlantic Coast Flyways course the Yukon Valley enroute to or returning from coastal breeding grounds. Many Pacific Flyway species that nest in the Alaskan and Canadian Arctic enter the lower Yukon system enroute to the North Slope.

The variety of species of nongame birds found in this region occupy a complex mosaic of feeding and habitat niches, ranging from seed-eating forest-dwellers to mud-probing shorebirds of the Delta. These species provide a variable prey base for numerous falcons, owls and other raptors that occur in this region.

Humans make little use of nongame birds in Western Alaska. However, species that breed in this region winter in other areas of Alaska as well as in other states and countries. While little direct recreational enjoyment by humans occurs in Western Alaska, extensive observation and

photography of these species occurs in other areas in other seasons. In addition to direct use, many outdoor activities are esthetically enriched by the sight and sound of birds.

SEABIRDS

The islands and coastal areas of Western Alaska host large breeding populations of seabirds. Adjacent fertile waters of the eastern Bering Sea support an estimated winter seabird density of 117 seabirds per square mile, with higher numbers in the summer. Many of the birds found offshore are non-breeding shearwaters and immature birds of other pelagic species.

High quality seabird nesting habitat is available in the region. Bering Sea islands generally provide the steep cliffs and vegetated seaside slopes required by cormorants, fulmars, kittiwakes, murres, and alcids. The alluvial plains of the Yukon-Kuskokwim delta contain excellent breeding habitat for gulls and terns, and support some breeding puffins. Three nesting areas Cape Newenham, Yukon-Kuskokwim delta, and Nunivak Island, each support over 1 million seabirds. Three others, St. Mathew, Hall and Pinnacle Islands, support an estimated 100,000 to 1 million seabirds. Principal nesting seabirds include cormorants, fulmars, gulls, kittiwakes, murres, guillemots, auklets, and puffins. The largest northern fulmar colony in Alaska extends more than 5 miles along the cliffs of St. Matthew Island.

Accurate population data is lacking, but some trends have been noted. Scavengers such as gulls and fulmars appear to be increasing, probably as a result of supplemental food provided by large scale fishing operations. Local abundance of seabirds apparently depends on proximity of nesting grounds and location of preferred food sources.

Nunivak Island, Saint Matthew Island, and the associated Hall and Pinnacle Islands are federal wildlife refuges, as is 2,900 square miles of the Yukon-Kuskokwim Delta area. Maintenance of these important breeding areas as refuges will ensure protection of seabirds from excessive human disturbance during the nesting season.

Most seabirds rely on the ocean for sustenance. Food items range from euphasids, fish larvae and other plankton to squids, smelt, capelin, cod, blennies, and immature salmonids. Gulls and jaegers are scavengers and also prey on eggs and nestlings of other seabirds and on small mammals. In many instances seabirds compete directly with man for the fisheries resource. Some, such as scavenging gulls and fulmars, benefit from fisheries waste products. Seabirds are a dynamic part of marine food systems. Hundreds of thousands of tons of biological material are cycled through seabirds each year. Some of the smaller seabird species such as auklets or murrelets are important prey for the peregrine falcon which is often associated with seabird colonies. Many species fall prey to land based predators such as foxes and mustelids.

Human use of seabirds in Western Alaska consists of local domestic consumption of eggs, and some adult auklets. Gathering seabird eggs in spring is practiced primarily on Nunivak Island and the Yukon-Kuskokwim Delta. Some birds fall prey to indiscriminate shooting. Use of seabirds for viewing and photography is increasing.

RAPTORS

Raptors* which occur in Western Alaska include the bald and golden eagles, osprey, rough-legged hawk, marsh hawk, goshawk, sharp-shinned hawk, gyrfalcon, peregrine falcon, merlin, kestrel, and the great horned, great grey, snowy, hawk, boreal and short-eared owls. Red-tailed and Swainson's hawks may nest, to a limited extent, in the eastern portion of this region. With the exception of the goshawk, gyrfalcon, and a small number of eagles, the remaining diurnal birds of prey are only summer residents of the Western region. With two exceptions, owls are residents throughout the year. The snowy owl winters in portions of the Western area while the short-eared owl is a summer resident of this region. Migration times vary among species and with seasonal weather patterns, but summer residents generally arrive in Western Alaska in April and leave during September.

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. These variations are thought to occur in response to changes in prey abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered peregrine falcon, migratory species occurring in Western Alaska are currently at moderate levels of abundance. Breeding populations of bald eagles and ospreys, endangered or threatened in eastern and southern North America, nest in moderately high densities along the Kuskokwim and its tributaries in Western Alaska.

Numbers of two subspecies of Peregrine falcons have declined throughout the state during the last 20 years. This decline has coincided with documented declines of this species throughout the world as a result of chemical contamination. Peregrines are known to nest in limited numbers along the Kuskokwim and Hoholitna Rivers of Western Alaska, and they probably breed in other drainages of this region. Because of marked declines in other portions of the continent, peregrine populations that exist in Western Alaska are of key importance.

All habitat types in Western Alaska are utilized by raptors during the breeding season. Raptors range widely in hunting activities using a combination of vegetation types as foraging habitat during the nesting season. However, the various species display marked preferences for particular types of nesting sites. Ospreys and bald eagles select lowland forests along river or lake systems as nesting habitat. Golden eagles, gyrfalcons and rough-legged hawks prefer to nest on cliffs. The other buteos, the accipiters, merlins, kestrels and owls (with the exception of the short-eared owl), are primarily tree-nesters, and are found throughout forested regions. Of these species, goshawks display a

* A list of raptor species considered in these plans follows this regional plan.

marked preference for hardwood forests, while kestrels utilize cavities in trees as nest sites. The peregrine falcon nests on cliffs along major river systems. The marsh hawk and short-eared owl are the only consistent ground-nesters in the Western region. Both of these species select open areas for nesting, but unlike marsh hawks, short-eared owls nest in tundra and forested habitats. Except for gyrfalcons which remain in alpine areas throughout the year, resident raptors range widely over all major habitat types during the winter in search of food. The habitat changes that have occurred to date in the Western region have not significantly influenced raptor abundance.

Raptors do not have high reproductive potentials and, like other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance depends primarily on the abundance and conditions of prey populations. The diet of raptors as a group in Interior Alaska varies seasonally and encompasses a wide array of species including insects, fish, birds and mammals. Not only are the abundance and distribution of these prey species important, but diseases or harmful residues carried by these species are a prime concern. Many of the common diseases carried by domestic fowl and wild gallinaceous birds are known to be transmitted to raptors. Residues from pesticides have been cited as the primary factor responsible for declines in peregrine falcon numbers, not only in Alaska, but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic residues have seriously depressed populations of these species. Findings presently available indicate that residues are not significantly affecting resident populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks, gyrfalcons and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included residents, nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase in the future.

SMALL MAMMALS

About 15 species of small mammals*** are found in Western Alaska. The house mouse and rat are both introduced species associated with human habitations. Of the indigenous species, the tundra vole, the northern red-backed vole, the common, tundra and dusky shrews and the brown lemming are distributed throughout the mainland portion of the region. Of these only the common shrew and the brown lemming are found on Nunivak Island. Three additional species of voles also occur in the Western Region. The meadow vole is widely distributed while the St. Matthew Island vole is restricted to

*** A list of small mammal species considered in these plans follows this regional account.

Hall and St. Matthew Islands. The yellow-cheeked vole is found only in the upper drainages of the Kuskokwim River.

Three species of lemmings inhabit the region. These are the brown, northern bog and collared lemmings. Brown lemmings are found in all areas except St. Matthew Island. The northern bog lemming is found primarily south of the Yukon River but upstream from the Delta, while the collared lemming occupies areas to the west, principally the Yukon-Kuskokwim Delta.

Other small mammals include the meadow jumping mouse, the pygmy shrew and the region's only species of bat, the little brown bat. The latter ranges on the Yukon-Kuskokwim Delta south of the Yukon River. The pygmy shrew is found from the northern slope of the Alaska Range to the upper Kuskokwim drainages.

Habitat requirements are as varied as the number of species found in this group. Species such as the brown and collared lemmings require treeless tundra, while other species such as the common shrew or red-backed vole are adapted to a variety of habitats such as marshy grassy or forested areas.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. The voles and lemmings in particular are noted for the rhythmic fluctuations in numbers, generally with 3 to 4 years between peaks. The slow-growing vegetation in alpine or tundra habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents as food and when populations of these small mammals are high they form a significant part of the summer diet of wolves and bears. Avian predators such as the jaegers and many raptors also utilize rodents.

LIST OF RAPTOR SPECIES IN WESTERN ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharp-shinned Hawk	*Accipiter striatus*
	Rough-legged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*

Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*

LIST OF SMALL MAMMALS IN WESTERN ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Tundra Shrew	*Sorex tundrensis*
	Dusky Shrew	*Sorex obscurus*
	Pygmy Shrew	*Microsorex hoyi*
Bats	Little Brown Bat	*Myotis lucifugus*
	Keen's Bat	*Myotis keeni*
	Big Brown Bat	*Eptesicus fuscus*
Pikas	Pika	*Ochotona collaris*
Rodents	Deer Mouse	*Peromyscus maniculatus*
	Collared Lemming	*Dicrostonyx groenlandicus*
	Bog Lemming	*Synaptomys borealis*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Long-tailed Vole	*Microtus longicaudis*
	Yellow-cheeked Vole	*Microtus xanthognathus*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Meadow Jumping Mouse	*Zapus hudsonius*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparatively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Birdlife in interior Alaska is dominated by those forms characteristic of the dominant interior spruce and birch forest habitats. Among permanent residents of the area are ravens, gray jays, white-winged crossbills, chickadees and woodpeckers. In summer many species migrate north to breed in the area; these include robins, kinglets, flycatchers, woodpeckers, warblers, sparrows and thrushes.

Alpine tundra occurs at higher elevations and several species are found here that are typical of coastal and arctic tundra regions beyond treeline. Lapland longspurs, savannah sparrows, gray-crowned rosy finches, horned larks, upland and golden plovers and common snipe are familiar species.

Thousands of small ponds, lakes and streams and extensive marshy habitats in Interior Alaska provide for the needs of numerous water and shorebirds. In addition to many species of waterfowl, loons, grebes, plovers, yellowlegs, sandpipers, phalaropes, swallows, kingfishers and dippers are common.

In addition to those species which nest or reside there, Interior Alaska is annually visited by large numbers of birds migrating through to Arctic or Western Alaska areas. Many thousands of waterbirds utilize the Yukon Valley as an extension of the Central Mississippi and Atlantic Coast Flyways, enroute to or returning from the coastal or Arctic breeding grounds. The Mississippi Flyway via the MacKenzie Basin in Canada is an important source of many songbirds for Alaska. Many Arctic-nesting birds affiliated with the Pacific Coast Flyway enter the lower Yukon River area and move to the Arctic Slope via Anaktuvuk Pass.

The major human uses of non-game birds are non-consumptive. Birdwatching is a popular recreational activity enjoyed by thousands of Alaskans. Observation and photography of birds occurs primarily along roads and trails and near major communities. In addition to direct use, many outdoor activities are enriched by the sight and song of birds. Scientific study of birds has provided much fascinating and valuable information on animal migrations, ecological relationships, and evolutionary mechanisms.

RAPTORS

Raptors* which occur in Interior Alaska include the bald and golden eagles, osprey, red-tailed, Harlan's, rough-legged and Swainson's hawks, marsh hawk, goshawk, sharp-shinned hawks, gyrfalcon, peregrine falcon, merlin, kestrel, and the great-horned, great-grey, snowy, hawk, boreal and short-eared owls. With the exception of the goshawk and gyrfalcon, the diurnal birds of prey are summer residents on the Interior, although there have been records of a few eagles overwintering in the Interior. With two exceptions, the owls are Interior residents throughout the year. The snowy owl winters in the Interior, while the short-eared owl is a summer resident of this region. Migration times vary among species and with seasonal weather patterns, but summer residents generally arrive in the Interior in April and leave during September.

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. Eight-fold variations in goshawk breeding densities over a period of four years have been documented in the Interior. These variations are thought to occur in response to changes in prey abundance, and flucuations of similar magnitudes probably occur within populations of other resident raptor species. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered peregrine falcon, migratory species occurring in the Interior are at moderate levels of abundance. Breeding populations of bald eagles and ospreys, endangered or threatened in eastern and southern North America, do not appear seriously low at this time in Alaska. Important osprey breeding populations occur in the Minto Flats, Northway Flats and Tetlin Lakes areas.

Numbers of two subspecies of peregrine falcons have declined in the Interior over the last 20 years; the only known population approximating its former breeding density occurs along the Yukon River between the Alaska-Canada border and Circle City. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of marked declines in other portions of the continent, peregrine populations on the Yukon, Porcupine and Tanana Rivers of Interior Alaska are of key importance.

Most habitat types in the Interior are utilized by raptors during the breeding season. Raptors range widely in hunting, using a combination of vegetation types as foraging habitat during the nesting season. Nevertheless, the various species display marked preferences for particular types of nesting sites. Ospreys and bald eagles select lowland forests along river or lake systems as nesting habitat. Golden eagles, gyrfalcons and rough-legged hawks prefer to nest on cliffs. The other buteos, the

* A list of raptor species considered in these plans follows this regional account.

accipiters, merlins, kestrels and owls (except for the short-eared owl), are principally tree-nesters, and are found throughout forested regions. Of these species, goshawks display marked preference for hardwood forests, while kestrels utilize cavities in trees as nest sites. The peregrine falcon nests on cliffs along major river systems. The marsh hawk and short-eared owl are the only consistent ground-nesters in the Interior region. Both of these species select open areas for nesting, but unlike marsh hawks, short-eared owls nest in tundra and forested habitats. Except for gyrfalcons which remain in alpine areas throughout the year, resident raptors range widely over all major habitat types during the winter in search of food. To date, human-caused habitat changes that have occurred in the Interior have not significantly influenced raptor abundance.

Raptors do not have high reproductive potentials and, like many other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance depends primarily on the abundance and condition of the prey populations. The diet of raptors as a group in Interior Alaska varies seasonally and encompasses a wide array of species including insects, fish, birds and mammals. The abundance and distribution of these prey species are important, and diseases or harmful residues carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmissible to raptors. Pesticide residues have been cited as the primary factor responsible for declines in peregrine falcon numbers not only in Alaska but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have seriously depressed populations of these species. Findings presently available indicate that residues are not significantly affecting resident populations. Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks, gyrfalcons and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included Alaska residents, nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase.

SMALL MAMMALS

About 21 species of small mammals*** are found in Interior Alaska. The house mouse and rat are both introduced species associated with human habitations. Of the indigenous species, the tundra vole, the northern red-backed vole and the common shrew are distributed throughout the Interior Region. Five additional species of voles also occur in the region but are generally limited to habitats south of the Arctic Circle. Three species of lemmings inhabit Interior Alaska: the brown, northern bog and collared lemmings. Brown lemmings are found in all areas except the Tanana Hills and the Alaska Range near the Canadian border. The

northern bog lemming is found primarily south of the Arctic Circle, while the collared lemming occupies areas to the north of the Arctic Circle.

The masked, Arctic and pigmy shrews and perhaps also the water shrew inhabit portions of the region in varied patterns of distribution. Other small mammals include the meadow jumping mouse, the collared pika, and the Interior Region's only bat, the little brown bat. The latter ranges north to Fort Yukon, while the collared pika is found from the Tanana River to the Mt. McKinley region.

Habitat requirements are as varied as the number of species found in this group. Species such as the pika, which requires high altitude rock and talus slopes, or the northern bog lemming, which is limited to wet tundra and sphagnum bogs, are rather narrow in their habitat requirements. Others such as the common shrew or meadow jumping mouse are adapted to a variety of habitats such as marshy, grassy, or forested areas. Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. Voles and lemmings in particular are noted for the rhythmic fluctuations in numbers generally with 3 to 4 years between peaks. The slow-growing vegetation in alpine habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents as food and when populations of these small mammals are high they form a significant part of the summer diet of foxes, coyotes, wolves and bears. Avian predators such as jaegers and many raptors also utilize rodents.

LIST OF RAPTOR SPECIES IN INTERIOR ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharpshinned Hawk	*Accipiter striatus*
	Red-tailed Hawk	*Buteo jamaicensus*
	Harlan's Hawk	*Buteo harlani*
	Swainson's Hawk	*Buteo swainsoni*
	Rough-legged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*

Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
	Kestrel (Sparrow Hawk)	*Falco sparverius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*
Shrews	Common Shrew	*Sorex cinereus*
	Tundra Shrew	*Sorex tundrensis*
	Dusky Shrew	*Sorex obscurus*
	Pygmy Shrew	*Microsorex hoyi*
Bats	Little Brown Bat	*Myotis lucifugus*
Pikas	Pika	*Ochotona collaris*
Rodents	Collared Lemming	*Dicrostonyx groenlandicus*
	Bog Lemming	*Synaptomys borealis*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Long-tailed Vole	*Microtus longicaudis*
	Yellow-cheeked Vole	*Microtus xanthognathus*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Meadow Jumping Mouse	*Zapus hudsonius*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparatively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Only 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Nongame birds of Northwestern Alaska occupy a variety of habitats including spruce, spruce-birch and birch-poplar forests, streamside alder and willow thickets, tundra, and sedge-grass marshes. About 58 species of nongame birds occur in Northwestern Alaska, with about 11 species staying year-round. The region achieves some faunal distinction by its proximity to the Bering Straits, which results in a number of Asiatic species such as dotterels, Kennicott's arctic warblers and red-spotted bluethroats visiting Alaska during the summer. The interface between sub-arctic forest and arctic tundra in the northern portion of this region results in an abrupt transition zone where the range of many bird species terminates. The extensive waterways, lakes and marshes are occupied by more than 20 species of swallows, shorebirds, cranes, loons and grebes. Small passerine species that use the alder-willow thickets along rivers and streams include tree sparrows, Wilson's and yellow warblers and yellow wagtails. The interior spruce-birch forest and forest edges harbor typical forest species such as ruby-crowned kinglets, fox sparrows, slate-colored juncos and black-polled and myrtle warblers. Common tundra species include snow buntings, lapland longspurs, golden plovers and the ubiquitous savannah sparrows. Ravens, gray jays and redpolls are the most common permanent residents.

Little use of nongame birds occurs in the region except in the vicinity of Nome where bird watching is enjoyed by increasing numbers of visitors in the summer. In addition, many species of nongame birds that breed in Northwestern Alaska migrate seasonally and extensive observational and photographic use of these populations may occur in other areas of North America. Besides direct use, many outdoor activities are esthetically enriched by the sight and sound of nongame birds.

SEABIRDS

During summer months the islands and coastal habitat of Northwestern Alaska support millions of nesting seabirds. St. Lawrence, Little

Diomede and King Islands, and Cape Lisburne on the mainland all maintain breeding colonies of 1 million or more birds. Colonies containing 50,000-1,000,000 birds occur at Cape Thompson, Fairway Rock, Bluff, and Cape Denbigh. Principal nesting species are pelagic cormorants, northern fulmars, glaucous gulls, black-legged kittiwakes, common and thick-billed murres, and 8 species of small alcids. Numbers vary with the seasons. Spring migrations tend to follow leads or cracks in the ice with resultant concentration of birds at such places. The distribution of birds in summer is centered around colonies. Nonbreeding shearwaters and fulmars tend to concentrate around upwellings where food sources are greatest. Little data is available to determine exact population trends, but seabird numbers are known to fluctuate in Northwestern Alaska.

Nesting habitat requirements vary between species. Principal requirements appear to be isolation, steep seaside cliffs or grassy slopes, and a limited amount of predation or other disturbance. Presence of abundant food resources within feeding range is also a critical factor. Huge colonies occur where these factors are concurrent on a large scale.

Cliff nesting species include cormorants, kittiwakes, and many alcids. Murres and glaucous gulls utilize cliff ledges by preference but also nest on exposed ground. Puffins and auklets use either crevices among rocks or burrows in steep banks. Crevice and burrow nesters tend to be crepuscular or nocturnal in their return to the nest and feed at greater distances from the colony than do cliff nesters.

Seabirds of Northwestern Alaska breed later than birds in more southerly colonies; egg laying reaches a peak in June rather than May. High summer oceanic productivity provides abundant food which supports rapid growth of nestlings. The principal food of cormorants and alcids is small fish such as cod and capelin. For some species like the horned puffin, these are augmented by squid, crustaceans, and mollusks. Crested, least and parakeet auklets are plankton feeders. Gulls and jaegers are scavengers that also prey on eggs and nestlings of other species of birds. Numerous small alcids provide abundant prey for peregrine falcons. Nesting birds, particularly burrow and crevice-nesters, also fall prey to foxes and mustelids.

Natives have traditionally used seabirds as an important source of food in the spring. Eggs are still being collected for food, but the degree of use is diminishing. Relatively few adults are taken. Nonconsumptive use by viewers and photographers is increasing.

Seabirds have proved susceptible to chronic oil pollution. As many as 400,000 die each year in the Atlantic from this cause. Pelagic birds may provide valuable data as biological monitors of marine habitat degradation, particularly from oil pollution.

RAPTORS

Raptors* which occur in Northwestern Alaska include the golden eagle, osprey, rough-legged, marsh and sharp-shinned hawks, goshawk, gyrfalcon, peregrine falcon, merlin, kestrel, and short-eared, snowy, great-horned,

* A list of small mammal species considered in these plans follows this regional account.

and boreal owls. Except for the goshawk and gyrfalcon, raptors are present in the Northwestern Region as summer residents only. There also have been records of a few eagles overwintering. Migration times vary among species and with seasonal weather patterns, but summer residents generally arrive in the region in May and leave during August and September.

Goshawks, gyrfalcons and snowy owls appear to be at moderate densities, although marked fluctuations in abundance occur over time. These fluctuations are often localized and are thought to occur in response to changes in prey abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered peregrine falcon, migratory species occurring in Northwestern Alaska are currently at moderate levels of abundance. Breeding populations of ospreys, greatly reduced in eastern and southern North America, do not appear seriously low at this time in Alaska. Most osprey breeding populations in Northwestern Alaska occur along the Kobuk River system.

Peregrine falcon numbers apparently have declined from former levels. The species is presently found in very low numbers in Northwestern Alaska. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of marked declines in other portions of the continent, remaining peregrine populations in Northwestern Alaska are of importance in maintaining viable populations.

Some of the highest gyrfalcon densities in Alaska are found in the Northwestern Region, especially in the western half of the Seward Peninsula. The numerous large rock outcrops in this area provide excellent raptor nesting habitat. An abundance of other nesting bird species, ground squirrels and other small mammals provide a ready supply of prey species for the gyrfalcons. Gyrfalcons, rough-legged hawks, golden eagles and ravens utilize similar nesting habitat and all of these species commonly occupy the same or adjacent nesting sites over the course of a few years. More than 165 nest sites are known and more than 300 are estimated to have been active over the entire peninsula in recent years.

Raptors range widely in hunting activity, using a combination of vegetation types as foraging habitat during the nesting season. Nevertheless, the various species display marked preferences for particular types of nesting sites. Ospreys select lowland forests along river or lake systems as nesting habitat. Golden eagles, gyrfalcons and rough-legged hawks prefer to nest on cliffs. The kestrels and owls, except for the short-eared owl, are principally tree-nesters, and are found throughout forested regions. The peregrine falcon nests on cliffs along major river systems. The marsh hawk and short-eared owl are the only consistent ground nesters in the Northwestern Region. Both of these species select open areas for nesting, but unlike marsh hawks, nesting short-eared owls occur in tundra and forested habitats. Except for gyrfalcons which remain in tundra areas throughout the year, resident raptors range widely in the winter over all major habitat types in search of food.

Raptors do not have high reproductive potentials and, like many other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance depends primarily on the abundance and condition of the prey populations. The diet of raptors as a group in Northwestern Alaska varies seasonally and encompasses a wide array of species including birds, mammals, fish and insects. The abundance and distribution of these prey species are important, and diseases or harmful residues carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmissable to raptors. Pesticide residues have been cited as the primary factor responsible for declines in peregrine falcon numbers, not only in Alaska, but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have seriously depressed populations of these species. Findings presently available indicate that residues are not significantly affecting resident gyrfalcon populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks, gyrfalcons and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included Alaska residents, nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase. The white color phase of the gyrfalcon is one of the most prized birds of prey by falconers.

SMALL MAMMALS

Distributions of small mammal* populations in Northwestern Alaska are relatively poorly known. About 12 species are found including the house mouse and rat, both introduced species associated with human habitations. Of the indigenous species, the collared and brown lemmings, the tundra and red-backed voles, and the common and tundra shrews are distributed throughout the Northwestern Region mainland. Two additional species of voles also occur in the region. The Alaska vole is found throughout the region north of Norton Bay, while the meadow vole is found south of the Noatak River and north of the Buckland River. In addition to the red-back vole, St. Lawrence Island also has one species of lemming and one species of vole which are unique to the island. Dther small mammals include the meadow vole and the vagrant dusky shrew.

Habitat requirements are as varied as the number of species found in this group. The lemmings require treeless tundra, while other species such as the common shrew or red-backed vole are adapted to a variety of habitats such as marshy, grassy, or forested areas.

* A list of small mammal species considered in these plans follows this regional account.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. Voles and lemmings in particular are noted for rhythmic fluctuations in numbers, generally with 3 to 4 years between peaks. The slow-growing vegetation in alpine or tundra habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents as food and when populations of these small mammals are high they form a significant part of the summer diet of foxes, wolves and bears. Avian predators such as jaegers and many raptors utilize rodents.

LIST OF RAPTOR SPECIES IN NORTHWESTERN ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
	Osprey	*Pandion haliaetus*
Hawks	Goshawk	*Accipiter gentilis*
	Sharpshinned Hawk	*Accipiter striatus*
	Rough-legged Hawk	*Buteo lagopus*
	Marsh Hawk	*Circus cyaneus*
Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*

LIST OF SMALL MAMMALS IN NORTHWESTERN ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Tundra Shrew	*Sorex tundrensis*

Rodents	Collared Lemming	*Dicrostonyx groenlandicus*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LAND AND SHORE BIRDS

Alaska, despite its large size, has a comparatively limited variety of birds as a result of the rather uniform character of the habitats occurring in the state. Over 325 species have been recognized as occurring in Alaska. About half of the total are waterbirds, a relatively high proportion in comparison to most other states and indicative of the extent and importance of marine and freshwater habitats. About 170 species are landbirds, roughly divisible into groups inhabiting tundra, interior forest and coastal forest habitats. Less than one-fourth of the species occurring in Alaska are permanent residents of the state. The majority of species are new-world forms which migrate to Alaska to breed. In addition a few old-world species breed in Alaska and about a dozen species migrate to or through, but do not breed in, the state.

Birdlife in Arctic Alaska is dominated by species characteristic of the dominant low arctic tundra vegetation and associated ponds and lakes. The relatively homogenous nature of the arctic habitat, in conjunction with an abbreviated summer, results in a reduced diversity of species of birds in relation to other regions of the state. Comparatively few species spend the entire year in the Arctic Region. The most common year-round residents are ravens, gray jays and redpolls. About 55 species of nongame birds have been recorded breeding in the region, but the occurrence of many is irregular, and total numbers of some species are much reduced in comparison to regions to the south. More than 25 species have strong associations with surface waters, both marine and fresh. These include shorebirds, sandhill cranes, loons and grebes. Many passerine species typical of the taiga and boreal forests to the south have been recorded breeding in Arctic Alaska, e.g. gray jays, thrushes, warblers and fringillid sparrows, but only lapland longspurs and snow buntings are conspicuous on the coastal plain tundra. The presence of boreal species in Arctic Alaska is due to the presence of protected and isolated pockets of spruce and tall shrubs. Arctic Alaska birds with Asiatic affinities are yellow wagtails, bluethroats, wheatears and yellow-billed loons.

Little human use of nongame birds occurs in Arctic Alaska. A limited amount of birdwatching is done by the residents of Barrow and other communities. Many nongame birds produced in Arctic Alaska, however, are subsequently viewed and photographed by people in other areas of North America. Besides direct use, nongame birds enhance the aesthetic values of outdoor recreation. Scientific studies of nongame birds has provided much fascinating and valuable information on migration, ecological interrelationships and evolution.

SEABIRDS

Arctic Alaska north of Cape Lisburne supports relatively few breeding groups of seabirds. Principal nesters are glaucous gulls and three species of jaegers. Other gulls and terns are also arctic nesters. Some black guillemots nest in sheltered areas of Seahorse, Cooper and Igalik Islands, a few horned puffins breed on Seahorse Island, and small numbers of thick-billed murres nest near Barrow.

Resident Arctic populations of seabirds are limited in number and widely dispersed. Shearwaters, fulmars, black-legged kittiwakes, Sabine's gulls and arctic terns either feed or breed in the Arctic and move south with cold weather. Ivory and Ross' gulls disperse or migrate in east-west directions, and probably winter near open leads in the pack ice of the Chukchi and Beaufort seas. Post-breeding dispersal of adults and young brings glaucous gulls, murres, guillemots, horned puffins, and parakeet and crested auklets north to the Chukchi Sea in the fall. These birds migrate south with the onset of winter.

The birdlife of the Beaufort Sea consists of fewer species and lower numbers than that of the Chukchi or Bering Seas to the south. Marine birds of the Beaufort Sea can be divided into four habitat groups according to breeding and feeding requirements: 1) Inland birds that obtain most or all of their food from lakes or tundra during the breeding season but move to marine habitats following breeding. These include most breeding jaegers and some Sabine's gulls. 2) Coastal birds that nest on the tundra or beaches and scavenge food along the beaches. These include some Sabine's gulls and jaegers, and all breeding glaucous gulls. 3) Inshore birds that consume foods in shallow waters and that utilize barrier islands and river mouths for breeding, roosting and molting. These include arctic terns and black guillemots. 4) Pelagic birds, predominantly nonbreeders, that are not directly dependent on land and range to or beyond the continental shelf. These include murres, nonbreeding jaegers and gulls.

The coastal habitat of the Arctic Region lacks the precipitous cliffs favored by many marine birds for nesting. Species such as the black guillemot that usually nest in cliff situations, nest on barrier islands wherever they can find cover. Drift ice covering up to 75 percent of the ocean surface provides preferred feeding conditions. Arctic cod, a major food fish, approach closer to the surface when ice is present. Drifting floes provide resting perches.

Parasitic, pomarine and long-tailed jaegers vary in relative numbers from year to year. Their principal food sources during migration are eggs, nestlings and food stolen from other seabirds. Primary foods while nesting are lemmings and other microtine rodents although passerine birds and fishes are taken as available. Gulls are scavengers and predators that feed primarily on surface fish and crustaceans at sea or in pack ice. Alcids dive for fish and crustaceans.

Gathering of eggs in spring by natives is common along coastal areas near villages. Offshore barrier islands receive relatively little attention. Human use is generally not concentrated. Human populations are low and bird populations diffuse.

RAPTORS

The diversity of raptors* nesting in Arctic Alaska is relatively low. Golden eagles, rough-legged hawks, peregrine falcons, gyrfalcons, snowy owls, and short-eared owls are most commonly found but records indicate that low numbers of nesting merlins, goshawks, sharp-shinned hawks, marsh hawks and great horned owls also may be found in some years. Except for gyrfalcons and snowy owls which remain in arctic uplands and foothills throughout the year, all other arctic raptors seek habitat types and foraging areas to the south during the winter.

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. These fluctuations are thought to occur in response to changes in prey abundance. Snowy owls, short-eared owls, and rough-legged hawks fluctuate in response to cyclic rodent populations and gyrfalcons fluctuate with changes in ptarmigan abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered subspecies of peregrine falcon, migratory species occurring in the Arctic are at moderate levels of abundance. Peregrine falcon numbers have declined in the arctic over the last 20 years; only remnants of former populations exist. Breeding densities and productivity continue to decline. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of marked declines in other portions of the continent, peregrine populations of Alaska are of key importance.

Raptors range widely in hunting activity, using a combination of vegetative types as foraging habitat during the nesting season. Nevertheless, the various species show marked preferences for particular types of nesting sites. Golden eagles and gyrfalcons prefer to nest on cliffs. Rough-legged hawks build stick nests, usually on cliffs, river bluffs or on rocky outcrops which are elevated from surrounding area. Peregrines often use nests built previously by rough-legged hawks or ravens but will also utilize "scrapes" or shallow depressions in the ground, protected by stunted willows or rocky outcrops. Snowy owls, short-eared owls and marsh hawks are the only consistent ground-nesting raptors in the Arctic Region.

The habitat changes that have occurred to date in the Arctic have not significantly influenced raptor abundance. However, there is a trend toward increased oil-related development and construction in this region which may result in habitat alteration in localized areas.

* A list of small mammals considered in these plans follows this regional account.

Raptors do not have high reproductive potentials and, like other predators, exist at relatively low densities. Given adequate nesting conditions, raptor abundance depends primarily on the abundance and condition of the prey populations. The diet of raptors as a group in Arctic Alaska varies seasonally and encompasses a wide array of species including insects, birds and mammals. Not only are the abundance and distribution of these prey species important, but diseases or harmful pesticide contaminants carried by these species are of prime concern. Many of the common diseases carried by domestic fowl and by wild gallinaceous birds are known to be transmittable to raptors. Residues from pesticides have been cited as the primary factor responsible for declines in peregrine falcons numbers not only in Alaska but throughout the world. Because little work has been done with migratory raptor species in Alaska other than Peregrines, it is not certain whether toxic chemical residues have depressed populations of these species. Findings presently available indicate that residues are not currently affecting resident populations.

Observation, photography and enrichment of wilderness experiences are recognized by the Department as the primary uses of raptors. However, the taking of a limited number of goshawks, gyrfalcons and kestrels under a tightly regulated falconry permit system is compatible with nonconsumptive uses. The number of persons interested in raptors for falconry purposes has been low in the past and has included Alaska residents; nonresidents and aliens. There has been a slight increase in interest during the last five years. The number of permits issued in 1974 was less than 30, but the demand for birds to be used for falconry is expected to increase in the future.

SMALL MAMMALS

The variety of small mammals* in Arctic Alaska is the most limited in the state with only about nine species occurring in this region. The common and tundra shrews, brown and collared lemmings, and the red-backed, tundra and Alaska voles all have area-wide distribution. Species with limited distribution include the dusky shrew found in the upper portions of the north slope of the Brooks Range, and the meadow vole, found generally east of the Canning River. Habitat requirements of these species are generally similar in this region, however the shrews and several voles prefer bushy overhead cover.

Due to the high reproductive capacity of many of these species, the main factor limiting numbers is the availability of food. The voles and lemmings in particular are noted for the rhythmic fluctuations in numbers generally with 3 to 4 years between peaks. The slow-growing vegetation in tundra habitats is rapidly exhausted by dense microtine populations, resulting in population "crashes" or movements.

Small mammals are an extremely important source of food for many terrestrial and avian predators. Most carnivorous furbearers utilize rodents as food and when populations of these small mammals are high they form a significant part of the summer diet of wolves and bears. Avian predators such as the jaegers and many raptors also utilize rodents.

* A list of small mammals considered in these plans follows this regional account.

LIST OF RAPTOR SPECIES IN ARCTIC ALASKA

	Common Name	Scientific Name
Eagles	Bald Eagle	*Haliaeetus leucocephalus*
	Golden Eagle	*Aquila chrysaetos*
Hawks	Goshawk	*Accipiter gentilis*
	Rough-legged Hawk	*Buteo lagopus*
Falcons	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Merlin (Pigeon Hawk)	*Falco columbarius*
Owls	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Hawk Owl	*Surnia ulula*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*

LIST OF SMALL MAMMALS IN ARCTIC ALASKA

	Common Name	Scientific Name
Shrews	Common Shrew	*Sorex cinereus*
	Tundra Shrew	*Sorex tundrensis*
Rodents	Collared Lemming	*Dicrostonyx groenlandicus*
	Brown Lemming	*Lemmus trimucronatus*
	Red-backed Vole	*Clethrionomys rutilis*
	Meadow Vole	*Microtus pennsylvanicus*
	Tundra Vole	*Microtus oeconomus*
	Alaska Vole	*Microtus miurus*
	House Mouse	*Mus musculus*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

LOCATION

The entire state of Alaska.

THE SPECIES

About 22 species of hawks, falcons, eagles and owls occur regularly within the state. Detailed population data for raptors are lacking. Accurate censuses of raptors are difficult because of the secretive behavior of many species, and the wide distribution but low density of most species.

International concern has resulted from the worldwide decline of the endangered peregrine falcon. Alaska and northern Canada provide the last extensive nesting populations of peregrines in North America. Population estimates for Alaska range from 115 to more than 300 nesting pairs. However, much of the potential nesting habitat has not been surveyed and the population may be even larger.

Kestrels, marsh hawks and short-eared owls are seasonally among the most abundant raptors. Conspicuous species such as rough-legged and Swainson's hawks, and great-horned owls are probably most commonly observed. Southcentral Alaska supports the greatest variety of species due to the diversity of habitats present in the region.

While raptor habitat throughout Alaska has remained relatively stable, populations have fluctuated annually, largely in response to other environmental factors. Local habitat changes have occurred in areas of urban development, agriculture, or transportation corridors and have, in addition to disturbance associated with human activity in such areas, reduced local raptor populations, particularly nesting populations.

Viewing, photography and enrichment of wilderness experience are significant, but unmeasurable uses of the raptor resource. With increased human population growth in Alaska these uses will increase. Use of raptors for falconry has not been a common practice in Alaska, although a few individuals do practice the sport. Alaskan peregrine falcons and gyrfalcons have been taken for use by falconers in other parts of the world; however, with protection under the Endangered Species Act and the Migratory Bird Treaty Act, protection or closely controlled utilization of raptors in Alaska was effected. Currently, use of goshawks is allowed under the terms of a permit. At least one species of raptor, the snowy owl, is utilized for domestic consumption by residents of Northwestern and Arctic Alaska.

ALASKA BALD EAGLE

LOCATION

Entire state of Alaska.

THE SPECIES

The highly productive coastal zone areas of Southeastern Alaska, the Gulf of Alaska, and the southwestern coast to the Aleutian Islands support the largest populations of bald eagles in North America. Eagles are also found along major inland drainages of Western and Southcentral Alaska, although not in the densities present in coastal areas. Numbers of eagles within the state vary seasonally. Summer populations exceed 50,000 birds, but migrations reduce the total substantially by winter. Spawning cycles of several fish, primarily salmon and herring, cause spectacular concentrations of eagles in some coastal streams and spawning grounds. Noteworthy concentration areas include the lower drainages of the Chilkat and Stikine rivers, and coastal shorelines near Klawock and Craig.

Nesting pairs are distributed throughout the species' range. Surveys in Southeastern Alaska have revealed at least 1,709 eagle nests with less than 50 percent of the habitat surveyed. Additional nesting concentrations occur in Prince William Sound, the Kodiak Archipelago and along some Aleutian Island sea cliff habitat.

In the past, persecution of eagles by commercial fishermen was predicated on the belief that eagles had significant adverse impacts on the salmon fishery. At one time bounties on eagles were offered to provide incentive for their reduction. Since 1953 the bald eagle has received complete protection under law, and populations in Alaska have remained healthy. Nonconsumptive uses include viewing and photography, especially at feeding concentration sites. In addition, scientific studies of eagles in Alaska provide ecological bases of comparison for evaluating status and trends of endangered bald eagle populations in other parts of the country.

HOLITNA RIVER OSPREY

LOCATION

In Game Management Unit 19, the drainages of the Holitna and Hoholitna Rivers and Titnuk Creek.

THE SPECIES

The lower drainages of the Holitna and Hoholitna Rivers and Titnuk Creek support one of the largest concentrations of nesting ospreys found in Alaska. Surveys have indicated a minimum of sixteen nesting pairs in this area.

Of primary importance to nesting osprey and bald eagles in the Holitna River area is the presence of large mature white spruce and cottonwood nest trees, a product of periodic flooding and deposition of fine soils on the floodplains of these drainages. In addition, clear uncontaminated waters with abundant fish populations provide a ready source of food for ospreys.

Human use of ospreys in the area has not been documented. The area does receive use by sport hunters and fishermen.

TANANA CLIFFS PEREGRINE FALCON

LOCATION

In Game Management Units 20A, 20C and 20D, all cliffs and bluffs bordering the Tanana River between the Yerrick and Salcha Rivers, to include the drainage of the Salcha River below the confluence of Flat Creek.

THE SPECIES

This portion of the Tanana River drainage has suffered a loss of breeding peregrines in recent years. Surveys in 1970 indicated that at least 20 pairs of falcons had previously nested along the entire Tanana River. Very few if any active eyries remain in the area. The elimination of this subpopulation is a result of a combination of factors: disturbance, low productivity and possible behavioral changes. The latter two factors have resulted from pesticide residue build up. Additional mortality undoubtedly resulted from adverse climatic conditions and loss of nest sites due to landslides.

Habitat has remained relatively stable in this section. However, the limited development of agriculture around Delta Junction may have created additional foraging areas. The habitat is presently under-utilized, although utilization will increase if this subpopulation is reestablished. The presence of previously used eyries is important for birds introduced to an area. Elsewhere peregrines have shown preference for nest sites used earlier. The presence of peregrines in the past undoubtedly enhanced the outdoor enjoyment of visitors to the area, and reestablishing the species in this area would be desirable.

TWELVE MILE-EAGLE SUMMIT UNCLASSIFIED GAME

LOCATION

In Game Management Units 20B and 20C, that area within one-half mile of the Steese Highway between Mile 83 and 115.

THE SPECIES

This area is characterized by alpine tundra with interspersed spruce-hardwood forest. Plovers, horned larks, lapland longspur, and several species of shorebirds are commonly found in the alpine habitat of this area. One species, the upland plover, although common here is rare throughout much of Alaska. Golden eagles are summer residents and the gyrfalcon is present throughout the year. Forest inhabitants include woodpeckers, finches, thrushes and jays.

The Twelvemile - Eagle Summit area is representative of Interior Alpine tundra habitat and associated fauna. The area is popular among resident Alaskans and out-of-state visitors for it provides an opportunity to view bird species not commonly encountered along much of Interior Alaska's road system.

UPPER YUKON PEREGRINE FALCON

LOCATION

In Game Management Units 25 and 20C, all cliffs and bluffs bordering the Yukon River from Eagle to Circle, including the Charley River below the confluence of its east and west forks.

THE SPECIES

This portion of the Yukon River system represents one of the major nesting areas of peregrine falcons in the state. Early surveys in the 1950's indicated that 16 to 20 pairs produced approximately 30 fledged young per year in this section. This sub-population slowly declined throughout the 1950's and 1960's until 1970 when only seven pairs produced 18 young. Recent surveys have indicated that the population has leveled off at this low point. The Charley River, although not intensively surveyed, has a high potential, four to five nesting pairs being found in recent overflights.

Nesting failure appears to be the primary cause of population declines both in this area and throughout most of the species range. Concentrations of organochlorine residues appear to be the major factor affecting nesting failure. High contaminant levels have resulted in addled eggs and eggs with weak shells. Critical levels of some residues may affect nesting behavior of adults resulting in increased abandonment of nests.

Peregrine falcons from this region are migratory and winter south of Alaska. Many of the prey species in this area also winter in southern regions, thus subjecting both predator and prey to accumulation of pesticide residues outside of Alaska. The peregrine is subject to continued accumulation when ingesting contaminated prey while in Alaska. Additional mortality occurs from natural causes such as landslides in nesting cliffs, and adverse weather during nesting.

Nesting and foraging habitats have remained stable throughout this section. Landslides along the Yukon have destroyed some eyries; however, similar slides have also created potential nest sites.

Little human use of peregrines has occurred in the area. Peregrines in the Upper Yukon have been protected from the use or disturbance that populations in more accessible areas have experienced. Although highly esteemed by falconers for centuries, relatively few peregrines were obtained in Alaska for sport. The species now receives complete protection in Alaska and the "Lower 48" under the Endangered Species Act of 1969. The knowledge that peregrines occur in the upper Yukon drainages has added to the wilderness experience of many who use the area. Nonconsumptive use can be expected to increase in the area as access improves. Designation of the Charley River as part of the Wild Rivers system will attract additional users.

NOME AREA ORNITHOLOGICAL

LOCATION

In Game Management Unit 22, that portion of the Seward Peninsula draining into Norton Sound and the Bering Sea between and including Canyon Creek on the north and the Solomon River below its confluence with the East Fork on the south.

THE SPECIES

The Nome area contains a variety of habitats which provide suitable nesting conditions for 180 or more species of birds. Coastal marshes, wet and dry tundra and shrub communities are found within the area. The wide diversity of birds includes several old world species which have a limited range in Alaska and are considered rare in North America. Included among these are the red-spotted bluethroat, European wheatear, Kenicott's arctic warbler, Alaskan yellow wagtail, and the dotterel.

Prior to the 1960's local residents used birds largely as a source of food and secondarily as a material for garments. Waterfowl, ptarmigan, and shorebirds were killed in that order of preference for food and clothing. However, their value as food has recently diminished.

An increasing number of professional and amateur ornithologists have visited the Seward Peninsula in recent years to view and study birds. Most viewers arrive in May and June when birds are establishing nesting territories. Suitable viewing locations are reached by one of three road systems radiating from Nome. Sea bird rockeries on Sledge Island (located 20 miles west of Nome) are also becoming popular with bird watchers.

IRON CREEK GYRFALCON

LOCATION

In Game Management Unit 22, the entire drainage of Iron Creek above its confluence with the Pilgrim River.

THE SPECIES

The Seward Peninsula is noted for its high density of breeding raptors during spring. Over 165 raptor nest sites that have been active within the past five years have been located in drainages flowing into the Bering Sea and Norton Sound on the southern half of the Peninsula. Eyries are scattered throughout the peninsula, although raptors concentrate in relatively high numbers in a few places contianing sutiable habitat. Iron Creek supports a large number of gyrfalcons as well as other raptors. Numerous bluffs and rocky outcrops where more than 13 pairs of raptors have selected nest sites are located along a fifteen mile stretch of the creek. Four nesting pairs of gyrfalcons were present in 1973, and at least two active nest sites were present in both 1974 and 1975. Rough-legged hawks and golden eagles have also established active eyries along the creek.

Weather usually is the major factor in nesting success, but recently human activity in the area may have affected productivity by increased disturbance. Iron Creek was once heavily mined, but later was abandoned and remained relatively undisturbed until the summer of 1975, when an old mining lease was reactivated. Portions of the creek were used as a route for hauling materials to another mining claim several miles distant. Although the nesting bluffs themselves have not been altered, disturbance to eyries and habitat degradation to the surrounding tundra has occurred.

Until recently, use of gyrfalcons along Iron Creek has been limited. Some nestlings may have been illegally removed from nests in recent years, since unexplained disappearance of nestlings has occurred close to the road systems. The lower portion of Iron Creek is less than 2 miles from the nearest point of highway access.

In the late 1960's a study was conducted as part of an area-wide investigation to study distribution, numbers, breeding success and life history of raptors. With increasing mineral exploration and the high density of raptors along Iron Creek, the area has a high potential for studying effects of human activities on nesting success of gyrfalcons and other raptors. Accessibility of gyrfalcons from roads on the Seward Peninsula has drawn an increasing number of amateur ornithologists to the area, and viewing is expected to increase in the future.

SERPENTINE HOT SPRINGS GYRFALCON

LOCATION

In Game Management Unit 22, all drainages of Hot Springs Creek above its confluence with the Serpentine River.

THE SPECIES

The drainages around Serpentine Hot Springs support a relatively high density of breeding gyrfalcons. At least 15 known raptor nesting sites, most of which are gyrfalcon sites, exist in a 10-square mile area near the springs. Surveys in 1975 revealed at least two breeding pairs of gyrfalcons; as many as 6 pairs have used the area in the past. Rough-legged hawks, golden eagles, and other raptors have also established active eyries in the vicinity.

The area has received relatively heavy human use in the past from miners and recreationists. A building was erected on the premises to lodge guests, and, although it is in need of repair, the hot springs continue to receive some use, particularly in the winter months. Summer use is restricted because access can only be gained by light aircraft or all-terrain vehicles. The limited human use of the area has not created any serious habitat degradation, but construction of a road to the site would adversely impact nesting habitat.

Little if any consumptive or nonconsumptive use of falcons has occurred in the area. Several years ago birds were killed because they were considered a nuisance, but that practice has largely ceased. In the late 1960's this area was included in a raptor investigation to learn more about distribution, numbers, breeding success, and other life history parameters.

FRANKLIN BLUFFS PEREGRINE FALCON

LOCATION

In Game Management Unit 26, that portion of the east bank of the Sagavanirktok River known as Franklin Bluffs.

THE SPECIES

Peregrine falcon populations throughout much of Arctic Alaska have been declining. Surveys conducted along the Franklin Bluffs indicate a similar pattern between 1958 and 1975. Five pairs nested in the Bluffs in 1958, but surveys conducted from 1970 to 1975 located only two pairs in most of those years, and only one pair in 1975.

Nesting failure appears to be the primary cause of population declines both in this area and throughout much of the species range. During the years 1970 and 1972, 5 known nesting attempts by peregrins resulted in 10 young or a production of 2.0 young per eyrie; however by 1974 and 1975, three nesting attempts resulted in only 2 young fledged or 0.7 young per eyrie. Concentrations of organochlorine residues appear to be the major factor affecting nesting loss. High contaminant levels have resulted in addled eggs and eggs with weak shells. Critical levels of some residues may affect nesting behavior of adults resulting in increased abandonment.

Peregrine falcons from this region are migratory and winter in southern climates. Since many of the prey species in this area also winter in southern regions, both predator and prey are subject to accumulation of pesticide residues outside of Alaska.

Additional mortality occurs from natural causes such as land slides in nesting cliffs, and adverse weather during nesting. Peregrine falcon habitat in the area has remained relatively stable. A number of nest sites and vast foraging areas are at present under-utilitzed.

Little information is available on past human use of peregrines along the Franklin Bluffs. Some utilization of birds by falconers may have occurred. The species now receives complete protection in Alaska and the "Lower 48" under the Endangered Species Act of 1969.

SAGWON BLUFFS PEREGRINE FALCON

LOCATION

In Game Management Unit 26, the bluffs along the Sagavanirktok River between the Ivishak and Lupine Rivers.

THE SPECIES

Peregrine falcon populations throughout much of Arctic Alaska have been declining. Surveys conducted along Sagwon Bluff indicate a similar pattern between 1958 and 1970. Only two eyries were occupied by peregrines in 1974 and 1975. Production of young falcons has been low. Three young were fledged in 1974 and none in 1975.

Nesting failure appears to be the primary cause of population declines both in this area and throughout much of the species' range. Concentrations of organochlorine residues appear to be the major factor affecting nesting loss. High contaminant levels have resulted in addled eggs and eggs with weak shells. Critical levels of some residues may affect nesting behavior of adults resulting in increased abandonment. Fledgling success has also been poor. In 1974 and 1975 fledgling success was 0.75 and 0.70 birds per eyrie, respectively (data combined with Franklin Bluffs). Peregrine falcons from this region are migratory and winter in southern climates. Many of the prey species in this area also winter in southern regions, thus both predator and prey are subject to accumulation of pesticide residues outside of Alaska.

Additional mortality occurs from natural causes such as landslides in nesting cliffs, and adverse weather during nesting. Peregrine falcon habitat in the area has remained relatively stable. Nest sites and foraging areas are presently under-utilized.

Little information is available on past human use of peregrines along the Sagwon Bluffs. Some utilization of birds by falconers may have occurred. The species now receives complete protection in Alaska and the "Lower 48" under the Endangered Species Act of 1969. Until construction of the North Slope Haul Road, the Sagwon Bluff peregrines were relatively isolated from any use or disturbance. If the Haul Road is opened to the public and as interest in peregrines increases, nonconsumptive use of the birds is expected to increase.

COLVILLE RIVER PEREGRINE FALCON

LOCATION

In Game Management Unit 26, all cliffs and bluffs adjacent to the Colville River between Ocean Point and the mouth of the Kuna River; including drainages of the Kuna River below the confluence of Story Creek, drainages of the Etivluk River below the confluence of Nigu River, drainages of the Killik River below the confluence of Silalinigun Creek to include the Okpikruak River and Okokmilaga River below Fire Creek, drainages of the Chandler River below Gunsight Mountain, Sivugak Bluff including the Siksikpuk River north of Desolation Creek and the drainage of Anaktuvuk River below the confluence of Anayaknaurak Creek to include drainages of Tuluga River and Nanushuk Rivers below the confluence of Cobblestone Creek.

THE SPECIES

The lower Colville remains one of the most preferred peregrine falcon nesting areas in Alaska. Trend surveys, however, have indicated a decline in the population. In 1969, 33 nesting pairs was observed, but by 1971 only 14 pairs were located. The population has apparently stabilized at this lower level. Nesting pairs upstream from the Kuna River now number only 7 indicating an overall decline in the upper Colville drainage. Poor production of young appears to be responsible for much of the reduction. In 1969, 13 pairs produced 26 young while in 1973, 11 pairs fledged only 9 young. Mortality of the young and reduced productivity of the adults appears to be closely linked with pesticide residues in adult birds. The migratory nature of both the peregrine falcon and certain prey species combine to increase residue levels in the falcon both outside and within the state, even though pesticide application in Alaska is very low. Egg shell thickness has been declining in this region and has apparently reached critical levels. Suspension of use of DDT may ultimately reverse this trend. Adverse weather conditions or land slides have undoubtedly accounted for additional mortality.

Nesting and foraging habitat remains unaltered from pre-decline periods, and could support increased populations. Presence of former nest sites will be a valuable asset if populations begin expanding.

Little information is available on past human use of peregrines along the Colville River, although some utilization by falconers undoubtedly occurred. The species now receives complete protection in Alaska and the "Lower 48" under the Endangered Species Act of 1969. The presence of peregrine falcons has added to the wilderness experience of many recreational users of the Colville River and its tributaries. Non consumptive use of peregrines can be expected to increase in the area as interest in the species grows and access to the area improves.

ALASKA SEABIRDS

LOCATION

Entire state of Alaska.

THE SPECIES

Over 40 species of seabirds migrate through, breed on, or visit Alaska's coastline and adjacent waters. Approximately 24 species are known to breed in Alaska, usually in colonies ranging from a few hundred to a million or more birds. Most of the large colonies are located on islands in the Bering Sea or in the Aleutian Islands, but sizeable colonies are located wherever precipitous sea cliffs occur along the mainland coast from Cape Lisburne to Southeastern Alaska. The most abundant nesting species are murres, murrelets, gulls, kittiwakes, fulmars, and petrels. Several species of auklets, puffins, and cormorants, though not as numerous as some other species, are widely distributed. Seabird populations in Southwestern and Southcentral Alaska exhibit greater species diversity than those found in the remainder of Alaska because of greater diversity of favorable habitats.

In addition to millions of nesting seabirds, many millions more utilize pelagic waters off Alaska as summer feeding grounds. Of these, slender-billed and sooty shearwaters are the most numerous.

Seabirds migrate south as winter approaches and populations in Alaskan waters become much reduced from those of summer. Many birds, however, overwinter in ice-free waters, and substantial numbers are found in and south of the Aleutian Islands.

Historically, seabirds have provided food and clothing to coastal native people in the state. Traditional use of seabird eggs and adult birds, principally auklets, puffins and murres, has been greatest along the Northwestern and Western Alaska coast. Limited domestic use of seabirds occurred in Southeastern and Southcentral Alaska. Consumptive utilization has decreased in the past 10 to 20 years as coastal residents have adopted a cash economy.

Nonconsumptive use is now becoming the dominant use of seabirds. As the potential impact of energy resource development on these species has become apparent, scientific surveys of Alaskan seabirds are being conducted throughout the state. Studies of seabird distribution, population sizes, and habitat requirements should increase knowledge about these species. Seabirds may eventually serve as biological indicators of the health of marine environments.

Viewing and photography are becoming major activities at seabird nesting colonies in the more accessible waters of the state. The more conspicuous colonial nesters such as gulls, murres, and kittiwakes support the most use, but less numerous or more secretive species such as puffins, cormorants,

auklets, and murrelets are receiving increased attention. Fortunately, many seabird colonies are protected from habitat alteration or undue disturbance by their inclusion in the National Wildlife Refuge System. These areas receive additional protection under the state's refuge and sanctuary system.

ALASKA SMALL GAME

LOCATION

Entire state except national parks or other areas which are closed to all hunting.

THE SPECIES

Small game species addressed in this management plan are blue, spruce, ruffed and sharp-tailed grouse; willow, rock and white-tailed ptarmigan; and snowshoe, arctic and European hares. Small game populations fluctuate considerably in successive years, and little is known of annual population status except in relatively small, localized areas. A feature common to most Alaskan small game populations is a recurrent cycle of abundance and scarcity. In most instances, a complete cycle lasts 8 to 12 years. Populations of the various species appear to fluctuate in phase over most of Alaska, although local pockets of animals may remain at high numbers while populations are declining elsewhere. Coastal populations seem to exhibit less drastic oscillations than populations in the interior. Blue grouse, found only in Southeastern Alaska spruce-hemlock forests, occur in relatively stable numbers. The three species of ptarmigan in coastal parts of their range exhibit erratic, rather than cyclic, population fluctuations. Grouse and ptarmigan populations in Interior and parts of Southcentral Alaska were high during 1960 to 1962-63 and again in 1968 to 1970. Hare populations followed a similar pattern, including less drastic, more erratic fluctuations in numbers in coastal areas.

Factors causing the oscillations in small game numbers are not well understood, although weather, food, predation and diseases probably all play a role, with different factors varying in significance during different stages of the cycle. The general synchrony of small game population fluctuations suggests that some major extrinsic factor, perhaps weather, is the cause for population cycles. Natural mortality rates for all small game species are very high, perhaps reaching 80 percent in some years. Severe winters and wet, cold springs which adversely impact nesting success and chick survival may be the main sources of grouse and ptarmigan mortality. Snowshoe hare abundance may be related to available food supplies as well as weather.

Small game habitat has been little affected by human activity over most of the state, although some habitat has been lost or altered by urbanization and agriculture near Anchorage and in the Matanuska-Susitna Valley and by extensive logging in Southeastern Alaska. Logging activities and fires may enhance habitat for hares and ruffed and sharp-tailed grouse, while reducing suitable habitat for spruce and blue grouse and willow ptarmigan. Rock and especially white-tailed ptarmigan breed at higher elevations than willow ptarmigan, and their habitat has probably been little altered by human activity.

Recreational hunting by Alaskan residents is the primary use of small game with most harvested animals retained for domestic consumption. Most small game hunting occurs along established road systems close to

human population centers, although some hunters employ snowmachines in winter and boats in summer and fall to reach more distant areas. A few hunting parties travel by plane to remote regions specifically to hunt small game. Most small game hunting in remote areas, however, is incidental to quests for big game and serves mainly to supplement camp rations. Nonresident hunters contribute little to the small game harvest. Hunter effort and harvest levels of small game depend mainly on small game abundance and accessibility. The high natural mortality and fecundity rates of small game populations preclude hunting as a significant limiting factor. Small game hunting seasons and bag limits have changed little since statehood. The only significant change was a shortening of seasons and summer closures to small game hunting in Chugach State Park near Anchorage.

Nonconsumptive uses of small game vary significantly between areas. Most viewing and photography occurs adjacent to major human population centers, such as in Chugach State Park near Anchorage, along the roads, trails and footpaths in Chugach National Forest and the National Moose Range on the Kenai Peninsula, and the Twelvemile and Eagle Summits on the Steese Highway. Besides being an important hobby of many urban-area residents, viewing and photography of small game occur incidental to other outdoor pursuits, such as berrypicking, skiing, snowshoeing, hiking, and mountain climbing. Although most nonconsumptive users are Alaska residents, nonresidents also enjoy small game, particularly in Interior Alaska along roads leading to and near Mt. McKinley National Park.

Ptarmigan are the most common and popular gamebirds in Alaska. Willow and rock ptarmigan are distributed throughout the state. White-tailed ptarmigan are restricted to the Alaska Range and mountainous areas to the south including the Cook Inlet area, the Kenai Peninsula, the coast of Prince William Sound and the Gulf of Alaska, and Southeastern Alaska. Rock and willow ptarmigan make extensive altitudinal migrations in spring and fall, while white-tailed ptarmigan generally remain at higher elevations throughout the year. Willow ptarmigan occur in willow-grown flats and foothills near timberline during summer and fall and move to lower riparian areas in winter. Rock ptarmigan breed above timberline to about 3500 feet, and white-tailed ptarmigan occur as high as 5000 feet. Comparatively little ptarmigan habitat has been altered or destroyed in Alaska, although greater efficiency in fire suppression may be having an impact on willow and rock ptarmigan wintering areas.

Willow ptarmigan are the most frequently encountered gamebird because they are most abundant and they winter at lower elevations. The magnitude of harvest is unknown, but hunting effort varies considerably from year to year depending on bird abundance. Some of the most popular recreational ptarmigan hunting areas include the Copper River Delta, lands adjacent to the headwaters of the Little Susitna River, the Isabel Pass area, Eagle and Twelvemile Summits on the Steese Highway, Mt. Fairplay and, on Kodiak Island, the Upper Station Lakes and Tugidak Island. In Southeastern Alaska, the most used ptarmigan hunting areas are near Haines, Juneau, Ketchikan, and along beach and river systems from Yakutat to the Alsek River. Ptarmigan hunting is most intensive in late winter after snow

depths at high elevations have forced birds to move down. Ptarmigan are an important year-round source of food for rural residents in much of northern, western and interior Alaska and are taken whenever available. The extent of domestic utilization by local residents is dependent on cyclical ptarmigan abundance; when birds are scarce relatively little effort is expended to procure them. Observation and photography of ptarmigan occurs year-round and are popular whenever and wherever the birds are accessible. Many people also view ptarmigan incidentally to other outdoor activities.

Grouse are less abundant and less conspicuous than ptarmigan, although spruce grouse are widespread and at times locally abundant. Blue grouse are common in spruce-hemlock forests of Southeastern Alaska but their range extends only as far north as the Dangerous River. Sharp-tailed and ruffed grouse are distributed through Interior Alaska in a broad band that approximates the drainage of the Yukon River, although these species also occur in areas south of the Alaska Range. Ruffed grouse are present in Southeastern Alaska. Ruffed grouse have an affinity for hardwood trees and replace spruce grouse where aspen and birch stands occur in the predominantly spruce forests. The sharp-tailed grouse prefers transitional habitats between forests and tundra or grasslands. Spruce grouse are the most widespread and numerous of Alaskan grouse, present in spruce-birch and spruce-hemlock forests over most of the state. Little information is available on abundance, except on a comparative basis. Whereas ruffed and sharp-tailed grouse probably benefited from widespread wildfires that occurred earlier in the century, spruce grouse have probably benefited from forest fire prevention now provided by federal and state agencies.

Most grouse hunting is by Alaska residents for recreation and domestic use. The magnitude of harvest is unknown. Hunting effort declines substantially when grouse populations decline. Grouse are typically hunted along road systems in fall and early spring when the birds are gathering grit. Spruce grouse have been relatively common along the Steese Highway between Mile 120 and 148, near Manley Hot Springs, between Ester and Nenana on the Nenana Road near Fairbanks, along the Alaska and Taylor Highways near Fortymile, near Glennallen, and on many secondary roads on the Kenai Peninsula.

In Southeastern Alaska spruce and ruffed grouse occur in such low numbers that they are usually taken by hunters only incidental to quests for other species, usually big game. Blue grouse, however, are subject to intensive local hunting from mid-April to mid-May when "hooters" (territorial males) are conspicuous; most of the blue grouse harvest consists of males. Most grouse hunting occurs adjacent to major road systems.

Grouse viewing and photography are primarily by Alaska local residents, although an increasing number of nonresidents, usually summer tourists, are important nonconsumptive users in state and national parks and along major road systems. Comparatively few people seek grouse specifically for viewing and photography, but they are clearly important adjuncts to some outdoor activities such as hiking, camping, fishing etc.

Hares are probably the most important small game in Alaska. Three species occur in the state. Snowshoe hares and arctic hares are indigenous

species. European hares are introduced. Native hare populations are extremely cyclic in inland areas of the state; hare numbers may vary by factors of 100 or more between years. Snowshoe hares reach their greatest density about every 10 years, with catastrophic population declines during intervening periods. Coastal populations of arctic and snowshoe hares seem less cyclic and exhibit erratic population oscillations. Hare population fluctuations have been documented since the late 1800's in Alaska. Hares were abundant in Interior Alaska in 1885, probably during the mid-1890's, in 1905, from 1913 to 1915, in 1924, in 1935, from 1946 to 1947, in 1954, in 1963, and finally around 1970. Hare numbers were again at low levels by the mid-1970's. Less is known of arctic hares, but their numbers seem to show a similar pattern. European hares have been established by the release of domestic hares on a number of islands including Umnak and Hog in the Aleutians, and Middleton Island in Prince William Sound. The Middleton Island transplant of three females and one male in 1954 increased to at least 6000 by 1960 and the population is currently at about that level, although drastic fluctuations in numbers have occurred over the last 15 years. The Alaska Game Commission authorized a transplant of snowshoe hares to Kodiak and Afognak Islands in 1934. The transplant was successful, and snowshoes were subsequently released on Woody and Long Islands and later on Popof Island in the Shumagin group. Most hare habitat has probably been little altered by human activity, although improved efficiency in fire suppression and prevention by state and federal agencies may have reduced some hare habitat. Habitat requirements of hares appear flexible but most often consist of streamside willows, dwarf birches, and brush thickets. Hares are widespread during population highs. Urban sprawl and livestock grazing are probably having adverse local impacts on hare numbers in some areas.

Snowshoe hares are probably the most popular small game species in Alaska. Most use is recreational hunting for food. Most hares are harvested by local residents although nonresidents take hares incidentally to quests for big game. Areas adjacent to roads and waterways are most heavily hunted. Access to hunting areas is often by walking, but more hunters are employing boats, all-terrain vehicles and snowmachines to reach distant areas. A few hunting parties travel by plane to remote regions exclusively to hunt hares. Hunting effort varies with population fluctuations, being intense when hares are abundant and limited when they are scarce. Snowshoe hares are less common in Southeastern Alaska and provide a limited amount of recreational hunting near Juneau, Haines, and Skagway. Villagers in remote areas make extensive domestic use of hares. Most hare hunting occurs in fall and winter. Hares are also popular with nonconsumptive users, particularly near urban areas. Although many people wishing to view hares often blame hunting for low numbers during years of hare scarcity, the high reproductive and natural mortality rates make the impact of losses due to hunting insignificant.

GROUSE AND PTARMIGAN

Blue, spruce and ruffed grouse and willow, rock and white-tailed ptarmigan, all members of the family Tetraonidae, are gallinaceous birds inhabiting various parts of Southeastern Alaska.

Blue grouse (*Dendragapus obscurus*) are the most widely distributed and hunted small game species in Southeastern. They occur primarily in spruce-hemlock forests from Yakutat south throughout the rest of the panhandle except for Prince of Wales Island. Franklin's grouse, a subspecies of spruce grouse (*Canachites canadensis*), occurs in limited numbers in spruce-hemlock forests on the mainland south of Unuk River and on Revillagigedo and Prince of Wales Islands. Ruffed grouse (*Bonasa umbellus*) are found in very low numbers in cottonwood forests and riparian willow stands on mainland river drainages from the Unuk River north to Haines.

Willow ptarmigan (*Lagopus lagopus*) are the most abundant ptarmigan species and occur on the mainland and all larger islands except Prince of Wales and Kiui Islands. White-tailed ptarmigan (*L. leucurus*) are found throughout Southeastern Alaska except for Prince of Wales Island. Rock ptarmigan (*L. mutus*) occur in low numbers along the entire mainland coast and on Revillagigedo Island.

Ptarmigan move downwards in October to their winter ranges. Among rock and willow ptarmigan the sexes segregate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout winter, while the females undergo movements of several miles to brushy subalpine or timbered winter range. The birds are funneled through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March. The degree of sexual segregation among white-tailed ptarmigan is not known.

The tetraonids have evolved so that each major vegetation type in Alaska provides habitat for one or more species at some period of the year. Therefore, disturbances such as burning, timber removal and agriculture produce vegetative changes that decrease the range quality for some species while favoring otherspecies. Spruce and blue grouse and the three species of ptarmigan tend to occupy mature or climax habitats. Conversely, disturbed communities provide ruffed grouse habitat.

Although populations of grouse and ptarmigan fluctuate in Southeastern Alaska the extreme cyclic fluctuations evident over large northern Alaska areas have not been observed in the region. Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Although populations can probably withstand repeated harvest amounting to 40 percent of the fall population,

hunting pressure and harvest will probably continue to fluctuate with tetraonid abundance. Habitat management has not been attempted in Alaska, but ruffed grouse populations would probably respond to habitat manipulation. Higher densities of this species could probably be attained in some years through intensive habitat manipulation although it is doubtful if "cyclic" lows could be prevented.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sport hunters in Southeastern. Most hunters are residents, and the distribution of hunting pressure is primarily restricted to access routes and areas in close proximity to human population centers. Most grouse hunting occurs in the spring when the male blue grouse are "hooting." Ptarmigan and some grouse are also taken in the fall in conjunction with deer or goat hunting.

Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest results incidental to big game hunting. Interest in grouse and ptarmigan hunting is expected to increase along with human population growth. This increased hunting pressure will probably continue to be exerted in relatively localized, traditional hunting areas. Like hunting, nonconsumptive uses such as observation and photography have been light in the past, but an increase should also be expected. For the most part consumptive and nonconsumptive uses can be provided concurrently on all small game ranges in Southeastern Alaska.

HARES

The snowshoe hare (*Lepus americanus*) is the only hare occurring in Southeastern Alaska. It is found mainly in the major river deltas of the mainland, and is very sparse elsewhere. There are no hares on the islands.

Hares are never as abundant in the Southeastern Region as they are in more northern parts of the state but their densities are still influenced to some extent by cyclic fluctuations in population levels. These fluctuations average 10 years between peaks, but never reach the magnitude that occurs in interior Alaska areas. No estimates are available for hare densities in the Southeast.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred, or will support a higher density. Hares prefer the more open aspen and birch communities with brushy understories of willow, alder, blueberry, etc. and streamside areas with willows seem to be optimum habitat for hares. In Southeastern Alaska suitable habitat occurs mainly along the major river bottoms. Dense spruce-hemlock forests support few hares.

Habitat disturbances such as wildfire and clearing of timber usually benefit the snowshoe hare, since regrowth of herbaceous and woody species provides cover and food. Increased logging operations in the region may possibly benefit the hare. Climax communities of dense spruce do not provide suitable brushy understories for snowshoe hares.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food, and populations of lynx fluctuate with hare populations, with high and low points in lynx populations following those of hares by about one year. In years of low hare numbers, few if any lynx kittens are raised. Both red foxes and wolves also depend to a great extent on hares. Raptors such as the great horned owl and the goshawk utilize hares as a major part of their diet, and their numbers are influenced by the snowshoe hare populations.

The cyclic nature of snowshoe hare populations precludes management programs designed to stabilize hare populations. In Southeastern Alaska especially, it is the availability of suitable habitat which controls the hare populations. Hunting pressure on hares increases as populations increase and hares become more available, but as hare populations decline and become harder to find, there is correspondingly less interest in hunting them, and hunting then has little effect on the natural population cycle. Snowshoe hares are not considered an important small game animal in Southeastern Alaska as their populations are so scattered. Most hare hunting in the region is probably incidental to hunting for other species. Local populations of hares, such as those in the Mendenhall flats area near Juneau, may receive significant hunting pressure as the human population in the area increases.

GROUSE AND PTARMIGAN

Spruce grouse (*Canachites canadensis*), ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Pediocetes phasianellus*) and rock ptarmigan (*Lagopus mutus*), willow ptarmigan (*L. lagopus*) and white-tailed ptarmigan (*L. leucurus*), all members of the family Tetraonidae, are the gallinaceous birds inhabiting the Southcentral Region. Within this region rock, willow and white-tailed ptarmigan and spruce grouse are found wherever suitable habitat occurs. Sharp-tailed grouse inhabit the basin bounded by the Talkeetna Mountains, the Alaska Range and the Wrangell Mountains southward along the Copper River drainage to the Chitina area. Ruffed grouse are restricted to the upper portions of the Copper River drainage.

Although there is considerable overlap in geographical distribution of the various tetraonid species, each displays a marked preference for certain habitat types. Spruce grouse are found most commonly in white spruce-birch communities and black spruce associations. Ruffed grouse inhabit upland aspen and birch communities and riparian willow stands. Sharp-tailed grouse occupy a variety of habitat types including subalpine brushlands, sparsely timbered black spruce bogs, mature birch woodlands, regenerating hardwood forests and open fields.

In Southcentral Alaska, breeding habitats of the three species of ptarmigan are separated altitudinally, although some overlapping occurs. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in riparian shrub communities, generally between elevations of 2,000 and 2,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright, woody vegetation. White-tailed ptarmigan breed at elevations of 3,500 to 5,000 feet. They occupy rough terrain where vegetation forms a low, sparse cover interrupted by boulder fields, talus slopes, ledges and glaciers.

Unlike forest grouse, ptarmigan move downward in October to their winter ranges. Among rock and willow ptarmigan the sexes segretate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout winter, while the females move up to 100 miles to brushy subalpine or timbered winter range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March. In some years flocks numbering in the hundreds of birds move through Isabel Pass, and there are probably similar seasonal concentration areas for birds in other areas. The degree of sexual segregation among white-tailed ptarmigan is not known.

The tetraonids have evolved so that each major vegetative type in Alaska provides habitat for one or more species at some period of the year. Disturbances such as burning, timber removal and agriculture produce vegetative changes that decrease the habitat quality for certain species while favoring others. Spruce grouse and ptarmigan tend to occupy

mature or climax habitats. The forests of the western Kenai Peninsula provide some of the best spruce grouse habitat in Alaska. Ruffed and sharp-tailed grouse thrive in disturbed communities, and in the Southcentral region fire has been a prevalent factor producing and maintaining ruffed and sharp-tailed grouse habitat. Favorable habitat resulting from burning lasts for up to 60 years but, because of this relatively short time span, the maintenance of grouse habitat for these species involves a regime of repeated burning. Recent trends in fire control, particularly in the vicinity of human population centers, may be resulting in a decline in the amount of habitat for these species.

Inland populations of the various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations involving seven to nine years between peaks. These patterns are evident over large geographical regions, but the abundance of a given species in a local area may vary from the general pattern at any given time. During the last 15 years Southcentral grouse populations were high during the periods 1960-62 and 1968-69. Low grouse densities occurred in 1964-66 and again in the early to mid 1970's. Similarly, ptarmigan were abundant in 1961-63 and 1968-70, and scarce in 1964-66 and in the early to mid 1970's.

Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Habitat management has not been attempted in Alaska, but ruffed and sharp-tailed grouse populations would probably respond to habitat manipulation. Higher densities of these species could probably be attained in some years through intensive habitat manipulation although it is doubtful if "cyclic" lows could be prevented. If increased densities of self-sustaining populations of ruffed or sharp-tailed grouse are desired, the intensive habitat management approach is definitely preferred over the usually unsuccessful techniques involving captive breeding, stocking and transplanting.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sportsmen and "subsistence" hunters in the Southcentral region. Although bird populations can probably withstand repeated fall harvests amounting to 40 percent of the fall population, hunting pressure and harvest will probably continue to fluctuate with tetraonid abundance. Most hunters are Alaskan residents, and the distribution of hunting pressure is primarily restricted to access routes and areas in close proximity to human population centers. Most grouse hunting occurs from early September through October. Ptarmigan hunting follows the same pattern during autumn but, a moderate amount of hunting also occurs during March and April. Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Past harvests have had little if any influence on overall

abundance, but interest in grouse and ptarmigan hunting is expected to increase along with accelerated human population growth. This increased hunting pressure will probably continue to be exerted in relatively localized, traditional hunting areas. Like hunting, nonconsumptive uses such as observation and photography have been light in the past, but an increase should also be expected. For the most part consumptive and nonconsumptive uses are presently compatible. This situation is expected to continue where grouse are involved, but there is a possibility of future conflicts between nonconsumptive users and spring ptarmigan hunters.

HARES

The snowshoe or varying hare (*Lepus americanus*) is the only hare occurring in Southcentral Alaska, being common throughout the area wherever suitable habitat occurs. The highest hare densities are found around the upper Cook Inlet area, in the Matanuska Valley and Knik River drainages, around Glennallen and Talkeetna, and on the Kenai Peninsula around Soldotna. In 1976 hares were present in low numbers throughout most of the region, but there were some localized pockets with moderate numbers. Densities are influenced by cyclic fluctuations in population levels averaging 10 years between peaks. In the Southcentral Region snowshoe hare populations were high around 1971-73. Fluctuations are fairly synchronous throughout the area, but tend to peak first in the more northern part. These cyclic fluctuations seem to be most extreme in the central portions of the snowshoe's range. Interior Alaska has historically experienced the greatest extremes in hare density. During population peaks, densities may average 1500 or more per square mile.

The abundance of hares in local areas may vary greatly, and even in periods of low population levels local areas of abundance will occur in optimum habitat. As populations increase hares spread into less desirable habitat, and when populations decline, they disappear from these areas first. The decline may be abrupt, or it may be gradual and occur over a period of 3 to 4 years.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred and will support a higher density of hares. Hares can be found in subalpine areas, brush lands, white spruce-birch communities and scrubby black spruce stands. The more open aspen and birch communities with brushy understories of willow, alder, highbush cranberry and wild rose, and streamside areas with willows seem to be optimum habitat for snowshoe hares.

Habitat disturbances such as wildfire and clearing of timber usually benefit the snowshoe hare, since regrowth of herbaceous and woody species provides cover and food. However increased fire control is decreasing prime habitat for hares. Climax communities of dense spruce do not provide suitable brushy understory for snowshoe hares.

In years of high snowshoe populations, girdling of willow and other browse plants, and to a lesser extent spruce saplings, occurs over large areas. Such girdling can seriously reduce the amount of available browse for a number of years and may affect moose populations as well as

the hares themselves.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food, and populations of lynx fluctuate with hare populations, with high and low points in lynx populations following those of hares by about one year. In years of low hare numbers, few if any lynx kittens are raised. Both red foxes and wolves also depend to a great extent on hares. Raptors such as the great horned owl and the goshawk utilize hares as a major part of their diet, and their numbers are influenced by snowshoe hare populations.

The cyclic nature of snowshoe hare populations makes management programs designed to stabilize hare populations difficult. Too many factors are involved in these population cycles for man to have much effect other than by modifying the habitat. Hunting pressure on hares increases as populations increase and hares become more available, but as hare populations decline and they become harder to find, there is correspondingly less interest in hunting them, and hunting then has little effect on the natural population cycle. Also, hunting pressure is concentrated along roads and trails and around human population centers; over vast areas the animals are not hunted by man.

When snowshoe hares are abundant, the harvest by sport hunters may be fairly high in very localized areas. Most hunters are residents. Most hunting occurs in the fall, but hare hunting is popular all winter long when snowshoe hare populations are high. On mild winter days, many people enjoy going out for a few hours to hunt hares as a form of winter recreation, combining it with skiing, snow machining, or snowshoeing. Hares are used as human and dog food, and as bait for traps. The hides are fragile, but are sometimes used for mittens and blankets.

GROUSE AND PTARMIGAN

Spruce grouse (*Canachites canadensis*) and rock ptarmigan (*Lagopus mutus*) and willow ptarmigan (*L. lagopus*), all members of the family Tetraonidae, are the most abundant gallinaceous birds inhabiting the Southwestern Region. Where suitable habitat exists, rock and willow ptarmigan inhabit the entire region including the Aleutian and Kodiak-Afognak Island complexes. Spruce grouse occur in the lower, forested habitats north of Becharof Lake. Spruce grouse are not found on Kodiak Island. While not widespread in southwestern Alaska, white-tailed ptarmigan (*L. leucurus*) inhabit the higher elevations of the Aleutian Range in the northeastern portion of the region and ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Pediocetes phasianellus*) may occur in the upper reaches of the Chichitnok, Nushagak and Mulchatna drainages. Upland game birds do not occur on St. Matthews or the Pribilof Islands.

Although there is considerable overlap in geographical distribution of the various tetraonid species, each displays a marked preference for certain habitat types. Spruce grouse are found most commonly in white spruce-birch communities and black spruce associations. Ruffed grouse inhabit upland aspen and birch communities and riparian willow stands. Sharp-tailed grouse occupy a variety of habitat types including subalpine brushlands, sparsely timbered black spruce bogs, mature birch woodlands, regenerating hardwood forests and open fields.

In mountainous sections of Southwestern Alaska, breeding habitats of the three species of ptarmigan are separated altitudinally although some overlapping occurs. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in riparian shrub communities generally between elevations of 2,000 and 2,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright, woody vegetation. White-tailed ptarmigan breed at elevations of 3,500 to 5,000 feet. They occupy rough terrain where vegetation forms a low, sparse cover interrupted by boulder fields, talus slopes, ledges and glaciers. In the lower, coastal portions of the region the differences between rock and willow ptarmigan habitats are poorly understood.

Unlike forest grouse, ptarmigan in mountainous portions of Southwestern Alaska move downward in October to their winter ranges. Among rock and willow ptarmigan the sexes segregate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout the winter, while females move up to 100 miles to brushy subalpine or timbered winter range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March.

The tetraonids have evolved so that each major vegetative type in Alaska provides habitat for one or more species at some period of the year. Disturbances such as burning, timber removal and agriculture produce vegetative changes that decrease the habitat quality for certain species while favoring others. In Southwestern Alaska little such habitat disturbance has occurred, consequently man's activities have had no significant impact on the distribution or abundance of tetraonids in this region.

Inland populations of the various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations involving seven to nine years between peaks. In maritime situations, such as most of the Southwestern region, population fluctuations do occur, but they are thought to be erratic and not necessarily in phase with those recorded from continental habitats. Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Since the major upland game bird species in this area occupy mature or climax vegetation types, habitat manipulation is not considered a feasible technique for increasing carrying capacity.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sport and domestic hunters in the Southwestern Region. Harvests probably fluctuate with tetraonid abundance and have had little influence on regional population trends. Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Like hunting, nonconsumptive uses such as observation and photography have been light in the past, and for the most part consumptive and nonconsumptive uses are compatible.

HARES

Both the snowshoe hare (*Lepus americanus*) and the tundra hare (*L. arcticus*) are found in Southwestern Alaska. The snowshoe hare occurs naturally on the mainland, and has been reported as periodically abundant around Lake Clark and along the Chulitna River. Specimens have been taken at Nushagak, Lake Aleknagik, Ekwok, and Kakwok River. They probably do not range far beyond the timbered areas.

Showshoe hares were introduced to the Kodiak Island group in 1934 with a release of 558 snowshoe hares on Kodiak and Afognak Islands. This transplant was successful and in 1952 hares from Kodiak Island were captured and introduced to the adjacent Woody and Long Islands. These introductions were also successful.

Tundra hares have been found throughout the Alaska Peninsula and Bristol Bay area. They are not present on the islands, although there is a record of one specimen collected on Popof Island in 1913. Murie reports that tundra hares were abundant in 1936 at Snag Point, near Nushagak, and in 1925 were seen at the west end of the Alaska Peninsula. Tundra hares inhabit shrub thickets of dwarf birch, willow and alder in the coastal tundra areas of the Peninsula. Windswept areas of tundra and rocky slopes provide access to habitat free of snow in the winter. There is little information available on the status of tundra hare populations in this area.

Densities of snowshoe hares, and possibly of tundra hares as well, are influenced by cyclic fluctuations in population levels averaging 10 years between peaks. On Kodiak Island, snowshoe hares occur in moderate densities in good habitat, but they do not have suitable habitat everywhere on the island and individual populations fluctuate sporadically.

The abundance of snowshoe hares in local areas on the mainland may vary greatly, and even in periods of low population levels, local areas of abundance will occur in optimum habitat. As populations increase hares spread into less desirable habitat, and when populations decline, they disappear from these areas first.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred and support a higher density of hares. Hares can be found in subalpine areas, brush lands, white spruce-birch communities and scrubby black spruce stands. The more open aspen and birch communities with brushy understories of willow, alder, highbush cranberry and wild rose, and streamside areas with willows seem to be optimum habitat for snowshoe hares.

Habitat disturbances such as wildfire and clearing of timber usually benefit the snowshoe hare, since regrowth of herbaceous and woody species provides cover and food. However, increased fire control is decreasing prime habitat for hares. Climax communities of dense spruce do not provide suitable brushy understories for snowshoe hares.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food, and populations of lynx fluctuate with hare populations, with high and low points in lynx populations following those of hares by about one year. In years of low hare numbers, few if any lynx kittens are raised. Both red foxes and wolves also depend to some extent on tundra hares and snowshoe hares. Raptors feed on both species of hares, and their numbers may be influenced somewhat by hare populations.

The cyclic nature of snowshoe hare populations makes management programs designed to stabilize hare populations difficult. Too many factors are involved in these population cycles for man to have much effect other than by modifying the habitat. Hunting pressure on hares increases as populations increase and hares become more available, but as hare populations decline they become harder to find, and there is correspondingly less interest in hunting; hunting then has little effect on the natural population cycle.

When snowshoe and tundra hares are abundant, domestic utilization and recreational harvests may be fairly high in very localized areas. There is very little information on harvest levels for either species of hare in this area, except for snowshoe hares on Kodiak. On Kodiak, there is an intense hunting effort both for sport and food along the Kodiak road system and in the Port Lyons and Ouzinke areas.

GROUSE AND PTARMIGAN

Spruce grouse (*Canachites canadensis*), ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Pediocetes phasianellus*) and rock ptarmigan (*Lagopus mutus*), willow ptarmigan (*L. lagopus*) and white-tail ptarmigan (*L. leucurus*), all members of the family Tetraonidae, are the gallinaceous species occurring in the Western Region. Willow ptarmigan occur throughout the entire region, including Nunivak Island, where suitable habitat exists. Rock ptarmigan and spruce grouse occur throughout with the exception of the western portion of the Yukon-Kuskokwim delta. Ruffed and sharp-tailed grouse occur throughout the Yukon and Kuskokwim drainages above Holy Cross and Aniak, respectively. White-tailed ptarmigan are restricted to the upper slopes of the Alaska Range in the southeastern portion of this region.

Although there is considerable overlap in geographical distribution of the several tetraonid species, each displays a marked preference for certain habitat types. Spruce grouse are found most commonly in white spruce-birch communities and black spruce associations. Ruffed grouse inhabit upland aspen and birch communities and streamside willow stands. Sharp-tailed grouse occupy a variety of habitat types including subalpine brushlands, sparsely timbered black spruce bogs, mature birch woodlands, regenerating hardwood forests and open fields.

In mountainous sections of Western Alaska, breeding habitats of the three species of ptarmigan are separated altitudinally although some overlapping occurs. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in streamside shrub communities, generally between elevations of 2,000 and 3,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright, woody vegetation. White-tailed ptarmigan breed at elevations of 3,500 to 5,000 feet. They occupy rough terrain where vegetation forms a low, sparse cover interrupted by boulder fields, talus slopes, ledges and glaciers. In the lower, coastal portions of the region the differences between rock and willow ptarmigan habitats are poorly understood.

Unlike forest grouse, ptarmigan in mountainous portions of Western Alaska are known to move downward in October to their winter ranges. The sexes segregate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout the winter, while females move up to 100 miles to brushy subalpine or timbered winter range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March.

The tetraonids have evolved so that each major vegetative type in Alaska provides habitat for one or more species at some period of the year. Disturbances such as burning, timber removal and agriculture produce

vegetative changes that decrease the habitat quality for certain species while favoring others. Spruce grouse and ptarmigan tend to occupy mature or climax habitats whereas ruffed and sharp-tailed grouse select disturbed plant communities. In the Western region fire has been the most prevalent factor producing and maintaining ruffed and sharp-tailed habitat. Favorable habitat resulting from burning lasts up to 60 years but, because of this relatively short time span, the maintenance of grouse habitat for these species involves a regime of repeated burning. Recent trends in fire control, particularly in the eastern portion of this region, may be resulting in a decline in the amount of habitat for these species. Elsewhere in the Western region habitat alterations as a result of human development have not been widespread and changes that have occurred have not influenced tetraonid populations significantly.

Inland populations of the various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations with seven to nine years elapsing between peaks. These patterns are evident over large geographical regions but the abundance of a given species on a local area may vary from the general pattern at any given time. During the last 15 years grouse populations in the interior were high during the period 1960-62 and 1968-70. Low grouse densities occurred in 1963-65 and again in the early to mid 1970's. Similarly, ptarmigan were abundant in 1961-63 and 1969-71 and scarce in 1964-66 and the early to mid 1970's. These data are probably applicable to grouse and ptarmigan population trends in the eastern portions of the Western Region. Populations in the coastal portions of this region fluctuate erratically and not necessarily in phase with those of the interior.

Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Habitat management has not been attempted in Alaska, but ruffed and sharp-tailed grouse populations would probably respond to habitat manipulation. Higher densities of these species could probably be attained in some years through intensive habitat manipulation although it is doubtful if "cyclic" lows could be prevented. If increased densities of self-sustaining populations of ruffed or sharp-tailed grouse are desired, the intensive habitat management approach is definitely preferred over the usually unsuccessful techniques involving captive breeding, stocking and transplanting.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sport and "subsistence" hunters in Western Alaska. Although populations can probably withstand repeated harvest amounting to 40 percent of the fall population, hunting pressure and harvests will probably continue to fluctuate with tetraonid abundance. Most hunters are Alaskan residents,

and the distribution of hunting pressure is primarily restricted to access routes such as rivers, roads and trails in areas close to human population centers. Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Past harvests have had little if any influence on overall abundance. Like hunting, nonconsumptive uses such as observation and photography have been light in the past. For the most part, consumptive and nonconsumptive uses are presently compatible, and this situation is expected to continue into the foreseeable future.

HARES

Both the snowshoe hare (*Lepus americanus*) and the tundra hare (*L. arcticus*) occur in Western Alaska. Tundra hares are found in the coastal tundra areas in low to moderate numbers, while snowshoe hares occur further inland along the major stream drainages. Snowshoe hares are fairly abundant along the Kuskokwim River and in the mountain valleys to the south.

Densities of snowshoe hares are influenced by cyclic fluctuations in population levels averaging 10 years between peaks. In the Western region, snowshoe hare populations were high around 1971-73. These cyclic fluctuations seem to be most extreme in the central portions of the snowshoe's range. Hare densities have averaged 1500 or more per square mile during population peaks. The abundance of hares in local areas may vary greatly, and even in periods of low population levels local areas of abundance will occur in optimum habitat. As populations increase hares spread out into less desirable habitat, and when populations decline, they disappear from these areas. Sometimes the decline may be abrupt, or it may be gradual and occur over a period of 3-4 years.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred, or will support a higher density of hares. Hares can be found in subalpine areas, brush lands, white spruce-birch communities and scrubby black spruce stands. The more open aspen and birch communities with brushy understories of willow, alder, highbush cranberry and wild rose, and streamside areas with willows seem to be optimum habitat for snowshoe hares. The preferred habitat for the tundra hare is brushy tundra and windswept rocky slopes, with alder thickets and willows along the low wide river valleys near the coast.

Habitat disturbances such as wildfire and clearing of timber usually benefit snowshoe hares, since regrowth of herbaceous and woody species provides cover and food. However, increased fire control is decreasing prime habitat for hares. Climax communities of dense spruce do not provide suitable brushy understories for snowshoe hares.

In years of high snowshoe populations, girdling of willow and other browse plants, and to a lesser extent spruce saplings, occurs over large areas. Such girdling can seriously reduce the amount of available browse for a number of years and may affect moose populations as well as the hares themselves.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food, and populations of lynx fluctuate with hare populations, with high and low points in lynx

populations following those of hares by about one year. In years of low hare numbers, few if any lynx kittens are raised. Both red foxes and wolves also depend to a great extent on hares. Raptors such as the great horned owl and the goshawk utilize hares as a major part of their diet, and their numbers are influenced by the snowshoe hare populations.

The cyclic nature of snowshoe hare populations makes management programs designed to stabilize hare populations difficult. Too many factors are involved in these population cycles for man to have much effect other than by modifying the habitat. Hunting pressure on hares increases as populations increase and hares become more available. But, as hare populations decline and they become harder to find, there is correspondingly less interest in hunting them, and hunting then has little effect on the natural population cycle. Also, hunting pressure is concentrated along roads and trails and around human population centers; over vast areas the animals are not hunted by man.

Tundra hares are hunted by the natives of coastal tundra areas who often herd and kill them with clubs. Some are shot or snared. Most are taken for food in the fall, winter or spring. There is no estimate of harvest, but the meat and occasionally the hides are used domestically. In the past, tundra hare pelts were sold commercially, and exported from Alaska by the hundreds, but there is little demand for tundra hare pelts at present.

SMALL GAME IN INTERIOR ALASKA

GROUSE AND PTARMIGAN

Spruce grouse (*Canachites canadensis*), ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Pediocetes phasiannellus*) and rock ptarmigan (*Lagopus mutus*), willow ptarmigan (*L. lagopus*) and white-tailed ptarmigan (*L. leucurus*), all members of the family Tetraonidae, are the gallinaceous species inhabiting the Interior Region. Within this region white-tailed ptarmigan are restricted to relatively high elevations of the Alaska Range, but the other species occur throughout the region where suitable habitat occurs.

Although there is considerable overlap in geographical distribution of the various tetraonid species, each displays a marked preference for certain habitat types. Spruce grouse are found most commonly in white spruce-birch communities and black spruce associations. Ruffed grouse inhabit upland aspen and birch communities and streamside willow stands. Sharp-tailed grouse occupy a variety of habitat types including sub-alpine brushlands, sparsely timbered black spruce bogs, mature birch woodlands, regenerating hardwood forests and open fields.

In Interior Alaska breeding habitats of the three species of ptarmigan are separated altitudinally although some overlapping occurs. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in riparian shrub communities generally between elevations of 2,000 and 2,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright, woody vegetation. White-tailed ptarmigan breed at elevations of 3,500 to 5,000 feet. They occupy rough terrain where vegetation forms a low, sparse cover interrupted by boulder fields, talus slopes, ledges and glaciers.

Unlike forest grouse, ptarmigan move downward in October to their winter ranges. The sexes segregate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout winter, while the females move up to 100 miles to brushy subalpine or timbered winter range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March. In some years flocks numbering hundreds of birds move through Anaktuvuk and Isabel Passes, and there are probably similar seasonal concentration areas for birds in other areas. The degree of sexual segregation among white-tailed ptarmigan is not known.

The tetraonids have evolved so that each major vegetative type in Alaska provides habitat for one or more species at some period of the year. Disturbances such as burning, timber removal and agriculture produce vegetative changes that decrease the habitat quality for certain species while favoring others. Spruce grouse and ptarmigan tend to occupy mature or climax habitats. Conversely, disturbed communities provide ruffed and sharp-tailed grouse habitat. In the Interior fire has been a prevalent factor producing and maintaining ruffed and sharp-tailed

grouse habitat. Favorable habitat resulting from burning lasts for up to sixty years, but, because of this relatively short time span, the maintenance of grouse habitat for these species involves a regime of repeated burning. Recent trends in fire control, particularly in the vicinity of human population centers, may be resulting in a decline in the amount of habitat for these species. Ruffed grouse habitat near cities in the Interior is also being rapidly lost as a result of its use as building sites. Elsewhere in the Interior habitat alterations as a result of human development have not been widespread, and changes that have occurred probably benefited tetraonids.

Inland populations of the various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations involving seven to nine years between peaks. These patterns are evident over large geographical regions, but the abundance of a given species on a local area may vary from the general pattern at any given time. During the last 15 years Interior grouse populations were high during the periods 1960-62 and 1968-70. Low grouse densities occurred in 1963-65 and again in the early to mid 1970's. Similarly, ptarmigan were abundant in 1961-63 and 1969-71, and scarce in 1964-66 and in the early to mid 1970's.

Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Habitat management has not been attempted in Alaska, but ruffed and sharp-tailed grouse populations would probably respond to habitat manipulation. Higher densities of these species could probably be attained in some years through intensive habitat manipulation although it is doubtful if "cyclic" lows could be prevented. If increased densities of self-sustaining populations of ruffed or sharp-tailed grouse are desired, the intensive habitat management approach is definitely preferred over the usually unsuccessful techniques involving captive breeding, stocking and transplanting.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sport and "subsistence" hunters in the Interior. Although bird populations can probably withstand repeated harvests amounting to 40 percent of the fall population, hunting pressure and harvest will probably continue to fluctuate with tetraonid abundance. Most hunters are Alaskan residents, and the distribution of hunting pressure is primarily restricted to access routes and areas in close proximity to human population centers. Most grouse hunting occurs from early September through October. Ptarmigan hunting follows the same pattern during autumn but, in addition, a moderate amount of hunting occurs during March and April. Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Past harvest have had little if any influence on overall abundance, but

interest in grouse and ptarmigan hunting is expected to increase along with accelerated human population growth. This increased hunting pressure will probably continue to be exerted in relatively localized, traditional hunting areas. Like hunting, nonconsumptive uses such as observation and photography have been light in the past, but an increase should also be expected. For the most part consumptive and nonconsumptive uses are presently compatible. This situation is expected to continue where grouse are involved, but there is a possibility of conflicts between nonconsumptive users and spring ptarmigan hunters in the future.

HARES

The snowshoe hare (*Lepus americanus*) is the only hare occurring in Interior Alaska, being common throughout the area wherever suitable habitat occurs. Densities are influenced by cyclic fluctuations in population levels averaging 10 years between peaks. In the Interior Region hare populations were high in 1960-62 and 1970-72 and low in the mid-1960's and mid-1970's. Fluctuations have been fairly synchronous throughout the area but have tended to peak first in the more northern part. Peaks occurred in the Yukon Flats in 1970-71, in the Fairbanks area in 1971-72, and in the McKinley area in 1972-73. These cyclic fluctuations seem to be most extreme in the central portions of the snowshoe's range. The Interior Region historically has experienced extremes in hare density equal to any reported elsewhere. During population peaks, densities have averaged 1,500-2,000 per square mile, or even higher, with reports of up to 30,000 per square mile existing in the literature. The abundance of hares in local areas may vary greatly, and even in periods of low population levels local areas of abundance will occur in optimum habitat. As populations increase hares spread into less desirable habitat, and when populations decline, they disappear from these areas. The decline may be abrupt, or it may be gradual and occur over a period of 3-4 years.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred, or will support a higher density of hares. Hares can be found in subalpine areas, brush lands, white spruce-birch communities and scrubby black spruce stands. The more open aspen and birch communities with brushy understories of willow, alder, highbush cranberry and wild rose, and streamside areas with willows seem to be optimum habitat for snowshoe hares.

Habitat disturbances such as wildfire and clearing of timber usually benefit the snowshoe hare, since regrowth of herbaceous and woody species provides cover and food. However, increased fire control is decreasing prime habitat for hares. Climax communities of dense spruce do not provide suitable brushy understories for snowshoe hares.

In years of high snowshoe populations, girdling of willow and other browse plants, and to a lesser extent spruce saplings, occurs over large areas. Such girdling can seriously reduce the amount of available browse for a number of years and may affect moose populations as well as the hares themselves.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food and populations of lynx fluctuate with hare populations, with high and low points in lynx populations following those of hares by about one year. In years of low hare numbers, few if any lynx kittens are raised. Both red foxes and wolves also depend to a great extent on hares. Raptors such as the great horned owl and the goshawk utilize hares as a major part of their diet, and their numbers are influenced by the snowshoe hare populations.

The cyclic nature of snowshoe hare populations makes management programs designed to stabilize hare populations difficult. Too many factors are involved in these population cycles for man to have much effect other than by modifying the habitat. Hunting pressure on hares increases as populations increase and hares become more available. But, as hare populations decline and they become harder to find, there is correspondingly less interest in hunting them, and hunting then has little effect on the natural population cycle. Also, hunting pressure is concentrated along roads and trails and around human population centers; over vast areas the animals are not hunted by man.

When snowshoe hares are abundant, domestic utilization and recreational harvest may be fairly high in very localized areas. Most hunters are residents. Most hunting occurs in the fall, but hare hunting is popular all winter long when the snowshoe hare populations are high. On moderate winter days, many people enjoy going out for a few hours to hunt hares as a form of winter recreation, combining it with skiing, snow machining, or snowshoeing. Hares are used as human and dog food, and as bait for traps. The hides are fragile, but are sometimes used for mittens and blankets.

GROUSE AND PTARMIGAN

Rock ptarmigan (*Lagopus mutus*) and willow ptarmigan (*L. lagopus*) and spruce grouse (*Canachites canadensis*), all members of the family Tetraonidae, are the gallinaceous species occurring in the Northwestern Region. Game birds are absent from St. Lawrence and Little Diomede Islands. Rock and willow ptarmigan occur throughout the Northwest region where suitable habitat exists. Spruce grouse are absent from the western two-thirds of the Seward Peninsula and the tundra in the vicinity of Pt. Hope, but otherwise occur where suitable habitat exists.

Although various tetraonid species overlap in geographical distribution, each displays a marked preference for certain habitat types. Spruce grouse are found most commonly in white spruce-birch communities and black spruce associations. In mountainous portions of this region, breeding habitats of the two species of ptarmigan are separated altitudinally. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in shrub communities, generally between elevations of 2,000 and 2,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright woody vegetation. In the lower, coastal portions of this region the differences between rock and willow ptarmigan habitats are poorly understood.

Unlike forest grouse, ptarmigan in mountainous portions of Northwestern Alaska move downward in October to their winter ranges. The sexes segregate during this seasonal habitat shift. Male rock and willow ptarmigan remain near the breeding grounds throughout the winter, while the females move up to 100 miles to brushy subalpine or timbered winter range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March.

Tetraonids have evolved so that each major vegetative type in Alaska provides habitat for one or more species at some period of the year. Disturbances such as burning, timber removal and agriculture produce vegetative changes that decrease the habitat quality for certain species while favoring others. In Northwestern Alaska little such habitat disturbance has occurred. Consequently, man's activities have had no significant impact on the distribution or abundance of tetraonids in this region.

Inland populations of the various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations with seven to nine years elapsing between peaks. In maritime situations, such as over much of the Northwestern Region, population fluctuations probably occur, but they are thought to be erratic and not necessarily in phase with those of inland habitats. Due to the lack of knowledge regarding factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities

from year to year are not feasible at present. Since the major upland game species in this region occupy mature or climax vegetation types, habitat manipulation is not considered a feasible technique for increasing carrying capacity.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators, their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

Grouse and ptarmigan have received only light to moderate harvest by sport and "subsistence" hunters in the Northwestern area. Harvests probably fluctuate with tetraonid abundance and have little influence on regional population trends. Although some individuals may hunt specifically for grouse and ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Like hunting, nonconsumptive uses such as observation and photography have been light in the past, and for the most part, consumptive and nonconsumptive uses are compatible.

HARES

Both the snowshoe hare (*Lepus americanus*) and the tundra hare (*L. arcticus*) occur in Northwestern Alaska. The tundra hare is found in coastal tundra areas and is periodically abundant on the Seward Peninsula. The status of tundra hare populations is undetermined and it is probably one of the least known mammals of Alaska. Fluctuations in population levels occur similar to those of the snowshoe hare. Tundra hares were abundant on the Seward Peninsula in 1971 and 1972.

The snowshoe hare occurs inland along rivers throughout Northwestern Alaska. The upper drainages of the Kobuk and its tributaries support moderate populations of snowshoe hares, while the lower, treeless valleys of the Kobuk and Noatak are more suitable for tundra hares. Snowshoe hare populations suffered a mild "crash" two or three years ago throughout most of the northwest and now (1976) are starting their recovery.

Cyclic fluctuations in snowshoe hare populations seem to be most extreme in the central portions of the snowshoe's range. The Interior Region historically has experienced extremes in hare density with 1500 or more per square mile being reported during population peaks. Present densities of snowshoe hares in Northwestern Alaska are unknown. The abundance of hares in local areas may vary greatly, and even in periods of low population levels local areas of abundance will occur in optimum habitat. As populations increase hares spread into less desirable habitat, and when populations decline, they disappear from these areas. The decline may be abrupt, or it may be gradual and occur over a period of 3-4 years.

Snowshoe hares occupy a variety of habitats, although certain types seem to be preferred, or will support a higher density of hares. Hares can be found in subalpine areas, brush lands, white spruce-birch communities and scrubby black spruce stands. The more open aspen and birch communities with brushy understories of willow, alder, highbush cranberry and wild rose, and streamside areas with willows seem to be optimum habitat for snowshoe hares.

The preferred habitat for the tundra hare is brushy tundra and windswept rocky slopes, with alder thickets and willows along the low wide river valleys near the coast.

Habitat disturbances such as wildfire and clearing of timber usually benefit snowshoe hares, since regrowth of herbaceous and woody species provides cover and food. However, increased fire control is decreasing prime habitat for hares. Climax communities of dense spruce do not provide suitable brushy understories for snowshoe hares.

In years of high snowshoe populations, girdling of trees and shrubs over large areas. This may kill trees and shrubs and reduce the amount of available browse for several years.

The snowshoe hare is an extremely important prey species for several predators. Lynx depend almost entirely on snowshoe hares for food in Northwestern Alaska. Lynx seem to be extending their range into the habitat of the tundra hare, and may be preying on these this species, as well as on ptarmigan in the region. Both red foxes and wolves also depend to a great extent on hares. Several species of raptors utilize hares as a major part of their diet.

The cyclic nature of snowshoe hare populations makes management programs designed to stabilize hare populations difficult. Too many factors are involved in these population cycles for man to have much effect. Hunting pressure on hares increases as populations increase and hares become more available, but as hare populations decline, there is correspondingly less interest in hunting them. Also, hunting pressure is concentrated along roads and trails and around human population centers; over vast areas the animals are not hunted by man.

When snowshoe hares are abundant, domestic utilization and recreational harvests may be fairly high in very localized areas. Most hunters are residents. Most hunting occurs in the fall, but hare hunting is popular all winter long when populations are high. On moderate winter days, many people enjoy going out for a few hours to hunt hares as a form of winter recreation, combining it with skiing, snow machining, or snowshoeing. Hares are used as human and dog food, and as bait for traps. The hides are sometimes used for mittens and blankets. So little is known about tundra hare populations that it is hard to evaluate the effects of hunting pressure on these populations. A few recreational hunters from urban centers such as Anchorage and Nome hunt for these large hares, and natives hunt them for meat, often by herding and clubbing them. Historically, hides from arctic hares were exported for the fur trade.

GROUSE AND PTARMIGAN

Rock ptarmigan (*Lagopus mutus*) and willow ptarmigan (*L. lagopus*), all members of the family Tetraonidae, are the most common gallinaceous birds inhabiting the Arctic Region, occurring throughout the region where suitable habitat exists. Spruce grouse (*Canachites canadensis*) probably occur to a limited extent in spruce communities at the lower elevations in the southern portions of this region.

In the mountainous portions of the Arctic, breeding habitats of the two species of ptarmigan are separated altitudinally. Willow ptarmigan breed close to timberline, often partially within the fringe of coniferous woodland, and also along stream courses in shrub communities, generally between elevations of 2,000 and 2,800 feet. Rock ptarmigan breed from timberline to approximately 3,500 feet in habitat ranging from brushy stands of dwarf birch less than four feet tall to areas above the limit of upright woody vegetation. In the lower, coastal portions of this region the differences between rock and willow ptarmigan habitats are poorly understood.

Ptarmigan occurring in inland areas move downward in October to their winter ranges. The sexes segregate during this seasonal habitat shift. Males of these two species remain near the breeding grounds throughout the winter, while females move up to 100 miles to brushy subalpine or timbered range. The birds funnel through river valleys and low mountain passes during this fall movement and again when returning to their breeding grounds in March. In some years, flocks numbering hundreds or thousands of birds move through Anaktuvuk Pass, and there are probably similar seasonal concentration areas for birds in other areas.

Inland populations of various Alaskan tetraonids demonstrate marked, generally synchronous, fluctuations with seven to nine years elapsing between peaks. In maritime situations, such as much of the Arctic Region, population fluctuations occur, but they are thought to be erratic and not necessarily in phase with those recorded from continental habitats. Due to lack of knowledge regarding the factors governing population fluctuations, management programs aimed at stabilizing tetraonid densities from year to year are not feasible at present. Since the major upland game species found in Arctic Alaska occupy mature or climax vegetative types, habitat manipulation is not considered a feasible technique for increasing carrying capacity. The habitat disturbance that has occurred in Arctic Alaska has probably had no significant impact on the distribution and abundance of tetraonids in this region.

Gallinaceous birds are important prey for avian and mammalian predators. The number of grouse and ptarmigan taken by predators not only varies according to their abundance, but also with predator densities and availability of buffer species such as snowshoe hares. Even in years when grouse and ptarmigan sustain relatively heavy losses to predators,

their long-term population trends are not significantly altered. Therefore, the use of these species as prey is compatible with the various human uses.

The upland game bird resource in this area has received only light to moderate harvest by sport and "subsistence" hunters in the past. Harvests have probably fluctuated with ptarmigan abundance, and have had little influence on population trends in this region. Although some individuals may hunt specifically for ptarmigan, a significant amount of the harvest occurs incidental to big game hunting. Like hunting, nonconsumptive uses such as observation and photography have been light in the past and for the most part consumptive and nonconsumptive uses are compatible.

HARES

Both the snowshoe hare (*Lepus americanus*) and the tundra hare (*L. arcticus*) occur in Arctic Alaska but neither is common. The snowshoe hare is rare. They were observed along the Canning River in 1973, after high population levels occurred south of the Brooks Range in 1971 and 1972. It is possible that high populations in adjacent areas south of the divide caused migrations into the north slope areas.

Tundra hares have been collected from the Colville River drainage. They may not be present in the eastern third of the region. The best habitat for both species of hare in this region is habitat with an abundance of willow principally found along major water courses. Because of the scarcity of hares in the region little if any use by humans occurs.

GREATER ALASKA FURBEARERS

LOCATION

Entire state except Game Management Units 7, 14 and 15 and national parks or other areas closed to all hunting and trapping.

THE SPECIES

The species of furbearers addressed in this plan include wolverine, marten, mink, beaver, muskrat, lynx, land otter, coyote, red and arctic foxes, short-tailed and least weasels, arctic ground squirrel, red squirrel, marmot and raccoon. The wolf has been treated separately.

Many of these species have wide distribution in the state; consequently most are represented to some extent any given area. The arctic slope, the Aleutian Islands, and many islands in the Bering Sea, the northern Gulf of Alaska, and Southeastern Alaska have relatively few species present although large numbers of any one species may occur. On a number of islands furbearers are present as a result of past introductions from fur farming or from efforts to establish harvestable populations. Each individual species may vary in abundance according to habitat preferences and availability of food. There is little information available on numbers, distribution, or utilization of the various species. Much of what is known is acquired from fur export reports, some field observations and reports from trappers.

Furbearer population levels and trends depend primarily on the abundance of food. Most species such as wolverine, otter and beaver rely on a variety of prey species or on a relatively stable vegetative food source are less subject to fluctuations than those furbearers such as lynx and arctic fox are dependent on a single or only a few prey species. At times diseases cause significant reductions in furbearer populations. Rabies, mange, and distemper affect fox populations, beavers are subject to endemic hemorrhagic disease, and in Southeastern Alaska, nutritional steatitis affects those mustelids that feed on rancid fish fat. Those species which occupy aquatic or riparian habitats, particularly beaver, muskrat, and mink are subject to flooding or "glaciering" conditions. A number of the smaller furbearers including weasels, muskrats, squirrels, and marmots are prey to larger furbearers or other mammalian and avian predators.

Commercial and domestic utilization are the most important uses of furbearers in much of Alaska. Some recreational trapping and nonconsumptive use occurs near urban centers, but viewing and photography are limited to relatively few species whose habits provide opportunities for observation. Most furs are sold but some are retained for domestic use in parkas, mukluks, or as trim for garments. Wolverine, muskrat, and beaver are the species most used in the domestic manufacture of garments, but almost all species are utilized to some extent, particularly when the furs are not in prime marketable condition. Beaver, muskrat, ground squirrels, and to a limited extent lynx and red squirrels are also used as human or dog food.

Furbearer trapping seasons and bag limits have remained relatively unchanged since statehood. Seasons have generally been timed to coincide with periods of pelt primeness. Liberal seasons and bag limits have had little effect on populations of most species of furbearers except for small localized areas of overharvest associated with ease of access. The vulnerability of beavers to intensive trapping and that of wolverines in tundra regions to tracking by snowmachine has resulted in depressed populations of these species in some areas. In most areas of the state and for most species harvests are regulated primarily by abundance and availability of furbearers, and by market values. At low levels of abundance or in inaccessible areas, trapping effort usually ceases when it becomes unprofitable; then the high reproductive potential of most species rapidly restores populations to carrying capacity. Trapping is done primarily to supplement income derived from other sources. Few full-time professional trappers operate in the state.

Snowmachines are the most commonly used mode of transport for trapping or hunting furbearers, although aircraft are also used extensively. Snowmachines are the standard means of transport at all bush communities and provide rapid and efficient coverage of large areas surrounding settlements. Aircraft are useful for trapping in areas far from human habitation and are also used as an aid in locating and shooting foxes and wolverines from the ground. In Southeastern Alaska, boats are the primary transport means for trappers because most trapping activity occurs along the beach fringe.

Wolverine occur throughout mainland Alaska and on some islands in Southeastern Alaska. Population densities are variable depending on suitable habitat and, in some western and northern areas, on the degree of harvest. Wolverines are most abundant in interior Alaska and least abundant in southcoastal areas. Sparse populations exist over most of Southeastern Alaska, with moderate numbers in the Stikine, Taku, Chilkat, Yakutat and gulf coast areas. Wolverines are generally abundant over the remainder of the state, particularly in forested and alpine habitats. Densities are relatively low on portions of the arctic slope, northwestern coastal tundra areas, and on the Yukon-Kuskokwim Delta.

In comparison to other furbearers, wolverine never attain high densities, due in part to their large territorial requirements and apparently low reproductive rate. Wolverine have catholic food habits; much of their food is scavenged and a dependable source of carrion may be important in maintaining populations.

More than 800 wolverine are harvested each year by hunters and trappers. Southcentral Alaska and the Yukon River drainage yield the largest harvests with about 250 and 200 wolverine, respectively, taken there. Although sealing (marking) of wolverine skins is required, some skins are used domestically for parkas, ruffs and garment trim and are not reported; consequently, reported harvests are minimum numbers. Trapping is the most common method of taking wolverines in forested areas, such as in Interior and Southcentral Alaska while in the open country of Western and Arctic Alaska or in alpine areas ground-shooting from snowmachines or with the aid of aircraft predominates.

Use of wolverine varies between areas. In Western and Arctic Alaska, most wolverine are in high demand for domestic use in garments and few are sold commercially. Most skins never leave the villages. Coastal villagers acquire pelts by bartering with Interior residents or purchasing from commercial furriers. In Interior and Southcentral Alaska most skins are sold commercially with a few kept for domestic use.

Regulations and remote wilderness areas provide some measure of protection for wolverine populations. Where lack of cover renders the animals vulnerable to tracking with mechanized vehicles, local extirpation may occur, especially near settlements. High prices for pelts and the demand for local use of skins for garments provides continuous incentive to trappers and hunters. In forested areas with relatively low wolverine densities the species is not actively sought and many that are taken are caught in wolf sets.

Marten occur throughout most of the state but are absent north of the Brooks Range, on the Yukon-Kuskokwim Delta, and the Alaska Peninsula. Marten were introduced to Prince of Wales and Baranof Islands in 1934 and to Chichagof and Afognak Islands in the early 1950's; they are abundant on Admiralty Island, but are otherwise absent from most of the islands in Southeastern Alaska, Prince William Sound, and the Kodiak Archipelago. Marten distribution coincides with that of climax spruce forests. Their dependence on mature spruce habitat makes this species particularly susceptible to forest fires and clearcut logging practices. In northern Interior Alaska extensive burns have resulted in reduced populations of marten over large areas. Much good habitat is still present in Interior Alaska, however, and marten are abundant over the area as a whole. Marten populations are lower south and west of Interior Alaska; marten in Western and Southeastern Alaska are less abundant than in past years.

In good marten habitat, population densities may be as high as four animals per square mile. Although males occupy a larger home range than females, neither generally range over an area greater than one square mile, except during the breeding season or in mountainous terrain where marten may undertake seasonal altitudinal movements due to changing food availability. Microtine rodents constitute the main source of food for marten although a variety of prey is utilized, depending on availablity. The red squirrel is a minor item in their diet. Berries may be an important food in late summer and fall.

Past marten harvests have fluctuated widely, but in the period from 1962 to 1972 averaged about 8000 per year. In 1973 the harvest increased to about 18,000. The price of marten fur, a primary determinant of trapping effort on the species, increased from $30 to $40 per pelt in 1973. Current prices of $40-50 are incentive for continuing intensive trapping effort. Harvests in Interior Alaska have been relatively low (2000-3000 per year) despite high marten densities; here low trapping effort is probably a result of the availability of other employment in the area. Currently, Southeastern and Western Alaska have the largest harvests, with each area exporting 4000 or more pelts per year in recent years. Most marten trapped are sold commercially. A few are kept in Western Alaska for domestic use as garment trim and on slippers.

Mink are common throughout the state except for the Kodiak Archipelago, the Aleutian Islands, the off-shore islands of the Bering Sea, and most of the Arctic Slope. Mink are usually associated with riparian habitats - streams, ponds, marshes, and salt water beaches and their diet reflects the variety of food species available there; small mammals, birds, fish, and insects and other invertebrates are eaten. Southeastern Alaska and the northern Gulf of Alaska Coast-Prince William Sound area have relatively stable, high density mink populations, distributed primarily along the coastal fringe where their food supply including a variety of small mammals, marine invertebrates and fish, is diverse and abundant. Mink populations in interior Alaska areas are characterized by lower densities and greater fluctuations than southcoastal populations as a result of seasonal or unstable food sources, and lower productivity of freshwater habitats. Microtine rodent populations typically fluctuate drastically and are a primary factor affecting mink abundance. An abundance of mice or hares in upland areas will sometimes prompt mink populations to expand inland in search of prey.

In 1976, mink population levels were variable over most of Alaska excluding Southeastern. Mink in northern Interior areas and in Northwestern Alaska were relatively abundant and increasing. Over most of the remainder of the state, mink were moderately abundant, having declined somewhat from high levels in the mid-1960's. Populations were low in some parts of the central Interior such as the Tanana River drainage.

Factors controlling mink population levels are not well known. Food availability is probably the major factor. In some areas spring flooding may reduce populations by drowning young mink in dens. In southcoastal areas nutritional steatitis may be important; it was a significant mortality factor to mink raised commercially in past years.

Traditionally mink have been one of the most important commercially trapped species of furbearers in the state. Reduced pelt prices, increased levels of employment, and availability of welfare, have resulted in reduced trapping effort in many areas in the past decade, and mink are currently underharvested over much of the state. Western Alaska, particularly the Yukon-Kuskokwim Delta, has always been an important mink producer. Delta mink are not only much larger than in other parts of Alaska but they are more uniform in color which, in combination, contribute to consistently higher prices. Large harvests also occur in Southeastern Alaska where climatic conditions are less of a deterrent to trapping than to the north. Elsewhere in the state harvests are variable, depending as much on the abundance of mink as on current market values. In some locations such as near Fairbanks and along the Copper River Highway near Cordova interest in recreational trapping is high despite price or abundance considerations. The majority of trapping effort, however, continues to be commercial in nature. Most mink trapped are sold to outside buyers. A few are retained for use as garment trim on slippers, gloves, hats and parkas.

Beaver are presently distributed over most of mainland Alaska from the Brooks Range south to the middle of the Alaska Peninsula and into Southeastern Alaska. Beaver are rare in much of Prince William Sound, and in Southeastern Alaska are now abundant only in the Yakutat forelands and some of the major mainland river drainages. They are present in low numbers on many

Southeastern Alaska islands. In Southwestern Alaska there has been a general decline in the beaver population north of the Kvichak watershed, particularly near settlements. Beaver are abundant in remote areas and are increasing there because of reduced wilderness trapping. Populations are also high and increasing on the Alaska Peninsula and southwest of the Kvichak watershed. Beaver were introduced to islands in the Kodiak area in the 1920's and are now well established in suitable habitat on Kodiak, Afognak, Raspberry and several other islands. Beaver populations in Interior and Western Alaska are moderate to high and generally increasing except in the lower Yukon-Kuskokwim area where overtrapping has occurred. Very few beavers were present in Northwestern Alaska prior to the 1930's, but since the 1950's populations there have been increasing and expanding into the Selawik and lower Kobuk drainages.

Distribution and abundance is a reflection of habitat availability except in areas where overtrapping has occurred. The most productive beaver habitat is characterized by a dependable water supply with little fluctuation in stream flow and by willow, aspen, cottonwood, or birch vegetation. Beavers are found from sea level to elevations of 4000 feet; they are absent on treeless tundra bordering the Arctic Ocean and the Bering Sea, and on the Aleutian islands. Populations fluctuate naturally in response to availability of food in localized areas. In some years high water levels force beavers out of lodges where they become vulnerable to predation. Endemic hemorrhagic disease can reduce populations when they attain high densities.

Beavers are unique in the degree to which their presence modifies riparian habitats. Beaver dams stabilize watersheds, reducing flooding and silting. Raising of water tables and impoundment of water alters vegetative cover and provides aquatic and riparian habitat for many species of wildlife. Although some species of fish benefit by increased production of fish food, dams often create serious barriers to spawning anadromous fish.

Beginning with the 18th century Russian fur trade, beavers have been one of Alaska's most important furbearers. Heavy utilization of beaver in early territorial days led to a period of scarcity in the early 1900's, but populations have recovered and are now at moderate to high levels in many areas. Although prices of beaver pelts have not risen as dramatically as other furs, beavers remain an important furbearer in Alaska.

Trapping pressure varies between areas. The largest harvests come from the lower Yukon-Kuskokwim River drainages where about 3500 beavers are taken annually. Trapping is also heavy in the Bristol Bay drainages where more than 1600 beavers are taken each year. A declining salmon industry in that area has resulted in increased trapping effort. Harvests in Interior and Southcentral Alaska are relatively small; poor prices, low limits on take and relatively high employment rates contribute to low trapping effort. Trappers on Kodiak Island annually take about 200 beavers, but the traditional low prices offered for coastal beaver pelts discourages effort there. Southeastern Alaska trappers also take about 200 beavers per year, mostly from the mainland; harvests tend to fluctuate widely between years.

Most beaver trapping occurs near human settlements by local inhabitants. Because beaver are easily overtrapped, concentrated trapping near villages and along road systems results in overharvests and depletion of local populations. This is especially evident in Southwestern Alaska where beaver are five times as abundant in remote locations as compared to areas near villages. The percentage of beavers less than one year old (kits) in the harvest is also indicative of harvest pressure. Up to 30 percent of the harvest near some Southwestern and Western Alaska villages are kits, as contrasted to 10 percent kits or less on the average in more remote areas.

Beavers are trapped mainly for commercial use, but in some areas such as Western and northern Interior Alaska they are also used for human and dog food. Pelts, particularly those from kits, may be used domestically for garment trim on hats, mittens and slippers. Beaver castors are used as a perfume base and are valuable to trappers as a component of scent lures.

Beavers are one of the few furbearer species that provide for nonconsumptive use. Much viewing and photography take place not only near the larger human settlements, but also in "bush" areas.

Muskrats occur throughout all of the Alaska mainland south of the Brooks Range except the Alaska Peninsula west of the Ugashik Lakes. The species was introduced to Kodiak Island in 1929 and later to Afognak and Raspberry Islands, but is absent from most other Alaskan islands. The densest muskrat populations are found in five areas: the Yukon Flats surrounding Fort Yukon, Minto Flats, Tetlin Lakes, the Yukon-Kuskokwim Delta and the Selawik-Kobuk-Noatak area. Four fifths of the annual muskrat harvest comes from these areas. Muskrat abundance elsewhere in the state varies depending on localized wetland habitat conditions. In Southeastern Alaska, muskrats have never been abundant and are currently present in fair numbers only near Haines, Juneau, and the Stikine River. Muskrats were once very abundant on the Copper River Delta but are now relatively scarce throughout the northern Gulf of Alaska coast. Populations over most of the remainder of the state are generally at moderate levels, down from higher densities of past years.

Muskrats are vulnerable to unfavorable weather conditions affecting their wetland habitat. Populations are reduced by winter kill when the ice becomes too thick and animals are forced into limited forage areas or emigrate. In years of heavy snow, muskrats are flooded out in the spring. Losses to predation and starvation increase under such situations. Reduced muskrat populations in many areas of Alaska can be attributed to adverse winter and spring conditions of recent years.

Hunting and trapping have relatively little effect on muskrat populations. The species is highly productive (about 15 young produced annually per adult female) and capable of repopulating depleted habitats rapidly. Heavy harvests can be sustained if habitat conditions remain good. A relatively small proportion of the total good muskrat habitat is hunted or trapped, usually only areas of high density populations within three or four miles of major streams and lakes. Unhunted areas act as reservoirs of breeding stock.

Although the open season for harvesting muskrats extends from November into June, most are taken in the last six weeks of the season. Eighty percent or more of the muskrat harvest is taken by shooting with small caliber rifles; trapping is usually considered too time consuming.

In the 1950's, muskrats ranked first in numbers of furbearers harvested in Alaska, and was among the first four in total value. Low prices combined with increased employment and availability of welfare are responsible for current greatly reduced harvest efforts, although recent pelt price increases may increase harvests. Most muskrats are taken for commercial sale of fur, but some are utilized domestically for food and for parkas and trim on boots and slippers. In Western and Northwestern Alaska domestic use exceeds commercial use. In northern Interior Alaska muskrats are an important food in the spring. Muskrats also provide some nonconsumptive use, particularly near human population centers to which they readily adapt, but observation of muskrats is much less than that of the more conspicuous beavers.

Lynx occur throughout Alaska except on the Aleutian Islands, the islands Lynx are relatively uncommon along the northern Gulf Coast and in Southeastern of the Bering Sea and some of the islands of Prince William Sound and Southeastern Alaska. The lynx is primarily an inhabitant of the northern boreal forest where it feeds largely on snowshoe hares. It occassionally occurs on the tundra beyond treeline, and in starvation years it ventures far out onto the tundra in search of arctic hares, lemmings, and ptarmigan. Lynx are relatively uncommon along the northern Gulf Coast and in Southeastern Alaska, being present on the larger river systems where they have emigrated from interior populations.

Population estimates are not available but lynx were very abundant over much of their range in Alaska from about 1971 to 1974. Currently lynx are present in low numbers and are still declining. Like snowshoe hares, lynx populations fluctuate greatly with a 10-year periodicity in abundance. The amplitude of lynx population fluctuations is very great as indicated by records of exported pelts. Population highs are not synchronous throughout Alaska and broad two to four year peaks of catch probably reflect consecutive population peaks in different areas. In increasing lynx populations the females breed in the first year of life and almost 100 percent of the females conceive. Large litters and high survival of kits is common. After snowshoe hare populations decline, female lynx may not breed during their first year, the number of kits produced is reduced, and those kits that are born have low survival rates.

Lynx fur has again become popular for parkas, coat trim, jackets, hats and muffs after a long period of unpopularity. High prices in recent years have resulted in intensive trapping effort. Harvests during the recent period of peak abundance were about 2000 to 2500 annually, half of which came from Interior Alaska. Trapping effort is centered around villages and along road systems and the majority of the harvest is by local residents. Most pelts are sold but some are kept for domestic use. The meat is edible and is occasionally used for human and dog food.

Land otters are most abundant in the Southeastern Alaska and Prince William Sound coastal regions, and in the Yukon-Kuskokwim Delta, although they are found throughout the state except on the Aleutian Islands, islands of the Bering Sea, and the arctic coastal plain east of Point Lay. Land otter populations are relatively stable, especially in coastal areas where marine food is always abundant. Shellfish, crustaceans, insects, fish, frogs, birds, small mammals and vegetable matter are all eaten. Parasites and disease are not normally important mortality factors. Flooding in the spring sometimes drowns young otters in dens.

Land otters are probably utilized more in the Southeastern and Southcentral coastal areas than in Interior Alaska. Overtrapping is usually not a factor affecting populations, but temporary reductions in local populations can be effected by an efficient trapper. From 1000 to 2000 land otters are taken annually, most near villages or communities in Southeastern Alaska, Prince William Sound and the Yukon-Kuskokwim Delta. Land otters are an important furbearer on the Kodiak Archipelago where 200-250 are taken and sold locally. Pelt prices affect trapping effort because otters are difficult to catch and to skin. Most otter hides are sold commercially, but in the Northwestern area they are often used domestically for trim on garments and slippers. Otter hides that are used domestically are usually those which are taken late in the season and are less than prime. Land otters often provide excellent viewing opportunities, especially around coastal towns where they are often seen in the harbors.

Coyotes apparently first arrived in Alaska about 1915. A rapid population expansion occurred, with the center of abundance first in the Tanana Valley around 1930 and later in Southcentral Alaska. At the present time coyotes occur as far west as the Alaska Peninsula and the north side of Bristol Bay, and are rare north of the Brooks Range. While not especially abundant, coyotes are common in many areas, particularly in the drainages of the Tanana, Copper, Matanuska and Susitna Rivers, and on the Kenai Peninsula. Populations may become locally abundant periodically.

Although snowshoe hares may be important prey in some areas and at certain times, coyotes are catholic in their food habits. The diversity of their foods and their adaptability to a variety of habitats including those affected by man are probably factors which have allowed them to compete successfully against indigenous wolf populations.

Relatively few coyotes are trapped and those which are taken are usually caught incidental to trapping for fox, lynx, and wolf. A few coyotes are taken by sport hunters. Most coyotes are sold commercially. Some are used for parka ruffs and mittens. Prior to 1969 there was a statewide bounty of $30 for coyotes. No bounties have been paid since 1969.

Red foxes occur over the entire state except for some of the islands of Southeastern Alaska and Prince William Sound. The species is native to Kodiak Island but on many of the other islands where it occurs it was introduced by fox farming operations in the early 1900's. Red foxes are most abundant south of the arctic tundra although they are present in Arctic and Northwestern coastal tundra regions where their distribution

overlaps that of arctic foxes. The best red fox habitat appears to be in Interior Alaska and on the coastal areas south of Norton Sound, including the Alaska Peninsula. Red fox populations along the northern Gulf of Alaska coast and in Southeastern Alaska are sparse, with most foxes occurring in the major mainland drainages which connect to interior areas.

Red fox populations fluctuate in response to availability of food. Fluctuations of snowshoe hare and rodent populations will cause the fox populations to fluctuate also. Fox populations in Interior areas of the state are currently declining due to low hare numbers. In coastal areas such as Kodiak Island and the Alaska Peninsula, red foxes feed on carrion on the beaches and are not so dependent on small mammal populations; populations in these areas are therefore more stable. Fox populations are affected by diseases such as rabies, mange and distemper.

Red foxes are one of the more important furbearers in the state. In the last two to three years the value of their pelts has increased greatly, which may result in increased trapping pressure; however, foxes are probably not overtrapped anywhere in the state. The estimated red fox harvest in 1973-74 was 14,580.

Silver and cross foxes, color variations of the red fox, are in high demand for wall mounts. Most red foxes taken are sold commercially, but some are used domestically for garments including parkas, ruffs, hats, and trim. In some areas such as McKinley National Park, the North Slope Haul Road and other roads and trails, red foxes provide substantial enjoyment to viewers and photographers. The species readily becomes accustomed to the presence of humans and once so conditioned can be observed at close range.

Arctic or white foxes are found in Alaska along the coast from the Aleutian Islands north. On the mainland (except the lower Alaska Peninsula) and St. Lawrence and Nunivak Island the white color phase predominates while on the Pribilofs and most of the Aleutians west of Unalaska, the blue phase predominates. Blue foxes were transplanted to the Pribilofs, Aleutians and many other islands.

Arctic foxes are noted for their extreme fluctuations in population levels. Periodic peaks in arctic fox populations occur approximately every four years in Alaska, Canada and Greenland and are tied to cyclic fluctuations in small rodent abundance. Arctic foxes have a high reproductive potential, breeding at one year of age and averaging four to eight pups per litter. Apparently there is a reduced production of pups during periods of food scarcity. Studies in Canada show that mean litter size varied directly with lemming numbers. Although microtine rodents are the primary prey, arctic foxes are highly efficient predators on the eggs and young of waterfowl, and are an important factor governing the nest locations of seabirds.

Considerable variation exists in the yearly harvest of Alaskan arctic foxes. Since pelt prices have remained relatively stable the size of the annual harvest has been most affected by cyclical abundance of foxes. The average annual harvest between 1912 and 1963, (derived from

the number of furs exported) was 4,072 white fox pelts. Between 1968 and 1974 the annual harvest averaged 2,369 pelts. Arctic foxes are the most important furbearer north of the Brooks Range because they are the only furbearer that occurs in large numbers. Approximately 40 percent of the arctic fox harvest comes from the arctic slope. The highest catch per unit of area, however, comes from the Bering Sea islands where about 30 percent of the harvest is taken. Most Alaskan white fox furs are sold and utilized outside of Alaska.

Short-tailed weasels, also known as ermine, are present throughout Alaska except for the Aleutian Islands west of Unimak Island and the offshore islands of the Bering Sea. Least weasels, have a similar range except that they are not found in Southeastern Alaska south of Glacier Bay, the mountains in the southeastern corner of Southcentral Alaska, nor on Kodiak Island. The ermine favors wooded or brushy terrain with some topographic relief whereas least weasels prefer damp, marshy habitat with its high microtine populations. Ermine are seldom numerous anywhere within their range. The smaller least weasel is sparsely distributed throughout its range except in some years of peak rodent populations.

Weasels are voracious predators that take a variety of rodents, young snowshoe hares, young birds, eggs, fish and earthworms. When live prey is scarce weasels utilize carrion and berries or other vegetable matter. Weasels are not selective among prey species but take them in direct proportion to their abundance and availability. Weasels in turn fall prey to raptors and other carnivorous furbearers.

Most weasels are now taken incidental to trapping for other species. Weasel pelts are sold although their value is low. Some skins are used for trim on parkas and slippers and in the manufacture of tourist items.

Arctic ground squirrels are found in well drained tundra areas throughout Alaska from sea level to the uplands. They are most abundant in mountainous terrain. Ground squirrels live in colonies where there are loose soils on well-drained slopes, vantage points from which the surrounding terrain can be observed, and bare soils surrounded by vegetation in early stages of succession. Colonies in high areas or well drained slopes are least affected in the spring by water from melting snow. Hibernation protects ground squirrels from the low temperatures of winter, and lasts as long as seven or eight months. Ground squirrels feed on a variety of food including seeds, roots and bulbs, plant stems and leaves, mushrooms, insects, carrion and bird eggs. Quantities of seeds and vegetation are stored in underground chambers. Ground squirrels are an important food source for raptors, weasels, foxes, wolverines and grizzly bears.

Residents of the Arctic Slope, northern Interior Alaska, and Northwestern Alaska trap, snare and shoot ground squirrels and use them for food and parkas. Ground squirrels are an important food supplement for these people in the spring soon after the squirrels emerge from hibernation. Local residents extract fat and oil from squirrels by boiling and eat the fat along with the lean meat of other animals. Elsewhere in the

state, utilization of the arctic ground squirrel fur is much less than other furbearers. Nonconsumptive use of ground squirrels occurs in alpine areas but except for park areas and upland campgrounds, observation of ground squirrels is usually incidental to other outdoor activities.

Red squirrels are found over most of Alaska where white spruce are present. These squirrels are abundant in the Interior, especially along river bottoms with abundant stands of white spruce. They are highly dependent on white spruce seeds as a food source; squirrel populations fluctuate in response to spruce cone abundance, with sharp declines when spruce cone failures come in consecutive years. Squirrels will utilize spruce buds in winters when there are no cones, but there may be severe attrition in the squirrel population. Red squirrels may have some effect on the scattering of spruce seeds, aiding reforestation.

Red squirrels are prey for a variety of predators including marten, fox, lynx, and many raptors. They are also hunted and trapped by man, mostly for recreation, with some utilization for food, fur, and trap bait. Some are taken in traps set for other species. The hides are worth about 50¢ to $1.50 each and the fur harvest is insignificant. Many red squirrels are shot as nuisances around human dwellings as they can be destructive to insulation if they gain access to a building. Red squirrels are one of the most commonly observed small mammals in Alaska. Viewing and photography are significant uses in campgrounds, waysides and other recreation sites.

Northern flying squirrels are a relatively little-known species which inhabits the boreal forest in Interior, Southcentral, and Southeastern Alaska. The species is rarely seen due to its nocturnal habits. Flying squirrels eat a variety of seeds, fruits, and other vegetable material and scavenge on carrion. This proclivity for meat results in flying squirrels often being caught in traps set for other species. The fur is of no commercial value.

Hoary marmots are present throughout most of the mountainous regions of Alaska, but are generally absent from the lower regions such as the Seward Peninsula, the Yukon-Kuskokwim Delta, the North Slope, and the lower Alaska Peninsula. None are present on the Kodiak Island group or the outer islands in the Southeastern Alaska group. Hoary marmots prefer the precipitous sides of canyons and valleys where boulders are large and have accumulated to a depth sufficient to give subsurface protection.

Marmots are sometimes trapped and the fur used for parkas. If the pelts are taken in the fall while they are prime and softly furred they make a fine garment. There is not much commercial use of marmot fur, however, and little information is available on the harvest. Marmots may be seen in some of the national parks, notably Mt. McKinley National Park, and provide opportunities for interesting viewing and photography.

A closely related species, the woodchuck is present in eastern Interior Alaska, in a small area lying between the Yukon and Tanana Rivers east of Fairbanks to the Alaska-Yukon border. Woodchucks prefer open woodlands and thickets, near fields and clearings on dry soil. They have a very spotty distribution in Alaska.

Raccoons have been released by private individuals in Southeastern Alaska in the past, and a small population has become established. Only occassional sightings are reported.

FURBEARERS IN SOUTHEASTERN ALASKA

Almost all species of furbearers* common to Alaska occur in Southeastern Alaska. The region is comprised mostly of the Alaska Archipelago and the distribution of several species is discontinuous throughout the area. Mink, otter and marten are the prominent species with wolverine, lynx and other species occurring either sporadically or at low densities in a few areas. White fox are not present. The coastal and estuarine habitats, influenced by the warmth of the Japanese current, contain an abundant food supply which provides for relatively high numbers of those furbearer species which utilize the marine environment. Otter are as abundant throughout their range in Southeastern Alaska as anywhere in their world-wide range. Furbearers have been transplanted to several locations in Southeastern Alaska and some transplants have been very successful, particularly the marten transplants to Prince of Wales, Baranof and Chicagof Islands. Red squirrel transplants have also been successful in the region.

Population levels and trends of carnivorous furbearers are often closely tied to relatively few prey species or even a single prey species. The abundance of snowshoe hare and small rodents are often reflected in the abundance of lynx, coyote, marten, weasels and red foxes. Although mink, marten and weasel populations fluctuate greatly, otter populations are generally stable. The herbivorous furbearers do not appear capable of seriously damaging their food supply. Although beavers are capable of overutilizing their immediate food supply, they are not widely distributed or abundant in Southeastern Alaska, therefore they have no important influence on the environment. Beaver, muskrat, squirrels and marmots are all subject to significant levels of predation by other furbearers.

The most important influence on Southeastern furbearer habitats has been logging. The activities associated with logging, such as log storage and handling facilities, mills etc. almost always occur along the tidal zones which are important mink, otter, and weasel habitat.

Human consumptive use of furbearer populations throughout Southeastern Alaska is highly variable and almost always depends on recent fur market values. Southeastern otters command the highest prices of Alaskan otters, whereas mink and marten, although very abundant, have a much lower value relative to other Alaskan areas, and the trapping effort which is expended on these species is much more dependent upon annual market conditions. In the past mink have been heavily trapped to the point where it was necessary to have alternate-year openings and closings in many areas. Present market conditions and the resulting trapping efforts do not require alternate-year season openings.

Long established traditions, market conditions, and trapping regulations have limited the use of furbearers to the season from October to May when pelts are prime. Consumptive use of red squirrels occurs at other seasons because this species is used for food.

The seasonal nature of employment in Southeastern Alaska has not changed significantly over the years. Unlike other areas which have seen changes in the traditional patterns of use of furbearers, Southeastern has remained relatively stable, although some shift from commercial to recreational trapping has occurred. The trend in the intensity of use, however, has been towards a slowly decreasing utilization. Trapping pressures are relatively low now and will probably not decrease further. Recent increases in fur prices may stimulate some increase in trapping pressures. Compared with other areas of Alaska there is little nonconsumptive use of furbearers in Southeastern. The furbearers which predominate are generally those which are nocturnal or secretive in nature and provide limited viewing opportunities.

* A list of furbearer species considered in these plans follows this regional account.

FURBEARERS IN SOUTHCENTRAL ALASKA

Almost all species of furbearers* common to Alaska occur in the Southcentral Region. The most noticeable exception is the arctic or white fox. Beaver, otter, mink and muskrat are the most prominent species in riparian and aquatic habitats. Wolverine, lynx, marten, weasels, squirrels and marmots are common to the upland and alpine habitats. The red fox is common in lowland and upland areas.

Population levels and trends of carnivorous furbearers are often closely tied to relatively few prey species or even to a single prey species. Lynx abundance can often be predicted from snowshoe hare population trends. In those portions of the Southcentral Region drained by the Copper River and the Susitna River the snowshoe hare and lynx abundance cycle runs about nine years from peak population to the following peak population. Lynx and hare populations also show great fluctuations in abundance on the Kenai Peninsula but they do not seem to be synchronous with the cycles of the interior of the state. Densities of marten, red foxes, weasels and coyotes appear to be dependent upon densities of small rodents, although red fox and coyote abundance also appears related to snowshoe hare population levels. Coyotes are more abundant on the Kenai Peninsula than elsewhere in the state. Some areas also seem to be capable of sustaining high land otter populations, particularly along the coast from Cordova to Valdez.

The herbivorous furbearers do not appear capable of seriously damaging their food supply. Although beavers are capable of over-utilizing their immediate food supply, this rarely results in major population fluctuations because the effect is not simultaneous over large areas. At any given time a substantial percentage of the beaver population in any drainage is emigrating into new habitat as occupied habitat becomes less productive. Muskrat population fluctuations, though not well understood in Alaska, are related to productiveness of their habitat. Deep freezing may be a major factor reducing muskrat populations. Beaver, muskrats, squirrels, and marmots are subject to significant levels of predation by other furbearers.

Furbearer habitat in this area is extremely diverse, ranging from mature spruce forests and fire-dominated habitats in the inland portion to coastal rain forests in the southern portion. The frequency, intensity, and acreage burned by wildfire has varied greatly in the past, but considering that over half of the State's human population lives within this area, it is unlikely that wildfire will be a dominant influence in the future. Because of the relatively high human population much furbearer habitat has already been irreversibly altered by development activities. This trend towards habitat change will probably continue.

Human consumptive use of furbearer populations throughout the Southcentral Region is highly variable and generally depends on the abundance and current market value of the various species. In some locations trapping

COOK INLET FURBEARERS

LOCATION

Game Management Units 7, 14 and 15.

THE SPECIES

Furbearers in the Cook Inlet area include beaver, wolverine, lynx, coyote, red fox, marten, mink, weasel, muskrat, land otter, red squirrel and marmot. The wolf has been treated separately. Furbearers vary in abundance between species according to habitat preferences, and the abundance of food. There is little information available on numbers and distribution of furbearers or on the factors which affect abundance and distribution. In general furbearer population fluctuations are closely tied to those of their prey species. Those furbearers who rely on several prey species or on a relatively stable food source such as vegetation are less subject to fluctuations than those dependent on one or a few prey species. Furbearer habitat in the Cook Inlet area remains relatively unaffected by the presence of man, with some exceptions. Forest fires on the Kenai Peninsula and urban and agricultural development have altered some areas.

Recreational trapping by residents of Anchorage and other Cook Inlet communities is the primary use of furbearers in the area. Some commercial trapping occurs but most of the area does not support furbearer populations conducive to profitable commercial utilization. Nevertheless, commercial aspects are usually present in some degree as most trappers sell their catch and trapping effort is stimulated by high market values for pelts. Some pelts are tanned and kept for personal use such as wolverine and coyote.

Furbearer trapping seasons and bag limits have remained relatively unchanged since statehood. Seasons have generally been timed to coincide with the period of pelt primeness. Liberal seasons and bag limits have had little effect on most species of furbearers except for small localized areas of overharvest associated with ease of access. Although the Cook Inlet area has well developed roads and trails in comparison to the remainder of the state, large tracts of land remain relatively inaccessible and trapping pressure is light. Furbearer population fluctuations occur in spite of, rather than as a result of, trapping in most cases.

Snow machines are the most commonly used transport for trapping in the area although highway vehicles are used for roadside trapping and aircraft for more remote sites. Mink, muskrat and beaver are more intensively trapped near roads and trails, whereas trapping of lynx, wolverine and land otter requires the mobility of snow machines and aircraft.

Except for beavers, red squirrels and marmots, nonconsumptive uses of furbearers such as viewing and photography are practically nonexistent. Furbearers as a group are difficult to observe due to their nocturnal or secretive habits and their relatively sparse distribution. Some muskrats and mink are observed incidental to other activities such as hunting, fishing, and canoeing.

Beaver occur throughout the Cook Inlet plan area but are most abundant on the eastern portion of the Kenai Peninsula and in the drainages of the Talkeetna Mountains. Moderate to low populations occur on lakes and streams on the western Kenai Peninsula; however, populations there appear to be increasing in the area north of Tustumena Lake. In the Anchorage area beavers are common in the drainages of the Twentymile River and Portage Creek and on lands within the military bases.

Good beaver habitat is present throughout the area but is limited in mountainous terrain. Loss of habitat has occurred in the lower Matanuska Valley with agricultural development of the land, and on the Kenai Peninsula where a considerable amount of beaver habitat was lost to the 1969 forest fire.

Use of beavers by trappers in the Cook Inlet area has increasingly become a recreational activity as human populations and access have increased in the area. Trapping pressure has been light to moderate in most areas, depending on the abundance of beaver and fur prices. For the area as a whole harvests of beaver have been below the sustained yield level. While the majority of beaver colonies are untrapped because they are relatively inaccessible, those that are readily accessible from the road system are often overutilized.

Over the past decade harvests on the Kenai have ranged between 46 and 259 per year. Within the lower Matanuska Valley and southwestern Talkeetna Mountains an average of about 130 beavers has been taken annually, although the take has fluctuated widely in numbers.

Observation and photography of beavers is popular wherever beavers are accessible to viewing. Thousands of people view beavers at the Portage area annually. Colonies in the Hatcher Pass area also provide considerable viewing, and additional sites include Fort Richardson and the Eagle River Drainage. Many people also view beaver incidental to other activities such as fishing, hiking, hunting and canoeing.

Wolverines are fairly abundant in the mountainous sections of the area, and along the outer Kenai Peninsula gulf coast, but are relatively scarce over lowland portions of the area. Annual harvests have averaged about 60 wolverines for the past 5 years although the take has fluctuated widely between years. Trapping has not appeared to be a limiting factor on wolverine populations. Hunting and trapping of wolverine have been prohibited within Chugach State Park since 1973.

Lynx occur throughout the area, but are most common adjacent to the mountains or in the major mountain drainages. They are occasional to rare along the gulf coast. In 1975 populations were at moderate to low levels following the decline of the snowshoe hare population. Habitat alterations which benefit hares also favor lynx. The 1947 burn area harbors some of the best lynx populations on the Kenai Peninsula.

Although high fur prices have stimulated trapping effort for lynx, harvests have remained at moderate levels. At the peak of the lynx cycle in 1974, the harvest on the Kenai Peninsula did not exceed 350.

Harvests from the Knik, Eklutna, and Eagle River drainages are thought not to exceed 10-15 per year. In the lower Matanuska Valley area and the southwestern Talkeetna Mountains average annual harvests probably don't exceed 200-300 lynx.

Coyotes are abundant throughout the area. They are versatile in their habitat requirements and adapt well to areas with high human populations. Because coyotes utilize a variety of prey species and scavenge on carrion they are less subject to the population fluctuations suffered by some other furbearers. Coyotes are taken in low numbers by trappers because they are difficult to trap and because their fur is of relatively low value. Hunters take some coyotes by utilizing predator calls, and this sport appears to be increasing in popularity. The effects of hunting and trapping on coyote populations is negligible. The annual harvest is estimated to be less than 200 coyotes.

Red Foxes occur in mountainous sections of the Cook Inlet area in relatively low numbers except for the southwestern Talkeetna Mountains where they are moderately abundant. Few foxes are taken by trappers.

Marten occur in low to moderate numbers, primarily in the forested areas of the eastern Kenai Peninsula, from Kenai Lake to Seward, and in the southwestern Talkeetna Mtns. Utilization of marten by trappers is very low, probably not exceeding 20-30 per year.

Mink are common in many lowland areas, with the highest densities along the gulf coast. Populations are subject to wide fluctuations that are a function of prey availability, such fluctuations being more pronounced in inland areas. Harvests of mink are strongly affected by the market value of pelts. Generally, harvest levels are low because large areas of mink habitat are untrapped. Intensive trapping in accessible areas has temporarily depressed mink populations in some localized sites, but has had little long-term effect on populations.

Weasels including short-tailed and least weasels occur throughout the area. The short-tailed weasel is common while least weasels are uncommon. Weasels are abundant in lowland areas where mice and shrews are common. They are often observed in residential areas. Very little harvesting of weasels occurs as their pelts have traditionally been of little value. Most that are taken are accidentally trapped in sets for other species, particularly mink.

Muskrats are common in the lower Matanuska Valley and in the lowlands between Anchorage and the Knik River, but are relatively uncommon on the Kenai Peninsula. Harvests of muskrats are low except for small areas trapped near Anchorage and in the Matanuska Valley. Harvests have had little effect on muskrat populations.

Land Otters are abundant along the east side of Kachemak Bay and along the gulf coast. They also occur in lower numbers along inland lakes and streams on the remainder of the Kenai Peninsula and in the southwestern Talkeetna Mountain drainages. Other populations appear to fluctuate

less than most other carnivorous furbearers because they rely on a relatively stable fish prey base. Harvests of land otter in the Cook Inlet area probably does not exceed 50-60 per year. Harvests are well below sustained yield levels and large areas are virtually untrapped. However, past harvests on streams flowing into Cook Inlet south of the Kasilof River may be responsible for reduced numbers there.

Red Squirrels and Marmots are common in the area wherever suitable habitat occurs. Red squirrels occur in spruce forests while marmots are most abundant in alpine areas. Except for large areas of squirrel habitat lost in the 1947 and 1969 forest fires on the Kenai Peninsula, these species have been unaffected by man's presence. Although a few people hunt squirrels for sport and food, the primary use of squirrels and marmots is nonconsumptive. Squirrels are commonly observed in campgrounds and residential areas and marmots are conspicuous to hikers or other visitors to alpine areas.

FURBEARERS IN SOUTHWESTERN ALASKA

All species of furbearers* common to Alaska occur in the Southwestern Region. A great diversity of furbearer habitat is present in this region which encompasses an area from the Aleutian Islands to the crest of the Alaska Range. The distribution of furbearers reflects the diversity of the habitat.

Excellent beaver habitat exists in the northern half of this region and on Kodiak Island where they were introduced some years ago. In the Nushagak drainage beavers achieve some of the highest densities within Alaska. Beavers do not exist on the western end of the Alaska Peninsula or the Aleutian Islands. On the extremity of their range on the Alaska Peninsula beaver populations may fluctuate with the condition of their habitat. Wolverines occur throughout the mainland portion of the region and on Unimak Island, but are absent on the Aleutian Islands. Wolverines appear to be abundant, but, as elsewhere in the state, accurate information on population size and composition is not available. Arctic fox, particularly the blue phase, occur on many of the Aleutian Islands, the Alaska Peninsula, and the coastal fringe to the north. Foxes were introduced to many of the Aleutian Islands and efforts have been made recently to remove them from islands where they are seriously impacting ground nesting birds. Fox populations are abundant throughout the area but have a tendency to fluctuate in density over the years. Coyotes are found only rarely in some rare portions of the region and where found do not achieve the abundance that they do elsewhere in the state. Lynx are found in the northeastern portion of the area but do not achieve densities similar to those in the Interior and Southcentral Regions. Land otters reach high population levels in many portions of the region but are not present on the Aleutian Islands. There is little of marten habitat in the area and they do not achieve the high densities found in the Western and Interior areas. Marten and red squirrels were transplanted to Afognak Island in 1952 and both have become established on the island. Mink and weasels are found throughout most of the region and at times are very abundant. Red squirrels and ground squirrels achieve high populations in many portions of this area. Little is known about population densities of flying squirrels. Marmot are also common but population densities are unknown.

Population levels and trends of carnivorous furbearers are often closely tied to relatively few prey species or even to a single prey species. The abundance of lynx can often be predicted from snowshoe hare population trends. Lynx in Southwestern Alaska do not achieve densities as high nor exhibit fluctuations in population levels as extreme as those found in Interior Alaska, possibly because snowshoe hare densities are lower than those of Interior areas. Densities of marten, red foxes, weasels and coyotes appear to be dependent upon densities of small rodents, although red fox abundance also appears related to snowshoe hare population levels. Mink, marten, and beaver achieve population densities as high as anywhere in the state.

* A list of furbearer species considered in these plans follows this regional account.

The herbivorous furbearers do not appear capable of seriously damaging their food supply. Although beavers are capable of over-utilizing their immediate food supply, this rarely results in major population fluctuations because the effect is not simultaneous over large areas. At any given time a substantial percentage of the beaver population in any drainage is emigrating into new habitat as occupied habitat becomes less productive. Muskrat population fluctuations, though not well understood in Alaska, are related to productiveness of their habitat. Beavers, muskrats, squirrels, and marmots are subject to significant levels of predation by other furbearers.

Human consumptive use of furbearer populations in Southwestern Alaska is highly variable and generally depends on the abundance and current market value of the various species. Long-established traditions, market conditions and trapping regulations have generally limited use to the seasons when the pelts are prime. This period is generally October through May depending upon the species. In some locations trapping effort is expended on beaver and wolverine regardless of market conditions. Wolverine are in high demand for local use as parka ruffs. Beaver are sought for food as well as fur, and beaver trapping is a traditional spring activity in many areas. Beaver are generally more heavily trapped than other furbearer species. Beaver distribution in the lower Nushagak drainage may be severely restricted because of excessive utilization. They are not present in parts of some drainages where the habitat appears capable of supporting them. Other drainages within this area have experienced excessively high use of beaver in the past, but in the early 1970's the harvest did not appear to be excessive.

Trapping is a very important and traditional use of furbearers in this region, particularly in Game Management Unit 17 and in the upper portions of Unit 9. Over the years there has not been a great change in the use of furbearers within this area. In some locations trapping still provides a substantial portion of a family's needs. This situation may not persist for a long period of time. If the human population increases significantly and new population centers are established, the trend will be towards more trappers who will trap on a part-time basis. The take of furbearing animals may become a less important part of the annual income of the trapper. As in other areas of Alaska this may precipitate a shift in the value of trapping from an economic sustenance activity to a cultural or outdoor experience.

Little nonconsumptive use of furbearers occurs in Southwestern Alaska. Most species are nocturnal or secretive in nature and provide limited viewing opportunities. However, red squirrels and beavers provide viewing opportunity for fishermen and hunters, and in alpine areas ground squirrels and marmots are commonly observed incidental to other activities. In some areas, arctic or blue foxes and red foxes are readily available to viewers and photographers.

LIST OF FURBEARERS IN SOUTHWESTERN ALASKA

	Common Name	Scientific Name
Canids	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
	White (Arctic) Fox	*Alopex lagopus*
Felids	Lynx	*Lynx canadensis*
Mustelids	Mink	*Mustela vison*
	Sea Otter	*Enhydra lutris*
	Land Otter	*Lutra canadensis*
	Marten	*Martes americana*
	Wolverine	*Gulo gulo*
	Weasel	*Mustela rixosa*
		Mustela ermina
Rodentia	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Snowshoe Hare	*Lepus americanus*
	Marmot	*Marmota caligata*
	Arctic Hare	*Lepus arcticus*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Ground Squirrel	*Citellus parryii*
	Flying Squirrel	*Glaucomys volans*

FURBEARERS IN WESTERN ALASKA

All species of furbearers* common to Alaska occur in the Western Region. Coyotes, however, are uncommon and arctic foxes occur only on the coastal fringe. Although the geographical distribution of various furbearer species overlaps, some separation of species occurs between general habitat types. Beaver, otter, mink and muskrat are the prevalent species in the riparian and aquatic habitats. Mink and otter particularly, reach high densities on the Yukon-Kuskokwim Delta. Wolverine, lynx, marten, weasels, squirrels and marmots are found in upland forest and alpine habitats. The ubiquitous red fox is common in lowland and upland areas.

Population levels and trends of carnivorous furbearers are often closely tied to relatively few prey species or even to a single prey species. The abundance of lynx can often be predicted from snowshoe hare population trends. Lynx in Western Alaska do not achieve densities as high nor exhibit fluctuations in population levels as extreme as those found in Interior Alaska, possibly because snowshoe hare densities are lower than those of Interior areas. Densities of marten, red foxes, weasels and coyotes appear to be dependent upon densities of small rodents, although red fox abundance also appears related to snowshoe hare population levels. Mink, marten, and beaver achieve population densities as high as anywhere in the state.

The herbivorous furbearers do not appear capable of seriously damaging their food supply. Although beavers are capable of over-utilizing their immediate food supply, this rarely results in major population fluctuations because the effect is not simultaneous over large areas. At any given time a substantial percentage of the beaver population in any drainage is emigrating into new habitat as occupied habitat becomes less productive. Muskrat population fluctuations, though not well understood in Alaska, are related to productiveness of their habitat. Beavers, muskrats, squirrels and marmots are subject to significant levels of predation by other furbearers.

The most important influence on Western Alaska furbearer habitats has been wildfire, particularly in forested or brushy areas. Establishment of early stages of vegetation following a fire produces favorable habitat for many species of small rodents, snowshoe hares, and beavers. High populations of rodents and hares in turn benefit the carnivorous furbearers.

Human consumptive use of furbearer populations throughout the Western Region is highly variable and generally depends on the abundance and current market value of the various species. In some locations trapping effort is expended on beaver and wolverine regardless of market conditions. Beaver are sought for food as well as fur, and beaver trapping is a traditional spring activity in many areas. Wolverine are in high demand for local use as parka ruffs. Beaver are generally more heavily trapped

* A list of furbearer species considered in these plans follows this regional account.

than other furbearer species. Beaver distribution in the Yukon-Kuskokwim Delta area in particular may be currently restricted by excessive trapping. Lynx have been heavily trapped in past years because of their relatively high market value. Wolverine also have a high market value but are less vulnerable to trapping than lynx. Mink from the Yukon-Kuskokwim Delta are known throughout the world for their large size and highly desirable fur characteristics. There is very little consumptive use of red squirrels, ground squirrels or marmots in the region.

In Western Alaska there has been little change from the traditional subsistence trapping of furbearers. This situation may not persist in the future if human populations increase significantly. With urbanization of rural areas many trappers will become more dependent on the cash economy and less dependent on trapping. As in other areas of Alaska, there may be a shift in the value of trapping from an economic sustenance activity to a recreational experience.

Little nonconsumptive use of furbearers occurs in the region. Most species are nocturnal or secretive in nature and provide limited viewing opportunities. Red squirrels and beavers provide viewing opportunity for fishermen and hunters and in alpine areas ground squirrels and marmots are commonly observed incidental to other activities.

LIST OF FURBEARERS IN WESTERN ALASKA

	Common Name	Scientific Name
Canids	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
	White (Arctic) Fox	*Alopex lagopus*
Felids	Lynx	*Lynx canadensis*
Mustelids	Mink	*Mustela vison*
	Land Otter	*Lutra canadensis*
	Marten	*Martes americana*
	Wolverine	*Gulo gulo*
	Weasel	*Mustela rixosa*
		Mustela ermina
Rodentia	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Snowshoe Hare	*Lepus americanus*
	Arctic Hare	*Lepus arcticus*
	Marmot	*Marmota caligata*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Ground Squirrel	*Citellus parryii*
	Flying Squirrel	*Glaucomys volans*

FURBEARERS IN INTERIOR ALASKA

Almost all species of furbearers* common to Alaska occur in the Interior Region. A notable exception is the arctic fox. Beaver, otter, mink and muskrat are the most prominent species in riparian and aquatic habitats. Wolverine, lynx, coyote, red fox, marten, weasels, squirrels and marmots are common in upland forest and alpine habitats.

Population levels and trends of carnivorous furbearers are often closely tied to relatively few prey species or even to a single prey species. The abundance of lynx can often be predicted from snowshoe hare population trends. Marten, weasels, red foxes and coyotes are largely dependent on small rodent abundance. However, red fox and coyote abundance may also be related to snowshoe hare populations.

The herbivorous furbearers do not appear capable of seriously damaging their food supply. Although beavers are capable of over-utilizing their immediate food supply, this rarely results in major population fluctuations because the effect is not simultaneous over large areas. At any given time a substantial percentage of the beaver population in any drainage is emigrating into new habitat as occupied habitat becomes less productive. Muskrat population fluctuations, though not well understood in Alaska, are related to productiveness of their habitat. Beaver, muskrats, squirrels and marmots are subject to significant levels of predation by other furbearers.

The most important influence on Interior furbearer habitats has been wildfire, particularly in forested or brushy areas. Establishment of early stages of vegetation following a fire produces favorable habitat for many species of small rodents, snowshoe hares, and beavers. High populations of rodents and hares in turn benefit the carnivorous furbearers. Increasingly effective fire suppression over the last 20 years has resulted in a considerable increase in the acreage dominated by more advanced (but less productive) stages of vegetation.

Human consumptive use of furbearer populations throughout the Interior Region is highly variable and generally depends on the abundance and current market value of the various species. In some locations trapping effort is expended on beaver and wolverine regardless of market conditions. Beaver are sought for food as well as fur, and beaver trapping is a traditional spring activity in many areas. Wolverines are in high demand for local use as parka ruffs. Beavers are generally more heavily trapped than other furbearer species. Lynx have been heavily trapped in past years because of their relatively high market value. Wolverine also have a high market value but are less vulnerable to trapping than lynx.

Long established traditions, market conditions, and trapping regulations have limited the use of furbearers to the season from October to May when pelts are prime. Consumptive use of red squirrels, ground squirrels and marmots occur at other seasons because these species are used for food and because ground squirrels and marmots hibernate during the winter.

* A list of furbearer species considered in these plans follows this regional account.

A diminishing percentage of the fur harvest is being taken by the traditional wilderness trapper who derives a substantial proportion of his annual income from trapping. Trapping now radiates from population centers. Trapping pressure in remote watersheds for the smaller furbearer species will continue to decrease unless fur prices rise dramatically.

Nonconsumptive use of furbearers occurs near population centers and along the road and trail systems. The most commonly observed and photographed furbearers are beavers, red squirrels and ground squirrels. Red squirrels abound throughout most of the Interior and provide almost unlimited viewing opportunity in campgrounds, waysides and other recreational sites. Ground squirrels are also numerous in some recreational areas. Beavers are available for viewing on fishing streams and at stream road crossing. Most other furbearers are nocturnal or secretive in nature and provide limited viewing opportunities.

LIST OF FURBEARERS IN INTERIOR ALASKA

	Common Name	Scientific Name
Canids	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
Felids	Lynx	*Lynx canadensis*
Mustelids	Mink	*Mustela vison*
	Land Otter	*Lutra canadensis*
	Marten	*Martes americana*
	Wolverine	*Gulo gulo*
	Weasel	*Mustela rixosa*
		Mustela ermina
Rodentia	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Snowshoe Hare	*Lepus americanus*
	Marmot	*Marmota caligata*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Ground Squirrel	*Citellus parryii*
	Flying Squirrel	*Glaucomys volans*

FURBEARERS IN NORTHWESTERN ALASKA

All species of furbearers*** common to Alaska occur in the Northwestern Region. Mink, otter, muskrat, and red and arctic foxes reach high levels of abundance in this region. Wolverine, lynx, beaver, marten and other species common to upland and alpine habitats are less abundant than in other northern Alaska areas. Coyotes are uncommon to rare in much of the region and do not inhabit the western portions of the Seward Peninsula or the lower portions of the Noatak, Kobuk, and Selawik River systems. Beaver and lynx populations are expanding their historical ranges in the region, with beaver moving into the northern portion of the region and lynx becoming established on the Seward Peninsula. The Noatak, Kobuk and Selawik floodplains are noted for their high quality mink and muskrat. Furbearers on St. Lawrence Island are limited to arctic foxes and ground squirrels.

Little overall change in furbearer habitat has occurred in Northwestern Alaska. Some long-term climatic change may be affecting vegetation, as reflected in expanding distributions of moose, beaver and snowshoe hares. Wildfire has had relatively little influence in this region although portions of the Kobuk and Selawik valleys have burned. Mining activities have affected some riparian habitat on the Seward Peninsula. Effects of mining activities on furbearers are unknown. Most of the region is highly mineralized and future habitat disturbance seems inevitable.

Most human use of furbearers in this region is consumptive. The degree of use varies with the abundance, market value, and traditional utilization of various furbearer species. Relatively high human use appears to be limiting wolverine density and distribution. In addition to high pelt prices, wolverines are valued for local use in the manufacture of parka ruffs. In recent years high market prices have led to intensive trapping of arctic and red foxes. By contrast, relatively poor market conditions and a general decrease in dependence upon furbearers as a source of income have led to minimal harvests of mink and muskrats. Long established traditions, market conditions and trapping regulations have limited the use of furbearers to the season from October to May when pelts are prime, although some species are taken at other times. Beaver are used for food as well as fur, and may be taken when pelts are not prime. Squirrels have also been used for food and garments, but are unavailable in the winter.

Some viewing and photography of furbearers occurs in the region, primarily by tourists. Arctic and red foxes, and ground squirrels provide for the majority of nonconsumptive use.

*** A list of furbearer species considered in these plans follows this regional account.

LIST OF FURBEARERS IN NORTHWESTERN ALASKA

	Common Name	Scientific Name
Canids	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
	White (Arctic) Fox	*Alopex lagopus*
Felids	Lynx	*Lynx canadensis*
Mustelids	Mink	*Mustela vison*
	Land Otter	*Lutra canadensis*
	Marten	*Martes americana*
	Wolverine	*Gulo gulo*
	Weasel	*Mustela rixosa*
		Mustela ermina
Rodentia	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Snowshoe Hare	*Lepus americanus*
	Arctic Hare	*Lepus arcticus*
	Marmot	*Marmota caligata*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Ground Squirrel	*Citellus parryii*

FURBEARERS IN ARCTIC ALASKA

Furbearers* in general do not achieve the degree of importance in Arctic Alaska that they do in Western and Interior Alaska. The variety of harvestable species is lower there than in regions to the south. Marten, beaver, muskrat and red squirrel reach the northern limits of their distribution at the southern boundary of the Arctic region. Lynx, mink, land otter and coyote are present in low densities. Economically important furbearers include arctic fox, red fox, wolverine, weasels and arctic ground squirrel. There is insufficient information to evaluate marmot populations in the area.

The arctic fox is the most important furbearer in the region. Arctic fox populations are cyclic with highs occurring every three or four years. These usually coincide with or immediately follow brown lemming population peaks. In addition to annual variations in the population density of arctic fox, it also varies considerably in the various physiographic areas of the region. Highest densities occur on the arctic coastal plain. Low to moderate densities occur in the foothill regions of the Brooks Range, and very low numbers exist in the Brooks Range. Red foxes have less stringent habitat requirements as is reflected in their wide distribution throughout North America. Development activities which will disrupt the natural environment will probably not affect red foxes as seriously as they will arctic foxes. The red fox is, at times, abundant in the region. In contrast to arctic foxes, red fox populations are highest in the mountains and foothills and lowest in the coastal plains.

Wolverine are present throughout the area. They are most numerous in the Brooks Range and foothills and scarce along the coast or on the coastal plain. Wolverine densities vary considerably on an annual basis. The mechanisms causing changes in wolverine populations are not well understood.

Ground squirrels are found throughout the region from the coast to high in the mountains. In many areas they are the most conspicuous furbearer. Their fur is valuable to the local garment industry, but few are ever exported from the region. The ground squirrel provides a food source for several other furbearers, big game carnivores and raptors, and for man.

Throughout the various habitats occupied by arctic foxes the most significant limiting factor may be the availability of denning sites within the coastal areas where arctic foxes achieve their highest densities. Considerable development is presently underway and more is planned for the coastal plain sections of the Arctic Region. Arctic fox denning habitat, in general, may become the major source of fill material for developmental purposes throughout the region. Shoreline habitat is also very important to arctic foxes as they are a major scavenger in both winter and summer along the coast.

* A list of furbearer species considered in these plans follows this regional account.

The consumptive use of furbearers in the Arctic is almost exclusively by residents. Arctic fox trapping in particular is a very important local industry and it is zealously guarded by local trappers. Arctic and red foxes and wolverine are used intensively and extensively. Trapping and hunting of both species of foxes have not been known to be detrimental to the fox populations. Fox populations appear to be more closely regulated by the abundance of their food supply than by consumptive utilization by humans. Wolverine, on the other hand, are quite vulnerable to human use in many portions of the region. Their present distribution and abundance may be greatly influenced by the degree of hunting and trapping. Consumptive use of furbearers has been confined to that period when pelts are prime. This varies considerably between species but generally extends from November through April. Ground squirrels and marmots hibernate and are not available from November to April.

Arctic and red foxes adapt very rapidly to the presence of humans when they are undisturbed and provide a considerable amount of viewing opportunity in the summer months. Because of the seasonal nature of viewing, trapping and hunting there has been little conflict between uses.

LIST OF FURBEARERS IN ARCTIC ALASKA

	Common Name	Scientific Name
Canids	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
	White (Arctic) Fox	*Alopex lagopus*
Felids	Lynx	*Lynx canadensis*
Mustelids	Mink	*Mustela vison*
	Land Otter	*Lutra canadensis*
	Marten	*Martes americana*
	Wolverine	*Gulo gulo*
	Weasel	*Mustela rixosa*
		Mustela ermina
Rodentia	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Snowshoe Hare	*Lepus americanus*
	Arctic Hare	*Lepus arcticus*
	Marmot	*Marmota caligata*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Ground Squirrel	*Citellus parryii*
	Flying Squirrel	*Glaucomys volans*

ALASKA SEA LION

LOCATION

Alaska coastal waters in Game Management Units 1-10, 15, 18, and 22 except Glacier Bay and Katmai National Monuments, and the Juneau, Resurrection Bay, and Chiniak Bay Sea Lion Management Plan areas.

THE SPECIES

The Alaska population of Steller or northern sea lions is estimated to exceed 200,000. Approximately 10,000 occur in the Southeastern Region, 19,000 in the Southcentral Region, and 185,000 in the Southwestern Region. An unknown number range into the seasonal pack ice of the Bering Sea. These estimates are based primarily on counts of animals on hauling grounds and rookeries. A large part of the sea lion population is hauled out at any given time although many may be at sea. Reproductively active animals concentrate at rookeries in summer for pupping and breeding. These rookeries are usually large, often containing over 10,000 animals, and tend to be on remote islands exposed to the open sea. Limited pupping and breeding activity occurs at some hauling areas. Hauling areas are primarily used by reproductively inactive animals in summer and by all animals in winter.

Use of rookeries and hauling areas varies seasonally. Some, particularly those in more protected waters, may be used only in winter, others are used all year, although the numbers of sea lions hauling out may vary seasonally. Some areas may be used only rarely, perhaps only when food species concentrate in the vicinity. Significant shifts in concentrations of animals in the water also occur. These movements are poorly understood but probably are related to the distribution of food species. Movement between areas appears common.

Shifts between areas may give the appearance of overall population changes, however surveys over the last 20 years indicate no major change in population size or in distribution of sea lions other than an increase in numbers on the high seas associated with foreign fishing fleets. The population appears to be near carrying capacity in all parts of its range. Natural mortality, particularly of pups and subadults, appears to be the main population regulatory mechanism although lowered productivity has been suggested. Harvest of pups may have exerted a slight influence on sea lion numbers in localized areas of the Kodiak Archipelago between 1963 and 1972, but no change has been observed.

No known habitat changes significant to sea lions have occurred. The present population probably exceeds the level at the time white man arrived, since historical evidence indicated that aboriginal hunting maintained the sea lion population at a reduced level.

At present the influence of human activites is probably minor. However, projected increases in activities related to the oil, logging and other industries, projected growth of coastal communities, and the current high levels of foreigh fishing for sea lion food species increase the chances that sea lions will be affected in the future.

Sea lion populations in Alaska have been subjected to hunting pressure of varying intensities for many centuries. Remains of sea lions in middens indicate the coastal dwelling natives utilized the resource to a high degree. Historical records indicate that hunting pressure prior to the early 1900's was so intensive that the sea lion populations in much of Alaska were reduced to low levels. Hunting pressure apparently declined sometime after the turn of the 19th century, because natives were no longer dependent upon them for subsistence and white man turned to more economically attractive materials. As a result sea lions greatly increased in numbers.

In more recent times sea lions have been hunted for a variety of reasons. Prior to passage of the Marine Mammal Protection Act of 1972 (MMPA) fishermen annually killed an unknown but relatively small number of sea lions in the course of domestic commercial fishing operations. A small number (probably less than 100) were taken for crab or shrimp bait. In 1959 a total of 630 were taken from several areas of Game Management Units 8 and 9 in a study of potential commercial uses of sea lions. Between 1963 and 1972 harvests of pups for pelts were conducted at several rookeries in Game Management Units 8, 9 and 10. The total harvest included 14,180 from Marmot Island; 16,753 from Sugarloaf Island; 8,632 from Akutan Island; 638 from Atkins Island; 574 from Round Island; 3,773 from Ugamak Island and 628 from Jude Island.

The MMPA removed all restrictions on harvest of marine mammals by Eskimos, Indians and Aleuts but prohibited all others from taking them. This effectively stopped the commercial harvest, however, an undetermined number have been taken either legally or illegally in the course of domestic fishing operations. Incidental harvest in conjunction with foreign fishing fleets appears to have increased in recent years. Some estimates place the annual take at over 10,000. Permits were issued for the taking of a few hundred sea lions for scientific purposes.

Viewing and photography of sea lions has increased in recent years. Recreational boaters and fishermen often visit hauling areas near coastal communities and a small number of tourists and professional photographers travel to more remote rookeries each year. A few individuals derive a portion of their annual income guiding and transporting photographers seeking sea lion.

Experience prior to 1972 demonstrated that commercial harvest and viewing of sea lions can be compatible if properly regulated.

SOUTHERN ALASKA HARBOR SEAL

LOCATION

Alaska coastal waters in Game Management Units 1-10 and 14-17 except Glacier Bay and Katmai National Monuments, and the Juneau, Resurrection Bay, Kachemak Bay and Iliamna Lake Harbor Seal Management Plan areas.

THE SPECIES

Land breeding harbor seals are common along the entire coast from Dixon Entrance to the southern Bering Sea. During periods when seasonal pack ice occurs in the southern Bering Sea they intermingle with ice breeding harbor seals but are genetically isolated by differences in breeding season.

Along rocky coasts seals tend to be scattered, although up to 300 might be seen hauled out in certain prime areas. Larger concentrations frequently occur in glacial fjords, estuaries or near extensive shallow areas where thousands may haul out on glacial ice or sandy beaches at one time. Examples of such haul-out areas are Icy Bay, Glacier Bay, the Copper River, Tugidak Island, Port Moller and Port Heiden. Seals frequently ascend major rivers where seasonal concentrations of food species occur.

It is difficult to accurately assess seal numbers since an unknown and highly variable percentage of the population is in the water at any given time. A conservative estimate based on aerial surveys and harvest records is 270,000 in Alaskan waters. The population as a whole appears to have been near carrying capacity for many years, and no major population changes have been documented. However, densities have been reduced by man in a few areas. An extensive predator control program greatly reduced seal numbers in the Copper River in the 1950's. Commercial harvesting in the mid 1960's reduced densities in portions of Southeastern and Southcentral Alaska, Kodiak Island and Bristol Bay. When hunting pressure diminished in the late 1960's seal numbers increased and are again near carrying capacity in most areas.

There is no documented evidence that human activities are influencing seal numbers at the present time, although limited effects may occur near towns or areas of concentrated industrial activity. Increasing fishing pressure on bottom fish, projected Outer Continental Shelf oil and gas development and other industrial activities increase the potential for significant impacts on seal numbers in the future.

Seals have always been used by coastal residents for domestic purposes including clothing and food. Some were taken in conjunction with fisheries conflicts and a bounty was paid for seal scalps for many years. Small numbers were used for commercial garments and souvenirs and for trap bait. In 1963 Alaskan seal skins entered the European fur market. High prices were paid for raw seal skins, stimulating a great deal of interest in harvesting the animals. The estimated yearly harvest in Alaskan

waters climbed from about 6,000 to 10,000 harbor seals prior to 1963, to over 50,000 seals in 1965. The market price of seal hides then dropped, resulting in a significant decline in hunting pressure. The seal harvest in 1966 dropped to 25,000-30,000 and continued to decline each year thereafter. By the late 1960's the annual harvest in the area was 8,000 to 12,000 seals. Pelt prices again rose to a relatively high level in the early 1970's, but this failed to stimulate a significant increase in harvest. This may have been due to the fact that many potential commercial seal hunters had learned that successful commercial seal hunting requires skill, effort and in some cases a significant cash outlay.

After 1966 hunting pressure was considerably below what the population could support. No significant harvest occurred over vast areas of southern Alaska. Heavy hunting pressure, primarily directed at pups, was limited to a few areas of high seal density. The harvest was controlled by manipulating seasons and, when necessary, closing areas by field announcement.

The Marine Mammal Protection Act of 1972 (MMPA) effectively terminated commercial hunting. While Eskimos, Indians and Aleuts were allowed to harvest seals without restriction on numbers or season, they could not sell them to fur dealers. Nonnatives were prohibited from taking seals for any purpose. The initial effect of the MMPA was to reduce the harvest of seals to a very low level. Several native groups have discussed organizing a seal harvesting industry. This creates the potential for a greatly increased harvest and perhaps overharvest in some areas.

Viewing and photography of seals has increased in recent years. Seal behavior is such that few individuals deliberately seek this species for observation relative to some other marine mammals; however, the presence of undisturbed seals contributes significantly to the enjoyment of many individuals engaged in other pursuits. Seals have become accustomed to humans in Glacier Bay National Monument and are readily observed and photographed there.

SOUTHERN ALASKA SEA OTTER

LOCATION

Alaska coastal waters in Game Management Units 1, 2, 3, 4, 5, 6, 7, 14, 15 and 16.

THE SPECIES

Sea otters were once abundant throughout Southeastern Alaska, Prince William Sound, along the outer Kenai Peninsula coast and in lower Cook Inlet. It is not likely that significant numbers occurred in upper Cook Inlet. By 1911 commercial hunting had eliminated sea otters from much of this range. One or more small populations persisted around the outer islands of Prince William Sound. These populations have grown steadily since 1911 and have expanded their range northward along the islands and mainland of both sides of Prince William Sound, eastward toward Yakutat and westward along the Kenai Peninsula. In the mid-1960's a group perhaps from the Barren Islands migrated to the southwestern tip of the Kenai Peninsula and merged with animals migrating from Prince William Sound.

While there were occasional unconfirmed reports of individual animals, no established population occurred in Southeastern Alaska until 1965. Between 1965 and 1969, a total of 402 sea otters were transplanted to several locations between Cape Spencer and Dixon Entrance and tdn were released in Yakutat Bay. Sea otters now occupy most areas of former sea otter habitat in the region, but expansion into northern Prince William Sound, along the Gulf of Alaska coast toward Yakutat and into lower Cook Inlet is still occurring. Populations around the outer islands of Price William Sound are probably near carrying capacity; here, there was a marked increase in the incidence of beach-dead juveniles accompanied by rapid range expansion into adjacent unpopulated habitat in the 1960's. This usually is an indication that food availability has become a limiting factor. Other recently repopulated areas such as Sheep and Gravina Bays may support densities well above carrying capacity even though nutritionally related mortality appears to remain low. Sea otter numbers east of the Copper River, in parts of northern Prince William Sound and in lower Cook Inlet remain below carrying capacity. The populations should reach aboriginal levels in all areas of Prince William Sound and around the outer Kenai Peninsula in the next few years. Repopulation of the area east of Kayak Island and lower Cook Inlet will take somewhat longer and this population should continue to expand eastward into Game Management Unit 5 and perhaps to the Alaska Peninsula. Present estimates of sea otter numbers are 4,000 to 6,000 in Prince William Sound and 1,500 to 2,000 along the Kenai Peninsula.

At the present time, an estimated 600 to 800 sea otters inhabit the Alexander Archipelago. Established and rapidly growing populations exist at Yakobi Island, Khaz Bay, Coronation Island and the Maurelle Islands. Smaller concentrations of uncertain status have been located in the Necker and Barrier Islands. Scattered individuals are reported

from other areas. Little is known about the status of sea otters in Game Management Unit 5 but small numbers are occasionally seen at several locations between Icy Bay and Dry Bay.

Present sea otter populations in Southeastern appear far below carrying capacity and the observed pup-adult ratios and rates of population increase indicate that high productivity and low mortality. Barring any unexpected mortality factors or habitat alteration, the existing population nuclei should increase rapidly and expand their range into most areas of former sea otter habitat.

After 1911 federal laws prohibited the taking of sea otters except by Eskimos, Indians and Aleuts using aboriginal methods and means. In 1959 management authority passed to the State and all public harvest was prohibited. The Marine Mammal Protection Act of 1972 returned management authority to the federal government and removed all restrictions on the taking of marine mammals by natives. Throughout this period the only recorded take of sea otters has been 184 removed from the vicinity of Hinchinbrook and Montague Islands during transplants. A few were taken for scientific purposes and some were shot illegally. Legal native take, accidental entanglement in fishing gear, and oil pollution may have removed small numbers from the population. Recently some Alaska Native organizations have discussed the possibility of starting a sea otter hunting industry, but few or none have been taken to date.

By the early 1960's sea otter numbers in Southcentral Alaska had increased to a level where public viewing and photography became a regular use. Opportunities for observation have been steadily increasing as sea otters expand their range and recreational boating increases. Since 1970 Resurrection Bay has provided more opportunity for the general public to view sea otters than any other part of Alaska even though that area contains relatively poor sea otter habitat and supports only modest densities. Kachemak Bay should provide excellent viewing opportunities in a few years and increasing numbers of recreational boaters are traveling to areas of high sea otter densities throughout Prince William Sound and portions of the Kenai Peninsula. While many people travel to this area for other purposes, the opportunity to see sea otters often becomes a significant part of their experience.

The opportunity to view and photograph sea otters in Southeastern has existed since August 1965, but relatively few individuals were able to locate them. By 1970 several populations had grown to the point where it was always possible to find moderate numbers. The Department began publicizing the locations of concentrations and requested sightings from the public. In recent years, public interest has increased and a few people now travel by boat to the area specifically to view and photograph sea otters. This use should steadily increase as the populations expand their range into more accessible areas.

Limited scientific studies on the impact of sea otter predation on invertebrate populations have been conducted. The precise knowledge of the history of sea otter populations creates an ideal opportunity to monitor changes in the marine community as sea otters enter the system.

SOUTHWESTERN ALASKA SEA OTTER

LOCATION

Alaska coastal waters in Game Management Units 8, 9, and 10 except Katmai National Monument.

THE SPECIES

Southwestern Alaska contains a large percentage of the sea otter's former range. When white men arrived in the 1740's sea otters were distributed along most of the Southwestern coasts. There was probably interchange between areas throughout the range although broad deep waters between islands may have provided partial barriers to movements. Commercial hunting between 1742 and 1911 eliminated the sea otter from parts of the range and greatly reduced numbers in all other areas. In 1911 only small scattered groups of otters were left. A number of these colonies persisted and grew. Suspected locations of surviving groups include Augustine Island, the Barren Islands, Shuyak Islands, the Trinity Island, Sutwick Island, Simeonof Island, the Sandman Reefs, Savak Island, northern Unimak Island, Tigalda Island, Sanalga Island and several locations in the Andreanof, Delarof and Rat Islands.

Some of these nucleus populations have increased to the tens of thousands, and expanded their range into adjacent unpopulated areas and in some cases merged with other populations. Other populations have barely become established. At the present time sea otters occupy all but a few small areas of their former range. Although densities in many areas have reached carrying capacity and thousands starve annually, there are large areas where densities are still well below carrying capacity. Some dense populations are contributing to the repopulation of adjacent areas while others are not.

The following is a summary of the present status of sea otters in various parts of the region.

Kamishak Bay - estimated population 1,000, increasing and expanding its range southwestward along Katmai coast.

Kodiak Archipelago - estimated population 4,000 to 6,000, near carrying capacity around the Barren, Shuyak and northern Afognak Islands, lesser concentrations around the Trinity and Chirikof Islands. Increasing and expanding range around southern Afognak and northern Kodiak Islands.

Southern Alaska Peninsula - estimated population 8,000 to 10,000, near carrying capacity between Chignik and Amber Bays, increasing rapidly and expanding range both northeastward and southwestward.

Shumagin Islands - estimated population 8,000 to 10,000, near carrying capacity in southern islands, rapidly expanding to adjacent mainland coast.

Sanak Island and Sandman Reefs - estimated population 6,000 to 10,000, near carrying capacity around Sanak Island and vicinity of Cherni Island, expanding to mainland coast and merging with Shumagin population.

North Unimak-Alaska Peninsula - estimated population 5,000 to 10,000, high densities north of Unimak Island and Izembek Lagoon. By 1970 expanded range to Port Heiden. Range and numbers were reduced by extreme sea ice conditions in early 1970's. May expand to Krenitizin Islands in future.

Pribilof Islands - estimated population less than 25, seven transplanted in 1959 and 55 in 1968; possibly some immigration from Bristol Bay. Future of population uncertain.

Fox and Krenitzin Islands - estimated population 600 to 1,200, four established and growing concentrations, population far below carrying capacity.

Islands of Four Mountains - no known population.

Andreanof Islands - estimated population 32,000 to 40,000, near carrying capacity around all islands west of Atka Pass, rapid eastward expansion along Atku Island and well established populations on Amlia and Sergeran Islands.

Delarof Islands - Estimated population 6,000 to 8,000, near carrying capacity, not contributing to repopulation of any other area.

Rat Islands - estimated population 17,000 to 24,000, near carrying capacity, some animals may be emigrating from Kiska to Near Islands but most of the population not contributing to repopulation of any area.

Near Islands - estimated population 500, established but well below carrying capacity.

After 1911 federal laws prohibited the taking of sea otters except by Eskimos, Indians and Aleuts using aboriginal means. A small but unknown number were taken under these laws and a few more were taken for scientific purposes and transplants. In 1959 management authority passed to the State and all public harvest was prohibited. Between 1962 and 1971 a total of 1,927 were removed from Amchitka Island, 606 from Tranaga Island, 318 from Kanaga Island, 494 from Adak Island and 144 from the Delarof Islands for experimental harvests, transplants and scientific studies. In 1971 an estimated 1,000 to 1,350 were killed at Amchitka Island by a nuclear test. Small numbers were illegally taken or accidentally caught in crab fishing gear.

The Marine Mammal Protection Act of 1972 returned management authority to the federal government and removed all restrictions on the taking of marine mammals by Natives. No known harvest other than small numbers of accidental and illegal kills has occurred since 1972, however Native corporations have considered the possibility of starting a sea otter hunting industry.

While many areas in the region provide excellent opportunities for viewing and photographing sea otters, most of the area is inaccessible to the general public. Public viewing has been a significant use in a few areas such as Sweeper Cove and Finger Bay at Adak and portions of Amchitka Island when the Atomic Energy Commission was active there. Viewing opportunities should also increase as sea otters repopulate range near towns. This should occur in the Chiniak Bay area of Kodiak in the next few years and small numbers can already be seen near Sand Point, Cold Bay, Resurrection Bay, Nikolski and Atka. Commercial fishermen, and to a lesser degree recreational boaters, are able to visit much of the sea otter range. Many individuals throughout the world who will never see a sea otter derive satisfaction from the knowledge that a species that almost became extinct because of man's activities now inhabits most of its former range in large numbers.

MARINE MAMMALS IN SOUTHEASTERN ALASKA

Southeastern Alaska coastal waters provide habitat for a number of marine mammal species* including harbor and elephant seals, sea lions, sea otters, whales, dolphins and porpoises. Although there are some specific habitat preferences, the several species are generally widely distributed and abundant, reflecting the high productivity of the Alaska coastal marine environment. Several species affect and are affected by man's utilization of marine fishery resources. Some species have at times supported substantial commercial or domestic human utilization. In the case of sea otters, populations eliminated by excessive exploitation have been reestablished through a transplant program. On the other hand, use of harbor seals and sea lions had relatively minor impacts on stock status; populations of these species are near or have reached the carrying capacity of the habitat. Since 1972, consumptive use of all marine mammals has been limited to Alaskan natives under a moratorium on use established by the Marine Mammal Protection Act. Little use of marine mammals now occurs in Southeastern Alaska.

Harbor Seals

Harbor seals are abundant in nearshore waters usually less than 30 fathoms in depth. Unlike other species, harbor seals are at home in turbid water as well as in clear water. At times they may move up rivers for considerable distances.

Harbor seals are primarily fish eaters, although marine invertebrate species are also taken. They compete with fishermen for certain species of sport and commercially valuable fish. Depredation on gill-netted salmon has occurred in the Stikine and Taku areas; however, this is less a problem in Southeastern Alaska than in other regions.

Population size is controlled primarily by availability of food. Predation by killer whales and sharks accounts for some losses. Abandonment of pups is relatively common, particularly when seals in pupping areas are disturbed by man. Loss of pups also occurs due to malnutrition or drowning. The presence of pesticide and mercury accumulations in harbor seals has been demonstrated but the effects of these contaminants are unknown.

Coastal residents have used harbor seals for food and clothing. During the early to mid-1960's, temporary high prices for seal skins effected a dramatic increase in commercial harvests which subsequently tapered off as the value of pelts declined. There was relatively little increase in hunter effort when prices again rose to moderately high levels. Only limited use of harbor seals by coastal natives has occurred since passage of the Marine Mammal Protection Act in 1972.

Sea Lions

Sea lions are abundant along the Southeastern coast with at least 10,000 animals known to be associated with about 20 different rookeries and

* A list of marine mammal species considered in these plans follows this regional account.

hauling-out sites. The largest rookeries are located on Lowrie Island and and nearby rocks where about 4,000 sea lions can be found during the breeding season. Movements and interchange of sea lions between areas occurs during the fall when many animals leave the exposed breeding areas and move to more protected waters, and again in the spring when they return to the breeding rookeries. No changes in sea lion population size have been detected in recent years and populations in Southeastern Alaska are probably near the carrying capacity of their habitat.

Sea lion habitat can be found nearly anywhere along the coastline although only traditional haul-out areas are used regularly. The best habitat appears to be remote islands with extensive shallow water and rocky bottoms productive of sea life. Clear waters are preferred with most feeding occurring at depths less than 50 fathoms. Since they are primarily fish eaters, sea lions often concentrate in areas where fish are abundant, such as large herring and pollock schooling areas and spawning grounds, and salmon staging areas. Sea lions probably travel long distances to follow and feed on their prey.

Little change has occurred to sea lion habitat that has not been associated with man. The most significant impact has been on man's utilization of food species vital to sea lions. Several of the species important to sea lions have become commercially valuable and are fished extensively both by United States and foreign fishing fleets. Some alteration of habitat has resulted from the development of coastal communities. Continued development and pollution associated with exploration, extraction, and transportation of oil resources have the potential for serious adverse impacts on sea lions.

Sea lion populations are limited by a variety of factors including availability of food, losses of pups due to adverse weather during pupping and to abandonment, malnutrition, drowning, and losses to predation by killer whales and sharks.

Historically, sea lions were harvested by aboriginal natives for a variety of uses including meat, skin covering for boats, and garments. Prior to passage of the Marine Mammal Act in 1972, commercial harvests of sea lions were directed toward control of fisheries depredations and use of pup skins for the foreign garment trade.

Sea Otter

The sea otter population in Southeastern Alaska was completely exterminated by commercial hunting in the 1800's. A total of 412 sea otters were transplanted to several sites between Yakutat Bay and Dixon Entrance between 1965 and 1969. Several small but well established and rapidly growing populations now occur along the outside coasts. Some sea otters may have immigrated to the outside coast near Icy Bay and Yakutat from Prince William Sound. Southeastern Alaska now supports 600 to 800 sea otters and this number should increase rapidly.

Sea otters, limited to waters shallower than 30 to 40 fathoms in their foraging activities, exert a profound effect on many littoral species of invertebrates and possibly on certain species of bottom fish. Sea urchins and mollusks are preferred food and population size and structure of these and other food species may be significantly altered by sea otter feeding pressure. In some Southwestern Alaska sea otter populations, numbers of otters have reached or exceeded carrying capacity and many hundreds of otters have died from starvation. In other areas, starvation may be the primary natural mortality factor, particularly on subadults in late winter. Southeastern populations are far below carrying capacity and starvation does not appear to be a significant factor at this time. Predation may account for some losses of sea otters. Although otters harbor several species of parasites found in other marine mammals, mortality due to parasites is not thought to be significant.

Whales, Dolphins and Porpoises

More than a dozen species of whales can be found in waters off Alaska, varying in abundance from common to rare. Some species such as the blue and Sei whales extend only into the north Pacific, others including the gray, minke, fin, bowhead, humpback, and killer whales occur in the Chukchi and Bering Seas as well as in the Gulf of Alaska. Most species move far south in winter and occur off Alaska only in summer, while others remain in Arctic waters year-round. The Belukha whale occurs only in small numbers south of the Bering Sea. Similarly, the bowhead whale is found primarily in Chukchi and Bering Sea waters, and the Narwhal is an Arctic Ocean resident.

A number of the larger whales now under complete protection were over-exploited by whalers during the 19th and early 20th centuries. The black right whale has shown slight increases since it was driven almost to extinction. The bowhead, gray, blue and humpback whales have remained stable or shown slight increases in populations since they were afforded complete protection. Commercial utilization continues on several species with no apparent detrimental effects. Among these, the sperm whale is the most important industry species. Sei and fin whales are valuable baleen whales. Some domestic use of whales occurs along Alaska's coast. Alaskan natives annually take from 1 to 37 bowheads, and in some years may take from 1 to 3 gray whales. Belukha whales are an important source of muktuk, oil, and meat for residents of the Bering Sea and Arctic Ocean coasts. Only a few Belukhas are harvested in Bristol Bay.

Because most species of whales feed on plankton, krill or ocean fishes not currently of interest to man, few conflicts with man occur. Beluga whales feed on several species of fish utilized by man and their predation on salmon smolt in particular may impact significantly on depressed salmon populations in some areas such as in Bristol Bay. Killer whales are known to take salmon and herring and thus compete directly with fishermen. In addition killer whales damage fishing gear and interfere with long line fisheries.

Pacific whitesided dolphins and Dall and harbor porpoises occur in Alaskan waters; these species are abundant in inshore waters during winter. These mammals feed on several species of commercially valuable fish such as herring, cod, flounder, and sardines. Porpoises are sometimes caught accidentally in fishermen's nets. Approximately 20,000 Dall porpoises are lost each year to the Japanese high seas salmon gillnet fishery.

Whales, dolphins and porpoises in Alaska are protected by one or more federal laws and by international treaties and laws. These include the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

Other Pinnipeds

Elephant seals and California sea lions have been expanding their ranges northward in recent years. Sightings of elephant seals are reported each summer in the southern areas of the Alexander Archipelago. California sea lions now occur in British Columbia and a few stray animals may reach Alaska. Fur seals inhabit offshore waters of the region seasonally and small numbers of subadult animals often stray into coastal waters. No human use of these species occurs in this region.

LIST OF MARINE MAMMAL SPECIES IN SOUTHEASTERN ALASKA

	Common Name	Scientific Name
Seals	Elephant Seal	*Mirounga leonina*
	Harbor Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
Whales	Blue Whale	*Balaenoptera musculus*
	Bowhead Whale	*Balaena mysticetus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	North Pacific Right Whale	*Eubalaena glacialis*
	Pacific Blackfish (Pacific Pilot Whale)	*Globicephala melaena*
	Sei Whale	*Balaenoptera borealis*
	Sperm Whale	*Physeter catodon*
Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
	Pacific Whitesided Dolphin	*Lagenorhynchus obliquidens*
Other Marine Mammals	Sea Otter	*Enhydra lutris*
	Steller Sea Lion	*Eumetopias jubata*

JUNEAU HARBOR SEAL

LOCATION

In Game Management Unit 1C, that area bounded by a line starting at Point Bridget and then extending southeasterly along the mainland shore to Point Salisbury, thence to Point Tantallon on Douglas Island, thence along the Gastineau Channel and Fritz Cove shores of Douglas Island to Outer Point, thence to the southeast Shelter Island light, thence along the east shore of Shelter Island to its northernmost point, thence to the point of beginning at Point Bridget.

THE SPECIES

No quantitative data are available on seal use of the Juneau area. However, seals are common throughout much of the area and regularly haul out in several locations including islets and rocks frequented by recreational boaters. Information from nearby areas indicates that seal densities were reduced in the mid 1960's by hunting but have since recovered and stablized near carrying capacity. While no data are available to indicate that human activities are influencing seals in the Juneau area it is likely that human activities have reduced carrying capacity of at least part of the area.

No harvest data specific to the Juneau area are available. The close proximity to a major population center suggests that a fairly heavy harvest for sport, hides, food, and in response to fisheries conflicts occurred prior to passage of the Marine Mammal Protection Act of 1972. It is unlikely that any concentrated commercial hunting effort occurred within the area although the statewide harbor seal population was subjected to intensive commercial hunting in the mid 1960's. The most intensive use of seals in the area has probably been viewing, particularly around Auke Bay and Douglas Island.

JUNEAU SEA LION

LOCATION

In Game Management Unit 1C that area bounded by a line starting at Point Bridget and then extending southeasterly along the mainland shore to Point Salisbury, thence to Point Tantallon on Douglas Island, thence along the Gastineau Channel and Fritz Cove shores of Douglas Island to Outer Point, thence to the southeast Shelter Island light, thence along the east shore of Shelter Island to its northernmost point, thence to the point of beginning at Point Bridget.

THE SPECIES

Several hundred sea lions occur in the waters of this area seasonally and use Benjamin Island as a haulout. Few data are available on the numbers in the area at different seasons or on the reasons for changes in abundance. Food availability, particularly the occurance of large schools of herring may be a governing factor.

No data are available on population changes or condition of the habitat within the closed area. High human densities create the potential of adverse impacts through disturbance or reduction of food species. Such influence could reduce sea lion use of the area without any significant effect on the sea lion population as a whole. Conversely impacts on the population in other areas could influence sea lion use of the Juneau area.

No information is available on harvest of sea lions from this area. A few may have been taken for domestic purposes, for bait or animal food, or shot because of real or imagined conflicts with fisheries. No commercial harvest has ever been conducted in the area.

The Juneau area has one of the largest fleets of recreational boats in Alaska. Good access provides greater opportunities for viewing and photographing sea lions than in many areas of much higher sea lion densities. Viewing and photographing sea lions, seals and whales has become a popular recreational activity in the area and the opportunity to see these species contributes to the enjoyment of many people engaged in other activities such as boating and fishing.

MARINE MAMMALS IN SOUTHCENTRAL ALASKA

Southcentral Alaska coastal waters provide habitat for a number of marine mammal species* including harbor seals, sea lions, sea otters, whales, dolphins and porpoises. Although there are some specific habitat preferences, the several species are generally widely distributed and abundant, reflecting the high productivity of the Alaska coastal marine environment. Several species affect and are affected by man's utilization of marine fishery resources. Some species have at times supported substantial commercial or domestic human utilization. In the case of sea otters, populations severely depleted by excessive exploitation have, under protective management, recovered to moderate and still increasing levels. On the other hand, use of harbor seals and sea lions has had relatively minor impacts on stock status; populations of these species are near or have reached the carrying capacity of the habitat. Since 1972, consumptive use of all marine mammals has been limited to Alaskan natives under a moratorium on use established by the Marine Mammal Protection Act. Little use of marine mammals now occurs in Southcentral Alaska.

Harbor Seals

Harbor seals are abundant in nearshore waters usually less than 30 fathoms in depth. Unlike other species, harbor seals are at home in turbid water as well as in clear water. At times they may move up rivers for considerable distances. In excess of 55,000 seals are estimated to occur in Prince William Sound and on the south side of the Kenai Peninsula.

Harbor seals are primarily fish eaters, although marine invertebrate species are also taken. They compete with fishermen for certain species of commercially valuable fish. Depredation on gill-netted salmon has occurred, most notably in the salmon fishery at the mouth of the Copper River.

Population size is controlled primarily by availability of food. Predation by killer whales and sharks accounts for some losses. Abandonment of pups is relatively common, particularly when seals in pupping areas are disturbed by man. Loss of pups also occurs due to malnutrition or drowning. The presence of pesticide and mercury accumulations in harbor seals has been demonstrated but the effects of these contaminants are unknown.

Coastal residents have used harbor seals for food and clothing. During the early to mid-1960's, temporary high prices for seal skins effected a dramatic increase in commercial harvests which subsequently tapered off as the value of pelts declined. Only limited use of harbor seals by coastal natives has occurred since passage of the Marine Mammal Protection Act in 1972.

* A list of marine mammal species considered by these plans follows this regional account.

Sea Lions

Sea lions are abundant along the Southcentral coast with at least 19,000 animals known to be associated with about 30 different rookeries and hauling-out sites. The largest rookeries are located on Outer Island, on several of the Chiswell Islands, and along the west side of the Kenai Peninsula, where about 10,000 sea lions can be found during the breeding season. Rookeries and haul-out areas of lesser importance occur in Prince William Sound. Movements and interchange of sea lions between areas occurs during the fall when many animals leave the exposed breeding areas and move to more protected waters, and again in the spring when they return to the breeding rookeries. No changes in sea lion population size have been detected in recent years and populations in Southcentral Alaska are probably near the carrying capacity of their habitat.

Sea lion habitat can be found nearly anywhere along the coastline although only traditional haul-out areas are used regularly. The best habitat appears to be remote islands with extensive shallow water and rocky bottoms productive of sea life. Clear waters are preferred with most feeding occurring at depths less than 50 fathoms. Since they are primarily fish eaters, sea lions often concentrate in areas where fish are abundant, such as large herring and pollock schooling areas and spawning grounds, and salmon staging areas. Sea lions probably travel long distances to follow and feed on their prey.

Little change has occurred to sea lion habitat that has not been associated with man. The most significant impact has been by man's utilization of food species vital to sea lions. Several of the species important to sea lions have become commercially valuable and are fished extensively both by United States and foreign fishing fleets. Some alteration of habitat has resulted from the development of coastal communities. Continued development and pollution associated with exploration, extraction, and transportation of oil resources have the potential for serious adverse impacts on sea lions.

Sea lion populations are limited by a variety of factors including availability of food, losses of pups due to adverse weather during pupping and to abandonment, malnutrition, drowning, and losses to predation by killer whales and sharks.

Historically, sea lions were harvested by aboriginal natives for a variety of uses including meat, skin covering for boats, and garments. Prior to passage of the Marine Mammal Act in 1972, commercial harvests of sea lions were directed toward control of fisheries depredations and use of pup skins for the foreign garment trade.

Sea Otter

The sea otter population in Southcentral Alaska is centered primarily around Hinchinbrook entrance in Prince William Sound. In recent years this population, estimated at about 5,000 otters, has expanded its range into the Sound, particularly around Knight Island and Port Gravina. A second population became established on the southern side of the Kenai Peninsula in the late 1960's and now numbers at least 1,500 otters.

This group is also increasing and spreading to Kachemak Bay and Lower Cook Inlet. Both populations should continue to grow although deep water limits the available suitable habitat for expansion.

Sea otters, limited to waters shallower than 30 to 40 fathoms in their foraging activities, exert a profound effect on many littoral species of invertebrates and possibly on certain species of bottom fish. Sea urchins and mollusks are preferred food and population size and structure of these and other food species may be significantly altered by sea otter feeding pressure. In some Southwestern Alaska sea otter populations, numbers of otters have reached or exceeded carrying capacity and many hundreds of otters have died from starvation. In all areas of high sea otter densities, starvation may be the primary natural mortality factor, particularly on subadults in late winter. Predation may account for some losses of sea otters. Although otters harbor several species of parasites found in other marine mammals, mortality due to parasites is not thought to be significant.

Heavy human exploitation, responsible for reducing sea otter populations to small remnants during the period 1742 to 1911, was eliminated by the Fur Seal Treaty of 1911 and by subsequent Federal and State management regulations. Resultant recoveries of Alaskan sea otter populations enabled numerous transplants to be made to other historic Pacific sea otter habitats within and outside of Alaska. From 1965 to 1971 over 100 sea otters were captured in Prince William Sound and transplanted to other areas.

Whales Dolphins and Porpoises

More than a dozen species of whales can be found in waters off Alaska, varying in abundance from common to rare. Some species such as the blue and Sei whales extend only into the north Pacific, others including the gray, minke, fin, humpback, and killer whales occur in the Chukchi and Bering Seas as well as in the Gulf of Alaska. Most species move far south in winter and occur off Alaska only in summer, while others remain in Arctic waters year-round. The Belukha whale occurs only in small numbers south of the Bering Sea. Similarly, the bowhead whale is found primarily in Chukchi and Bering Sea waters, and the Narwhal is an Arctic Ocean resident.

A number of the larger whales now under complete protection were over exploited by whalers during the 19th and early 20th centuries. The black right whale has shown slight increases since it was driven almost to extinction. The bowhead, gray, blue and humpback whales have remained stable or shown slight increases in populations since they were afforded complete protection. Commercial utilization continues on several species with no apparent detrimental effects. Among these, the sperm whale is the most important industry species. Sei and fin whales are valuable baleen whales. Some domestic use of whales occurs along Alaska's coast. Alaskan natives annually take from 1 to 37 bowheads, and in some years may take from 1 to 3 gray whales. Belukha whales are an important source of muktuk, oil, and meat for residents of the Bering Sea and Arctic Ocean coasts. Only a few Belugas are harvested in Bristol Bay.

Because most species of whales feed on plankton, krill or ocean fishes not currently of interest to man, few conflicts with man occur. Beluga whales feed on several species of fish utilized by man and their predation on salmon smolt in particular may impact significantly on depressed salmon populations in some areas such as in Bristol Bay. Killer whales are known to take salmon and herring and thus compete directly with fishermen. In addition killer whales damage fishing gear and interfere with long line fisheries.

Pacific whitesided dolphins and Dall and harbor porpoises occur in Alaskan waters, and are abundant in inshore waters during winter. These mammals feed on several species of commercially valuable fish such as herring, cod, flounder, and sardines. Porpoises are sometimes caught accidentally in fishermen's nets. Approximately 20,000 Dall porpoises are lost each year to the Japanese high seas salmon gillnet fishery.

Whales, dolphins and porpoises in Alaska are protected by one or more federal laws and by international treaties and laws. These include the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

Other Pinnipeds

Rare sightings of elephant seals, California sea lions and walruses have been made in Southcentral Alaska. These are probably accidental strays resulting from increasing populations of those species in other areas. Fur seals occur offshore seasonally but sightings near shore are limited to a few subadults.

LIST OF MARINE MAMMAL SPECIES IN SOUTHCENTRAL ALASKA

	Common Name	Scientific Name
Seals	Elephant Seal	*Mirounga leonina*
	Harbor Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
Whales	Belukha Whale	*Delphinapterus leucas*
	Blue Whale	*Balaenoptera musculus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	Pacific Blackfish (Pacific Pilot Whale)	*Globicephala melaena*
	Sei Whale	*Balaenoptera borealis*

Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
	Pacific Whitesided Dolphin	*Lagenorhynchus obliquidens*
Other Marine Mammals	Sea Otter	*Enhydra lutris*
	Steller Sea Lion	*Eumetopias jubata*

RESURRECTION BAY SEA LION

LOCATION

That portion of Game Management Unit 7 in Resurrection Bay inside of a line extending from Aialik Cape to Cape Resurrection including Barwell Island.

THE SPECIES

Resurrection Bay is used seasonally by sea lions. Quantitative data are limited but it appears that several thousand may feed in the bay and several hundred may haul out on Hive, Rugged and Barwell Islands at various times during the winter and spring, while lesser numbers may occur there in summer. Sea lion abundance in Resurrection Bay may be influenced by a number of factors occurring in other areas such as concentration of prey species or breeding activity.

No information is available on historic changes in sea lion occurrence in the bay, however the population appears to have remained near carrying capacity in recent years. There is no documented evidence that human activities have influenced sea lion numbers in Resurrection Bay, but human development in the vicinity of Seward may have altered some sea lion habitat. Large numbers of sea lions have been observed feeding in the upper bay which indicates that habitat degradation has not become a serious problem. The projected growth of Seward, associated with the Outer Continental Shelf Oil and Gas leasing program, could adversely affect sea lion use of Resurrection Bay in the future; however, these impacts need not occur in Resurrection Bay itself. Changes in the sea lion population outside of Resurrection Bay may influence sea lion abundance in the bay.

Little information is available on harvest of sea lions in Resurrection Bay. Small numbers may have been taken for domestic purposes, for bait or animal food, or shot because of fisheries conflicts. No commercial harvest has ever been conducted in the bay.

Recreational hunting and fishing are popular activities in Resurrection Bay. While the peak boating period does not coincide with the peak of sea lion abundance, good public access creates some of the best opportunities for Alaska's urban population to see sea lions and other marine mammals.

RESURRECTION BAY HARBOR SEAL

LOCATION

That portion of Game Management Unit 7 in Resurrection Bay inside of a line extending from Aialik Cape to Cape Resurrection including Barwell Island.

THE SPECIES

Moderate densities of harbor seals inhabit Resurrection Bay. No quantitative data are available on seal densities or changes in densities within the bay. Seal numbers appeared near carrying capacity along most of the Kenai Peninsula until the mid 1960's when commercial hunting reduced densities in some areas. The population appears to have largely recovered from this brief period of high exploitation. No data are available to indicate that human activities are influencing seals in Resurrection Bay; however, human activity around the town of Seward may have reduced seal use of portions of the area.

No harvest data specific to Resurrection Bay are available. Most of the intensive commercial harvest during the mid 1960's was in adjacent bays containing higher densities. However, it can be assumed that a relatively high harvest in response to fisheries conflicts also occurred, for sport, hides and food occurred. Some commercial hunting did continue within Resurrection Bay until passage of the Marine Mammal Protection Act of 1972.

Seward has become an important center for recreational boating and sport fishing. Resurrection Bay has become one of the most accessible areas of marine mammal habitat to people from Alaska's population centers. This access provides seal viewing opportunities greater than those in areas supporting higher seal densities. The opportunity to view seals, sea lions, sea otters and whales contributes significantly to the enjoyment of many individuals engaged in other activities within the bay.

KACHEMAK BAY HARBOR SEAL

LOCATION

That portion of Game Management Unit 15 in Kachemak Bay inside a line extending from Dangerous Cape to Anchor Point.

THE SPECIES

Seals are moderately abundant along the south side of Kachemak Bay. No quantitative information is available on seal numbers and changes in numbers. There may have been some reduction in numbers in the mid 1960's due to heavy commercial hunting pressure, however, densities appear to be approaching carrying capacity at the present time. No data are available indicating that human activities are influencing seals in Kachemak Bay, but extensive human use of coves along the south side of the bay may have reduced seal use of some areas.

No harvest data specific to Kachemak Bay are available. Most of the intensive commercial hunting of the mid-1960's was directed at nearby areas supporting higher seal densities. Some seals were taken within the bay for sport, hides and food, and in response to fisheries conflicts until passage of the Marine Mammal Protection Act of 1972. Kachemak Bay has become one of the most accessible areas of marine mammal habitat to people from Alaska's population centers. This access provides seal viewing opportunities greater than those in areas supporting higher seal densities. The opportunity to view seals, sea lions, sea otters and whales contributes significantly to the enjoyment of many individuals engaged in other activities such as recreational boating and fishing.

COOK INLET BELUKHA

LOCATION

Those portions of Game Management Units 9 and 14-16 in Cook Inlet including adjacent bays and rivers.

THE SPECIES

An estimated 500 belukha whales inhabit the waters of Cook Inlet. This is apparently a geographically discrete population separated from the larger Bering-Chukchi-Beaufort Seas population by many miles of habitat unsuitable for belukhas. Information on the seasonal distribution of this population is limited. Most of the population appears to spend the summer in northern Cook Inlet in the vicinity of the Susitna River. Many ascend the river on high tides to feed on schooling fish. In fall they tend to move south as far as Kachemak Bay. Estuaries tend to be the primary feeding areas. Groups of belukhas are periodically seen around the Kenai, Kasilof and Fox Rivers. Less information is available on the distribution of belukhas on the west side of Cook Inlet but many estuaries there are probably important feeding areas. Groups of belukhas are seen in Kamishak Bay in winter. The occurrence of concentrations of schooling fish in shallow waters and to some extent the distribution of ice probably regulate belukha movements in Cook Inlet. Few extensive areas of suitable belukha habitat appear to exist in adjacent areas outside of Cook Inlet. A few estuaries might be suitable for seasonal use but are removed from potential wintering areas. Infrequent sightings of belukhas outside of Cook Inlet have been made and no significant range expansion is expected. The present population appears stable and is presumed to be near carrying capacity.

Little harvest of belukhas has occurred in recent times. A commercial harvesting industry in the 1930's failed after 100 were taken. Since that time only small numbers have been taken for food or in response to fisheries conflicts. Viewing of belukhas has probably been the most significant use although many people are unaware of the available opportunities.

CHINIAK BAY SEA LION

LOCATION

That portion of Game Management Unit 8 in Chiniak Bay between Spruce Cape and Cape Chiniak.

THE SPECIES

Chiniak Bay is used by several thousand sea lions throughout the year. There are two hauling areas. Up to 75 may be hauled out at Long Island and 775 at Cape Chiniak. Little information on seasonal movements exists but there is probably regular interchange between Chiniak Bay and other sea lion concentrations in the area, such as Marmot Island. No information is available on historic changes in sea lion occurrence in the bay, however, the population as a whole appears to have remained near carrying capacity in recent years.

Human activities have not had any apparent effect on sea lion numbers in Chiniak Bay. Human development in the vicinity of the town of Kodiak may have altered some sea lion habitat; however, the regular occurrance of sea lions around Long Island suggests that such impacts have been minor. Proposed onshore facilities associated with Outer Continental Shelf oil and gas development could influence sea lion use of Chiniak Bay in the future.

Little information is available on harvest of sea lions in Chiniak Bay. Small numbers may have been taken for domestic purposes, bait or animal food, or in response to fisheries conflicts. No commercial harvest was ever conducted in Chiniak Bay, but a total of 14,180 pups were commercially harvested from nearby Marmot Island between 1963 and 1972.

The Long Island and Cape Chiniak hauling areas are accessible to recreational boaters from Kodiak and provide good viewing and photographic opportunities. As the human population of Kodiak grows in response to Outer Continental Shelf activities, the demand for such opportunities will increase.

MARINE MAMMALS IN SOUTHWESTERN ALASKA

Southwestern Alaska coastal waters provide habitat for a number of marine mammal species* including harbor seals, sea lions, walrus, fur seals, sea otters, whales, dolphins and porpoises. Although there are some specific habitat preferences, the several species are generally widely distributed and abundant, reflecting the high productivity of the Alaska coastal marine environment. Several species affect and are affected by man's utilization of marine fishery resources. Some species have at times supported substantial commercial or domestic human utilization. In the case of sea otters, populations severely depleted by excessive exploitation have, under protective management, recovered to moderate and still increasing levels. On the other hand, use of harbor seals and sea lions had relatively minor impacts on stock status; populations of these species are near or have reached the carrying capacity of the habitat. Since 1972, consumptive use of all marine mammals has been limited to Alaskan natives, and in the case of fur seals, the National Marine Fisheries Service, under a moratorium on use established by the Marine Mammal Protection Act. Little use of marine mammals other than fur seals now occurs in Southwestern Alaska.

Harbor Seals

Harbor seals are abundant in nearshore waters usually less than 30 fathoms in depth. Unlike other species, harbor seals are at home in turbid water as well as in clear water. At times they may move up rivers for considerable distances. In excess of 160,000 seals are estimated to occur around the Kodiak Archipelago, Alaska Peninsula and Aleutian Islands. Several of the largest concentrations of harbor seals in the world occur along the north side of the Alaska Peninsula and at Tugidak Island.

Harbor seals are primarily fish eaters, although marine invertebrate species are also taken. They compete with fishermen for certain species of sport and commercially valuable fish. Depredation on gill-netted salmon has occurred, most notably in the salmon fishery in Bristol Bay.

Population size is controlled primarily by availability of food. Predation by killer whales and sharks accounts for some losses. Abandonment of pups is relatively common, particularly when seals in pupping areas are disturbed by man. Loss of pups also occurs due to malnutrition or drowning. The presence of pesticide and mercury accumulations in harbor seals has been demonstrated but the effects of these contamainants are unknown.

Coastal residents have used harbor seals for food and clothing. During the early to mid-1960's, temporary high prices for seal skins effected a dramatic increase in commercial harvests which subsequently tapered off as the value of pelts declined. A substantial harvest of pups continued around Kodiak and the north side of the Alaska Peninsula until 1972. Only limited use of harbor seals by coastal natives has occurred since passage of the Marine Mammal Protection Act in 1972.

* A list of marine mammal species considered in these plans follows this regional account.

Sea Lions

Sea lions are abundant along the Southwestern coast with at least 185,000 animals known to be associated with over 150 different rookeries and haul-out sites. This area contains the largest rookeries in the world including Sugarloaf Island, Marmot Island, Ugamak Island, Akutan Island and Attu Island, each of which may support 10,000 or more sea lions during the breeding season. Rookeries and haul-out areas of lesser importance occur throughout the area. Movements and interchange of sea lions between these areas occurs during the fall when many animals leave the breeding areas and move to winter feeding areas, and again in the spring when they return to the breeding rookeries. No changes in sea lion population size have been detected in recent years and populations in Southwestern Alaska are probably near the carrying capacity of their habitat.

Sea lion habitat can be found nearly anywhere along the coastline although only traditional haul-out areas are used regularly. The best habitat appears to be remote islands with extensive shallow water and rocky bottoms productive of sea life. Clear waters are preferred with most feeding occurring at depths less than 50 fathoms. Some animals are found far offshore in association with foreign fishing fleets and increasing numbers utilize seasonal pack ice in the southern Bering Sea. Since they are primarily fish eaters, sea lions often concentrate in areas where fish are abundant, such as large herring and pollock schooling areas and spawning grounds, and salmon staging areas. Sea lions probably travel long distances to follow and feed on their prey.

Little change has occurred to sea lion habitat that has not been associated with man. The most significant impact has been man's utilization of food species vital to sea lions. Several of the species important to sea lions have become commercially valuable and are fished extensively both by United States and foreign fishing fleets. Some alteration of habitat has resulted from the development of coastal communities. Continued development and pollution associated with exploration, extraction and transportation of oil resources have the potential for serious adverse impacts on sea lions.

Sea lion populations are limited by a variety of factors including availability of food, losses of pups due to adverse weather during pupping and to abandonment, malnutrition, drowning, and losses to predation by killer whales and sharks.

Historically, sea lions were harvested by aboriginal natives for a variety of uses including meat, skin covering for boats, and garments. Prior to passage of the Marine Mammal Act in 1972, commercial harvests of sea lions were directed toward control of fisheries depredations and use of pup skins for the foreign garment trade.

Sea Otter

Between 88,000 and 131,000 sea otters, perhaps 90 percent of the world's population, inhabit Southwestern Alaska. Dense populations occur around Afognak Island, Kujulik Bay, the Shumagin Islands, Sanak Island, the

Sandman Reefs, north of Unimak Island and the Alaska Peninsula and the Andreanof, Delarof and Rat Islands. Smaller populations are found in Kamishak Bay, the Fox and Krenitzin Islands, the Pribilof Islands and the Near Islands.

Population in the Rat, Delarof and western Andreanof Islands have reached carrying capacity and are probably not contributing significantly to repopulation of other areas. The population north of the Alaska Peninsula and Unimak Island is currently being limited by periodic formation of sea ice. Only small numbers occur in the Pribilof Islands. All other populations appear well established and are expanding their range into unpopulated habitat.

Sea otters, limited to waters shallower than 30 to 40 fathoms in their foraging activities, exert a profound effect on many littoral species of invertebrates and possibly on certain species of bottom fish. Sea urchins and mollusks are preferred food and population size and structure of these and other food species may be significantly altered by sea otter feeding pressure. In some Southwestern Alaska sea otter populations, numbers of otters have reached or exceeded carrying capacity and many hundreds of otters have died from starvation. Starvation may be the primary natural mortality factor, particularly on subadults in late winter. Predation may account for some losses of sea otters. Although otters harbor several species of parasites found in other marine mammals, mortality due to parasites is not thought to be significant.

Heavy human exploitation, responsible for reducing sea otter populations to small remnants during the period 1742 to 1911, was eliminated by the Fur Seal Treaty of 1911 and by subsequent Federal and State management regulations. Resultant recoveries of Alaskan sea otter populations enabled numerous transplants to be made to other historic Pacific sea otter habitats within and outside of Alaska. Between 1962 and 1971 approximately 3,500 sea otters were removed from the area between Amchitka and Adak Islands for experimental harvest, transplants and scientific studies. Almost 600 of these were transplanted to other areas. In 1971 an estimated 1,000 or more sea otters were killed by a nuclear test at Amchitka Island.

Walrus

Portions of the Pacific walrus population inhabit Bristol Bay and the waters north of the Alaska Peninsula seasonally. Distribution of walrus in winter is strongly influenced by the distribution of sea ice. When sea ice advances to Bristol Bay, a portion of the walrus population moves to the area north of Port Heiden and Port Moller. In years of extreme sea ice coverage, walrus may be found as far south as Unimak Island. In spring most of the walrus move northward with the retreating ice pack. In some years 80 to 100 may haul out on Amak Island for a brief period. Over 10,000, mostly bulls, remain in northern Bristol Bay througout the summer spending much of their time hauled out on Round Island.

Prior to passage of the Marine Mammal Protection Act of 1972, State regulations prohibited the taking of walrus south of Cape Newenham and the Walrus Islands were designated as a State game sanctuary. After 1972 federal laws permitted the taking of walrus in these areas by

Natives. In order to reduce disturbance, State regulations required a permit for access to Round Island and adjacent waters. In 1976 walrus management authority was returned to the State and hunting by all individuals was again prohibited south of Cape Newenham.

Fur Seal

The Pribilof Islands are the breeding ground for approximately 1.3 million northern fur seals. This species rarely occurs near shore in other areas. Vast offshore areas north and south of the Alaska Peninsula and eastern Aleutian Islands serve as feeding areas. Eastern Aleutian passes are major migration routes. Management authority for fur seals is under the National Marine Fisheries Service. The population was greatly reduced by commercial hunting but has fully recovered since signing of the Fur Seal Treaty in 1911. A regulated annual harvest is taken each year.

Whales Dolphins and Porpoises

More than twenty species of whales may occur in waters off Alaska, varying in abundance from common to rare. Some species such as the blue and Sei whales extend only into the north Pacific, others including the gray, minke, fin, humpback, and killer whales occur in the Chukchi and Bering Seas as well as in the Gulf of Alaska. Some species move far south in winter and occur off Alaska only in summer, while others remain in Arctic waters year-round. The Belukha whale occurs only in small numbers south of the Bering Sea. Similarly, the bowhead whale is found primarily in Chukchi and Bering Sea waters, and the Narwhal is an Arctic Ocean resident.

A number of the larger whales now under complete protection were over-exploited by whalers during the 19th and early 20th centuries. The black right whale has shown slight increases since it was driven almost to extinction. The bowhead, gray, blue and humpback whales have remained stable or shown slight increases in populations since they were afforded complete protection. Commercial utilization continues on several species with no apparent detrimental effects. Among these, the sperm whale is the most important industry species. Sei and fin whales are valuable baleen whales. Some domestic use of whales occurs along Alaska's coast. Alaskan natives annually take from 1 to 37 bowheads, and in some years may take from 1 to 3 gray whales. Belukha whales are an important source of muktuk, oil, and meat for residents of the Bering Sea and Arctic Ocean coasts. Only a few Belugas are harvested in Bristol Bay.

Because most species of whales feed on plankton, krill or ocean fishes not currently of interest to man, few conflicts with man occur. Beluga whales feed on several species of fish utilized by man and their predation on salmon smolt in particular may impact significantly on depressed salmon populations in some areas such as in Bristol Bay. Killer whales are known to take salmon and herring and thus compete directly with fishermen. In addition killer whales damage fishing gear and interfere with long line fisheries.

Pacific whitesided dolphins Dall porpoises and harbor porpoises occur in Alaskan waters; the latter two are abundant in inshore waters during winter. These mammals feed on several species of commercially valuable fish such as herring, cod, flounder, and sardines. Porpoises are sometimes caught accidentally in fishermen's nets. Approximately 20,000 Dall porpoises are lost each year to the Japanese high seas salmon gillnet fishery.

Whales, dolphins and porpoises in Alaska are protected by one or more federal laws and by international treaties and laws. These include the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

LIST OF MARINE MAMMAL SPECIES IN SOUTHWESTERN ALASKA

	Common Name	Scientific Name
Seals	Harbor Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
	Ribbon Seal	*Phoca fasciata*
Whales	Belukha Whale	*Delphinapterus leucas*
	Blue Whale	*Balaenoptera musculus*
	Bowhead Whale	*Balaena mysticetus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	Pacific Blackfish (Pacific Pilot Whale)	*Globicephala melaena*
	Sei Whale	*Balaenoptera borealis*
	Sperm Whale	*Physeter catodon*
Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
	Pacific Whitesided Dolphin	*Lagenorhynchus obliquidens*
Other Marine Mammals	Pacific Walrus	*Odobenus rosmarus*
	Sea Otter	*Enhydra lutris*
	Steller Sea Lion	*Eumetopias jubata*

ILIAMNA LAKE HARBOR SEAL

LOCATION

Iliamna Lake in Game Management Unit 9.

THE SPECIES

Iliamna Lake supports one of the few populations of fresh water seals in the world. Seals enter other lakes in Alaska seasonally, but only the Iliamna population remains in fresh water throughout the year. There appears to be interchange with the Bristol Bay seal population through the Kvichak River. The degree of interchange is unknown but appears sufficient to consider Iliamna seals a subpopulation rather than a population by itself. Data about numbers of seals in the lake are limited. During the late 1960's the population numbered approximately 300 seals. In 1975 it was estimated at less than 100. The reduction was probably due to a series of severe winters which greatly reduced the limited areas of suitable winter habitat.

No harvest data specific to Iliamna Lake are available. Seal hunting by all persons was legal there until passage of the Marine Mammal Protection Act of 1972. Since then, only taking by Eskimos, Indians and Aleuts has been permitted. In the past, small numbers have been taken for recreational and domestic purposes. As Iliamna Lake has increased in popularity as a recreational area, the demand for viewing seals has increased. Support for preserving this subpopulation has grown as more people have become aware of its unique nature and the seal population has declined.

BRISTOL BAY WALRUS

LOCATION

Those portions of Game Management Units 9 and 17 in Bristol Bay.

THE SPECIES

A portion of the north Pacific walrus population uses this area when seasonal pack ice extends into Bristol Bay. In an average year several thousand walrus may occur in the northern portion of Bristol Bay with smaller groups as far south as Port Heiden. In periods of more extreme sea ice formation walrus may occur as far south as Unimak Island. Most of the walrus remain offshore, although small numbers may occur at various points along the north side of the Alaska Peninsula. Up to 100 may briefly haul out on Amak Island as the ice retreats in spring.

Most of the walrus population moves north with the retreating ice pack, but several thousand males remain in Bristol Bay using Round Island in the Walrus Islands State Game Sanctuary as a hauling area. Round Island has attracted world wide fame as a place to photograph and view walrus. Walrus concentrations vary from day to day as animals leave the island to feed and return. Numbers vary from less than 1,000 to more than 8,000 individuals. Animals hauling out on the island are primarily males. Females are uncommon. Walrus are present from the time the ice departs in late May until freeze up.

Historically walrus were harvested in Bristol Bay for food and other domestic uses. Following a period of many years when walrus hunting was prohibited in the area, the Marine Mammal Protection Act of 1972 removed restrictions on harvest by Eskimos, Indians and Aleuts. Harvests of walrus since 1972 were primarily to obtain ivory for sale. Little ivory was carved and most ivory was sold illegally as raw ivory. Ivory carving, an art form which was dormant in this region for many years, has only recently been revived. In April 1976 walrus management authority was returned to the State of Alaska and walrus hunting in Game Management Units 9 and 17 by any individual was again prohibited.

The primary use of walrus in the area has been for viewing and photography on Round Island. As the number of visitors to the area increased the Department initiated access restrictions to Round Island and surrounding waters. Transportation to the island is primarily by boat. Float-equipped or amphibious aircraft can land when sea conditions allow. Close, low flights over the island are not allowed as these disturb resting walrus.

MARINE MAMMALS IN WESTERN ALASKA

The Bering Sea is one of the richest areas in the northern hemisphere in terms of biological productivity, even surpassing many places in the tropics. Nutrient-rich water from the Yukon and Kuskokwim Rivers are distributed throughout the Bering Sea by prevailing northerly currents providing the nutrient basis for supporting a myriad of marine organisms in a complex food web. At the upper trophic levels is a variety of marine mammal species* whose total numbers are conservatively estimated to exceed three million animals. Principal species found in the area at some time in their annual cycles are sea otter, sea lion, walrus, polar bear, fur seal, four species of ice-associated phocid seals (ringed, bearded, spotted and ribbon) bowhead, grey, minke, and belukha whales, as well as other less numerous species of whales and porpoises.

To some extent all species are seasonally migratory, usually moving north in spring and retracing their path in fall to suitable winter habitat in warmer southern waters. Distribution and numbers of marine mammals are continually shifting. The southern Bering Sea supports more animals in the winter, and northern areas receive more intensive use during the summer.

The diversity and large numbers of marine mammals off Alaska's coast were a contributing stimulus which accounted for the exploration and settlement of the territory beginning in the early 1700's. The history of early utilization is one of unchecked exploitation rather than conservation, and it extended into the Bering Sea. Initially exploitation was directed at the sea otter, but through the next two centuries many species were heavily exploited, some being reduced to near extinction. Within the last fifty years, most species have again become abundant following reduced harvests and better protection. Some seal species (ringed, spotted and bearded seals), whose populations were never heavily exploited have remained relatively stable through the years.

Residents living along the coast traditionally have depended on marine mammals for sustenance, and today throughout Western Alaska these species still play an important role in the local economy. Passage of the Marine Mammal Protection Act in 1972 limited all hunting to Alaska natives and imposed a moratorium on users of other ethnic backgrounds.

The Act remains in effect today, but restrictions are being lifted on a species by species basis as each population is fully enumerated and justified biologically. The moratorium was first waived on walruses in April, 1976. In the future other marine mammals of the area may be used in more diversified ways.

WALRUS

Historically, the Bering, Chukchi, Beaufort and east Siberian Seas supported about 200,000 walruses. They were first hunted heavily on a

* A list of marine mammal species considered in these plans follows this regional account.

commercial basis by whalers starting around 1868. At one point in the early 20th century, there may have been less than 50,000 walrus remaining in the population. Following cessation of commercial hunting at the turn of the century and increased protection in the 1960's, the walrus population increased significantly. Today it is estimated at 200,000 animals. Despite an apparent decline in productivity and an annual Soviet-American kill in excess of 5,000, the population seems to be increasing slowly.

Wintering largely in the central and southeastern Bering Sea, generally many miles from the Alaska mainland, the majority of the population begins a northward migration in late March and April. Females with young are usually the vanguard, followed later by bulls and barren cows. Most walrus leave Western Alaska by mid-June, although some small groups of bulls remain until July. In contrast to Bristol Bay further south, few walrus spend the entire summer in the area. Most move into the Chukchi Sea, some even traveling into the Beaufort Sea as far east as the Canadian border. In September or early October the most northern migrants begin moving south. They usually arrive on their wintering grounds off Western Alaska sometime in November.

In the past the annual harvest of walrus by Alaskans has averaged about 1,600 animals actually retrieved, but has shown a marked increase since passage of the Marine Mammal Protection Act which eliminated protective measures on females. Residents of Western Alaska annually take only 100 walrus or less. The harvest is small because most of the migration occurs several miles from the mainland and often at a time when ice conditions preclude access. For the same reason coastal residents of the area have never depended on walrus to any great extent. When one is killed, it is often considered an exceptional event. Generally hunters from Nunivak Island or those living in the vicinity of Etolin Strait are the most successful.

Walrus are used primarily for human consumption, dog food, and ivory carvings. Because the ivory supply within the area is small use for carving plays a relatively minor role compared to villages near Bering Strait.

In April 1976, the U.S. Fish and Wildlife Service waived the moratorium on walruses established by the Marine Mammal Protection Act and returned management to the State of Alaska. Under State regulations, nonnatives will be eligible to take walrus on a permit basis. In the future, walrus in Western Alaska will be hunted for sporting purposes, but such use will probably be limited.

PACIFIC BEARDED SEAL

Exact determination of the size of the bearded seal population is difficult because like other ice-associated phocid seals they are widely distributed and difficult to enumerate. The population currently appears to be stable and near carrying capacity. The total Bering and Chukchi Seas population is estimated to be 300,000. Soviet estimates place the population at over 450,000 bearded seals including the entire pacific population.

Adult bearded seals rarely venture far from ice, but juveniles often remain in ice-free areas during the summer. In late winter and early spring, bearded seals occur from the southern edge of the ice pack in the Bering Sea north to the solid cover of the polar pack ice. Most, however, are south of Bering Strait. Seldom do they use shore-fast ice. They prefer the moving pack ice and undertake a general movement away from land with the onset of winter. Bearded seals commonly haul out on ice but do not normally come ashore. As the ice disintegrates and moves northward, bearded seals follow its retreat and by late summer are distributed along the edge of the polar pack ice. Most of the population summers along the southern edge of the Polar ice pack. They move south in the fall, and usually enter the Bering Sea, starting in November. Because they prefer bottom dwelling organisms such as crabs, shrimps, clams, and amphipods, bearded seals do not compete with man for commercially valuable fishes, crustaceans, or mollusks.

The crude birth rate for bearded seals is 22 percent. Annual recruitment to age one is at least one half of this figure. Conservatively, the population probably can withstand a harvest of 6 to 7 percent per year, or 18,000 seals. Present take by Soviet and Alaskan hunters is about 4,000 bearded seals, but hunting loss is high and probably the true kill is more than double the number actually retrieved. The population appears to be stable, indicating that the total annual mortality, including harvesting, is about equal to recruitment.

Because of their large size, high quality meat and blubber, and strong durable skin, the bearded seal has always been important in the economy of coastal residents. In the last few years many changes have occurred in the Eskimo's way of life as they move closer to a cash oriented economy. The necessity for taking marine mammals has decreased, but hunting bearded seals is a tradition still pursued with enthusiasm in many communities. After spring whaling, hunters in Western Alaska look forward to the "oogruk" season, hoping to acquire enough meat to last them through the entire year. The annual harvest from this area is 1,000 seals or less. Shorebased hunting is not likely to seriously affect population status. The greatest threat to the security of the bearded seal stems from environmental pollutants resulting from off-shore mineral and energy resource development.

RINGED SEAL

The ringed seal is the most widely distributed ice-inhabiting seal of arctic and sub-arctic Alaska. Although population status is difficult to determine exactly, its habit of utilizing land-fast ice and its behavior of hauling out on ice during long spring days helps determine relative abundance. The population appears to be high and stable. It is estimated to contain a minimum of 250,000 animals in areas of land-fast ice alone. The total ringed seal population of the Chukchi and Beaufort Seas exceeds one million.

In Western Alaska adult ringed seals prefer land-fast ice in winter, although it is not uncommon to find them anywhere in ice covered areas. Ringed seals migrate in the spring, following the retreat of the pack ice. Seals wintering in the Chukchi Sea travel longer distances; movements of seals in the Beaufort Sea are probably of short distance.

The diet of ringed seals is variable depending on season, location, and depth of water, but the predominant items consumed are zooplankton in the form of mysids, amphipods euphausids and shrimp. They seldom compete with man for food but commonly take small fish such as saffron cod, polar cod and sculpin.

Recently, harvests by Alaskan hunters have been around 5,000 seals annually, and the total harvest including the Soviet kill is estimated to be between 8,000 and 10,000. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest.

Because the ringed seal is seasonally the most numerous species of seal, it is the mainstay in the diet of coastal Eskimos. While archaeological evidence points to the reliance of many Eskimo settlements on a diversity of marine mammals, the ringed seal was probably the key element in supporting people during winter. Ringed seals provided not only meat, but oil for heat and light, and skins for warmth. Since coastal residents have adopted a cash oriented economy and are now able to obtain nonnative food through the winter, the importance of ringed seals has decreased. The current annual harvest is only 1/2 to 1/4 of the harvest in the early 1960's. Only in a few communities is there a concerted effort to hunt seals in the winter. Most seals are taken in the spring when there are better weather conditions.

To date, man has not altered ringed seal habitat greatly. While some contamination of food webs by pesticides and heavy metals has been documented, the effects have apparently been minimal and probably have not altered carrying capacity of habitat in recent years. However, offshore development of mineral and energy resources is imminent. Unless the proper environmental restraints are exercised, serious problems could develop which would have a marked impact upon ringed seal populations.

SPOTTED SEAL

There are two subspecies of spotted seal occurring in the Bering Sea: one that gives birth to its pups on land at colonial locations, and the other on the pack ice, usually disassociated from others of its own kind. Only in the southern portion of Western Alaska do the ranges of the two overlap. The ice-breeding spotted seal is seasonally found from the Aleutian Islands north to the Arctic Ocean. There is no currently reliable means of accurately censusing the population, but through indirect methods it is estimated there are a minimum of 200,000 to 250,000 seals. Soviet biologists feel the actual number is closer to 450,000, including the population of the Okhotsk Sea.

Spotted seals are seasonally dependent upon sea ice for the birth and nurture of their pups. Prior to parturition in late winter, the entire population inhabits the southern edge of the pack ice, usually in the central Bering Sea. As spring break-up progresses, most seals follow the northward retreat of the pack ice, and gradually move toward land (including islands) where intermittent rest and feeding may occur. During the ice-free summer and early fall, they are found along the entire coast of Northern Alaska. A substantial portion of the population spends all or part of the summer in Northern waters. With the approach of winter they begin moving south, usually preceding the formation of heavy pack ice. Most of the population winters in Western Alaska waters or the area immediately to the south.

Diet of the spotted seal varies depending on season and location; primary food species are pelagic, demersal and anadromous fishes. Because spotted seals often feed on fish sought for commercial purposes, notably salmon, problems have occurred with fishermen who compete for the same resource. Due to their migratory nature, the impact of spotted seal predation is minimized somewhat when the seal moves north in the late spring. Natural mortality among adults is probably low. They are infected by a variety of internal and external parasites, but the effects of this form of pathology are unknown. Some spotted seals are undoubtedly taken by killer whales and polar bear, but hunting by humans is probably the greatest single mortality factor.

The annual harvest of spotted seals by both American and Soviet hunters is 7,000 or less, more than one-half of which are taken by Soviets. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest of up to 17,500 spotted seals annually. Coastal residents use spotted seal for dog food, clothing, rope, human consumption, and various household articles. Since a large portion of the population winters in Western Alaska, spotted seal are used to a greater extent than in more northern areas. A bounty was instituted in the early 1960's which coupled with high fur prices, resulted in an annual harvest of two to three times its present level. A reduction in the price of seal skins and passage of the Marine Mammal Protection Act greatly reduced the harvest. Currently spotted seals represent about 20 percent of the annual local harvest of seals.

RIBBON SEAL

Ribbon seals are distributed in two groups: one in the Bering-Chukchi Sea and the other to the west near Russia in the Sea of Okhotsk. Because of the lack of physical barriers there is probably some degree of inter-change between the two populations but to what extent has not yet been determined. No satisfactory method of accurately censusing ribbon seal has been developed to date. Based on relative indices of abundance, the Bering-Chukchi population of ribbon seals is currently less than maximum; this results from a brief period of intense commercial exploitation by Soviets during the 1960's. Recovery has taken place due to the implementation of restrictive quotas, and recent estimates indicate the population is now between 80,000 and 100,000 seals. The total Alaskan harvest is usually 100 seals or less.

Ribbon seals are seasonally pelagic, but depend on the sea ice for birth and muture of their pups. In the late winter and early spring, the entire population is concentrated along the southern edge of the pack ice in the Bering Sea. Following spring break-up of sea ice there is a moderate movement north associated with dispersal of the pack ice. However, few seals pass north of Bering Strait; most remain in the Bering Sea during the summer. The prinicpal foods are pelagic and demersal fishes, but also include small marine organisms, such as shrimp.

Although ribbon seals were hunted extensively by the soviets for their skins, they have played a minor role in the Alaskan economy. Due to their pelagic nature and limited distribution, the harvest of ribbon seals seldom exceeds 20 animals in Western Alaska. Because of their distinctive markings, most ribbon seals are used for clothing; meat has usually been of secondary importance. Since the population is relatively low and their distribution does not favor an extensive shore-based harvest, it is unlikely these seals will be taken in large numbers by Alaskan hunters in the near future. However, increased commercial sealing by foreign governments could again depress the population. The main threat in the immediate future seems to be enviornmental pollution from the development of off-shore mineral and energy resources.

SEA LIONS

Although Western Alaska seemingly contains suitable habitat for sea lions, only a few occur in the area. In winter an extensive ice pack and cold temperatures limit their distribution to areas further south. During ice free months, a small number migrate north and establish temporary colonies at scattered sites along the coast. On occasion sea lions have been reported at St. Matthew and Nunivak Islands, portions of Kuskokwim Bay, and even as far north as Hooper Bay. Utilization by coastal residents is low. It is estimated the total annual kill, including hunting loss, is less than 30.

SEA OTTER

Sea otters occur in Western Alaska only rarely and usually as stragglers which have wandered north of their range. Although they appear to be expanding northward, it is doubtful that there are any populations that reside in the area on a year-round basis. Because they are easily mistaken for hair seals, a few sea otter are occasionally taken by native hunters, but the annual harvest can be considered negligible.

WHALES AND PORPOISES

The belukha is the most abundant whale species occurring in the Bering Sea, although its population status is not well known. The total Alaskan population is estimated to be at least 16,000 animals, and probably more than 5,000 whales migrate migrate seasonally through Western Alaska to points further north. Belukhas are gregarious animals both when traveling and feeding. Herds of 100 are common and as many as

1,000 in a single group have been observed during migration. Small groups of 2 to 15 whales, usually led by a large male seem to be the most common group size. All belukhas residing in Western Alaska are migratory to some extent. Timing of migration is dependent on ice conditions, but the onset is usually in late March or early April. Some individuals may travel only a few hundred miles while others may cover a distance of 1,000 miles to their summering areas. Most belukhas (north of Bristol Bay) spend the summer in ice-free portions of the northern Bering Sea or Arctic Ocean concentrating in shallow areas and estuaries. Young are born from May through July, often during migration. Some belukhas may return to the same calving area each year, and this homing behavior may have led to the extirpation of local groups in the past. As waters freeze in the fall belukhas migrate south where leads are abundant or the area is ice free. Most belukhas probably winter in waters off Western Alaska's coast or areas further south.

Belukhas concentrate in estuaries when food species such as smelt or salmon smolt are abundant. Studies have shown that large numbers of salmon smolt are eaten by belukhas as they migrate to sea, and a lesser number of adult salmon are consumed when they ascend the rivers to spawn. As belukhas have been seen many miles up the Kuskokwim River, it is thought they may significantly impact fish populations in some of the major river drainages in Western Alaska. Belukhas also eat crabs, squid, clams, shrimp, and small cod.

Belukhas were historically taken by coastal Eskimos for meat, oil, muktuk and other domestic needs. However, due to the relatively small population (compared to other marine mammal species) and because these whales were only available on a seasonal basis, the annual harvest was never high. Today the harvest in Western Alaska is estimated to be 75 animals or less, most being taken in Hooper Bay and southern Norton Sound. Dependency on belukhas is decreasing due to the transition to a cash economy. Muktuk, dried meat and oil of Belukhas are used primarily as dietary supplements.

Several other species of whales and porpoises are found in Western Alaska, but most occur only on a seasonal basis. During the last half of the 19th century a commercial whaling industry thrived on the larger whales, primarily the bowhead, although minke, gray and sei whales were also taken.

From 1867 to 1929 Alaska exported over $14 million dollars of whale oil and whalebone (baleen), most of which came from the Arctic. Because of unregulated harvests, whale stocks were significantly reduced by 1900, and the United States whaling industry in the Bering Sea declined as a result. However, commercial whaling by foreign countries continues on a reduced scale today. Increased protection has resulted in population increases of most species, although they have not attained their former numbers.

Coastal Eskimos killed whales prior to the advent of the American whaling industry, and they intensified their efforts when whale products brought high prices in the 1800's. After the decline of the commercial industry, whaling by Eskimos continued, and some whales have been taken every year since the turn of the century.

Residents of Western Alaska, are not noted as whale hunters. It would be a rare event if they killed a large whale. Alaskan natives further north generally take less than 20 whales annually and most of these are bowheads. Oil, muktuk, and meat are still important products, but more recently the increasing demand for articles of native handicraft has increased the value of baleen and whale bone. Further, whales are sold on a limited commercial basis when muktuk and meat is obtained in excess of community needs.

Since most species of the larger whales feed on plankton or ocean fishes not currently of interest to man, few human conflicts have occurred. Porpoises feed on several species of commercially valuable fish such as cod, herring and flounder in Alaska. Competition between porpoises and man has been greatest on the high seas fisheries, and many are killed accidentally when they become tangled in fishermen's nets.

Because of their pelagic habits and seasonal distribution small whales (other than belukha) have been of little importance in supplying food for coastal residents. A few are taken annually, usually on an incidental basis.

Whales and porpoises in Alaska are protected by one or more federal laws and by international treaty or law. These laws and conventions include the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

LIST OF MARINE MAMMAL SPECIES IN WESTERN ALASKA

	Common Name	Scientific Name
Seals	Bearded Seal	*Erignathus barbatus*
	Spotted Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
	Ribbon Seal	*Phoca fasciata*
	Ringed Seal	*Phoca hispida*
Whales	Belukha Whale	*Delphinapterus leucas*
	Bowhead Whale	*Balaena mysticetus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	Narwhal	*Monodon monoceros*
	Pacific Blackfish (Pacific Pilot Whale)	*Globicephala melaena*
	Sei Whale	*Balaenoptera borealis*
Porpoises	Dall Porpoise	*Phocoenoides dalli*

	Harbor Porpoise	*Phocoena phocoena*
	Pacific Whitesided Dolphin	*Lagenorhynchus obliquidens*
Other Marine Mammals	Pacific Walrus	*Odobenus rosmarus*
	Steller Sea Lion	*Eumetopias jubata*

SLEDGE-BESBORO ISLANDS WALRUS

LOCATION

In Game Management Unit 22, Sledge Island 20 miles west of Nome and Besboro Island 24 miles northeast of Unalakleet.

THE SPECIES

Present estimates place the Bering and Chukchi walrus population at about 170,000 animals. Commercial exploitation from the late 1800's to the early part of the 20th century reduced the population to less than 40,000. Since then it has recovered to its present level and appears to be slowly increasing. The annual retrieved harvest has averaged about 1,600 animals while the total Alaska kill exceeds 3,000.

Females produce one calf every two or three years. The rate of natural mortality is unknown, although it is suspected to have increased in recent years. The adult mortality rate is estimated at less than five percent due largely to accidents, disease, and predation by killer whales.

The walrus undertakes an annual migration from the Arctic Ocean in summer to the central Bering Sea in winter. Throughout its range walrus utilize hauling grounds which serve as resting and feeding areas as well as gathering points for social interaction. Islands on the migration route and those which afford sanctuary are used most often, although such locations are limited. Some sites may be utilized by over 10,000 animals at the same time.

In 1971 over 1,000 walrus used Sledge Island as a summer resting area, but they moved north after continued harassment by hunters. Since 1971, the island has been used sporadically as a hauling ground. Although Besboro Island is less ideally situated, it has also been used as a hauling ground. Walrus return to islands that have been afforded protection from hunting (Walrus Island and Big Diomede) each year in increasing numbers.

Although hunting has been the dominate use of the walrus, scientific study has been important in determining the role of the animals in the marine ecosystem. Viewing is becoming more popular as the marine mammals receive increasing national publicity. Walrus using Sledge or Besboro Island as a hauling ground could be viewed by undertaking a relatively short boat ride from Nome or Unalakleet, respectively.

BERING-CHUKCHI-BEAUFORT SEAS BELUKHA

LOCATION

In Game Management Units 9, 10, 18-19, 21-23 and 26, all waters of the Bering, Chukchi and Beaufort Seas and all waters draining into them.

THE SPECIES

Belukha whales are common along the Alaska coast as far south as Bristol Bay. They are gregarious and may travel in groups of hundreds of whales. Belukhas often ascend rivers. In shallow rivers such as the Kvichak they often travel as much as 30 to 40 miles upstream on very high tides. In deep rivers such as the Yukon, they may travel upstream beyond the tidal influence. Belukhas are occasionally sighted at Nulato, 450 miles upstream on the Yukon River.

Belukhas in the Bering, Chukchi and Beaufort Seas are considered to be one population. The Bristol Bay component is estimated to total 1,500 animals, while observations and aerial and vessel sightings indicate that the Bering, Chukchi and Beaufort Seas component must be comprised of at least 8,000 individuals. The total population may be substantially larger than 9500, however. The population has never been subjected to heavy rates of exploitation and is believed to be near the carrying capacity of its habitat.

Studies in Kvichak Bay have demonstrated that belukhas can be significant predators on salmon and may compete with man for this resource. The Department has developed a technique of transmitting killer whale sounds underwater to repel belukhas from key areas to minimize their impact on salmon populations.

Belukhas in Alaska have never been subjected to heavy rates of exploitation. Belukhas have traditionally been used as a source of meat, muktuk and oil for both humans and dogs in certain villages on the Bering Sea and Arctic Ocean coasts and along rivers that belukhas periodically ascend. The decrease in numbers of sled dogs (a result of the introduction of the snow machine), the availability of alternate commercial food sources through the development of a cash economy, and welfare measures such as food stamps have greatly reduced the demand for belukha products. This is particularly true in the southern portions of the belukha's range. From Norton Sound north, belukhas are still taken regularly in some communities. The recent average annual harvest of belukhas has been 150-300 animals. Some additional loss of animals killed but not recovered occurs. The number of belukhas killed by hunting is small in relation to the population size.

BERING-CHUKCHI-BEAUFORT SEAS WALRUS

LOCATION

Within Game Management Units 18, 22, 23 and 26, all waters of the Bering, Chukchi and Beaufort Seas and the adjacent coastline with the exception of the following: Bering Sea State Game Refuge, Hazen Bay State Game Refuge, Chamisso Island State Game Refuge, Sledge Island and Besboro Island.

THE SPECIES

Present estimates place the Bering and Chukchi walrus population at about 170,000 individuals and slowly increasing. There has been an apparent decline in productivity, perhaps associated with depletion of major food species in wintering areas. The walrus population was estimated to contain about 200,000 animals prior to the 1850's. Whalers began taking walrus for oil and ivory around 1868, and during the next two decades severely reduced the population with annual harvests which occasionally approached 40,000. Commercial hunting continued into the 20th century on a reduced scale. During the late 1920's and 30's walrus probably reached their lowest level. With the cessation of commercial exploitation, hunting was primarily by local Natives, and the population began to slowly recover. By the early 1950's the population had increased to more than 50,000 walrus. At that time there was a slight revival in commercial utilization as the demand for ivory increased. Annual native harvests increased, but the population continued its rapid growth. After 1961 herd productivity improved as a result of a regulation limiting the take of females. In the late 1960's the Russians imposed a quota system which reduced annual harvests and further assisted population growth. The walrus population may currently be nearing carrying capacity, although it continues to increase one to five percent per year, depending on the magnitude of annual harvests. Recent trends of harvest and use of walrus by Alaska Natives may pose a serious conservation problem.

Walrus may migrate 2,000 miles from their wintering areas in the Bering Sea to their summer range in the Arctic Ocean. The northward spring migration usually begins in March, but its timing is partially dependent on weather and ice conditions. The migration indicates some distinct patterns with parturient females and those supporting young calves migrating first, followed later by bulls and barren cows. During the fall migration the order is reversed although the sexes may be more mixed.

In recent years calf production seems to have decreased. This may be a response to a reduced food supply or other density-dependent factors. Some natural mortality of walruses results from trampling by stampeding animals disturbed after hauling out in large concentrations.

To date walrus habitat has remained relatively unaffected by man's activities. Proposed offshore development may pose a threat in the future. Studies indicate the walrus may have reduced the carrying capacity of their range by over-utilization of preferred species of clams in a portion of their wintering areas (predominately south of St Lawrence Island).

Coastal natives take 95 percent or more of the annual harvest. Walrus were traditionally used to supply a variety of products, such as skin coverings for boats, harpoon lines, dog food, oil, meat, and ivory for carvings. The walrus is still important in providing some of these items on a reduced scale. However, ivory has become an important element in the transition to a cash oriented economy. Villages near Bering Strait may obtain up to 90 percent of their income from the sale of raw or carved ivory. The increased demand for ivory has resulted in walrus being taken in excess of the numbers required for food by Eskimo communities, leading to considerable waste.

Although at least 42 villages have taken walrus in the past, most of the annual kill is taken at 15 sites. Four villages usually take over 70 percent of the total annual kill. In the last 15 years the annual retrieved harvest has been approximately 1,600 animals, of which an average of 20 percent have been females. The actual kill including hunting loss is usually from 1 to 2 1/2 times the retrieved kill, depending on the experience of the crew and the hunting conditions. The total annual Alaska kill has averaged a little over 3,000; about 90 percent of the annual kill occurs between May and July, about 4 percent in winter, and about 6 percent in fall.

Prior to the Marine Mammal Protection Act in 1972 which prevented nonnatives from taking marine mammals, less than 100 walrus were taken by sport hunters. While this had a minor impact on the harvest, guiding sport hunters became a major source of income to the villages. In some villages such as Gambell and Savoonga it may have contributed up to 20 percent of the income during May and June. In April 1976 walrus management authority was returned to the State of Alaska and hunting by nonnatives again became legal.

Most walrus are killed with the aid of a boat, usually while the animals are hauled out on ice. A few walrus may occasionally be shot from the ice edge while the hunter is on foot. In the ice free months walrus may be hunted in open water. Animals are usually first wounded so they can be approached closely, harpooned, and dispatched without loss.

BERING-CHUKCHI-BEAUFORT SEAS SEAL

LOCATION

In Game Management Units 17, 18, 22, 23 and 26, all waters of the Bering, Chukchi and Beaufort Seas and the adjacent land areas with the exception of the following: Bering Sea State Game Refuge, Hazen Bay State Game Refuge, Chamisso Island State Game Refuge, Sledge Island, and Besboro Island.

THE SPECIES

Four species of ice-inhabiting hair seals occur in the Bering, Chukchi and Beaufort Seas. The total population is estimated at a minimum of 850,000 seals, and probably exceeds one million. Estimated minimum population by species is as follows: ringed seal 250,000; bearded seal 300,000; spotted seal (ice breeding only) 200,000; and ribbon seal 100,000.

Trends in abundance have been difficult to monitor since no satisfactory method of censusing seals has been developed. However indirect methods and relative indices of abundance indicate that populations of ringed, spotted, and bearded seals are high and probably stable. The ribbon seal population is relatively low following rather extensive commercial exploitation, principally by Russians during the 1960's. In recent years, Soviet regulations have accorded increased protection to this species.

Rates of natural mortality are unknown, although pup mortality appears to be relatively high, particularly for ringed seals where birth lairs are subject to destruction from moving ice and predation from polar bears. All species of seals may abandon pups under continued harassment. Polar bears, and killer whales kill a number of seals. The age structure of the population reveals that individuals of most species are capable of attaining the age of 20 years or more. After one year of age natural mortality appears to be relatively constant at a low level in each age class. Although distribution is dependent on habitat requirements (often ice conditions), most seals undertake an annual migration or redistribution following the advance and retreat of the pack ice. Usually, the tendency to migrate is less pronounced in young seals.

Each of the four species exploits a slightly different ecological niche. Their distribution commonly overlaps, but each species usually is found in distinct geographical areas or habitat types. Ribbon seals tend to be pelagic in the summer and follow the "inner" ice edge in the winter. Spotted seals inhabit the "outer" ice edge in winter and remain near coastal areas or islands during the summer. Adult ringed seals are found predominately near areas of land-fast ice in the winter and in the broken polar ice of the Chukchi Sea in summer. Bearded seals prefer moving ice in the winter, usually south of Bering Strait, and the broken floes of the polar ice (over shallow water) in summer.

Ribbon seals are sleek speedy swimmers depending largely on fish; spotted seals are also fish eaters but favor the near shore varieties; ringed seals forage on zooplankton, shrimp, copepods, and other small marine organisms and bearded seals are bottom feeders relying mostly on crabs, small bottom fish, and mollusks.

Traditionally, seals were used by Alaska residents for food, oil, dog food, boat coverings, clothing and other practical items. A bounty, primarily to increase the local economy, was paid on seals taken north of 58 degrees North latitude from the early 60's until June of 1972. Natives presently depend on seals for some products, but the prevalence of cash has reduced this dependence. Prior to 1972 a few seals were taken by sport and recreational hunters, but these factions never accounted for more than 10 percent of the harvest in northern Alaska.

Until passage of the Marine Mammal Protection Act (MMPA), seals were hunted throughout the year with no limit. The Act permitted Eskimos, Indians and Aleuts to continue harvesting but nonnatives could not hunt seals or possess raw seal products. At no time in the last 15 years has the harvest of the northern seal species by Alaskans been responsible for a population decline.

The annual harvest of the four species of seals in Alaskan waters by American hunters since 1972 has been 7,000 to 9,000. This represents a substantial reduction from the early 1960's when the harvest averaged about 18,000 per year. A moderate decline in utilization related to cultural changes occurred in the latter part of the 1960's. However, the most pronounced impact on seals occurred with the passage of the MMPA. Since nonnatives could not possess raw products, this legislation restricted the sale of raw seal skins which had brought needed revenues to the villages. Hunting incentive was reduced because of a decreased demand for seal skins, and a decreased need for seal meat.

Recent studies indicate that the composition of the annual harvest is 62 percent ringed, 25 percent bearded, 12 percent spotted, and 1 percent ribbon seals. The seasonal distribution of the harvest is partially dependent on ice and other weather conditions. However, ringed seals are taken predominately from late winter through spring, bearded seals from April through July, spotted seals from June through October, and ribbon seals sporadically throughout the year. The composition of seal harvests is usually weighted in favor of males, which may reflect behavioral patterns rather than actual sex ratios in the population.

Seals are usually hunted on foot, by boat or a combination of both. Foot hunters usually walk to a suitable lead and wait for seals to surface, while boat hunters may pursue seals in open water or locate seals resting on ice or land. Although winter hunting has been popular, the majority of seals are presently killed in spring during breakup or in fall before freeze-up.

MARINE MAMMALS IN NORTHWESTERN ALASKA

The Bering and Chukchi Seas, comprise are one of the richest areas in the northern hemisphere in terms of biological productivity, even surpassing many places in the tropics. Nutrient-rich water from the Yukon River is distributed throughout the Bering and Chukchi Sea by prevailing northerly currents, providing the nutrient basis for supporting a myriad of marine organisms in a complex food web. At the upper trophic levels are a variety of marine mammal species* whose total number is conservatively estimated to exceed 2 million animals. Principal species found in the area during some time in their annual cycles are sea lion, walrus, polar bear, fur seal, four species of ice-associated phocid seals (ringed, bearded, spotted, and ribbon), bowhead, grey, minke, and belukha whales, as well as other less numerous species of whales and porpoises.

To some extent all species are seasonally migratory, usually moving north in the spring to occupy previously "virgin" feeding area and then retracing their path in the fall to suitable winter habitat in warmer southern waters. Distribution and numbers of marine mammals are continually shifting. The Bering Sea supports more animals in the winter and the Chukchi Sea receives the most intensive use during the summer.

The diversity and large numbers of marine mammals were a contributing stimulus to the exploration and settlement of Western and Arctic Alaska beginning in the early 1700's. The history of early utilization is one of unchecked exploitation rather than conservation. Many species were reduced to low numbers, particularly whales and walrus, and some species were extirpated in local areas. Within the last fifty years, most have become abundant following reduced harvests and better protection. Ringed, spotted and bearded seals, whose populations were never heavily exploited, have remained relatively stable through the years.

Residents living along the Northwestern Alaska coast traditionally have depended on marine mammals for their essential domestic needs. Although Eskimo cultures have changed markedly in the last few decades, marine mammals still play an important role in the local economy. They are used for food and provide a variety of raw products for the arts and crafts industry.

Passage of the Marine Mammal Protection Act in 1972 limited all marine mammal hunting to Alaska Natives and imposed a moratorium on non-native users. The Act remains in effect today, but restrictions on use are being reviewed on a species by species basis as each marine mammal population is fully enumerated and proposed use is justified biologically. In April 1976, walrus became the first species for which management authority was returned to the State of Alaska, and for which use by non-natives was again allowed. In the future other marine mammals of the area may be used in more diversified ways.

* A list of the marine mammal species considered in these plans follows this regional account.

WALRUS

Historically, the Bering, Chukchi, Beaufort, and east Siberian Seas supported about 200,000 walruses. They were first hunted heavily on a commercial basis by whalers, starting around 1868. At one point in the early 20th century there may have been less than 50,000 walrus remaining in the population. Following cessation of commercial hunting at the turn of the century, and increased protection in the 1960's, the walrus population increased significantly. Today it is estimated at 200,000 animals. Despite an apparent decline in productivity and a Soviet-American kill in excess of 5,000, the populations seems to be increasing slowly.

Wintering largely in the central and northwestern Bering Sea, generally many miles from the Alaskan mainland, the majority of the population begins a northward migration in late March and April. Females with young are usually the vanguard, followed later by bulls and barren cows. The height of the nursery herd migration enters Bering Strait in late May and early June, and reaches the Northern Chuchi Sea by mid-July. Most of the bulls pass into the Chukchi Sea by the last of June. Most of the population goes west along the Soviet coast, and the remainder moves northward toward Point Hope. Eventually the walrus disperse along the southern polar ice in the east, and frequently congregate in large herds, on land, in the west. Some travel into the Beaufort Sea as far east as the Canadian border. In September or early October the most northern migrants begin moving south. Walrus arrive near St. Lawrence Island in November. Some walruses remain in the Bering Sea, particularly in Bristol Bay and the Gulf of Anadyr, throughout the summer months.

The annual retrieved harvest of walruses by Alaskans has averaged about 1,600, but has shown a marked increase since passage of the Marine Mammal Protection Act which eliminated protective measures on females. Because most of the walrus population funnels through Bering Strait, villages in that vicinity often take more than one-half the annual harvest. The villages that are consistently successful (Gambell, Savoonga, Little Diomede, and Wales) usually take 100 or more animals. The harvest throughout all Northwestern Alaska often approaches 90 percent of the total statewide kill.

Walrus are used for human consumption, dog food, boat coverings and rawhide. Today the most important use of walrus in many communities is as a source of raw ivory for carvers. Often the sale of carvings may contribute more than 50 percent of the cash in the local economy.

Prior to 1972, guiding of sport hunters was a means of providing extra cash in some villages. In the future, sport hunting may become more important. In April 1976, the U.S. Fish and Wildlife Service waived the moratorium on walruses established by the Marine Mammal Protection Act and returned management to the State of Alaska. Under State regulations nonnatives will be eligible to take walrus on a permit basis.

PACIFIC BEARDED SEAL

Exact determination of the size of the bearded seal population is difficult because like other ice-associated phocid seals they are widely distributed

and difficult to enumerate.

The population currently appears to be stable and near carrying capacity. The total Bering Sea-Arctic Ocean population is estimated to be 300,000. Soviet estimates place the population at over 450,000 bearded seals including the entire Pacific population.

Adult bearded seals rarely venture far from ice, but juveniles often remain in ice-free areas during the summer. In late winter and early spring, bearded seals occur from the southern edge of the ice pack in the Bering Sea north to the solid cover of the polar pack ice. Most, however, are south of Bering Strait. Seldom do they use shore-fast ice. They prefer the moving pack ice, and undertake a general movement away from land with the onset of winter. Bearded seals commonly haul-out on ice, but do not normally come ashore. As the ice disintegrates and moves northward, bearded seals follow its retreat and by late summer are distributed along the edge of the polar pack ice. Most of the population summers along the southern edge of the polar ice pack. They move south in the fall, and usually enter the Bering Sea, starting in November. Because they prefer bottom dwelling organisms such as crabs, shrimps, clams, and amphipods, bearded seals do not compete with man for commercially valuable fishes, crustaceans, or mollusks.

The crude birth rate for bearded seals is 22 percent. Annual recruitment to age one is at least one half of this figure. Conservatively, the population probably can withstand a harvest of 6 to 7 percent per year, or 18,000 seals. Present take by Soviet and Alaskan hunters is about 4,000 bearded seals, but hunting loss is high and probably the true kill is more than double the number actually retrieved. The population appears to be stable, indicating that the total annual mortality, including harvesting, is about equal to recruitment.

Because of their large size, high quality meat and blubber, and strong durable skin, the bearded seal has always been important in the economy of coastal residents. In the last few years, many changes have occurred in the Eskimo's way of life as they move closer to a cash oriented economy. The necessity for taking marine mammals has decreased, but hunting bearded seals is a tradition still pursued with enthusiasm in many communities. After spring whaling, hunters in Northwestern Alaska look forward to the "oogruk" season, hoping to acquire enough meat to last them through the entire year. The annual harvest from this area is 1,000 seals or less. Shishmaref, Gambell, Savoonga, Stebbins, and Kotzebue are villages which generally take the most bearded seals and are most dependent on their meat. Shorebased hunting is not likely to seriously affect population status. The greatest threat to the security of the bearded seal stems from environmental pollutants which result from off-shore mineral and energy resource development.

RINGED SEAL

The ringed seal is the most widely distributed ice-inhabiting seal of the Bering and Chukchi Seas. Although population status is difficult to determine exactly, its habit of utilizing land-fast ice and its behavior of hauling out on ice during long spring days helps determine relative

abundance. The population appears to be high and stable and is estimated to contain a minimum of 250,000 animals in areas of land-fast ice alone. The total ringed seal population of the Chukchi and Beaufort Seas exceeds one million.

In Northwestern Alaska most of the ringed seal are found in areas covered by extensive land-fast ice in winter, although it is not uncommon to find juveniles anywhere in ice covered areas. Ringed seals migrate in the spring, following the retreat of the pack ice. Except for some juveniles, most seals spend the summer in the northern Chukchi sea, and may travel over 600 miles to reach it.

The diet of ringed seals is variable depending on season, location, and depth of water, but the predominant items consumed are zooplankton in the form of mysids, amphipods, euphausids and shrimps. They seldom compete with man for food, but commonly take small fish such as saffron cod, polar cod and sculpin.

Recent harvests by Alaskan hunters have been around 5,000 seals annually, and the total harvest including the Soviet kill is estimated to be between 8,000 and 10,000. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest.

Because the ringed seal is seasonally the most numerous species of seal, it is the mainstay in the diet of coastal Eskimos. While archaeological evidence points to the reliance of many Eskimo settlements on a diversity of marine mammals, the ringed seal was probably the key element in supporting people during winter. Ringed seals provided not only meat, but oil for heat and light, and skins for warmth. Since coastal residents have adopted a cash oriented economy and are now able to obtain non-native food through the winter, the importance of ringed seal has decreased. The harvest is only 1/2 to 1/3 of what it was in the early 1950's.

Today seals are used mainly as a food and clothing supplement. Only in a few communities such as Gambell, Savoonga and Pt. Hope is there a concerted effort to hunt them in winter, and most seals are taken in spring when weather conditions are better. Of the four species of seals taken in Northwestern Alaska, ringed seals account for more than half the annual harvest.

To date, man has not altered ringed seal habitat greatly. While some contamination of food webs by pesticides and heavy metals has been documented, the effects have apparently been minimal, and probably have not altered carrying capacity of habitat in recent years. However, off-shore development of mineral and energy resources is imminent. Unless the proper environmental restraints are exercised, serious problems could develop which would have a marked impact upon the ringed seal population.

SPOTTED SEAL

The spotted seal is found seasonally from the Aleutian Islands north to

the lack of phusical barriers there is probably some degree of interchange between the two populations, but to what extent has not yet been determined. No satisfactory method of accurately censusing ribbon seals has been developed to date. Based on relative indices of abundance, the Bering-Chukchi population of ribbon seals is currently less than maximum; this results from a brief period of intensive commercial exploitation by Soviets during the 1960's. Recovery has taken place due to the implementation of restrictive quotas, and recent estimates indicate the population is now between 80,000 and 100,000 seals. The total Alaskan harvest is usually 100 seals or less.

Ribbon seals are seasonally pelagic, but depend on the sea ice for birth and nuture of their pups. In the late winter and early spring, the entire population is concentrated along the southern edge of the pack ice in the Bering Sea. Following spring break-up, of sea ice there is a moderate movement north associated with dispersal of the pack ice. However, few seals pass north of Bering Strait; most remain in the Bering Sea during the summer. The principal foods are pelagic and demersal fishes, but also include small marine organisms, such as shrimp.

Although ribbon seals were hunted extensively by the soviets for the their skins, they have played a minor role in the Alaskan economy. Due to their pelagic nature and limited distribution, the harvest of ribbon seals seldom exceeds 10 animals in Northwestern Alaska. Because of their distinctive markings most ribbon seals are used for clothing; meat has usually been of secondary importance. Since the population is relatively low and their distribution does not favor an extensive shore-based harvest, it is unlikely these seals will be taken in large numbers by Alaskan hunters in the near future. However, increased commercial sealing by foreign governments could again depress the population. The main threat in the immediate future seems to be evirоonmental pollution from the development of off-shore mineral and energy resources.

SEA LIONS

Sea lions occur in Northwestern Alaska only in a few places, usually as stragglers. In winter an extensive ice pack and cold temperatures limit their distribution to areas further south. During ice free months, a small number migrate into the central and northern Bering sea, but it is unlikely there are any established summer colonies. On occasion seal lions have been reported at St. Lawrence Island, but it is rare to find animals north of this latitude. Utilization by coastal residents is low. The total annual kill, including hunting loss, is estimated at less than 10.

Whales and Porpoises

The belukha is the most abundant whale species occurring in the Bering and Chukchi Seas, although population status is not well known. The total Alaskan population is estimated to be at least 16,000 animals and probably more than 5,000 migrate seasonally through Northwestern Alaska

the Beaufort Sea. The population is estimated at 200,000 to 250,000 individuals, but the census technique is based largely on indirect methods. Soviet biologists feel the actual number is closer to 450,000, including the population of the Okhotsk Sea.

Spotted seals are seasonally dependent upon sea ice for the birth and nurture of their pups. Prior to parturition in late winter, the entire population inhabits the southern edge of the pack ice, usually in the central Bering Sea. As spring break-up progresses, most seals follow the northward retreat of the pack ice, and gradually move toward land (including islands) where intermittent rest and feeding may occur. During the ice-free summer and early fall, they are found along the entire coast of northern Alaska. A substantial portion of the population spends all or part of the summer in northern waters. With the approach of winter they begin moving south, usually preceding the formation of heavy pack ice. Most of the population winters outside northwestern Alaska waters in the southern Bering Sea.

Diet of the spotted seal varies depending on season and location; primary food species are pelagic, demersal and anadromous fishes. Because spotted seals often feed on fish sought for commercial purposes, notably salmon, problems have occurred with fishermen who compete for the same resource. Due to their migratory nature, the impact of spotted seal predation is minimized somewhat when the seal moves north in the late spring. Natural mortality among adults is probably low. They are infected by a variety of internal and external parasites, but the effects of this form of pathology are unknown. Some spotted seals are undoubtedly taken by killer whales and polar bear, but hunting by humans is probably the greatest single mortality factor.

The annual harvest of spotted seals by both American and Soviet hunters is 7,000 or less, more than one-half of which are taken by Soviets. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest of up to 17,500 spotted seals annually. Since a large portion of the population winters south of Norton Sound, residents of Northwestern Alaska seldom have the opportunity to take spotted seal until the spring migration. About half the harvest occurs during June and July, when the seals are moving north, and the remainder are killed in the fall migration, usually during September and October. Spotted seals are considered less palatable than ringed or bearded seals and are usually used for dog food. The skins are often made into pokes (floats), and are also prized for making garments. Spotted seals were eagerly sought in the 1960's when fur prices were high and the State offered a bounty. The harvest then was two to three times its present level. A reduction in the price of seal skins and passage of the Marine Mammal Protection Act greatly reduced the harvest.

RIBBON SEAL

Ribbon seals are distributed in two groups: one in the Bering-Chukchi Sea and the other to the west near Russia in the sea of Okhotsk. Due to

to the Arctic Ocean. Belukha are gregarious animals both when traveling and feeding. Herds of 100 are common and as many as 1,000 in a single group have been observed during migration. Small groups of 2 to 15 whales, usually led by a large male seem to be the most common group size. All belukhas north of the Aleutian Islands appear to be migratory to some extent. A few belukha winter in the Northwestern Alaska waters, but most move through during the spring migration from southern areas. Timing of migration is dependent on ice conditions, but the onset is usually in late March or early April. Some groups may travel only a few hundred miles while others may cover a distance of 1,000 miles to their summering areas. Some groups may return to the same local area in ice-free portions of the northern Bering Sea and Arctic Ocean each summer, concentrating in shallow areas and estuaries. Young are born from May through July, often during migration. Some belukhas may return to the same calving area each year, and this homing behavior may have led to the extirpation of local groups in the past. As waters freeze in the fall belukhas migrate south where leads are abundant or the area is ice free.

Belukhas concentrate in estuaries when food species such as smelt or salmon smolt are abundant. Studies have shown that large numbers of salmon smolt are eaten by belukhas as they migrate to sea, and a lesser number of adult salmon are consumed when they ascend the rivers to spawn. As belukhas have been seen many miles up the Yukon River, it is thought they may significantly impact fish populations in some major river drainages in Northwestern Alaska. Belukhas also eat crabs, squid, clams, shrimp, and small cod.

Belukhas were historically taken by Northwestern coastal Eskimos for meat, oil, muktuk and other domestic needs. However, due to the relatively small, dispersed population (compared to other marine mammal species) and because these whales were only available on a seasonal basis, the annual harvest was never high. Hunters from a few communities (such as Buckland and Kotzebue) located near estuaries often took 100 or more. In such cases their local economy was more dependent on whale products.

Today the harvest in Northwestern Alaska is estimated to be 150 belukhas or less, most being taken in Norton or Kotzebue Sound. Dependency on belukhas is decreasing due to the transition to a cash economy, as well as other forms of cultural change. Muktuk, dried meat, and oil of belukhas are used primarily as dietary supplements. Several other species of whales and porpoises are found in Northwestern Alaska, but most occur only on a seasonal basis. During the last half of the 19th century a commercial whaling industry thrived on the larger whales, primarily the bowhead, although minke, grey and sei whales were also taken.

From 1867 to 1929 Alaska exported over $14 million dollars of whale oil and whalebone (baleen), most of which came from the Arctic. Because of unregulated harvests, whale stocks were significantly reduced by 1900, and the United States whaling industry in the Bering Sea declined as a result. However, commercial whaling by foreign countries continues on a reduced scale today. Increased protection has resulted in population increases of most species, although they have not attained their former numbers.

Coastal Eskimos killed whales prior to the advent of the American whaling industry, and they intensified their efforts when whale products brought high prices in the late 1800's. After the decline of the commercial indistry, whaling by Eskimos continued, and some whales have been taken every year since the turn of the century.

Natives residing in Northwestern Alaska kill 10-20 bowhead whales annually. Pt. Hope, Gambell and Savoonga are the most successful whaling communities. Oil, muktuk, and meat are the products utilized, but recently the increased demand for articles of native handicraft has increased the value of baleen and whale bones. Further, whales are sold on a limited commercial basis when muktuk and meat is obtained in excess of community needs.

Since most species of the larger whales feed on plankton or ocean fishes not currently of interest to man, few human conflicts have occurred. Porpoises feed on several species of commercially valuable fish such as cod, herring and flounder, in Alaska. Competition between porpoises and man has been greatest on the high seas fisheries, and many are killed accidentally when they become tangled in fishermen's nets.

Because of their pelagic habits and seasonal distribution small whales (other than belukha) and porpoises have been of little importance in supplying food for coastal residents. A few are taken annually, usually on an incidental basis.

Whales and porpoises in Alaska are protected by one or more federal laws and by international treaty or law. These laws and conventions include the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

POLAR BEAR

Polar bears found in Northwestern Alaska comprise the Chukchi Sea population. This population is found in the Chukchi Sea west and south of a line extending northwest from Pt. Lay. The southern limit of common occurrence of the Chukchi Sea population is the Bering Strait with bears occasionally reaching St. Lawrence Island in some winters. Polar bears begin to move south as the Chukchi Sea freezes in the fall and as heavy ice is carried south by prevailing northerly winds. Members of this population migrate north in the middle of March. Their range in the summer is the southern edge of the ice pack. This population numbers about 5,000 bears with about one-third, or 1,700 bears, found on the Alaska side of the dateline. Within this area distribution and abundance varies seasonally in any given location particularly in response to changing ice conditions. Although definitive data are lacking, it appears that populations are probably stable and near the maximum level the habitat can support.

Polar bears concentrate in areas of available food, often where currents keep ice in motion causing open leads or newly frozen leads. Seals, congregate in these leads where they maintain breathing holes and are vulnerable to bear predation.

Denning areas are critical habitats for polar bears. The Chukchi Sea population is probably associated with the denning area on Wrangell Island off the coast of Siberia. Present information indicates that some denning occurs on the Alaskan mainland coast. Some denning may also take place on the drifting sea ice, but these dens are subject to ice breakup. The land and shorefast ice provides stable conditions for denning and bears tend to select snow-filled gullies and cutbanks as desirable sites. In late October and November pregnant females come on shore to go into winter dens where the cubs are born. During the denning period males will also come ashore in search for beach carrion or other food but do not den. Denning lasts until late March or early April when the bears move back out onto the sea ice to begin feeding on seals.

Very little information on natural mortality factors is available. Polar bears have no natural predators and no known diseases or serious parasites. Few bears in the wild live beyond 25 years of age.

Historically, Eskimos from all coastal villages killed polar bears. Some skins were used for sale or barter and others, particularly cubs, yearlings and two-year-olds, were used for garments. In the late 1950's and early 1960's sport hunters using aircraft began to kill significant numbers of polar bears. Most hunts in this area were based in Kotzebue, Teller and Pt. Hope. Aerial hunting was curtailed by the requirement for permits in 1971 and 1972 and in November of 1972 the passage of the Marine Mammal Protection Act (MMPA) banned all hunting of polar bears except by Alaskan natives. The average annual harvest of polar bears in Alaska during the late 1960's was about 250 per year with about two-thirds coming from the Chukchi Sea population. Fifty to 60 bears have been taken annually by natives in Alaska since 1972 and in most cases the meat was consumed. Until 1974 regulations promulgated under terms of the MMPA did not permit polar bear skins to be tanned commercially. Because Natives did not have a ready market for the sale of raw products some waste occurred. Presently the MMPA does not place restrictions on the number, age or sex of polar bears taken by Natives for subsistence purposes. The number of bears taken annually by Natives varies widely depending upon the distribution of bears and response to changing ice conditions. Although data do not indicate an increase in bear populations since passage of the MMPA, some change in distribution of bears in the last two years has occurred. More bears occur near shore. This may be related to cessation of aerial hunting, resulting in an increase in the number of bears or a tendency for them to move closer to coastal villages. However, the most important factor seems to be the recent changes of sea ice conditions.

The State of Alaska has requested the return of management jurisdiction over nine species of marine mammals including polar bears. Until this occurs the use of bears will continue to be restricted to Natives residing along the north coast. The harvest is not expected to vary appreciably from the present pattern. If management of polar bears is returned to the State of Alaska the State would probably allow recreational hunting by ground transportation only. Sport hunting under these controls would not remove as many bears as were previously taken with the aid of aircraft. Less than 100 bears per year would probably be taken in this region by recreational hunters. Return to State management would have the additional advantage of allowing Natives to realize economic return from animals and from services furnished to recreational hunters.

LIST OF MARINE MAMMAL SPECIES IN NORTHWESTERN ALASKA

	Common Name	Scientific Name
Seals	Bearded Seal	*Erignathus barbatus*
	Spotted Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
	Ringed Seal	*Phoca hispida*
Whales	Belukha Whale	*Delphinapterus leucas*
	Bowhead Whale	*Balaena mysticetus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	Narwhal	*Monodon monocerus*
Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
Other Marine Mammals	Pacific Walrus	*Odobenus rosmarus*

MARINE MAMMALS IN ARCTIC ALASKA

Arctic Alaska is bordered by two markedly different marine systems: The northern Chukchi Sea and the Beaufort Sea. The former is characterized by relatively high biological productivity and the latter by low productivity. Diversity and numbers of marine mammals* correspond accordingly. The Chukchi Sea derives its productivity from the nutrient-rich water that flows north from the Bering Sea. Distributed north by prevailing currents, this water provides the initial key for supporting a myriad of marine organisms in a complex food web, with marine mammals at or near the top. Nutrient-rich water does not usually extend east of Barrow, although the Colville and Mackenzie Rivers contribute significant material. The productivity of the Beaufort Sea is comparatively low.

Many species of marine mammals are found in Arctic Alaska, but only a few inhabit the area on a year-round basis. Most marine mammals are migratory, moving north in spring and retracing their path in fall to suitable winter habitat in southern waters. Principal species found in the Arctic area during some time in their annual cycles are walrus, polar bear, four species of ice-associated phocid seals (ringed, bearded, spotted and ribbon), bowhead, grey, and belukha whales, and porpoises. The area is estimated to support in excess of two million marine mammals during summer.

Shortly after Alaska was colonized by Europeans in the 1700's, concentrations of marine mammals attracted commercial hunters. The history of early utilization is one of unchecked exploitation rather than conservation. Many species were reduced to low numbers, particularly whales and walrus, and some species were extirpated in local areas. Within the last fifty years, most have again become abundant following reduced harvests and better protection.

Residents living along the arctic coast traditionally have depended on marine mammals for their essential domestic needs. Although Eskimo cultures have changed markedly in the last few decades, marine mammals still play an important role in the local economy; they are used for food and provide a variety of raw products for the arts and crafts industry.

Passage of the Marine Mammal Protection Act in 1972 limited all marine mammal hunting to Alaska Natives and imposed a moratorium on non-native users. The Act remains in effect today, but restrictions on use are being reviewed on a species by species basis as each marine mammal population is fully enumerated and proposed use is justified biologically. In April 1976, walrus became the first species for which management authority was returned to the State of Alaska, and for which use by non-natives was again allowed. In the future other marine mammals of the area may be used in more diversified ways.

WALRUS

Historically, the Bering, Chukchi, Beaufort, and east Siberian Seas supported about 200,000 walruses. They were first hunted heavily on a commercial basis by whalers, starting around 1868. At one point in the early 20th

* A list of the marine mammal species considered in these plans follows this regional account.

century there may have been less than 50,000 walrus remaining in the population. Following cessation of commercial hunting at the turn of the century, and increased protection in the 1960's, the walrus population increased significantly. Today it is estimated at 200,000 animals. Despite an apparent decline in productivity and a Soviet-American kill in excess of 5,000, the population seems to be increasing slowly.

Wintering largely in the central and southeastern Bering Sea, generally many miles from the Alaskan mainland, the majority of the population begins a northward migration in late March and April. Females with young are usually the vanguard, followed later by bulls and barren cows. The height of the nursery herd migration enters Bering Strait in late May and early June, and reaches the Northern Chukchi Sea by mid-July. Most of the bulls pass into the Chukchi Sea by the last of June. Most of the population goes west along the Soviet coast, and the remainder moves northward toward Point Hope. Eventually the walrus disperse along the southern polar ice in the east, and frequently congregate in large herds, on land, in the west. Some travel into the Beaufort Sea as far east as the Canadian border. In September or early October the most northern migrants begin moving south. Walrus arrive near St. Lawrence Island in November. Some walruses remain in the Bering Sea, particularly in Bristol Bay and the Gulf of Anadyr, throughout the summer months.

The annual retrieved harvest of walruses by Alaskans has averaged about 1,600, but has shown a marked increase since passage of the Marine Mammal Protection Act which eliminated protective measures on females. Because most of the walrus population funnels through Bering Strait, villages in that vicinity often take more than one-half of the annual harvest.

The residents of Arctic Alaska kill only about 100 walrus a year because most communities satisfy their sustenance needs from whaling and are not usually interested in walrus. Also, walrus disperse rather widely in the northern Chukchi and Beaufort Seas, and are not always accessible. Ivory is of some importance to the northern Eskimo villages, but few residents in the far north depend on it as a major source of income. Walrus are used mainly for human and dog food.

In April 1976, the U.S. Fish and Wildlife Service waived the moratorium on walruses and returned management to the State of Alaska. Under State regulations nonnatives will be eligible to take walrus on a permit basis. Prior to 1972, guiding of sport hunters was a source of revenue in some villages. In the future, sport hunting for walrus may become more important in Arctic Alaska.

PACIFIC BEARDED SEAL

Exact determination of the size of the bearded seal population is difficult because like other ice-associated phocid seals, they are widely distributed and difficult to enumerate.

The population currently appears to be stable and near carrying capacity. The total Bering Sea-Arctic Ocean population is estimated to be 300,000.

Soviet estimates place the population at over 450,000 bearded seals including the entire Pacific population.

Adult bearded seals rarely venture far from ice, but juveniles often remain in ice-free areas during the summer. In late winter and early spring, bearded seals occur from the southern edge of the ice pack in the Bering Sea north to the solid cover of the polar pack ice. Most, however, are south of Bering Strait. Seldom do they use shore-fast ice. They prefer the moving pack ice and undertake a general movement away from land with the onset of winter. Bearded seals commonly haul-out on ice, but do not normally come ashore. As the ice disintegrates and moves northward, bearded seals follow its retreat and by late summer are distributed along the edge of the polar pack ice. Most of the population summers along the southern edge of the Polar ice pack. They move south in the fall, and usually enter the Bering Sea, starting in November. Because they prefer bottom dwelling organisms such as crabs, shrimps, clams, and amphipods, bearded seals do not compete with man for commercially valuable fishes, crustaceans, or mollusks.

The crude birth rate for bearded seals is 22 percent. Annual recruitment to age one is at least one half of this figure. Conservatively, the population probably can withstand a harvest of 6 to 7 percent per year, or 18,000 seals. Present take by Soviet and Alaskan hunters is about 4,000 bearded seals, but hunting loss is high and probably the true kill is more than double the number actually retrieved. The population appears to be stable, indicating that the total annual mortality, including harvesting, is about equal to recruitment.

Because of their large size, high quality meat and blubber, and strong durable skin, the bearded seal has always been important in the economy of coastal residents. In the last few years, many changes have occurred in the Eskimo's way of life as they move closer to a cash oriented economy. The necessity for taking marine mammals has decreased, but hunting bearded seals is a tradition still pursued with enthusiasm in many communities. After spring whaling, hunters in Arctic Alaska look forward to the "oogruk" season, hoping to acquire enough meat to last them through the entire year. The annual harvest from this area is 500 bearded seals or less. Residents of Wainwright and Pt. Lay generally take the most bearded seals per person and are most dependent on meat of these seals.

Shorebased hunting is not likely to seriously affect population status. The greatest threat to the security of the bearded seal stems from environmental pollutants as a result of off-shore mineral and energy resource development.

RINGED SEAL

The ringed seal is the most widely distributed ice-inhabiting seal of arctic and sub-arctic Alaska. Although population status is difficult to determine exactly, its habit of utilizing land-fast ice and its behavior of hauling out on ice during long spring days helps determine relative abundance of animals. Minimum average density in the Beaufort

Sea on land-fast ice was found to be 2 per square mile. In the Chukchi Sea it was 5 per square mile. Overall, the average density on drifting ice during winter is probably less than 2 per square mile. The population appears to be high and stable. It is estimated to contain a minimum of 250,000 animals in areas of land-fast ice alone. The total ringed seal population of the Chukchi and Beaufort Seas exceeds one million.

In Arctic Alaska adult ringed seals prefer land-fast ice in winter, although it is not uncommon to find them anywhere in ice covered areas. Ringed seals migrate in the spring, following the retreat of the pack ice. Seals wintering in the Chukchi Sea travel longer distances; movements of seals in the Beaufort Sea are probably of short distance.

The diet of ringed seals is variable depending on season, location, and depth of water, but the predominant items consumed are zooplankton in the form of mysids, amphipods, euphausids and shrimps. They seldom compete with man for food, but commonly take small fish such as saffron cod, polar cod and sculpin.

Recent harvests by Alaskan hunters have been around 5,000 seals annually, and the total harvest including the Soviet kill is estimated to be between 8,000 and 10,000. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest.

Because the ringed seal is seasonally the most numerous species of seal, it is the mainstay in the diet of coastal Eskimos. While archaeological evidence points to the reliance of many Eskimo settlements on a diversity of marine mammals, the ringed seal was probably the key element in supporting people during winter. Ringed seals provided not only meat, but oil for heat and light, and skins for warmth. Since coastal residents have adopted a cash oriented economy and are now able to obtain non-native food through the winter, the importance of ringed seal has decreased. The current annual harvest is only 1/2 to 1/4 of the harvest in the early 1960's.

Today seals are used mainly as a food and clothing supplement. Few residents make a concerted effort to hunt them in winter, and most seals are taken in spring when weather conditions are better. Of the four species of seals taken in Arctic Alaska, ringed seals account for more than half the annual harvest.

To date, man has not altered ringed seal habitat greatly. While some contamination of food webs by pesticides and heavy metals has been documented, the effects have apparently been minimal, and probably have not altered carrying capacity of habitat in recent years. However, off-shore development of mineral and energy resources is imminent. Unless the proper environmental restraints are exercised, serious problems could develop which would have a marked impact upon the ringed seal population.

SPOTTED SEAL

The spotted seal is found seasonally from the Aleutian Islands north to the Beaufort Sea. The population is estimated at 200,000 to 250,000 individuals, but the census technique is based largely on indirect

methods. Soviet biologists feel the actual number is closer to 450,000, including the population of the Okhotsk Sea.

Spotted seals are seasonally dependent upon sea ice for the birth and nurture of their pups. Prior to parturition in late winter, the entire population inhabits the southern edge of the pack ice, usually in the central Bering Sea. As spring break-up progresses, most seals follow the northward retreat of the pack ice, and gradually move toward land (including islands) where intermittent rest and feeding may occur. During the ice-free summer and early fall, they are found along the entire coast of northern Alaska. A substantial portion of the population spends all or part of the summer in northern waters. With the approach of winter they begin moving south, usually preceding the formation of heavy pack ice.

Diet of the spotted seal varies depending on season and location; primary food species are pelagic, demersal and anadromous fishes. Because spotted seals often feed on fish sought for commercial purposes, notably salmon, problems have occurred with fishermen who compete for the same resource. Due to their migratory nature, the impact of spotted seal predation is minimized somewhat when the seal moves north in the late spring. Natural mortality among adults is probably low. They are infected by a variety of internal and external parasites, but the effects of this form of pathology are unknown. Some spotted seals are undoubtedly taken by killer whales and polar bear, but hunting by humans is probably the greatest single mortality factor.

The annual harvest of spotted seals by both American and Soviet hunters is 7,000 or less, more than one-half of which are taken by Soviets. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest of up to 17,500 spotted seals annually. However, there are presently no reasons which warrant a harvest of this magnitude. Since spotted seals spend winters in the Bering Sea, residents of Arctic Alaska can only hunt them successfully in summer and early fall. Most are taken in July shortly after break-up of sea ice and during the northward migration. Fall hunting is popular, but few seals are killed. Spotted seals are considered less palatable than ringed or bearded seals and are usually used for dog food. The skins are often made into pokes (floats), and are also prized for making garments. Spotted seals were eagerly sought in the 1960's when fur prices were high and the State offered a bounty. The harvest then was three to four times its present level. A reduction in the price of seal skins and passage of the Marine Mammal Protection Act greatly reduced the harvest.

RIBBON SEAL

Based on relative indices of abundance, the Bering-Chukchi population of ribbon seals is currently less than maximum, this results from a brief period of intensive commercial exploitation by Soviets during the 1960's. Recovery has taken place due to the implemention of restrictive quotas, and recent estimates indicate the population is now between 80,000 and 100,000 seals. The total Alaskan harvest is usually 100 seals or less.

Ribbon seals are seasonally pelagic, but depend on the sea ice for birth and nuture of their pups. In the late winter and early spring, the entire population is concentrated along the southern edge of the pack ice in the Bering Sea. Following spring break-up of sea ice there is a moderate movement north associated with dispersal of the pack ice. However, few seals pass north of Bering Strait; most remain in the Bering Sea during the summer. The principal foods are pelagic and demersal fishes, but also include small marine organisms, such as shrimp.

Although ribbon seals were hunted extensively by the soviets for their skins, they have played a minor role in the Alaskan economy. Due to their pelagic nature and limited distribution, the harvest of ribbon seals seldom exceeds 10 animals in Arctic Alaska. Because of their distinctive markings most ribbon seals are used for clothing; meat has usually been of secondary importance. Since the population is relatively low and their distribution does not favor an extensive shore-based harvest, it is unlikely these seal will be taken in large numbers by Alaskan hunters in the near future. However, increased commercial sealing by foreign governments could again depress the population. The main threat in the immediate future seems to be environmental pollution from the development of off-shore mineral and energy resources.

WHALES AND PORPOISES

The belukha is the most abundant whale species occurring in the Arctic Ocean, although its population status is not well known. The total Alaskan population is estimated to be at least 16,000 animals and probably more than 5,000 whales migrate seasonally to the Chukchi and Beaufort Seas. Belukhas are gregarious animals both when traveling and feeding. Herds of 100 are common and as many as 1,000 in a single group have been observed during migration. Small groups of 2 to 15 whales, usually led by a large male seem to be the most common group size. Some belukhas may winter in arctic waters, but most migrate from southern areas during the spring. Timing of migration is dependent on ice conditions, but belukhas usually arrive in the Arctic during April, and by late May most migrants will have moved into the Chukchi Sea. It is not uncommon for some groups to travel over 1,000 miles to reach their summering areas. Some groups may return to the same local area in ice-free portions of the Arctic Ocean each summer. Young are born from May through July, often during migration. Some belukhas may return to the same calving area each year, and this homing behavior may have led to the extirpation of local groups in the past. As waters freeze in the fall belukhas migrate south where leads are abundant or the area is ice free.

Belukhas concentrate in estuaries when food species such as smelt or salmon smolt are abundant. Salmon predation by belukhas in the Arctic Region is probably of little importance, although belukhas may eat commercially valuable fish in their wintering areas.

Belukhas were historically taken by arctic coastal Eskimos for meat, oil, muktuk and other domestic needs. However, due to the relatively small, dispersed population (compared to other marine mammal species) and because these whales were only available on a seasonal basis, the annual harvest was never high. Hunters from Wainwright and Barrow took

some belukhas in conjunction with other whaling activities, and continue to do so today. The current annual harvest in arctic Alaska is estimated to be 50 animals or less. Dependency on belukhas is decreasing due to the transition to a cash economy, as well as other forms of cultural change. Muktuk, dried meat and oil of Belukhas are used primarily as dietary supplements.

Several other species of whales and porpoises are found in Arctic Alaska, but most occur only on a seasonal basis. During the last half of the 19th century a commercial whaling industry thrived on the larger whales, primarily the bowhead, although minke, grey and sei whales were also taken.

From 1867 to 1929 Alaska exported over $14 million dollars of whale oil and whalebone (baleen), most of which came from the Arctic. Because of unregulated harvests, whale stocks were significantly reduced by 1900, and the United States whaling industry in the Bering Sea declined as a result. However, commercial whaling by foreign countries continues on a reduced scale today. Increased protection has resulted in population increases of most species, although they have not attained their former numbers.

Coastal Eskimos killed whales prior to the advent of the American whaling industry, and they intensified their efforts when whale products brought high prices in the late 1800's. After the decline of the commercial industry, whaling by Eskimos continued, and some whales have been taken every year since the turn of the century.

Natives residing in arctic Alaska kill 15-30 bowhead whales annually. Barrow hunters have the most sophisticated equipment and that village is the most successful whaling community. Oil, muktuk, and meat are the products utilized, but recently the increased demand for articles of native handicraft has increased the value of baleen and whale bones. Further, whales are sold on a limited commercial basis when muktuk and meat is obtained in excess of community needs.

Since most species of the larger whales feed on plankton or ocean fishes not currently of interest to man, few human conflicts have occurred. Porpoises feed on several species of commercially valuable fish such as cod, herring and flounder, in Alaska. Competition between porpoises and man has been greatest on the high seas fisheries, and many are killed accidentally when they become tangled in fishermen's nets.

Because of their pelagic habits and seasonal distribution small whales (other than belukha) and porpoises have been of little importance in supplying food for coastal residents. A few are taken annually, usually on an incidental basis.

Whales and porpoises in Alaska are protected by one or more federal laws and by international treaty or law. These laws and conventions include the Marine Mammal Protection Act of 1972; the Endangered Species Act of 1973; the International Whaling Convention signed in 1946, and the International Convention of Trade in Endangered Species of Wild Fauna and Flora.

POLAR BEAR

Polar bears in Arctic Alaska are seasonally distributed throughout the Beaufort and Chukchi Seas, including the coastal areas. Bears occurring from the eastern Beaufort Sea westward to a line extending northwest from Pt. Lay are considered to be one population of approximately 2,500 animals. Within this area, distribution and abundance varies seasonally in response to changing ice conditions. Populations are probably stable and near the maximum level that the habitat can support.

Polar bears concentrate in areas of available food, often where currents keep ice in motion causing open leads or newly frozen leads. Seals congregate in these leads where they maintain breathing holes and are vulnerable to bear predation. New leads are more common within 100 to 200 miles of the coast than further north in heavy pack ice.

North of Pt. Barrow polar bears move east during late April, toward Barter Island where ice is more stable. The southern edge of the ice pack varies in position during summer, depending upon the winds. It can be lodged against the shoreline from Pt. Barrow eastward or can be as far north as 100 miles off shore. Polar bears generally stay with the moving ice during the summer and concentrate on its southern edge where seals are more abundant.

Denning areas are critical habitats for polar bears. Present information indicates that some of the most intensive denning on the Alaskan coast takes place from the Colville River east to the Canadian border. This zone is approximately 50 miles wide and includes a corridor of land extending about 25 miles from the coast and the strip of adjoining shorefast ice. Some denning also takes place on the drifting sea ice, but these dens are subject to ice breakup. The land and shorefast ice provide stable conditions for denning. Bears denning on land tend to select snow-filled gullies and cutbanks as desirable den sites.

Very little information on natural mortality factors is available. Polar bears have no natural predators and no known diseases or serious parasites. Few bears in the wild live beyond 25 years of age.

Historically, Eskimos from all coastal villages killed polar bears. Some skins were used for sale or barter and others, particularly cubs, yearlings and two-year-olds, were used for garments. In the late 1950's and early 1960's sport hunters using aircraft began to kill significant numbers of polar bears. Most hunts in this area were based in Barrow. Aerial hunting was curtailed by the requirement for permits in 1971 and 1972 and in November of 1972 the passage of the Marine Mammal Protection Act (MMPA) banned all hunting of polar bears except by Alaskan natives. The average annual harvest of polar bears in Alaska during the late 1960's was about 250 per year with about one-third coming from the Beaufort Sea population. Fifty to 60 bears have been taken annually by natives in Alaska since 1972 and in most cases the meat was consumed. Until 1974 regulations promulgated under terms of the MMPA did not permit polar bear skins to be tanned commercially. Because Natives did not have a ready market for the sale of raw products,

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The State of Alaska has requested the return of management jurisdiction over nine species of marine mammals including polar bears. Until this occurs the use of bears will continue to be restricted to natives residing along the north coast. The harvest is not expected to vary appreciably from the present pattern. If management of polar bears is returned to the State of Alaska, the State would probably allow recreational hunting by ground transportation only. Sport hunting under these controls would not remove as many bears as were previously taken with the aid of aircraft. Less than 50 bears per year would probably be taken in this region by recreational hunters. Return to State management would have the additional advantage of allowing Natives to realize economic return from animals and from services furnished to the recreational hunter.

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Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
Other Marine Mammals	Pacific Walrus	*Odobenus rosmarus*

WATERFOWL IN SOUTHEASTERN ALASKA

Southeastern Alaska annually supports millions of waterfowl* enroute to and from northern Alaska and Canadian breeding grounds. Because waterfowl are scattered over thousands of small coastal tideflats and stream deltas there are only a few major concentration areas: deltas of the Situk, Ahrnklin and Dangerous Rivers; the Alsek River delta and Dry Bay; Mendenhall Wetlands; Stikine River delta; Rocky Pass; and tideflat areas in Duncan Canal. Breeding populations of waterfowl are not large but the number of wintering birds probably exceeds two million.

Breeding habitat in Southeastern Alaska is limited by the mountainous character of much of the region. There are no major production areas but thousands of small sedge flats at the heads of bays and deltas of small streams collectively support a substantial number of birds. Numerous ponds, generally below 1500' elevation, also support some birds. Definitive breeding duck surveys have not been conducted in the Southeastern Region but an estimated 100,000 "dabbling" ducks and 10,000 "divers" nest here. A substantial population of nongame ducks (mergansers and harlequin) also breed here.

During the summer several hundred thousand immature nonbreeding scoters remain in Southeastern waters. In addition adult males, after mating in northern areas, return to Southeastern Alaska for their summer molt.

Nearly the entire world's population of Vancouver Canada geese breed and remain here year-round. The estimated annual fall population is 60,000 geese. Although most geese are permanent residents a small percentage of the population migrate as far south as Oregon during the winter. A few Canada geese are known to nest and summer-molt in the Yakutat area but their subspecific classification is unknown.

Trumpeter swans nest primarily in the Yakutat area although nests have been recorded in the Haines and Ketchikan area. The total average fall flight from this region is perhaps 100-150 swans. Some trumpeters also overwinter in the southern part of the region; their numbers vary with the severity of the winter.

Because most salt water in the region remains ice-free during winter months, large numbers of birds overwinter. Besides Vancouver Canada geese, mallards, scoters, mergansers, harlequin, old squaw, goldeneyes, bufflehead and other dabblers and divers are abundant. The total wintering waterfowl population probably exceeds two million birds annually. Mallard populations vary according to the winter's severity, but possibly average over 150,000 each year.

Waterfowl habitat conditions are generally good throughout the region. Change is occurring in some areas from "glacial rebound" and silt deposit, most noticeably on the Stikine River Delta and Gustavus tidelands.

* A list of waterfowl species considered in these plans follows this regional account.

On these areas the uplands have risen markedly and vegetation changes are occurring. A loss of upland ponds and a decrease in waterfowl use has occurred.

In Southeastern Alaska waterfowl are utilized primarily for recreational hunting. Unlike most areas in Alaska hunters here can make use of the full 107 day season. However, inclement weather after early November precludes much waterfowl hunting except when waterfowl and big game hunts are combined. Many more ducks and geese are produced in Southeastern Alaska than hunters succeed in shooting.

Less than 20 percent of all waterfowl sport hunters in Alaska live in Southeastern Alaska. Nearly 25 percent of the state's total hunter days, about 20 percent of the duck harvest and over 10 percent of the total goose harvest occurs in the region. Over 90 percent of the ducks harvested are mallard, pintail, American widgeon, and green-winged teal. Canada geese comprise about 90 percent of the total goose harvest with Vancouvers the predominant subspecies. The locations of major hunting activity and waterfowl harvest are: Mendenhall Wetlands, Stikine River Delta, Yakutat area (east from Yakutat through Dry Bay), Duncan Canal, Blind Slough, Rocky Pass, St. James Bay, Farragut Bay and the Chilkat River. The Stikine River Delta and Yakutat area are the most popular hunting areas for Southeastern waterfowl hunters.

Most of the hunting effort occurs in areas accessible only by aircraft or boat. However, in the Juneau, Petersburg, Yakutat and Haines vicinities hunting opportunities are available from road systems. Less than 2 percent of all waterfowl hunters travel out of the Southeastern region to take most of their waterfowl.

Nonconsumptive use of waterfowl is low to moderate in the region but high in a few areas where road systems permit easy access. The greatest use occurs near Juneau where a highway parallels the Mendenhall Wetlands for several miles. Other areas of moderate to high nonconsumptive use include: Yakutat, Petersburg, Haines, Ketchikan and in the immediate vicinity of the numerous small towns and villages along the coast. Travelers on the state ferry and commercial cruise ships have fair bird viewing, primarily of pelagic species.

Both hunting pressure and nonconsumptive use are expected to increase in proportion to the increase in human population. The average annual number of hunter use days during the past four seasons have been 13,000. By 1980 an anticipated 15,000 days spent hunting will occur yearly in the Southeastern region. A significant increase in nonconsumptive use in the Juneau area is anticipated. If the capitol is moved from Juneau a significant decrease in all uses will occur.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	GreenWinged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*
Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*

Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

MENDENHALL WETLANDS WATERFOWL

LOCATION

In Game Management Unit 1C, the state-owned lands in Gastineau Channel south of the Glacier Highway, north of the north Douglas Road, east of Mendenhall Peninsula and west of Salmon Creek.

THE SPECIES

There are no extensive quantitative waterfowl use data for the Mendenhall area, but because the wetlands are one of the largest tideland areas in southeast Alaska, waterfowl use is substantial. Over 3,000 ducks have been counted in late August on the area. Lesser concentrations occur during the hunting season primarily because of shooting pressure. Canada geese numbering usually over 200 birds are present in late summer and smaller numbers occur during the hunting season. After the season closes 200-300 Canada geese return to the flats to overwinter. Over 1,000 ducks also overwinter including about 400 mallards. Swans also migrate through the area in substantial numbers from September thru mid-November. Most migrant waterfowl depart by November 15. Spring use by waterfowl on the area is heavy but occurs during a shorter time period than in the fall. The estimated total numbers of birds using Mendenhall wetlands during spring and fall are: ducks - 30,000 in the spring, 50,000 in the fall; geese - 3,000 in the spring, 5,000 in the fall; swans - 1,000 in the spring, 500 in the fall.

Duck and Vancouver Canada goose production occurs on the area. Total production of ducklings is probably less than 250 while probably less than 5 broods of geese are reared. Goose nesting is known to have decreased, probably because of increased human activity on and near the wetlands. Waterfowl use during spring and fall has also generally decreased in the past 10 years for the same reason.

During the past four years duck and goose harvests on the area have annually averaged 3,325 and 250 birds, respectively. Over 3,865 days of hunter activity occur annually by hunters over 16 years of age. However, field checks show 25-30 percent of all hunters are juveniles, so actual days spent on the area exceeds 5,000 each year. Almost all hunters are from the Juneau-Douglas area. Hunters are very crowded on the area opening day and for the first few weekends. Hunter success is generally good opening day but declines significantly thereafter. Light, but constant, hunting pressure throughout the season keeps waterfowl concentrations from occurring. Ducks concentrate near tideline and thus partially remain unavailable to hunters. However, high tides move birds and excellent hunting is available on such days.

The major access route to the wetlands is through airport property. However, with the completion of the new Glacier Highway additional public access is available, but vehicle parking is a problem. Other access routes

are available, but most are through private land. On the south side of the wetlands the Fish Creek area affords good access but some of this land is privately owned. The Mendenhall River offers good boat access but tides complicate boat hunting.

Exceptional viewing, photography and other nonconsumptive use opportunities are available and utilized on the wetlands. During winter and spring especially, large numbers of birds congregate close to roads and other readily accessible viewpoints. Berms along ponds adjacent to the airport are excellent places of concealment for photographers. Little user conflict (hunter vs. nonconsumptive) has occurred to date for several reasons. People seem more interested in viewing birds in the spring after a long winter than in the fall, and the birds are much more colorful during spring. Also, the Auke Lake closed area near the Mendenhall wetlands offers some viewing opportunity in the fall.

WATERFOWL IN SOUTHCENTRAL ALASKA

Southcentral Alaska annually supports millions of migratory waterfowl* enroute to or from the great delta, coastal plain and river valley breeding grounds of western, interior and arctic Alaska. Very large fall and spring migrant populations occur on coastal salt marshes in Cook Inlet, Kachemak Bay, Prince William Sound, Copper River Delta and Controller Bay. Although the majority of birds utilize Southcentral habitats only for resting and feeding during migration, approximately 140,000 ducks and 30,000 geese breed within the region. Additionally, some ducks remain through the winter in coastal areas; large wintering duck populations occur in Kachemak Bay and Prince William Sound, while other birds are scattered wherever there is open water.

Breeding habitat within Southcentral Alaska is limited by the mountainous character of much of the region. There are three major production areas within the region: the Nelchina Basin, the Copper River Delta and the Kenai-Susitna Basin. About 94,000 ducks utilize the Nelchina Basin each year for breeding. Of these 20,000 are "dabbling" ducks and 74,000 are "divers" and nongame ducks. Breeding bird densities are about 24 ducks per square mile over the 3,900 square miles of habitat. The area annually produces about 94,000 young ducks for the fall flight. Substantial numbers of nesting and nonbreeding trumpeter swans also occur in the basin.

The Copper River Delta in Prince William Sound has a production area covering only 308 square miles but has the highest breeding duck densities in Southcentral Alaska (63 per square mile). About 15,000 dabblers and 4,500 divers and nongame ducks annually produce an estimated 18,000 young ducks for the fall flight. The Delta also provides nesting habitat for the world population of dusky Canada geese. Between 19,000 and 37,000 geese have flown south annually to wintering areas in Oregon and Washington during 1970-1975. The breeding population was estimated at 26,000 in 1975. In addition, an estimated summer population of 2,500 Canada geese can be found in Prince William Sound and about 300 birds also winter there. The subspecific classification of these geese is unknown. Their geographic proximity to the Copper River Delta suggests they are dusky, but behaviorial characteristics suggest they are Vancouver geese like those in Southeast Alaska. Surveys of trumpeter swans from Cordova eastward indicate the coastal population has probably reached carrying capacity. Little change in the total population occurred from 1968 to 1975. The trumpeter swan population in this area averages 750 to 800 birds in the fall flight.

The Kenai-Susitna Basin area contains approximately 2,500 square miles of nesting habitat where about 26,000 dabbling ducks and 13,000 divers and nongame ducks produce about 37,000 young ducks for the fall migration. Coastal sedge-marsh habitat in Cook Inlet apparently has a breeding duck density of about 60 ducks per square mile, or roughly five times the density of surrounding upland habitat, demonstrating the greater importance of coastal marshes to breeding ducks. An estimated population of 2,000 lesser Canada geese has become established in Cook Inlet since

* A list of waterfowl species considered in these plans follows this regional account.

By far the most important waterfowl habitat in this region is associated with the coast. Migrating birds utilize near-coastal and tideline areas heavily for feeding and resting. These areas are ice-free in the spring and fall, thus allowing birds to arrive in Alaska before inland breeding areas are open and to remain in Alaska during the fall after inland production areas freeze. Coastal salt marshes above high tide are also important production areas as indicated by breeding bird densities.

The 1964 earthquake markedly changed some coastal habitat; the Copper Delta raised about six feet. The initial effect has been a large increase in flood-free nesting habitat, but long-term effects may include habitat loss through plant succession on uplifted areas. Coastal lands around Cook Inlet generally lowered one to three feet in 1964; this appears to be reducing habitat on the Chickaloon and Susitna Flats by tidal gut erosion into upland ponds. However, additional habitat in upland areas that are now under tidal influence may be created. Evidently, the habitat change in Cook Inlet was favorable for lesser Canada geese as few geese nested around the Inlet before 1964.

New waterfowl nesting habitat in upland areas is created by river channeling processes, retreating glaciers, and beaver pond formation. Trumpeter swans especially favor the new habitat as soon as emergent vegetation becomes established in ponds.

In Southcentral Alaska waterfowl are utilized primarily for recreational hunting and viewing. Although hunting seasons are adequate, the opportunity to hunt is limited by the early freeze-up of many of Southcentral's waterfowl areas. Except in Kachemak Bay and Prince William Sound (where little hunting occurs), hunters are generally limited to about 50 days of hunting before freeze-up. Thousands of ducks and geese are produced in Southcentral Alaska in addition to those that hunters harvest.

About one-half of Alaska's waterfowl sport hunters live in the Southcentral area. Also, the area accounts for about one-half of the State's total average duck harvest and hunter use days, and about one-fifth of the goose harvest. About 80 percent of the ducks harvested are pintail, mallard, widgeon, green-winged teal and shoveler. Over 90 percent of the geese harvested are various subspecies of Canada geese. The only species of duck or goose harvested in sufficient magnitude to be of biological concern is the dusky Canada goose. The locations of major hunting activity and waterfowl harvest are: Susitna Flats, Palmer Hay Flats, Copper River Delta, Potter Marsh, Kachemak Bay, Eagle River Flats, Portage area, Chickaloon Flats, Goose Bay, Trading Bay and Redoubt Bay.

Much of the hunting effort occurs in areas accessible only by airplane or boat. However, in the Anchorage vicinity several hunting locations are reached by automobile. About 5 percent of all waterfowl hunters travel out of the Southcentral area to take most of their ducks, while an estimated 15 percent travel out of the area to harvest most of their geese. Cold Bay, Pilot Point, and the Copper River Delta are the most visited goose hunting areas.

Nonconsumptive use of waterfowl is greater in Southcentral than in any other area in Alaska. The heaviest use areas near Anchorage include Potter Marsh, Portage, Eklutna and the Palmer Hay Flats. Kachemak Bay, the road from Cordova across the upper Copper River Delta, and Prince William Sound also provide many people with opportunities to observe, study, and photograph birds. Travelers on the State ferry in Prince William Sound have excellent bird viewing.

Both hunting pressure and nonconsumptive use is expected to increase in proportion to the increase in human population. The average number of hunter days during the past four seasons have been 23,400. By 1980, an anticipated 35,000 days of hunting will occur annually in the Southcentral Region. Nonconsumptive use is expected to increase also, perhaps at a greater rate than hunting effort, particularly in the Anchorage area.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	Green-Winged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*

Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

SOUTHERN ALASKA WATERFOWL

LOCATION

Game Management Units 1-17, 19 and 20 except the areas included in the Izembek, Port Moller, Port Heiden, Cinder River, Pilot Point, Egegik, Naknek River, Minchumina, Fairbanks, Potter Point, Jim-Swan Lakes, Chickaloon Flats, Kenai and Kasilof Flats, Fox River Flats, Controller Bay, Copper River Delta, and Mendenhall Wetlands Waterfowl Management Plan areas.

THE SPECIES

Southern Alaska annually provides resting and feeding habitat for millions of waterfowl enroute to or from Northern Alaskan, Canadian or Russian breeding grounds. Spectacular concentrations of migrating ducks, geese and swans occur in areas such as southern Bristol Bay, Cook Inlet, and Prince William Sound. Although breeding populations in the Southern Alaska area are not nearly as large as those to the north, over one-fourth of the fall duck flight and over 10 percent of the fall goose flight from Alaska originates from the area. About 900,000 ducks, 90,000 geese, 11,000 whistling swans, and 2000 trumpeter swans nest in such areas as lower Bristol Bay, Yukon Flats, Minto Flats, the Tanana and Kuskokwim Rivers, the Susitna and Nelchina basins, and the Copper River Delta. Southeastern Alaska has no large areas suitable for nesting waterfowl; however, approximately 60,000 Vancouver Canada geese are year-round residents and about 110,000 ducks nest there in the many tideflat and stream delta areas. Essentially all of Alaska's wintering waterfowl occur in Southern Alaska. Coastal areas from the south side of the Alaska Peninsula south to Southeastern Alaska are used by wintering birds with Kachemak Bay, Prince William Sound and the many bays and inlets of Southeastern Alaska being particularly important as wintering areas. Southeastern Alaska alone supports an estimated 2,000,000 wintering waterfowl.

Recreational waterfowl hunting is the dominant use over most of the area. Although freeze-up limits the time waterfowl are available in interior areas, hunters in some coastal areas are able to hunt for a major portion of the season. Hunters in Southeastern Alaska, Kodiak and Aleutian Islands make use of the full 107 day hunting season. Over 93 percent of Alaska's recreational duck harvest, 88 percent of the goose harvest, and about 95 percent of the total sport hunter days occur in the Southern Alaska area.

The following list of areas are specific locations within the Southern Alaska area where use by waterfowl and/or use of waterfowl is important. These areas are not discussed in other management plans, but are places where control of human use or habitat protection is desirable. For each area the applicability of management guidelines is indicated.

AREA	Management Guideline No.						
	1	2	3	4	5	6	7
Southeastern Alaska							
Behm Canal	X			X		X	X
Berner's Bay	X			X		X	X
Brown's Cove	X			X		X	X
Chickamin R. Flats	X			X		X	X
Chilkat River	X			X	X	X	X
Marten R. Flats	X			X		X	X
Smeaton Bay	X			X		X	X
Sandborn Canal	X			X		X	X
Traitor's Cove	X			X		X	X
Unuk R. Flats	X			X		X	X
Walker Cove	X			X		X	X
Wilson R. Flats	X			X		X	X
Farragut Bay	X			X		X	X
Big Salt Lake	X			X		X	X
Calder Bay	X			X		X	X
Exchange Cove	X			X		X	X
Fish Egg Island Area	X					X	X
McFarland Island Area	X					X	X
Mud Bay	X			X		X	X
Portage Bay	X			X		X	X
Portillo Channel	X			X		X	X
Port Real Marina	X			X		X	X
Port Refugio	X			X		X	X
Red Bay	X			X		X	X
Salmon Bay	X			X		X	X
Sarkar Lakes	X			X	X	X	X
Sea Otter Sound	X			X		X	X
Shinaku Inlet	X			X		X	X
Staney Creek	X			X		X	X
Suemez Island Area	X			X		X	X
Sweet Briar Lake	X			X	X	X	X
Trocadero Bay	X			X		X	X
Bay of Pillars	X			X		X	X
Blind Slough	X			X		X	X
Colorado Creek	X			X		X	X
Kadake Bay	X			X		X	X
Petersburg Creek	X				X	X	X
Port Camden	X			X			
Rowan Bay	X			X		X	X
Saginaw Bay	X			X		X	X
Tebenkof Bay	X			X		X	X
Security Bay	X			X		X	X
Three Mile Arm	X			X		X	X
Totem Bay	X			X		X	X
Wrangell Narrows	X			X	X	X	X

AREA	Management Guideline No.						
	1	2	3	4	5	6	7
Zimovia Strait	X			X		X	X
Chaik Bay	X			X		X	X
Gambier Bay	X			X		X	X
Hood Bay	X			X		X	X
Favorite Bay	X			X		X	X
Fish Bay	X			X		X	X
Hoohah Sound	X			X		X	X
Kadashan Bay	X			X		X	X
Mitchell Bay	X			X	X	X	X
Neka Sound	X			X		X	X
Pybus Bay	X			X		X	X
Youngs Bay	X			X		X	X
Eagle R. Flats	X			X	X	X	X
Stikine River Delta	X	X	X	X		X	X
Rocky Pass	X			X	X	X	X
Duncan Canal	X			X		X	X
Gustavus Flats	X			X		X	X
St. James Bay	X			X		X	X
Arrons Creek	X			X		X	X
Bradfield River Flats	X			X		X	X
Northern Gulf Coast							
Yakutat SE thru Dry Bay	X			X		X	X
Prince William Sound	X			X		X	X
Portage Flats	X		X	X	X	X	X
Pt. Campbell-Woronzof Flats	X			X	X	X	X
Palmer-Hay Flats Refuge	X	X	X	X	X	X	X
Matanuska Valley	X		X	X	X	X	X
Goose Bay Refuge	X		X	X		X	X
Susitna Flats	X		X	X		X	X
Trading Bay	X		X	X		X	X
Redoubt Bay	X		X	X		X	X
Kodiak-Afognak Islands	X		X	X	X	X	X
Interior							
Nelchina Basin	X			X		X	X
Copper River Valley	X				X	X	X
Delta Management Area	X	X	X	X	X	X	X
Tetlin-Northway				X	X	X	X
Minto Flats	X			X		X	X

Some of the areas listed have exceptionally large concentrations of waterfowl during some or all periods of the year and are considered especially sensitive and important from the standpoint of maintaining undisturbed habitat. These areas include the Stikine River Delta, Rocky Pass, Duncan Canal, Yakutat southeast through Dry Bay, Prince William Sound, Palmer Hay Flats Refuge, Susitna Flats, Trading Bay, Redoubt Bay, Kodiak-Afognak Island, and Minto Flats.

The majority of areas listed receive relatively light use by hunters at present, primarily because of their inaccessibility to population centers. Heaviest hunter use occurs in areas near population centers where a short flight or boat trip or access via the road system puts hunting locations within the physical and financial reach of many urban hunters. The Stikine River Delta, Portage Flats, Palmer Hay Flats, Susitna Flats, Minto, and the Delta Management area all receive high hunter use which may in some cases require more intensive management to better distribute and regulate hunter use.

Most of the nonconsumptive use of waterfowl in Alaska occurs in Southern Alaska at relatively few locations which lend themselves to public viewing due to their proximity to human populations or their good access. These are the Chilkat River, Wrangell Narrows, Gastineau Channel, Eagle River Flats (Juneau), Portage Flats, Palmer-Hay Flats Refuge, and the Matanuska Valley.

Limited domestic utilization by local residents occurs primarily around villages in the lower Bristol Bay area and in some interior areas such as Tetlin and Minto.

COPPER RIVER DELTA WATERFOWL

LOCATION

In Game Management Unit 6, the tidal lands and uplands at the mouth of the Copper River, bounded on the west by the Heney Range Mountains, on the north by the Chugach Mountains and on the east by Katalla.

THE SPECIES

The world's population of dusky Canada geese breeds on the Copper River Delta. In 1975 the fall flight was about 31,000 geese. During the past five years the fall population has fluctuated between 19,000 and 37,000 birds. Production has varied between 11 and 51 percent young in the population during this period. Annual productivity is mainly dependent on weather conditions in late April and May. Predation is also high in some years but this may be a function of weather conditions. This species population has stabilized and is gradually increasing. Prime nesting habitat (forb-grass plant communities) has increased since the 1964 earthquake; however, natural plant succession in the long term may restrict nesting habitat of dusky geese. A cooperative management agreement for the subspecies between Alaska, Oregon and the U.S.F.W.S. was signed in 1973.

The 1974-75 two-year average breeding duck population on 308 square miles of habitat has been 19,450 birds, or 63 ducks per square mile. Pre-1964 populations averaged 27,600 ducks per year. Major decreases in divers have occurred since 1964, probably because of lowered pond fertility and vegetation changes. Dabblers now comprise 76 percent and divers 24 percent of the population. The total fall flight, after production, is estimated to be just over 33,000 ducks. Over 50 pairs of trumpeter swans annually nest on the delta. The total fall flight, after production of young and including nonbreeding swans is over 400 birds each year. This population has stabilized and is apparently at carrying capacity.

Migrant waterfowl populations during the spring and fall are large. Spring totals are estimated to be ducks - 200,000-500,000, geese - 100,000-125,000, whistling swans - 5,000-15,000, trumpeter swans - 2,500; fall totals are: ducks - 300,000-600,000, geese - 75,000-130,000, whistling swans - 20,000-30,000, trumpeter swans - 3,000.

Hunters on the Copper River Delta take about 10 percent of the total annual dusky goose harvest; the majority of the harvest occurs in Oregon. The four year average goose harvest on the Delta for all species is 875 birds per year. Duck harvest has averaged 4,550 birds each year since 1971. Mallards and pintails are the predominant birds in the bag. Local duck production far exceeds annual hunter take. An early flight of white-fronted geese through the area and good duck hunting early in the season dictate a continued Sept. 1 opening. Freeze-up and cessation of hunting usually occurs by October 25.

Hunter days of activity have averaged 2,750 since 1971. Most hunters are local Cordova residents, but a growing number of people travel from Anchorage and elsewhere to hunt on the Delta. A major means of public access is from the road system out of Cordova. Many people hunt from the road or launch boats to reach much of the Delta. Other hunters fly into more remote areas. U.S. Forest Service regulations prohibit use of motorized vehicles in the area before adequate protective snow cover is present, except by special permit. Public use of U.S. Forest Service cabins and other private cabins on the delta is heavy throughout the season.

Since 1951 various waterfowl and habitat research studies have been conducted. The unique wildlife and habitat relationships on the Delta are conducive to future research of various types. Viewing and photography of waterfowl on the Delta are also growing in popularity. The road system allows for excellent public viewing opportunities.

CONTROLLER BAY WATERFOWL

LOCATION

In Game Management Unit 6, the Controller Bay Flats inland to the north, including Bering Lake and the Bering River, bounded on the east by the Suckling Hills and on the west by Katalla.

THE SPECIES

Although a few dusky Canada geese are probably produced in the area and some duck nesting occurs, the area is best noted as a trumpeter swan production and molting area. Numbers of nesting and molting swans at least equal those on the Copper River Delta (50 nesting pairs and over 350 total swans). The swan population has apparently stabilized.

Intertidal lands are concentration areas for large numbers of waterfowl and shorebirds during spring and fall migrations. Peak waterfowl populations each season are in excess of 50,000 birds and total waterfowl use probably exceeds 250,000 birds in the spring and 350,000 in the fall.

Hunting pressure is very light due to long distances from population centers. In addition, no overnight cabins are available. Access is solely by aircraft except in the winter when all-terrain vehicles can reach the area. Salt water access by boat is also possible. The few hunters using the area originate mainly from Cordova.

JIM-SWAN LAKE WATERFOWL

LOCATION

That portion of Game Management Unit 14A within 1/4 mile of Jim Lake and Swan Lake.

THE SPECIES

Breeding duck densities are apparently high based upon a 1975 survey indicating 141 ducks per square mile in the general area of Jim and Swan Lakes. Possibly 500 or more ducks, producing a like number of young, are present on the actual management area each summer. One or two pairs of trumpeter swans also nest in the Jim-Swan Lake area.

During spring and fall migration periods large numbers of ducks and swans use the two lakes. During the fall peak trumpeter swan concentrations of over 500 birds have been observed. During some years small numbers of molting-nonbreeding trumpeter swans are present throughout the summer.

Waterfowl use in this area is presently limited by poor access. Only a crude 4-wheel drive trail exists into the area which is impassable during wet periods. A few waterfowl hunters also get to the area by boat, but the trip is long and difficult. Little nonconsumptive waterfowl use is made at the present. The few waterfowl hunters who use the area are from the Palmer or Anchorage areas.

POTTER POINT WATERFOWL

LOCATION

In Game Management Unit 14C, the inter-tidal area bounded on the north by Pt. Woronzof, on the south by Potter Creek, and including the Potter Point State Game Refuge.

THE SPECIES

The Potter Refuge contains about 1,990 acres of uplands and 1,750 acres below mean high tide. An estimated 500 ducks breed in this area and the total fall flight of young and adult birds is about 1,000. Over 95% of the birds are dabblers. Lesser Canada geese also nest on the refuge and the average total fall flight is estimated at 300 adults and young. Their wintering area is in Oregon's Willamette Valley.

Peak migrant populations occur from about April 25 - May 12 in the spring and September 10 - October 5 in the fall. Total waterfowl numbers during these periods are estimated at: ducks - 30,000 spring and 20,000 fall; geese - 10,000 spring and 4,000 fall; swans (both species) - 1,000 spring and 200 fall. Waterfowl use during the winter is insignificant.

The 1964 earthquake lowered the area some 2 feet and a loss of nesting habitat resulted. A series of ponds and berms created in 1973 as mitigation for a sewer line put through part of the refuge significantly improved habitat and increased nesting and migrant waterfowl use.

Because of the area's proximity to Anchorage hunting pressure is heavy. During the four seasons 1971-1974, average hunter days on the area were 855, while harvests averaged 1,050 ducks and 90 geese. Hunting pressure is very heavy the first two weekends of the season and tapers off after that. Very high tides are also a popular time to hunt as the tides move ducks closer to shore and hunter success is improved.

There are four main access points to the hunting area. One access route is through state owned land, and the other three are through either city, private or federal land. Access to the area which is closed to hunting, on the north side of the Seward Highway, is good. However, the construction of one or two pull-offs, and habitat improvement near the road would facilitate viewing.

Numbers of viewers, photographers and other nonconsumptive users on the area are not known, but these users far exceed waterfowl hunters. Probably over 10,000 people each year purposely visit Potter Marsh to view birds. Viewers concentrate along the Seward Highway adjacent to the closed area, but use occurs throughout the area. Other uses which occur on the area include: hiking, nature study, berry picking, canoeing, cross-country skiing, snowmachining, picnicking and horse riding.

CHICKALOON FLATS WATERFOWL

LOCATION

In Game Management Unit 15, the inter-tidal area and upland marsh in Turnagain Arm between Bedlam Creek and Burnt Island.

THE SPECIES

Large numbers of geese and ducks use the Chickaloon Flats area during spring and fall migration periods. Swan use is light and occurs primarily during the spring. Concentrations of over 10,000 geese and 15,000 ducks are common during both seasons. During the fall migration when Portage Pass becomes clouded in for several days, a "piling up" of waterfowl may occur with up to 100,000 birds accumulating on the Flats. Lesser Canada geese nest on the flats but probably less than 25 young are produced annually. Up to 175 molting adult geese have been observed in July and August. The birds are believed to winter in Oregon's Willamette Valley. Trumpeter swans nest on the area, but probably less than three nesting pairs use the flats each year. In 1975 a breeding duck survey was conducted and an estimated 1,500 dabbling ducks were observed nesting on 39 square miles of waterfowl habitat. These 1,500 nesting birds produce about 1,500 young for the fall flight.

The 1964 earthquake lowered the flats about three feet. Consequently the amount of land covered by tides has increased, resulting in a decrease of nesting habitat. Tide gut erosion has drained some upland ponds.

Average yearly hunter harvest and hunting activity on the flats for the four seasons 1971-1974 are calculated to be: hunter days - 950; duck harvest - 1,700; goose harvest - 590. Hunter activity on the area is limited mainly by a lack of good access. A gas pipeline access trail exists on the south side of the area, but it is strictly 4-wheel drive access. The only other means of access is by plane. Plane access is limited to float planes except during a period of low tide when wheel planes can land on the upper, drier parts of the flats. There are no public cabins on the flats but a U.S. Fish and Wildlife Service cabin is heavily used by hunters. A Department of Fish and Game cabin is located about one mile from the nearest waterfowl hunting, but the walk from the cabin is long and difficult. However, some waterfowl hunter use of this cabin occurs. One other cabin exists on the east side of the area, but this is a privately owned pipeline maintenance cabin. Nonconsumptive use of waterfowl is very limited due to the difficulty and expense of getting to the area.

FOX RIVER FLATS WATERFOWL

LOCATION

In Game Management 15, the inter-tidal area in upper Kachemak Bay between Martin River and Fox Creek.

THE SPECIES

Substantial numbers of waterfowl utilize this area during spring and fall migration periods. Although exact populations are unknown, total spring and fall use probably exceeds 100,000 ducks, 25,000 geese and 500 swans. From 1,000 to 3,000 mallards and possibly 10,000 divers and nongame ducks also winter in Kachemak Bay. These birds heavily utilize Fox River Flats until the area becomes ice covered, usually late in the winter. Much of the upland sedge flats is without ponds or permanent water. Except at high tides most of the birds remain on the exposed mud flats near tideline. Duck nesting occurs but probably in low densities.

Hunting intensity on the flats is moderate because access is limited to boat, airplane, and all-terrain vehicles. During the four seasons 1971-1974 approximately 1250 ducks and 175 geese were harvested annually, and about 500 hunter-use days per year occurred in Kachemak Bay. Most hunters come from Homer, but a substantial number also reside in the Kenai, Soldotna and Anchorage areas. Hunters usually spend only one day hunting on the area due to a lack of overnight facilities. Some hunters who operate from large boats remain for several days. Nonconsumptive use of waterfowl is very light due to the area's relative inaccessibility.

KENAI AND KASILOF FLATS WATERFOWL

LOCATION

In Game Management Unit 15, the inter-tidal area of the Kenai and Kasilof Rivers.

THE SPECIES

Each spring these areas are the first waterfowl habitats to become ice-free on the west side of the Kenai Peninsula. Consequently, large numbers of ducks, and particularly geese, congregate for several weeks on the relatively small amount of habitat. Lesser numbers of birds use these areas during the fall. Some duck nesting also occurs and cranes have been reported to nest on the Kenai Flats. Both of these areas are readily accessible for public viewing and hunting. Over 5,000 geese (mostly snow geese) have been observed on the Kenai Flats in the spring.

Hunting pressure on both areas is usually fairly light; but in 1969, an estimated 600 hunter days were spent on the Kenai Flats. Virtually all hunters on these areas are local residents. These areas provide the only good hunting area close to Kenai and Kasilof. Probably more use of these areas is made by viewers and photographers than by hunters, although such use occurs primarily in the spring. Most viewers are also from the local area.

WATERFOWL IN SOUTHWESTERN ALASKA

Southwestern Alaska annually supports millions of migrating waterfowl,* several hundred thousand breeding birds and several million wintering waterfowl. Primary breeding habitat occurs around Bristol Bay, generally below 800' elevation. Production also occurs on Kodiak and the Aleutian Islands. Major spring and fall migration concentration areas occur in lagoons and on deltas of larger rivers on the northern coast of the Alaska Peninsula. However, birds can be found in varying numbers on practically every bay and estuary and on many inland lakes and rivers. Major wintering areas are on the Pacific side of the Alaska Peninsula, the Kodiak and Afognak Island coastal areas and throughout the Aleutian Islands. Offshore waters in Bristol Bay, the Bering Sea and Gulf of Alaska also accommodate millions of pelagic waterfowl and other birds.

Estimates of the total average annual breeding duck population in Southwestern Alaska, derived from surveys on 9,900 square miles of production habitat around Bristol Bay, include 117,000 dabblers, 123,000 divers and 165,000 nongame ducks. These ducks are assumed to produce approximately 274,000 young for a total fall flight of about 679,000 birds.

Few geese are produced in Southwestern Alaska, but the entire world population of endangered Aleutian Canada geese nest on Buldir Island in the Aleutians and migrates to California (and possibly to Mexico and Japan) to winter. The average annual fall flight is about 1,200 geese. In addition, a fall flight of about 1,000 white-fronted geese originate primarily from the northwestern part of the region.

The estimated fall flight of whistling swans from the 9,900 square miles of Bristol Bay habitat is about 10,600 birds. Ranges of breeding whistler and trumpeter swans overlap in the northeastern part of the region. A small resident population of about 300 whistlers is present on the southern tip of the Alaska Peninsula and Unimak Island. In recent years small numbers of wintering whistlers have been reported on Kodiak Island. A small group of Asian whooper swans annually overwinter in the Aleutians.

Exact numbers of waterfowl wintering in the Southwestern Region are unknown, but total birds number in the millions. Rafts of king eiders covering several square miles have been seen 40 miles offshore in northeastern Bristol Bay. Nearly all of the world population of emperor geese winter in the Aleutians; a few birds also winter on southern Kodiak Island and on the Pacific side of the Peninsula. Steller's eiders, scoters, common eiders, old squaws, harlequins, mergansers, mallards, and other dabblers and divers also overwinter in Southwestern Alaska.

Although numbers of breeding and wintering waterfowl in the region are impressive, they are overshadowed by huge concentrations of ducks and geese during the spring and fall. Seven lagoons and river deltas on the north side of Bristol Bay have the most spectacular waterfowl concentrations: Izembek Lagoon, Nelson Lagoon-Port Moller, Ilnik Lagoon, Port Heiden, Cinder River, Ugashik Bay, and Egegik Bay. Of the seven areas, Izembek hosts the largest bird concentration primarily because it has the

* A list of waterfowl species considered in these plans follows this regional account.

largest eel grass bed in the world. All seven areas are extremely productive because of interactions between tides and the continual deposit of rich silt from fresh water streams.

The entire world population of cackling Canada geese, and North American populations of black brant, emperor geese and Pacific Flyway white-fronted geese can at times be found in these areas. Additionally about 200,000 snow geese from Wrangell Island in Russia and over 100,000 lesser Canadas also stop there. In total, nearly one million geese are present in the fall and probably over 500,000 geese appear in the spring. Numbers of ducks during spring and fall exceed geese by perhaps 50 percent. Dabblers, divers and nongame ducks are all abundant throughout the region but, as with geese, the seven bays and lagoons on the Alaska Peninsula are major concentration areas. Of special interest are adult Steller's eiders which migrate from northern Russia to Izembek and Nelson Lagoons in September for feather molt. Perhaps 500,000 eiders overwinter in near shore areas that remain ice free.

Habitat is excellent throughout Southwestern Alaska. Earthquakes in the Aleutians undoubtedly contribute some minor continual changes in estuary and coastal habitat. Waterfowl habitat has remained in a pristine condition in this region because human developmental activities have, to date, been very limited.

Waterfowl in Southwestern Alaska are utilized primarily for recreational hunting purposes. Hunters on the Alaska Peninsula and on the north side of Bristol Bay have 60-70 days of hunting before freeze-up. Kodiak hunters and the few sport hunters on the Aleutian Islands can utilize the full 107 day season.

Only a small number of waterfowl hunters live in the region, but about 44 percent of the state's total goose harvest and 9 percent of the state's total sport duck harvest occurs here. The average annual harvests over the past four years have been 7,075 ducks and 5,875 geese as determined by hunter questionnaires. Major harvest areas are Izembek Lagoon, Ugashik Bay, Kalsin Bay and the King Salmon-Naknek area. Over 36 percent of the state's total goose harvest occurs at Izembek and Ugashik. Emperor geese, lesser and cackling Canada geese and black brant comprise most of the goose harvest while pintail, mallard, widgeon, green-winged teal, shoveler and gadwall make up over 90 percent of the duck harvest. Sport harvest in this region is not adversely affecting any species; however, the black brant kill may, in combination with harvests elsewhere, be limiting the population.

Hunter access is primarily by aircraft or boat. Limited road access is available at Cold Bay, King Salmon-Naknek, Kodiak, Dillingham and Adak. Walk-in hunting from points on the Cold Bay road system in October apparently cause some geese to shift their use patterns which reduces hunter success in localized areas. Hunters from Anchorage, Kodiak or other Alaskan communities use private aircraft, airline, or charter aircraft to fly to Alaska Peninsula hunting areas, particularly Cold Bay and Pilot Point. Many big game hunters from other states also take advantage of the excellent waterfowl hunting while they are in the area.

Domestic utilization of waterfowl by local residents is probably not great. Most harvest is by people from small villages on Kodiak Island, the Aleutian Islands and on the north side of Bristol Bay. Such harvest is not believed to be adversely affecting any waterfowl species. Total domestic use is estimated to be: geese - 5,600; ducks - 8,000; whistling swans - 300; and cranes - 100. Most of the ducks are nongame species and most geese are emperors.

Because of the region's remoteness, little nonconsumptive use of waterfowl is made except by local residents and other people who are traveling in the region. However, residents of towns and villages along the coast and at King Salmon are annually treated to waterfowl concentrations and a diversity of species seldom matched anywhere in North America.

Hunting pressure in Southwestern Alaska, especially on the Alaska Peninsula, is expected to increase at a faster pace than the general population increase in Alaska. More and more people are learning of the waterfowl hunting opportunities in this region. As the demand grows, commercial guides and other facilities which will cater to waterfowl hunters are expected to become established. The average number of annual hunter days in the region during the past four seasons has been 5,250. An increase to 7,000 or more annual hunter days is anticipated by 1980. Nonconsumptive use and domestic use is not expected to change appreciably by 1980.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	Green-Winged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*

Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*
Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

NAKNEK RIVER WATERFOWL

LOCATION

In Game Management Unit 9, the Naknek River from its mouth to Naknek Lake.

THE SPECIES

The Naknek River is of interest primarily because of whistling swan concentrations in the spring and fall, and lesser numbers during the summer. Because the river is one of the first bodies of water to open in the spring, large numbers of swans congregate, particularly in the King Salmon area, for several weeks. In some years up to 10,000 swans are present. During the summer several hundred molting nonbreeding swans can be found on the river above King Salmon. Fewer swans are present during the fall than in the spring, but several thousand birds may stay until the river freezes. Large numbers of ducks and geese also use the river during the spring. In the aggregate, 50,000 or more birds may be present at any one time. Summer populations number several hundred ducks (primarily scoter, harlequin, and scaup), while in the fall perhaps 5,000 birds can be found here at any one time.

Waterfowl viewing opportunities are excellent during the spring as large bird concentrations are present adjacent to and in King Salmon. For example, ducks and geese are frequently found near the river in people's yards. Local residents and others traveling through the area are the primary springtime users. Hunting pressure during fall months is light and comes mainly from King Salmon, South Naknek, and Naknek residents. A few moose and caribou hunters also take birds incidentally to their primary game. Hunter access is primarily by boat but a limited number of trails are present.

EGEGIK WATERFOWL

LOCATION

In Game Management Unit 9, lands in the Egegik estuary, designated critical habitat by AS 16.20.230.

THE SPECIES

This area accomodates very large numbers of ducks, geese and swans during the fall and spring. Peak fall duck numbers are perhaps 100,000 and emperor geese numbers about 10,000 in the Egegik area. Snow and cackling Canada geese are also present. Spring goose populations probably number about 10,000 during a short time period.

Hunting pressure on the area is light. A few local residents and big game hunters combining hunts are the primary users. Hunter access to the area is primarily by aircraft, except for the few local residents who own boats. Hunting pressure in the future is not expected to increase to a point where excessive harrassment of birds will occur.

PILOT POINT WATERFOWL

LOCATION

In Game Management Unit 9, lands in the Pilot Point estuary, designated critical habitat by AS 16.20.230.

THE SPECIES

This area accommodates very large numbers of ducks, geese and swans during the fall and lesser numbers of birds during other periods of the year. Nearly all the cackling Canada geese in the world (about 150,000) stop at Pilot Point in the fall. Most of the snow geese from Wrangell Islands in Russia (perhaps 250,000) also stop for a lesser period of time. Large numbers of whitefronts also occasionally stop in the fall, depending on weather conditions. Peak duck numbers on the area exceed 100,000. Probably over 25,000 emperor geese also use the area.

Pilot Point ranks as the number two goose harvest area in Alaska. During the four hunting seasons 1971-1974, there was a calculated average yearly harvest of 2,165 birds. Duck harvest averaged 1,575 birds while there was a calculated 1,275 hunter days spent on the area. Most waterfowl hunters using the area are from Anchorage and Kodiak, but the area is also popular with residents of Dillingham and the King Salmon-Naknek area. Hunter access to the area is primarily by aircraft, except for the few local residents who own boats. Hunting pressure in the future may increase to a point where excessive harassment of birds occurs.

CINDER RIVER WATERFOWL

LOCATION

In Game Management Unit 9, lands in the Cinder River estuary, designated critical habitat by AS 16.20.230.

THE SPECIES

This area accommodates large numbers of ducks, geese and swans during the fall and lesser numbers of birds during other periods of the year. Peak fall duck numbers are perhaps 100,000 and emperor geese number about 10,000. Up to 20,000 sea ducks utilize the intertidal area and river mouth. Up to 30,000 snow and cackling Canada geese are also present.

Hunting pressure in the area is light. A few local residents and big game hunters are the primary users. Hunter access to the area is primarily by aircraft. Hunting pressure in the future is not expected to increase to a point where excessive harassment of birds is experienced.

PORT HEIDEN WATERFOWL

LOCATION

In Game Management Unit 9, lands in the Port Heiden estuary, designated critical habitat by AS 16.20.230.

THE SPECIES

This area accommodates large numbers of ducks, geese and swans during the fall and lesser numbers of birds during other periods of the year. Approximately 75,000 sea ducks (scoters, eiders, old-squaw and harlequin) utilize the waters of the bay each spring and fall. More than 50,000 game ducks concentrate in the marshes in the fall. Peak duck numbers on the area exceed 100,000. Probably over 25,000 emperor geese and over 25,000 total of snow, cackler, and white-fronted geese also use the area.

Hunting pressure on the area is light. A few local residents and big game hunters combining hunts are the primary users. Hunter access to the area is primarily by aircraft, except for local residents who own boats. Hunting pressure in the near future is not expected to increase to a point where excessive harassment of birds is experienced.

PORT MOLLER WATERFOWL

LOCATION

In Game Management Unit 9, lands in the Port Moller estuary, designated critical habitat by AS 16.20.230.

THE SPECIES

This area accommodates very large numbers of ducks, geese and swans during the fall and lesser numbers of birds during other periods of the year. Few Canada or snow geese use the Port Moller area, but emperor geese during spring and fall number over 100,000. Peak duck numbers are probably over 500,000 (mostly nongame species).

Hunting pressure on the area is light. A few local residents are the primary users. Hunter access to the area is primarily by boats. Hunting pressure in the future may increase to a point where excessive harassment of birds is experienced if the community of Nelson Lagoon achieves the growth figures projected by some agencies.

IZEMBEK WATERFOWL

LOCATION

In Game Management Unit 9, the intertidal areas of Izembek Lagoon including Moffet Lagoon and Applegate Cove.

THE SPECIES

Each fall essentially the entire North American black brant population (150,000 birds) and emperor goose population (150,000 geese) use the area. Also, about 100,000 lesser Canada geese and in some years one-quarter of a million ducks are also found on the area. Whistling swans numbering some 100 birds are permanent residents, interchanging between Unimak Island and the southern portion of the Alaska Peninsula. Spring waterfowl use is substantially less for brant and ducks. Emperor geese, eiders and some game ducks overwinter on Izembek in mild years when complete freeze-up does not occur. Total numbers of wintering birds probably are less than 5,000. The lagoon is used as a molting area during September by Steller's eiders which have traveled from North Slope, Canadian and Russian nesting areas. Total numbers of Steller's eiders in Izembek Lagoon probably exceed 100,000 birds. The world's largest eel grass bed in the lagoon is critical to brant. Upland browse, berries, eel grass and other foods are critical to other waterfowl. All waterfowl which use the area, except black brant, are considered to be in excellent status. The brant population has decreased over 75,000 birds during the past 20 years and the population has failed to stabilize.

Izembek Lagoon is the top goose harvest area in Alaska. During the four hunting seasons 1971-1974, an average of 2,630 geese (20 percent of state total) were taken there annually. The composition of the harvest is estimated to be: Canada and emperor geese - 35 percent each and black brant - 30 percent. The four year average number of hunter days on the area is 735. Duck harvest averages 615 each year.

Although local residents at Cold Bay account for some waterfowl harvest, the majority of birds are taken by hunters from the Anchorage vicinity and Kodiak. Several large groups annually charter aircraft for weekend hunts in October. Visiting military personnel also account for substantial harvest. Although hunting is excellent in September, most harvest occurs in October when the birds are in better physical condition.

Hunter access is primarily walk-in from the roads to Outer Marker and the Air Force radar site. Only a few other trails are available which are suitable for standard vehicles. Limited use is made of boats and outboard motors on the lagoon partially due to the problem of operating an outboard motor in the eel grass. Growing numbers of hunters in the northeast end of Applegate Cove and in the Outer Marker area appear to

be keeping the geese out of these areas to some degree. Although this is not adversely affecting the birds, hunting conditions at times become crowded and success is lowered. The U. S. Fish and Wildlife Service has closed an area around Grant Point, near the radar site, to hunting. This is designated as a viewing area and receives substantial use by local and itinerant viewers. Other viewing and photography opportunities are available along the road systems. The only factor keeping Izembek Lagoon from being Alaska's foremost waterfowl viewing area is its distance from population centers.

WATERFOWL IN WESTERN ALASKA

Western Alaska annually supports more nesting ducks and geese than any other region in Alaska.* Millions of other waterfowl also pass through the region, particularly coastal areas on the Yukon-Kuskokwim Delta, on their way to and from northern areas in Alaska, Canada and Russia. Waterfowl habitat in Western Alaska is in relatively pristine condition, since industrial activities have not yet reached this region.

The most concentrated goose nesting occurs on the outer coast of the (Y-K) Yukon-Kuskokwim Delta from Kipnuk north to Scammon Bay. This area probably has more geese per square mile than any other production area in the world. Other important goose production areas include the remainder of the Y-K Delta, the Koyukuk Valley and the Innoko River Valley. In addition, hundreds of tributaries of the Kuskokwim, Stony, Innoko, Tanana and Yukon Rivers support thousands of Canada and white-fronted geese annually.

Major duck nesting areas in the region are on the Y-K Delta and valleys of the Yukon, Innoko, Stony, Tanana, Kuskokwim and Koyukuk Rivers. For the 26,000 square miles of Y-K Delta nesting habitat, a portion of which lies outside of the Western Region, the average annual breeding duck population is 1,472,600 birds, or about 55 ducks per square mile. Dabblers comprise 413,500, and divers 359,800 birds. An additional 700,000 are nongame ducks. The total fall duck flight from the Delta is calculated to be 2,446,300 birds. Breeding duck densities for the Innoko Valley, lower Koyukuk Valley and Tanana-Kuskokwim Valleys are about 43, 32 and 67 birds per square mile, respectively.

The average fall flight from Western Alaska is about 4 million ducks and 616,000 geese each year. The goose estimates by species are: brant - 90,000, emperor - 148,000, white-front - 178,000 and Canada - 290,500. White-fronted geese on the Y-K Delta comprise nearly the entire Pacific Flyway population.

Whistling swans are found throughout the Delta but are concentrated on the outer coast north of Kipnuk. The population on the Y-K Delta is estimated to contain 40,000 birds which migrate primarily to West Coast wintering areas in Nevada and central California. Trumpeter swans inhabit forested areas in all major river valleys but occur in low densities. Perhaps 200-300 trumpeters occur in the region.

The outer coast of the Delta and areas near Cape Newenham are heavily used during migration periods by ducks and geese. Large pre-migration concentrations of lesser Canadas, cacklers and brant are also found on Nunivak Island. Besides ducks and geese from the Delta, about 200,000 snow geese from Wrangell Island in Russia and the remainder of the black brant population from the North Slope and Canada use these areas during spring and fall, although fall use is greater. Off-shore areas in the region are major migration routes for millions of eiders and other birds.

* A list of the waterfowl species considered in these plans follows this regional account.

Waterfowl production success on the Delta and to some extent in inland river valleys is influenced primarily by spring temperatures and snow cover. "Early" springs promote good production while "late" springs cause poorer breeding conditions. High, wind-blown storm tides have destroyed substantial numbers of duck and goose nests in some years. Such tides destroy nests several miles inland. Flooding is probably the major factor affecting production, especially in the lower Innoko, Yukon and Koyukuk Valleys. However, periodic flooding, although detrimental for one season, undoubtedly increases overall productivity of river valley ponds by "flushing" and depositing new fertile silt on the pond bottoms.

Waterfowl in Western Alaska are used primarily for local domestic purposes. The volume of such use in the region far exceeds that in any other region in Alaska. In 1964, an estimated 83,000 geese, 35,000 ducks, 5,600 swans and 1,000 cranes were taken and about 40,000 eggs collected by local residents on the Y-K Delta. Harvests for Western Alaska villages not included in the 1964 survey were estimated in 1974 to total another 5,000 geese and 8,000 ducks. Because most hunting for domestic use occurs during the closed season in the spring, those species arriving earliest (geese, mallards and pintails) receive the most use. Spring harvest occurs mainly on the most productive segment of the region's goose populations - mated pairs of birds which are the first geese to arrive in the spring.

Relatively little sport harvest of waterfowl occurs in Western Alaska, although hunting is excellent in many areas. Remoteness and lack of accommodations in the best hunting areas discourage recreational use. Some sport hunting occurs near Bethel, Galena and McGrath. Access is primarily by boat for local hunters and by aircraft for others. During the past four years the sport hunter harvest of ducks and geese in Western Alaska has averaged 2,000 ducks and 650 geese each year.

Nonconsumptive use of waterfowl is limited to local residents, tourists and other visitors to towns and villages. Neither domestic utilization, sport hunting, nor nonconsumptive use of waterfowl are expected to change markedly before 1980.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*

	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	GreenWinged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*
Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

WATERFOWL IN INTERIOR ALASKA

Interior Alaska annually supports millions of breeding waterfowl* and other birds which are enroute to or from breeding grounds in northern and western parts of Alaska and Canada. Major breeding and migration concentration areas are the Yukon Flats, Minto Flats, Tetlin area, Tanana Valley and the upper Koyukuk River Valley. However, thousands of small river and stream valleys which flow into the major rivers in the region, have substantial nesting duck and goose populations. Wintering waterfowl are rare, but a few birds are present where open water exists.

Breeding habitat Interior Alaska is limited by the mountainous character of much of the region. Most waterfowl habitat is located in the major river valleys. The broad Yukon Flats, formed by the Yukon and Porcupine Rivers, is the state's most productive area for ducks. An estimated 1,073,600 ducks annually nest on the flats. Of these 49 percent are dabbling ducks and 51 percent are divers. Of the divers, a relatively small percent are nongame species. Most of the 26,000 old squaws (nongame) annually counted in late May are migrating and do not nest in the area. The breeding duck population averages over 99 birds per square mile in 10,800 square miles of habitat. This density is the highest in Alaska and equals that found in prime habitat in southcentral Canada and the northcentral U.S. The annual fall duck flight from the flats is an estimated 2,019,900 birds.

The Tanana Valley including the Tetlin and Minto areas, and the Lake Minchumina area have in total an estimated breeding duck density of about 67 birds per square mile. The total annual breeding duck population from these areas exceeds 300,000 birds and the fall flight, after production, is over 560,000 ducks. Species composition is 46 percent dabblers and 54 percent divers.

The upper Koyukuk Valley contains about 3,000 square miles of waterfowl habitat and an annual breeding duck population of 97,000 birds, or over 32 ducks per square mile. Species composition is similar to other areas except for a larger percentage of nongame ducks. The total annual fall flight is estimated at over 175,000 ducks.

White-fronted and lesser Canada geese nest in this region. Lesser Canadas are found primarily on islands in the Yukon River, on the Yukon Flats, in the Minto area, in the Lake Minchumina vicinity and in the Tanana Valley from Fairbanks west. The total fall flight of Canada geese from the region is conservatively estimated at 6,000 geese. White-fronts are found primarily on Minto Flats, the Yukon Flats and in the Koyukuk Valley. The total fall flight is estimated to be 15,000 geese.

Trumpeter swans are found throughout the central Tanana Valley and in lesser numbers in the Lake Minchimina area and the upper Koyukuk Valley. Fall flights from Interior Alaska contain 750-1,000 trumpeters. Whistling swans do not nest in this region.

* A list of waterfowl species considered in these plans follows this regional account.

Waterfowl production in Interior Alaska is influenced primarily by flooding and weather. Flooding occurs periodically, and is most influential on the Yukon Flats, Minto Flats and in the Koyukuk Valley. During years of widespread flooding, duck production is reduced. However, flooding is probably beneficial in the long term as ponds are "scoured" and new fertile silt is deposited. In years with "late" springs, production is less than in years when snow and ice cover disappear early in the season. Waterfowl habitat in this region, like most of Alaska, is in excellent condition. The lack of industrial or resource development activities has allowed habitat to remain in unaltered condition.

Waterfowl in Interior Alaska are utilized both for domestic and recreational hunting. Local residents take an estimated 3,500 geese and 15,000 ducks for domestic use annually. Swans are also taken in small numbers. Although hunting seasons are adequate, the opportunity for sport hunting is limited by the early freeze-up of Interior hunting areas. Hunters are limited to about 30 days of hunting before cold weather and ice drives the birds south.

About 20 percent of all Alaskan sport hunters live in Interior Alaska. About 17 percent of the state's total hunter use days, 19 percent of the duck harvest and 8 percent of the goose harvest occur here. Over 85 percent of the duck harvest is made up of pintails, mallards, widgeons, shovelers and green-winged teal. Canada and white-fronted geese comprise almost the entire goose harvest. The locations of major hunting activity and waterfowl harvest are: Minto Flats, Salchaket Slough, Eielson AFB, the Delta area, Healy Lake and the road system near Tok. Minto Flats is the most popular hunting area; it is accessible by road, boat, and aircraft. Other areas of lesser activity are reached mainly by automobile and boat. A significant amount of waterfowl hunting occurs in conjunction with moose hunting in areas accessible only by aircraft, such as the Yukon Flats and the Koyukuk River Valley.

Nonconsumptive use of waterfowl is greatest at the Fairbanks Wildlife Management Area during spring waterfowl migration in late April and early May, where fields cleared of snow attract large numbers of ducks and geese. Many people take advantage of the opportunity to view waterfowl. Nonconsumptive use occurs in other areas near towns and villages and along the road systems wherever concentrations of birds occur.

Both sport hunting and nonconsumptive use is expected to increase as human population increases. The average annual number of hunter days during the past four years has been 9,200. By 1980, an anticipated 12,000 days spent hunting will annually occur in the Interior region. Domestic utilization is not expected to change markedly.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	GreenWinged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*
Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*

Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

FAIRBANKS WATERFOWL

LOCATION

In Game Management Unit 20C, the state-owned land about two miles west of Fairbanks formerly known as Creamers Field, lying between Farmers Loop Road and College Road.

THE SPECIES

The Fairbanks Wildlife Management Area is most noted for its spring concentrations of migrating waterfowl. During late April thousands of ducks and geese use the snow cleared fields. Canada and white-fronted geese, pintails, mallards, widgeons, shovelers, green-winged teal and cranes are the most abundant species. Summer populations of waterfowl are small, primarily because little good brood rearing water exists. However, a limited number of ducks, geese and cranes are known to nest on the area each year. Fall populations of waterfowl concentrating on this area are much smaller than those in the spring, apparently due to lack of water. However, several thousand ducks and several hundred geese and cranes utilize the fields during some autumns.

Thousands of people visit the area during a two-week period in the spring to view the birds. Viewers are primarily residents of the Fairbanks area and include individuals, families and students from the elementary, secondary and college levels. Some years snow is removed from the field immediately in front of the parking area and grain is dispensed to help hold the birds and enhance viewing opportunities. Other human uses of the area include dog mushing, retriever training, skydiving, cross country skiing, hiking, snow machining and hunting. These uses have been slight to date, and because of their seasonal nature, they have not conflicted with waterfowl enhancement and viewing potentials.

PAIMUT SLOUGH WATERFOWL

LOCATION

In Game Management Unit 21: T21N, R55W, Sections 5-8, 17-20, 29-32; T21N, R56W, Sections 1-36; T21N, R57W, Sections 1-36; T21N, R58W, Sections 1-36; T20N, R57W, Sections 1-36; T20N, R58W, Sections 1-36; T20N, R59W, Sections 1-36

THE SPECIES

The estimated average annual breeding duck population on the area is 12,100 birds, or 53 ducks per square mile over 228 square miles of habitat. Species composition is about 73 percent dabbler, 23 percent diver and 4 percent nongame ducks. The average fall flight is estimated to be 22,400 ducks. Lesser Canada geese, white-fronted geese and cranes also breed in the area in large numbers. Both whistling and trumpeter swans may also breed in the area. Larger lakes are major fall staging areas for ducks, Canada geese and white-fronts. Total bird use during both spring and fall migration probably exceeds 250,000 ducks and 100,000 geese.

Sport hunting pressure is light primarily because of the distance from population centers and the lack of public-use cabins. An estimated 10 sport hunters annually use the area. Access is primarily by aircraft from Aniak although a few local residents of Holy Cross boat to the area. Illegal spring domestic utilization by local residents of Holy Cross is substantial. Except for local hunters and occassional visitors, nonconsumptive use of waterfowl on the land is nonexistant.

MINCHUMINA WATERFOWL

LOCATION

In Game Management Unit 20C: T12S, R24W; T12S, R23W; T11S, R24W, Sections 19-36; T11S, R23W, Sections 19-36; T11S, R25W, Sections 1-3, 9-12, 16-18, 22-24, 28-30, 33-36; T12S, R25W, Sections 1-3, 9-12, 16-18, 22-24, 28-30, 33-36, McKinley Quadrangle.

THE SPECIES

Large spring and fall migrant waterfowl populations occur in the Minchumina area. Probably over 100,000 birds are present each season. The area supports a relatively dense breeding duck population of about 67 birds per square mile. Several thousand ducks and geese reportedly molt on the large lake during mid-summer. Trumpeter swans also breed in this area in low densities, producing a fall flight of 25-40 birds.

Hunting pressure is currently very light. A few local residents and visitors hunt in the fall. Illegal spring hunting is also light in intensity. Access to the area is limited to aircraft. A privately owned commercial operation on the main lake has a small number of overnight facilities to accomodate hunters. However, fishermen and BLM fire crews are the main users of these facilities during the summer. Except for fishermen during the summer and fall, local residents, and BLM firefighters, nonconsumptive use is limited.

WATERFOWL IN NORTHWESTERN ALASKA

Northwestern Alaska annually supports over 3/4 million nesting ducks and over 70,000 geese.* Several million additional waterfowl utilize habitat in this region on their way to and from North Slope, Canadian and Russian breeding grounds. Waterfowl habitat in the region is in relatively pristine condition since industrial and developmental activities have been limited in the area.

Nesting habitat is limited by the mountainous character of much of the region. Major production areas include the Kobuk River Valley-Selawik Lakes-Noatak River Valley complex, and the Imuruk Basin on the Seward Peninsula. Waterfowl production in this area, as in many areas of Alaska, is strongly influenced by weather. Late snow cover and cold weather during some springs result in poor production, while "early" springs usually result in fairly good duck and goose production.

Breeding duck densities in the river valley complexes at the head of Kotzebue Sound average 44 birds per square mile over 5,350 miles of habitat. Annual breeding duck populations average 104,500 dabblers, 129,200 divers, of which 44,200 are nongame ducks. The fall flight averages about 400,000 ducks. On the Seward Peninsula breeding duck densities average 64 birds per square mile over 3,850 square miles of nesting habitat. Breeding duck populations average 102,400 dabblers and 83,200 divers of which 29,900 are nongame ducks. The fall flight averages about 410,000 after production of young. Other numerous but small pockets of nesting habitat occur throughout the region but remain unsurveyed. These areas produce thousands of additional ducks.

The annual fall flight of geese from Northwestern Alaska includes about 25,000 lesser Canada geese, 30,000 white-fronted geese and a few thousand brant and emperor geese. In addition summer concentrations of up to 20,000 nonbreeding emperor geese annually molt on St. Lawrence Island, and several thousand molting white-fronted geese and about 10,000 lesser Canada geese occur near the headwaters of the Noatak River. Lagoons east of Nome and the series of lagoons on the north side of the Seward Peninsula are important to migrant waterfowl, and provide the only large sheltered waters between the Yukon Delta and the North Slope. Large concentrations of brant and pintails are common on the lagoons during spring and late summer. Snow goose colonies present in the Shishmaref area around 1900 apparently were eliminated by the reindeer industry. Whistling swans are fairly common throughout the region where suitable habitat exists. The total fall flight of whistlers is perhaps 10,000 birds.

Waterfowl in Northwestern Alaska are utilized primarily for local domestic purposes. Domestic utilization occurs at every town and village in the region but is most important in coastal villages. The Land Use Planning Commission for Alaska estimated about 42,000 ducks, 15,000 geese and about 6,000 eggs were taken by residents in the area in 1974.

* A list of waterfowl species considered in these plans follows this regional account.

Some sport harvest of waterfowl occurs in Northwestern Alaska, primarily near Nome. Although hunting is excellent in many locations, especially along the coast, hunters are limited by a short season--usually 2 or 3 weeks--before freezeup. During the past four seasons sport harvests have averaged 2,460 ducks and 665 geese. Most ducks harvested are probably pintail while most geese are black brant.

Nonconsumptive use of waterfowl is primarily limited to village residents and tourists. Guided tour groups of bird watchers from the other states visit Nome and Kotzebue each year. Nonconsumptive and recreational consumptive use is expected to increase as human population grows in the region. Significant changes in the amount of domestic utilization are not anticipated.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	Green-Winged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sposa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*

Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

NORTHERN ALASKA WATERFOWL

LOCATION

Game Management Units 18 and 21-26 except the Paimut Waterfowl Management Plan area.

THE SPECIES

Northern Alaska provides extremely important habitat for millions of North American waterfowl. More than 3,000,000 ducks and 400,000 geese nest in the area annually. Fall migrations to the south number more than 6,000,000 ducks, 900,000 geese, and 60,000 whistling swans. Of the total fall waterfowl flight from Alaska, the northern area contributes about 75 percent of the ducks and 90 percent of the geese. Important breeding areas in the Northern Alaska area include the Yukon-Kuskokwim Delta, Imuruk Basin and lower Kobuk-Selawik-Noatak Valleys in western coastal Alaska; the Yukon Flats and the Koyukuk and Innoko River Valleys in the Interior; and to a lesser extent the Arctic coastal plain and barrier islands.

Domestic consumption by local residents is the dominant use of waterfowl throughout the Northern Alaska area. Although residents of all towns and villages in proximity to waterfowl habitat utilize waterfowl, the greatest use occurs along the coast. The majority of use is illegal and occurs in the spring when newly arrived birds are a source of fresh meat. Intensive use of eggs in some areas also occurs. Although recent accurate estimates of domestic use are not available, rough estimates place annual domestic utilization at 125,000 ducks, 110,000 geese, and over 60,000 eggs. By far the greatest use occurs around villages in the lower Yukon and Kuskokwim drainages, including the Yukon Delta, followed by northwestern Alaska villages. Boats, float travel and snow machines are the primary means of access for local residents.

Very little recreational waterfowl hunting takes place over most of Northern Alaska because the majority of waterfowl areas are long distances from major population centers and because early freeze-up limits the time available for sport hunting to a few weeks. Sport hunting near large communities or by relatively few hunters who utilize aircraft to reach distant hunting locations is very limited. Nonconsumptive uses, such as viewing and photography, are almost nonexistent except in areas close to communities or as an incidental use to other outdoor activities. Few changes in waterfowl use patterns are expected in the next five years.

The following is a list of specific locations within the Northern Alaska area where use by waterfowl and/or use of waterfowl is important. These areas are not discussed in other management plans, but are places where regulation of human use or habitat protection is desirable. For each area the applicability of management guidelines is indicated.

Area	Management Guideline No.					
	1	2	3	4	5	6
Yukon River Flats	X	X	X		X	X
Kanuti Flats	X	X	X		X	X
Lower Koyukuk Valley	X	X	X		X	X
Howe Island	X				X	X
Egg Island	X				X	X
Spy Island	X				X	X
Thetis Island	X				X	X
Bug Island	X				X	X
Pt. Barrow Spit	X	X	X	X	X	X
Coastal lagoons - Barrow to Camden Bay	X	X		X	X	X
Shishmaref Lagoon	X	X			X	X
Lopp Lagoon	X	X			X	X
Safety Lagoon	X	X			X	X
Coastal waters off Clarence Rhode NWR (and State Refuge)	X	X			X	X
Coastal waters off Arctic NWR (and State Refuge)	X				X	X
Coastal waters off Cape Newenham NWR (and State Refuge)	X				X	X
Coastal waters - Pt. Lay to Wainwright	X	X			X	X
Coastal waters in Kotzebue Sound	X	X			X	X

WATERFOWL IN ARCTIC ALASKA

Arctic Alaska annually supports hundreds of thousands of breeding and molting waterfowl* plus several million birds going to and from Arctic Canada nesting grounds. Primary breeding habitats occur north of the Brooks Range on the coastal plain, generally below 600' elevation. Coastal barrier islands are also important for eiders and other nesting birds. River deltas are especially important for migrants as they are the first areas to have open water in the spring. The large lakes in the Lonely-Cape Halkett area are heavily used by molting white-fronted and Canada geese, black brant and snow geese. Large concentrations of molting old squaw ducks and other birds are found on coastal lagoons between the barrier islands and the mainland.

Aquatic habitat in this region is extensive but does not procure great numbers of waterfowl. Even with long periods of continuous sunlight, the waters are cold and plant productivity is lower than other Alaskan waterfowl habitats. Snow cover and cold weather virtually preclude waterfowl production during some years. Productivity in coastal estuarine habitat is limited because low tides in Arctic Alaska are insufficient to create wide and productive intertidal flats. Except for coastal barrier islands waterfowl habitat in this region is quite stable and is generally in good condition. Barrier islands gradually change because of tidal action and severe storms. These islands are essential to creating inshore lagoons and associated waterfowl habitat.

Extensive breeding duck surveys, conducted over most of Alaska, have not been made in Arctic Alaska. However, results of some intensive aerial and ground surveys indicate average breeding duck populations over the 23,000 square miles of nesting habitat are: dabbling ducks - 228,300; divers - 20,400 and nongame ducks - 309,500. Collectively, these ducks are estimated to produce 248,800 young. The average fall flight of geese from the region is estimated at: white-fronted - 175,000, Canada - 35,000, black brant - 10,000, emperor - 2,000, and snow - 500. The flight of white-fronted geese represents over half of the Mid-continent Population. The only known snow goose colony in Alaska occurs on Howe Island in the Sagavanirktok River Delta.

An estimated average of 10,000 whistling swans originate from the Arctic Region and migrate primarily to Chesapeake Bay and other East Coast wintering areas. Trumpeter swans are rare and probably do not nest in the region.

Waterfowl in Arctic Alaska are utilized primarily for domestic consumption, with most of the harvest occurring outside of the legal hunting season. Most harvest occurs at Barrow, but birds and eggs are taken at all towns and villages, especially those along the coast. Two estimates of eider harvest at Barrow are available. In 1954 the kill was estimated to be 11,000 and in 1970 8,800 birds. A 1974 Land Use Planning Commission study estimated the total native subsistence harvest on the Arctic Slope

* A list of waterfowl species considered in these plans follows this regional account.

to be: ducks - 16,600; geese - 960; and eggs collected (all species) - 45,000. The spring take depends a great deal on the success of whale hunts. Domestic utilization in Arctic Alaska is not known to adversely affect any waterfowl species.

Sport hunting for waterfowl is limited primarily to the Barrow area and only a few hundred birds are taken annually. Very few people travel to the Arctic for waterfowl hunting primarily because of the cost, lack of accommodations and the short season. Many birds leave the region by September 1 and by mid-September all birds are gone, except for eiders and old squaws along the coast.

Nonconsumptive use of waterfowl is low and is limited primarily to areas near towns, villages, DEW line sites and oil drilling camps. Neither sport hunting, domestic utilization or nonconsumptive use of waterfowl is expected to appreciably increase in the forseeable future.

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
Dabbling Ducks	Aleutian Common Teal	*Anas crecca nimia*
	American Widgeon	*Mareca americana*
	Baikal Teal	*Anas formosa*
	Black Duck	*Anas rubripes*
	Blue-Winged Teal	*Anas discors*
	Chinese Spot Bill	*Anas poecilorhyncha zonorhyncha*
	Cinnamon Teal	*Anas cyanoptera*
	European Widgeon	*Mareca penelope*
	European Common Teal	*Anas crecca crecca*
	Falcated Teal	*Anas falcata*
	Gadwall	*Anas strepera*
	Garganey	*Anas querquedula*
	Green-Winged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*

Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polystiota stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

BLACK BEARS IN SOUTHEASTERN ALASKA

Black bears (*Ursus americanus*) are distributed throughout Southeastern Alaska on both the island and mainland areas with the exception of Admiralty, Baranof and Chichagof Islands and a few of the smaller offshore islands. They are abundant throughout their range in the region, and with the exception of deer, are the most commonly encountered big game animal in this area.

The areas in which black bears occur coincide closely with the distribution of forests but seasonal variations in habitat use are apparent within this vegetative zone. Black bears prefer open forests rather than dense stands of timber, and the highest densities of black bears generally occur in areas having interspersed vegetation types. Semi-open forested areas with understory composed of fruit-bearing shrubs and herbs, lush grasses and succulent forbs are particularly attractive to black bears. Extensive, open-canopy areas are generally avoided. Most of Southeastern Alaska's mature forest has a semi-open canopy, a good understory of food producing plants and is excellent black bear habitat. Black bear densities are probably higher on the islands than the mainland area because of the greater percentage of usable habitat on the islands. The mainland contains large amounts of ice and rock and the beaches tend to be steeper and rockier than on much of the island habitat. On the mainland competition with brown bears may also be a factor.

In spring, black bears are frequently found in moist lowland areas where early growing green vegetation is available. The sedge and grass areas of open beaches are particularly important. The first skunk cabbage, which is an important food, also appears in these beach fringe areas. Clearcuts less than 20 to 30 years of age that are at lower elevations also receive considerable use in spring.

Black bears spend the summer in transition from beach areas to berry-producing areas and along fish streams. Summer use of berries by black bears occurs from sea level to alpine areas. Some salmon become available in late July but fish are not present in large enough numbers to become an important food item until mid-August or later. By the end of September most salmon spawning is completed with the exception of some streams with late chum and coho runs and there large numbers of bears can be found into late October and even November. Black bears are capable of traveling long distances and have shown a remarkable homing ability in returning to their home ranges when transplanted to other locations. Some of the longer movements may be associated with travels to major fish streams in the fall.

Little information is available regarding natural controls on black bear populations and the degree of population fluctuations. Deep, long-lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability

of new green vegetation after emergence. Some bears are killed by other bears and by wolves, but the extent of such predation is unknown. Cubs are precocious; some orphans as young as five months of age have survived without maternal care. Parasites and diseases do not cause significant mortality. One parasite of concern to man, Trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten.

Black bears in Southeastern Alaska are primarily used for recreational hunting for skins and meat. Despite traditionally liberal hunting seasons and bag limits, the harvest of this species in Southeastern has remained near 200 bears annually.

Black bear hunting is popular in spring when they, brown bears, and wolves are the only species of big game that can be legally taken. Hunters seek bears shortly after the bears emerge from hibernation when the hides are usually of excellent quality. Bears are also more concentrated and available to hunters along the beaches in spring; hunting from boats is both enjoyable and successful. Hide quality deteriorates as the winter hair is shed and rubbed spots appear, and most sport hunting ceases by mid-June. The harvest of males is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation.

Sport hunting of bears resumes in September when hides have improved in quality and continues until bears den for the winter. Many of the black bears harvested in the fall are taken incidental to hunts for other species, particularly deer and waterfowl.

Southeastern Alaska mainland black bears occur in three main color phases with the common black phase accounting for about 90 percent of the harvest over the past two years. The cinnamon phase provided about 9 percent of the harvest during this period and the blue color phase, found mainly around Yakutat, one percent. Nearly 100 percent of the bears taken on Southeastern Alaska islands are of the black color phase.

SOUTHEAST ALASKA BLACK BEAR

LOCATION

Game Management Units 2-5 and that portion of Game Management Unit 1 not included in the Behm Canal Black Bear Management Plan area or in Glacier Bay National Monument.

THE SPECIES

Black bears are relatively abundant throughout Southeastern Alaska. Seasonal concentrations of bears occur on beaches and tidal areas during the spring and along salmon streams in fall. Black bear populations appear to have been stable for the past several years. Little is known of natural mortality factors. Three principal color phases of black bears occur on the mainland: black, cinnamon, and blue (glacier) bears. Almost all black bears on the islands are of the black color phase.

Prime black bear habitat in Southeastern Alaska consists of climax, semi-open, mature forest with a good food-producing understory. The only activity which has significantly altered this black bear habitat has been large-scale, clear-cut logging. Although clear cutting was used as early as the late 1800's, it did not reach significant proportions until the early 1950's. Clear-cut logging occurred at an annual rate of 16,300 acres during 1971, 1972 and 1973 and has since increased. Most logging has occurred in the southern portion of the area. Long-range U.S. Forest Service plans call for clear-cutting most commercially valuable timber; it is unknown at this time what effect the change from a climax to a second-growth forest will have on black bears, as the species appears to adapt to numerous habitats.

Most human use of black bears in Southeastern Alaska is recreational hunting for skins and meat. Photography and observation are significant uses but are usually incidental to other forms of activity. Hunter success for black bears has been generally high in the area. The number of bears harvested appears to be low compared to population size. The reported black bear harvest was 162 in 1974 and 191 in 1975. Males comprised about 80 percent of the harvest for both years. The black color phase accounted for about 90 percent of the harvest, the cinnamon phase 9 percent and the blue (glacier) phase 1 percent. The blue phase is found primarily near Yakutat. Hunters prefer the blue and cinnamon color phases, and this selectivity may increase representation of these color phases in the total harvest.

Over three-fourths of the annual harvest occurs in the spring, particularly during May. Black bears are most available to hunters in spring when they are concentrated on the grass flats of estuarine areas. Hunting effort is high at this season because black bears, brown bears, and wolves are the only species of big game that can be legally taken in the spring, because hides are of excellent quality early in the year, and because bears are readily available to boat hunters. Black bears are also hunted in the fall but often incidental to hunts for other species, particularly deer, goat, and waterfowl.

Local residents primarily from Ketchikan and Juneau account for most of the black bear harvest. About 74 percent of the kill in 1974 was by residents; in 1975 the resident take was 63 percent. The decrease in kills by residents was due to an increase in the proportion of bears taken by unguided nonresidents, from 9 percent in 1974 to 20 percent in 1975. Guided nonresidents accounted for 17 percent of the kill in both years. The heaviest use by nonresidents occurs in Game Management Units 2 and 3. Guides are most active in Unit 3. In 1975, 62 percent of the Unit 3 harvest was taken by nonresidents.

Marine waterways provide almost unlimited access to black bear hunting areas in Southeastern Alaska for hunters using aircraft or boats. Most successful hunters utilize boats. Relatively few bears are taken along roads due to the limited road system and roadside hunting closures near communities.

Despite traditionally liberal hunting seasons and bag limits, hunting has not noticeably affected black bear populations. The harvest remains small except near larger communities where increases in hunting pressure have resulted from both an increased interest in hunting black bears and an increasing human population. Besides the sport harvest, at least eight bears were killed in the past two years in defense of life and property.

The liberal September 1 to June 30 season has remained unchanged since statehood. Restrictions prohibiting the taking of cubs and females accompanied by cubs have been in effect since 1963 for the blue (glacier) color phase, and since 1967 for all color phases. In 1971 the bag limit was reduced from three to two bears because of the increasing demand for black bears as big game trophies.

PETERSBURG CREEK BLACK BEAR

LOCATION

In Game Management Unit 3, the drainages of Petersburg Creek on Kupreanof Island.

THE SPECIES

Although black bears are commonly observed within the Petersburg Creek drainage, there is little information available on population status. The lower four miles of the drainage is estuarine habitat. Grass flats parallel either side of the stream. Black bears are attracted by the vegetation during spring and summer months and by the availability of salmon in the upper streams during late summer and fall.

Petersburg Creek is an exceptional sport fishing stream, attracting both resident and nonresident fishermen. Access to the lower reaches of the stream is by boat (only a few minutes from Petersburg). The stream originates from Petersburg Lake which is accessible by either foot trail or aircraft. The entire Petersburg Creek system is a popular recreation site and the wild character of the area is very attractive. The opportunity to observe black bears increases the total experience by area users. In 1975, the drainage was closed to black bear hunting by public request. Prior to the closure, several black bears were taken each year by hunters. The easy access by skiff and the closeness to a population center made bears very vulnerable to hunters. The majority of the public supported the closure, considering it more valuable to observe than to hunt black bears, and there has been little opposition to the closure since 1975.

BLIND SLOUGH BLACK BEAR

LOCATION

In Game Management Unit 3, the Blind Slough - Blind River area on Mitkof Island between Wrangell Narrows and Sumner Strait, bounded on the northeast by the Mitkof Highway and on the southwest by a line lying 1/4 mile southwest and paralled to Blind Slough and Blind River.

THE SPECIES

The Blind Slough area is a small portion of black bear habitat on Mitkof Island. It is about ten miles in length and averages less than one mile in width. Little data are available on actual population status; however, black bears are common on all of Mitkof Island. There are seasonal concentrations along Blind Slough providing a better opportunity to observe black bears than on most other areas of the island. In spring bears are attracted to vegetation on grass flats and in summer and fall by the presence of salmon in the numerous small streams which drain into Blind Slough. Usually the observer doesn't see large numbers of bears, normally less than five, but observations are enhanced by the aesthetically pleasing conditions of the area.

Blind Slough is a high use recreation area. Estuarine habitat is present at the northern and southern extremities and the entire slough is bounded by grass flats. The Mitkof Highway parallels the slough and much of the area used by black bears is visible from the highway. Blind Slough is an excellent sport fishing location. There are several public campgrounds along the slough and the area receives much recreational use by both local residents and tourists. The opportunity to view black bears contributes to the total experience. Less than five black bears are normally taken annually by hunters within the area.

ANAN CREEK BLACK BEAR

LOCATION

In Game Management Unit 1B, the drainage of Anan Creek on the Cleveland Peninsula.

THE SPECIES

The lower portion of Anan Creek has historically been noted as a good location to view and photograph black bears. During summer and fall months, when salmon are spawning in the stream, black bears are abundant, at which time it is not uncommon to observe more than 20 black bears along the stream. Most of these bears are attracted from other areas on the mainland by the abundance of salmon. Few bears are observed in the area when salmon are not present in the stream.

Anan Creek is one of the most popular locations to view and photograph black bears in Southeast Alaska. Access to the area is by boat or aircraft. The entire drainage is within the Tongass National Forest and the Forest Service maintains two cabins and an observatory adjacent to the stream. In 1975 there were 600 man-days use of these cabins by 178 individuals, primarily observing and photographing black bears. The drainages of Anan Creek have been closed to the taking of black bears since prior to Statehood.

BEHM CANAL BLACK BEAR

LOCATION

All of the mainland portion of Game Management Unit 1A except that part of the Cleveland Peninsula south of Spacious Bay.

THE SPECIES

Black bears are abundant throughout the timbered and adjacent portions of the area. Seasonal concentrations occur along beaches and tideflat areas in the spring and along salmon creeks in late summer and fall. The population appears stable and natural mortality does not seem excessive. The population has few bears of trophy size. None of the skulls from bears taken in this area in 1974 and 1975 made the Boone and Crockett listing. The area contains cinnamon colored black bears that are not normally found on islands in Southeastern Alaska. The climax spruce, hemlock and cedar forest habitat is unlikely to change in the near future. The commercial quality of the timber is generally lower than on the islands in Southeastern Alaska; this area has been given a low priority for development by the U.S. Forest Service.

All forms of human use of black bears in the area are light in intensity. The predominant use is recreational hunting. The only change in black bear hunting regulations in the area since 1961 has been a reduction of the bag limit from three to two bears in 1971. The number of hunters has increased somewhat but the harvest remains low and hunter success is high. In 1974, 19 bears were taken during the spring and 6 in the fall; in 1975 the kill was 15 bears in the spring and one in the fall. Most bears are taken in the spring when no other big game hunting seasons are open. Bears killed in the fall are usually taken incidental to deer, goat and waterfowl hunting.

The current harvest has not noticeably affected the bear population although the sex ratio has probably been altered somewhat by the large percentage of males taken. Approximately 90 percent of the spring harvest and 68 percent of the fall harvest for the past two years has been males.

Local residents account for most of the bears harvested. No professional guides operate in the area. Hunting for hides is the primary use with few bears used for food. Considerable hunter effort is expended for bears of the cinnamon color phase. A total of ten cinnamon bears were reported taken in 1974 and 1975.

Transportation used for bear hunting in the area is primarily boat. Over the past two years 68 percent of the hunters used boats and the rest used air transportation to reach the hunting areas. Hunting usually occurs along beach and tideflat areas in the spring, particularly at the mouths of the bigger rivers, and along major salmon spawning streams in the fall. Hunters tend to concentrate in the more southern portions of the area. Of the 41 bears taken during 1974 and 1975, 24 came from Boca

de Quadra and Smeaton Bay. The best hunting is a minimum of 50 water miles from Ketchikan and few people take boats this far. There are no fuel or repair facilities in the main hunting area.

Nonresidents are the primary nonconsumptive users of black bears in this area. Viewing and photography occur mainly in late summer months when bears are no longer on beaches and is of minor importance except on the Unuk and Chickamin Rivers. One of two resorts in this area conducts trout fishing trips on these two rivers; observation of bears on the salmon streams is an important part of those trips.

Almost all of the area is owned by the U.S. Forest Service. The few private holdings are small and there are no Native corporation lands in the area. There are private holdings at the mouths of the Chickamin and Unuk Rivers but they should not prevent access to the rivers. The only possible transportation corridor would be along the Unuk River and the feasibility of this is very low.

BLACK BEARS IN SOUTHCENTRAL ALASKA

Black bears (*Ursus americanus*) are widely distributed in Southcentral Alaska, with highest densities occurring in Prince William Sound, on the Kenai Peninsula, and in the lower Susitna Basin. Bear densities are generally lower in interior sections than in southern or coastal areas where foraging seasons are longer and food complexes more diverse. Black bears are absent from most of the islands in the northern Gulf of Alaska.

The areas in which black bears occur coincide closely with the distribution of forests, but seasonal variations in habitat use are apparent within this vegetative zone. Black bears prefer open forests rather than dense stands of timber, and the highest densities of black bears generally occur in areas having interspersed vegetation types. Semi-open forested areas with understories composed of fruit-bearing shrubs and herbs, lush grasses and succulent forbs are particularly attractive to black bears. Extensive, open-canopy areas are generally avoided. Coastal black bear habitat in the northern Gulf of Alaska is restricted by topography to a narrow band of relatively flat land covered by spruce, hemlock and alder which rapidly grades into near-vertical mountains and glaciers. This area has numerous glaciers which bisect the narrow band of bear habitat, forming islands of habitable terrain. These discrete islands of habitat may contain separate bear populations. Elsewhere in southcentral Alaska, spruce and spruce-birch forests form extensive black bear habitat. In spring, black bears are frequently found in moist lowland areas where early growing green vegetation is available. In July and August, coastal black bears congregate along streams in Prince William Sound to feed on spawning salmon. During fall, concentrations of black bears frequently occur in alpine areas in years when berries are plentiful.

Most black bears have relatively small annual home ranges, especially in coastal areas where seasonal movements are altitudinal in nature. However, black bears are capable of traveling long distances and have shown a remarkable homing ability in returning to their home ranges when transplanted to other locations.

Little information is available regarding natural controls on black bear populations and the degree of population fluctuations. Deep, long-lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability of new green vegetation after emergence. Such mortality may cause significant year-to-year fluctuations in bear numbers. Some bears are killed by other bears and occasionally by wolves, but the importance of such losses is unknown. Parasites and diseases do not cause significant mortality. One parasite of concern to man, Trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten. Available information indicates little cub mortality through the first eight months of life. Cubs are precocious; instances are known when orphans as young as five months of age have survived without maternal care.

Black bears in Southcentral Alaska are used primarily for recreational hunting for skins and meat. Despite traditionally liberal hunting seasons and bag limits, the harvest of bears remains relatively small except near coastal communities in Prince William Sound, where large increases in hunting pressure have resulted from development and growth of human populations.

Black bear hunting is popular in spring when bears are one of the few species of big game that can be legally taken. Hunters seek bears shortly after the bears emerge from hibernation, when the hides are usually of excellent quality. Hide quality deteriorates as the winter hair is shed and rubbed spots appear, and therefore most sport hunting ceases by mid-June. The harvest of males is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation.

Sport hunting of bears resumes in September when hides have improved in quality and continues until bears den for the winter. Black bears provide considerable use at this time, but many of the bears harvested are taken incidental to hunts for other species. The proportion of females in the fall harvest is greater in comparison to the spring harvest due to a greater availability of sows that have become separated from grown cubs.

PRINCE WILLIAM SOUND-GULF COAST BLACK BEAR

LOCATION

Game Management Unit 6.

THE SPECIES

Black bears are abundant over much of Prince William Sound and the Northern Gulf of Alaska Coast. They are absent on Kayak, Middleton, Perry, Naked, Green, Montague and Hinchinbrook Islands and are seen occasionally on Hawkins Island. The black bear habitat is excellent. It has received relatively little human disturbance.

Black bear abundance in the area has varied considerably in the past but the reasons for such fluctuation are not known. Winter mortality induced by severe winter and late spring breakup is believed to be the primary factor controlling the population. Spring bear hunting in Prince William Sound may also affect bear abundance.

Spring black bear hunting in the area has become a very popular recreational activity, especially for Anchorage and Fairbanks hunters. Most hunters seek any legal bear and are not too concerned with trophy aspects of hide or skull size. Probably less than 10 percent of the harvest is taken by hunters seeking black bear meat. The majority of the harvest occurs in the spring when black bear concentrate along the beach fringe, especially on alder slides and grassy meadows at the heads of bays. Prior to leaf emergence they are very vulnerable to hunters for a period of about one month. Hunters commonly utilize boats to cruise the beaches to locate bears.

Hunting pressure in Prince William Sound has been fairly intensive since statehood and was the reason for gradual reductions in the bag limit from three bears per year down to one by 1969. The season (September 1 to June 30) has not changed since statehood.

Harvest records from 1974 to 1975 indicate about 100 to 150 black bear are annually taken in the area, with 80 to 85 percent coming from Prince William Sound. Seventy-five to 90 percent of the animals are taken during the spring season, and males constitute about 70 percent of the harvest, Alaskan hunters take about 85 percent of the total harvest; local area hunters take less than 25 percent.

KENAI BLACK BEAR

LOCATION

Game Management Units 7 and 15.

THE SPECIES

Black bears are widely distributed throughout the Kenai Peninsula and have always been relatively common. Although there are no established methods for censusing black bears, public reports and miscellaneous observations by Department personnel indicate populations are high. Black bears occur from alpine tundra to sea level. Population densities appear to be dependent upon the frequency and quantity of salmon runs and berry crops. Bears are particularly abundant along the coastline and the western slope of the Kenai Mountains.

Black bear hunting is a popular pursuit on the Kenai Peninsula. Liberal hunting seasons and bag limits--August 10 to June 30, 3 bears per hunter--have been in effect for a number of years. Both have had a negligible impact on bear populations. Prior to 1973 the only harvest data available were from 1969 harvest questionnaires. These data indicated a minimum annual harvest of 73 bears. Since 1973 the Department has acquired harvest data through mandatory sealing of hides and skulls. The annual Kenai Peninsula harvest for the years 1973 through 1975 was 109, 107 and 146, respectively. Boars have comprised about 55 percent of the annual kill. Most of the harvest (approximately 80 percent) occurs during the fall. Less than two percent of the hunters ever take the full bag limit of 3 bears. About 50 percent of the hunting pressure originates on the Kenai Peninsula. Non-Alaska residents account for about 17 percent of the total kill. The remainder of the harvest is taken primarily by hunters from Anchorage. Alaskan residents generally average three days per successful hunt. Nonresidents average more days hunted than residents because they hunt specifically for black bear, while most residents take bears incidental to hunting other species. Approximately 10 percent of nonresident outings are guided hunts. Most nonresident hunters pursue black bears for trophy hides while resident hunts are for a combination of meat and hide. Large black bears are sought as trophies by resident and nonresident hunters. The frequency of large bears in the population does not appear to be different than that found in other less heavily hunted portions of the state. Most Peninsula residents hunt black bears along roads or employ boats. In recent years, the use of aircraft by non-Peninsula residents has increased. Inclement weather often limits airplane use, however. Bear-human conflicts usually result in the demise of about 2 bears annually. Often these conflicts result from inadequate garbage disposal which draws bears into areas of human activity.

Black bears are most available for viewing and photography during early spring and late fall as they either emerge or prepare to enter winter dens. During this period they are highly conspicious in relation to

vegetation and snow cover. Most non-hunting activities consist of roadside viewing in the northern mountainous portions of the area. Black bear photography during this time period usually involves a hike to alpine tundra. At irregular intervals black bears can be observed at camp grounds scavenging discarded food items. Some black bear viewing and photography occur during the summer along salmon streams where bears tend to concentrate for feeding. Most non-hunting use is by non-Peninsula residents primarily from Anchorage or out of state.

WEST CHUGACH BLACK BEAR

LOCATION

All of Game Management Unit 14C, and in Game Management Unit 7, the drainages of Glacier Creek and Twentymile River.

THE SPECIES

Incidental aerial and ground observations, harvest figures, and reports of black bears in residential areas indicate bears exist in the West Chugach area at a moderate to high level. Present abundance is probably comparable to levels of the past several decades. Most of the area comprises excellent black bear habitat, although a large portion of lowland residential area within Anchorage and surrounding communities is no longer available to bears. Natural mortality among bears in the area has not been documented. Deep, long-lasting winter snows may cause mortality to adults, as well as cubs, by slowing emergence from hibernation and delaying the availability of new green vegetation.

Black bears have been hunted in the area for at least the past 60 years. Harvests prior to 1973 are unknown, but thought to be comparable to present levels. Since the fall of 1973, when sealing of black bears first become mandatory, a total of 31 bears have been legally taken, eight in 1973, four in 1974 and 19 in 1975. These substantial harvest fluctuations do not reflect similar total population changes but rather changing habitat use patterns which affect visibility of bears; in some years, poor berry crops result in few bears utilizing open subalpine areas and the harvest is reduced. More bears (65 percent) have been taken in the fall than in the spring and most bears taken were males. A large percentage of bears are taken either as a result of chance encounters or incidental to hunting other species such as moose. Of the 19 bears shot in 1975, two were killed in resident's backyards and eight were killed during the moose hunting season.

Nearly all bears are taken by local residents, without utilizing the services of a guide. Most hunting is undertaken from established roadways or by foot travel to back country. Several roads and numerous connecting trails provide excellent access to most of the area. Except for the lands around Upper Lake George, most bear country within the area can be reached by a one to ten mile walk from major access points. Boat travel up the Twentymile River allows fair access to its upper reaches.

Current hunting seasons and bag limits in the West Chugach area remain liberal except for the area within Chugach State Park where the bag limit is reduced to one bear and hunting is allowed after Labor Day when Park public visitation rates drop off. Motorized vehicle restrictions have been imposed in the area since 1968.

Other popular uses of black bears include viewing and photography. Although such use occurs at any time of year when bears are active, viewing is particularly

good in late summer and early fall when single bears and family groups are frequently found feeding in alpine berry patches. Portage Glacier Road, the Seward Highway south of Bird Creek, and the Eklutna Road are locations where bears are often observed. Recently established closed areas in Eagle River and the Anchorage hillside area may increase opportunities to view bears.

PORTAGE GLACIER BLACK BEAR

LOCATION

In Game Management Unit 7, the drainages into Portage Creek bounded on the west by the Anchorage-Seward Railroad and on the east by Placer Creek, Portage Lake, the mouth of Byron Creek, Glacier Creek and Byron Glacier.

THE SPECIES

Black bears are common in the Portage Glacier Area and are often observed on the surrounding mountain sides. Part of the population is believed to be transient, and the actual number of bears varies with seasonal food availability. Between 10 and 20 black bears occupy the area. Black bear habitat has been altered somewhat by development, but there has not been a significant reduction in black bear numbers.

Viewing and photographing black bears are the main human uses of the species in the area. Most black bears are seen in or near campgrounds and picnic sites. The scenic values of the Portage Glacier Area are its primary attraction for people. The availability of wildlife for viewing adds to the visitors' experience. Human use of the Portage Glacier Area has almost doubled since the early 1970's; an estimated 286,000 people visited Portage Glacier in 1975.

SUSITNA-NELCHINA BLACK BEAR

LOCATION

Game Management Units 11, 13, 14A, 14B and 16 except Mt. McKinley National Park.

THE SPECIES

Black bears are common throughout forested portions of the Susitna-Nelchina area; however, estimates of numbers are not available. Black bears usually occupy densely vegetated areas where they are not easily enumerated. Within the area bears are most abundant in the drainages of the Susitna and Matanuska Rivers and in the area south of the Tazlina River and west of the Copper River. They are uncommon to rare in the northern portions of the Nelchina Basin.

Black bears are hunted only lightly over much of the area, even though liberal hunting seasons and bag limits have prevailed since statehood. Interest in hunting black bears is presently not high and most bears are taken incidental to hunts for other species, particularly sheep and moose. Some bears are also taken as nuisance animals around cabins. Annual fluctuations in the kill of black bears reflect the availability of bears to hunters rather than population levels. Bears are most vulnerable to hunters when they forage for berries in open or alpine areas in the fall. In years of poor berry production bears are less visible to hunters.

Approximately 250 to 300 black bears are killed each year with about two-thirds of the total coming from the lower Matanuska River and the Susitna River drainages. About one-half of the bears taken in the Nelchina basin come from the area south of the Glenn Highway. More than three-fourths of the bears are taken by Alaska residents. Little guiding directed specifically at black bears occurs. Some nonresidents take black bears on guided "combination" hunts in the Nelchina Basin and in the eastern drainages of the Susitna River.

Hunter access to remote areas is primarily by aircraft or boat. The majority of the harvest is taken near road systems by road-based hunters.

BLACK BEARS IN INTERIOR ALASKA

Black bears (*Ursus americanus*) are widely distributed throughout Interior Alaska. Although bear densities are not as high as in the southcoastal areas of the state, the Interior region provides a larger area of suitable habitat.

The areas in which black bears occur coincide closely with the distribution of forests but seasonal variations in habitat use are apparent within this vegetation zone. Spruce and spruce-birch forests form extensive black bear habitat in Interior Alaska. Black bears prefer open forests rather than dense stands of timber, and the highest densities of black bears generally occur in areas having interspersed vegetation types. Semi-open forested areas with understory composed of fruit-bearing shrubs and herbs, lush grasses and succulent forbs are particularly attractive to black bears. Extensive, open tundra areas are generally avoided.

In spring, black bears are frequently found in moist lowland areas where early growing, green vegetation is available. Horsetail is a major food item from May to mid-July. During the summer and fall some use of spawning salmon occurs but opportunities for such use are limited. Berries are an important food item in late summer and fall, and bears move into alpine and subalpine areas where berries are plentiful.

Little information is available regarding natural controls on black bear populations. Interior populations appear to fluctuate widely in numbers from year to year. Deep, long-lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability of new green vegetation after emergence. Such mortality may cause significant year-to-year fluctuations in bear numbers. Some bears are killed by other bears and occasionally by wolves, but the importance of such losses is unknown. Parasites and diseases probably do not cause significant mortality. One parasite of concern to man, Trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten. Available information indicates little cub mortality through the first eight months of life. Cubs are precocious; some orphans as young as five months of age have survived without maternal care.

Black bears in Interior Alaska are used primarily for recreational hunting for skins and meat. Some bush residents utilize black bears for domestic purposes whenever bears are available. Despite traditionally liberal hunting seasons and bag limits, the harvest of bears remains relatively small. Black bears have long been considered nuisance animals, particularly during years in which populations have been high and bear-human encounters more frequent. Greater interest in black bears as game animals has been evident in recent years, particularly as opportunities to hunt other species have become more limited.

Black bear hunting is popular in spring when they are one of the few species of big game that can be legally taken south of the Yukon River.

Hunters seek bears shortly after the bears emerge from hibernation when the hides are of excellent quality. Hide quality deteriorates as the winter hair is shed and rubbed spots appear, and therefore most sport hunting ceases by mid-June. The harvest of males is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation.

Sport hunting of bears resumes in September when hides have improved in quality and continues until bears den for the winter. Black bears provide considerable use at this time, but many of the bears harvested are taken incidental to hunts for other species. The proportion of females in the fall harvest is greater in comparison to the spring harvest due to a greater availability of sows that have become separated from grown cubs.

UPPER BIRCH-PREACHER-BEAVER CREEKS BLACK BEAR

LOCATION

In Game Management Unit 20 the drainages of Birch Creek above the confluence of Birch Creek with the South Fork of Birch Creek, the drainage of Big Windy Creek, the drainage of Preacher Creek above its confluence with Loper Creek on the south and the North Fork of Preacher Creek on the north, and the drainage of Beaver Creek above its confluence with Moose Creek, including the drainage of Moose Creek.

THE SPECIES

Black bears are distributed throughout the area although they evidently are not particularly abundant. No estimates of numbers of bears have been attempted in this area since they spend much of their life in forested country which makes accurate censuses difficult. However, bears may be seen more easily during certain seasons. In spring many bears move to open grass flats to feed on new shoots, and again in fall when the berries ripen, bears move up to the slopes near and sometimes above timberline to feed. Occasionally bears become very abundant. During 1963-64 and 1970 bears were reported to be common over much of interior Alaska. The reason for these periodic "highs" and specific factors regulating bear populations are not well known. The highs in bear populations seem to correlate with years of poor berry crops. It has been speculated that bears may appear more abundant because they spend more time in these years searching for food in low country where they come in contact with people rather than dispersing into the hills during late summer and fall.

Based on sealing information, this area supports a relatively light harvest of bears. In 1974, two bears were reported taken from the eastern portion, while seven bears were taken in 1975. Four of the latter were harvested in the Beaver Creek Drainage. This small harvest probably is an indication of the light hunting pressure for bears rather than a reflection of bear abundance. Beaver and Birch Creeks receive some recreational use in the summer months when water levels are high enough to allow sport fishermen to navigate these streams; however, the area does not appear to attract people who are specifically interested in hunting black bears.

Birch Creek is accessible from the Steese Highway where the road crosses the river at two locations. Trails heading south from the Steese Highway at Eagle Summit terminate near ridgetops along the north drainages of Birch Creek. The Pinnell Mountain hiking trail, approximately 24 miles in length, extends from Twelve Mile Summit to Eagle Summit north of the Steese Highway. The Portage Creek road provides access to alpine areas near Circle Hot Springs. The headwaters of Beaver Creek are accessible from Mile 55 Steese Highway on the 6-mile-long Nome Creek Trail. Further

access to Beaver Creek is available from the White Mountains Trail, originating from Mile 27 Elliott Highway and terminating at Beaver Creek. Many of these access points are usable for all-terrain vehicle travel only during snow-free periods in summer. Smow machine access is feasible along these trails from October through mid-April. Aircraft access to Beaver Creek occurs at a landing strip on the western end of the White Mountains as well as via float-equipped aircraft along suitable segments of the river.

MINTO-MURPHY DOME BLACK BEAR

LOCATION

In Game Management Unit 20, the area bounded on the south by the Tanana River and the Alaska Railroad, on the east and north by the Murphy Dome Road, Murphy Creek, the Chatanika River, and the Elliot Highway, and on the west by the hydrographic boundary separating the drainages into the Tolovana River from the drainages into the Tanana River below its confluence with the Tolovana River.

THE SPECIES

Black bears are distributed throughout the area and are relatively abundant. No estimates of numbers of bears have been attempted in this area since they spend much of their life in forested country which makes accurate censuses difficult. However, bears may be seen more easily during certain seasons. In spring many bears move to open grass meadows in Minto Flats and along the major rivers to feed on new vegetation. During late summer and fall the bears generally move to open hillsides to feed on ripened berries.

Occasionally bears become very abundant. During 1963-64 and 1970 bears were commonly seen over much of the Interior and particularly in the area of Murphy Dome. The reason for these periodic "highs" and specific factors regulating bear populations are unknown. The highs in bear populations seem to correlate with years of poor berry crops. It has been speculated that bears may appear more abundant because they spend more time in these years searching for food in low country where they come in contact with people rather than dispersing into the hills during late summer and fall.

Bears in Interior Alaska tend to be small but occasionally a record book bear is taken. The quality of the pelt is important when considering trophies. Pelts are prime only during the period of late fall through early spring. The proportion of trophy bears in the population is not known. However, the rate of harvest of bears by hunters in this area is probably as high as anywhere in interior Alaska, and the likelihood of finding a large bear here may be correspondingly lower than in some other areas. But, since bears are relatively abundant, hunters have the opportunity to be selective.

The area is popular as a black bear hunting area. Analysis of harvest data for 1974 and 1975 indicate the drainages of the Tatalina, Tolovana and Chatanika Rivers lying within this area supported a large portion of the total kill in Game Management Unit 20. During 1974, 25 bears (17 males, 8 females) were taken from this area. Nine of these bears were taken by hunters who hunted specifically for bears; the remainder were shot either in defense of life and property or incidental to other recreational pursuits (fishing, moose or duck hunting). Fifty-two

percent of these bears were taken prior to June 30. In 1975, thirty-three bears were taken, consisting of 24 males and 9 females. Fifteen bears were taken by hunters who hunted specifically for bears. Sixty-nine percent of the harvest occurred prior to June 30. The proportion of the bear population taken by hunters is unknown, but the number of large bears in the 1975 harvest indicates that the bear population has not been subjected to overhunting (36 percent of the bear skulls which were measured totalled 17 inches or greater).

Hunting pressure has been almost exclusively by residents who either float the Chatanika or Tolovana Rivers, fly into Minto Flats, or merely drive the Elliott Highway. Portions of the area are easily accessible from the road and trail network along Murphy Dome and the Elliott Highway after spring breakup and prior to snowfall in October. The Chatanika and Tolovana Rivers are generally navigable from June through mid-September. Float-equipped aircraft are capable of landing in ponds and sloughs of Minto Flats from mid-May through September. Several enterprising hunters have realized the value of establishing bait stations for bears, consisting of piles of domestic meat scraps which are checked periodically. Although the village of Minto lies in the northcentral portion of the area, little domestic use of the bear resource appears to occur. Residents of the immediate Fairbanks area are realizing the recreational value of the black bear both as a source of meat and for hide quality.

BLACK BEARS IN SOUTHWESTERN ALASKA

In Southwestern Alaska black bear (*Ursus americanus*) populations are low and limited primarily to the lower Cook Inlet drainages, the Lake Clark area, and the upper Mulchatna River and Chilikadrotna River drainages. Although the southern limit of distribution is Katmai National Monument and the Naknek River, black bears may be expanding their range southward.

In spring black bears are frequently found in moist lowland areas and on the beach fringe where early growing, green vegetation is available. During the summer and fall spawning salmon are eaten whenever available. Berries are an important food item in late summer and fall, and bears move into alpine and subalpine areas where berries are plentiful.

Little information is available regarding natural controls on black bear populations and the degree of population fluctuations. Deep, long lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability of new green vegetation after emergence. Such mortality may cause significant year-to-year fluctuations in bear numbers. Some bears are killed by other bears and occasionally by wolves, but the importance of such losses is unknown. Parasites and diseases do not cause significant mortality. One parasite of concern to man, trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten. Available information indicates little cub mortality through the first eight months of life. Cubs are precocious; some orphans as young as five months of age have survived without maternal care.

Black bears in Southwestern Alaska are used primarily for domestic utilization of meat and skins by local residents. Some recreational hunting of black bears occurs, usually incidental to hunts for other big game species. Despite traditionally liberal hunting seasons and bag limits, the harvest of this species remains relatively small. However, greater interest in black bears as game animals has been evident in recent years, particularly as opportunities to hunt other species in other areas of the state have become more limited, and recreational harvests have increased.

The harvest of male bears is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation. The proportion of females in the fall harvest increases in comparison to the spring harvest due to a greater availability of sows that have become separated from grown cubs.

The harvest by hunters other than local residents occurs primarily in fall when hunting seasons for other big game species are open, but there has been some spring hunting in the Cook Inlet area. Harvests by local residents probably is equally distributed between spring and fall.

BLACK BEARS IN WESTERN ALASKA

Black bears (*Ursus americanus*) are widely distributed throughout forested areas of Western Alaska but seasonal variations in habitat use are apparent within this vegetation zone. Although bear densities are not as high in the vegetation zone. Although bear densities are not as high as in the southcoastal areas of the state, the Western Region provides a larger area of suitable habitat. Spruce and spruce-birch forests form extensive black bear habitat in the Western Region. Black bears prefer open forests rather than dense stands of timber, and the highest densities of black bears generally occur in areas having interspersed vegetation types. Semi-open forested areas with understory composed of fruit-bearing shrubs and herbs, lush grasses and succulent forbs are particularly attractive to black bears. Extensive, open tundra areas are generally avoided.

In the spring black bears are frequently found in moist lowland areas where early growing green vegetation is available. Horsetail is a major food item from May to mid-July. During summer and fall spawning salmon are eaten whenever available. Berries are also an important food item in late summer and fall, and bears move into alpine and subalpine areas where berries are plentiful.

Little information is available regarding natural controls on black bear populations. Populations in Western Alaska appear to fluctuate widely in numbers from year to year. Deep, long-lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability of new green vegetation after emergence. Abnormally cold and snowless winters may also cause increased denning mortality. Berry crop failures may be related to subsequent losses of wintering bears if animals enter the dens underweight. Such mortality may cause significant year-to-year fluctuations in bear numbers. Some bears are killed by other bears and occasionally by wolves, but the importance of such losses is unknown. Parasites and diseases do not cause significant mortality. One parasite of concern to man, Trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten. Available information indicates cub mortality through the first eight months of life is slight. Cubs are precocious; some orphans as young as five months of age have survived without maternal care.

Black bears in Western Alaska are used primarily for domestic utilization of skins and meat by local residents. Some recreational hunting of black bears occurs, usually incidental to hunts for other big game species. Despite traditionally liberal hunting seasons and bag limits, the harvest of bears remains relatively small. Black bears have long been considered nuisance animals, particularly during years in which populations have been high and bear-human encounters more frequent. Greater interest in black bears as game animals has been evident in recent years, particularly as opportunities to hunt other species in other areas of the state have become more limited.

Black bear hunting is popular in spring when bears are one of the few species of big game that can be legally taken south of the Yukon River. Hunters seek bears shortly after the bears emerge from hibernation when the hides are of excellent quality. Hide quality deteriorates as the winter hair is shed and rubbed spots appear, and therefore most sport hunting ceases by mid-June. The harvest of males is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation.

Sport hunting of bears resumes in September when hides have improved in quality and continues until bears den for the winter. The proportion of females in the fall harvest is greater in comparison to the spring harvest due to a greater availability of sows that have become separated from grown cubs.

BLACK BEARS IN NORTHWESTERN ALASKA

Black bears (*Ursus americanus*) are relatively uncommon in Northwestern Alaska. They are absent or sparsely distributed on the Seward Peninsula and in the Noatak River drainage. Some occur in the Unalakleet, Ungalik and Koyuk River drainages, but the species is most abundant in the Kobuk and Selawik River drainages. The population appears to be increasing and expanding to the north and west.

In those areas where bears occur, they are associated primarily with forested habitat. Black bears prefer open forests rather than dense stands of timber, and the highest densities of black bears generally occur in areas having interspersed vegetation types. Semi-open forested areas with an understory of fruit-bearing shrubs and herbs, lush grasses and succulent forbs are especially attractive to black bears. Extensive, open tundra areas are generally avoided.

In the spring black bears are frequently found in moist lowland areas where early growing green vegetation is available. Horsetail is a major food item from May to mid-July. During the summer and fall spawning salmon are eaten whenever available. Berries are also an important food item in late summer and fall, and bears move into alpine and subalpine areas where berries are plentiful.

Little information is available regarding natural controls on black bear populations. Populations in Northwestern Alaska appear to fluctuate in numbers from year to year. Deep, long-lasting snows are thought to cause mortality of adults and cubs by slowing emergence of hibernating bears from dens and delaying availability of new green vegetation after emergence. Abnormally cold and snowless winters may also cause increased denning mortality. Berry crop failures may be related to subsequent losses of wintering bears if animals enter the dens underweight. Such mortality may cause significant year-to-year fluctuations in bear numbers. Some bears are killed by other bears and occasionally by wolves, but the importance of such losses is unknown. Parasites and diseases do not cause significant mortality. One parasite of concern to man, Trichinae, is present in some bears and is transmissable to man when raw or partially cooked bear meat is eaten. Available information indicates little cub mortality through the first eight months of life. Cubs are precocious; some orphans as young as five months of age have survived without maternal care.

Black bears in Northwestern Alaska are used primarily for domestic utilization of meat and skins by local residents. Some recreational hunting of black bears occurs, usually incidental to hunts for other big game species. Despite traditionally liberal hunting seasons and bag limits, the harvest of bears remains relatively small. Recreational hunters seek bears shortly after the bears emerge from hibernation when the hides are of excellent quality. Hide quality deteriorates as the winter hair is shed and rubbed spots appear, and therefore most sport hunting ceases by mid-June. Sport hunting of bears resumes in September when hides have improved in quality and continues until bears den for the winter. Local hunters do not place a great value on the skin, and bears are therefore killed whenever they are encountered. The harvest of males is greatest in spring because they leave the den before females and because females accompanied by cubs are protected by regulation. The proportion of females in the fall harvest is greater in comparison to the spring harvest due to a greater availability of sows that have become separated from grown cubs.

PROSPECT BLACK BEAR

LOCATION

In Game Management Units 24 and 25, the area bounded on the west by the south fork of the Koyukuk River from its confluence with Fish Creek to its confluence with John R. Creek, then northwest to the Middle Fork of the Koyukuk River to the North Fork of the Koyukuk River, then the North Fork of the Koyukuk River from its confluence with the Middle Fork of the Koyukuk River to its confluence with Glacier River, then Glacier River, Roy Creek, and upper Hammond River; on the north by the crest of the Brooks Range; on the east by the north fork of the Chandalar River downstream to Quartz Creek, then south to Big Spruce Creek, Twin Lakes and the South Fork of the Koyukuk River to its confluence with Granite Creek, then south along the hydrographic boundary between the South Fork of the Koyukuk River and the Hodzana River; and bounded on the south by Fish Creek.

THE SPECIES

Black bears are distributed through the timbered portion of the area and are very abundant in the southern half of the area. Censuses of bears are difficult since they spend most of their life in or near forests; therefore no censuses have been attempted. However, bears may be viewed more easily during particular seasons. In spring many bears move to open grass flats to feed on new shoots. In fall when the berries ripen, bears move up to the slopes near and sometimes above timberline to feed. Occasionally bears become very abundant. During 1963-64 and 1970 bears were reported as common over much of interior Alaska, although no specific information on bear abundance in this area during those years is available. The reason for these periodic "highs" and specific factors regulating bear populations are unknown.

Bears in interior Alaska tend to be small but occasionally a record book bear is taken. The harvest by hunters is low and bears are abundant in the area; hunters who are selective should be able to find large bears. The quality of the pelt is important when considering trophies. Pelts are prime only during the period from late fall through early spring.

Accurate harvest data and the intensity of use of the area by black bear hunters is not available, because the mandatory sealing requirement does not extend north of the Yukon River. The area's remoteness and inaccessibility undoubtedly discourage hunters from hunting solely for black bears. A closure to the taking of big game within five miles of either side of the pipeline also reduces black bear harvests. Resident and nonresident hunters in the Brooks Range are attracted by the moose, caribou, sheep and grizzly bear hunting opportunities, and probably take black bears incidental to other hunting. Little if any guiding activity solely for black bears occurs. It is anticipated that accelerated use of the area by hunters and non-hunters will result in an increase in the number of legal sport kills and bears taken in defense of life and property.

INTERIOR-WESTERN ALASKA BLACK BEAR

LOCATION

Game Management Units 9, 12 and 17-26 except for the Prospect, Minto-Murphy Dome and Upper Birch-Preacher-Beaver Creeks Black Bear Management Plan areas.

THE SPECIES

Black bears are widely distributed in the boreal forest and forest-tundra fringe habitats of interior and western Alaska. Although bear densities are relatively low in comparison to south coastal Alaska, the Interior-Western area includes the most extensive contiguous black bear habitat in the state. Black bears are largely absent north of the Brooks Range, on the Seward Peninsula, the Yukon-Kuskokwim Delta, and the Alaska Peninsula south of the Naknek River. However, populations appear to be expanding their range south on the Alaska Peninsula and west on the Seward Peninsula. Black bear numbers may be declining on the lower and middle reaches of the Kuskokwim and Yukon River drainages but are at relatively high levels or increasing in the upper Yukon and Tanana drainages and in the Northwestern portion of the range. Five thousand to 6,000 black bears are estimated to occur in the Interior-Western area. However, because bears are very difficult to enumerate no systematic censuses have been conducted. Representative lowland river bottom areas where bear densities are greatest include the upper Kuskokwim, Yukon, and Tanana Rivers, the Kobuk and Selawik drainages in the northwest, and the upper Mulchatna, Chilikadrotna, and lower Cook Inlet drainages.

Human use of black bears differs over the large geographic area in Interior-Western Alaska. Domestic utilization by local residents is the dominant use over most of the area. Most bears taken by local domestic users are taken for food and to a lesser extent for skins. Bears are taken when available throughout the year. Bears are shot by waterfowl and muskrat hunters in the spring. In the fall bears are shot by berry pickers. In the summer bears are killed when they appear at fish camps or fish wheels. Many of these bears are shot and abandoned, since some bush residents consider black bears nuisance animals. Domestic use appears to be declining and is currently light to moderate over the area. Aside from bears shot on an opportunistic basis, relatively little hunting is directed specifically at black bears. Boats are the chief means of transport for bush residents who do hunt black bears.

Recreational hunting for black bears frequently occurs near human population centers. Resident sport hunters are active along road and trail systems, although many utilize aircraft, all terrain vehicles, or riverboats to reach less accessible locations. The black bear is usually relegated to a lower status than given other big game species. Interest in black bear hunting is increasing, perhaps due in part to increasing hunting restrictions on other big game species. Some guides, have focused

increased attention on black bears as sport animals in the foothills of the Alaska Range and in the Lake Clark Pass and Cook Inlet areas.

Recreational and domestic harvests over the Interior-Western area have had little influence on black bear populations. Accurate harvest information is difficult to obtain because skin or skull sealing is not required in much of the area. However, total harvest for the entire area probably does not exceed 400 bears. Many areas have the potential to support much larger harvests. Despite liberal hunting seasons and bag limits since statehood harvests have remained low. Industrial and urban development have resulted in increased bear-human interactions and an increase in the number of bears destroyed in defense of life and property.

Nonconsumptive use of black bears is restricted to bear populations immediately adjacent to urban population centers. Except where they gather to exploit locally abundant sources of food, black bears in the Interior-Western region are too sparsely distributed to provide for significant levels of nonconsumptive use.

BROWN BEARS IN SOUTHEASTERN ALASKA

Brown bears (*Ursus arctos*) occur throughout Southeastern Alaska except on the islands south of Frederick Sound. Portions of this area support as dense a population of brown bears as may be found in the state. Although specific information on abundance is lacking, there is general understanding of the species status. Brown bears are probably as abundant in this area now as they have ever been. The ABC Islands (Admiralty, Baranof and Chichagof) support larger populations than mainland areas except for the possible exception of the Yakutat area. Brown bear and black bear co-exist on the mainland but not on the islands.

Brown bears were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. Reproductively isolated populations may exist on the ABC Islands and Yakutat forelands; however, at this time there is no data to support subspecific designation.

All major habitat types are utilized by brown bears with seasonal differences in use governed by the availability of food. Emerging from dens beginning in late April, most brown bears move to the beach areas where they feed almost exclusively on sedges and kelp and on skunk cabbage, wild celery and parsley when available. Winter killed ungulates and marine mammal carcasses which wash ashore are also eaten. Herring and herring roe are utilized when available in mid-May. Spring bear predation on moose, deer, and goats may occur but is significant only in localized areas. Berries are utilized during summers in years when they are available. With the appearance of anadromous fish in the streams in July bears congregate along streams and remain there as long as spawning fish are present, usually until Ocotber. The quantity and quality of protein foods, especially salmon, and the longer period of the year in which food is available to bears in coastal areas are believed to be the major factors responsible for differences in size between coastal bears and bears from interior Alaskan areas.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting and gunshot wounds. Cannibalism and other extraspecific strife may cause significant mortality. *Trichinella spiralis* is the known parasite infecting bears, because it is transmissible to man in raw or partially cooked bear meat; however it is of minor significance to infected bears.

In accessible and inhabited areas, human activities are doubtless the most significant source of bear mortality. Sport hunting is presently the most important mortality factor, but several nuisance bears are also killed near human habitations. Bears are killed in defense of life and property when they are attracted to garbage dumps and endanger human safety.

Recreational uses of brown bears predominate in Southeastern Alaska. Subsistence utilization is not known to occur. Sport hunting is the primary use with the ABC Islands being the most productive hunting areas. From the mid 1940's, trophy hunting of brown bears gained rapidly in popularity, with Admiralty Island becoming the favority hunting area in Southeastern Alaska. At one time cannery workers and others connected with the commercial fishing industry destroyed bears indiscriminately. Until recently, hunting pressure has not appeared to be excessive. Low harvests have allowed hunting regulations to remain liberal. In the spring, more males are taken because males emerge from dens before females and because females with cubs are protected. In the fall, more females are available for harvest due to natural separation of sows from grown cubs. Guided hunters have had the highest success rates, probably due to the efficiency of their hunting methods. Since the early 1960's, the annual kill from Southeastern Alaska has been from 10 to 13 percent of the statewide harvest. The ABC Islands have contributed about 9 percent of the statewide harvest and 70 percent of the Southeastern harvest. Since about 1968, there has been an upward trend in the kill from the ABC Islands. The overall quality of the hunting experience for bear hunters in the Southeastern Region has been extremely high, but with increasing hunter interactions quality has begun to deteriorate.

Nonconsumptive use of brown bears in Southeastern Alaska occurs throughout the region but primarily at Pack Creek on Admiralty Island, an area reserved for such use. The Thayer Mountain area, also on Admiralty Island, is similarly closed to the taking of brown bears. Visitors take advantage of opportunities for observation and photography when brown bears concentrate there during late summer salmon runs. Growing national interest in brown bears is certain to increase the demand for nonconsumptive use opportunities.

SOUTHEASTERN MAINLAND BROWN BEAR

LOCATION

Game Management Units 1B, 1C, 1D, 5 and that portion of Unit 1A not included in the Behm Canal Brown Bear Management Plan area.

THE SPECIES

The southeastern mainland brown bear populations appear to have remained fairly stable with only a decrease in numbers in those few areas where urbanization, such as in the Mendenhall Valley north of Juneau, have significantly changed or eliminated bear habitat. Probably the major factor affecting mainland bear numbers is the intraspecific strife resulting from territorialism and cannibalism, as the mainland brown bears are lightly hunted.

Hunting pressure on southeastern mainland brown bears is light in relation to areas such as the ABC islands. Harvest is usually less than 35 bears annually. Hunting seasons have been liberal since statehood and as such appear acceptable to the public and within the current replacement rate of the resource. Large bears (trophy size) are present in small numbers throughout this area but because of dense cover, nocturnal feeding habits and difficult hunter access, utilization of these large bears is believed to be below the capability of the population to produce large individuals.

BEHM CANAL BROWN BEAR

LOCATION

All of the mainland portion of Game Management Unit 1A except that part of the Cleveland Peninsula south of Spacious Bay.

THE SPECIES

Brown bears are common throughout this area and are particularly abundant on the Unuk and Chickamin Rivers during the salmon spawning season. Historical populations have probably been stable since the habitat has changed little and hunting pressure, except along the Unuk River, is extremely light. Brown bear habitat in this area is unlikely to change significantly for many years. Mining activity could impact small areas and logging is planned, but most of the timber is not of sufficient quality to support logging at this time. Declining salmon stocks could have an effect on bear populations.

Almost all hunting occurs along the Unuk River. The low density of brown bears over the rest of the area discourages extensive hunter effort. The brown bear kill from 1961 to 1974 averaged slightly more than 2 bears per year with 60 percent of the harvest coming from the Unuk River. Illegal kills occur which probably stem from a combination of general dislike of bears and their status as competitors for fish. Poaching for hides in this area is probably limited.

Season dates and bag limits have changed little since 1961 and transportation methods and access are unchanged. Access is by plane or boat, as there are no roads in the area. The majority of hunters hunt from skiffs. Most local residents hunt the Unuk River and use river skiffs for transport. Brown bears are hunted for trophies and recreation. Professional guides have not operated in the area since about 1965.

ABC ISLANDS BROWN BEAR

LOCATION

In Game Management Unit 4, Admiralty, Baranof and Chichagof Islands, except for the Pack Creek-Windfall Harbor Brown Bear Management Plan area.

THE SPECIES

The density of brown bears on Admiralty, Baranof, and Chichagof Islands is perhaps as great as it is anywhere in Alaska. Recent studies by the Alaska Department of Fish and Game show that Hood Bay, a rather typical bay on southwest Admiralty Island, can have as many as 50 different bears using it during the course of a year. These findings are consistent with those of a joint study conducted in 1932 by the U. S. Forest Service and the Alaska Game Commission. These studies together suggest a population of about 1,000 bears on Admiralty Island and a somewhat lesser number on Baranof and Chichagof Islands. Studies at Hood Bay have shown that on the average, about 25 percent of the spring-time population consists of cubs under two years of age, suggesting high reproduction. Rates of natural mortality are not known, for it is seldom that a bear carcass, other than ones killed by hunters, is encountered. It is suspected that much of the natural mortality occurs during the period of winter dormancy. Aside from losses to starvation and old age, intraspecific strife and cannibalism are probably the most important natural mortality factors.

There has been considerable alteration of the climax forest ecosystem on the ABC islands. Foremost has been clear-cut logging which began with the long-term sales to encourage pulping operations in the 1950's. At this point in time, several of the major river systems have been clear-cut. Logging now consists of much smaller scale operations, but these are programmed to continue ad infinitum, based on a 100-year rotational cycle. Currently basic knowledge of the impact of logging on other forest resources, including bears is lacking, but studies are being designed to attempt to measure these impacts. Except for native lands and a few other small private holdings, brown bear habitat on the ABC islands is under management jurisdiction of the U. S. Forest Service.

Sport hunting has long been the dominant use of the brown bear resource of Southeast Alaska, and the ABC islands have been a favored brown bear hunting area. During the 11-year period from 1949 to 1959 an average of 40 bears per year were taken by guided sportsmen while harvests by unguided resident hunters went unrecorded. Large numbers of bears were also killed by fishermen, loggers, and cannery workers, but this loss has generally been reduced in more recent years. Since 1961, when the mandatory sealing program was instituted, the average annual kill has been 63 of which about 74 percent were males, 71 percent were taken during the spring season, and 52 percent were taken by nonresident hunters. While the hunting season has generally run from September 1 through June 10, the most productive hunting period has been from May 15 through June 10. Admiralty Island has generally contributed about 52

percent of the ABC island kill, Baranof about 15 percent, and Chichagof about 33 percent. In recent years there has been an upward trend of the harvest from Chichagof and a corresponding downward trend from Baranof. The southern half of Admiralty has contributed about 45 percent of the Admiralty kill and 35 percent of the total kill from the ABC islands. The most productive bays have been Hood, Chiak, Gambier, and Pybus. On a statewide basis, since 1961 the ABC islands have contributed 9 percent of the total brown bear harvest. Since 1969, this proportion has risen to about 11 percent of the statewide harvest. Measurements of harvested bears have remained remarkably consistent, suggesting that sport hunting has had little impact on the brown bear resource. Since 1961, the average male hide size (length plus width) has been 13.9 feet, the average male skull size since 1967 (length plus width) has been 22.3 inches, the average male age since 1968 has been 7.9 years, and the average female age since 1971 has been 7.7 years.

Records indicate that about half of the annual kill is taken by commercially guided hunters. About 12 registered guides operate the area each year. There has been a fairly rapid turnover in the guides who operate these hunts. Only three or four have consistently hunted this area since 1965. Residents, acting as guides for nonresident relatives account for only a small percentage of the annual kill. Up until about 1970, the mean annual recorded kill for the ABC islands was about 60 animals. The quality of the hunts was very high. Hunter interactions in the field were uncommon. Since that time there has been a gradual increase in hunter numbers and the total harvest. The 1975 recorded kill was 105 animals. Hunter interactions have become much more common.

Since the mid-1940's many hunters and guides have expressed much satisfaction with the high quality of hunting experienced while bear hunting on the ABC islands. This is particularly true during spring-time hunts. Hunters have been comfortably based on boats. During the spring, male blue grouse are "hooting", filling the bays with their pulsating calls; fishing and clam digging are productive, waterfowl and deer are abundant for viewing, herring are spawning, and the attendant predation by eagles, gulls, and other predators, including brown bears, that the large masses of herring attract, can be observed; and the weather is usually fairly good. Bears are plentiful enough that it is not uncommon for a guided or seasoned hunter to look at 50 or more different bears on a ten-day hunt.

PACK CREEK-WINDFALL HARBOR BROWN BEAR

LOCATION

On Admiralty Island in Game Management Unit 4, all drainages into Windfall Harbor including Pack Creek.

THE SPECIES

Windfall Harbor, on north Admiralty Island at the north end of Seymour Canal, contains the necessary components to support a population of brown bears: high country for denning and summer foraging, grassy beaches for spring and summer foraging, and five streams which support runs of salmon upon which the bears feed in summer and fall. No current data are available on the number of bears which inhabit the area. Studies elsewhere on Admiralty Island suggest perhaps 30 animals inhabit the area.

Admiralty Island is under the management jurisdiction of the U.S. Forest Service. While the Wildfall Harbor area is not under any particular current timber sale contract commitment, logging is a possibility under future sale arrangements. There is one known human habitation, a floating residence near the mouth of Pack Creek.

Sport hunting has been relatively light with an average of about one bear per year taken from the area since 1963. The Pack Creek drainage was closed to bear hunting during the 1930's to furnish an undisturbed area for viewing; people may easily watch a concentration of brown bears fishing during the late summer-early fall months. Observation towers were constructed by the Civilian Conservation Corps (CCC) from which to observe bears. Fifty or more persons, mostly Juneau residents, visit the area annually to view and photograph the bears.

The area (Pack Creek drainage only) is recognized by the U. S. Forest Service as the Pack Creek Research Natural Area.

BROWN BEARS IN SOUTHCENTRAL ALASKA

Brown bears (*Ursus arctos*) occur throughout Southcentral Alaska, including Montague, Hinchinbrook and Hawkins Islands in Prince William Sound. Although precise data on bear abundance in the region is lacking, there is a general understanding of the species' status. In areas surrounding human population centers and on the Kenai Peninsula and lower Matanuska-Susitna Valley area where human development continues to expand, reductions in brown bear populations have occurred. In the Nelchina Basin and surrounding mountain ranges bear populations have shown substantial increases in the past decade.

Brown bears were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. Brown bears on Kodiak-Afognak Islands, however, are considered a reproductively isolated population with distinctive cranial features and are classified as *U. a. middendorffi*. No reproductively isolated populations are known to exist in Southcentral Alaska.

All habitat types are utilized by brown bears, but grass communities appear to be most important. Where bears occur in forested areas, substantial meadows, muskegs, sedge flats, or other grassy areas are present. Grasslands appear especially critical for bears during the spring when other high quality bear foods are scarce.

The brown bear's diet includes a wide range of animal and plant foods and is highly variable between areas and during different seasons. In spring, grass and other early-growing herbaceous plants make up the bulk of the diet. During summer and fall, salmon and berries constitute the major food items. Bear predation on moose and caribou may be significant in some areas. The quantity and quality of protein foods, especially salmon, and the longer period of the year in which food is available to bears in coastal areas are believed to be the major factors responsible for differences in size between coastal and interior brown bears.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichinella spiralis*, is the best known parasite infecting bears because it is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bears.

In accessible, inhabited areas, human activities are doubtless the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of

nuisance bears near human habitations. Bears are killed when they are attracted to garbage dumps, and endanger human safety. Losses of free-ranging livestock sometimes necessitate removal of offending bears.

Recreational hunting and viewing are the predominant uses of brown bears in Southcentral Alaska. With increases in hunting pressure, regulations affecting season lengths and methods of transport have became more restrictive so that allowable harvest levels were not exceeded. Guided hunters have had the highest success rates due to the efficiency of their hunting methods. Since the early 1960's, the annual kill in Southcentral Alaska has been about 18 percent of the statewide harvest; management has intensified to maintain productive bear populations. Timing of spring and fall bear hunting seasons is used to influence the proportion of male bears in the harvest, allowing for manipulation of sex ratios to optimize productivity. In the spring, more males are taken because males emerge from dens before females and because females with cubs are protected. In the fall, more females are available for harvest due to natural separation of sows from grown cubs.

Growing national interest in brown bears is certain to increase the demand for nonconsumptive use opportunities. Limited opportunities for nonconsumptive use exist in Southcentral Alaska because there are few natural areas where bears can be regularly observed.

UPPER COOK INLET BROWN BEAR

LOCATION

All of Game Management Unit 16.

THE SPECIES

Brown bears are abundant in the area but data on population size are unavailable. Brown bear habitat in the area has been altered little by human encroachment. Other factors probably have more impact on bear populations, especially annual variations in food supplies.

Past brown bear harvests in the area have not been excessive, and at this time hunting effort appears to be light. Average age and skull sizes of bears taken differ little from the 10-year average, suggesting the population's status has not been altered. Harvests have exceeded 40 animals in three of the past ten years, although as few as 23 animals have been taken in one year. Over 50 percent of the bear harvest is taken by nonresidents, indicating high use of the area by the guiding industry.

There have been spring and fall brown bear hunting seasons since 1969. The spring season generally extends from May 10 or 15 to May 25 or June 10 to 15. Fall seasons begin on September 1 or 10 and continue until October 10 or 15. Brown bear hunters are required to not hunt the same day they have been airborne, and cubs and sows accompanied by cubs are protected by regulation. Season lengths are apparently effective techniques for regulating the harvest in this area. When hunting seasons were reduced in length the total harvest was also reduced those years.

The area is not known for large brown bears, but nearly all bears taken are utilized as trophies. The hide and skull are salvaged, but the meat is seldom used for human food. Bears carry trichinae, but danger to people can be minimized if the meat is properly cooked.

Access to the area is difficult. Aircraft are the most important means of access, but boats are also used. Climatic constraints on brown bear hunting are significant, particularly during fall. There is probably much brown bear habitat that is unhunted due to inaccessibility. Viewer use is probably low in this area, because brown bears are generally dispersed widely and the area does not receive many human visitors.

NELCHINA BASIN BROWN BEAR

LOCATION

Game Management Units 11, 13 and 14B, excluding the Paxson and Klutina Lake Brown Bear Management Plan areas.

THE SPECIES

Brown/grizzly bears are distributed throughout the Nelchina Basin. Historical information is limited but bears appeared to be numerous during the early 1900's and fairly common during the intervening years except during the early 1950's when intensive poisoning of wolves also reduced bear numbers. Bears have been increasing for the past decade and are presently abundant. Most natural grizzly bear natural losses are probably related to food supplies and intraspecific strife. Available information indicates that bears survive well their first two years; subadults, after separation from the sows, may suffer considerable losses by being forced into marginal habitats and by direct attacks from older bears, presumably boars. Natural mortality among adult grizzly bears is probably low.

Grizzly bear hunting has been for recreational-trophy purposes almost exclusively. Annual harvests in the Nelchina Basin have averaged 58 bears. Males have comprised 57 percent of the harvest. Guided nonresidents have accounted for more than half of the grizzly harvest. The proportion of males in the kill has increased slowly since 1961. Average ages and skull sizes of bears harvested west of the Copper River have been increasing but have decreased slightly in the Wrangell Mountains. Bears taken recently by hunters have averaged 7-8 years old. Hunting pressure has been high but well dispersed in the area since the 1950's. The sex and age structure of the bear population has been little changed by hunter harvest since the 1960's. Nelchina Basin bears are not generally vulnerable to overharvests except where hunters are concentrated. Human expansion at Kenny Lake and along the Nabesna Road has resulted in localized overkills, due to destruction of "problem" bears. Most bears are probably taken by hunters near discarded remains of ungulate hunter kills, but they are also vulnerable during salmon runs on the upper Gulkana River and in the vicinity of Klutina Lake.

MC NEIL RIVER BROWN BEAR

LOCATION

That portion of Game Management Unit 9 described as the McNeil River State Game Sanctuary.

THE SPECIES

The July and August concentration of brown bears at McNeil River has gained worldwide fame. Prior to statehood, bear hunting was banned in this area to protect the unique concentration. Following statehood, the ban remained and the area became a state game sanctuary. Since 1973, a permit system which regulated human activity and densities within the sanctuary during the period of brown bear concentration has been in effect.

The number of bears present has varied between 75-90 in recent years. Reports from the late 1950's indicate that greater numbers of bears were present at that time. All ages of bears use the area and are highly visible for recreational observation, photography, or scientific study. The population of bears spends only part of each year within the sanctuary boundaries. At least seven McNeil River bears have been taken outside the sanctuary by sport hunters.

Between 1963 and 1972 the Department of Fish and Game collected data on the life history of McNeil River brown bears. This program included immobilization and marking of animals. The program terminated, but tagged bears remain in the population. These markings are being lost naturally and bears are returning to a pristine appearance. From 1970 to 1975, Utah State University graduate students conducted research on brown bear behavior.

Prior to 1970, public use of the sanctuary during the period of concentrated bear use was limited. In recent years, use has greatly increased and in 1975 reached 385 man days during July and August. The permit system now regulating human use of the sanctuary was developed in response to increased public use. Requests have been received to develop the area for a larger volume of daily visitors, but have been discouraged as incompatible with maintaining a high concentration of brown bears. Present use is primarily by non-Alaskans and professional or semi-professional photographers.

KENAI BROWN BEAR

LOCATION

Game Management Units 7 and 15.

THE SPECIES

Brown bears range over most of the Kenai Peninsula. Bears are present in moderate numbers in those portions of the Peninsula draining into Cook Inlet and they occur in low numbers over the remainder of the area except for occasional local concentrations along the coast. Reports from hunters and incidental observations indicate that the population is growing. Presently the population is estimated to be between 150 to 250 bears.

Historically, brown bears were never abundant on the Kenai Peninsula, although the population was probably considerably larger before the Peninsula was settled. Persecution by settlers appears to have been the cause for the reduction in numbers. Urbanization, road construction and increased recreational use have altered part of the area making it no longer suitable brown bear habitat.

Brown bear-human conflicts are becoming more prevalent. In most cases, problems have been resolved by proper garbage disposal, but in some instances it has been necessary to destroy bears. A significant number of bears are also killed in defense of life and property primarily by persons hunting other species. The total number of non-sport kills may approach the sport kill in magnitude in some years.

The reported brown bear harvest on the Kenai Peninsula has varied from two to eleven and has averaged about five per year. Male bears harvested since 1961 have averaged 5.2 years in age with a mean skull size of 22.1 inches. Hunting pressure has been light with most bears taken incidental to hunting for other species. Anchorage and Kenai Peninsula hunters harvest almost all of the brown bears taken on the Kenai. Occasionally, bears are killed by nonresident hunters but the nonresident harvest is nominal. Limited guiding for brown bears occurred in the past but in recent years there has been none. Because of the relatively poor chance for success, guides offered brown bear hunts in combination, usually with a moose hunt. Reductions in the moose season have made this impractical. Trophy brown bears are available on the Kenai Peninsula but, because of the heavy forest and brush cover, hunting conditions are difficult. Many of the bears harvested are attracted to and killed in the vicinity of moose kills. Because bears are difficult to locate and opportunities to be selective are extremely limited, few bear hunters are attracted to the Kenai.

The length of the brown bear season has varied little since statehood, although the dates of the season have changed. The bag limit on brown bears was changed from one per year to one every four regulatory years in 1968. The hunting of brown bears has had little effect on the population. The population appears to be growing, and the harvest appears to be well

below the sustained yield level. Since 1961, 55 percent of the harvest has been males.

Nonconsumptive use of the brown bear resource has been limited. Bears are occasionally viewed from the road or by hikers and fishermen, but most viewing and photography occurs incidental to other activities.

WEST CHUGACH BROWN BEAR

LOCATION

Game Management Unit 14C and, in Game Management Unit 7, the drainages of Glacier Creek and Twentymile River.

THE SPECIES

Incidental aerial and ground observations, harvest figures and reports of brown bears in residential areas indicate that bears exist in this area at a low level. Population estimates are difficult to make, but probably less than 25 to 35 brown bears inhabit the entire area. Present numbers may be only slightly reduced from levels of the past several decades; large concentrations of brown bears have probably never existed in this area due to the lack of substantial salmon spwaning streams.

A significant portion of lands within the area are not conducive to brown bear habitation, mainly because the wilderness characteristics bears require are lacking. Timbered and subalpine areas at the upper reaches of several drainages still provide excellent habitat.

Brown bears have been hunted in the area for at least the past 60 years. Harvest levels prior to 1961 are unknown, but were probably somewhat higher than in recent years. Between 1961 and 1975, only 21 brown bears were legally harvested throughout the entire area; only one was taken in the past four years. Nine of the 21 bears were taken in the Eklutna drainage, and four were taken in Ship Creek. Eight additional bears have been killed in defense of life and property during the past 15 years. Of the total of 29 bears, 14 were males, 14 were females, and 1 was of unknown sex. All bears were taken by residents of local communities. Hunting is not believed to have had any effect on the present population levels.

Chugach State Park, the area of major bear habitation, has been closed to brown bear hunting since 1973. The Portage area, the Anchorage hillside area, portions of Eagle River, and the military reservations are also closed to hunting. Consequently, there are few drainages where bears can still be hunted, and hunting pressure is very light. Most bears are taken incidental to hunting goats, sheep, moose, or black bears. Prior to 1973, the Park or other lands open to bear hunting had variable hunting seasons of about 30 days duration during September and October. During recent years, the season has run from September 10 to October 10 with a bag limit of one. Since 1968, hunters have been allowed to take only one bear every four regulatory years.

Access to locations where bears may be hunted is mainly via the Hunter Creek trail or the Twentymile River. The Eklutna Road and the Girdwood-Crow Creek Road also provide initial access for bear hunting. With the exception of the Twentymile River, where motorized boats are allowed,

all backcountry travel is by foot or horseback. Vehicular transportation restrictions have been in effect in the West Chugach Management Area since 1968 and within Chugach State Park since 1972. Access restrictions within the Park apply to both hunting and nonhunting uses.

Other uses of brown bears include viewing, photography and observation of bear sign. No area is considered good for viewing, although if bears are to be seen anywhere, the Eklutna drainage is the most likely location. Bears may also be seen in the Eagle River and Bird Creek drainages on rare occasions. Observations of footprints in silty riverbeds or mucky ponds are probably the most commonly "viewed" evidence of bears. Such sign can often be seen near most backcountry trails.

LOWER MATANUSKA-SUSITNA VALLEY BROWN BEAR

LOCATION

All of Game Management Unit 14A.

THE SPECIES

No estimates of brown/grizzly bear abundance are available for this area, but bear density is low. Harvest data indicate bears may have been more abundant in the past. Brown bear habitat has been considerably altered in this area by urbanization, agricultural and industrial development, and mining.

Despite a low brown bear population, conflicts between bears and people occur every year, usually because bears are attracted to garbage; some bears are killed. Complaints have been annually received by the Department regarding brown bears near human dwellings.

Hunting pressure is light because the area is difficult to hunt and the bears are sparsely distributed. The average annual harvest for the 196273 period was about nine animals, while in 1974 the harvest was three bears and in 1975, two bears. Shifts in hunting season timing may account at least in part for these differences. Most bears are taken incidental to hunts for other species. In most years residents harvest more bears than nonresidents. Few bears are taken by guided hunters. Nearly all persons take brown bears for trophies. Hides are usually well cared for and eventually become wall rugs. Access to hunting areas or camps is usually by auto, plane or boat, and then by foot. Adverse fall weather occasionally may significantly restrict the amount of hunting in the area. Hunting has little effect on the bear population.

AFOGNAK-SHUYAK BROWN BEAR

LOCATION

In Game Management Unit 8, Shuyak Island, Ban Island, Marmot Island and Afognak Island northwest and east of the Southern Afognak-Raspberry Island Brown Bear Management Plan area.

THE SPECIES

The Afognak-Shuyak area is relatively remote and largely uninhabited. Recognizing the scenic and wilderness qualities of the area, the U.S. Forest Service has recommended that 55,000 acres in the Red Peak-Ban Island areas be designated a Scenic Area. Another 5,300 acre parcel has been designated the Paramanof Research Natural Area.

The brown bear population is estimated at 200 to 300 animals for the entire Afognak-Raspberry-Shuyak Islands group. Although information on movements is lacking, it is suspected that there is considerable interchange of bears between management areas. Heavily forested Shuyak Island has few productive spawning streams and a low bear density. The northwestern part of the area contains dense Sitka spruce forest at lower elevations, grading into grass-brushlands and finally extensive rugged alpine areas above 1500 feet elevation. Eastern Izhut Bay and Tonki Peninsula are slightly more accessible but contain equally rugged terrain. East of Izhut Bay, spruce forest becomes less dense giving way to large expanses of open alpine and steep, brushy hillsides.

The Paramanof Bay drainage is one of the most popular hunting locations due to many open hillsides and valleys with good conditions for spotting bears. Tonki Peninsula is also popular although less accessible due to its limited anchorages and exposure to storms.

Resident hunters are the primary users of the area. However, three guiding operations have recently used the Paramanof Bay area. Hunting pressure and harvest are relatively light because the area is not very accessible by small boat. Float and amphibious aircraft are the primary means of transportation into the area. Access to the interior of the area is limited to a few lakes. No maintained trails exist although scattered elk and bear trails provide limited access. Annual sport harvests average about six bears.

PORTAGE LAKE BROWN BEAR

LOCATION

That portion of Game Management Unit 8 on Afognak Island which includes Portage Lake from the outlet of Upper Portage Lake to one-half mile below the fish pass on Portage River, including a strip 1.5 miles wide along both sides of Portage Lake, along Portage River and along the outlet of Upper Portage Lake.

THE SPECIES

The Portage Lake drainage, Afognak Island's best red salmon producing system, is also one of the best areas to view brown bears. Bears concentrate in red salmon spawning areas from mid-July to late August. Bears then disperse to some extent, but continue to frequent the area, feeding on pink and silver salmon until October. Although heavy timber limits viewing opportunity, bears can often be seen where streams meander through meadows and openings in the canopy.

A recently constructed timber haul road crosses one of the major spawning streams near the best viewing area on Portage Lake. Traffic on this road may reduce bear feeding activity within the drainage. Sport fishermen frequent the area from June through September and the U.S. Forest Service maintains a recreational cabin on the lake.

Hunting pressure is presently light in the drainage, with only occasional bears taken. Illegal harvest may increase with improved access provided by the road.

SOUTH AFOGNAK-RASPBERRY ISLAND BROWN BEAR

LOCATION

In Game Management Unit 8, Raspberry Island and adjacent small islands, except Whale Island; Afognak Island south and east of the Malina Bay drainages including drainages into Raspberry Straits and Marmot Bay west of the head of Saposa Bay and bounded on the east by the Gretchen Lake, Laura Lake, Pauls Lake drainages and bounded on the north by a line from Shields Point to Delphin Point, not including drainages into Delphin Bay. The Portage Lake Management Plan area is excluded.

THE SPECIES

Estimates of the bear population in the Afognak-Raspberry-Shuyak Islands complex are difficult to make due to the difficulty of observing bears in dense forest growth. Bear densities appear to be much less in the Afognak group than on Kodiak Island. Based on past harvest, observation of salmon stream concentrations, hunter reports and general observations, it is estimated that the bear population is 200-300 animals.

Spruce habitat is generally thought to support lower bear densities than areas with higher vegetative diversity. Salmon are proportionately much less abundant in the Afognak group than on Kodiak. Sitka spruce vegetation is gradually invading the western side of Afognak where large areas of open grass-brushlands now exist. As spruce invades, vegetative diversity is lessened and presumably habitat is less suitable for brown bears. The rate of spruce invasion is relatively slow and no detectable short term effects on the bear population can be expected. A few scattered seasonal and permanent residences are scattered through the management area, but few changes in the near-wilderness environment have occurred. Limited logging activity has occurred since the 1940's, but it was not until 1975 that large scale logging began in the Kazakof and Perenosa Bay areas. Currently a logging road transects Afognak Island from Kazakof to Discoverer Bay. Although ultimately clearcuts may provide improved vegetative diversity, it remains to be seen if increasing forage will offset the disturbance of bear activities and defense of life and property mortality which generally accompany logging activity.

Dense spruce forest over much of the Afognak group makes it difficult to observe and stalk bears. Late spring breakup and frequent inclement weather are additional handicaps to hunters. Hunting pressure has been relatively light in the past with sport harvest averaging about 12 bears annually, about half of which are taken from this area. Raspberry Straits, Malina Lakes, Portage Lake, and Afognak Lake areas are popular hunting spots. Local hunters use small commercial fishing boats or skiffs for hunting this area. Numerous protected anchorages are present. Charter and private aircraft are used to reach inland lakes.

As has occurred in the remainder of the Kodiak area, seasons have been gradually curtailed to keep harvest at allowable levels. Afognak's seasons remain open slightly longer in spring and are open nearly three weeks earlier in fall than in the Southwestern Kodiak Island Management area. Relatively low hunter success will permit some increase in numbers of hunters without much increase in the harvest.

Residents do most of the bear hunting in this management area, although recently an increasing number of guides have begun to take nonresidents to Afognak as competition for hunting areas around the state increase. Afognak has a local reputation for large trophy bears, although only occasionally is an unusually large bear taken.

NORTHEASTERN KODIAK ISLAND BROWN BEAR

LOCATION

That portion of Game Management Unit 8 on Kodiak Island east of Rough Creek in Ugak Bay and east of the divide between Kizhuyak Bay and Sharatin Bay including all drainages into Chiniak Bay.

THE SPECIES

Chronic conflicts with human activities have resulted in a lowered density of brown bears in this management area. This area supports most of the industrial, agricultural and urban development of Kodiak Island. Much of the coastal portion is accessible by road. Conflict with the cattle industry has been primarily responsible for present management which encourages maximum bear harvest. Cattle were first introduced to Kodiak in 1794 by Russian settlers, and it is safe to assume that the battle with brown bears began immediately. Predation by bears was well documented by a Department study in 1964-65. Thirty-three cattle were verified to have been killed by bears during a 14-month study. This represented less than three percent of the actual cattle population, excluding calves.

Bears were systematically hunted, trapped and poisoned by ranchers with frequent assistance from the Federal government prior to statehood. The Department continued to assist with a bear control program and liberal hunting seasons were maintained. Sport hunting has not been successful in alleviating the predation problem. Fencing was seriously considered as a possible solution to ingress by bears. During the early 1960's, an aerial shooting program was conducted by the Department, but was soon dropped due to intensive public pressure against it. The Department continued to control suspected predator bears until 1970. Alaska law permits the killing of any game animal in defense of life or property, and ranchers continue to take bears on their grazing leases, although few report the kills as is required by regulation. Presently six ranches are in active operation and periodic bear predation continues.

Current annual harvest from all sources probably does not exceed 15 bears. During the three-year period 1963-1965, a total of 83 bears were killed, an average of about 28 per year. Forty-two bears were killed in 1963, 35 of them by the Department on cattle leases. The 1965 bear population in this area was estimated at 48 bears. There is little doubt that the intensive bear control activities during the 1960's drastically reduced the bear population in this area. The current average population probably does not exceed 75 animals.

No major habitat changes have occurred since the 1960's and increasing frequency of bear sightings suggests that the bear population is increasing somewhat despite heavy hunting pressure. Resident hunters do most of the hunting and less than five percent are successful. Two bear guiding operations consistently hunt the area.

SOUTHWESTERN KODIAK ISLAND BROWN BEAR

LOCATION

In Game Management Unit 8, all drainages into the eastern side of Kizhuyak Bay and all of Kodiak Island south and west of the Rough Creek drainage, including Uganik, Whale, Amook and Sitkalidak Islands. The Karluk Lake drainage is not included.

THE SPECIES

Brown bear density on Kodiak Island is at least as high as in any area of comparable size in Alaska. Bears are distributed throughout the management unit except on some of the smaller offshore islands. The bear population may exceed 2,000 animals. No recent population declines have been documented although some local residents maintain that a higher population was present in the past. There has been a decline in the proportion of large adult males through selective trophy hunting. The average hide and skull size of males harvested has declined during the past 20 years, although it now appears to have stabilized. Annual aerial surveys do not indicate a decline in productivity or survival of offspring.

Information on sources of natural mortality in Kodiak bear populations is scanty. Predation on cubs by adult males is commonly thought to be a source of mortality. Selective hunting for males as occurs on Kodiak may favor survival of young to some extent. Mortality related to periodic food shortages may be important. Persistent late spring snow retards plant growth and probably limits foraging success by bears at a time when their body reserves are lowest. Bears which entered dens in poor fall condition would be especially susceptible to malnutrition in late spring.

The habitat in this management area is little changed from prehistoric times. The coastal dwelling native population in the eighteenth century was approximately three times larger than the present human population on Kodiak Island. Five small villages are located in the management area. The Kodiak National Wildlife Refuge occupies more than three fourths of the area. This refuge, administered by the U.S. Fish and Wildlife Service, was established in 1941 to preserve the natural habitat of the Kodiak brown bear.

Relative to other ranges around the world, Kodiak's habitat supports an extremely high density of brown bears. Scores of streams containing from one to four species of spawning salmon occur throughout the island. Luxuriant plant growth provides abundant green forage, roots and berries. Carrion and tidal organisms are available in coastal tideland areas. Alpine habitats are utilized heavily during early summer by bears foraging primarily on sedges. An excellent diversity of food sources is available and periodic movements by bears in response to seasonal availability of the various food sources are well documented. Salmon runs on Kodiak have decreased to approximately one-third of levels recorded in the early 1900's. The extent to which this reduction has affected the bear population is unknown, although there is little doubt that salmon is an important food resource for bears.

Prior to 1925, commercial hunting for brown bears was common on Kodiak Island, but regulations have become increasingly restrictive since that period. Progressively shorter seasons have been set to keep the harvest within allowable levels. Increasingly intensive hunting pressure in the early 1960's resulted in excessive harvest in popular hunting areas while adjacent areas went largely unharvested. In 1968, the U.S. Fish and Wildlife Service initiated a system on the Kodiak National Wildlife Refuge assigning hunters specific hunting areas. This system improved the distribution of harvest and lessened the extent of crowded hunting conditions. Increasingly restrictive regulations on brown bear hunting in other areas of the state and the closure of polar bear hunting by the Marine Mammal Protection Act generated a substantial rise in hunting pressure and harvest on Kodiak Island in 1973. The Department implemented a new permit system for this management area in 1976. A limited number of permits for each of 26 hunting units are now awarded by lottery for both fall and spring seasons.

Annual harvests have fluctuated considerably depending on weather conditions during the hunting season as well as changing hunting pressure from year to year. The average annual harvest for this management area was about 115 animals during the 1961-1975 period. Males generally comprise at least 60 percent of the annual harvest. Wounding loss, defense of life and property kills and illegal harvest are estimated at 10-15 percent of the sport kill. Nonresident hunters account for about 40 percent of the hunting effort. Hunting success of nonresidents, who are required to hunt with a guide, averages approximately 70 percent compared to 30 percent for residents. Approximately two-thirds of the annual harvest is taken during the spring season. Most guides conduct hunts from permanent camps along the coastline using skiffs for transportation within the hunting area. Resident hunters, who usually have tent camps and lack boats, are restricted to hunting within a relatively small area surrounding their camps.

Brown bear guiding is an important, although seasonal, local industry. Although nonresidents comprise less than half the hunters, their take is nearly two-thirds of the annual harvest.

KARLUK LAKE BROWN BEAR

LOCATION

In Game Management Unit 8, all drainages into Karluk Lake above the lake outlet including Moraine Creek.

THE SPECIES

Brown bears of the Karluk drainage have been the focus of a long-term study by the U.S. Fish and Wildlife Service. Containing some 96 square miles, the area is located in the interior of southwestern Kodiak Island within the Kodiak National Wildlife Refuge. The U.S. Fish and Wildlife Service has estimated the area's population at 160 bears, the highest recorded population density for an area of comparable size in the world.

Historically, the Karluk system has been the major red salmon producer on Kodiak Island. When red salmon begin arriving in good numbers during July, bears congregate along the numerous inlet streams and the lakeshore to feed on spawning fish. Although peak feeding activity occurs in July, some bears may pursue salmon until the late fall denning period. Concentrations as high as 10 bears per square mile have been recorded in the O'Malley drainage. The Karluk red salmon declined significantly over the last 50 years. The extent that this has influenced bear populations is unknown, but summer bear density was probably much higher when salmon were more abundant.

Karluk Lake has long enjoyed a reputation among hunters, naturalists and photographers for its excellent bear populations. It is the most popular hunting area on Kodiak Island. The average annual kill during 1954-1962 was 18 bears, a harvest which was considered within allowable limits. The harvest reached about 30 annually by 1966, an excessive level which prompted a fall season closure of Karluk and several other drainages in 1967. Annual harvests averaged 11 bears during the 1968-1975 period. One hundred ninety-four hunters obtained bear hunting permits during this period, an average of 24 per year. Under the present permit system, about 15 hunters are allowed to hunt each year, and they annually harvest about 10 bears. Charter aircraft provide access to the lake, and small skiffs and rafts are used for transportation within the hunting area.

Both the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game maintain research facilities on Camp Island which are used primarily during summer and early fall. One bear guide maintains a hunting camp near the upper end of the lake. A public recreational cabin, administered by the U.S. Fish and Wildlife Service, is located at the lake outlet.

Naturalists, photographers and tourists who want to view Kodiak brown bears frequent Karluk Lake during the summer. Although no accurate records of such visits are available, an estimated 15 to 25 parties annually visit the area for wildlife-related recreation. Several documentary wildlife movies have been made wholly or in part at Karluk Lake. Both professional and amateur photographers visit the area concentrating on red salmon, bald eagle, and brown bear photography.

KLUTINA LAKE BROWN BEAR

LOCATION

In Game Management Unit 13D, that area within two miles of Klutina Lake and the Klutina River from Klutina Lake to the Richardson Highway.

THE SPECIES

Spawning and dead salmon along the drainages of Klutina Lake and the banks of the Klutina River have provided food for local brown bears for as long as local residents can remember. A high density of bears congregate in the area and are particularly accessible for viewing and hunting. The peak periods of bear abundance, related to peak salmon spawning periods, are July 20 to August 15 for Manker, St. Anne and Mahlo Creeks, and August 15 to September 15 for Haley Creek and the outlet of Klutina Lake.

The popularity of the Klutina Lake area for fishing and camping has increased tremendously in recent years, due in part to state maintenance of the Klutina Road. As a consequence the opportunity for observing bears in the area has become better known, and this use has increased substantially. Hunting of bears occurs in September and October. The average annual reported kill from 1970 to 1975 has been three bears. Concentrations of bears have given hunters the opportunity to be selective.

PAXSON BROWN BEAR

LOCATION

In Game Management Unit 13B, the Paxson closed area including the eastern drainage of the Gulkana River lying west of the Richardson Highway and the western drainage of the Gulkana River between the Denali Highway and the north end of Paxson Lake where the Gulkana River enters Paxson Lake.

THE SPECIES

Large numbers of salmon spawn in the Gulkana River during late summer, providing resident and nonresident visitors excellent opportunities to view salmon and the brown bears attracted by the fish. The area has been closed to the hunting of big game for many years. The area, located at the junction of the Richardson and Denali Highways, is visited by many travelers particularly during the fall when large numbers of hunters pass through.

PRINCE WILLIAM SOUND BROWN BEAR

LOCATION

That portion of Game Management Unit 6 from Valdez to Icy Cape, including Hinchinbrook and Montague Islands.

THE SPECIES

Brown bears are common in Prince William Sound from Valdez Arm to Icy Bay and on Montague and Hinchinbrook Islands. They are occasionally reported on Hawkins Island but do not appear to be resident there. Brown bears are not normally found in the northern or western portion of Prince William Sound.

Due to their secretive habits and preference for dense vegetative cover brown bears are difficult to inventory. Until a good censusing technique is developed, indices to population status such as magnitude of harvest and average age or skull size of bears in the harvest will be used. Currently the population may be somewhat lower than during the 1960's. Brown bear habitat is generally excellent. Disturbance by humans has been minor. The 1964 earthquake raised portions of Montague Island by as much as 31 feet. The uplift has greatly curtailed salmon production with unknown consequences for bears.

Hunting pressure is currently moderate, although a few areas are heavily hunted. The annual harvests of brown bears in the area have ranged from 13 to 63 bears with a 15-year annual average of 32. Peak years were 1967 and 1968 with harvests of 60 and 63 animals, respectively. The kill has been below average for the past several years (24 in 1975). During the past 15 years, males averaged 61 percent of the harvest, with hide size averaging 14.3 feet, skull size 23.4 inches and age 6.4 years. All 1975 male harvest statistics were higher than the 15-year average. Sixteen bears were taken illegally or in defense of life and property during the past 3 years, a considerable increase over previous years.

Most hunting and harvest occur during the 16-day spring season with half of the harvest by nonresidents. Local hunters take few bears. Normally about 10 guides operate in the area, and one air charter service takes out several hunting parties. Airplanes are the major means of transportation for bear hunters. Some boat hunting occurs in Prince William Sound, but few brown bears are taken by boat hunters. The proportion of hunters that are successful is unknown since unsuccessful hunters are not required to report.

An analysis of harvest data for the past 15 years indicates that hunting is not adversely affecting the brown bear resource in the area. The availability of big bears probably was reduced slightly following peak harvest years of 1967 and 1968, but it appears that many bears are now present. Prince William Sound and the Gulf Coast have not produced many trophy brown bears, although a few Boone and Crockett class animals have been taken.

BROWN BEARS IN SOUTHWESTERN ALASKA

Brown bears (*Ursus arctos*) occur throughout Southwestern Alaska except on the islands west of Unimak in the Aleutian Chain. This region supports the largest populations of brown bears in the state, and although precise data on abundance is lacking, there is a general understanding of the species' status. Brown bears are probably as abundant in this region now as they have ever been. Coastal areas support larger populations than Interior regions, possibly due to the abundant supply of fish and other foods that are available to bears over a longer period of the year.

Brown bears were once classified into a large number of species and subspecies, but the bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. Brown bears on Kodiak and Afognak Islands, however, are considered a reproductively isolated population with distinctive cranial features and are classified as *U. a. middendorffi*. Other reproductively isolated populations may exist; however, at this time there are insufficient data to determine if they deserve subspecific designation.

All habitat types are utilized by brown bears, but grass communities appear to be most important. The highest densities of bears occur in lush grassland areas such as those on Kodiak Island and the Alaska Peninsula. Where bears occur in forested areas, substantial meadows, muskegs, sedge flats, or other grassy areas are present. Grasslands appear especially critical for bears during spring when other high quality bear foods are scarce.

The brown bear's diet includes a wide range of animal and plant foods and is highly variable between areas and during different seasons. In spring, grass and other early-growing herbaceous plants make up the bulk of the diet. Bears also feed on a variety of animals such as dead seals, walrus, whales and other marine mammals which wash ashore on coastal beaches. Spring bear predation on moose and caribou also appears significant. During summer and fall salmon and berries constitute the major food items. The quantity and quality of protein foods, especially salmon, and the longer period of the year in which food is available to bears in coastal areas are believed to be the major factors responsible for differences in size between coastal and interior brown bears.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichinella spiralis* is the best known parasite infecting bears, because it is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bears.

In accessible, inhabited areas, human activities are doubtless the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Bears are killed when they are attracted to garbage dumps, and endanger human safety. Losses of free-ranging livestock sometimes necessitate removal of offending bears.

Recreational uses of brown bears predominate in Southwestern Alaska although subsistence utilization continues to some extent. Sport hunting is the primary use with the Alaska Peninsula and Kodiak Island being preeminent as hunting areas. After the early 1940's, trophy hunting of brown bears rapidly gained in popularity, especially on Kodiak Island. Hunting on the Alaska Peninsula was quite limited until the early 1960's. As hunting pressure increased, regulations affecting season lengths and methods of transport became more restrictive so that allowable harvest levels were not exceeded. Guided hunters have had the highest success rates due to the efficiency of their hunting methods. Since the early 1960's, the annual kill in Southwestern Alaska has been about 50 percent of the statewide harvest; management has intensified to maintain productive bear populations. Timing of spring and fall bear hunting seasons is used to influence the proportion of male bears in the harvest, allowing for manipulation of sex ratios to optimize productivity. In the spring, more males are taken because males emerge from dens before females and because females with cubs are protected. In the fall, more females are available for harvest due to natural separation of sows from grown cubs.

Nonconsumptive use has increased in recent years. A prime attraction in Katmai National Monument is its undisturbed brown bear population. Viewing and photography opportunities at unique bear concentration areas such as at the McNeil River State Game Sanctuary attract larger numbers of people each year. Growing national interest in brown bears is certain to increase the demand for nonconsumptive use opportunities.

BROWN BEARS IN WESTERN ALASKA

With the exception of the Yukon-Kuskokwim Delta, brown bears (*Ursus arctos*) occur throughout Western Alaska. Although there are no precise data on the abundance of brown bears in the region, bears are probably as abundant in this area now as they have ever been.

Brown bears were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. No reproductively isolated populations are known to exist in Western Alaska.

All habitat types are utilized by brown bears, but grass communities appear to be most important. Where bears occur in forested areas, substantial meadows, muskegs, sedge flats, or other grassy areas are present. Grasslands appear especially critical for bears during the spring when other high quality bear foods are scarce.

The brown bear's diet includes a wide range of animal and plant foods and is highly variable between areas and during different seasons. In spring, grass and other early-growing herbaceous plants make up the bulk of the diet. During summer and fall salmon and berries constitute the major food items. Some bear predation on moose and caribou also occurs.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichinella spiralis* is the best known parasite infecting bears because it is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bear.

In accessible, inhabited areas, human activities are doubtless the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Bears are killed in defense of life and property when they are attracted to garbage dumps and endanger human safety.

Sport hunting is the primary use of brown bears in Western Alaska. Domestic utilization of bears by local residents is well documented. However, the degree of use in the past as well as the present is unknown. Guided hunters have had the highest success because of the efficiency of their hunting methods. Since the early 1960's, the annual kill in Western Alaska has amounted to about 4 percent of the statewide harvest. As hunting pressure increases, regulations affecting length of season and methods of transport will become more restrictive in order that allowable harvest levels not be exceeded. Nonconsumptive use is of minor significance in the Western Region.

KVICHAK-NUSHAGAK-TOGIAK BROWN BEAR

LOCATION

Game Management Unit 17 and that portion of Game Management Unit 9 lying north of Katmai National Monument and the drainage of the Naknek River, but excluding McNeil River State Game Sanctuary.

THE SPECIES

This area has a relatively large brown bear population that has experienced only light to moderate hunting pressure. The greatest densities of bears occur along the Cook Inlet watershed and the Lake Iliamna area. Lower densities of bears occur in the Nushagak, Wood and Togiak River systems. Populations appear stable, but data on population sizes, composition and reproductive success are lacking. Brown bears den throughout this area, and areas of den concentrations have been located in the northern Aleutian Range.

Hunting is primarily by nonresidents (67 percent of reported harvest) but the percentage is not as large as elsewhere on the Alaska Peninsula. Harvest levels since 1961 have averaged 42 bears annually, with about two-thirds of the harvest occurring in the fall. Fall hunts are most popular because of the concurrent opportunity for hunters to take other big game species. In the past five years the harvest level has increased to average 70 bears annually. The greater harvest is the result of increased hunting effort by residents and nonresidents. Most of the increase has occurred in Game Management Unit 17 with hunting pressure shifting into that unit in response to more restrictive regulations in Unit 9.

This area has a large, established guide industry, particularly for sport fishing. Approximately 32 sport fish lodges provide service to visiting fishermen during the summer and early fall. Associated with sport fishing, there has been increased guiding of hunters for big game. In addition to brown bear, moose, caribou, Dall sheep and black bear can also be hunted. Much of the harvest of bears by Alaskan residents is incidental to other big game hunting. Hunter transportation to and within the area is primarily by light aircraft with hunting conducted on foot. Roads within this area are limited. Use of all-terrain vehicles for hunting occurs infrequently. The area retains high hunting aesthetics because of its basically unaltered wilderness nature.

Local residents have little interest in hunting brown bears for sport. Occasionally bears are taken for domestic use, particularly in the Togiak, Wood River, and Nushagak systems. In the Iliamna watershed bears were regularly taken by local residents in the past, but interest is now low.

The area is essentially wilderness. The impact of oil exploration work and hard mineral development has been minimal. It is probable that both resources shall be developed in the future and will have an impact on brown bear management.

NAKNEK-KING SALMON BROWN BEAR

LOCATION

In Game Management Unit 9, all drainages into the Naknek River west of the boundary of Katmai National Monument.

THE SPECIES

During the summer months, this area has a high density of brown bears. As many as 40 individual bears have been in and around the communities of Naknek, South Naknek and King Salmon during a single season. Originally, few bears were present, but salmon remains from canneries attracted and held roaming brown bears in the area. The number of bears capitalizing upon this artificial source of food gradually increased to the high density that now exists.

Most bears within this area occupy winter dens within Katmai National Monument. After spring emergence, bears gradually enter the area with the greatest influx occurring in July and August. All ages of bears are present, from single males to sows accompanied by cubs. Numbers then decline as bears leave to fish the salmon spawning areas of the Naknek River and Lake system. While in the area, nuisance bears may damage smoke houses, meat houses or homes. A local man was severely mauled by a brown bear in the summer of 1973.

The present bear population appears to be high, but relatively stable. Local residents regularly kill bears illegally or under the provisions of the "defense of life and property" regulation. The known nuisance kill averages 3 to 5 bears annually, but this figure is minimal as many illegal kills are never located. The legal sport harvest has been only 1 or 2 bears annually. Legal sport hunting is almost entirely by local residents. Little guiding occurs and few other Alaskans hunt here. Local residents do not value brown bears as game animals. Losses to the bear population from these sources are compensated for by reproduction or by immigration of young bears from adjoining areas. Katmai National Monument directly adjoins this area. Brown bear production within the Monument boundaries will provide a continuing flow of bears into the area. Brown bears will always be present. Bears immobilized and marked in the Naknek-King Salmon area have been observed at Brooks Camp within the Monument.

CENTRAL ALASKA PENINSULA BROWN BEAR

LOCATION

In Game Management Unit 9, that portion of the Alaska Peninsula draining into the Bering Sea southwest of the Naknek River drainage and Katmai National Monument to and including Reindeer Creek on the south, and those drainages into the Pacific Ocean from Katmai National Monument on the north to Cape Igvak on the south.

THE SPECIES

A high-density brown bear population now occurs in this area. The population is dominated by younger age class animals and biased towards females because of past sport harvest. Older age animals still occur in the harvest. Productivity appears high, and sows with large litters are frequently observed. Data on population size and composition are lacking, but indications are that numbers are relatively stable or increasing slightly. An interchange of bears across the Aleutian Range to the Pacific drainages occurs regularly. Some movements also occur between this area and Bering Sea drainages to its north and south. Bears den throughout the area, but dens most commonly occur in the lower elevations of the Aleutian Range.

The area has been hunted heavily for a number of years. Harvest records indicate a minimum of 700 brown bears have been taken since 1961. The majority of the kill has been by guided nonresidents (78 percent) and has occurred during the fall season (525 bears). Harvest levels increased until the mid-1960's and then declined slightly to current levels of about 50 bears annually.

A large guide industry operates in the area with 15 permanent guide camps established. Resident hunters from other areas of the state also frequently hunt the area. The presence of both moose and caribou makes multi-species hunts possible and serves to attract hunters. Because of the populatity of multi-species hunts, fall has been the most popular hunting period, accounting for three-quarters of the reported bear harvest.

Residents of the villages of Egegik, Pilot Point, Ugashik and Port Heiden have little interest in sport hunting bears. Domestic use of the species is nonexistent. Occasionally a nuisance brown bear is killed within the villages.

The area has been altered little by man's activities. Oil exploration crews have drilled test holes and constructed large landing strips in four locations. Seismic tests have been conducted with the aid of all-terrain vehicles in the past, although recent work has been with helicopters or with all-terrain vehicles on frozen tundra in winter. Marks from past vehicle use are readily visible from the air but less evident on the ground.

Transportation within the area is primarily by light aircraft with hunting then conducted on foot. All-terrain vehicles and 4-wheel drive vehicles are used by a few guides for transportation. Air charter services located in King Salmon provide transportation for many hunters.

PACIFIC-MESHIK BROWN BEAR

LOCATION

In Game Management Unit 9, all drainages into the Pacific Ocean from Cape Igvak on the north to Cape Kumlium on the south and all drainages into Port Heiden Bay.

THE SPECIES

Brown bears are now abundant within this area but the population does not necessarily remain discrete within the boundaries of this area. Bears move across drainages and over the Aleutian Range into and from other areas. Data on population size, composition, and areas of use are minimal. At this time the population generally appears young and highly productive, although some older age individuals are present.

Sport hunting has become increasingly important in the area. Harvest over the past five years has averaged about 30 bears annually, about five bears per year more than the 15-year average. Approximately 60 percent of the harvest occurs in the fall when moose and caribou are also available. Most bears are taken by guided nonresidents. Six permanent guide camps have been established in the area, but most guiding still occurs from temporary camps.

Brown bear habitat has been altered little by man. Large landing strips associated with oil or mineral exploratory work were constructed near the Meshik River and at Wide Bay. The use of tracked vehicles for hunting has been limited to the Meshik Valley, but such vehicles have been used throughout much of the southern area for oil exploratory efforts. Vehicle tracks remain readily visible from the air for several years but are less evident on the ground.

The Pacific watersheds of the proposed area have received light hunting pressure because weather frequently makes travel to, from, and within the area difficult and, until recently, other lightly harvested game populations were more available. The Meshik River drainages have also had limited hunting because access, including aircraft, is limited. Floatplane landings are possible in some areas. The river, although shallow, can be floated by raft. Other aircraft access is restricted to wheel landings on inter-tidal beaches, pumice patches, gravel bars, or abandoned mining strips. Tracked vehicles may not be utilized for hunting in the Alaska Peninsula Management Area which composes a large portion of the proposed management area. The basic wilderness nature of the area supplements high hunting aesthetics.

Most hunting is recreational. Only occasionally do residents of local villages harvest bears for domestic use. Because of the sparce human population, few bears are killed in "defense of life and property" situations.

LOWER ALASKA PENINSULA BROWN BEAR

LOCATION

In Game Management Unit 9, that portion of the Alaska Peninsula lying north and east of a line between the heads of Port Moller Bay and American Bay and to the south and west of, but not including, the drainages of the Meshik and Aniakchak Rivers and Kujulik Bay.

THE SPECIES

This area has a high abundance of brown bears. The population may be the most productive of any population in Alaska. Data are not available on total bear numbers, but Department research conducted in the Chignik-Black Lake area suggests females out-number males by as much as five to one with few old males present. The average age of bears in the harvest is less than six years.

The heaviest brown bear hunting pressure on the Alaska Peninsula occurs in this area. Over the past 10 years, it has produced about 60 bears annually, with about 53 percent of the harvest in the fall. Most of the brown bear harvest is by guided nonresidents who make up 76 percent of successful hunters. Permanent guide camps have been established at seven locations, with additional temporary camps constructed seasonally. Hunting effort by resident hunters has been increasing in recent years. The presence of moose and caribou have been important in attracting hunters. Combination hunts for bears with one or both of these other species are popular with both all hunters. Hunting regulations for moose and caribou thereby affect hunting pressure on the brown bear population.

The Chignik residents occasionally have problems with nuisance brown bears. "Defense of life and property" kills have averaged about one bear annually. Illegal killing of bears remains a problem but is less serious than in past years.

Transportation within the area is primarily by light aircraft with hunting occurring on foot. Two all-terrain vehicles have been introduced by guides. Boats are used for transportation in the Chignik River system and along the Pacific shoreline.

The area remains essentially wilderness in spite of numerous oil exploratory efforts in recent years. All-terrain vehicle trails, readily visible from the air but less evident on the ground, mark areas of extensive seismic work. Test holes were drilled and a large landing strip was constructed in one location. There is a high probability that future oil and mineral development will occur in the area.

SOUTHWESTERN ALASKA PENINSULA BROWN BEAR

LOCATION

In Game Management Unit 9, that portion of the Alaska Peninsula south and west of a line drawn from the head of Port Moller Bay on the Bering Sea side to the head of American Bay on the Pacific side, except that area included in the Cold Bay Brown Bear Management Plan.

THE SPECIES

This area supports a high density of brown bears including old age individuals. The sex and age composition of the population has not been altered by hunting to the degree that it has elsewhere on the Alaska Peninsula. Reproductive success appears good, but specific data on population size and composition are lacking.

The area has been altered little by man's activities but oil exploratory efforts have had local impacts, with test holes drilled and large landing strips constructed at five locations. Three communities, Nelson Lagoon, King Cove, and Cold Bay, exist within the immediate area. Residents of Nelson Lagoon frequently travel the beaches as far as Izembek National Wildlife Range in four-wheel drive vehicles or other all-terrain vehicles. The Wildlife Range is managed by the U. S. Fish and Wildlife Service which restricts travel to foot or by boat.

Little bear hunting is done by local residents, but the area is popular with Alaskan residents from other areas of the state. Harvest levels are comparatively low. About 66 percent of the harvest since 1961 has been by nonresidents, a lower percentage than any other area on the Alaska Peninsula. Four guides have established permanent hunting camps in the area.

Since 1961, the harvest has averaged 31 bears annually, but it has increased in the past five years to an average of 46 bears. In 1975, 83 bears were harvested. Most of the brown bear harvest (51 bears) occurred in the spring of 1975 when the more heavily hunted central portion of the Alaska Peninsula was closed. The level of the spring harvest has exceeded the fall harvest in this area. Since the area lacks a huntable moose population, it does not attract hunters interested in the multi-species big game hunts that have resulted in high fall brown bear harvests in other areas. The reported spring harvest has been 56 percent of the total kill since 1961. In the past five years this trend has reversed, with more bears being taken in the fall (58 percent). Hunters in this area are primarily interested in brown bears, but the bear-caribou combination is becoming an increasingly attractive hunt as a result of restrictive big game seasons elsewhere in Alaska. The brown bear population appears capable of sustaining the average harvest level of the past five years while maintaining the desired harvest characteristics. However, continued harvests at 1975 season levels could prove excessive for proposed management.

Most transportation is by light aircraft with hunting then occurring on foot. No all-terrain vehicles except motor bikes have been used by guides within the area. Residents of Nelson Lagoon utilize four-wheel drive vehicles to hunt caribou but have little interest in brown bears. Occasionally, brown bears are killed at Nelson Lagoon and King Cove when they become a potential danger to the communities.

COLD BAY BROWN BEAR

LOCATION

That portion of Game Management Unit 9 bounded by a line starting at Blaine Point in Izembek Lagoon, then due south to Kinzarof Lagoon, then along the mean high tide line west and south to the mouth of Thin Point Lagoon, then along a line west to Frosty Peak, then along a line northwest to Izembek Lagoon, then along the mean high tide line north and east to the point of origin.

THE SPECIES

The Cold Bay area supports a high density of brown bears, although there is little information available on total bear numbers, sex and age structure of the population and natural mortality factors. Brown bears occur in or travel through the area in all seasons except winter, with greatest use occurring in summer when the bears gather in the local streams to feed on spawning salmon. Brown bears den on nearby Frosty Peak. Though data are lacking, the bear population may contain a relatively high proportion of older, larger males since the area was closed to brown bear recreational hunting between 1968 and 1974. Apart from buildings and roads associated with the village of Cold Bay, Izembek National Wildlife Range, and abandoned military installations, humans have made little impact on brown bear habitat.

The Cold Bay area was closed to brown bear hunting between 1968 and 1974. Sport hunting resumed in 1975 with a spring and fall season. About six bears are killed annually, with more than 80 percent of the harvest being taken by Alaska residents. One guide occasionally brings clients to hunt in the area. Hunter access over the area is generally unrestricted except within Izembek National Wildlife Range where restrictions on motorized vehicles limit access to walking except on established roads.

Little change is expected in land ownership. Should oil development take place in the lower Alaska Peninsula, the Cold Bay Airport would probably become an important logistic center.

UNIMAK ISLAND BROWN BEAR

LOCATION

In Game Management Unit 10, Unimak Island.

THE SPECIES

Brown bears are abundant on Unimak Island. Old age animals are present, and the population has been little affected by hunting. Specific data on population numbers, composition, and reproductive success are lacking, but the population appears stable. Most denning occurs on the slopes of the Island's volcanos. Bears feed in streams when spawning salmon are present. In addition, caribou, beach carrion, rodents and berries are available food sources.

The Island is wilderness except for limited areas around False Pass and the U. S. Coast Guard stations at Cape Sarichef and Scotch Cape. Hunting aesthetics on the island are high with the landscape unaffected by man; the few hunters present result in little competition for animals. Unimak is part of the Aleutian Island Refuge system, and brown bear hunting is regulated by a permit system presently administered by the U. S. Fish and Wildlife Service. The number of permits issued has been low, and this has been the major factor in maintaining a low harvest level. In recent years, the hunter kill has ranged between 2 and 5 bears with the harvest almost entirely by Alaskan residents. The small number of bears in the harvest precludes meaningful conclusions concerning the age structure or sex of bears in the population.

Access for persons other than local residents is difficult and expensive. Local air charters have not been regularly available, and small boats for recreational use are unavailable. The U. S. Fish and Wildlife Service restricts brown bear hunters transported by aircraft to landings in areas below mean high tide and to water surfaces. These restrictions have discouraged persons from using the area.

There is little local interest in sport hunting for brown bears. Most hunting is by trophy and recreational hunters from other areas of the state. Domestic use of bears is nonexistent. Because of the sparse human population, the number of illegal kills or "defense of life and property" kills are also low. Natural mortality factors have the greatest impact on the island's brown bear population.

BROWN BEARS IN INTERIOR ALASKA

Brown bears (*Ursus arctos*) were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. No reproductively isolated populations are known to exist in Interior Alaska. Most laymen and scientists designate bears found near coastal areas as brown bears, especially in the southern half of Alaska, while those found inland and in the northern half of Alaska and the remainder of North America are called grizzly bears.

Grizzly bears occur throughout Interior Alaska. Higher densities occur in the mountains, foothills and mountain valleys than in the forested lowlands. In any locality the abundance of grizzlies may vary seasonally depending on available food sources. Densities of grizzlies on the south slope of the Brooks Range are low, varying from 1 bear per 50 square miles in areas of preferred habitat to 1 bear per 100 square miles when the entire habitat used in considered. South of the Yukon River, from the alpine areas of the Alaska Range to the lowlands of the Yukon, population figures are not known. In general terms, grizzlies range in abundance from low to moderate densities. On a region-wide scale, grizzlies appear to be as numerous as they have been in the past, but declines in abundance may be occurring in some areas, notably on the south slope of the Brooks Range.

Along the south slope of the Brooks Range, all habitat types are used by grizzly bears but the alluvial valley bottoms near river courses are the most important. During the spring these areas are used as travel routes after the bears leave winter dens, especially by males in search of moose or caribou carrion. The soil thaws earliest in the mountains and foothills and bears forage along the valley bottoms in these areas for roots of Eskimo potato (*Hedysarum*) or other vegetation. Berries from the previous fall which remained intact through the winter are another spring food sought in alpine and subalpine habitat. From early summer until late August grizzlies tend to disperse from river valleys to the alpine, foothill and coastal plain areas where they feed on vegetation, primarily *Equisetum*, grasses and sedges. During late August to mid-September, the grizzlies return to the river valleys to search out berries and dig for roots. Throughout the rest of Interior Alaska, habitat requirements for grizzlies are not as well known but they do live mainly in alpine and subalpine habitat. With some exceptions salmon are not available in the numbers which occur in coastal areas. Interior bears are more dependent on semi-aquatic and riparian vegetation, berries, terrestrial carrion, and small and large mammals. They may also be prone to frequenting garbage dumps. Bears appear to need large expanses of preferred habitat because they are at the top of the mammalian food chain and occur in relatively low densities over large areas. Den sites are generally found on steep south-facing slopes which are vegetated, well-drained and where permafrost is deep enough to allow den construction. Historical records indicate that the habitat in this area has changed

little until recent times. However, there is a great potential for reduction of available habitat by oil and gas exploration and development, and resultant transportation corridors and construction activities.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichanella spiralis* is the best known parasite infecting bears, because it is transmissible to man in raw or partially cooked bear meat; however it is of minor significance to infected bears.

In accessible, inhabited areas, human activities are doubtless the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Bears are killed when they are attracted to camps or garbage dumps, and endanger human safety. In some portions of Interior Alaska, the reproductive potential of grizzlies is low and therefore they may be very susceptible to over-hunting. Generally, grizzlies do not reach sexual maturity until they are 6 years of age although some apparently don't successfully rear young until age 10 or 11. Also, their litters are small and the interval between successful production of young may be from three to four years. The survival of young varies, but in some areas it is low.

Recreational uses of brown bears predominate in Interior Alaska although domestic utilization continues to some extent. Sport hunting is the primary use with the Southern Brooks Range and Alaska Range being the most important hunting areas. After the early 1940's trophy hunting of grizzly bears gained rapidly in popularity. Bear hunting in Interior Alaska was quite limited until the early 1960's. As hunting pressure increased, regulations affecting season lengths became more restrictive to avoid excesive harvests. Guided hunters have had the highest success rates due to the efficiency of their hunting methods. It is expected that the trend of increased hunting pressure will continue. Nonconsumptive use will also increase throughout the area.

UPPER YUKON-PORCUPINE BROWN BEAR

LOCATION

That portion of Game Management Units 24 and 25 lying south of the Brooks Range Brown Bear Management Plan area.

THE SPECIES

The abundance of brown/grizzly bears in this region is low, but may vary seasonally depending on available food sources. The density of bears may reach 1 bear per 100 square miles in localities of preferred habitat but when considering the entire area, a density of 1 bear per 150 square miles is more appropriate. On this basis, the upper Yukon-Porcupine area may support a minimum population of 410 grizzlies.

Specific habitat utilization by grizzlies in this area is poorly known. Grizzlies are regularly found throughout alpine, sub-alpine, and river valley habitat and occur sporadically in the forested lowlands. Except for the habitat lost during the construction of the trans-Alaska pipeline, there have been few instances of habitat change in the area.

The area is not known for producing large grizzlies and few people are attracted to the area specifically to hunt bears. Probably no more than 10 bears are killed annually. However, there may be a substantial number of grizzlies taken but not reported by local residents.

Most kills by recreational hunters are probably made incidental to moose hunting rather than the result of a hunt specifically for grizzlies. The length of the season has been shortened considerably since 1968. During 1970, 1972, and 1974 either or both of the fall and spring seasons were closed as a result of excessive harvest in the adjacent Brooks Range area.

Most of the kill in the Yukon-Porcupine area is made by local hunters using river boats. Some resident hunters from outside the area use aircraft or occasionally river boats to reach hunting areas. Guiding is not an important activity.

The relatively low level of use which occurs now does not appear to be adversely affecting the grizzly bear population in this area. No sizable increase in hunting pressure is anticipated in the near future. However, once the pipeline haul road is opened to the public as far as the Yukon River, hunting pressure will undoubtedly increase in that vicinity. An increasing amount of nonconsumptive outdoor recreation such as boating, photographing, hiking is expected to occur. The presence of grizzlies in the area definitely will increase the appeal of these activities to many of these users.

UPPER BIRCH-PREACHER-BEAVER CREEKS BROWN BEAR

LOCATION

In Game Management Unit 20, the drainages of Birch Creek above the confluence of Birch Creek with the South Fork of Birch Creek, the drainage of Big Windy Creek, the drainage of Preacher Creek above its confluence with Loper Creek on the south and the North Fork of Preacher Creek on the north, and the drainage of Beaver Creek above its confluence with Moose Creek, including the drainage of Moose Creek.

THE SPECIES

Brown/grizzly bears are present in the area, but no data are available on population numbers or trends, productivity or survival. The rolling terrain offers extensive areas of alpine habitat suitable for denning and conducive to the growth of berry producing plants.

Most grizzly bears are taken incidental to other activities or hunts for other species. Harvests of bears have been light. Between 1969 and 1975 only 13 bears were reported taken in or near the area. Six of these were taken along the Steese Highway, the only road access through the area. The remaining seven were taken in more remote locations, six by hunters utilizing aircraft and one by canoe. Twelve bears were taken in fall hunts and one was taken during the spring. There were eight males and five females in the harvest. Resident hunters accounted for all of the harvest. Guiding for bears is negligible, although the area has the potential for producing large bears. Skulls of three bears taken between 1969 and 1975 averaged 24 5/8 in total measurements. Hunting seasons were gradually shortened from a total of 154 days in 1961 to a total of 22 days in 1971. The present season totals 42 days. There have been both spring and fall seasons each year except for 1970 and 1971.

Access is limited due to the undeveloped nature of the area. Consequently hunting pressure has been light. In recent years caribou movement patterns have changed and they no longer frequent the area. Moose numbers have also declined. Thus, many hunters who formerly entered the area seeking moose and caribou no longer do so and encounters with grizzly bears have diminished accordingly. Hunters gain access by landing light aircraft on or along Beaver Creek, by canoeing down Birch Creek, or by driving off-road vehicles along the cat trail to Beaver Creek and along the short mining access roads along the Steese Highway. Some hunters hike along the ridge system from several points on the Steese Highway.

YUKON-TANANA BROWN BEAR

LOCATION

Game Management Unit 12, and Unit 20 excluding the Central Alaska Range and the Upper Birch-Preacher-Beaver Creeks Brown Bear Management Plan areas, and Mt. McKinley National Park.

THE SPECIES

The occurrence of brown/grizzly bears throughout the area is variable. While grizzly surveys have not been conducted, casual observations and harvest levels suggest that bears are generally abundant. High densities of bears have been observed in the headwaters of the Chena and Salcha Rivers during surveys of calving caribou but whether bears are attracted to caribou calving grounds is unknown.

No major changes in the quantity or quality of the habitat have occured in recent years and in general bear habitat is in good condition. Some small alterations have occurred, caused by forest fires, (which are probably beneficial to the species) and developmental activities by man. However, these changes are minor and have had little impact on the bear population. Increased encounters between people and bears have occurred with increased human development in the area. In recent years approximately four bears have been killed in defense of life and property.

Hunting seasons for grizzly bears have varied in length and timing since statehood, but the Yukon-Tanana area generally has had liberal seasons. In recent years a month-long fall season and a two-week spring season have been allowed. Most of the bears harvested have come from areas south of the Tanana River, primarily the north slopes of the Alaska Range, and the Mentasta, Wrangell and Nuzotin Mountains. During the period 1969 through 1972, 76 bears were taken in this southern portion of the area while 20 were reported taken between the Tanana and Yukon Rivers. Many of the bears killed north of the Tanana River come from east of the Salcha River. Ages of bears killed indicate present harvest levels are not limiting population growth.

About three-fourths of the harvest is by Alaska residents, and many of the bears taken are killed incidentally to hunts for other species. Relatively few bears are killed in the spring. Most nonresident hunting activity occurs in the southeastern portion of the area.

Access is lacking in much of the area north of the Tanana River except along the Steese and Taylor Highways and by riverboat along some of the larger rivers. There are few airstrips and these generally are poorly maintained. South of the Tanana River, aircraft, off-road vehicles and horses provide access into hunting areas.

Little nonconsumptive use of bears occurs except where bears are attracted to food sources near human habitations. Some observation of bears, for example, occurs at the Ft. Greely dump.

CENTRAL ALASKA RANGE BROWN BEAR

LOCATION

Game Management Unit 20A and that portion of Game Management Unit 20C south of the Tanana River and west of the Totatlanika River.

THE SPECIES

The Central Alaska Range area currently supports a relatively dense brown/ grizzly bear population. The greatest number of bears occur in the alpine and subalpine portions of the Alaska Range and adjacent foothills. Movements of grizzlies north of Mt. McKinley Park are from denning areas to floodplains and river bars in April and early May, then to alpine areas in late May, dispersal to berry producing areas in late July and finally to denning areas in October and November. Two critical habitat areas, Toklat Springs and Moose Creek, are utilized by spawning chum salmon and consequently attract large numbers of bears in October and November. The area north of the park is used more frequently by single and subadult bears than it is by sows with cubs. Other seasonal concentrations of bears have been noted on the calving grounds of the Delta caribou herd between the Delta River and Dry Creek during May and June.

Minimal loss of prime grizzly bear habitat has occurred through development, fire or succession. Intensive development of coal in the Healy and Lignite Creek drainages has resulted in the formation of a mining community at Usibelli and a myriad of roads in the vicinity of the coal pits. Mining activity in the Kantishna District, which probably peaked in the 1960's, may have resulted in some habitat loss. Recent wildfires have altered a small portion of sub-alpine habitat lying between the East Fork of the Little Delta River and Buchanan Creek.

The harvest of bears for the period 1969-1975 has averaged 18 bears per year. Of the 125 bears killed, 72 were males. During the 1974 and 1975 seasons a greater proportion of the harvest consisted of females. Hunting season length and timing has varied since statehood in different portions of the area. Harvests of bears during spring seasons, when held, have been small in comparison with fall season harvests. For example, in 1974 and 1975 more than 80 percent of the bears killed were taken in the fall. Although the level of harvest has not adversely affected the availability of legal bears, recruitment to the population will be reduced if the trend to more females in the harvest continues.

The area has produced old bears in sufficient numbers during the period 1970-73 to maintain a high trophy potential for the area. For example, 18 bears (42 percent of the male harvest) 8 years or older were taken from the area during this 4 year period. Three of six male bears taken from this area in 1975 met minimum Boone and Crockett scores.

This portion of the Alaska Range received heavy use by guides in the late 1960's and early 1970's when liberal seasons for other big game

species allowed for productive combination hunts. About 16 guides utilized the area from the Delta River westward along the Alaska Range north of McKinley Park. Declining numbers of moose and caribou, decreased availability of legal Dall sheep rams, and more restrictive seasons have reduced the area's potential for guided hunts. There are now approximately five guides active within this area. Most bears taken on guided hunts are from the Yanert and Toklat River areas, the latter attracting bears during salmon spawning periods.

Aircraft has been the principal means of access for bear hunting in this area, despite the regulation prohibiting the taking of bears the same day a person is airborne. Numerous strips and wide gravel bars enable hunters to reach alpine and subalpine habitat. In addition, the area is accessible by off-road vehicles along the Bonnifield, Rex, Terry and Stampede Trails. Guided hunts with the aid of horses are presently conducted in the upper Wood and Yanert areas.

BROWN BEARS IN NORTHWESTERN ALASKA

Brown bears (*Ursus arctos*) were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. No reproductively isolated populations are known to exist in Northwestern Alaska. Most layment and scientists designate bears found near coastal areas as brown bears, especially in the southern half of Alaska, while those found inland and in the northern half of Alaska and the remainder of North America are called grizzly bears.

Grizzly bears can be found throughout the country from the Seward Peninsula and the land bordering Norton Sound to the southern edge of the Brooks Range. Higher densities occur in the mountains, foothills and valley bottoms than on the lowlands near the coast or on the Seward Peninsula. Abundance of grizzlies in this region may vary seasonally depending on available food sources. Although detailed population data are not available, general observations and limited survey work indicate low to moderate population levels. On a region-wide scale, grizzlies appear to be as numerous as they have ever been, but in localized areas some decline in abundance may be occurring.

All habitat types in Northwestern Alaska are used by grizzly bears but the most important are the alluvial valley bottoms near river courses. During the spring these areas are used as travel routes after the bears leave winter dens, especially by males in search of moose or caribou carrion. The soil thaws earliest in the mountains and foothills and bears forage along the valley bottoms for roots of Eskimo potato (*Hedysarum*) or other vegetation. Berries from the previous fall which remained intact through the winter are another spring food sought in valley bottoms and nearby slopes. In some portions of Northwestern Alaska from early summer until late August, grizzlies disperse from river valleys to the alpine, foothill and coastal plain areas where they feed on vegetation, primarily *Equisetum*, grasses and sedges. In other areas, where salmon are available, bears may congregate near rivers and feed on salmon extensively. During late August to mid-September, the grizzlies return to the river valleys to search out berries and dig for roots.

In northeastern Alaska where the denning characteristics of a similar population of bears are known, den sites are generally found on steep south-facing slopes which are vegetated, well-drained and where permafrost is deep enough to allow den construction. Historical records indicate that the habitat in Northwestern Alaska has changed little until recent times. However, there is a great potential for reduction of available habitat by oil and gas exploration and development and resultant transportation corridors and construction activities.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably

few. Grizzly bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichanella spiralis* is the best known parasite infecting bears because it is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bears.

In Northwestern Alaska, the grizzly bear is at the northern limit of its range. The period during which food is available in summer is short, and reproductive potential may be low. Accordingly populations may be more susceptible to the pressures of human development and sport hunting than they are in some other regions. At this latitude in northeastern Alaska, bears do not produce their first litters until they reach an average age of about 10 years. In the same region litter size ranges from one to three cubs, with an average of 1.8 and the mean interval between litters is about 4 years.

In accessible, inhabited areas, human activities are doubtless the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Problems arise when bears are attracted to camps or garbage dumps, where they may eventually endanger human safety.

Recreational uses of brown bears predominate in Northwestern Alaska although domestic utilization continues to some extent. Sport hunting is the primary use and the Noatak and Kobuk valleys in the southern Brooks Range are the most important hunting areas. After the mid 1940's trophy hunting of grizzly bears gained rapidly in popularity. Bear hunting in this area was quite limited until the early 1960's. As hunting pressure increased, regulations affecting season lengths became more restrictive to avoid excessive harvests. Guided hunters have had the highest success rates due to the efficiency of their hunting methods. It is expected that the trend of increased hunting pressure will continue. Nonconsumptive use will also increase especially in the Noatak and Kobuk River drainages.

NORTHWESTERN ALASKA BROWN BEAR

LOCATION

All of Game Management Unit 23 except for the drainages of the Noatak River above Mayumerak Creek, and the drainages into Kotzebue Sound west of and including the Buckland River.

THE SPECIES

Because of the diversified habitat, the large area, and the lack of data it is difficult to determine the number of brown/grizzly bears in northwestern Alaska. Although the history of the population is not well known, it appears that bears were common during the 1950's after increasing from low numbers resulting from heavy hunting during the early part of the 20th century. During the 1960's, guides offered combination hunts for both grizzly and polar bears. This practice resulted in an increased grizzly harvest. When polar bear hunting by non-natives became illegal in 1972, fewer guides offered spring grizzly hunts in the area. The grizzly population has since increased and will probably continue to increase if hunting pressure remains at current levels.

Natural mortality is unknown but is believed greatest in young bears as a result of predation by other bears. Observations of sows with cubs suggest productivity is high.

The habitat is of high quality, despite the arctic climate. Most major rivers and associated tributaries support large numbers of chum salmon. Berries and other edible plants are common, and stands of spruce or large willow provide extensive cover. Although grizzly bears do not usually attain a large size (the average adult hide will square 8 feet), the area is noted for producing quality trophies.

From 1961 through 1975, the reported annual harvest averaged 15 bears. However, the actual kill is higher because rural hunters rarely comply with sealing requirements. The Northwestern Alaska Native Association (NANA) listed the subsistence take of grizzly bears in the early 1970's as 80 per year. Because the demand for grizzlies by local residents is presently low, the average harvest is estimated at 60 bears annually. Annual harvests over the last 15 years may have approached 100 animals, however. Seventy-eight percent of the recorded kill has consisted of males. Except for the springs of 1971 and 1972, spring and fall hunting has been allowed every year since statehood.

Local residents currently account for approximately 85 percent of the harvest. Some rural hunters hunt grizzly bears for food, but bears are taken incidental to other activities. Also they are often shot indiscriminately because many local residents consider them nuisances.

Sixty-two percent (155) of 251 bears sealed since 1961 were taken by nonresidents. Guiding in the area may again be increasing since bears have become more

abundant. Although the harvest has been equally divided between spring and fall, guides prefer to hunt during spring hunting because bears are easier to find at that time.

Local hunters commonly use boats to take bears on the Kobuk or Noatak Rivers in summer and early fall. Sport hunters depend on aircraft for access, especially when they are hunting the tributaries of the Noatak and Kobuk Rivers. Most hunting effort occurs on the Kelly, Kugururok and lower Noatak Rivers in the fall and on the Squirrel, Salmon, and Wulik Rivers in the spring.

SEWARD PENINSULA BROWN BEAR

LOCATION

Game Management Unit 22 and that portion of Game Management Unit 23 draining into Kotzebue Sound west of and including the Buckland River drainage.

THE SPECIES

The Seward Peninsula has a relatively small population of brown/grizzly bears. Low bear density is probably due to limited food supplies. Low bear density makes comprehensive surveys impractical but a general impression of relative abundance can be obtained from: (1) counting tracks in the spring after the bears emerge from hibernation; (2) reports of fisheries biologists counting salmon in summer; and (3) recording incidental sightings.

Historical records indicate that grizzly bears have occupied the Seward Peninsula for several hundred years. During the early 1900's, encounters between gold prospectors and bears were common and resulted in a substantial reduction of the bear population. Grizzlies were killed because they were a threat to miners and their possessions, and as a source of food. Bears began to slowly increase in numbers as the number of miners decreased. Bear populations are probably still increasing and may continue to increase if hunting pressure remains at the current level.

Natural mortality rates are unknown, but are probably relatively high among young animals as a result of predation by other bears. Observations of sows with cubs suggest annual recruitment is approximately 10 to 20 percent. In the immediate future, bear population size will be influenced by availability of food, principally salmon, and most importantly, by hunting pressure.

The annual grizzly bear harvest has averaged two bears for the past ten years and was highest in 1974 with ten. Considerable non-compliance with sealing regulations occurs in rural villages and the actual harvest may approximate 20 to 25 bears per year. A subsistence survey in the early 1970's indicated a harvest of 61 bears for all villages within the Bering Straits Regional Corporation. This figure may be high, especially since demand for grizzly bears by local residents is low. However, in past years the total harvest may have approached 50 animals. There have been an annual spring and fall hunting seasons since statehood, except the springs of 1971 and 1972. Seventy-two percent of the recorded kill has been males.

Most bears have been taken from one of the three road systems near Nome and from boats along major rivers. Snowmachines and aircraft have become popular recently, especially in spring. The Kuzitrin, Koyuk, Buckland, Niukluk and Kwik River drainages receive the greatest hunting pressure. Coastal areas where bears concentrate to feed on carrion are also heavily hunted.

Local residents currently account for about 90 percent of the annual harvest, and rural subsistence hunters probably take more than 75 percent of this total. Most kills are made while hunters are engaged in some other outdoor activity. With the relative ease of hunting bears due to the open terrain and lack of brush, guides have become more active on the Seward Peninsula. Hunting pressure by guided hunters will likely increase. Of the 40 bears sealed since 1961, six were taken by nonresidents on guided hunts. Four of these were taken in 1974 and 1975.

YUKON-KUSKOKWIM BROWN BEAR

LOCATION

Game Management Units 18 and 21 and that portion of Game Management Unit 19 lying north of the Kuskokwim River.

THE SPECIES

Brown bears are moderately abundant in those portions of the area south of the Kuskokwim River, and north of the Yukon River, but are relatively scarce in the broad flood plains of the Yukon River. Good brown bear populations are known to exist in the Beaver Mountains, Cloudy Mountains, Sunshine Mountains, Nowitna River Drainage, Kokrine Hills, and the Anvik River.

Large bears are uncommon over most of the management area. Occassionally a very large bear is taken but the hunter can seldom expect to see trophy bears in this area. Few brown bears are harvested annually in this area. Much of the terrain involved does not lend itself to bear hunting because it is too brushy and inaccessible. Most bears are taken in defense of life and property by local hunters or trappers. Brown bears are destructive to property and fish camps, and most local residents consider them a nuisance.

FAREWELL BROWN BEAR

LOCATION

In Game Management Unit 19, that area within a line drawn from the outlet of Telequana Lake north to Lone Mountain, east to Farewell, east northeast to the northwest corner of Mt. McKinley National Park, south to the Unit 19 boundary, along the Unit 19 boundary to Telequana Pass, and down the Telequana River to the starting point.

THE SPECIES

Brown/grizzly bear appear to be increasing throughout much of this area following several years of relative scarcity. These increases are reflected in hunter success and increased frequency of bear observations.

Grizzly bear hunting was of insignificant proportions in the Farewell area prior to 1970. Less than 20 bears were taken in most years. Both guided hunters and residents from other parts of the state began utilizing bear in this area to a greater extent as decreasing bear populations and regulations restricted brown/grizzly bear hunting elsewhere. Prior to 1974, spring bear harvests were of little consequence. However, closing of both the Brooks range and the Alaska Peninsula to spring bear hunting prompted a number of guides and resident hunters to hunt bears in Game Management Unit 19. This resulted in more than double the highest spring harvest previously recorded. Harvests in recent years have ranged between 30 and 40 bears per year. While hunting has continued to increase, hide size, skull size, and average age of bears in the harvest have not decreased. This suggests that harvest levels are still within the capacity of the population to support present levels of hunting pressure. Large grizzly bears are fairly common in this area. Guided non-residents take about 70-80 percent of the bears killed each year. Aircraft are the primary means of access to the area.

SOUTH KUSKOKWIM BROWN BEAR

LOCATION

In Game Management Unit 19, all drainages flowing into the south bank of the Kuskokwim River and the north fork of the Kuskokwim River from Aniak east, excluding the Farewell Brown Bear Management Plan area.

THE SPECIES

Brown/grizzly bear are abundant throughout the South Kuskokwim area. Past data for this area are scant, but local hunters and trappers say brown bear were also very common in the past; many local residents considered bears a nuisance and many bears were indiscriminately shot. The South Kuskokwim area includes excellent spawning habitat for several species of salmon, thereby creating an important food base for brown bears. Abundant crops of wild berries and large small mammal populations provide additional food. Plentiful food sources and good denning terrain provide prime habitat for brown bears and may account for the large bears common to this area. Several record-class bears have been taken from various drainages in this area over the past few years.

Prior to 1970, little recreational hunting for brown bears occurred in the South Kuskokwim area, and harvests were below five bears per year. Since 1970 hunting pressure has increased substantially, with about 20 bears being taken from the area each year. Most bears are killed by nonresidents on guided hunts. A few bears are taken by hunters from other parts of Alaska, and occasionally by local residents in defense of life and property. Hunting activity is about equally divided between fall and spring hunting seasons. Measurements of bears killed to date do not indicate overharvesting is occurring in the area.

Access into the area is by aircraft or boat. Nearly all bears are taken by hunters using wheel or ski-equipped aircraft. Boat transportation has not been utilized to its full potential. Most boat hunters are local residents.

BROWN BEARS IN ARCTIC ALASKA

Brown bears (*Ursus arctos*) were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. No reproductively isolated populations are known to exist in Arctic Alaska. Most laymen and scientists designate bears found near coastal areas as brown bears, especially in the southern half of Alaska, while those found inland and in the northern half of Alaska and the remainder of North America are called grizzly bears.

Grizzly bears can be found throughout the Arctic Region from the crest of the Brooks Range north to the Arctic Ocean, although higher densities occur in the mountains, foothills and valley bottoms than on the flat coastal plain. The density of bears is low, varying from 1 bear per 50 square miles in localities of preferred habitat to 1 bear per 100 square miles when the entire habitat utilized is considered. Local abundance of bears may vary seasonally depending on available food sources. There is some evidence that grizzlies in this area are not as abundant now as they were in the early 1960's, based on population data from bears in a 5,000 square mile area in the eastern Brooks Range.

All habitat types on the north slope are used by grizzly bears but the most important are the alluvial valley bottoms near river courses. During the spring these areas are used as travel routes after the bears leave winter dens, especially by males in search of moose or caribou carrion. The soil thaws earliest in the mountains and foothills and bears forage along the valley bottoms for roots of Eskimo potato (*Hedysarum*) or other vegetation. Berries which remained intact through the winter are another spring food source in valley bottoms and slopes. From early summer until late August grizzlies tend to disperse from river valleys to the alpine, foothill and coastal plain areas where they feed on vegetation, primarily *Equisetum*, grasses and sedges. During late August to mid-September, the grizzlies return to the river valleys to search out berries and dig for roots. Although denning is not restricted to one particular habitat type in this area, most winter dens are found on south-facing slopes which are vegetated, well-drained and where permafrost is deep enough to allow den construction. Most den sites are dug in steep slopes although some can be found along river bottoms at higher elevations and on the coastal plain. Historical records indicate that the habitat in Arctic Alaska has changed little until recent times. However, there is a great potential for reduction of available habitat by oil and gas exploration and development, and resultant transportation corridors and construction activities.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other introspecific strife may cause significant

mortality. *Trichinella spiralis* is the parasite infecting bears, and is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bears.

In Arctic Alaska, the grizzly bear is at the northern limit of its range; the period of food availability during the summer is short, and reproductive potential is low. This low production by the population coupled with the lack of escape cover in tundra habitat makes these grizzlies more susceptible to the pressures of human development and sport hunting than they are in some other regions.

In accessible, inhabited areas, human activities are the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Bears are killed in defense of life and property when they are attracted to camps or garbage dumps, eventually endangering human safety.

Recreational uses of brown bears predominate in Arctic Alaska although domestic utilization continues to some extent. Sport hunting is the primary use with the Brooks Range being the most important hunting area. Hunting in the Brooks Range was quite limited until the early 1960's. As hunting pressure increased, regulations affecting season lengths became more restrictive to avoid excessive harvests. Guided hunters have shown the highest success rates due to the efficiency in hunting methods developed by guides. It is expected that the trend of increased hunting pressure will continue. Nonconsumptive use will also increase if the proposed Gates of the Arctic National Park is established.

BROOKS RANGE BROWN BEAR

LOCATION

Game Management Unit 26; that portion of Game Management Unit 23 draining into the Noatak River above Maiyumerak Creek; and those portions of Game Management Units 24 and 25 lying north of a line from Norutak Lake due east to the Alatna River, down the Alatna River to its confluence with the Koyukuk River, up the Koyukuk and South Fork of the Koyukuk River to Fish Creek, up Fish Creek to the Game Management Unit 25 boundary to the headwaters of the West Fork of the Chandalar River, then down the West Fork of the Chandalar River to the confluence with the East Fork of the Chandalar River, then up the East Fork of the Chandalar River to its confluence with Lush Creek, then a direct line eastward to Bob Lake and the Christian River, down the Christian River to its confluence with Otter Creek, up Otter Creek to its headwaters, then south to the headwaters of Thluichohnjik Creek and down Thluichohnjik Creek to its confluence with the Sheenjek River, then up the Sheenjek River to the southern boundary of the Arctic Wildlife Range, then eastward along the Arctic Wildlife Range boundary to the Alaska-Canada border.

THE SPECIES

The Brooks Range area supports fewer bears per unit of area than more favorable range situated to the south. The long winters and short, cool summers which occur in the region limit plant growth on which the bears depend. Growth rates of individual bears are slow and population production is relatively low. Rates of natural mortality in this region also appear to be low. Deaths in winter dens have been recorded as have deaths caused by other grizzlies, usually young animals or females which were attacked by adult males.

Brooks Range grizzly bears are relatively small and there are few "record class" bears in the population. However, the remote character of the region and the possibility of hunting in an area where few other persons are encountered definitely increase the appeal of the area to hunters.

Most bears reported killed by hunters in Game Management Units 23-26 are taken in the area included in this management plan. A possible exception may occur in Unit 23, where much of the harvest occurs along the Kobuk and lower Noatak River drainages. During 1975, sport hunters reported a total kill of 69 grizzlies in Units 23-26. This figure has only been exceeded twice since 1961 when 74 were killed in 1970 and 89 were killed in 1973. Hunting pressure has steadily increased in the area since 1961. Season length has been shortened considerably, but the number of bears killed has remained static or increased. Despite closure of the spring season in 1974 and poor weather during the fall season, the number of bears presented for sealing (34), did not decrease appreciably from the mean hunter-take for the previous 10 years when generally longer seasons prevailed. During 1975, when both spring and fall seasons were open, harvest again increased to the high levels reached in 1970 and 1973.

Over the last 15 years, an average of 60 percent of the bears killed have been taken by nonresidents. This proportion has been increasing in recent years and in 1975 was 67 percent. Most of the remainder of the harvest is by non-local Alaska residents, primarily during the spring season. Area residents occasionally take bears for domestic use, but the reported kill for such purpose is low. Indirect commercial use, in the form of guiding hunters, is important in the Brooks Range and contributes to the livelihood of an increasing number of guides.

Hunting is distributed throughout the area during spring and fall seasons but overharvest may occur locally along well used routes of air travel. Domestic use by local residents occurs primarily near villages or along accessible rivers.

Although riverboats are utilized to some extent, aircraft provide the majority of the access to hunting areas. The availability of landing sites on gravel bars throughout the area has played an important role in the harvest of the grizzly population. During both spring and fall seasons, river valleys receive high use from grizzlies. Because the stunted vegetation in these areas provides little cover, and landing sites are abundant, the bears are very vulnerable.

BISON IN SOUTHCENTRAL ALASKA

During historic time bison (*Bison bison*) in Southcentral Alaska have originated from transplants from the Delta bison herd, itself the product of an introduction from Montana in 1928. The Copper River herd resulted from a transplant of 17 bison to the Slana area in 1950, a transplant intended to establish a herd on the upper Nabesna River. Instead these animals traveled south from the release site and during the 1950's found a suitable year-round range near the Copper River in the Dadina River-Chetaslina River vicinity. By 1962, 61 adult bison were counted and in 1964 80 adults were observed. Since that time the herd size has been stabilized by hunting. Bison seen in areas other than their present home range have died or disappeared.

Another transplant of bison to Southcentral Alaska was made in 1962 when 35 bison were released in the Chitina River valley. Most of the Chitina transplant died during the winters of 1963-64 and 1964-65. However, a small band of about seven adults became established on the upper Chitina River above the confluence of the Tana River during 1963, either from the Chitina transplant, or from wanderers of the Copper River herd. The Chitina herd has increased since its establishment. Twenty-six adults were seen during 1974.

Bison are grazing animals requiring grasses, sedges and forbs for forage. Such vegetation in Southcentral Alaska is largely limited to river bars, streamside bluffs and meadows in timbered habitat. Grasses on the Copper River bluffs begin to leaf out early in the spring and are important early forage. Most bison gradually migrate up the Dadina River in the spring where grasses on dry bars serve as the primary summer forage. Increasing use is made of forbs and grasses growing as an understory under conifers and in meadows during late summer and fall. Timbered areas are used as resting habitat throughout the year and as protection from winter winds. Availability of winter forage is the most crucial factor limiting Southcentral bison herds. During autumn, Copper River bison move down from their summer ranges on upper Dadina River gravel bars to utilize sedges on frozen wet meadows and grasses on and along the edge of the windswept Copper River bluffs. When deep snows limit the availability of sedges in meadows, heavy grazing pressure is exerted on small areas of suitable bluff habitat. The density of grasses on grazed sites is one-third that on ungrazed sites. Starvation of bison has occurred during severe winters in these areas.

Chitina River bison apparently utilize Chitina River bars in summer as well as winter. Much of the potential bison range in this area has been severely damaged by grazing of horses. The remaining range used solely by bison is changing rapidly, apparently due primarily to reduced ground moisture. Management of the Chitina herd will be necessary to avoid heavy winter mortality.

Starvation during winters having deep or crusted snow is thought to be the primary cause of natural mortality, with calves of the year especially vulnerable. Predation has not been an apparent cause of losses, possibly because bison are especially rugged and aggressive in their own defense. Observed natural losses to other causes have been negligible.

Carefully controlled sport hunting has been used successfully to stabilize the Copper River herd. The allowable harvests have been predetermined, and the seasons have been closed when the desired harvests were approached. Finer adjustment of bison numbers to longterm maintenance of the bluff habitat has been occurring as more detailed knowledge of bison winter range, yearling recruitment, and seasonal bison distributions as related to winter snowfall have become available. Hunters have gained access to the Copper River herd primarily with aircraft, although use of boats has increased in recent years. Most hunters have been Alaskan residents from Anchorage and from Copper River basin communities.

The Chitina bison herd has not been hunted, but it is believed that the herd's future welfare will depend on preventing herd growth substantially above its current level of abundance. Sport hunting is probably the best way to limit growth of this herd.

COPPER RIVER BISON

LOCATION

In Game Management Unit 11, that area bounded by the Kotsina River and Long Glacier on the east, the Copper River on the southwest, the Nadina River and Glacier on the northwest and the crest of the Wrangell Mountains on the northeast.

THE SPECIES

The Copper River bison herd was established by a transplant of 17 bison from the Delta herd to the Nabesna Road in 1950. The herd relocated to the Dadina-Chetaslina River vicinity during the 1950's and increased steadily until stabilized by hunting at a level of 70-90 overwintering adults. Relatively little natural mortality has been observed in this herd. Observed carcasses and skeletons indicate that starvation during winters with deep snows is the most common source of natural mortality. Accidents, such as drowning and falling, and predation of calves are probably less important mortality factors.

Bison winter range has consisted primarily of sedges found on bog and pond margins, and grasses found along the Copper River bluffs. The windblown bluff habitat appears to have been relatively more important during winters with deep snowfall. Sedge within bogs is not utilized substantially before ground freeze; therefore, sedges have not deteriorated under heavy grazing pressure. The Copper River bluff habitat, however, has deteriorated under grazing pressure and trampling damage. Grasses, the main forage on the bluffs, are being replaced by perennial forbs with large woody rootstalks that are resistant to grazing and trampling. Past bison use has reduced overwinter carrying capacity of the bluffs.

Hunting of Copper River bison (to maintain the population in balance with its habitat) began in 1964. An average of 14 bison harvested during 8 hunts in the past 12 years has stabilized herd size. Low natural mortality and close control of harvests by registration hunts have allowed for relatively intensive recreational utilization. Although there have been no restrictions on sex of kill, harvests have averaged 54 percent bulls.

Hunter success is dependent to a large degree on methods used and timing of periods during which hunting is allowed. Use of aircraft for spotting bison markedly increases hunter success because bison seen grazing in an area during any one day of the fall hunt are likely to be in the same area on the following day. Bison graze on forbs in the timber during late summer and early fall where they are difficult to see and approach. By early winter, many bison have moved to frozen bogs and the Copper River bluffs where they are more easily seen and approached. Snow aids in locating and tracking bison. The trend of management has been to increase the quality of the hunt by adjustments that also decrease hunter success.

All but a small percentage of hunters participating in the Copper River bison hunts have been Alaskan residents. During the 1973 and 1974 harvests, 54 percent of the hunters were from Anchorage, 8 percent were from Fairbanks, 24 percent were from Copper River valley localities, and 13 percent were from other locations. During 1973 and 1974 harvests, 53 percent of the hunters registering for the hunt used aircraft, 40 percent used boats and 3 percent used horses and off-road vehicles. Not all hunters registering have hunted. Boats and aircraft have been the only practical means of transportation. There has been a minimal amount of guiding activity, although use of commercial air taxi operators has been high.

Because hunters have selected for larger bulls, there are few if any trophy-class bulls left in the herd. Younger bulls are not as distinguishable from cows by hunters as are older bulls, and heavy hunting pressure will probably not excessively lower bull: cow ratios.

CHITINA BISON

LOCATION

In Game Management Unit 11, the drainage of the Chitina River upstream of the confluence of the Chitina and Tana Rivers.

THE SPECIES

The Chitina bison herd has grown from a nucleus of about seven adult bison that survived the winter of 1963-64, following the transplant of 35 bison to the area in 1962. In 1976 the herd numbered 45 bison, including calves. A few wandering bison from the Copper River herd were observed after joining this herd during the 1960's, contributing to the increase. The average increase in total numbers each year since 1965 has been over 18 percent per year. The herd contains several large bulls.

The only substantial natural mortality factor known for this herd has been starvation during winters with deep snowfall. Predation by wolves or bears has not been observed. This herd has never been legally hunted by man.

Observations of this herd during both summer and winter have shown the herd to usually be north or east of Bear Island. Ground surveys near Bear Island have tentatively identified silverberry as the principal winter browse plant. Smaller amounts of balsam poplar and willow trees are also utilized. Silverberry plants in the vicinity of Bear Island show evidence of use by both bison and moose. Many plants are "hedged" and appear to be slow in recovering from heavy utilization. Patches of silverberry plants are dying due to unknown causes, possibly insufficient ground moisture. There is no alternate winter range of substantial quantity along the upper Chitina River. Dry bars above and below the Chitina bison herd's range have been utilized by horses which are in direct competition with bison for silverberry forage. Examination of the dry bar below Bear Island indicates that overwintering horses have almost destroyed the area as bison winter range by excessive utilization of silverberry. Because the limiting factor on this herd is winter forage, and since bison numbers have been rapidly expanding while preliminary range surveys show that the principal winter browse plants have been dying, and because substantial nearby alternate winter forage does not exist, there is a strong possibility of a large-scale winter die-off during the next winter with deep snow.

No legal hunting seasons have been established to date. Once hunting begins, continued availability of trophy-size bulls could be managed by limiting future harvests of bulls to allow some bulls to live to an old age. Because the herd is not accessible by highway vehicle and a relatively long air charter flight is required to view the herd, little nonconsumptive use by the public has occurred.

BISON IN WESTERN ALASKA

The Farewell bison (*Bison bison*) herd is the only bison herd occurring in Western Alaska, ranging in the Alaska Range from the Rhon (Tatina) River downstream on the South Fork of the Kuskokwim River. The herd was established in 1965 by a transplant of 18 bison from the Delta herd in Interior Alaska. A second transplant to the area in 1968 added 20 more bison. Counts in 1971 indicated 70 to 75 bison in the area including 16 calves. Since 1972 the population has been stabilized by hunting.

Bison are grazing animals requiring grasses, sedges, forbs and some browse for forage. Such vegetation in Western Alaska is largely limited to riverbars, streamside bluffs, shallow ponds in glacial moraines and to recently burned areas. Wet sedge meadows are utilized after the substrate freezes in the fall. During the winter the Farewell herd utilizes river bars, sedge ponds and occasionally a burn area near Farewell Lake. Availability of winter forage is the most critical natural factor affecting the herd. Starvation during winters having deep crusted snow is thought to be the primary cause of natural mortality, with calves of the year especially vulnerable. Calves are also susceptible to drowning during river crossings. Losses to predation have not been observed and are not thought to be significant because bison are especially rugged and aggressive in their own defense. Observed natural losses to other causes have been negligible.

Controlled sport hunting has been used since 1972 to stabilize the Farewell herd. The harvests have been predetermined and the hunts have been controlled by permit. Most Farewell bison hunters are Alaska residents from McGrath, Anchorage, and Fairbanks.

BISON IN INTERIOR ALASKA

During historic time bison (*Bison bison*) in Interior Alaska originated from a 1928 transplant from Montana to the Big Delta area. The animals thrived, growing to a herd of more than 500 during the early 1950's. Subsequently the herd declined because of overpopulation of its range, and then began slowly increasing again. Removal of animals by hunting has stabilized the population in recent years. In 1975 the herd numbered about 300 bison. The Delta herd has been the source of all other herds established by transplant in other areas of Alaska.

Bison are grazing animals requiring grasses, sedges, forbs, but also some browse for forage. Such vegetation in Interior Alaska is largely limited to riverbars, streamside bluffs or similar alluvial or aeolian deposits, shallow ponds in glacial moraines and to recently burned areas. Wet sedge meadows are utilized after the surface freezes in the fall. Availability of winter forage is the most critical natural factor affecting the Delta bison herd. In the fall the Delta herd migrates downstream from its summer range along the Delta River to the Delta Junction area to winter in burns and agricultural areas. During late winter the bison again move, this time to the sedge covered ponds within a 50-mile radius of Delta and then begin a leisurely movement toward the summer range.

Starvation during winters having deep crusted snow is thought to be the primary cause of natural mortality, with calves of the year especially vulnerable. Predation has not been an apparent cause of losses, possibly because bison are especially rugged and aggressive in their own defense. Observed natural losses to other causes have been negligible.

Carefully controlled sport hunting has been used successfully to stabilize the Delta herd. The harvests have been predetermined and the hunts have been controlled by permit. Most Delta bison hunters are Alaska residents mainly from Anchorage and Fairbanks.

DELTA BISON

LOCATION

In Game Management Unit 20, that area bounded by Delta Creek on the west, the Gerstle River and the Healy River on the east, the Goodpaster River on the north, and the Game Management Unit 13 boundary on the south.

THE SPECIES

Delta bison originated in Alaska from a transplant in 1928 from Montana to the Big Delta area. The animals thrived, growing to a herd of more than 500 during the 1950's. Subsequent population fluctuations due to the severity of winter and availability of forage have resulted in a present herd of 300 animals. The Delta bison herd is the largest in the state and has been the source of animals transplanted to all other herds throughout Alaska. Presently, the Delta bison herd is productive (70 calves per 100 cows and 80% yearling survival). Herd size has been stabilized through the removal by hunting of annual increases. Considering the high yearling survival, predation in its various forms does not appear to be a major mortality factor. Mortality exclusive of the legal harvest results in an 8 to 10 percent loss per year and includes losses to drowning, accidents, predation, illegal kills and vehicle-bison collisions.

Prior to the advent of agriculture in the Delta area lack of winter range was a severe problem. Heavy mortality in extreme winters was not uncommon. Forest fires in the 1940's and 1950's created sufficient winter range to allow the herd to expand, but as the burns became less useful because of vegetative changes, the capability of the area to support bison declined. Since 1960 agriculture has increased in the Delta area and its effect on the bison has been dramatic. Calf production and survival through the yearling age are at high levels and the physical condition of overwintering bison is good.

Hunting of Delta bison begins at the end of September after the harvest of agricultural crops, and continues through mid November. Hunting is controlled by permit. Approximately 3500 people have applied for 50 bison permits each year. Participation by permittees has been high and hunter success has been 100 percent. Conditions of the hunt have generally required permitees to be accompanied by a Department representative. At current population levels, 35 to 50 bison of either sex are taken each year. Harvests have reduced the proportion of bulls in the herd to about 40 per 100 cows. Most of the old, large bulls have been removed from the herd.

Bison are relatively accessible to hunters using highway vehicles. The majority of the hunters come from the Fairbanks and Anchorage areas.

Local residents usually receive 8 to 10 percent of the bison permits. Very few nonresidents have taken bison from the Delta herd. Virtually no professional guiding activities have been involved in Delta bison hunts.

In addition to hunting, Delta bison provide for considerable viewing and photographic opportunities for residents and visitors alike. During the fall and winter, roadside observation of bison is possible on highways near Delta. Summer observations require use of binoculars and spotting scopes because bison are on summer range across the Delta River from vantage points on the Richardson Highway.

FAREWELL BISON

LOCATION

In Game Management Unit 19, drainages of the South Fork of the Kuskokwim River.

THE SPECIES

Bison were established in the Farewell area on the South Fork of the Kuskokwim river by transplants of animals from the Delta herd. In 1965, 18 bison including 8 adult females and 4 calves were released at the Farewell airstrip. In 1968, 20 bison including 9 adult females and 7 calves were released. An aerial census of the area prior to the 1968 transplant revealed 25 bison present including 7 newborn calves. Subsequent aerial counts indicate an average population increase of between 10 and 20 percent annually. In July, 1975, 84 adults and 22 calves were counted. Relatively few bison have been found dead in surveys over the past 5 years. Predation by wolves and bears is not considered significant. Most natural mortality is attributed to starvation induced by deep snows or, in the case of young calves, to drowning when the herd crosses the South Fork.

Range studies in 1971 suggested that no more than 100 bison should be allowed on the South Fork-Farewell range. Controlled permit hunts in 1972, 1974 and 1975 were conducted to remove surplus animals. Twenty-seven bison, including 6 cows and 21 bulls, have been taken by hunters. Removal of 10 bison annually is possible with present herd growth. To date all hunters drawing permits have been Alaskan residents. Sixteen percent of these hunters were from McGrath and Nikolai. Hunter success has been close to 100 percent. Few hunters have been guided. Hunters utilize aircraft and riverboats for transport to the hunting area. Hunters have harvested several trophy class bulls and several large animals still remain in the herd. The area should continue to produce large bulls. Due to the area's isolation and minimal supervision of hunters in the field, many hunters consider taking bison in the Farewell area a true wilderness experience.

CARIBOU IN SOUTHCENTRAL ALASKA

Populations of barren ground caribou (*Rangifer tarandus granti*) in the Southcentral Region of Alaska have fluctuated widely in numbers, as they have historically over all of their ranges in the state. The region's largest population, the Nelchina herd, occupying the upper Copper, Nelchina and Susitna River basins, achieved a peak size of about 70,000 animals in 1962. The herd subsequently declined to 8,000 in 1972 and in 1975 numbered about 10,000. The population is gradually increasing.

The Mentasta herd, a smaller population, ranges on the northwest slopes of the Wrangell Mountains and the headwaters of the Copper River. This herd has numbered about 2,000-5,000 caribou over the past 15 years.

A small population of caribou exists in the northern Kenai Mountains. Caribou disappeared from the Kenai Peninsula in the early 1900's. A transplant of 44 caribou in the mid-1960's reestablished the species on the Kenai Peninsula. The population has increased very rapidly and in 1975 numbered about 450 animals.

Two additional caribou herds seasonally occupy portions of the region. In the vicinity of Rainy Pass, in the Alaska Range, a population containing an estimated 1,500 caribou has been relatively static in size for the past decade. Information on the herd is very limited. The McKinley herd ranges primarily on the north side of the Alaska Range in an area which includes Mt. McKinley National Park. This once large population now numbers less than 3,000 animals.

Although caribou utilize a variety of habitats throughout the year, much of their time is spent on the tundra or on treeless upland areas. In the Southcentral Region this zone generally lies between 3,000 and 5,000 feet in elevation where heath tundra, alpine tundra and sedge wetland plant associations dominate the vegetation. Timbered areas are used extensively as winter range but are abandoned as the snow melts.

A suitable calving area is an integral part of caribou habitat requirements. Calving grounds generally constitute a "center of habitation" for all caribou populations, and their occupation is the most consistent facet of otherwise vacillating and unpredictable movement patterns. The characteristics which distinguish calving areas are not well known but probably relate to such factors as availability of green vegetation following snowmelt, ease of movement and high visibility. With few exceptions, calving areas are above timberline.

Almost any vegetated habitat type can serve as caribou winter range, but the greatest use is made of timbered areas, especially spruce-lichen associations. Caribou have teeth adapted for eating soft, leafy vegetation, and are dependent in winter on fruticose lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands that can provide forage in significant quantities. Caribou utilize extensive areas for winter

range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to the limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. In Southcentral Alaska fires and overgrazing by caribou have depleted some caribou ranges. Extensive fires occurred in the Lake Louise Flats and upper Copper River basin prior to 1950. Lichens in these areas have not totally recovered. Fires on the Kenai Peninsula are cited as a probable cause for the disappearance of caribou near the turn of the century. The range currently occupied by Kenai caribou contains luxuriant lichen growths. Overgrazing of large areas of the Nelchina range occurred during the period of high population levels from 1955 to 1969. Depletion of forage contributed to the Nelchina population decline and may now limit the size of the population that can be supported by the area.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-worn trails of large populations in the past. Among many interrelated natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, while weather, disease and emmigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emmigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep, snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when most calves are born. Predation on calves and weather induced calf mortality, determine in large part whether populations increase or decrease. In infected populations, brucellosis can reduce the number of viable young born.

Caribou in Southcentral Alaska, particularly the Nelchina herd, have experienced intensive sport hunting use for the past 25 years. Although aboriginal use by natives may have been significant, populations of caribou from 1900 to 1950 were neither large enough nor widely distributed so as to provide for the domestic needs of many residents situated in the Nelchina-upper Copper River area. Between 1950 and 1972, a large and wide-ranging Nelchina herd satisfied both sport and domestic demands.

Caribou utilization is determined by accessibility. In the past, movements of some caribou along or across road systems resulted in large harvests. With the development and widespread use of snowmachines harvests of accessible caribou became excessive. Early hunting seasons during the mid-1970's, which limited hunting to snow-free periods have held harvests at desirable levels. Access to Nelchina caribou is now limited to hunters utilizing aircraft or off-road vehicles, but Nelchina caribou are still more accessible than other caribou populations in the region. There are no roads and few trails or aircraft landing areas in the Wrangell Mountains range occupied by Mentasta caribou, and access to Kenai caribou is regulated by the U.S. Forest Service which prohibits use of off-road vehicles during snow-free periods.

Mechanized off-road transportation is prominent in the success of caribou hunters in this region, where more than three-fourths of the caribou harvest is taken by hunters utilizing such methods. About three-fourths of the caribou hunters in this region are Alaska residents. The proportion of nonresidents is higher in the Mentasta caribou area where a higher percentage of hunters are guided, than in the Nelchina or Kenai areas.

KENAI MOUNTAINS CARIBOU

LOCATION

That part of Game Management Unit 7 bounded on the East by the Seward Highway and Sixmile Creek, on the South by the Sterling Highway, on the west by the Unit 7 boundary and on the north by Turnagain Arm.

THE SPECIES

This herd is the result of introductions made by the Department in 1965 and 1966. Caribou became established in the area shortly after the transplant and flourished on the excellent range. The herd had grown to 119 animals by the fall of 1970 and reached 336 caribou in the fall of 1974. The annual rate of recruitment has averaged about 36 percent. Regulated harvesting has maintianed the post-hunting season population at about 300 animals since 1974.

Natural mortality has been low as demonstrated by the rapid rate of growth in this herd. Wolf predation is now occurring on this herd and its effects will become more evident in the future since wolf numbers are rapidly increasing. Production over the past two years appears to be down; this may be a function of wolf predation although the extent of such predation has not been documented.

The condition and quality of the range utilized by this herd is excellent. No significant changes in the habitat have occurred due to human activities and none are expected in the foreseeable future. Presently this habitat may support more caribou, but since they utilize the same summer and winter range, with lichens being extremely vunerable to trampling, a conservative approach to range stocking is being taken. After 5 winters of carrying 300 animals, an assessment of the range will be made. If it is found that the range is understocked the herd will be allowed to expand.

Moderate numbers of trophy caribou have been available in this herd. Since this herd has grown at such a rapid rate it has a very young age structure. With the herd stabilized each year for the next several years, the proportion of the herd in the older age trophy class will increase. In view of the good bull:cow ratio of 70:100 and the changing age structure of the herd, the outlook for trophy production is excellent.

Harvesting of caribou was initiated in the fall of 1972 with a harvest of 6 caribou by 20 permittees. In 1973, 250 permits were issued and 12 caribou were harvested. In 1974 and 1975 an unlimited number of permits were issued and the total harvests were 44 and 87, respectively. The 1975 harvest was composed of 38 bulls and 49 cows. In 1975, 35 percent of the harvest was by residents of the Kenai Peninsula, 60 percent by residents of the Anchorage area and 5 percent by nonresidents.

Hunting pressure has grown rapidly as hunters have discovered this herd and focused more attention on it. Five-hundred-seventy-three permits were issued for the 1974-75 season and 869 for the 1975-76 season. A similar increase in pressure is expected for the future. With hunting pressure accelerating it may become necessary to limit the number of participants in the hunt in order to maintain adequate harvest controls. Hunters have expressed a high degree of satisfaction with the manner in which this herd has been managed. Their comments relate a great deal of satisfaction regarding success and enjoyment of the hunt. Harvesting of this herd has had no adverse effect on productivity or sex ratios. The harvest is very closely balanced between males and females, thus the availability of trophies has not been adversely affected.

Most use of caribou in this area is by recreational hunters, although some nonconsumptive use occurs. Guiding is of minor importance with only a few guides operating in the area. Nonconsumptive use is primarily incidental to hiking on the Resurrection Trail; a few people occasionally hike to the area primarily to view and photograph caribou. Some incidental viewing also occurs in conjunction with hunting for other species. Most nonconsumptive use takes place in the summer while hunting occurs primarily in the late summer and fall. Almost all of the harvest is taken between August 10 and October 15.

Access to this area is limited. Horses provide the easiest access, although most hunters backpack to the area over the Resurrection Trail. Aircraft access to Swan Lake puts the hunter within 3 to 4 miles of where caribou can be located.

KENAI LOWLANDS CARIBOU

LOCATION

Game Management Units 15A and 15B.

THE SPECIES

The Kenai Lowlands herd, presently numbering between 65 and 80 caribou, was established from transplants made in 1965 and 1966 by the Alaska Department of Fish and Game. The transplant appears to be successful to date. The herd has utilized the muskeg areas in the vicinity of the Kenai airport for calving and summer range and the Moose River Flats as winter range.

Although accurate censuses have been difficult to make, this herd appears to be growing at a moderate rate. Natural mortality factors working on this population are not well known. Predation by wolves, black bear and possibly coyotes is thought to occur but has not been documented. Predation is not thought to be a serious problem at this time.

The range utilized by this herd is very limited in size and is not typical caribou range. In addition, the quality of the habitat utilized by this herd is difficult to assess. The presently used winter range does not contain a significant amount of lichens and it is assumed that some other food items, probably sedges, are the primary winter foods. Since the herd has exhibited only a slow growth rate, it is assumed that range quality is not high.

In the past, fires have played a primary role in changing caribou ranges. Man-made fires in the late 1800's are believed to have destroyed most of the caribou ranges on the Kenai Peninsula and thus caused the extirpation of caribou before 1920. Several large fires have occurred since the caribou were extirpated, and these burns have kept large areas from reverting to the type of climax vegetation favorable for caribou.

Presently, the range utilized by this herd is thought to be under-utilized but the limits of their potential range are not known. In an effort to establish a sizable herd these caribou are presently completely protected from hunting.

The present uses of this herd are entirely viewing and photography. Almost all use is incidental to some other pursuit. Most caribou are observed by persons flying to or from the Kenai airport during the summer. Occasionally caribou are seen along the road system or by snowmobilers. Most use is by residents of the Kenai Peninsula.

EUREKA CARIBOU

LOCATION

That portion of Game Management Unit 13 bounded on the south by the Glenn Highway, on the west by Startup Creek and Crooked Creek, and on the north and east by the Little Nelchina River.

THE SPECIES

The Nelchina caribou population now numbers about 10,000 caribou and is slowly growing. For most of the past 20 years, a variable portion of the Nelchina herd has wintered near Eureka. Prior to 1972, early winter ingress of caribou in this accessible region resulted in heavy harvests. Hunters utilizing snowmachines were particularly successful. Hunting seasons since 1972 have closed before caribou have arrived or snow has fallen. The presence and viewability of caribou in the area since 1972 have provided considerable observation and photographic opportunities to highway travelers in the winter. Access to much of the area is provided by several off road vehicle trails which traverse or border the area.

NELCHINA CARIBOU

LOCATION

In Game Management Units 13 and 14, the area bounded on the south by the Tazlina, Nelchina and Matanuska Rivers, on the west by the Alaska Railroad and the Game Management Unit 13 boundary, on the north by the crest of the Alaska Range and on the east by the Copper and Slana Rivers except for the Eureka Caribou Management Plan area.

THE SPECIES

The Nelchina caribou population numbered about 11,000 animals in 1975. The population attained peak levels of approximately 70,000 in 1962 and subsequently declined to a low of about 8,000 in 1972. The population has increased slowly since 1972. Mortality of calves ranges between 40 and 60 percent annually, with predation probably the most important natural factor. Losses of adults to causes other than hunting is estimated at between 6 and 9 percent annually. Considering mortality of calves and adult caribou to all causes except hunting, an annual increment of from 800 to 2,000 caribou may be available for human utilization and/or herd growth for every 10,000 caribou in the population. Hunting is currently managed to take 10 percent or less of the population.

Nelchina lichen ranges were overutilized by caribou during the period of excessive populations in the 1950's and 1960's. Ranges are now in fair to poor condition and will require many years for recovery. Poor quality winter ranges may have contributed to emmigrations of caribou from the Nelchina population eastward in the mid-1960's, and to reduced recruitment of young to the population during the late 1960's and early 1970's.

The Nelchina herd has been the most heavily sports-hunted caribou herd in Alaska since 1950. Harvests exceeded 4,000 caribou in most years from 1959 to 1971. Sharp restrictions in hunting seasons and bag limits in 1972, from an eight-month season to a six week season, and a three caribou bag limit to one caribou, reduced the kill to about 600. The harvest increased to 800 in 1973 and to 1,200 in 1974. In 1975, a further reduction in season length to three weeks reduced the kill to about 800 caribou. Large harvests in the period 1967-1971 and proportionally large kills on a reduced population since 1972 can be attributed to increased access, greater use of all-terrain vehicles, and increased hunting pressure. Impacts of pipeline construction now serve to magnify these factors. Hunting, if not closely regulated may result in an overharvest. Severe hunting pressure contributed to the herd's decline from 1967 to 1971. Hunting has also created a strong imbalance in the adult sex ratio of the herd. Few large-antlered bulls are available in the population (less than 7 percent of the population in 1975). While this imbalance reduces the number of bulls available for hunters, it increases the number of calves the herd will produce for any given herd size.

About three-fourths of Nelchina caribou hunters are residents. Many of them are from Anchorage and Fairbanks. Relatively few caribou are taken by local residents. Hunter success has ranged from 34 percent to 40 percent since

1972, reflecting good accessibility of the herd to hunters. About 45 percent of successful hunters since 1972 used aircraft for transport. An additional 30 percent used off-road vehicles. With an early hunting season, caribou distribution makes them largely unavailable to road-based hunters. Most successful hunters reach caribou with aircraft access to lakes and unimproved strips in the Little Nelchina, Oshetna, Kosina, Watana, Butte and Coal Creek drainages. Well-used off-road vehicles trails also penetrate the Little Nelchina and Oshetna River areas, and the Butte Lake, Butte Creek and Watana Creek areas. A few caribou are taken by hunters using river access on the Susitna, McLaren and Nenana Rivers. Some caribou occasionally come within reach of hunters along the Denali Highway.

NORTH WRANGELL MOUNTAINS CARIBOU

LOCATION

Those portions of Game Management Units 11 and 12 bounded on the south by the Cheshnina River and the crest of the Wrangell Mountains, on the west and north by the Copper River, and on the east by Suslota Creek, the crest of the Mentasta Mountains and the Nabesna Glacier and River.

THE SPECIES

The Mentasta caribou population has numbered between 2,000 and 2,500 animals for the past 15 years. A census during the summer of 1975 showed 2,456 caribou of which only 19.5 percent were calves. Bull caribou have usually been separated from calf-cow aggregations during the summer, so the total herd size is probably larger. Natural mortality is suspected to be the major factor limiting population growth at this time. The cause of the low natality of early calf mortality indicated by the low proportion of calves was unknown. The condition of the range is unknown. There is a relatively large proportion of large bull caribou in the Mentasta herd reflecting the effects of a relatively small hunter harvest.

Harvests now approximate five percent of the population. Harvests have rarely been excessive with the possible exceptions of the 1970 and 1971 harvests, but overlaps in winter distribution with the Nelchina herd in the vicinity of the Nabesna Road confuse harvest data analysis for those years. The herd is vulnerable to overharvest when caribou occupy winter ranges near the Nabesna Road during hunting seasons. A characteristic of hunter harvests is high selectivity for large bulls. Hunter harvests from the Mentasta herd during the past 4 years have averaged 74 percent bulls, indicating the continuing availability of large bulls. Approximately one-third of past harvests have been by nonresidents, and most of these hunters were probably on guided hunts. The herd is relatively inaccessible during the current early hunting season, with most hunters being flown in to dirt airstrips or small lakes as access points into the hunting area. Horses and off-road vehicles are used to a limited extent. This type of hunt, where most hunters use aircraft to reach areas that they hunt on foot, frequently provides a high level of enjoyment per animal harvested. The harvests during recent years have mainly been at subalpine elevations on the slopes of Mt. Sanford and Mt. Drum. Most visitors to this area are hunters.

CHISANA CARIBOU

LOCATION

That portion of Game Management Unit 12 lying east of the Nabesna Glacier and river, and south of the Alaska Highway.

THE SPECIES

The Chisana caribou herd occupies the area between the White River and Chisana, eastward to approximately the U. S.-Canada border. No sex and age composition data are available, nor has a census been conducted. The herd is estimated to contain approximately 1000 animals. No traditional calving areas are known, however post-calving groups have been sighted in June and July on the alpine hills between Chisana and the Ptarmigan-Bray Lakes area. This population appears to be stable. Some range disturbance has occurred as a result of mining efforts, but the total effect has been insignificant. A large amount of spring-summer-fall range is available. Little is known concerning abundance or quality of winter range.

In recent years annual harvests have ranged between 35 and 50 animals. Although some hunting effort is directed specifically at caribou, most sport hunting is done in conjunction with sheep and grizzly bear hunting. A number of guides operate throughout the area; most specialize in sheep hunting, with caribou normally being taken as a bonus animal. Except for a few residents of Chisana, virtually no domestic hunting occurs on this herd. The area is accessible only by aircraft (floats or wheels), off-road vehicles or horses. Because of the herd's inaccessibility, viewing opportunities are quite limited.

CARIBOU IN SOUTHWESTERN ALASKA

Several barren ground caribou (*Rangifer tarandus granti*) populations exist in Southwestern Alaska. On the Alaska Peninsula three basically separate herds occur from King Salmon to Unimak Island. The largest of these numbered about 10,000 animals in 1975 and is located between King Salmon and Port Moller. About 2500 range between Port Moller and Cold Bay and at least 3000 are resident on Unimak Island. Some interchange between the latter two groups has occurred in the past when caribou have crossed Isanotski Strait, a distance of about one-half mile. All three segments of Alaska Peninsula caribou are increasing from low population levels, estimated at 2,500 animals in the 1940's.

The Mulchatna herd, the largest in Southwestern Alaska, numbers about 14,000 caribou and ranges in an area generally south of the Stony River, east of the Nushagak River, north of Iliamna Lake, and west of the Alaska Range. Some interchange of Mulchatna and Alaska Peninsula caribou has occurred when animals seasonally moved on and off the Peninsula. However, since the turn of the century there have been no interchanges between these populations. The Mulchatna herd is recovering from the low population levels of the 1940's.

A small herd is located on Adak Island in the central Aleutian Islands. Caribou were first introduced to Adak from the Nelchina herd in 1958 and 1959. Because of the abundant and excellent quality forage, the population has grown rapidly. Large animals are common. One adult male was killed that weighed 700 pounds, a record weight for North America. The population numbered about 450 in 1975.

Although caribou utilize a variety of habitats throughout the year, much of their time is spent on the tundra or on treeless upland areas. In southwestern Alaska this zone can vary from sea level on the Alaska Peninsula to above 2,500 feet north of Iliamna Lake. Below Becharof Lake the Peninsula is treeless. Here the lowland areas are dominated by wet sedge meadows, interspersed with heath on the drier sites. At higher elevations, heath, willow, alder and grass communities become more abundant. Above 1,200 feet heath dominates.

A suitable calving area is an integral part of caribou habitat requirements. Calving grounds generally constitute a "center of habitation" for all caribou populations, and their occupation is the most consistent facet of otherwise vacillating and unpredictable movement patterns. The characteristics which distinguish calving areas are not well known but probably relate to such factors as availability of green vegetation following snowmelt, ease of movement, and high visibility. In Southwestern Alaska, calving areas are above timberline or in treeless tundra areas.

Almost any vegetated habitat type can serve as caribou winter range, but the greatest use is made of timbered areas, especially spruce-lichen associations which can be found north of Becharof Lake. For caribou wintering below Becharof Lake, sedges constitute a major portion of the winter diet.

Caribou have teeth adapted for eating soft, leafy vegetation, and are dependent in winter on fruticose lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands that can provide forage in significant quantities. North of the Kvichak River, caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to the limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. In Southwestern Alaska fire does not seem to have been a significant factor in controlling recent caribou populations because with the exception of the Mulchatna herd they are not dependent on lichens. Possibly because of the milder climate found on the Alaska Peninsula, the range there does not appear to be limiting herd growth at the present time. Volcanic activity over the years has claimed an undetermined amount of range.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-worn trails of large populations in the past. Among many interrelated natural factors limiting caribou populations growth, weather and predation are important factors operating directly on small populations, while weather, disease and emmigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emmigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one-week period when most calves are born. Predation on calves and weather induced calf mortality determine in large part whether populations increase or decrease. In infected populations, brucellosis can reduce the number of viable young born.

Use of caribou for domestic consumption and utilization has long been important for residents of the Southwestern Region. Long hunting seasons and liberal bag limits, which are among the least restrictive in the state, allow for local use in the region.

Early exploitive human use of Alaska Peninsula caribou occurred in the late 1800's when intensive commercial hunting for hides and meat took place. Declines of caribou populations in the area and reduced demands for meat by a declining whaling industry brought an end to large scale harvests. Negligible harvests occurred from the early 1900's until the early 1960's.

Since 1960, recreational use of caribou on the Alaska peninsula and of Mulchatna caribou has increased as Alaska's human population has grown with caribou populations near human population centers in other parts of the state harvested at maximum rates, hunting pressure has shifted toward more remote populations.

Hunting of caribou on the Alaska Peninsula prior to 1972 was largely by guided hunters, many of them nonresidents. In recent years however, the proportion of unguided resident hunters has increased sharply as caribou hunting opportunities have been limited elsewhere. The Mulchatna herd, although less accessible than Peninsula caribou, have also received increased hunting pressure in recent years.

Almost all hunter access to caribou in Southwestern Alaska is by aircraft. Terrain on the Alaska Peninsula, in particular, lends itself to aircraft operation with numerous cinder-patch landing areas in the fall and treeless snow fields in the winter. Access to Mulchatna caribou by aircraft is limited largely to lakes during snowfree periods, but improves in winter when additional areas become accessible to ski-equipped aircraft.

CENTRAL ALASKA PENINSULA CARIBOU

LOCATION

In Game Management Unit 9, that portion of the Alaska Peninsula south of the Kvichak and Alagnak Rivers, Kukaklek Lake, Battle Lake, McNeil Lake and River, to a line drawn between the head of Port Moller Bay on the Bering Sea side and American Bay on the Pacific side, except for Katmai National Monument.

THE SPECIES

This area contains the largest single segment of the Alaska Peninsula caribou population. Numbers have fluctuated widely in the past with an apparent peak population just prior to the turn of the century and another of about 20,000 caribou in the early 1940's. The last population low occurred during the late 1940's when the U.S. Fish and Wildlife Service estimated only 2,000 caribou. Since that time the herd has experienced steady growth. A 1975 census indicated approximately 13,000 caribou in the population.

The primary calving ground is on the Bering Sea Flats near Ilnik. In recent years a secondary calving ground has been established near the mouth of Cinder River. Also, small bands of caribou calve at scattered locations throughout the area. The herd is presently experiencing high reproductive success. A June 1975 census indicated between 48 and 60 calves per 100 cows. In addition, a November 1975 count indicated that summer calf mortality was very low. High reproductive success and good yearling survival are indicative of a range in good condition.

Migration patterns have been increasingly erratic in recent years. Animals now regularly spend the summer and fall in the Pacific drainages. The "traditional" migration path along the Bering Sea flats is used sporadically and the herd appears to be spending increasing time in the foothills of the Aleutian Range. The break in the migratory paths identified for this group of caribou in the late 1950's and early 1960's is considered to be a reflection of the relatively high population density. Continued growth may be detrimental to carrying capacity of the range.

The effect of predators on this herd are unknown at this time, although wolves and brown bear are known to feed on caribou. In 1968 a major infection of "hoof rot" occurred in this area. An estimated 2,000 caribou died directly or indirectly of the disease. Undocumented reports indicate that a condition of freezing rain ""silver thaw") may occasionally coat the tundra in a layer of ice thick enough to prevent feeding. In such a case a large proportion of the herd may starve in a single winter. However, such mortality has not been documented with certainty in this herd.

Hunting pressure on caribou in this area is moderate to high as it is the area most readily accessible to visiting hunters. Most of the harvest now occurring is from trophy or recreational hunters, although there is a substantial harvest for domestic use. A major portion of the

Alaska Peninsula guide industry utilizes this area. In recent years the area has become increasingly popular with hunters from the more heavily settled areas of the state. Selection for bulls by trophy and recreational hunters has altered the bull-cow ratios. In the fall of 1970 the herd had 59 bulls per 100 cows, but by 1975 the retio had dropped to 33 bulls per 100 cows. The majority of the Alaska Peninsula caribou in the Boone and Crockett record book were reported from this area. Nine communities on the Alaska Peninsula harvest this segment of the herd for domestic use. A University of Alaska subsistence survey in 1974 indicated a harvest of approximately 560 caribou for domestic use. The estimated annual harvest from all sources is 1,500 to 2,000 caribou annually. Precise harvest data are lacking due in part to the lack of a harvest report requirement.

The majority of the range of this group of caribou is still wilderness and unaltered by development. Access is primarily by light aircraft. Some strips for larger aircraft exist as a result of exploratory oil work, but most landings are on water surfaces, beaches, or natural pumice patches and gravel bars. Tracked vehicles are locally important in some guide camps. Local residents frequently use snow machines or boats to facilitate harvest. Hunting aesthetics within the area remain high.

MULCHATNA CARIBOU

LOCATION

That portion of Game Management Unit 17 which drains into Bristol Bay east of Kulukak Bay; all drainages of the Kvichak River watershed above the Alagnak River in Game Management Unit 9; and that portion of Game Management Unit 19 lying south of the Chukowan River, Holitna River, Kuskokwim River, and the Swift River, except for the area included in the Farewell Caribou Management Plan.

THE SPECIES

The Mulchatna caribou herd ranges in an area generally south of the Stony River, east of the Nushagak River, north of Iliamna Lake and west of the Alaska Range. Numbers of caribou have fluctuated in the past, but historical data on the herd are limited. In the mid-1960's the herd was estimated at 3,000 animals. A census conducted in 1974 established a minimal herd size of 14,231 animals. The herd appears to be very productive at this time with an October 1974 calf/cow ratio of about 35 calves per 100 cows. The calving ground for the Mulchatna herd is in the Bonanza Hills area. Scattered calving also occurs along the northeastern shore of Lake Iliamna.

Migrational patterns are not well documented. Wintering areas have varied in recent years, but normally late winter concentrations occur in the drainages of the Chilikadrotna, Mulchatna, and Koholitna Rivers. Prior to the turn of the century, this herd regularly crossed the Kvichak River and interchanged with the northern portion of the Alaska Peninsula herd. During the winter of 1972-73 approximately 3,000 caribou crossed the Kvichak and wintered below Igiugig. There has been no repeated major crossing since.

Data on the condition of the caribou range are lacking. The observed reproductive success and excellent physical condition of the animals in the harvest suggest the range is in good condition; however, continued herd growth could adversely effect the condition of the range. Predators do not appear to be having any significant impact on the herd at this time although local residents are concerned about the effects of wolf predation. The number of wolves killed in the area used by wintering caribou has been high in recent years. Predation by wolves and bears may have an impact in the future, particularly if the Mulchatna herd declines significantly. No major outbreaks of disease have been reported, but disease could become a factor influencing the population and its subsequent management.

Hunting pressure on this herd has been low. Historically, the herd has been hunted by local residents, particularly from the villages of the Nushagak River and Lake Clark-Lake Iliamna area. A University of Alaska "subsistence survey" placed the harvest at just over 400 animals in 1974. The majority of the harvest occurs in the winter when dog sleds, snowmachines, and aircraft are used for transportation. Occasional caribou are taken at other times of the ear when locally available or when village activities allow hunting opportunity.

In the past access difficulties during the fall discouraged extensive sport harvest, and most sport hunting was by guided hunters. In recent years the number of guide operations within the area has increased and there has also been an increase in nonguided sport hunters from other areas of the state. The estimated sport harvest during the fall months is considered less than 200 caribou. In the past two years this herd has been subjected to a greatly expanded harvest level as a result of airborne hunting during the winter months. The proximity of its wintering grounds to the human population centers of the Cook Inlet area has made it readily accessible to ski-equipped aircraft. During periods of favorable weather and snow conditions, a large force of hunters has been transported into the area and hunter success has been high. Estimated harvest during the late winter period has been 1,250 to 1,500 caribou. The majority of this harvest has been by Alaskan residents living outside the range of the Mulchatna herd.

At this time the herd appears to be increasing in numbers, although the large harvest of the past two winters may have curtailed growth. Large antlered bulls are available and the area has produced good trophies.

SOUTHWESTERN ALASKA PENINSULA CARIBOU

LOCATION

That portion of Game Management Unit 9 on the Alaska Peninsula south and west of a line drawn from the head of Moller Bay on the Bering Sea side to the head of American Bay on the Pacific side, and in Game Management Unit 10, Unimak Island.

THE SPECIES

This area contains two major populations of caribou. One is on Unimak Island and the second extends northeast on the Alaska Peninsula to the west side of Moller Bay. Prior to the turn of the century interchange between these two groups was documented but no documentation of such movements exists in recent years. There is no evidence of any interchange of the mainland group with other caribou populations further to the northeast, beyond Port Moller Bay. Both groups of caribou within the Southwestern Alaska Peninsula area appear to be increasing in numbers and the geographic isolation of the two may not be maintained in the future.

Historically, the size of the mainland population has fluctuated widely. Population highs apparently occurred prior to the turn of the century and again in the late 1920's. The most recent population low occurred in the late 1940's or early 1950's when the U. S. Fish & Wildlife Service estimated about 500 animals present. The population has been increasing since the 1960's and in 1976 was estimated at 4,000 animals. The causes of low populations have not been documented but a reported condition of freezing rain which encases the tundra in ice may occassionally cause massive mortality during a single winter. Predation by wolves and brown bear is not considered significant at this time. Some caribou losses did occur from a minor outbreak of "hoof rot" during the late fall of 1975.

This group of caribou calves in the eastern portion of the area near the Black Hills and the Caribou River. It is currently experiencing good reproductive success with 49 calves per 100 cows observed in June 1971. Data are lacking on range conditions, but the high reproductive success and reported good physical condition of animals in the harvest suggest the range is in good condition. Continued growth of this population of caribou appears probable.

Population fluctuations of caribou on Unimak Island have closely coincided with changes in caribou numbers on the nearby Alaska Peninsula. This would seem to indicate that similar mortality factors have affected both populations. The most recent population low also occurred in the late 1940's or early 1950's when the U.S. Fish & Wildlife Service estimated less than 500 animals on the island. By the mid-1960's an estimated 1,500 animals were present. In 1976 the Unimak caribou population was considered to be in excess of 5,000 animals.

Calving on Unimak Island occurs in the eastern portion of the island. Specific data on reproductive success are lacking, but calving generally occurs one week later than for mainland populations. Data on range conditions are lacking.

The harvest of caribou from Unimak Island is low, with estimates of less than 100 animals annually. Similarly, hunter harvests are low on the adjacent mainland population, estimated at less than 200 caribou annually. Most of the harvest of these caribou is by local residents. The harvest by guided nonresidents is small. The low resident population at False Pass, Cold Bay, King Cove, and Nelson Lagoon have only a minor impact on the caribou resource. The majority of hunting by local residents occurs on an "as available" opportunity basis. Beause of the cost of logistics to and within the area, use by hunters from outside the area is light and usually is concentrated during the traditional September-October hunting period. The area lacks roads and has few man-made landing areas for light aircraft. As a result, most transportation is by aircraft landing on water surfaces, beaches, or natural landing sites. Local residents hunt primarily from boats or use vehicles to travel the limited roads or along the beaches. Because of the low harvest level, large-antlered males are available for trophies on both Unimak Island and the mainland.

Unimak Island is part of the Aleutian Island Refuge System and Izembek National Wildlife Range occupies significant acreage in the Cold Bay area. In both of these areas, the U. S. Fish & Wildlife Service has imposed additional restrictions on methods of transportation. These restrictions make it unlikely that a sufficient concentration of hunters would occur that would be imcompatible with management objectives, except in the immediate area of Cold Bay.

ALEUTIAN ISLANDS CARIBOU

LOCATION

In Game Management Unit 10, Umnak, Atka and Attu Islands.

THE SPECIES

Feral reindeer occur on Umnak, Atka and Attu Islands. Data are lacking for present population sizes or trends on any of these islands. Large predators are absent, so fluctuations in numbers occur in response to range condition and/or disease. Because of the low human population in the area, harvest has only a minor impact. Specific harvest data are lacking.

Regulations governing hunting feral reindeer on these islands are the most liberal in the state. Wide fluctuations in numbers of animals are expected and it is doubtful human harvest can influence present population trends. Local domestic use shall continue as the primary use of the resource. Cost of logistics to and within the area makes recreational and trophy hunting insignificant.

ADAK CARIBOU

LOCATION

In Game Management Unit 10, Adak Island.

THE SPECIES

Caribou on Adak Island are the result of a cooperative transplant program between the U.S. Fish and Wildlife Service, the U. S. Navy and the Alaska Department of Fish and Game conducted in 1958 and 1959. Twenty-four caribou were released and became the nucleus of the existing herd. By 1967 the herd had grown to 189 animals and recent population estimates place the herd in excess of 350 caribou. The herd is experiencing high reproductive success and apparently the range is in excellent condition. The area occupied by the caribou herd remains wilderness with high aesthetic quality. No large predators exist on the island and indications are that these caribou are relatively free of the disease and parasites reported in mainland populations. Hunting is the best available method for stabilizing the population and preventing the extreme fluctuation in numbers that have characterized other island reindeer populations.

The first hunt occurred in 1964 with a maximum of ten permits issued for bull caribou only. As the herd increased in size, harvest quotas and season lengths were liberalized to allow additional hunting. From 1972 through 1974 the harvest averaged nearly 100 animals annually while the harvest approached 150 animals in the 1975-76 season. Hunting is by persons associated with the Naval base on Adak. Harvest is monitored by personnel of the U.S. Fish and Wildlife Service and the U.S. Navy, and if necessary, the season is extended or shortened by emergency order under the authority of the Department of Fish and Game.

CARIBOU IN INTERIOR ALASKA

Interior Alaska contains the year round habitat of the Delta and Macomb Plateau barren ground caribou (*Rangifer tarandus granti*) herds and is seasonally occupied by several other populations. The Delta herd occupies the north slopes of the Alaska Range between the Alaska Railroad on the west and the Richardson Highway on the east. This herd, which may have arisen as a remnant of the large Fortymile herd in the early 1930's, numbered from 300-1,500 caribou from the 1930's through 1957, then increased to more than 5000 animals by 1964. Since the severe winter of 1970-71 the population has declined rapidly and presently numbers less than 2,000.

The Macomb Plateau herd occurs on the north side of the Alaska Range east of the Delta River and west of the Glenn Highway. This population is estimated to include about 1,000 animals and has been stable for several years.

The Fortymile and Chisana herds spend most of the year in Interior Alaska but also range into adjacent Canada. The Fortymile herd presently numbers about 5,000 and inhabits the Tanana Hills between the Tanana and Yukon Rivers. A review of this herd's population fluctuations during this century dramatizes the wide fluctuation in numbers that all herds in the state have experienced. During the early 1900's the herd was increasing and reportedly reached a peak of around 500,000 in the 1930's. By the early 1940's this large herd had declined to possibly only 10,000 caribou. It then increased steadily until the mid 1950's when it numbered 50,000. Since then it has declined to present low levels of about 5000 caribou.

The Chisana herd, like the Delta herd, may have arisen from remnants of the large Fortymile herd in the 1930's. The herd may have numbered up to 3,000 caribou until the 1960's; current estimates place the herd size at about 1,000 animals. This herd ranges in the Nutzotin Mountains.

The McKinley herd ranges primarily on the north side of the Alaska Range in the vicinity of McKinley Park. It numbered 20,000 to 30,000 in 1941 before declining. By the early 1960's approximately 10,000 caribou were still present. Since 1966 a rapid decline has been noted and currently 1,000 to 1,500 caribou remain.

The two great Arctic caribou herds seasonally occupy a portion of Interior Alaska. The Western Arctic herd's winter movements bring it into this region from the lower Koyukuk River eastward to Wiseman and the western tributaries of the Chandalar River. This herd reached a low level in the late 1800's and then increased through the 1900's and in 1970 contained at least 242,000 caribou. Current observations suggest that a substantial decline occurred from 1970 to 1976 and the herd may presently number about 50,000.

The Porcupine herd occurs in the Interior Region during part of the year. In most years substantial numbers winter in the upper tributaries of the Porcupine and Chandalar Rivers. Spring and fall migrations occur through the region. When last censused in 1972 the herd numbered around 100,000. The herd is presently stable or slowly increasing.

Ideal barren-ground caribou range consists of extensive alpine or arctic tundra areas. Spring, fall and summer demands are met by these areas. Here calving and breeding occurs, relief from insects is possible on wind swept ridges and high quality tundra or alpine forage is available. These same areas often furnish winter needs, but timbered areas, if available, are often used extensively for winter range. In this region alpine tundra areas normally occur above 3,000 feet in elevation. This vegetation zone normally contains the calving habitat, which is an important habitat requirement of caribou populations. Calving grounds comprise the "center of habitation" for the herd. The calving area is the most consistent facet of otherwise vacillating and unpredictable movement patterns in caribou herds.

Almost any vegetated habitat type can serve as caribou winter range, but if available, timbered areas, particularly spruce-lichen communities, are used most extensively. With teeth adapted for eating soft, leafy vegetation, caribou in winter are dependent on lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow growing plants requiring up to 100 years for development of stands that can provide forage in significant quantities. Caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. In Interior Alaska fires and overgrazing by caribou have depleted some caribou ranges to below their potential carrying capacities. Both of these factors have been advanced as contributing to the dramatic declines suffered by the Fortymile and McKinley herds during this century.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well worn trails of large populations in the past. Among many interrelated natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, while weather, disease and emigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when most calves are born. Predation on calves and weather

induced calf mortality determine in large part whether populations increase or decrease. In infected populations, brucellosis and a retained placenta condition can reduce the number of viable young born.

Caribou in several Interior Alaska herds have never experienced intensive sport hunting use. The Western Arctic, Porcupine, Chisana and McKinley herds have never received heavy sport hunting because of their relative inaccessibility, and until the past few years there were sufficient numbers of caribou in the more accessible Fortymile, Nelchina and Delta herds to satisfy most of this demand. However, potential for a rapid increase in sport hunting of these herds exists. The two Arctic herds have had a long history of domestic use by natives and were important food sources at various times for whalers, trappers, miners and other early day explorers of northern Alaska. Reported harvest from the Chisana herd has never exceeded 50 animals per year. Most of these are taken incidental to sheep hunting by hunters utilizing aircraft and horses for transportation. Low harvests of the McKinley herd in the past several years have occurred primarily by residents of Kantishna and sport hunters hunting near the Stampede Trail on the northeast corner of McKinley Park. Because the population is still declining, harvests will likely be curtailed in the near future.

The Fortymile herd has a history of more intensive sport hunting than any other in the region. The majority of the harvest in the past resulted when the herd crossed the Steese or Taylor Highways. Harvests varied from fewer than 100 to as many as 2,400 per year from 1950-1972 depending upon the timing of the caribou crossing. Restrictive season closures were adopted in 1973 and the reported harvest during the past three years has not exceeded 50 per year. Because of the "boom and bust" population levels the herd has experienced in this century, it has played varying roles in meeting domestic demands for caribou by residents within the herds' range.

The Delta and Macomb Plateau herds are relatively accessible to the population centers of the region. Sport harvests since the late 1960's were fairly intense until the season on the Delta herd was entirely closed in 1974. Use of the Delta herd will be curtailed until the population has a larger recruitment of young caribou. The Macomb herd occurs in a restricted access area; most harvest is by resident hunters with horses and by backpackers.

MACOMB PLATEAU CARIBOU

LOCATION

In Game Management Unit 20, the area bounded on the north by the Tanana River, on the east by the Slana-Tok Highway, on the south by the crest of the Alaska Range, and on the west by the Richardson Highway.

THE SPECIES

Approximately 1,000 caribou occur along the north slope of the Alaska Range between the Richardson and Glenn Highways. Upper areas of all the major drainages flowing into the Tanana River contain caribou. The area between the Johnson River and Robertson River, known as the Macomb Plateau, contains a fall concentration which numbers about 500 animals. Little is known about the movements and population fluctuations of this herd. However, the population may be a remnant of the Delta herd. Presently, calf production and survival are low possibly due to severe winters and predation by grizzly bears and wolves.

Use by recreational hunters is high on part of the Macomb Plateau. Other portions of the area receive less hunting pressure and produce fewer caribou because of more difficult access. An average of 37 caribou has been taken each year since 1971, and hunter success has averaged about 35 percent.

Transportation means are varied. About 50 percent of the animals harvested are taken by hunters using horses, 35 percent by hunters with ATV's and aircraft and 15 percent by walk-in hunters. Access restrictions to motorized vehicles during the caribou season on the Macomb Plateau have been in effect for two years and have significantly reduced harvest levels. One-half of the hunters using the area live in the Delta Junction area, 25 percent come from Fairbanks, and 25 percent come from the rest of the state, particularly the Anchorage area. Access routes to Macomb Plateau include two horse trails originating from the Alcan Highway and one lake large enough for float planes. Access to the remaining area originates from highways bisecting the area, bush landing strips, and ATV, horse and foot trails. Differences in accessibility result in a poorly distributed harvest. Caribou on the Macomb Plateau comprising only 35 percent of the population sustain 60 percent of the harvest as a result of easy hunter access. Caribou receive light hunting pressure in other areas.

DELTA CARIBOU HERD

LOCATION

In Game Management Unit 20, the area bounded on the south by the crest of the Alaska Range; on the east by the Richardson Highway; on the north by the Tanana River, the North Star Borough boundary, and a line extending the southernmost Fairbanks North Star Borough boundary due west to the Nenana River; and on the west by the Nenana River.

THE SPECIES

The Delta caribou herd currently numbers about 1,500-2,000 animals and is declining. Efforts to evaluate the status of this population were begun in 1969. At that time the herd numbered approximately 5,000 animals. Calf production and survival in the Delta herd have generally been low. Few newborn calves are seen on traditional calving grounds near the headwaters of Delta Creek, and composition data indicate that less than 10 percent of the calves born in 1973 and 1974 lived to 17 months of age. Approximately 80 percent of the population is older than 6 years, and since caribou rarely live past 12 years, the population will likely disappear by 1980 unless calf production and survival increase.

Reasons for the herd's poor reproductive success are unknown. Pathological or nutritional factors may be affecting the female segment of the population, resulting in failure to produce viable calves which can survive more than a few weeks. Wolves and grizzlies are abundant on caribou range, although their impact on caribou has not been evaluated. Bears frequent pre-and post-calving concentrations of caribou in May and June, while wolves are numerous on caribou winter range.

The quality of the Delta caribou range has not been evaluated. Recent wildfires have destroyed a small portion of winter range lying between the East Fork of the Little Delta River and Buchanan Creek. Earlier large populations which overgrazed their range may have contributed the presently reduced herd size. The poor reproductive success of this herd cannot be blamed on too few bulls; bull-cow ratios remained near 30:100 from 1971 to 1976.

The Delta herd formerly produced large trophy bulls, several of which qualified as Boone and Crockett records. Because old animals predominate in the population, trophy bulls are still available.

Liberal hunting seasons (August 10 - March 31) and bag limits (3 caribou) allowed for intensive hunting pressure and harvest until 1973 when the limit was reduced to one caribou. From 1969-73, 1,874 caribou were removed by hunting. Two-hundred-thirty-three animals were taken from August 10 - September 30 before the season was closed in 1973. The harvest in 1973 was the lowest since the 1969-70 season when 225 caribou were harvested. The shortened season in 1973 eliminated winter hunting by residents. In an attempt to slow the herd's decline, the season remained closed in 1974 and 1975.

Resident harvest varied from 64 to 75 percent of the total kill. Hunter success declined steadily since 1970. The trend in hunter success paralleled the population decline of the Delta herd. The average number of caribou taken per successful hunter dropped from approximately 1.5 in previous years to 1.0 in 1973 as a result of the bag limit reduction from 3 to 1. Since 1969 the percentage of bulls in the harvest was about 70 percent. The selection of bulls by hunters is partly responsible for the relatively low observed bull:cow ratio.

Areas occupied by the Delta herd were readily accessible to hunters throughout the time of liberal seasons prior to 1973. About 60 percent of the bull harvest and 57 percent of the cow harvest occurred before October. Weather and snow conditions during March provided easy access into areas inhabited by caribou (specifically Gold King and Little Delta River), resulting in 23 percent of the harvest occurring at that time.

Guided hunting was prevalent in the late 1960's and early 1970's when 14 guides operated in the area. However, this number has declined to four or five who now guide for sheep, moose, and brown bears in the area.

CARIBOU IN WESTERN ALASKA

The population identities of barren ground caribou (*Rangifer tarandus granti*) in Western Alaska are the least well defined of any region in the state. The Beaver herd is the primary resident caribou herd, with the McKinley and Mulchatna herds occupying the region seasonally. More recently many smaller populations have been recognized as being discrete from any of the above. The Rainy Pass, Granite Mountains, and Sunshine-Cloudy Mountains herds have been identified as being discrete populations in recent years and their range lies partially or wholly within the region. There is evidence to suggest other discrete populations in the Kilbuck Mountains and Kokrines Hills. In addition a population of wild reindeer/caribou occur in the vicinity of the Andreafsky River near the mouth of the Yukon River. The winter movements of the Western Arctic herd also extend into this region.

The year round range of the Beaver herd is contained in this region and includes the Beaver Mountains and the drainages of the Dishna and Innoko Rivers. In the 1930's the Twitchell reindeer herd grazed this area. The herd was abandoned in the 1940's, and these animals may have intermingled with small numbers of caribou to form the present Beaver herd. The herd contains 2,000-3,000 animals and appears to have been stable for several decades.

The McKinley herd ranges primarily to the north in the vicinity of McKinley Park. This herd numbered 20,000 to 30,000 in 1941. Since then the herd has shown a gradual decline. By the early 1960's approximately 10,000 were still present. Since 1966 a rapid decline has been noted and currently 1,000 to 1,500 remain. The Mulchatna herd has realized a fairly rapid growth from 5,000 in 1964 to 14,000 in 1974. This herd ranges south into the Southwestern Region during portions of the year. The Rainy Pass herd contains an estimated 1,500 and has been relatively stable in size for the past decade. This herd ranges in the vicinity of Farewell and Rainy Pass in the Alaska Range. The sizes of the Granite Mountains, Sunshine-Cloudy Mountain, Kilbuck Mountain and Kokrine Hills herds are not known, but it is unlikely that any group contains more than one thousand animals. Estimates of numbers in the Andreafsky River wild reindeer/caribou herd range from 1500 to 5,000. The Western Arctic herd when censused in 1970 contained a minimum of 242,000 caribou but recently has declined to 50,000 animals.

Although caribou utilize a variety of habitats throughout the year, much of their time is spent on the tundra or on treeless upland areas. In the Western Region this zone generally lies between 3,000 and 5,000 feet in elevation where heath tundra, alpine tundra and sedge wetland plant associations dominate the vegetation. Timbered areas are used extensively as winter ranges but are abandoned as the snow melts. An important habitat requirement of caribou populations is a suitable calving area. Calving grounds generally constitute a "center of habitation" for populations, and their occupation is the most consistent facet of otherwise vacillating and unpredictable movement patterns. The characteristics which distinguish calving areas are not well known but probably relate to such factors as availability of green vegetation following snowmelt, ease of movement and unobscured visibility. With few exceptions, calving areas are in timber-free areas.

Almost any vegetated habitat type can be and has been used by caribou for winter range, but the greatest use is made of timbered areas, especially spruce-lichen associations. With teeth adapted for eating soft, leafy vegetation, caribou in winter are dependent on lichens, grasses, sedges and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands that can provide forage in significant quantities. Caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristics of caribou is one of the mechanisms apparently acquired by the species through evolutionary selection to adapt to limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. In Western Alaska fires and overgrazing by caribou and reindeer have depleted some ranges.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-worn trails of large populations in the past. Among many interrelated natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, whereas weather, disease and emigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when most calves are born. Predation on calves and weather induced calf mortality determine in large part whether populations increase or decrease. In infected populations, brucellosis and a retained placenta condition can reduce the number of viable young born.

Until recent years, caribou in Western Alaska have not been intensively sport hunted because of limited access and a small resident human population. The region has no roads linking with the highway system. Recreational hunters utilizing aircraft transport have increased harvests from the Mulchatna and Rainy Pass herds. Although much of this pressure is by resident hunters, some nonresidents participate. Domestic use by natives was significant in the 1800's when a much larger population of caribou occurred in the region. In the past several decades domestic use of caribou has been locally important on a sporadic basis to villages that take advantage of variable movement patterns of caribou which occassionally bring them within reach of a village.

MCKINLEY CARIBOU

LOCATION

In Game Management Unit 20, the area bounded on the south by the north boundary of Mt. McKinley National Park, on the west by the southwest boundary of Game Management Unit 20C, on the north by a line drawn due east from Wien Lake to the Nenana River, and on the east by the Nenana River.

THE SPECIES

Accurate information on current size of this herd is not available. A major decline occurred between 1941 when the herd contained an estimated 30,000 caribou and 1963 when 12,000 may have been present. Recent observations by Park Service and Fish and Game personnel indicate that the herd has undergone a further decline. Currently about 500 animals spend the summer and early fall within the Park. This suggests the herd may now number only about 1,000-1,500 individuals. Emigration of animals may have occurred from the McKinley herd to adjacent groups occupying the Tonsona River, Happy Valley and Ptarmigan Pass areas. During March, 1973, an estimated 1,000 caribou were in these areas. Recent Park Service surveys indicate that relatively few caribou winter within the Park. Four-hundred-fifty animals were located between the headwaters of Moose and Boundary Creeks in 1974, and approximately 600 animals were located in the Bull River-Foggy Pass area in July 1975. Some calving may also occur within Park boundaries. Fewer than 500 caribou have recently occupied traditional winter ranges between the Nenana and Kantishna Rivers and Lake Minchumina and other areas west of the Park (Tonzona River) probably support only 1,000 caribou.

The condition of the range and its relationship to natural mortality has not been evaluated. Wolves and grizzly bears are abundant within and immediately adjacent to the Park boundary and could be contributing to the population decline.

Hunter harvests have removed relatively few animals from the McKinley herd. Prior to 1970-71, the annual harvest was approximately 20 animals. In 1971-72, the kill increased to 85, due to the availability of caribou along the Stampede Trail north of McKinley Park. Between 1973 and 1975, the annual harvest averaged nine caribou. Harvest tickets are not required for areas west of the Park, and hunters regularly take caribou in the foothills of the Alaska Range in the drainages of the Tonsona and Little Tonsona Rivers. These animals are considered part of the McKinley herd. About 50 to 100 of these caribou are taken annually, principally by guided hunters or by fly-in hunters from Anchorage.

Liberal seasons and bag limits for caribou in interior-arctic Alaska existed from statehood through the 1972-73 season. For the McKinley herd, a three caribou bag limit and a 4-7 month season were allowed. Restrictions to reduce harvests on other caribou herds in 1973 also applied to McKinley caribou. Since 1974, a bag limit of one caribou and a hunting season from August 10 to September 20 have been in effect for the McKinley Herd.

FAREWELL CARIBOU

LOCATION

In Game Management Units 16 and 19, that area within a line drawn from the outlet of Telequana Lake north to Lone Mountain, east to Farewell, east northeast to the northwest corner of Mt. McKinley National Park, then south along the Park boundary to the Yentna Glacier, down the Yentna Glacier and River to its confluence with the Skwentna River, then up the Skwentna River to its headwaters, then south along the Nagishlamina River to Chakachamna Lake, then west up the Neacola River to Telequana Pass and down the Telequana River to the point of beginning.

THE SPECIES

The Farewell caribou herd consists of several small groups of animals which probably were formerly part of the McKinley caribou herd. These caribou can be found near Rainy Pass, along Post River, and in scattered groups along the northwest side of the Alaska Range from McKinley Park to Telequana Lake where they contact the Mulchatna herd. The total population probably numbers about 3000. Natural mortality is probably the major factor limiting growth of this population. Although wildfire has destroyed some winter range in the foothills of the Alaska Range, most habitat is in good condition.

Fall harvest of this herd is light, except in the southern portion of the area where floatplane access is possible. A few caribou are hunted by local residents, but most caribou harvested in fall are taken by guided nonresidents or by residents from larger cities. Most of the harvest occurs in late winter and spring by residents using ski-equipped aircraft.

TOGIAK CARIBOU

LOCATION

That portion of Game Management Unit 17 draining into Bristol Bay between Cape Newenham and Kulukak Bay and including Kulukak Bay drainages.

THE SPECIES

At present this area does not have a population of caribou, although suitable habitat appears available. Local villages in this area have a high domestic use demand for meat which exceeds the availability of other local large game animal populations. The establishment of a caribou herd in this area could help provide for this demand as well as provide new recreational opportunities for nonresidents of the area.

LOWER YUKON-KUSKOKWIM CARIBOU

LOCATION

Game Management Unit 18; that portion of Game Management Unit 19 lying north of the Chukowan, Holitna, and Swift Rivers and the Farewell Caribou Management Plan area; Game Management Unit 21; and that portion of Game Management Unit 22 lying south of the Shaktolik River.

THE SPECIES

Before 1900, caribou were probably the most abundant ungulate found in the lower Yukon-Kuskokwim area where they roamed the timbered flats and mountainous areas. Severe wildfires beginning in the early 1900's destroyed much of the spruce and lichen understory habitat upon which the caribou depended. Eventually the large herds of caribou which roamed this vast area became more restricted in their home ranges. Introduction of reindeer into this area in the early 1900's further impacted available caribou range. Reindeer were established in two areas of the Kuskokwim Mountains, one group of about 5,000 head near the Beaver Mountains and a much larger herd in the Aniak River drainage. These herds persisted until the late 1930's and were then sold and removed or allowed to revert to the wild state, resulting in crossbreeding with caribou. At present several groups of caribou can be found in the Kuskokwim Mountains and in some nearby mountainous areas. There are about 500 caribou in the upper Nowitna River drainage, around the Sunshine and Cloudy Mountains. Another 2,000 caribou roam the river valleys and hills near the Beaver Mountains. There are probably over 1,000 more caribou in several isolated groups between the Beaver group and the head of the Aniak River.

The caribou populations occupying the Kuskokwim Mountains have shown no growth over the past five years. Calf production and survival has not exceeded 10 percent of the adult population by late fall. Hunting effort is light and has rarely exceeded 100 animals annually. Wolves and grizzly bears are abundant, but their impact on the caribou populations is not know. During the early 1970's severe winters could have been detrimental to caribou in the Kuskokwim Mountains, but the populations have shown little change after two relatively mild winters. Much of the Kuskokwim Mountain caribou range now appears to be in excellent condition. An exception to this are the north facing slopes of the Beaver Mountains which constitute the calving area for the Beaver herd. Cursory inspection of ground cover and lichens on these slopes shows considerable sign of trampling and overgrazing. At calving time this area is normally occupied by 1,200 to 1,500 caribou. Some large tracts of potential winter range were destroyed by fire in the 1950's, but fire damage has been light in the past ten years.

Caribou are hunted in the Kuskokwim Mountains from early fall to late winter. The most intensive hunting occurs after snowfall and during the winter. Nearly all the caribou taken from this area are harvested by local hunters for meat and hides. Hunters must fly to all herd locations

except near McGrath, where snowmachines are used for transportation to the Nixon Flats. There are few wheel landing areas throughout the caribou range and most hunting is accomplished with ski-equipped aircraft. Because these herds or groups of caribou are relatively isolated, hunting pressure has been light. No harvest reports are required of caribou hunters in the area, therefore little is known about harvest characteristics. Caribou in the Kuskokwim Mountains are not recognized as large antlered animals, nor are many large-bodied. However, some trophy size bulls have been taken from several different groups of caribou in this area.

FORTYMILE CARIBOU

LOCATION

That area bounded on the east, north and west by the Game Management Unit 20 boundary and on the south by the northern boundaries of the McKinley, Delta, McComb Plateau and Chisana caribou management plan areas.

THE SPECIES

The Fortymile caribou herd has undergone wide fluctuations in abundance over the past fifty years. During the early 1900's the herd was probably increasing in size, reaching its peak numbers (estimated at 1/4 to 1/2 million animals) in the 1920's. These caribou occupied a much larger range than they do today. At that time they utilized country north of the Yukon River, made yearly migrations near Nenana, Fairbanks and Circle, and wintered as far east as Dawson and Whitehorse and as far south as the Alaska Range and Nelchina Basin.

The population began to decline in the 1930's and its numbers may have reached a low of only 10,000 animals during the early 1940's. It then increased to approximately 50,000 caribou by the early 1950's, but again began declining in numbers and by 1969 likely numbered no more than 20,000 animals. In 1973 the herd was estimated to have declined further to 5,300 animals and it probably contains fewer caribou today (1976).

The Fortymile herd now calves south of the Steese Highway along the headwaters of the Chena and Charley Rivers and Birch Creek. In the past when the herd was larger, calving occurred in the White Mountains. Summer range includes the high country between the Steese and Taylor Highways. Fall migrations often take the caribou east across the Taylor Highway and on into Canada. Traditional wintering areas lie along the Alaska-Canada border.

Causes of the major decline during the 1930's are only speculative. The initial reason for the population decline may have been diminished range quality, resulting from the tremendous grazing pressure applied by the large numbers of caribou, and possibly the destruction of range by frequent wildfires. It is unlikely that hunting could have initiated the decline. Nonetheless, domestic use by miners and natives may have accelerated the decline once it had begun.

Declines since the 1950's have been attributed in part to emigrations of caribou from the herd. Large numbers of caribou are known to have left the Fortymile herd in 1957 and 1964, joining the Porcupine herd wintering nearby in Yukon Territory. Quite likely other major unrecorded emigrations occurred. Losses to hunting have also contributed to herd reductions. Recreational hunters along the Steese and Taylor Highways killed an estimated 5,080 caribou in 1970-1972 before more restrictive regulations in 1973 reduced annual harvests to less than 100 caribou. Despite almost total elimination of the harvest, the herd remains at a very low level.

Tok and Taylor Highway residents have long depended upon the Fortymile caribou herd to provide a significant portion of their protein diet. By far the majority of the harvest has traditionally been by area residents, but after 1971 a greater number of Alaskans from Anchorage, Fairbanks and Delta participated in the harvest. This was in large part caused by the decline and subsequent season and bag limit restrictions placed on the Nelchina caribou herd. Residents of Southeastern Alaska also hunted the herd when caribou were present along the highway during the hunting seasons. With the highly restrictive seasons and bag limits now in effect nearly all the harvest is by local residents. Some effort is put forth by nonresidents or residents from other areas of the state, but this is primarily road hunting, and little success is achieved. Off-road vehicles or aircraft and up-to-date knowledge regarding caribou movements are essential for successful caribou hunting, since much of the time the herd is normally located long distances from the road systems. Successful hunters generally utilize the Kechumstuck off-road vehicle trail or the short, unimproved airstrips at Molly Creek or Joseph near the headwaters of the Fortymile River, or one of the several strips located along the Seventymile River. Opportunities for roadside viewing and photography of caribou occur usually in October when the fall migration brings the Fortymile herd across the Taylor Highway.

CARIBOU IN NORTHWESTERN ALASKA

Northwestern Alaska is seasonally occupied by the majority of the Western Arctic barren ground caribou (*Rangifer tarandus granti*) herd in late fall, winter and early spring. Some caribou are present in the region in all seasons of the year. The herd was estimated to contain 300,000 in 1964 and 242,000 caribou in 1970. Survey efforts in 1975 suggest a sizeable reduction to perhaps 100,000 caribou, and similar efforts in 1976 revealed a population of only about 50,000.

A relatively obscure population of wild reindeer/caribou that winters east of the Andreafsky River in the Western Region of Alaska may occasionally range into the Northwest Region. Several hundred animals that may belong to this group, occupy the area at the head of the Unalakleet River and South Fork of the Nulato River, at least seasonally. These animals warrant further study. Additionally the Seward Peninsula contains the bulk of Alaska's reindeer herds. Several hundred stray animals from these reindeer herds occupy portions of the Seward Peninsula such as the head of the Kuzitrin River.

Although caribou utilize a variety of habitats throughout the year, much of their time is spent on alpine and Arctic tundra. Timbered areas are used extensively as winter ranges but are abandoned as the snow melts. An important habitat requirement of caribou populations is a suitable calving area. Calving grounds generally constitute a "center of habitation" for populations, and their occupation is the most consistent facet of otherwise vacillating and unpredictable movement patterns. The characteristics which distinguish calving areas are not well known but probably relate to such factors as availability of green vegetation following snowmelt, ease of movement and high visibility. With few exceptions, calving areas are above timberline. The Western Arctic herd's calving area is north in the Arctic Region.

Almost any vegetated habitat type can serve as caribou winter range, but the greatest use is made of timbered areas, especially spruce-lichen associations. With teeth adapted for eating soft, leafy vegetation, caribou in winter are dependent on lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands than can provide forage in significant quantities. Caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation favor caribou. In Northwestern Alaska fires and overgrazing by reindeer have depleted some caribou ranges. Extensive fires have occurred in the Kobuk River valley. Lichens in these areas have not totally recovered.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-

worn trails of large populations in the past. Among many interrelated natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, while weather, disease and emigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when calves are born. Predation on calves and weather induced calf mortality determine in large part whether population increases or decreases. In infected populations, brucellosis and a retained placenta condition can reduce the number of viable young born.

Caribou in Northwestern Alaska have long been important for domestic use. Some inland villages away from marine resources developed a culture centered around caribou. Today the cash economy has spread to all villages but domestic use of caribou still contributes significantly in enhancing the standard of living. From the early 1960's through the present, over 10,000 caribou have been used for domestic use annually. The number taken depends greatly on where spring and fall migrations of the Western Arctic Herd occur. Prior to 1969 a sizeable portion of the domestic use was for dog food, then the primary source of land transportation. Since then snow machines have largely replaced the dogs and have greatly facilitated the harvesting of caribou. River boats are the only other method of access that accounts for many animals. Aircraft are used in taking a minor portion of the harvest.

Very little sport hunting has occurred in this region in the past, primarily because of the remoteness of the area. There appears to be a growing interest in the area by sport hunters. Aircraft will continue to be the primary method of transportation for recreational hunting because of the logistics involved.

WESTERN ARCTIC CARIBOU

LOCATION

That portion of Game Management Unit 22 lying north of the Shaktolik River; all of Game Management Unit 23; those portions of Game Management Units 24 and 26 lying west of the Dietrich Caribou Management Plan area; and that portion of Game Management Unit 25 lying west of a line drawn from the headwaters of Fish Creek due south to the Yukon River.

THE SPECIES

From the 1940's to the early 1970's the western arctic caribou herd was the largest in Alaska. In 1963, the herd was estimated at 300,000 animals. A photo-census conducted in 1970 resulted in a minimum estimate of 242,000 caribou. A 1975 survey of post-calving aggregations yielded a tentative estimate of 100,000 caribou. Although caribou may appear to be abundant seasonally in some portions of the herd's 140,000 square mile range, the population is continuing to decline. No single factor appears to be responsible for this decline, but one important contributing factor has been the low proportion of young which survive to become yearlings. This proportion has dropped from 19 percent in 1970 to 8 percent in 1975. Since it is these animals which replace the adults which are lost from the population through natural and hunting-related mortality, such a decrease in their numbers has had serious consequences. Without drastic changes in the factors which cause mortality, the herd will continue to decline. Even if the present rates of survival of calves to yearling age increases to the level observed in 1970, the present herd size would not be able to produce the number of caribou necessary to sustain the amount of predation and hunting which now occurs. Predation is believed to be the most important natural mortality factor. Wolves, bears, wolverines, golden eagles and foxes prey on caribou but the highest kill is probably by wolves. An estimated 15,000 caribou per year may be killed by wolves, based on wolf density estimates of one wolf per 110 square miles. Wolf densities and predation are highest in the southern portion of the caribou range where the majority of the animals have wintered during the last two decades. If wolf predation does account for as many animals as these rough estimates project, it would be a significant contributing factor in the caribou herd decline.

Range conditions do not appear to be a limiting factor. The habitat utilized by caribou in both winter and summer ranges appears to be in good condition and still able to support greater numbers than now exist. In addition the physical condition of caribou taken by local residents has been good, and initial calf production has been high. Both of these factors indicate good habitat condition.

The western arctic herd has received heavy use by native residents throughout history. The average annual kill since 1963 has been about 25,000 caribou, varying from 20,000 to 29,000. Most of these animals are taken as they pass villages during the spring or fall migrations or when animals spend the winter near settlements. Since the kill is

largely dependent upon availability of caribou close to villages which is in turn dependent on migration routes and wintering areas, the kill near any particular settlement may fluctuate widely from year to year. During fall migration prior to the rut, adult bulls are often preferred. After this time cows or young bulls are taken when a choice is available. The total effect on the population is a reduction in the proportion of bulls. Hunting by local residents is primarily done with the aid of snow machines, although boats are sometimes used. Dog teams were the primary means of transportation until the late 1960's, but are rarely used today.

Past regulations have reflected the dependency of local people upon caribou for domestic use. From 1959 to 1976, there were no closed seasons or bag limits. In 1976 a limit of 15 caribou per year, closure of short portions of the season and prohibition of commercial sale of caribou were imposed to reduce total hunter kill.

Recreational harvests by persons not living in the area have probably not exceeded 1,000 caribou in any one year, and a more realistic estimate probably would be 300 animals, in either case a negligble proportion of the total kill. A majority of recreational hunting has been by guided nonresidents, but within the last five years an increasing number of resident hunters have been traveling to the area to hunt. Most of the access to the area by recreational hunters has been provided by aircraft. Though adult bulls in this area do not have exceptionally large antlers, the remote character of the region and the possibility of selecting trophies from large numbers of caribou increase the appeal to recreational hunters of hunting in the area.

CARIBOU IN ARCTIC ALASKA

Populations of barren ground caribou (*Rangifer tarandus granti*) in the Arctic Region of Alaska have fluctuated widely in numbers and distribution Currently, the region contains the year-round range of the Central Arctic (or Prudhoe herd). This herd contains 4,000-5,000 caribou and occupies the area east of the Kuparuk River, west of the Canning River and north of the crest of the Brooks Range. An additional small discrete herd of caribou ranges near the Colville River Delta and possibly another near Wainwright. Neither contains more than several hundred animals. The region also seasonally supports the bulk of the Western Arctic and Porcupine herds. The latter contains 100,000 or more caribou.

The Arctic Region lies north of the general tree line and has a fairly limited number of vegetation communities. Caribou movements and seasonal distribution can be correlated with different vegetation types. Normally, a rapid northward movement in April and May brings most of the cows to the dry tundra calving grounds in the foothills of the Arctic Slope at the time most snow has disappeared and the first green shoots and buds of cotton grass appear. The calves are born in late May and the first half of June. In late June and early July the population concentrates in the foothills and mountains where willows, birches and forbs first yield new growth. Most of the herd then disperses onto the coastal tundra where new growth of sedges and willows is beginning to develop. In late August and early September, most of the population moves south. In most winters some small segments of the herds spend the winter in windswept regions of the coastal tundra and foothills.

Because this region lies entirely north of treeline, the spruce-lichen community frequently used in other areas is not available, and animals wintering in the region are largely restricted to the wind-blown sedge-lichen areas. With teeth adapted for eating soft, leafy vegetation, caribou in winter are dependent on lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands that can provide forage in significant quantities. Caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. Because fires rarely occur in this region, overgrazing by caribou and reindeer are the primary forces depleting ranges. Reindeer were present in the area primarily prior to 1940. Since then few have been in the area and little competition with caribou has resulted.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-worn trails of large populations in the past. Among many interrelated

natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, while weather, disease and emigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when most calves are born. Predation on calves and weather induced calf mortality, determine in large part whether populations increase or decrease. In infected populations, brucellosis and a retained placenta condition can reduce the number of viable young born.

Caribou in Arctic Alaska have long been important for domestic use by native residents. The abundance or scarcity of caribou has been suggested as the principal factor determining if early-day natives could live inland or if they had to retreat to the coast where the more stable marine resources could be utilized. Whalers in the late nineteenth century were the first persons other than natives of the area to make use of caribou. Even today domestic use of caribou by local residents accounts for over 95 percent of the use by humans. Sport harvest has been negligible to date because of the prohibitive transportation problems, but this deterrent is rapidly disappearing. Construction of the Trans-Alaska Pipeline has prompted the closure of a corridor five miles wide on either side of the pipeline and a closed area in the Prudhoe Bay development area.

Domestic users harvest most caribou with snow machines and boats. Although dog teams were the primary transportation means until the late 1960's, they are rarely used today. Most sport hunting relies on aircraft as the principal transportation means. There is presently much concern that the increasing human population and general use of snow machines is resulting in excessive utilization of caribou.

DIETRICH CARIBOU

LOCATION

In Game Management Units 24 and 25, the area bounded on the west by the south fork of the Koyukuk River from its confluence with Fish Creek to its confluence with John R. Creek, then northwest to the Middle Fork of the Koyukuk River to the North Fork of the Koyukuk River, then the North Fork of the Koyukuk River from its confluence with the Middle Fork of the Koyukuk River to its confluence with Glacier River, then by Glacier River, Roy Creek, Upper Hammond River, the Itkillik River to its confluence with the Colville River, and the Colville River to the Arctic Coast; on the north by the Arctic Coast; on the east by the Sagavanirktok River to its confluence with the Lupine River, then the Lupine River to the Game Management Unit 25 boundary, then west and south along the boundary to the headwaters of Fish Creek; on the south by Fish Creek.

THE SPECIES

The number of caribou in this area has declined during recent years. Approximately 5,000 caribou are residents, although some migrating animals from the Western Arctic and Porcupine herds migrate through the area.

Factors regulating the population size are poorly understood. Sport and domestic hunting is light and predation is moderate at this time. In contrast, both hunting and predation have played a significant role in reducing the Western Arctic herd which in turn has decreased the total number of caribou utilizing the Dietrich area.

Presently, hunting pressure is light in this area since aircraft provide the only means of access for recreational hunting. Domestic use of caribou in the area by hunters from Wiseman, Nuiqsuit and Barrow is low.

PORCUPINE CARIBOU

LOCATION

That portion of Game Management Unit 25 east of a line drawn from the headwaters of Fish Creek due south to the Yukon River; that portion of Game Management Unit 26B lying east of the Dietrich Caribou Management Plan area; and Game Management Unit 26C.

THE SPECIES

The Porcupine herd currently ranks as one of Alaska's largest populations of barren-ground caribou. Although some animals probably remain in Alaska throughout the year, the majority of animals in the Porcupine herd spend only the spring and summer months in the state.

From 1900 to about 1940, the herd apparently increased in size and expanded its winter range westward into the central Brooks Range. A decline in numbers occurred following a population peak in the mid-1940's, probably due to emigration to the Arctic herd and/or across the Mackenzie into the Northwest Territories. Herd size probably increased in 1957 and 1964 with substantial immigrations of animals from the Fortymile herd involving some 20,000 caribou in 1964. Animals from the Porcupine and Arctic herd occasionally overlap on winter ranges in the vicinity of the Kanuti Flats and during spring migration in the Dietrich-Atigun area, indicating that Porcupine caribou may cross the pipeline corridor. Significant numbers of caribou from this herd sometime winter in the east-central Brooks Range, from the Colleen River to Chandalar. In addition, when caribou from the Porcupine herd winter near the Yukon River, there may be an interchange with the Fortymile herd. Calving occurs in the arctic foothills and coastal plain from the Canning River eastward into Canada.

Reliable estimates of herd numbers were not available until 1972, when a photo-census revealed a minimum herd size of 100,000 caribou. At that time initial calf production was a minimum of 55 calves:100 cows, and surveys the following October indicated a calf:cow ratio of 30:100. These figures indicated the herd was moderately productive and that in 1972 numbers were stable or increasing slightly. Surveys in July 1975 indicated excellent initial calf production with 53 calves:100 cows. In 1973 the bull:cow ratio was 57:100.

Historical records indicate that domestic (subsistence) utilization of this herd has been the primary use. No permanent settlements existed north of the Brooks Range between Barrow and Herschel Island prior to 1900, although temporary coastal settlements were common. Eskimos from villages at the eastern edge of the herd's range in Canada probably relied, at least partially, on caribou. Villagers along the Yukon River from Stevens Village to Eagle, as well as Arctic Village, Chandalar and Venetie utilized caribou but had alternate food sources (fish, moose and sheep).

The earliest non-native users of this herd were whaling crews in the Arctic Ocean. In the last half of the 19th century, whalers may have harvested 4,000-6,000 caribou annually when wintering groups of animals were available along the coast. Trappers, prospectors and traders moved into the upper and middle Yukon drainages during the early 1900's, but their impact on the caribou harvest was probably not as significant as the whalers'. Domestic use by whites was insignificant after the 1930's while harvest by natives was probably greatest in the late 1960's before dog teams were replaced by snow machines.

Liberal seasons and bag limits (no closed season, no limit) for the region north of the Yukon River have been maintained since statehood. Due to the remote areas from which current harvest occurs (both in Canada and Alaska) and the lack of harvest ticket reporting requirements, sport and domestic harvest data are difficult to obtain. Crude estimates derived from observations by biologists and interviews with resident hunters in 1972 and 1973 indicate a harvest of approximately 5,500 animals was taken from this herd between spring 1972 and spring 1973, of which 1,500 were taken by Alaskan village residents. Estimates for 1975 and 1976 indicate some 4,000-6,000 caribou may have been taken, 1,000 by residents of Arctic Village, Venetie and Chalkyitsik. Domestic needs of local users were apparently satisfied, as animals were being shipped to residents of Fort Yukon. At the current level of harvest, herd numbers will probably increase slightly with the rate of calf production and survival observed the past several years. There is no evidence that other mortality factors (disease, poor range condition and predation) are exerting a significant effect on this population.

DEER IN SOUTHEASTERN ALASKA

Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are found in varying abundance throughout most of Southeastern Alaska from Dixon Entrance north to Yakutat Bay. They are indigenous to the mainland and islands of the Alexander Archipelago south of Lynn Canal and Icy Strait, and their range has been extended by transplants to Yakutat in 1934 and to upper Lynn Canal in 1951 and 1952. The transplant to Yakutat was reasonably successful and moderate deer densities are now present on the islands within Yakutat Bay; however few deer have ever been present on the mainland. The transplant to northern Lynn Canal was less successful. Deer did establish on Sullivan Island, but are rarely observed on the mainland in the vicinity of Haines and Skagway. An occasional deer is reported on the Chilkat Peninsula and within Glacier Bay National Monument.

Deer populations have historically fluctuated in Southeastern Alaska. The inner islands populations have had the greatest fluctuations while mainland populations have remained relatively static. Islands where winter conditions are most severe, and where wolves are present, have had the greatest extremes of deer abundance. Deer have been most abundant on the islands of the Alexander Archipelago and on the mainland south of Ernest Sound. Some deer are usually present along the entire mainland, north of Ernest Sound, but populations there have never been high. On the northern islands deer populations in 1975 were moderately high and increasing. On the central islands, deer numbers were the lowest in many years; however, a slight upward trend was recently observed. The southern islands and mainland had moderate populations, with an upward trend exhibited on the islands.

During different seasons of the year deer utilize most habitat types where food is available. Their home range is usually small, but they do make vertical migrations from the beach to alpine areas as a result of snow depths and availability of food. During much of the year, low-growing forbs are the most important plant species used. These are particularly abundant in alpine habitat during summer, and where alpine terrain is available, summer food is never a limiting factor. During winter, deer continue to utilize forbs when available under forest cover, but when about six inches of snow covers these species, deer begin using woody plants, with blueberry being most important. Most species of shrubs are used to some extent during critical winter months. Tips of cedar, spruce, and hemlock trees are also used, but these provide barely a maintenance diet. When snow depth under timber cover exceeds 18 to 24 inches, deer begin to concentrate on the open beaches, utilizing dead beach grass, sedges and some kelp. These species will not maintain basic metabolism and winter mortality begins.

Clearcut logging has had more impact on deer habitat in Southeastern Alaska than any other human factor. Until recently, many cuts exceeded 1,000 acres in size. These openings in the forest produce a great amount of deer food during initial successional stages, but in winter, snow covers the vegetation and it becomes unavailable to deer. Also, in 15 to 20 years following cutting, coniferous regrowth forms a closed

canopy and most deer food species are shaded out. The forest floor becomes devoid of vegetation except for mosses and lichens, and many years must pass before sufficient vegetation is available in natural openings to support deer populations again. In the climax forest, small openings created by dying trees allow for growth of understory deer browse species. Recently there has been a trend toward smaller cuts which result in greater interspersion of vegetation types ("edge effect") and uneven-age forest stands. Such cuts may be beneficial to deer by creating habitat which remains favorable for long periods.

Although deer have been successfully transplanted to other coastal regions of Alaska, Southeastern Alaska is the natural northern limit of their distribution in North America. At the margins of any species range, populations are normally more susceptible to slight changes in habitat and climatic conditions. For deer in Alaska, the winter accumulation of snow creates critical survival conditions in many years. Deep snows render much otherwise available food inaccessible. In severe winters deer populations may be greatly reduced by losses to starvation.

Wolf predation is a second important cause of mortality for some Southeastern deer populations. Predation has had its greatest impact on deer populations decimated by starvation, often further depressing deer numbers, and retarding recovery of reduced deer populations for prolonged periods. Since the last extreme winter of 1968-1969, deer populations on the central islands inhabited by wolves have remained at low densities while populations on the northern islands, which had similar or perhaps more severe winter conditions but no wolves, have made a rapid recovery to moderately high densities.

Observed losses of deer to other natural mortality factors have not been significant. Deer in Alaska are remarkably free of parasites and diseases.

Historically deer have been the most important big game species providing meat for the larder in Southeastern Alaska. Even today almost as many hunters take deer for meat as for sport. Although hunting license sales have increased during the past 15 years, the number of deer hunters afield has remained remarkably close to 6,000 from 1959 to 1974. Most hunters are residents of Southeastern Alaska. Hunter success in most areas has been good with usually more than half of the hunters taking at least one deer. The annual kill has fluctuated between 5,000 and 12,000 deer. Harvests, including either-sex hunts, have never been shown to significantly impact deer numbers in the region. Seasons and bag limits have at times been curtailed when deer populations in specific areas were low, but these low densities were caused by factors other than hunting. Given favorable weather conditions and reasonable levels of predation, deer populations increase in spite of hunting pressure. With protection of sufficient habitat and management of predation, deer populations should be more than adequate for public use in the foreseeable future.

SOUTHEASTERN DEER

LOCATION

Game Management Units 1-5 except for the areas included in the Behm Canal, Missionary and Sherman Peaks, and the Virginia Peaks Deer Management Plans.

THE SPECIES

Deer are indigenous to all of Southeastern Alaska south of Glacier Bay National Monument. Transplants were made to Yakutat in 1934 and to Northern Lynn Canal (Taiya Valley and Sullivan Island) between 1951 and 1956. The Yakutat transplant was successful, deer being reasonably abundant on the islands of Yakutat Bay. Deer have never prospered in the upper Lynn Canal area. Deer are present on Sullivan Island, but are rarely observed on the mainland where winter weather conditions are apparently too severe for deer survival.

Indigenous deer populations in the remainder of Southeastern Alaska are relatively distinct. Deer have historically been cyclic in Southeastern Alaska. General lows in deer abundance have occurred around 1918, 1925, 1934, 1943, 1950, 1956 and 1971. Examination of climatic records shows a direct correlation between average winter temperature and deer abundance. Although winter weather conditions have been predominantly mild since 1973, there is presently a great deal of variation in deer population status in different parts of Southeastern.

The southern mainland and the outer islands normally have mild climatic conditions. Present deer status in this area is fair. On the mainland and the inner islands the climate becomes progressively more severe northward. On northern mainland deer ranges populations have always been relatively low, but appear to remain more stable than in other areas. On the central islands populations are currently very low. On the ABC Islands deer are abundant and appear to be increasing. The ABC Islands generally support more deer than any other area in Southeastern Alaska, but there have been times in the past when more southerly populations were higher.

Natural factors have historically determined deer status in Southeastern Alaska, with the primary factor being winter weather and the secondary factor being predation by wolves. Hunting has never been a significant factor. Winter mortality surveys, conducted since the early 1950's, indicate that when an average of more than one dead deer per mile of beach is observed, populations have begun to decline. Mortality, equal to or in excess of this, occurred from 1965 through 1971, with a few exceptions, when a widespread population decrease occurred. Since that time milder weather conditions have permitted populations to increase rapidly on the ABC Islands and more slowly on Prince of Wales Island. Deer populations on the central islands and on the mainland have shown little change.

Wolves presently appear to be the limiting factor in areas where they are present. In areas where no wolves are present, deer are abundant. This is especially evident in Game Management Unit 3. Within Unit 3, small islands which do not support wolves have fair to good deer populations while those islands which have wolves have very few deer. It appears that when deer populations have been reduced by winter losses, predation can become a significant factor, slowing recovery or even further reducing populations.

Deer habitat in Southeastern Alaska is predominantly steep, mountainous terrain. In the climax situation there is almost complete forest cover below 2,500 feet elevation with alpine habitat above that level. On poorly drained sites, the forest is interspersed with muskegs creating natural openings. When snow is not a factor, adequate food is available to support high deer populations. During most winters, however, snow forces deer to use areas below the 750-foot level. Habitat condition ranges from poor to good in this critical zone depending on deer abundance. It is presently poor on the ABC Islands and fair to good in the remainder of Southeastern. Even on good habitat, snow depths in excess of 24 inches restrict deer movements and makes the majority of food species unavailable. Quality of habitat may be as important as quantity. Ironically, the ABC Islands normally exhibit the poorest range conditions, yet support the most deer.

Deer have historically been the most important big game species for the resident hunter in Southeastern Alaska. Even today they supply a substantial portion of meat utilized by many families. Very few nonresident hunters come to Alaska specifically to hunt deer. The number of hunters in the field has remained very close to 6,000 for the past 15 years. More hunting licenses are sold each year, but a smaller proportion of license holders actually hunt.

Hunter success is determined by deer population levels and availability of the animals to hunters. If deer are abundant and concentrated at low elevations, the average hunter takes two or more deer. The annual kill has fluctuated between 5,000 to 12,000 deer. There is no evidence that hunting, with perhaps a few exceptions, has significantly influenced deer populations. Natural factors have much more impact on deer abundance than hunting.

Hunting seasons and bag limits are normally liberal. When deer are plentiful the season is usually open from August 1 through December 31 with a limit of four deer of either sex. Over 70 percent of the kill occurs in November and December when snow forces deer to lower elevations.

In Southeastern, boats and aircraft are the primary means of access used by deer hunters. There are some roads available around each major town but most hunters prefer to get "out of town". Most hunters use skiffs and small boats less than 30 feet in length. Hunting is concentrated within the one-day range of these boats. The majority of deer are therefore taken within a 25 mile radius of towns.

MISSIONARY AND SHERMAN PEAKS DEER

LOCATION

In Game Management Unit 3, that portion of Kupreanof Island which drains into Frederick Sound between Todahl Creek on the north and Fivemile Creek on the south.

THE SPECIES

The Missionary and Sherman Peaks area on Kupreanof Island has historically been a favorite location for high country deer hunts, primarily by residents of Petersburg. Deer populations in this area have fluctuated greatly in the past, similar to the remainder of Kupreanof Island. The last peak in deer abundance was in the early 1960's. Beginning in 1965, deer populations began declining and they are presently still low. When deer are reasonably plentiful, it is not unusual to observe over 50 in a single day in alpine habitat. Mature bucks utilize this high range more than does and yearling males, providing an above average opportunity of obtaining a trophy animal.

Buck seasons normally open August 1 and weather controls the period of deer availability. With the first frosts in September, deer begin moving down into the high timber. Hunters usually take only one deer per trip. The majority of hunts are completed in a single day. Use is extremely light; less than 5 percent of the annual deer kill is taken by high country hunters.

VIRGINIA PEAKS DEER

LOCATION

In Game Management Unit 3, that portion of Etolin Island which drains into Zimovia Strait, between Kunk Creek on the north and Anita Bay on the south.

THE SPECIES

The Virginia Peaks area on northern Etolin Island has historically been a favorite location for high country deer hunts, primarily by residents of Wrangell. Deer populations in this area have fluctuated greatly in the past, similar to the remainder of Etolin Island. The last peak in deer abundance was in the early 1960's. Beginning in 1965, deer populations began declining and are presently still low. When deer are reasonably plentiful, it is not unusual to observe over 50 in a single day in alpine habitat. Mature bucks utilize this high range more than does and yearling males, providing an above average opportunity of obtain a trophy animal.

Buck seasons normally open August 1 and weather controls the period of deer availability. With the first frosts in September, deer begin moving down into the high timber. Hunters usually take only one deer per trip. The majority of hunts are completed in a single day. Use is extremely light; less than 5 percent of the annual deer kill is taken by high country hunters.

BEHM CANAL DEER

LOCATION

All of the mainland portion of Game Management Subunit 1A excluding that part of the Cleveland Peninsula south of Spacious Bay.

THE SPECIES

Currently, in the Behm Canal area, deer abundance is variable. Deer are common on some localized, good quality ranges but are scarce in the remainder of the area. During population highs such as occurred in the mid-1960's, deer were abundant over much of the area.

Natural mortality is apparently quite high, particularly during severe winters such as 1968-69 when heavy die-offs occurred. Wolves are present throughout the area and probably exert significant pressure on the reduced deer population.

The general condition of the habitat should not change significantly for many years. Logging would be the main cause of habitat change, and this area generally supports timber of lesser grade than the islands. The U.S. Forest Service has classed much of the area for low development which discourages clearcutting.

Very little use is currently made of the deer in this area. Deer populations are larger on islands which are closer to Ketchikan. Hunters usually don't travel the greater distances to the mainland. During years of high deer populations, considerably more hunter effort was expended in this area for deer, often in conjunction with other activities such as trapping, fishing or hunting for other species. Most hunters of the area are local residents. Deer are taken for recreation and domestic use. Nonconsumptive use is light and is incidental to other activities as people do not travel to this area specifically to observe deer.

Boats and aircraft are the means of transport to the area and skiffs are the best method of transportation once in the area. In summer and early fall the deer are at higher elevations and air transportation to the alpine lakes is preferred. Boats and beach hunting are generally used late in the season, particularly after snowfall.

DEER IN SOUTHCENTRAL ALASKA

Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are found in varying abundance along the Gulf of Alaska from the Copper River west to Whidbey Bay (Cape Fairfield), including Prince William Sound. Greatest deer densities occur on Hawkins, Hinchinbrook and Montague Islands. Latouche, Green, Knight (eastern side) and Naked Islands also are good deer areas but are secondary in importance. The mainland is marginal deer habitat with the exception of the Gravina Point to Rude River area which contains a moderate deer density. The northern and western portion of Prince William Sound is very marginal deer habitat.

Deer are not indigenous to the Prince William Sound area. Eight deer were transplanted from the Sitka area to Hawkins and Hinchinbrook islands in 1916. An additional 16 deer were transplanted from 1917 through 1923. This was the initial big game transplant in the state and has proven to be one of the most successful. The deer increased and dispersed throughout Prince William Sound and along the mainland where suitable habitat existed.

Deer populations in Prince William Sound have fluctuated considerably. This is a natural phenomenon of most species at the northern limit of their range. Deer in Prince William Sound represent an extension of their natural northern distribution. From the original transplants, the deer population grew rapidly until it reached a peak level about 1945. Range deterioration probably commenced in the early 1940's, and by 1950 the range had been severely damaged.

Since the mid-1940's, the deer population has had several drastic population fluctuations. Major die-offs were reported in the late 1940's, mid-1950's, late 1960's and early 1970's. The deer herd has been fairly low in recent years but has shown signs of a gradual increase. Deer population fluctuations are regulated by winter severity, principally depth and duration of snow.

During different seasons of the year deer utilize most habitat types where food is available. Their home range is usually small, but they do make vertical migrations from the beach to alpine areas as a result of snow depth which regulates the availability of food. During much of the year, low-growing forbs are the most important plant species used. These are particularly abundant in alpine habitat during summer. During winter deer continue to utilize forbs under forest cover, but when about six inches of snow covers these species, deer begin using woody plants with blueberry being the most important species. When snow depth under timber cover exceeds 13 inches, deer are forced to move onto beaches where kelp and other beach vegetation constitute the bulk of their diet. If forced to remain on the beaches for an extended period, winter mortality begins.

Deer in Prince William Sound are dependent on climax forest vegetation rather than sub-climax habitats as is their normal relationship in the "lower 48". Deer need the shelter and forage available in climax forest

in the critical days of winter. Standing trees in climax forests intercept much of the snow while dead trees produce numerous scattered small openings which provide food for deer. Clear-cut logging has had minor effects upon deer habitat in Prince William Sound. Most logging has occurred in areas of minor importance to deer and has been in relatively small blocks.

Prince William Sound deer have relatively few natural enemies. Wolves and coyotes are not present on the islands where the bulk of the deer occur. Coyote are present in fair numbers on the eastern Prince William Sound mainland, and coupled with range limitations, probably regulate deer abundance. Bears are the only natural predators that occur on some of the islands, but bear predation is usually of minor importance. Bears feed primarily on winter-killed carcasses in the spring. Deer in Prince William Sound are remarkably free of disease or parasites.

Deer hunting commenced in 1935 for bucks. Antlerless deer, except fawns, became legal in 1953; fawns were allowed in 1960. Since the inception of deer hunting, deer have gradually become an important meat source for local hunters. Even today, most hunters take deer for the meat as well as sport. Although the number of local hunters probably has not increased noticeably in the past 10-15 years, the influx of Anchorage and Fairbanks hunters is gradually increasing. Hunter success in Prince William Sound is variable from year to year. Usually more than half the hunters take at least one deer. The annual kill is normally between 500-1500 animals.

Harvests, including either-sex hunts, have never had a significant impact on Prince William Sound deer populations. Seasons and bag limits for bucks and does has varied throughout the years, but since 1964, the present liberal season and bag limits have remained the same regardless of natural population fluctuations. With favorable weather conditions, deer populations increase in spite of hunting pressure. If critical winter ranges are protected, deer populations should be adequate for public use in the forseeable future.

PRINCE WILLIAM SOUND DEER

LOCATION

Game Management Unit 6, Prince William Sound.

THE SPECIES

In Prince William Sound deer are primarily found on the larger islands: Hawkins, Hinchinbrook, Montague, Latouche, Green, Knight Island (eastern side) and the Naked Island group. Smaller populations also exist on the coast between Gravina Point and Rude River. The northern and western portion of Prince William Sound's mainland is very marginal habitat.

In 1916, eight deer taken near Sitka were transplanted to Hawkins and Hinchinbrook Islands. From 1917 to 1923 sixteen more deer were added to supplement the original transplant. The virgin habitat was ideal. Deer increased rapidly and dispersed throughout Prince William Sound and along the mainland where suitable habitat existed. By 1945 the population had peaked, and by 1950 range damage was severe and the carrying capacity of the winter range was drastically reduced. Extreme population fluctuations are common with most species at the limits of their range, and Prince William Sound deer are no exception. Major die-offs were recorded in the late 1940's, mid 1950's, late 1960's and early 1970's. Winter snow depth and duration regulate survival of Prince William Sound deer. Since the early 1970's the deer population has remained fairly low but it is showing a gradual increase.

Disease or parasites have not been a problem. The major deer areas, namely the larger islands in Prince William Sound, are basically predator-free.

Bears are the only natural predators on the islands and bear predation is of minor importance since they are hibernating during most of the critical winter months. On the mainland, coyotes and habitat limitations probably regulate deer abundance along the eastern side of Prince William Sound to the Copper River.

Deer habitat has not been adversely affected by man in this area. Logging has been in small blocks and not in prime deer habitat. The major loss of deer habitat in the critical winter beach fringe has been caused by deer themselves. In many places the browse species along the beach fringe have been permanently damaged. The range's carrying capacity has been greatly reduced since the deer population originally peaked in the mid-40's. Presently the winter range along the beach fringe will support a relatively small deer herd. Only when a series of mild winters occur and the deer are not forced to utilize the beach fringe for any significant duration, does the Prince William Sound herd build up in abundance.

A bucks-only hunting season was initiated in 1935. Antlerless deer, except fawns, became legal in 1953 and fawn hunting was legalized in 1960. Season lengths and bag limits for bucks and does varied considerably prior to Statehood. Since 1964, the present liberal season and bag limit has remained the same.

Hunter success is quite variable and is primarily affected by weather. If the weather during the season is mild with little snow, the harvest is fairly small. But if early snows occur and the deer are forced onto the lowlands, the harvest increases. If the deer are confined to the beach fringe because of exceptionally deep snow, they are very vulnerable to boat hunters.

There appear to be two basic types of deer hunting: (1) hunting in alpine areas early in the season prior to deep snow, and (2) hunting after snow has concentrated the deer on the lowlands. The alpine hunter is the avid hunter who hunts for the sport and for the meat. The late season-deep snow hunter is more interested in the meat than sport, and may not hunt if snow doesn't push the deer to low elevations. Hawkins Island receives the majority of the early season hunting. Once snow moves the deer into the lower elevations, hunting pressure shifts to Hinchinbrook and Montague Islands. The other major deer islands are also normally hunted at this time but to a lesser extent. Local residents who tend to be more meat than sport oriented probably account for most of the harvest. They commonly utilize commercial fishing boats for hunting or else fly into one of several U. S. Forest Service Cabins. Anchorage and Fairbanks hunters are primarily sport oriented.

At present, good harvest data are not available. Hunter compliance with the deer hunter report card is poor and does not reflect the magnitude of the harvest. The harvest normally ranges from 500-1500 deer per year. Most hunters who go afield average slightly more than one deer and 3 or 4 days effort per deer. Hunter success is normally better than 50 percent.

Hunting of deer in Prince William Sound is not detrimental to the population. The winter range is of extremely low quality, and deer are capable of overutilizing this range, particularly during heavy snow years. Harvesting deer helps contain the population in balance with the range.

DEER IN SOUTHWESTERN ALASKA

In Southwestern Alaska Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are found only on Kodiak and Afognak Islands and several small nearby islands. Efforts to transplant deer to the Kodiak area began in 1924 with the release of 14 animals on Long Island. Two more deer were released there in 1930, but failure of the deer to move to Kodiak Island prompted the release of nine deer on Kodiak Island in 1934. Deer rapidly expanded into the northeastern corner of Kodiak Island and adjacent small islands. The first hunting season was held in 1953. By the early 1960's, the general southward and westward movement of the deer population had reached the Uganik Island area. Concurrent with the population increase in newly colonized areas, a significant decrease in populations occurred in the northeastern corner of Kodiak where deer had first become established. In the late 1960's deer populations began to build in the Uyak, Zachar and Spiridon Bay areas and those areas presently have the highest deer populations on Kodiak and Afognak Islands. Areas farther north and east appear to have experienced declines from mid-1960's levels. On the eastern side of Kodiak Island, the Shearwater Peninsula between Ugak and Kiliuda Bay has relatively high deer populations; however, this population appears to have declined significantly during the 1974-1975 winter. Raspberry, Shuyak, and Afognak Island's deer populations became well established in the late 1960's.

Deer that move into new habitats reach high initial population levels which usually exceed the carrying capacity of the range. Within a few years they significantly alter the carrying capacity of their habitat and populations decline to levels below those observed in the first years after colonization. Field observations of browse plant condition generally confirm that major browse species on older winter ranges have declined in forage production capability.

During different seasons of the year deer utilize most habitat types where food is available. Their home range is usually small, but they do make vertical migrations from sea level to alpine areas, influenced by snow depths and availability of food. During summer, deer utilize forbs extensively. Fireweed, which grows in abundance at elevations from sea level to subalpine is heavily utilized. With the first frosts in September deer begin a general movement from alpine areas to lower elevations where succulent vegetation may still be found. As fall progresses, shrubs such as wild rose, elderberry, willow, salmonberry, and highbush cranberry constitute an increasing proportion of the deer's diet. Wind-blown knolls near the coast which support heath vegetation, including bearberry and crowberry, are heavily utilized during winter. Alternating periods of rain and cold wind often produce heavily crusted snow conditions which allow deer to move to subalpine areas where they feed on shrubs which would otherwise be unavailable. In the Afognak Island area and other Sitka spruce habitats on northern Kodiak Island, deer also utilize spruce tips, blueberry, and low growing forbs.

Although deer populations do fluctuate in response to winter conditions, the fluctuations do not appear to be as frequent nor as devastating as in Southeastern Alaska. Frequent rains during the winter usually

prevent heavy snow accumulations at lower elevations. It is not unusual to find deer foraging at elevations above 500 feet elevation in mid-winter. Heavy deer losses did occur in the 1969-1970 and 1970-1971 winters, but populations have since recovered and are now at moderately high levels in many areas.

Competition with cattle for winter forage occurs in the coastal drainages of northeastern Kodiak Island, from Anton Larsen Bay to Ugak Bay. Cattle feed extensively on willow and elderberry, two major deer forage species. During periods of heavy snowfall woody plants provide the bulk of winter cattle forage. In some coastal areas where cattle concentrate, the browse has been heavily hedged or killed by cattle. There may be competition for forage between elk and deer on Afognak and Raspberry Islands, where deer have only recently become established.

Some loss of deer winter range to housing and industrial development has occurred in the northeastern corner of Kodiak Island where most of the human population is centered. Free roaming dogs are a serious decimating factor near the town of Kodiak and other areas of human habitation. Although actual kills by dogs are not common, the indirect effects of stress produced by dogs chasing deer take an unknown toll. Illegal harvest by Kodiak residents occurs commonly during winter months as deer are easily accessible from the Island's road system.

Observed loss of deer to other natural mortality factors have not been significant. Deer in the Kodiak area are remarkably free of parasites and diseases.

Deer are the most actively pursued big game species in the Kodiak-Afognak Island complex. Many hunters count on venison to supply a portion of their annual red meat demands. A five-month season and liberal bag limits provide ample hunting opportunity for deer hunters in the area. Depending on deer population levels as many as two thousand Kodiak deer hunters annually harvest 600-2,000 deer. With recent reductions of moose and caribou seasons in other areas of Alaska, increasing numbers of hunters from Anchorage, Fairbanks and other mainland population centers utilize the Kodiak and Afognak deer ranges. Harvests, including either-sex hunts, have not had a significant impact on deer numbers. In the more accessible areas along Kodiak's road system where late season hunting is a potentially limiting factor, seasons and bag limits have been restricted. Over most of the deer ranges, however, deer populations are only lightly harvested and periodic lows are related to weather factors. With protection of habitat, deer populations should be adequate for public use in the future.

NORTHEASTERN KODIAK ISLAND DEER

LOCATION

In Game Management Unit 8, that portion of Kodiak Island draining eastward into Anton Larsen Bay, including all drainages into Narrow Strait and Chiniak Bay, and those drainages into Ugak Bay east of the Rough Creek drainage.

THE SPECIES

Sitka blacktailed deer spread rapidly over the Chiniak Bay drainages after a 1934 transplant. The deer population reached its highest levels in the 1950's. By 1962 it was apparent that the population had declined appreciably from Women's Bay to Kalsin Bay. The deer population still remains far below the late 1950's level. The Chiniak Peninsula and drainages into Ugak Bay presently have the best deer populations along the Kodiak road system.

Habitat has undergone considerable deterioration since population highs in the 1950's. The conservative hunting seasons and bag limits during the initial years of hunting produced harvests which, hindsight suggests, were insufficient to prevent overutilization of deer winter ranges. Heavy use of winter ranges by cattle further depleted deer browse, including major deer forage species such as willow and elderberry. Gradual increases in human settlement have occurred along the road system. Increased use of snowmachines for recreation and small game hunting introduced an additional disturbance factor into deer wintering areas. Deterioration of the habitat is indicated by the fact that mortality from malnutrition has occurred even in relatively mild winters. As is true on all Alaskan deer ranges, when excessive snow depths make forage unavailable, deer mortality can be high. Predation and stress induced by pursuit by dogs is another significant mortality factor which occurs near the city of Kodiak and other human settlements.

The first hunt, held in 1953, produced a harvest of 38 bucks during the four-day August season. The harvest was distributed from Kizhuyak Bay to the Chiniak Peninsula, most of which is accessible by road. Harvests have declined with reductions in the deer population. The 1975 estimated harvest was 86 deer (8 percent of the total Game Management Unit 8 harvest), as compared to the 1960 kill of 390 deer. Despite the implementation of progressively more restrictive seasons, the deer population remains below former levels.

A 1973 survey indicated that approximately half the Kodiak resident deer hunters pursue deer in this management area one or more days during the August through October season. Most do not hunt until October when frosts somewhat reduce the density of vegetation. Either-sex hunting is now allowed only during October. The legal annual harvest is estimated at 75-125 animals, although the bag limit of one animal is difficult to enforce with adjacent areas open to the taking of four deer. Since most of the area is accessible by road, it is popular for brief, spur-of-the-moment hunts by Kodiak city residents. Although most hunters use automobiles for transportation, small boats and aircraft are also utilized to reach less accessible areas. Sufficient snow seldom occurs in October to

allow the use of snowmachines, although they were used to some extent when seasons extended into December.

Despite relatively easy access, hunting pressure on deer is generally not excessive under present seasons. In the most accessible drainages with heavy human settlement and attendant habitat deterioration the cumulative pressure of legal and illegal hunting has the potential to limit deer production. In the less accessible drainages deer are being harvested at a level below the annual increment.

SOUTHERN KODIAK ISLAND DEER

LOCATION

In Game Management Unit 8, that portion of Kodiak Island west and south of the Anton Larsen Bay drainage, including Whale, Uganik and Amook Islands, and that part of Kodiak Island west and south of the Saltery Creek drainage including Sitkalidak Island.

THE SPECIES

Deer have made a general southwestward movement across Kodiak Island since their introduction, in 1934. The largest populations are found in the most recently colonized areas from Larsen Bay to Spiridon Bay. Deer are found in extremely low densities south and west of Larsen Bay, and populations become progressively lower as one moves northeast from Spiridon Bay. In the eastern part of Kodiak Island deer numbers are highest in the southern Ugak Bay and northern Kiliuda Bay region. In 1976 deer populations appeared to be increasing as far south as Deadman Bay, but at a much slower rate than occurred on the west side of Kodiak Island.

Periodically, severe winters cause heavy mortality and subsequent population declines. Deer in the area from Uganik Bay northeast to Anton Larsen Bay appear to be most susceptible to winter mortality. This area has supported higher deer populations in the past and winter range quality has declined. Although the extent of range deterioration has not been quantified, field observations confirm heavy utilization of willows, elderberry, and other browse species. Highbush cranberry seems to be a good indicator, as it is a preferred browse species of relatively low abundance. This species is severely hedged and appears at reduced frequency on the older ranges in the northern part of the area. In the area from Spiridon Bay southward, which has been exploited heavily by deer for less than ten years, highbush cranberry is generally vigorous and only lightly used. This area undoubtedly has a much higher winter carrying capacity than areas with a longer history of use. Generally, snow depth and the length of time snow persists decrease as one moves southwestward along Kodiak Island. Possibly, high deer densities will be prolonged by this apparent weather phenomenon. Overutilization of the range is inevitable with current harvest levels and an unusually severe winter will impact the population strongly.

Encompassing most of Kodiak Island's best deer habitat, this area sustains well over half the Game Management Unit 8 harvest. Even so, most of the area is only lightly harvested. Estimated annual harvests in the mid-1970's have been 1000-1500 deer. Most of the harvest occurs from Spiridon Bay northward with less than five percent of the harvest occurring in the area west of Zachar and Deadman Bays. Illegal harvest by residents of remote areas and commercial fishermen occurs yearlong. Conservatively this harvest is estimated at 10 percent of the legal harvest figure, but it is not a limiting factor. Males comprise at least 60 percent of the reported harvest. Hunter success usually exceeds 50 percent. About 90 percent of the harvest occurs during October, November and December. Comparatively speaking, the most accessible part of the area between

Outlet Cape and Anton Larsen Bay receives a moderate harvest. Whale Island is one accessible and popular hunting area which most closely approaches harvest at maximum sustained yield levels.

Residents of Kodiak and the villages of Port Lions and Larsen Bay take most of the harvest. Nonresidents and residents from other parts of Alaska probably take less than ten percent of total harvest. Crowded hunting conditions seldom occur and the area could accommodate a considerable increase in hunting pressure. Lack of accessibility significantly limits hunting over much of the unit. The expense of chartering aircraft or boats to the best hunting areas is too great for some hunters. Frequent fall storms cancel many well-planned hunting trips. Storms lasting up to a week are not unusual. Lack of adequate shelter in remote areas discourages many of the less hardy hunters.

Small skiffs provide good access to the area between Outlet Cape and Sharatin Bay. Larger commercial fishing boats are used to reach more remote areas south of Uganik Bay and in Kiliuda Bay. More than half the harvest is taken by hunters using boats for transportation. Approximately one fourth of the harvest is taken by hunters utilizing private and chartered aircraft.

AFOGNAK ISLAND DEER

LOCATION

In Game Management Unit 8, that portion of Afognak Island west of a straight line from the mouth of Seal Bay Creek to the mouth of Saposa Creek, and including Raspberry, Shuyak, Marmot and adjacent islands except Whale Island.

THE SPECIES

Observations of deer on Afognak and Raspberry Islands became frequent in the early 1950's. Since there are no records of actual transplants to the islands it is assumed that deer became established by swimming from Whale Island and the Kupreanof Peninsula. By the mid-1960's deer were well established on Afognak and Raspberry Islands. Little Raspberry, Marmot and Ban Islands are all now inhabited by deer and deer populations on Afognak and Shuyak Islands appear to be increasing.

Sitka spruce forest is the dominant vegetative type in the Afognak Island group. The central part of Afognak is heavily forested and spruce is gradually invading along the westernmost Shelikof Strait side. Deer here exhibit seasonal migrations typical of other Alaskan deer ranges, moving onto alpine-subalpine ranges in the summer and dropping to lower elevations according to snow conditions. Preferred winter habitats as indicated by relative population densities are areas with patchy spruce groves interspersed with open areas of grass-brushlands, such as occur on southeastern Raspberry Island. Southern exposures near the coastline and windblown capes where vegetation is exposed receive heavy deer use during the winter. Deep snows force deer to the beachline as occurs in Southeastern Alaska. Afognak Island generally has heavier snowfall than further south on Kodiak Island and Afognak's breakup is frequently somewhat later. During many winters heavy rains prevent deep snow accumulations. When heavy snows do occur, sub-canopy snow accumulations in mature timber are much less than in openings. Deer become heavily dependent on timber near sea level to provide cover and food.

Winter deer mortality has been observed in the Afognak Island group during periods of deep snow, but the extent to which populations have fluctuated in the past is unknown. Generally the population seems to be increasing despite periodic winter losses. Relatively high populations of Roosevelt elk occupied many of the deer winter ranges during the 1960's. A heavy die-off occurred in 1970 and 1971 and elk numbers have not recovered to former levels. The reduction in elk numbers may have allowed increased deer populations in areas where elk wintered. Although deer and elk use many of the same plant species on winter ranges, the extent of competition is unknown.

Hunting pressure is increasing on Afognak and Raspberry Islands as these areas gain the reputation for producing deer. Most of the harvest comes from Raspberry Island and the southern part of Afognak Island which are relatively accessible to Kodiak hunters. By 1971 these islands yielded 10 percent of the Game Management Unit 8 harvest. In 1975 a record harvest of 256 deer from Afognak was reported (24 percent of the total Unit 8 kill). Some deer are taken incidental to elk and bear hunting. The relatively difficult hunting conditions in heavy spruce forest discourage many hunters.

Skiffs and commercial fishing boats are the chief transportation means utilized by local residents. Private and charter aircraft are used to a lesser extent. Access to the interior of the island is limited primarily to a few lakes where floatplanes may land. A road recently constructed connecting Discoverer and Kazakof Bays will improve access to a limited extent although it does not transect particularly high density deer range. Hunting pressure will undoubtedly increase as logging roads provide additional access, but it is unlikely that hunting will reach a level sufficient to crop the annual increment in the forseeable future.

TONKI DEER

LOCATION

In Game Management Unit 8, that portion of Afognak Island east of a straight line from the mouth of Seal Bay Creek to the mouth of Saposa Creek.

THE SPECIES

As in other sections of Afognak Island, deer in the Tonki area were well established by the mid-196D's. Deer populations appear to be relatively high on the Tonki Peninsula compared to other parts of Afognak. Better conditions for winter survival may exist here, resulting in higher deer populations than in the more heavily forested areas. Compared to central and western Afognak, snow accumulations are generally lighter and high winds expose vegetation on capes and steep slopes. Eastern Afognak Island is characterized by steep hillsides covered with grass-brushlands interspersed with spruce forest. Abrupt rock cliffs and wind blown capes typify the coastline.

Winter deer mortality has been recorded during past years when heavy snows occurred, and populations undoubtedly fluctuate to some extent as in other areas. Overuse of winter range can be expected to occur resulting in an eventual population decline. The Tonki area presently supports a minimum of 200 Roosevelt elk occupying some of the same winter ranges as deer. Some competition for forage may occur, but the extent of overlapping food requirements is unknown. Winter ranges in Seal Bay and Izhut Bay are scheduled for logging within ten years. Experience in other areas of Alaska indicates that clearcutting may be detrimental if sufficient mature timber is not maintained for winter cover and forage.

Tonki has a local reputation for producing large trophy bucks. During August and September, deer can be readily observed in alpine areas and selection for trophy bucks is possible. The isolated, inaccessible nature of the area makes it popular among hunters who enjoy backpack hunting. Elk are also available early in the season and many hunters seek both species. Excellent scenery and low density of hunters makes it appealing to the hunter who prefers a wilderness experience. The single public recreational cabin at Pillar Lake is usually fully booked several months prior to the hunting season.

Annual deer harvests from the Tonki area are low, probably less than 100 animals. Hunters using commercial fishing boats take much of the November and December harvest. A few small lakes and ridgetops provide marginal landing areas for small planes. Fatal aircraft accidents involving hunters occur occasionally and at least one aircraft accident is recorded there every hunting season. Protected anchorages are found in Seal Bay and Izhut Bay, but the remainder of the coastline is exposed to storm winds. Few beaches are suitable for skiff landings and small boat hunters seldom venture beyond the Izhut Bay drainages. Amphibious and float-equipped aircraft can operate in a few protected areas in Seal Bay and Izhut Bay. Most hunters who use small boats and aircraft for transportation do their hunting prior to mid-November, while daylight hours are longer and weather is warmer. The Tonki area has a local reputation for unusually severe weather.

Extensive rolling alpine areas provide relatively easy hiking routes. During July, August and September, both deer and elk can commonly be observed in these areas. The Tonki area provides ample opportunity for deer and elk photography during this season for those willing to undertake a backpack trip.

ELK IN SOUTHWESTERN ALASKA

In Alaska, elk (*Cervus canadensis roosevelti*) occur only in the northern Kodiak Archipelago on Afognak Island and nearby Raspberry Island. Established on Afognak Island in 1929 by a transplant of eight calves from Washington state, the elk population grew rapidly to an estimated 212 animals in 1948 and to a peak of 1,200-1,500 elk by 1965. A decline associated with over-utilization of winter range began in the late 1960's. Unusually heavy accumulations of snow and cold temperatures during the winters of 1970 and 1971 caused massive die-offs and by 1972 only about 450 animals remained. The elk population appears to be gradually increasing and in 1975 was estimated at about 500 animals. Even during recent relatively mild winters, however, losses to malnutrition have occurred and it is unlikely that the population levels of the mid-1960's will be attained again without significant improvements in habitat quality.

Elk attained their highest population levels in the grass-shrubland areas of southwestern Afognak Island and Raspberry Island. Willow stands along streams and bogs and dense stands of elderberry initially provided abundant winter forage but were depleted when elk populations became excessive prior to the mid-1960's crash. Currently the highest populations of elk winter in the densely forested central and easternmost parts of Afognak Island. The understory vegetation found in mature spruce forest is an important source of winter forage for elk which supplements the depleted grass-shrubland ranges. Mature forest provides cover for elk and reduced snow depths under the forest canopy facilitate access to forage. The spruce fringes near sea level appear to be especially critical habitat for elk during severe winters.

Mortality caused by winter severity has been and will continue to be the major population regulatory mechanism affecting Afognak's elk population, until such time as hunting becomes effective in controlling elk numbers. A different situation exists on Raspberry Island where heavy harvests of the accessible herd necessitated a closure to hunting in 1968. Poaching is suspected to be a primary factor controlling the growth of the Raspberry Island herd since that time.

Elk meat was rumored to have been on local tables for several years prior to the first legal hunt in 1950. During 25 years of hunting over 1,500 elk of both sexes have been harvested. When the population was at its highest, hunting was relatively successful. Harvests during the 1971-1975 period, however, have averaged less than 25 elk annually and hunter success has been less than 15 percent. The best elk populations now occur in interior and eastern Afognak Island where dense timber and difficult access result in relatively poor hunter success. A few elk are taken incidental to deer and bear hunting. Usually more than half the harvest is usually taken during September and October when floatplane or small boat access is best. After mid-November hunters utilize commercial fishing boats to hunt coastal areas with limited success.

An increased harvest of elk could easily be sustained as the average harvest is less than 10 percent of the population. Harvests may increase on herds accessible to roads constructed during logging operations. Other less accessible herds will continue to go largely unharvested.

AFOGNAK ELK

LOCATION

That portion of Game Management Unit 8 on Afognak Island which includes all drainages into Shelikof Strait south of Tanaak Cape; all drainages into Raspberry Strait, Afognak Bay, Marka Bay, Kazakof Bay, Duck Bay and drainages into Izhut Bay west of the head of Saposa Bay; all drainages into Perenosa Bay west of the mouth of Seal Bay Creek and east of the head of Big Waterfall Bay and including Raspberry and Little Raspberry Islands.

THE SPECIES

The Afognak management area includes all or parts of the ranges of six elk subpopulations. The Raspberry Island, Raspberry Straits, Duck Mountain and Kitoi Lake herds range exclusively within this management area. Herds which occur seasonally are the Paramanof Mountain and Paramanof Peninsula subpopulations. Recent aerial surveys indicate that the population of the area does not exceed 300 elk.

After the 1928 transplant, elk steadily expanded throughout southwestern Afognak Island and nearby Raspberry Island. In 1961, the elk population was estimated at 1100 animals, two-thirds of which occupied the Afognak area. Approximately 500 elk wintered in the Afognak-Lake-Raspberry Straits drainages. Range surveys conducted in the early 1960's indicated serious overuse of winter ranges. By 1969 a major decline in the Malina herd was apparent. Deteriorating winter range and overharvest contributed to the decline. The hunting season was closed in most of the Malina and Raspberry Straits areas in 1969 when excessive harvest in both these herds became apparent. More than half the Raspberry Straits elk population was lost to malnutrition during the 1970 and 1971 winters. Only 45 elk were located there during a 1972 survey. The Malina herd which numbered over 200 animals in the mid-1960's has failed to reoccupy its former range and may no longer exist. Gradual recovery has occurred in the Raspberry Straits herd and limited hunting will soon be allowed.

Elk on Raspberry Island reached a 1965 peak of at least 230 animals. A two-elk bag limit was in effect from 1964 through 1966 and during this period nearly half the total elk harvest came from Raspberry Island. The population at its peak was undoubtedly excessive for the available winter range and increased harvest was needed. The population declined precipitously and by 1967 less than 50 elk could be located. Sport harvest totaling 146 animals during the 1964-66 period was a major factor in the population decline. Unreported illegal harvest, emigration, and a natural reduction associated with increased winter mortality were possible additional factors in the decline. Despite a complete closure on hunting since 1968 and good calf crops the herd has failed to increase significantly. Winter mortality may be a factor but illegal hunting is suspected to be primarily responsible for the herd's failure to increase. The Kitoi Lakes and Duck Mountain herds are difficult to census as they

inhabit densely timbered areas. Their total population probably does not exceed 125 animals.

Elk winter range has deteriorated seriously in the southwestern part of the management area. Range studies conducted in the early 1960's indicated severe overbrowsing on willow and elderberry, two of the major winter forage species. The heavy die-off of elk in this area during the 1970 and 1971 winters was a further indicator of poor range conditions. Limited recovery of winter range may be occurring at current low elk population levels. The fact that winter mortality has occurred during recent less severe winters indicates range conditions are less than optimal.

Logging is the only imminent land use with potential impact on elk habitat. A limited logging operation has been conducted on the north side of Raspberry Straits for several years. A logging road was constructed in 1975 linking Kazakof and Discoverer Bays and clearcut logging was begun in late 1975. Cutting units are located throughout coastal elk winter range along Discoverer, Kazakof and Seal Bays. Consideration has been given to spacing and design of the cutting units to minimize impacts on critical elk winter ranges. Some improvement in forage conditions may be provided as grass and shrubs invade the clearcuts. Proportionately heavier snow accumulations in clearcuts than in adjacent timber will limit elk to foraging along the clearcut boundaries during severe winters. Previous studies indicate that elk are highly dependent on spruce timber for cover and during heavy snow accumulations forage extensively on the understory vegetation.

The first elk hunting season occurred in the Afognak area in 1950. Approximately 80 percent of the elk harvest during the 19581966 period were taken from the Raspberry Island, Raspberry Straits and Malina herds. The southwestern part of the area contains large open expanses of grass-brushland vegetation interspersed with spruce, and elk are much easier to locate there than in more heavily forested parts of the island. Access is relatively good. Small boats are popular for transport to the Raspberry Straits area and float-equipped aircraft can land in several lakes and protected bays. A good trail connects Malina Lakes, Afognak Lake and Muskomee Bay. Good access and relatively easy hunting conditions precipitated excessive harvest which eventually contributed to a population decline. Beginning in 1968 with the closure of Raspberry Island to hunting, the southwestern portion of the area, including the ranges of the Malina and Raspberry Straits herds, was closed to hunting by 1973. During 1974 and 1975 approximately half the harvest for Afognak Island was taken from the more densely forested central part of the island in the Kazakof and Discoverer Bay drainages. Elk did not become established in significant numbers there until the early 1960's and were largely unhunted until the more popular hunting areas were closed. This management area has been hunted primarily by local residents because of its proximity to Kodiak and the villages of Port Lions and Ouzinkie.

PARAMANOF ELK

LOCATION

In Game Management Unit 8, that portion of Afognak Island which includes the area draining into Shelikof Strait north of Tanaak Cape, and the area north and west of the outlet stream of Little Waterfall Lake.

THE SPECIES

Since the initial introduction of elk to Afognek Island, they have expanded very slowly into the interior and northwestern portions of the island. In the early 1960's scattered small bands were observed in the area. The population reached a peak in the late 1960's. Heavy winter mortality in 1970 and 1971 reduced the population significantly. Malnutrition during winters, when heavy snow accumulations limit movements and forage availability, is the major mortality factor. The Waterfall Lake herd winters along the coast of Perenosa Bay. The Paramanof Peninsula herd occupies the area north of Malina Bay and the Paramanof Mountain herd inhabits the drainages into the head of Paramanof Bay. The current population in the area is estimated at 200 elk. Recent aerial surveys indicate a slight upward population trend.

Sitka spruce is invading the western coast area, but open expanses of grass-brushland predominate over extensive areas. Browse plants have been heavily utilized in some traditional winter ranges along Paramanof Bay. Winter ranges are generally in better condition in this area than in areas with a longer history of occupation by elk. Recurring winter mortality in recent winters indicates that sufficient browse is not available during severe winters.

Stands of commercially valuable timber occur in the Shuyak Straits, Bluefox Bay and Perenosa Bay areas. Several clearcuts are planned for the Perenosa Bay drainage in traditional elk wintering areas. Consideration has been given to spacing and design of the cutting units to minimize impacts on these winter ranges. Previous studies indicate that elk are highly dependent on spruce timber for cover and that during heavy snow accumulation they forage extensively on understory vegetation. Some improvement in available forage may occur as grass and shrubs invade the clearcuts. Proportionately heavier snow accumulations in clearcuts than in adjacent timber will limit elk to foraging along the clearcut boundaries during severe winters.

Significant hunting pressure did not occur in the Paramanof area prior to the late 1960's. Presently, hunting pressure is relatively light and the area contributes less than 20 percent of the annual total elk harvest. Floatplane access is available to several lakes and bays although freeze-up may limit fresh water access after early November. Commercial fishing boats and skiffs are used by local hunters for hunting, although severe weather limits their use in the latter part of the season. Lack of suitable anchorages and floatplane landing areas limits access to much of the management area.

Largely uninhabited, the northwestern part of Afognak Island provides some of the most scenic vistas in the Kodiak Archipelago. Afognak's highest peaks occur here and the rugged, icy profile of the Alaska Range appears westward across Shelikof Straits. The U.S. Forest Service has recognized these special scenic qualities by recommending a 55,000-acre tract in the Red Peak-Ban Island area for a Scenic Area. Another 5,300 acres have been designated the Paramanof Research Natural Area.

TONKI ELK

LOCATION

In Game Management Unit 8, that portion of Afognak Island east of a straight line from the mouth of Seal Bay Creek to the mouth of Saposa Creek.

THE SPECIES

Elk were well established in the Tonki area by the 1950's. As elsewhere on Afognak, the population declined during the severe winters of 1971 and 1972. Aerial surveys indicated, however, that the Tonki herd was less seriously affected than elk herds elsewhere on the Island. Approximately one-third of the Afognak Island population now occupies the Tonki area during part of the year.

During summer and early fall elk occupy the extensive alpine and subalpine areas east of Izhut and Seal Bays. Two types of winter range are used by these elk. Mature Sitka spruce habitat in Seal Bay and Izhut Bay drainages are utilized extensively from November through May. Other groups of elk inhabit the capes along Tonki Bay and Marmot Straits where spruce forest is interupted by open grass meadows and heath vegetation. The cape winter ranges are relatively small and after more than two decades of heavy winter use are deteriorating. Apparent malnutrition-induced mortalities have been recorded during recent winters on these ranges. Elk inhabiting the forested portion of this management area are less restricted in movements and winter range quality does not appear to have declined seriously. During winters with deep snow accumulations, however, a narrow belt of coastal forest becomes critical to survival. Local overuse of winter range can be expected to occur under these conditions.

The Seal Bay and Izhut Bay drainages are scheduled for logging within the next ten years. Several clearcuts are to be made in coastal elk winter ranges. A road will be constructed linking Seal Bay and Izhut Bay, as well as numerous roads connecting the clearcut units. Consideration has been given to spacing and design of the clearcut units to minimize impact on critical winter ranges. Additional forage will be provided as grasses and shrubs invade the cut-over areas. This forage will be relatively unavailable when heavy snow accumulations occur except along the fringes of clearcuts.

During the 1973-75 period the Tonki area elk harvest ranged from seven to twelve animals annually. Most of the hunting effort occurs during August, September and October when weather is relatively mild. After October, freeze-up limits access to fresh water lakes and small boat operators are less willing to risk the chance of severe fall storms. Larger commercial fishing vessels are utilized throughout the season and provide the only reliable access to many of the less protected bays in the northeastern part of the area. The limited availability of protected anchorages or suitable landing areas continues to restrict hunting pressure to a relatively low level despite liberal either-sex seasons.

Presently, more than half the elk hunters are Kodiak residents. Residents of mainland Alaska and occasional nonresident hunters make up the balance. Many hunters pursue elk rather casually, as they count on taking the relatively more abundant blacktailed deer to make their trips successful from a meat-gathering standpoint.

Many hunters pursue elk with the hope of taking a large trophy bull. Although antlered bulls make up less than ten percent of the population, about half the reported annual harvest are males, most of which are antlered animals. There is no indication that productivity is limited either by the current harvest level or selectivity for bulls.

MOUNTAIN GOATS IN SOUTHEASTERN ALASKA

Mountain goat (*Oreamnos americanus*) populations in Southeastern Alaska are distributed along the coastal mountains from Dixon Entrance to Icy Bay and on Baranof Island where they were successfully introduced in 1923.

Population surveys conducted since 1959 indicated relatively stable populations until the early 1970's when severe winters caused area-wide declines. Overhunting, particularly on ranges abutting urban areas and access corridors, also probably contributed to some declines in goat numbers.

From early spring until fall mountain goats primarily utilize alpine and subalpine areas which are often extremely rugged and precipitous. Characterized by heavy snow accumulations in winter and short cool summers, these areas support grasses, sedges and forbs which comprise the bulk of the goat's diet. With the onset of winter snows goats move to rocky windblown ridges and ledges where forage remains available. As winter progresses, heavy snows tend to force goats to lower timbered elevations where forage such as shrubs, ferns and conifers are utilized. Mature coniferous forest reduces ground snowcover and is important to goats during winter. Goats also travel considerable distances through heavily forested areas since they are frequently observed on beaches.

Limited data suggest that mortality from winter weather conditions is the primary limiting factor on goat populations. In addition to limiting forage availability, precipitous terrain and excessive snow accumulations contribute to mortality through avalanches and accidental falls. Predation, particularly by wolves, may also be a major limiting factor on some goat populations, especially in combination with severe weather. Predation also retards population recovery.

Historical use of mountain goats by man included domestic utilization by coastal natives for meat, cosmetics and ornamental purposes, and by early-settlement whites for domestic use and for the market. Mountain goats are now hunted primarily for recreational values and meat. The species is increasing in popularity as a big game animal in Alaska, partly due to decreasing opportunities to hunt other species of big game throughout the state.

Differences in hunter accessibility to various goat ranges have resulted in two different patterns of use in Southeastern Alaska. Goat ranges near urban centers, alpine and subalpine lakes, and close to salt water receive considerable hunting pressure because of the ease of access. Since 1972, approximately 40 percent of the statewide harvest has occurred in the Southeastern Region, 87 percent of which has come from the inland coastal area between Haines and Ketchikan. Some goat populations have declined under heavy hunting pressure. Necessary reductions in season lengths and bag limits have accompanied increased utilization near urban centers. In contrast, relatively inaccessible goat populations have experienced only slight increases in hunting pressure. Seasons and bag limits remain liberal, however some reductions in season lengths may be necessary in the future.

Aesthetic values of mountain goats have in recent years received increased recognition. Opportunities for viewing and photographing goats are available at two established mountain goat observation areas: the Bullard Mountain goat observation area near Juneau and Adams Inlet in Glacier Bay. In addition, nonconsumptive use occurs throughout the goat's range in Southeastern Alaska.

SOUTHEAST MAINLAND GOAT

LOCATION

Game Management Units 1 and 5, the southeast Alaska mainland coast except that area included in the Glacier Bay National Monument, Bullard Mountain, and Skagway Goat Management Plan areas.

THE SPECIES

Mountain goat populations on the southeastern Alaska mainland are found along the entire coast from Dixon Entrance to Icy Bay. Historical population trends and estimated goat numbers indicate that the population was relatively low and stable during the 1940's until at least the early 1950's, increased during the 1950's and 1960's until reaching a high during the mid-1960's, decreased dramatically in the early 1970's to roughly 1/3 the size of the peak population, and has remained relatively constant the past two years. Populations throughout the mainland are still sufficiently large to provide reasonable hunter success and adequate recreational opportunities.

The primary cause of the recent population decline was probably the severe winters in the early 1970's followed by excessive wolf predation in some areas. Hunting pressure in areas of good access may have affected local reductions. Clearcut logging is continuing to remove timber from steep slopes, some of which goats have utilized as winter range for many years. The possible impact of forest management on key goat habitat is presently under study in southeast Alaska.

Harvests of goats have been greatest in goat habitats abutting urban centers such as Juneau, Haines, Skagway, Petersburg, Wrangell, Sitka and Ketchikan. Highway corridors, improved trails and small boats have provided relatively easy access to goat populations for many local hunters. In addition, hunters using float planes have increased harvests on goat populations in remote areas surrounding alpine and subalpine lakes. Since 1972, approximately 35 percent of the statewide harvest has occurred in the coastal area between Haines and Ketchikan. With the decline in goat populations that have occurred in the 1970's reductions in season lengths and bag limits have been imposed on goat populations near urban centers. Relatively inaccessible goat populations have experienced only slight increases in hunting pressure, and seasons and bag limits in such areas remain liberal; however, some reductions in the future may be necessary.

SKAGWAY GOAT

LOCATION

In Game Management Unit 1D, the mainland area north of Skagway lying east of Taiya Inlet and River between the Chilkoot Trail and the White Pass and Yukon Railroad.

THE SPECIES

The modest numbers of goats inhabiting the Skagway Mountains are in harmony with the available habitat of that area. Annual snowfall is extremely variable in this area with periods of high snow accumulations apparently coinciding with, or perhaps even causing a decline in goat populations. In addition to contributing to a shortage of winter food excessive snow accumulation further contributes to mortality through avalanches and accidental falls. Predation by wolves, coyotes and wolverines may also be a major factor affecting this goat population.

Some trophy-sized mountain goats are present in this population. After completion of the Skagway-Carcross Highway hunters or viewers will have an above average chance to take or view a large goat because of improved access.

This area has been closed to the taking of goats since 1975 in order to eliminate the possibility of excessive goat harvest during and after construction of the Skagway-Carcross Highway. Prior to 1975 mountain goat harvest levels were moderate (four to seven goats annually) according to hunter harvest report data. The majority of the goats harvested were taken by Skagway residents.

In addition to the new Skagway-Carcross Highway, the White Pass-Yukon Railroad and the historic Chilkoot and White Pass gold rush trails offer access into this area.

BULLARD MOUNTAIN GOAT

LOCATION

In Game Management Unit 1C, Bullard Mountain, near Juneau.

THE SPECIES

The limited Bullard Mountain goat habitat supports about a dozen animals. The major factor limiting population size appears to be winter weather. Snow accumulations probably reduce available winter food to a minimum. Wolf and coyote numbers are low and wolverine numbers are moderate in this area. It is doubtful if these predators, at current densities, exert significant pressure on this goat population.

The sole use of these goats is by viewers from the U. S. Forest Service Observatory site located immediately below the Mendenhall Glacier and Bullard Mountain. The observatory is open year around and viewers have free use of spotting scopes. Photographing goats is a minor activity in this area because of difficult foot access and U. S. Forest Service restrictions against trespass on the mountain to prevent persons from frightening the animals off their limited range.

BARANOF ISLAND GOAT

LOCATION

In Game Management Unit 4, Baranof Island.

THE SPECIES

Mountain goats were introduced to Baranof Island in 1923, using animals captured in Tracy Arm, southeast of Juneau. The Baranof transplant flourished, and by 1949 goats were sufficiently abundant to allow sport hunting. Goats now occupy most of the suitable habitat on Baranof Island though range extension to the south may still be in progress.

Aerial surveys of Baranof goats have been conducted sporadically since 1954. The number of goats observed has ranged from 116 in 1960 to 263 in 1954. In 1973, 253 goats were counted. Inclement weather frequently precludes comprehensive surveys. Based on the number of goats observed, the Baranof goat population is estimated to number about 300 animals. The herd has two centers of abundance which are separated by the ice field at the head of the Vodopad River.

Local observers and survey data indicate the population peaked several years ago and that it has since declined and stabilized. Reproductive rates, both actual and potential, are unknown. The limited survey data for Baranof Island have shown fall kid:adult ratios to average about 20 kids per 100 adults. These have varied from a low of 11:100 in 1970 to a high of 29:100 in 1960. Difficult flying conditions and the inability of some observers to differentiate kids from adults make these data suspect. A reproductive rate that results in 15-20 percent kids by fall is probably adequate to replace annual losses.

The influence of humans on Baranof mountain goat habitat has been substantial. Timber harvests have essentially removed all timber between the beaches and the heads of the canyons in some valleys. As a result, goat winter range on Baranof Island has been significantly reduced. The areas affected include the drainages into Katlian, Nakwasina, Fish and Rodman bays. Most logging activity occurred at about the same time as the reported peak in goat numbers. Few stands of marketable timber remain in goat winter ranges on Baranof.

Sport hunting has been the only significant use of the Baranof Island goat resource since its introduction. The annual sport kill has averaged between 10 and 30 animals since hunting first became legal in 1949. Most of the kill is by Sitka residents in the area north of the Vodopad River. The harvest approximates 3 to 10 percent of the esimated population. There was a marked increase in hunting pressure in 1975 with a corresponding increase in the kill.

Access to alpine goat ranges during the early portion of the hunting season is difficult. Hunting may be almost precluded for an entire season because of inclement weather. Goats normally occupy alpine areas up to 4,000 feet elevation. There are no alpine landing areas and only

a few alpine lakes suited to floatplane landing. Most goat hunts therefore originate at salt water by boat. Hunters must climb to perhaps 4,000 feet; as much as 2,000 feet of the climb may be through spruce forests and alder slides. Hunters may also traverse three to five or more horizontal miles. Many ridges occupied by goats are extremely steep and rugged.

Because of the difficulty of hunting goats on Baranof Island sport hunting is probably a minimal factor in regulating or controlling goat numbers, except possibly on the northern part of the island.

For those willing to expend the time and energies to pursue goats, a high-quality wilderness experience hunt is possible; indeed, is the rule. The exploitation rate of less than 10 percent, taken over a five-month season, has apparently exerted little overall control on the population while allowing almost unlimited hunting opportunity.

MOUNTAIN GOATS IN SOUTHCENTRAL ALASKA

Mountain goat (*Oreamnos americanus*) populations in Southcentral Alaska are distributed along the coastal mountains from Icy Bay to Cook Inlet and inland to the Wrangell and Talkeetna Mountains. Goats are most numerous along the coastal mountains where the climate is less severe and their range is not shared with sheep.

Population surveys conducted since 1959 indicate relatively stable populations until the early 1970's when severe winters caused area-wide declines. Overhunting, particularly on portions of the Kenai Peninsula, also contributed to declines in some goat populations.

From early spring until fall mountain goats primarily utilize alpine and subalpine areas which are often extremely rugged and precipitous. Characterized by heavy snow accumulations in winter and short cool summers, these areas support grasses, sedges and forbs which comprise the bulk of the goats' diet. With the onset of winter snows goats move to rocky windblown ridges and ledges where forage is available. Movements to winter ranges may cover distances of up to 10 miles or more. Heavy snows may force goats to lower timbered elevations where forage such as brush, ferns and conifers is utilized. The importance of mature coniferous forest to goats is not yet understood, but use of this habitat is well documented. Also, sightings of goats on saltwater beaches indicates movements of considerable distance through the forest zone.

Limited data suggest that mortality from winter weather conditions is the primary limiting factor on goat populations. In addition to limiting forage availability, precipitous terrain and excessive snow accumulations contribute to mortality through avalanches and accidental falls. Predation, particularly by wolves, may also be a major limiting factor on some goat populations.

Historical use of mountain goats by man included domestic utilization by coastal natives for meat, cosmetics and ornamental purposes, and by early-settlement whites for domestic use and for the market. Mountain goats are now hunted primarily for recreational values and meat. The species is increasing in popularity as a big game animal in Southcentral Alaska, partly due to decreasing opportunities to hunt other species of big game.

Differences in hunter accessibility for various goat ranges have resulted in two different pictures of use in Southcentral Alaska. In the Chugach Mountains near Anchorage and on the Kenai Peninsula, roads and lakes have provided relatively easy access to goat populations for many local hunters. In addition, since goat ranges often overlap Dall sheep ranges in these mountains, concurrent sheep hunting seasons have served to increase hunting pressure on goats. Goats are often taken by unsuccessful sheep hunters. Since 1972, approximately 60 percent of the statewide harvest has occurred in the Southcentral region, 55 percent of which has come from the Kenai Peninsula. Some goat populations have declined

under heavy hunting pressure. Necessary reductions in season lengths and bag limits have accompanied increased utilization near metropolitan centers.

In contrast, the relatively inaccessible goat populations of Prince William Sound have experienced only slight increases in hunting pressure. Seasons and bag limits remain liberal; however, some reductions in season lengths may be necessary in the future.

Aesthetic values of mountain goats have in recent years received increased recognition. Opportunities for viewing and photographing goats are available at three recently established mountain goat observation areas: the Goat Mountain and the Heney Range goat observation areas near Cordova and the Exit Glacier area near Seward. In addition, nonconsumptive use occurs throughout the goat's range in Southcentral Alaska.

PRINCE WILLIAM SOUND GOAT

LOCATION

That portion of Game Management Unit 6 west of the Copper River.

THE SPECIES

Mountain goat abundance in the Prince William Sound area is variable. Goats are not found on any of the Prince William Sound islands with the possible exception of Bainbridge Island. They occur in small scattered groups along the north and western mainland. From Valdez Arm to the Copper River they are abundant. Past records of goat abundance in the area are sketchy but indicate that the northern portion of the Sound may have had much larger goat populations than exist today. Goat habitat in the area has not been altered by man to any significant degree. The quality of the range is apparently good along the eastern side of the Sound, judging by the number of goats present. Goats there have long been reported as abundant.

Natural mortality results primarily from severe winters. Winter snows, which limit access to the available food supply, are probably the major regulating factor on goat distribution and abundance. Wolverines, coyotes, and brown and black bears are potential predators but their effect is thought to be minor. Disease or parasites are not known to be a problem.

Until recent years, mountain goats were not hunted to a significant extent for either meat or sport. Harvest data was poor until the inception of a harvest report program in 1972. According to 1973 and 1974 harvest data, 150-200 hunters have taken 65-90 goats per year from this area annually. Hunting during the first half of the season accounts for more than 70 percent of the harvest. Only about 7 percent of the hunters took 2 goats when a two-goat bag limit was in effect. Alaskan residents normally take about 65 percent of the harvest.

From 1968 through 1975 a liberal hunting season (August 1 - January 31) and bag limit (2 goats) was in effect. The 1976 season was reduced by one month and the bag limit was reduced to one goat in anticipation of increasing hunting pressure in the area.

At present, goats are taken primarily for sport with the meat a secondary benefit. Although a few guides operate in the Prince William Sound area, their clients take few goats. Trophy goats are available in the area, especially in the more inaccessible areas. Aircraft and boats are commonly used for transportation by hunters in Prince William Sound.

Although there have been fluctuations in the goat populations within the area adverse effects of hunting have not been demonstrated. Goats are still plentiful along the eastern portion of Prince William Sound where the majority of hunting occurs. Hunting is generally confined to the alpine ridges that are closest to salt water. Goats that remain inland are very inaccessible unless a lake offers floatplane landing access.

WRANGELL-CHUGACH GOAT

LOCATION

Game Management Units 11 and 13D, and that portion of Game Management Unit 12 lying south of the Nabesna River and the Alaska Highway.

THE SPECIES

Mountain goat density in the Wrangell-Chugach area is sparse in comparison to coastal goat densities. Insufficient data are available to estimate population size and no information is available on goat range relationships in this area. Winter snow conditions are probably the most important factor controlling population levels. In some years losses to predation may be substantial. Wolves are the most important predators on goats in the area.

Most goats killed by hunters in the area are taken as alternate or additional game by sheep hunters. During the years 1972-1975, an average of 61 goats were killed each year, the majority of which came from the southern Wrangell Mountains. Hunting pressure in the popular McCarthy area was considered excessive and in 1974 the bag limit was reduced from two goats to one, and the season opening was delayed from August 10 to September 1. These restrictions reduced the harvest in the southern Wrangell Mountains to 17, a 61 percent reduction from the 1972-1974 average.

Access to most of the area is by aircraft. Lakes and unimproved strips or river gravel bars provide landing sites. Opening of the McCarthy Road following construction of the Chitina bridge across the Copper River in 1973 has increased hunting pressure by road-based hunters in the McCarthy area.

MOUNTAIN GOAT

LOCATION

In Game Management Unit 6, that area bounded on the north by Miles Lake and Miles Glacier, on the south and east by Martin River and Martin River Glacier and on the west by the Copper River.

THE SPECIES

Mountain goats are fairly abundant within the Goat Mountain area. Their primary range is along the windblown ridges overlooking the Copper River Highway. During the summer months they may be found throughout the area, and during the winter the southern most ridges are preferred habitat. Population data are not available.

Winter severity is probably the major natural mortality factor. Some predation by wolves has occurred since a resident wolf population became established in the early 197D's, but the effect on the goat population is unknown.

In the past this goat population was utilized by both hunters and viewers. As many as 40 goats were often visible from the highway. Hunting was sporadic since the termination of the Copper River and Northwestern Railroad in 1938. Construction of the Copper River Highway occasionally opened up the area to hunters and viewers using highway vehicles. When access via the Copper River Highway was available hunters had good success along the bluffs overlooking the Copper River. An occasional guide has hunted this area but harvests from the area have been small. Hunting was terminated in 1975 when the area was classified as a Goat Observation Area. To date, the primary use of this goat herd has been by local residents of Cordova.

Construction of the Cooper River Highway to Miles Lake will be completed in several years, making the area readily available to viewers. Eventually the Copper River Highway will connect to the Richardson Highway and a considerable increase in public use of the viewing area can be expected. The proposed Bering River road, if constructed, would parallel the southern mountainous fringe, providing additional viewing opportunities.

HENEY GOAT

LOCATION

In Game Management Unit 6, the entire Heney Range, bounded on the north by the Copper River Highway, on the east by Eyak River and on the west by Orca Inlet.

THE SPECIES

Reports from "old timers" indicate that a fair number of mountain goats once inhabited this small mountain range. Evidently the goat population was killed off after the nearby town of Cordova was established. In recent years, an occasional goat or group of goats have wandered onto the range but are either killed or return to their original range. In 1976 the Heney Range was closed to goat hunting in hopes of establishing a resident population of goats for viewing.

COPPER RIVER-ICY BAY GOAT

LOCATION

In Game Management Unit 6, that area bounded on the west by the Copper River and on the north by the crest of the Chugach Mountains extending to Icy Cape.

THE SPECIES

Mountain goats are abundant throughout the Copper River-Icy Bay area. They are found wherever suitable habitat exists. Past records of goat abundance in the area are scarce but all reports indicate large goat populations which receive light hunting pressure. The habitat, judging by the abundance of goats, is in excellent condition, and it has not been disturbed by man to any significant degree.

Winter severity probably is the major population controlling factor in most areas. Predators have played a relatively minor role, but in recent years the establishment of a resident wolf population may be resulting in mortality in some areas. Other predators include black and brown bears, coyotes, wolverines and eagles.

Goats in this area are primarily sought for their recreational and/or trophy value. Most hunting is done via access by aircraft, and guided hunts are common. The area offers quality hunting conditions because of its wilderness nature coupled with large numbers of goats. Little information is available on goat harvests prior to the inception of a harvest report program in 1972. According to the 1973-1974 harvest data 35-50 goats are taken annually with more than 70 percent of the harvest occurring during the first three months of the season. Hunter success is approximately 65 percent. Weather and inaccessability of the area have restricted hunter effort and resultant harvests. Prior to 1976, hunting seasons (4-6 months) and bag limits (2 goats) were liberal. The 1976 season was reduced by one month (January) and bag limits were set at one goat in anticipation of increased hunting pressure in the area. The current harvest level is not adversely affecting the area's goat population. Goats on the north end of the Ragged Mountains and on the ridge overlooking the logging camp at Icy Bay are receiving considerable hunting pressure but the harvest has not been detrimental.

UPPER COOK INLET GOAT

LOCATION

Game Management Units 14A, 14B, and 13E.

THE SPECIES

Goat populations in the Upper Cook Inlet area are generally low. A sex and age composition survey conducted in June 1974 north of the Matanuska River revealed 28 goats (23 adults, 5 kids). It is doubtful that goats in this area reached high numbers in the past as Upper Cook Inlet appears to be on the very periphery of the range of this species. In these peripheral areas even elimination of use may not result in a large increase in numbers.

Little is known about natural mortality in this area, although goats occasionally are killed by snow or rockslides, or falls, and it is possible that wolves take some goats. No information is available on weather influences, but winters are severe in the area and the lack of winter range may be the major limiting factor.

The mountain goat is sought as a trophy animal; both males and females are taken as they both have similar horn development and most hunters cannot distinguish between sexes. This area is not noted for its trophy goat horns although the potential may exist.

Liberal hunting seasons have changed little since statehood. Currently a fall season of two to three months is in effect. There is usually a good deal of hunting interest (50 hunters in 1972, 47 in 1973 and 36 in 1974), but the extreme ruggedness of the goat range and poor weather conditions limit the harvest. Although little is known regarding goat movements, they have been observed moving long distances over tops of mountain ranges, thus making them unavailable in certain subunits at various times of the year. This movement often coincides with hunting periods. Since 1973, when harvest records first became available, an average of only 3 goats per year have been taken. Goat hunters occasionally report crippling or unrecovered kill losses when the goats fall into inaccessible areas. The number of animals lost in this manner is unknown, but this loss appears to be higher than occurs in other big game hunting.

Nearly all goat hunting is recreational, with the meat consumed by the hunters and their families. Although some nonresident guided hunts have been conducted in the area, most hunters are believed to be residents.

WEST CHUGACH GOAT

LOCATION

Game Management Unit 14C, and in Game Management Unit 7, the drainages of Glacier Creek and Twentymile River.

THE SPECIES

Mountain goats are fairly abundant within several drainages in the area and are rare or absent in others. During the last extensive aerial survey conducted in 1972, 183 goats were observed in the area, with 144 of those seen in the Hunter Creek-Lake George drainages. A recent limited survey conducted in August 1975 found goat concentrations in the vicinity of Lake George similar to 1972 levels. No surveys in the Chugach National Forest portion of the area have been conducted since 1970. During that year 45 goats were seen in the upper Penguin Creek-Glacier Creek drainages. In a 1969 survey of Portage Creek, the Twentymile River and the eastern side of Glacier Creek 101 goats were observed. Population size is difficult to estimate from aerial surveys because it is doubtful that more than 50-60 percent of all goats present are seen. Present goat numbers within the entire West Chugach management area are unknown, but are felt to be slightly reduced from 1972 levels and substantially reduced from levels of 10 to 20 years ago. Habitat conditions within drainages where major goat concentrations occur are thought to be good. These drainages include Hunter Creek, the entire Lake George area, Glacier Creek, and Twentymile River. Fair habitat exists in the drainages of Eklutna River, Eagle River and Bird Creek. Elsewhere habitat is poor to nonexistent. No observations of natural mortality have been documented in the area, although goats are known to die in spring snow avalanches within the precipitous habitat they occupy. Severity of winter weather is probably the major factor controlling population levels.

Mountain goats have been hunted in the area for many years. Hunter use during the 1950's and 1960's was fairly heavy, but it has been light during the early 1970's. Actual harvest levels prior to 1972 are unknown, but since then an average of 8 goats have been harvested annually. The number of hunters has declined from an average of 44 per year in 1972 and 1973 to 17 in 1974 and 19 in 1975. Since 1972 nearly all hunters have been local residents.

Seasons from statehood through the early 1970's ran from August 10 through November or December depending on the year and the location. The bag limit was usually 2 goats per year. Since the mid-1970's, in areas remaining open to goat hunting, seasons have been substantially reduced and the bag limit lowered to one. Further restrictions were imposed for 1976 by allowing goat hunting by permit only. Since 1973, goat hunting has been prohibited in Chugach State Park. Goats are not abundant within the Park. Present harvest levels are not felt to be detrimental to population productivity, sex ratios or availability of animals. In past years hunting pressure may have contributed to the reduction of goat numbers in the drainages of Bird Creek and Eklutna and Eagle Rivers. Hunting access is primarily via the Hunter Creek Trail, the Girdwood Road and adjoining trails and the Twentymile River.

Other uses of goats within the area include viewing and photography. Opportunities to see goats are best during May and June. Presently there are no accessible viewing areas where goats can be readily viewed. Small numbers of goats may be seen in the upper Eklutna Valley, upper Eagle River, Bird Creek, Crow Creek and Twentymile River. Viewing opportunities decrease as summer advances and goats retreat to more inaccessible habitat. Numerous goats may be observed from aircraft in the Lake George area during spring and summer. Viewing access routes include the Eklutna Road, the Eagle River Road and trail, the Bird Creek roads and trails, and the Crow Creek road. Access to locations inhabited by goats is far more difficult in winter than during late spring and summer.

Hunting and viewing use are both subject to restrictions on methods of transportation, which prevent use of motorized vehicles off established roadways except boats on Eklutna Lake and Twentymile River.

PORTAGE GLACIER GOAT

LOCATION

In Game Management Unit 7, the drainages into Portage Creek bounded on the west by the Anchorage-Seward Railroad and on the east by Placer Creek, Portage Lake, the mouth of Byron Creek, Glacier Creek and Byron Glacier.

THE SPECIES

An estimated maximum of 10 mountain goats now occupy the mountainous slopes of the Portage Glacier area. A scarcity of suitable habitat and deep and persistent snow cover probably limit mountain goat numbers. Black bears and coyotes are common, and brown bears and wolves are occasionally seen in the area, but these animals probably do not significantly affect the goat population. The mountain goat habitat of Portage Glacier is inaccessible to most visitors, and it has not been significantly altered by human activity.

Viewing is the major human use of goats in the area. Most goat viewing takes place from the valley bottom, although an unknown number of people also hike the mountain sides to view the animals at closer range.

EXIT GLACIER GOAT

LOCATION

In Game Management Unit 7, the Exit Glacier closed area.

THE SPECIES

Mountain goats occur throughout the area but are most conspicuous at Exit Glacier which is the terminus of the Resurrection River road. This area contains approximately 35 goats. The population has been stable for the last several years. Limited data suggest that winter weather conditions are the primary factors limiting goat abundance. Excessive snow accumulations contribute to mortality through avalanches and accidental falls, in addition to limiting forage availability.

The closed area was established in 1973 because of its close proximity to Seward and the scheduled completion of a road up Resurrection River which would have provided excessive hunter access. Completion of the project with a bridge crossing the River would provide excellent opportunities for nonconsumptive use. However, the bridge has not yet been constructed and little use has occurred.

KENAI PENINSULA GOAT

LOCATION

Game Management Units 7 and 15 except for that portion of the Kenai National Moose Range lying north of the Kenai River, and the Exit Glacier and Tustumena Goat Management Plan areas.

THE SPECIES

Mountain goats occur throughout the mountainous portions of the Kenai Peninsula area. Routine aerial surveys were initiated in 1968. At that time the total goat population was estimated at 2,000 animals. Surveys conducted since 1968 have indicated a downward trend in goat numbers, particularly where goat and Dall sheep distributions overlap. Goat habitat requirements are poorly understood, but area-wide population fluctuations are thought to be habitat related, particularly as affected by winter snow conditions. Goats on ranges occupied by sheep may be subject to competition for forage with sheep.

Since at least 1971 the eastern portion of the Kenai Peninsula has been the most intensively hunted goat area in the state. Goat hunting seasons and bag limits were liberal prior to 1971, generally August 10 to December 31 with a two goat limit. In 1971 the bag limit was lowered to one goat over most of Game Management Unit 7 in response to increasing hunting pressure. Goat harvest reports, initiated in 1972, provided the first accurate harvest data. These reports indicated that 425 hunters harvested 199 goats during the 1972 season, with most of the harvest occurring in Unit 7. That harvest was considered to be at or slightly above the sustained yield level. In 1973 hunters and harvest increased to 645 and 225, respectively. During the 1974 season all but four coastal areas were closed to the taking of goats after August 31. The early closure reduced the harvest in Game Management Unit 7 to 64 goats, while in the remaining area with a five-month season, 173 hunters harvested 75 goats. Evidence indicated that a significant portion of the Unit 7 goat harvest was being taken by unsuccessful sheep hunters. Consequently, the 1975 goat hunting season in most of Unit 7 was shortened to begin at the conclusion of the sheep hunting season. In addition, the bag limit for the entire area was lowered to one goat. The shortened Unit 7 season resulted in 183 hunters harvesting 64 goats. The harvest for the remaining portions of the Kenai Peninsula was 44 goats. The sex ratio of the harvest from 1972 through 1975 was almost equally divided, with males comprising 56 percent of the total harvest. Approximately one-half of the hunting pressure in the area currently is from Anchorage hunters. Kenai Peninsula residents comprise about 40 percent of the hunters while non-Alaskan residents constitute the remainder. Nearly all hunts are recreational in nature. Most hunting occurs during the first two months of the season when weather conditions are most favorable. Hunts after that period are often hampered by inclement weather and, for the most part, do not appeal to the average hunter. Hunters generally expend three to five days per hunt. Along the coastline hunters utilize boats and aircraft to reach hunting areas. For inland areas, automobiles are the primary transport mode.

Areas with relatively easy hunter access, particularly those adjacent to roads or lakes suitable for float plane landings, receive most of the hunting pressure. Other areas with relatively difficult access receive little or no hunting pressure. Overall current harvest levels are well within sustained yield levels. However, overharvests are occurring in areas where access is relatively easy. Since goats often utilize both the same summer and winter range the current harvest pattern can potentially eliminate small herds.

Potential for nonconsumptive uses has been unlimited but actual use has been light. Some viewing occurs adjacent to roads and along certain established trails. Viewing and photography also occur incidental to the hunting of other species.

TUSTUMENA GOAT

LOCATION

That portion of Game Management Unit 15 within the Kenai National Moose Range south of Skilak Glacier, River and Lake.

THE SPECIES

Mountain goats occur throughout the mountainous portions of the Tustumena area. They are most abundant in areas influenced by coastal weather and least abundant in inland areas. The estimated goat population in 1968 was 350, the last time surveys were conducted over the entire area. Surveys over similar habitat in adjacent areas have indicated a general population decline, and the Tustumena area may also have suffered a decline. Goats and Dall sheep occupy the same range throughout the area. Goat populations are highest south of Tustumena Glacier where sheep populations are low. More than 90 percent of the goats surveyed in the area were located south of the glacier. North of Tustumena Glacier sheep populations are high but goat populations are low. Reasons for the differences in species density are not known, but forage competition and behavorial differences between the species are suspected to be probable factors.

Liberal hunting seasons and bag limits for goats have existed for a number of years. Seasons have generally been five months long, opening on August 10 and closing on December 31. A two-goat bag limit was in effect until the 1974 season when it was lowered to one in an effort to reduce total harvest and to upgrade the image of the species as a game animal.

Harvest report data have been available since 1972. Based upon an approximate 70 percent return of reports, an average annual kill of 20 goats through 1975 is indicated. Females comprised approximately one-half of the annual harvest. Most hunting occurs during the first two months of the season. The Dall sheep hunting season runs concurrently with the goat season for the first month. Reported hunter success has averaged about 50 percent, but this figure is misleading as many goats are taken incidental to sheep hunting. In many cases sheep hunters take goats when the opportunity arises but do not report having hunted goats unless successful.

Nearly all of the harvest occurs adjacent to lakes and rivers that provide access by boat or float plane. Other portions of the area receive little hunting pressure. Overall the area is being harvested near the sustained yield level. Overharvesting is occurring adjacent to major access points such as Sheep Creek, Fox River and Tustumena Glacier. All hunting is of a recreational nature and nearly all bagged goats are considered trophies. Approximately 50 percent of the hunters reside in Anchorage while non-Alaska residents comprise about 10 percent. The remainder of the hunting pressure is from Kenai Peninsula residents. The average goat hunt lasts three to five days.

Opportunities for nonconsumptive uses are not restricted, but such use has been low due to difficult access. Most viewing activities on the

Kenai Peninsula occur on areas which are closed to hunting and are adjacent to highways. Since the Tustumena Area does not contain such observation areas, the little viewing that does occur is done incidental to hunting and hiking.

MOUNTAIN GOATS IN SOUTHWESTERN ALASKA

Southwestern Alaska's only mountain goat (*Oreamnos americanus*) population occurs on Kodiak Island. This herd results from transplants conducted in 1952 and 1953 when a total of seven males and ten females were released. The population slowly increased and is presently estimated at 150-200 animals. The herd is gradually expanding its range southward and westward from the original release site at Hidden Basin. The largest groups of goats are found in the Crown Mountain area within a few miles of the release site. Recent population surveys indicate that the growth of the herds inhabiting the Crown Mountain area may have stabilized. Overall population growth appears to have slowed considerably. Large areas of apparently good habitat have not yet been occupied or are only sparsely populated with goats. It will be several years before the success of the Kodiak transplant can be fully evaluated.

From early spring until fall mountain goats primarily utilize alpine and subalpine areas which are often extremely rugged and precipitous. These areas, characterized by heavy snow accumulations in winter and short, cool summers, support grasses, sedges and forbs which comprise the bulk of the goats' diet. With the onset of winter snows, goats move to rocky windblown ridges and ledges where forage such as brush and ferns is utilized.

Limited data suggest that mortality from winter weather conditions is the primary limiting factor on goat populations. In addition to limiting forage availability, precipitous terrain and excessive snow accumulations contribute to mortality through avalanches and accidental falls. Although occasional predation by brown bears undoubtedly occurs, it is probably not a limiting factor.

Hunting of Kodiak Island goats by permit has been allowed each year since 1968. Although the number of hunters afield has been gradually increasing, unfavorable fall weather limits hunting success. Most of the hunting effort has been concentrated in the relatively accessible Crown Mountain area which is inhabited by the largest group of goats.

Occasionally goats have been observed near the City of Kodiak. In an effort to encourage the establishment of goats in areas where they could be easily observed, the drainages adjacent ot the Island's road system have been closed to hunting. Presently little effort is expended in viewing or photographing of goats on Kodiak.

CROWN MOUNTAIN GOAT

LOCATION

In Game Management Unit 8, all of Kodiak Island.

THE SPECIES

Mountain goats have steadily expanded their range since their introduction to Kodiak Island in 1952 and 1953. Goats now occur throughout much of the higher mountainous terrain, although many areas are sparsely populated. The highest densities of goats occur in the Hidden Basin Creek and Wild Creek drainages.

Winter ranges in the Hidden Basin area have been heavily utilized and appear to have deteriorated to some extent. Mortality is poorly documented, but it is suspected that a combination of heavy snows and a decline in winter range quality produce some losses due to malnutrition. There is overlap in winter range with deer and some of the same plant species are used for winter forage. Goats tend to utilize steeper slopes at higher elevations than do deer, so competition for food is possibly not extensive. Cattle grazing occurs in part of the goat winter range in Ugak Bay, but competition is negligible with current stocking and distribution of livestock.

As a recent arrival on Kodiak, the mountain goat attracts considerable attention from local hunters wishing to hunt the species for the first time. The first Kodiak Island goat hunt was held in 1968, sixteen years after the first transplant. Six goats were taken that year by nine hunters. Hunting by permit has been allowed each year since 1968. Annual harvests have averaged about ten goats, although sixteen goats were taken in 1974. Hunter success has averaged over 50 percent. Both sexes have been about equally represented in the harvest. Although as many as 66 permits have been issued during the two month season, seldom have more than half the permittees actually hunted. Weather severity largely determines actual hunting pressure. Most of the hunting effort has been concentrated in the Crown Mountain area. Most hunters use float equipped aircraft for transportation to either Terror Lake or Hidden Basin. Some hunters drive to Saltery Cove and take skiffs to Hidden Basin.

MOOSE IN SOUTHEASTERN ALASKA

In Southeastern Alaska, moose (*Alces alces*) are presently found on the Malaspina forelands, Yakutat forelands, the river valleys between Haines and the Canadian border, Berners Bay and Taku Rivers near Juneau, the Stikine River valley and other drainages abutting larger Canadian herds. Throughout the region, moose habitat characteristics are fairly similar. Areas of alpine or riparian willows and river bars support the bulk of the population throughout the year. In low density willow areas, species such as cottonwood and ground forbs provide sustenance. Dense spruce stands and alder thickets provide cover but little food. During the summer months moose are found in areas of adequate browse from sea level to at least 2,000 feet. During the fall rut numerous individuals range to 3,500 feet or more. Winter snows force the moose back to lower elevations restricting them spatially to winter ranges. Calving takes place between mid-May and mid-June, frequently in dense spruce stands or on "islands" interspersed among sedge and grass marsh. Lowland river valleys are also commonly used parturition areas.

Moose were relatively scarce in Southeastern Alaska until expansion of moose populations in Canada resulted in emigrations of moose through access corridors such as the Alsek River, Chilkat River, Taku River and Stikine River valleys. By the 1950's moose were present on all major Southeastern ranges.

Typically, expanding moose populations exhibit a high reproductive rate. A larger percentage of young cows become pregnant and the frequency of twin calves is high. The incidence of twinning goes down as moose reach or exceed range carrying capacity. When winters are severe or browse is unavailable, cows debilitated by poor nutrition may fail to furnish adequate quantites of milk to newborn calves.

Many moose calves die during their first year of life. Calf mortality on some Southeastern moose ranges has reached 80 to 90 percent and generally averages above 50 percent for the area as a whole. Predation on calves, principally by wolves and bears, is perhaps greatest during the first six months. Loss to wolf predation continues through the winter. During severe winters food shortages cause mortality. Calves are the age segment most susceptible to winter starvation in moose populations. Calf mortality, coupled with natural and hunting mortality among adults has resulted in population reductions exhibited by several Southeastern moose populations.

Moose have long been one of the most important game species in Southeastern Alaska, initially providing for the domestic needs of early settlers and prospectors near the Stikine and Taku River valleys; and then for the past two decades supporting relatively intensive recreational utilization in those areas and in the Yakutat and Haines areas. Over 800 moose hunters went afield in the Southeastern area during the 1975 moose hunting season.

Moose populations in the Yakutat area have traditionally been heavily hunted for meat and trophies by both guided and unguided recreational hunters. Annual harvests over the past decade have fluctuated between 16 and 325 moose, with females constituting up to one-half of the kill of the larger harvests. In addition to hunting on foot from the road systems, aircraft, off-road vehicles and various types of boats have been widely used. Hunter access by airplane in the Yakutat area is accomplished on U.S. Forest Service landing strips, by landing on ocean beaches and river bars or on bodies of water with float planes.

Moose in the Haines area have experienced increasing hunting pressure in recent years, especially from Juneau-based hunters. The number of hunters has risen dramatically and use of air and jet boats in the Haines area has increased. Because of the inaccessibility of much of this country except by air boat, river boat or wheel-equipped aircraft, hunting in the area is still managable without regulating the number of hunters. From 28 to 120 moose are harvested annually, with one-third being females.

Other Southeastern moose populations consist of small herds in river valleys, managed either by permit drawing or bull only seasons, with limited cow seasons when moose populations are excessive to the available habitats.

MIDDLE SOUTHEASTERN MOOSE

LOCATION

Game Management Unit 1B and those portions of Game Management Units 1A and 1C not included in the Behm Canal and Upper Lynn Canal Moose Management Plan areas.

THE SPECIES

Small populations of moose are present in the Taku and Stikine River drainages and in the Thomas Bay area. The Taku and Stikine herds were established by emigrations of Canadian moose through the Coast Range to Alaska. Moose from the Stikine herd further extended their range to include Thomas Bay. Moose from these three populations occasionally inhabit other coastal areas and a few nearby islands.

The Taku herd has numbered from 40-100 animals since the early 1960's. The population was relatively stable until 1973 when the population began declining, probably as a result of poor calf production and survival, and increased hunting pressure. The Stikine herd was reportedly quite small in the early 1900's. Since the 1950's 100-300 moose have been present, and the population has remained relatively stable despite periods of low calf production. The recently established Thomas Bay herd inhabits an area of favorable habitat primarily consisting of post-logging vegetation. The herd probably numbers less than 50 animals and is expected to decline as a result of forest regrowth.

Moose numbers in the three herds are probably close to the carrying capacity of the habitat. Although summer ranges are in good condition, critical wintering ranges are limited in size and are in only fair condition. Predation and winter snow conditions are the major natural limiting factors affecting these populations. Wolves are the primary predator although brown bears also kill some moose. Deep snow reduces availability of browse and renders moose more vulnerable to predation.

The Taku moose herd has supported harvests of 30 or less bulls per year from 1959 to 1974. In 1974, the hunting season was reduced from one month to two weeks because of an apparent decline in herd size. Only five bulls were reported taken in 1974. Most Taku River moose hunters are Juneau residents. About 200 hunters participate annually.

Moose harvests from the Stikine herd ranged from 12 to 40 and averaged 27 bulls per year from 1952 to 1971. Low bull:cow ratios and poor calf production prompted a reduction in the hunting season from one month to two weeks during 1970 and 1971. A delayed season in 1971 appeared to favor calf production the following year. During 1972 and 1973 antlerless hunting was allowed by permit in conjunction with a late bull season. Although these either-sex hunts and late bull seasons continued to improve calf:cow ratios, the public opposed the changes. Weather conditions in October are usually poor and the opportunity to hunt earlier appears more important to hunters than a higher hunter success. Since 1974 there has been a one month bulls-only hunting season. Most of the 125

to 200 hunters using the Stikine River area are Petersburg and Wrangell residents. Hunting for moose also occurs in the upper Stikine drainage, in Canada. Since 1973 a total of 48 moose of both sexes have been taken by Canadian guide operations.

The Thomas Bay herd has been hunted for bull moose since 1952. Most hunters are Petersburg residents who take from 6 to 10 bulls annually.

Heavy hunting pressure and bulls-only hunting seasons on all three herds have resulted in low proportions of bulls in the population and very few older bulls. Yearling bulls usually account for about 80 percent of the harvest.

Primary methods of transportation in all areas are boats (jet or propeller-driven) and float-equipped aircraft. Air boats, highway vehicles and wheel airplanes are also used.

BEHM CANAL MOOSE

LOCATION

The mainland portion of Game Management Unit 1A excluding that part of the Cleveland Peninsula south of Spacious Bay.

THE SPECIES

Moose are found in limited numbers along the Unuk and Chickamin River drainages and are rare throughout the rest of the management area. This pattern has probably held for many years and reflects the limited moose habitat in the area. Moose calves were transplanted to the Chickamin River drainage in 1963 and 1964 to bolster the few moose occasionally seen there. Moose populations at present are apparently little changed from those existing prior to the release. This area was closed to hunting from 1963 to 1972.

The habitat is climax forest. Little logging is likely to occur. Future mining operations in the river valleys could develop, and, if a road is build to Ketchikan, it will undoubtedly come down the Unuk River. Such developments could change a significant portion of the moose habitat in these river bottoms.

Intensity of use is light by consumptive users and almost non-existent by nonconsumptive users. Access is difficult, and chances of finding bull moose are poor. The kill has probably averaged between one and two bulls for many years and almost all have been taken from the Unuk River. Since statehood the hunting season on the Unuk River has been September 15- October 15, with a limit of one bull per hunter. The Chickamin River, closed from 1963 to 1972 because of the transplant attempt, has been hunted but only one bull has been killed since 1972. Most use has been by Ketchikan area residents for recreation. There have been no guiding activities in the area since about 1965.

Transportation means used by hunters in the area are boats and float planes. There are some places in the rivers and a few lakes in valleys where float planes can land. Skiffs equipped with jet motors are also used in the rivers.

UPPER LYNN CANAL MOOSE

LOCATION

In Game Management Unit 1, the drainages into Lynn Canal north of Lincoln Island.

THE SPECIES

The Berners Bay herd found north of Juneau originated from transplants of 21 calves in 1958 and 1960. Aerial counts ranging from 50 to 90 animals have been common for this area since 1968. Such counts probably represent from 40 to 70 percent of the total moose herd. A noticeable herd reduction estimated at 40 percent was apparent in the fall of 1974. The hunting seasons for 1975 and 1976 were closed to allow for herd growth, and recent counts indicate this growth is occurring.

The Haines and Chilkat Range herd originated from migrations through river drainages from Canada in the 1930's. The herd numbers about 500 animals in an area extending from beyond Haines down Lynn Canal to Point Couverden (Chilkat Range). In the early and mid 1960's, the herd was estimated at 700 animals. At that time it was apparent that browse was being heavily utilized and range conditions were deteriorating. Between the late 1960's and 1976, moose numbers have remained at an estimated population of 500 animals.

The major natural mortality factors affecting these herds are severe winter weather and predation. Snow accumulations often reduce forage availability and certain snow densities increase the hunting success of wolves. Besides wolves, black and brown bears also prey on moose and such predation may be a significant limiting factor on these herds.

Good to excellent range conditions prevail throughout these areas. Except for severe winters in which snow accumulations are excessive, there is an adequate quantity of good quality browse.

The Berners Bay herd sustained bulls only hunting from 1963 to 1970. By 1970, it was apparent that too few bulls were present in relation to the number of cows to assure good reproduction. A limited either-sex harvest was allowed from 1971 to 1974. During 1975 and 1976, the hunting seasons were closed to allow the herd to increase after a 40 percent drop in herd size in 1974.

The Haines and Chilkat Range herd has sustained either-sex hunting seasons, but more bulls have been taken than cows. The number of hunters annually has averaged between 300 and 600 depending on the season and weather conditions. Most hunters are from the Haines and Juneau areas. An increased number of hunters in the early 1970's led to reduced seasons and bag limits. River boats (jet, prop and air-powered), overland and highway vehicles, float and wheel airplanes, and pack horses are used by hunters for transportation to the hunting areas.

YAKUTAT MOOSE

LOCATION

In Game Management Unit 5, all drainages into the Pacific Ocean between Icy Bay and Glacier Bay National Monument.

THE SPECIES

Moose emigrated from Canada into the Yakutat area during the early 1930's. The population increased to 2000-2500 by 1968 and then declined to 300 animals by March 1976. The decline was due primarily to several severe winters, especially 1971-1972, and secondarily to wolf and brown bear predation and hunting. Since 1972, the population has declined despite mild winters in 1973 and 1974, and a moose hunting closure since 1974.

Winter ranges were somewhat overbrowsed in the late 1960's, but have recovered considerably due to the moose population decline. Receding glaciers, logging, and geological uplift and subsidence are favoring early successional plant communities, which are important habitat for moose.

The Yakutat moose herd was heavily sport hunted from 1959 to 1973. An either-sex 80 day season from 1959 to 1972 produced an average annual harvest of 230 moose. In 1973 the season was reduced to 50 days and 147 moose were taken. Since 1974, the Yakutat forelands have been closed to hunting, while a limited number of bulls have been taken from the Malaspina forelands.

The majority of the hunters utilizing the Yakutat area are from Juneau. Residents of Yakutat represent less than half of the total hunters, but future oil and timber industry developments will assuredly swell the local hunter population of Yakutat by the late 1970's. The harvest by nonresident hunters represents less than five percent of the yearly harvest. Characteristic of Canadian moose, Yakutat moose have generally smaller antlers than the Alaskan subspecies, although some mature bulls have antlers of 50 to 60-inch spreads.

Aircraft are the main transportation method for moose hunters in the Yakutat area. The U.S. Forest Service has built and maintains airstrips throughout the Yakutat forelands in order to distribute moose hunters. The Yakutat road system also affords access to hunters out to the Dangerous River and in addition provides access to launching sites for boat hunters. Some larger boats utilize Yakutat Bay and Russell Fiord but inclement weather usually restricts their use for moose hunting. The area immediately surrounding the town of Yakutat and the airport area has historically been heavily hunted. At the present time moose numbers are low in this area.

MOOSE IN SOUTHCENTRAL ALASKA

Moose (*Alces alces*) are presently found throughout Southcentral Alaska except for the islands in Prince William Sound and mountainous areas above 5,500 feet. Throughout the region, moose habitat requirements are fairly similar. Areas of alpine or riparian willows, river bars, man-made clearings and fire regrowth support the bulk of the population throughout the year. In low density willow areas, species such as birch, and aspen and various ground forbs provide sustenance. Dense spruce stands and alder thickets provide cover but little food. During the summer months moose are found in areas of adequate browse from sea level to at least 3,500 feet. During the fall rut numerous individuals or pods of moose range to 5,000 feet or more. Winter snows force most moose back to lower elevations restricting them spatially to constricted winter ranges. Calving takes place between mid-May and mid-June, frequently in dense spruce stands or on "islands" interspersed among sedge and grass marsh. Lowland river valleys are also commonly used parturition areas.

Prior to settlement of Southcentral Alaska, moose were relatively scarce over much of the area. Clearing of land and fires which accompanied exploration and development created favorable browse habitat conducive to large moose populations. By the 1950's, moose were abundant on all major Southcentral Alaska ranges. Since the 1960's, population levels have markedly declined regionwide. Moose numbers are now from one-third to two-thirds reduced compared to population levels of 10 years ago. Major factors causing the decline are believed to be habitat related, although predators may have had a significant influence on declines and continuing low population levels in some areas. Habitat deficiencies are generally manifested by the scarcity of essential browse during the critical winter months. Such a situation is most apparent in the case of the Kenai Peninsula and to a lesser degree in the Copper and Susitna River drainages. Detrimental effects of such shortages have taken different forms, but primarily affect the production and survival of calves.

Typically, expanding moose populations exhibit a high reproductive rate. A larger percentage of young cows become pregnant and the frequency of twin calves is high. The incidence of twinning goes down as moose reach or exceed range carrying capacity, the situation now prevalent over much of Southcentral moose range. When winters are severe or browse is unavailable, cows debilitated by poor nutrition may fail to furnish adequate quantities of milk to newborn calves.

On inadequate ranges and those with large numbers of predators many moose calves die during their first year of life. Calf mortality on some Southcentral moose ranges has reached 80 to 90 percent and generally averages above 50 percent for the area as a whole. Predation on calves, principally by wolves and bears, is perhaps greatest during the first six months of life. Losses to predation continue through winter but

food shortages are believed to be the primary cause of mortality during this period. Calves are the population segment most susceptible to winter starvation. Calf mortality, coupled with natural losses and hunting mortality among adults has resulted in the population reductions.

Moose have long been one of the most important game species in Southcentral Alaska, initially providing for the subsistence needs of natives, early settlers, prospectors and explorers, and then for the past two decades supporting relatively intensive recreational utilization. Over 10,000 moose hunters went afield in the Southcentral Region during 1975 moose hunting season. Although today recreational hunting dominates use of moose in most sections of the region, moose continue to satisfy the domestic need for meat of many Alaskans.

Moose populations in the upper Copper and Susitna River drainages have been heavily hunted for meat and trophies by both guided and unguided recreational hunters. Annual harvests over the past decade have fluctuated between 800 and 2,000 moose, with females constituting up to one-third of the kill of the larger harvests. In addition to hunting on foot from the highway system, aircraft, off-road vehicles, boats, horses, motorbikes and snowmachines have been widely used. Many areas are laced with vehicle trails and evidence of aircraft use can be found around most lakes and landing strips within moose country.

Moose in the lower Susitna River Basin, from Talkeetna to Mt. Redoubt, have experienced increasing hunting pressure in recent years, especially from Anchorage-based hunters. The proportion of unguided hunters has risen dramatically with increasing use of private aircraft or commercial air transport services. Because of the inaccessibility of much of this country by other than float or ski-equipped aircraft, harvests have not been as high as to the east. Annual harvests have ranged from 300 to 900 with females comprising one-third of the take.

Harvests from the Matanuska Valley and vicinity have in past years provided up to 2,250 moose, about half of which were cows. In recent years, the kill has averaged 350 to 600, due to elimination of antlerless moose seasons. This area supports few commercial guides. Most hunting in this relatively accessible terrain is by recreational meat hunters utilizing a variety of motorized conveyances.

Kenai Peninsula moose harvests have ranged between 700 and 2,400 moose, with fewer kills in more recent years. Both guided and unguided hunters use the area, although guiding has become less popular as the moose population has declined. Much of the Kenai Peninsula is administered by the U.S. Forest Service or the U.S. Fish and Wildlife Service, both agencies effecting controls on the use of motorized vehicles. Nevertheless, hunters have enjoyed a relatively high rate of success by using aircraft, horses, boats and other permitted means of transportation.

COPPER RIVER DELTA MOOSE

LOCATION

In Game Management Unit 6, the drainages into the Gulf of Alaska from Orca Inlet and Rude River east to the west bank of the Copper River.

THE SPECIES

Moose on the Copper River Delta are the result of a transplant of 6 male and 14 female calves between 1949 and 1959. The transplant was an immediate success; the range was ideal and natural mortality was apparently low. The herd rapidly increased and dispersed throughout the Copper River Delta. The moose population peaked in 1971 with a fall population of 200 moose west of the Copper River. The winter of 1971-1972 was severe, resulting in a 15 to 20 percent winter loss, primarily of calves. The herd has been maintained at a fall population of 200 or less since 1971 to maintain a productive herd in balance with the range. At present, the herd is in excellent condition. A February 1976 count revealed 191 moose, 29 percent of which were calves.

Natural mortality takes a few animals each year. Brown bears are primary predators, especially on calves and weak adults in spring. Other predators, such as black bears, wolverines, and coyotes are of minor importance. Wolf predation has not been reported, but some wolves occasionally traverse the eastern edge of this area. The primary moose winter range is not frequented by wolves. Population size and composition are regulated by hunting.

Habitat studies have not been conducted on the Copper River Delta. Calf production and survival throughout the winter indicate this herd and the range to be in healthy condition. The 1964 earthquake uplifted the Delta approximately 6 feet. The uplift lowered the water table, and woody plants such as willows are spreading on the delta. The Copper River Delta is managed by the U. S. Forest Service. The portion of the Delta south of the Copper River Highway is part of the Copper River Delta Game Management Area. A cooperative agreement between the U. S. Forest Service, the Alaska Department of Fish and Game, and the Alaska Department of Natural Resources recognizes wildlife as the primary resource of the management area and is dedicated to maintaining the habitat in its present condition. Forest Service regulations prohibit wheeled all-terrain vehicle use in the management area.

In the fall of 1960, a limited harvest was initiated. Twenty-five bulls were taken by permit. The following year hunting was not allowed, but in 1962 hunters took another 25 bulls. Moose seasons have been held annually since. In 1968, the first 10 antlerless permits were issued. Fifteen antlerless permits were issued in 1969. In 1970, one moose of either sex was allowed with a total of 40 permits. Since 1971, moose hunting has been one moose by permit with conditions and number of permits annually described by Commissioner's announcement during a

September 10 to 15 season. Hunting pressure has been restricted by the number of permits issued. Typically about 500 people have applied for the 20 to 60 permits available. This regulation has permitted the previous winter's survival and the spring calf production to be determined prior to establishing the fall quota of moose to be harvested. In years when the moose population fell below the desired level, antlerless hunts were not held (1973 and 1975). Hunter success has normally been 80 percent or better. During the past 15 seasons, 427 moose have been taken (15 to 46 per year), primarily by Cordova residents. Guides do not take moose from this small herd because the permittees are determined by a public drawing.

The Copper River Highway offers good access to the Delta for hunters. The Alagnik Road is heavily hunted. Hunters primarily travel by foot from cars along the road and with the aid of air boats. Air boats are ideal for the Delta because of the extensive marshland, ponds, creeks, and sloughs. All-terrain vehicles are not allowed on the Delta south of the highway by U. S. Forest Service Regulations. Few moose are taken north of the highway.

The Copper River Delta moose herd is enjoyed year-round by local citizens. Driving the Copper River Highway for a "Sunday drive" is a popular pastime. Looking for wildlife and observing large antlered bulls are especially rewarding.

BERING RIVER-ICY BAY MOOSE

LOCATION

In Game Management Unit 6, the drainages flowing into the Gulf of Alaska between Katalla and Icy Bay.

THE SPECIES

Moose in the Bering River-Icy Bay area originated from descendants of the Copper River Delta moose transplant. Moose were transplanted to the Copper River Delta near Cordova in the 1950's. They increased rapidly and dispersed to the eastern side of the Copper River. Mountains between the Martin River Valley and Bering River retarded expansion to the east for a few years but by the late 1960's a small herd existed in the Bering River-Controller Bay flats. The Suckling Hills formed a natural boundary for this herd on the east, but did not prohibit them from extending their range toward Icy Bay. A few moose are now scattered along the coastal fringe between Suckling Hills and Icy Bay. Eventually two separate moose herds will probably exist in this area: 1) Bering River-Controller Bay and 2) Suckling Hills - Icy Bay. The Bering River-Controller Bay herd has increased in the past seven years from 19 moose in January, 1969 to at least 96 in January, 1976. Observations in the Suckling Hills - Icy Bay area have indicated about 20 moose occur in this area.

Natural mortality is suspected to be due primarily to predation by wolves and bears. In the past few years, wolves have become established along the Gulf Coast in conjunction with the moose herd. In the winter of 1975-76, five wolves were taken near Controller Bay and two were taken east of the Suckling Hills. Brown and black bears are numerous along the Gulf Coast. They prey primarily on newborn calves and weak adults.

The habitat along the Gulf Coast appears good. Judging by the rapid increase of moose around Bering River - Controller Bay, the area appears well suited for moose. Like the lower Copper River Delta, this area produces large antlered bulls at an early age, probably a reflection of excellent range.

Human use of this herd has been minimal. Hunting regulations for the Martin River Valley have applied to this area but, because of the remoteness and the small herd size, the harvest has been insignificant, perhaps five moose prior to 1975. To direct hunting pressure to the Bering River-Controller Bay herd, a separate moose quota was set for the 1975 season. Eight moose (five males and three females) were taken by one party of hunters that used seine boats to reach the area and then airboats for hunting. Hunting pressure will gradually increase as hunters learn where the animals are and how to hunt them. Aircraft will probably be the major mode of transportation east of the Suckling Hills; airboats and aircraft will be used west of the Suckling Hills. The equipment

required to reach the area and the chances of success discourage meat hunters from utilizing this resource. Cordova residents will probably dominate the harvest in the Bering River - Controller Bay area but, because of remoteness, guided hunts will probably dominate east of the Suckling Hills.

MARTIN RIVER VALLEY MOOSE

LOCATION

In Game Management Unit 6, the drainages west of Katalla flowing into the Gulf of Alaska to the west bank of the Copper River.

THE SPECIES

Moose were introduced to the west side of the Copper River Delta over a 10-year period, from 1949-1959. Some animals subsequently crossed the Copper River and became established in the Martin River Valley and the east side of the Copper River Delta. The new herd grew rapidly. It peaked in 1971 with a fall count of 261 moose. The winter of 1971-1972 was severe, resulting in a winter loss of roughly one-third of the herd. Considering the effects of a severe winter upon the 1971 herd, a post-season population of 150-175 moose is considered the most the range can reasonably sustain. In 1975, the moose population numbered about 130 animals.

Natural mortality occurs more frequently in the Martin River Valley area than on the western side of the Copper River Delta. The winters are more harsh and natural accidents, such as drownings, appear more common. Wolves and bears, especially brown bears, are the major predators. Brown bear predation on weak adults and newborn calves is common in spring. Wolves became established in this area once moose became numerous enough to provide a food source. Wolf predation is most noticeable during the winter months. The extent of bear and wolf predation is unknown but is suspected of retarding the moose population recovery from the severe 1971-1972 winter. Although no range studies have been made, high calf production and good over-winter survival in general indicate a healthy range. The area has not been significantly altered by humans. The Martin River Valley area is primarily on U. S. Forest Service land and is part of the "Copper Delta Game Management Area" established in 1962 by the U. S. Forest Service, the Alaska Department of Fish and Game, and the Alaska Department of Natural Resources to protect the habitat and give recognition to wildlife as the primary resource of the area.

This area opened to moose hunting in 1960,and with the exception of 1961, has had seasons each year. Prior to 1965, the harvest of bulls from the Martin River Valley was one or two animals; moose were more readily accessible on the western side of the Copper River Delta. By 1968, hunting pressure had increased and warranted separate regulations for each side of the Copper River. Harvests increased rapidly as the population grew. Fifteen moose were taken in 1968, 34 in 1969 and approximately 100 in 1970. The first antlerless season was held in 1969; seven cows were taken by 25 permit hunters. The 1970 regulations were the same but 26 cows were taken. In 1971 the regulations were modified to enable the Department to establish fall hunting regulations with a quota of males and/or females in the spring after winter survival and calf production were determined. This regulation eliminated the necessity of setting hunting regulations nearly a year in advance of the

actual season. Following the severe winter of 1971-72, the moose harvest was curtailed considerably to allow the herd to recover. The 1973 and 1974 season were restricted to bulls only, and 20 per season. In 1975, 31 moose were taken, including a limited harvest of antlerless moose. During the past 11 years 383 moose have been taken.

The Martin River Valley produces fine trophy bulls. A Department study on moose antler growth indicated this area (lower Copper River) produces large antlers on young moose. Because of the small herd, the number of bulls with trophy-sized antlers produced each year is limited.

Much of the moose harvest in previous years involved hunters spotting from the air and directing other hunters on the ground directly to the animals. It is now illegal for persons to hunt the same day they have been in an airplane or to use aircraft to guide hunters. Current practices include hunters locating moose from the air in late afternoon or evening and hunting the following morning from airboats, river boats, or on foot. U. S. Forest Service regulations prohibit use of all-terrain vehicles. In general, hunter success is poor unless airboats are used.

Hunting in the area is managed by a registration/permit system. Hunters are required to report their kill, thus providing for season closures for either sex animal when the desired harvest is obtained. In 1975, 287 persons registered to hunt the area. Roughly 90 percent of the hunters were from Cordova. Meat has been their primary objective; recreation has been secondary. Guides rarely hunt the area because competition with local hunters is great for the trophy moose that are available.

Poor access to the area has discouraged the general public from utilizing this resource for recreation other than hunting. Once the Copper River highway is open, some viewing opportunity will be available. The highway fringes the western edge of the moose habitat. Poaching has not been a problem to date because the moose are not readily accessible.

PORTAGE GLACIER MOOSE

LOCATION

In Game Management Unit 7, the drainages into Portage Creek bounded on the west by the Anchorage-Seward Railroad and on the east by Placer Creek, Portage Lake, the mouth of Byron Creek, Glacier Creek and Byron Glacier.

THE SPECIES

About 50 moose now occur in the 20 square mile Portage Glacier Area. Movements often take moose beyond the boundaries of the area where some bulls are taken by hunters. Consequently, large bulls are uncommon within the area but are still more numerous than in surrounding areas. Some loss of moose habitat has occurred due to construction of roads, campgrounds and parking lots. Large numbers of people utilizing the area may also have caused moose to avoid areas formerly inhabited.

Use of moose by visitors is primarily viewing and photography. Most moose are observed from the railroad, the road, parking lots, or campgrounds, and are commonly seen in the valley and on the surrounding hills. While the scenic values of the area are the primary attraction for people, the availability of wildlife for viewing adds to the visitors' experience. Human use of the Portage Glacier Area has almost doubled since the early 1970's. An estimated 286,000 people visited the area in 1975.

KENAI PENINSULA MOOSE

LOCATION

Those portions of Game Management Units 7, 15A and 15B, not included within the Resurrection Pass, Skilak, and Tustumena Moose Management Plan areas.

THE SPECIES

The moose population of this management area is estimated at about 4,000 animals. The population may have numbered in excess of 6,000 animals during the late 1960's. Numbers declined sharply between 1971 and 1976.

The major limiting factor has been high calf mortality. Calf losses from birth until late fall have ranged from 50 to 70 percent. Summer calf mortality has been lowest in the northwestern lowland areas and highest on the eastern half of the Peninsula. Losses from early winter through spring were very high from 1971-1975, particularly in the northwestern corner, north of the Sterling Highway. Localized areas, notably Twenty Mile River and Placer River, have had good survival of calves from birth through the following spring.

The primary cause of calf mortality if believed to be related to range quality, but predation by black bears and wolves may be a contributing factor. Winter ranges have deteriorated due to the advancement of plant succession and overbrowsing. Dead and suppressed willows are in evidence on most wintering areas. The 1947 burn that produced the large moose population of the 1960's is well past the stage of high browse production and it is rapidly losing its value to moose. The much smaller 1969 burn is just beginning to produce forage.

Hunting pressure is very heavy in areas where road access is available. The annual harvest has varied from a high of about 1,400 in 1964 to a low of about 160 in 1975 with an average of about 720 moose per year. Cows have made up about 30 percent of the annual harvest. Large bulls are rare in this area but are occasionally taken. Most hunting in the area is conducted from the road system, although a significant number of hunters gain access by landing planes on lakes. Most hunters are Anchorage area and Kenai Peninsula residents.

Nonconsumptive use is high and usually incidental to traveling the road system. Some tourists actively seek moose during summer months and enjoy fair success in finding animals to view and photograph. Most viewing is done from automobiles.

RESURRECTION PASS MOOSE

LOCATION

That portion of Game Management Unit 7 that includes the drainages of Juneau, Little Indian, Big Indian and Resurrection Creeks, the Chickaloon River and the drainages into Turnagain Arm between Little Indian and Resurrection Creeks.

THE SPECIES

The Resurrection Pass moose population is estimated at about 800 animals. The population appears to have remained relatively stable at this high level from the early 1960's through the early 1970's. Between 1971 and 1976, the population may have declined.

Calf mortality has been the major factor limiting this population. Mortality from birth until late fall has averaged about 70 percent. Mortality from early winter through spring has not been measured but is assumed to be similar to adjacent areas where losses were great between 1971 and 1976. The cause of calf mortality is believed to be related to deteriorating winter range. Losses through predation may also be a contributing factor in low calf survival. Black bears and wolves are abundant in the area and are known to be important predators on moose calves.

Habitat conditions in this area have been deteriorating. Encroachment of spruce forest is supressing important moose food species. Over-utilization of browse plants is evidenced throughout the area by dead and nearly dead plants. A portion of this herd winters in the lowlands to the east where deteriorating range conditions are also present.

Harvests of bulls and low yearling recruitment rates have depressed the bull/cow ratio to 10 to 15 bulls per 100 cows. Hunting has been primarily recreational for meat although some trophy hunting has occurred. Trophy bulls are available in the area in low numbers. Several guides have operated in this area but guiding activity appears to be declining. Hunters utilizing this area are primarily Kenai Peninsula and Anchorage area residents. A small percentage of the hunters are from other areas in Alaska or nonresidents. Lakes in the Juneau Creek drainage provide access by aircraft; hunting by horse is popular in the Resurrection, Big Indian, and Chickaloon River drainages. Use of motorized ground transportation during snowfree periods is prohibited by Forest Service regulations.

Nonconsumptive uses in this area are high. The area is bisected by the Juneau Creek-Resurrection Pass trail system and is used by thousands of hikers during the summer months. The viewing of wildlife, and particularly moose, is an important part of the hiking experience. Nonconsumptive users are primarily Anchorage area and Kenai Peninsula residents, although many nonresidents also frequent the area during summer.

SKILAK MOOSE

LOCATION

That portion of Game Management Unit 15 encompassed by the Pedersen-Kelly Lake access road, the Seven Lakes Trail to Engineer Lake, the Engineer Lake access road, the Skilak Loop Road west to the Sterling Highway, and the Sterling Highway back to the Pedersen-Kelly Lake access road.

THE SPECIES

The moose population in this area is estimated at about 75 moose during summer months and as many as 300 moose during winter. The major factor limiting moose numbers has been high calf mortality. Calf losses from birth until late fall have been rather constant at about 60 percent. Losses from early winter through spring have varied with winter severity. Winter calf mortality from 1971 through 1975 was about 80 percent. Moose numbers are well below late 1960's densities. Calf mortality has generally been range-related although predators, particularly black bears and recently, possibly wolves, may be a contributing factor. Winter range in this area has been deteriorating due to the advancement of plant succession and overbrowsing.

Large bulls are rare in this area. Past heavy hunting for bulls and low recruitment of yearlings have resulted in proportions of bulls of less than 10 per 100 cows. The area has been easily accessible from the Sterling Highway or the Skilak Loop Road. Past hunting in this area has been recreational with meat a prime objective.

Nonconsumptive use in the area has been high. Large numbers of people, including nonresident tourists, use the area in the summer and often spend time looking for moose. Dense second-growth timber causes viewing from the road to be difficult during the summer months and viewing success is poor.

TUSTUMENA MOOSE

LOCATION

Game Management Unit 15B east and that portion of Unit 15C north of Kachemak Glacier, Kachemak Creek, Bradley Lake, Bradley River, a line from the mouth of Bradley River to Fox Creek, east of Fox Creek to its head at Caribou Lake, north of a straight line from the outlet of Caribou Lake due west to Deep Creek, east of Deep Creek from that point to its confluence with the north fork of Deep Creek, the North fork of Deep Creek to the refuge boundary, and a straight line due north from that point to Tustumena Lake.

THE SPECIES

The Tustumena moose population is estimated at 7,000 animals. The population peaked in the early 1960's and remained relatively stable or declined very slowly until the early 1970's. Since that time numbers have declined sharply. Calf mortality has been the major factor causing the decline. Mortality between birth and late fall has ranged from 60 to 90 percent. In the area north of Tustumena Lake mortality was highest in the period 1967-1970, and lowest in the early 1960's and 1972-1974. South of Tustumena Lake, mortality was lowest from 1962-1970 and has been high since 1971. Mortality was extremely high in 1974 and 1975 with less than 7 calves per 100 cows observed in late fall surveys. These losses are believed to be range-related but predators may also be a factor. Calf mortality from early winter through spring has varied with winter severity. In three winters since 1970 deep snows persisting into late spring have caused heavy calf losses estimated at about 80 percent of the fall calf population.

Predation by black bears, brown bears and wolves may also be limiting moose numbers. The high wolf population in the area south of Tustumena Lake may be directly related to the extremely low fall calf-cow ratios observed in that area in 1974 and 1975.

Habitat conditions have deteriorated due to overbrowsing and plant succession. Declining moose numbers have reduced pressure on the winter range but range rehabilitation will be necessary to restore the range to its former carrying capacity.

Hunting pressure has traditionally been light but has increased in the last several years. Horses provide the only practical means of hunting the area, and the number of people keeping horses has increased rapidly. Most hunters utilizing this area hunt primarily for recreation and meat, although a significant number hunt for trophies. Trophy bulls are available in this area in moderate numbers. Presently there are about 25 to 30 bulls per 100 cows.

Nonconsumptive uses in this area are limited by its remoteness. Some groups have hiked into the area solely for viewing and photography, but numbers have been small. Some viewing occurs on the periphery of the area by boaters and fishermen.

KENAI MOOSE RESEARCH CENTER MOOSE

LOCATION

That portion of Game Management Unit 15A south of Coyote Lake and at the end of Swan Lake Road consisting of four one-square-mile fenced enclosures.

THE SPECIES

The Kenai Moose Research Center is a cooperative venture of the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service at the Kenai National Moose Range. Construction began in 1965 and the facility was functional by 1968. Four populations of moose are maintained at desired densities and sex and age composition dependent upon research needs. There are 22 corral type traps and five vegetation exclosures at the facility and a 10 acre enclosure for retaining moose for special projects. Two log cabins provide living quarters for two permanently assigned personnel, temporary employees, students and guests.

Results of research projects as generally outlined in the objectives are published upon completion. Over 50 reports and articles in Department research reports, scientific technical journals, conference proceedings and in popular magazines have been published to date. Among the studies reported have been behavior and survival of orphaned and nonorphaned moose calves; the importance of non browse foods to moose on the Kenai Peninsula; the accuracy and precision of aerial moose censusing; immobilization of moose with drugs; monitoring moose mineral metabolism by means of hair element analysis; studies of moose blood and milk parameters; and evaluation of moose pellet group count methods.

KACHEMAK BAY MOOSE

LOCATION

Game Management Unit 15(C) except the portion north of Kachemak Glacier and Creek, Bradley Lake and River, and a straight line from the mouth of Bradley River to Fox Creek; east of Fox Creek; north of a straight line from the outlet of Caribou Lake due west to Deep Creek; and east of Deep Creek from that point to its confluence with the north fork of Deep Creek, the north fork of Deep Creek to the refuge boundary, and a straight line from that point due north to Tustumena Lake.

THE SPECIES

The Kachemak Bay moose population numbers approximately 2,500 animals. Moose appear to have been most abundant in the early 1960's and remained moderately numerous until 1973. Moose numbers have apparently declined since 1973. Residents of the area generally feel that moose numbers declined significantly between the mid 1960's and 1973 but survey data have not supported this; the number of moose observed annually on sex and age composition counts remained relatively constant between 1966 and 1973.

Calf mortality is the major factor limiting this population. Mortality from birth until late fall has ranged from 55-80 percent. Young calf mortality was greatest in the early 1960's and early 1970's and lowest from 1965 through 1968. Presently calf losses appear to be increasing steadily. Calf losses are believed to be range related but predators may also be a factor. Calf mortality from early winter through spring has varied according to the severity of the winter and particularly in relation to snow accumulation and the length of time it persists. Heavy losses of calves have occurred in three winters since 1970. Calf losses in these winters may have exceeded 80 percent.

Predation by black bears, brown bears, and wolves is also a factor in limiting the population. The effects of wolf predation are expected to become more significant with the expansion of the wolf population.

Habitat conditions are deteriorating slowly. Overbrowsing has killed many browse plants and suppressed others. The species composition of willow communities in some areas has been altered, with palatable species becoming less abundant and unpalatable species increasing. Critical winter range in the Homer area is rapidly being lost to human development and urbanization. Some browse ranges created by homesteading are now growing out of reach and are losing their value to moose.

Moose have been subjected to relatively heavy hunting pressure in this area since prior to statehood. The average annual harvest since 1963 has been about 400 moose and has been composed of about two-thirds bulls and one-third cows. Antlerless moose have been taken by permit only since 1968. Hunting seasons have been progressively shortened since statehood. Shorter seasons have been necessitated by increased hunting

pressure and low calf survival. Harvests since 1972 have been well below the 15-year average. Hunting for bulls has resulted in a distorted sex ratio in favor of cows and a significant reduction in the average age of bulls. Most hunters utilizing this area are Kenai Peninsula residents although in recent years more Anchorage area residents have been hunting the area. The proportion of hunters from other areas is small. Very little guiding for moose occurs.

Moose hunting in this area is conducted primarily for recreation and meat. Most hunting is away from the road system and off-road vehicles are the most common transportation used. Nonconsumptive use occurs generally along the roadside and is incidental to other activities. Most viewing is in the winter.

PALMER HAY FLATS MOOSE

LOCATION

In Game Management Unit 14A, the area one-half mile on each side of the Glenn Highway from the Knik River on the south to the Alaska Railroad crossing on the north.

THE SPECIES

Moose can usually be viewed from the Glenn Highway in late winter and early spring. The number of moose varies from year to year and may be related to the depth of snow in surrounding areas. As many as 200 moose have been seen. Some moose use the area for calving but few animals remain during the summer and fall. Most moose utilizing the area are cows because hunting in the Matanuska Valley has reduced the proportion of bulls in the population to low levels.

Harvest intensity in the proposed area was heavy in past years when seasons coincided with the appearance of moose on the flats. With the recent restricted seasons, only an occasional moose has been harvested in the area. Moose killed by vehicles and poaching probably account for more animals than are legally harvested.

WEST CHUGACH MOOSE

LOCATION

Game Management Unit 14C and in Game Management Unit 7, the drainages of Glacier Creek and Twentymile River.

THE SPECIES

Moose are found throughout the West Chugach Management Area below elevations of 5500 feet. During aerial surveys in fall, 1975, 580 moose were observed, indicating a total population of 800-1000 animals. Present moose abundance is significantly lower than during the mid-1950's through the early 1970's when 2000-3000 moose inhabited the area.

Mortality of moose is high and has been for many years. Starvation, poaching, road and train kills, and other accidents take a large number of moose each year. More moose die annually from these factors than are added to the population, consequently moose numbers are declining.

Moose habitat within the mountainous summer range is considered good. Extensive urbanization within the Anchorage lowlands and hillside area has eliminated large tracts of former prime winter range. Loss of winter habitat is a major factor in the decline of the population.

Moose have been heavily hunted in the area over the past 25-30 years. Prior to 1940 moose were infrequently found and therefore seldom hunted. At the end of World War II increased moose and human populations, coupled with improved access, resulted in a greater interest in moose hunting. Moose harvests increased during the 1950's and peaked during the early to mid-1960's. In 1965, more than 500 moose (50 percent cows) were taken. An average of 120 moose (25 percent cows) were taken annually between 1966 and 1973. Only 54 moose were legally taken in 1974, and in 1975 only 43 were taken. The decreasing harvest is a function of the reduced moose population, more closed areas, shortened seasons, access restrictions, and bulls-only hunting. Hunter numbers have also decreased from a 1965 high of 800 to 900 to a 1975 low of 235.

Moose hunts by permit only have been held on Fort Richardson Military Reservation several times over the past 10 years. These hunts were an attempt to reduce the number of moose-auto collisions and to keep the Fort Richardson moose population in balance with its habitat. The hunt was popular with local residents but has not been held in recent years because of reduced moose abundance on the Base. Hunters applying for the Fort Richardson hunt, as well as those hunting during the regular season, were mainly residents of Anchorage and surrounding communities.

Viewing and photography are popular year-round uses of moose. Land in the vicinity of Fort Richardson and lower Eagle River offer the best opportunities for viewing moose. About 300 moose winter on Fort Richardson and vicinity and throughout the December-April period some moose are visible from the Glenn Highway where it passes through the base. Moose are also commonly seen in the Portage and Eklutna drainages.

Popular hunting access routes include the Knik River Road and Hunter Creek trail, the Eklutna Road, the Eagle River Road and trails, the Ship Creek trail, the Bird Creek trail, and the Twentymile River. Since the creation of the old West Chugach Management Area in 1968, hunting transportation off established roadways has been restricted to foot, boat, or horse travel only. Present Chugach State Park access restrictions are similar to those for the old management area and apply to all uses of the area.

MATANUSKA VALLEY MOOSE

LOCATION

Game Management Unit 14A excluding the Chickaloon River drainage above Boulder Creek, the Palmer Hay Flats Moose Management Plan area, and the drainages flowing into the south side of the Matanuska River east of Wolverine Creek drainage.

THE SPECIES

Extensive land clearing and fires associated with settlement of the Matanuska Valley during the 1930's created much favorable moose habitat and resulted in a rapid increase in the moose population during the 1940's and 1950's. Subsequently, the population experienced large winter die-offs as a result of overpopulation. Large harvests of moose since the early 1960's have helped to check population growth, but some winter mortality still occurs. Estimates of population size are difficult because movements of moose into and out of the valley affect densities of animals present at different times of the year. Aerial moose composition surveys are generally conducted in November or December after snow has driven moose down into the valley and they are more visible. In most years since 1967 more than 2000 moose have been seen on aerial surveys; actual numbers of moose present, however, may be twice that observed.

Starvation during severe winters, particularly during past years of excessive moose populations, has been the most important mortality factor. Some moose are taken by wolves and black and brown bears, but predation probably has little effect on moose abundance in the area because predators are relatively scarce due to the large human population. Nonhunting human-related mortality is significant; in 1974, 33 moose were killed by autos, at least 7 by trains, 7 killed in defense of life and property, and at least 49 killed illegally. Survival of calves until November-December has been good in recent years with more than 40 calves observed for every 100 cows. High levels of recruitment have supported sustained large hunter harvests.

The Matanuska Valley moose population has been one of the most intensively harvested populations in the state. More than 10,000 moose have been taken since statehood with annual harvests ranging from 164 to 1369. Antlerless moose hunts contributed to larger harvests prior to 1973. Since 1973 only antlered moose have been legally harvested. In most years from one thousand to two thousand persons have hunted in the valley. Season reductions in recent years and the lack of antlerless hunts have lowered hunting pressure somethat, but it remains intensive and its effect on the moose population, especially in the absence of antlerless hunts, has been to lower the bull: cow ratio. Fifteen males were observed for every 100 females in 1975 surveys. Very few large antlered bulls have been available to hunters because most bulls are killed as young animals.

Nearly all hunters are Alaska residents except for personnel from the military bases near Anchorage. Guiding is limited because competition with local hunters is intense. Recreational hunting for meat has been the primary use of moose in the valley.

Access is good over much of the valley on a network of side roads and trails. Many lakes, gravel bars and maintained airstrips provide aircraft landing sites. Snowmachines were used in the past, but season timing in recent years has precluded their use due to lack of snow.

MATANUSKA GLACIER MOOSE

LOCATION

In Game Management Units 13 and 14, all drainages flowing into the south bank of the Matanuska River east of the Wolverine Creek drainage to and including the East Fork of the Matanuska River.

THE SPECIES

The Matanuska Glacier area is largely inaccessible and supports generally poor moose habitat and relatively few moose. The dominant plant species in the area are spruce and alder. Some browse species are found in smaller drainages which join the Matanuska River. Little information about numbers of moose is available, but concentrations of 20 or more moose have been observed along the South Fork of the Matanuska River. Local residents report that 15 to 20 years ago more moose were found along Glacier Creek than is the case today.

Few hunters use the area, and the number of moose killed is low. In 1974 only 5 moose were known to have been taken in the area. Cow moose have seldom been taken. Guided hunts in the area are rare. The most likely attraction of the area for the few hunters who use it is the opportunity for a relatively secluded hunt.

Access is limited in the area. The Glacier Creek trail was used for many years by hunters, but a private development at the foot of the Matanuska Glacier has discouraged its use in recent years. The South Fork is accessible in late fall by walking, all-terrain vehicles, horses, and later by snowmachine. Access is poor or non-existent elsewhere. The Matanuska River is a formidable barrier much of the year, and several people have drowned trying to cross it.

SKWENTNA MOOSE

LOCATION

That portion of Game Management Unit 16B west of the Yentna Glacier, the East Fork of the Yentna River and the Yentna River.

THE SPECIES

Information from aerial composition surveys, past harvest data, and observations of winter kills all indicate that moose in the Skwenta area number into the thousands. Aerial composition surveys have alternated among sample areas from year to year, and numbers of moose seen have ranged from 300 to 1000 moose. Moose harvests prior to implementation of more restrictive regulations ranged from 600 to 1000 animals, yet moose remain relatively abundant. Winter-killed moose are regularly seen along Alexander Creek and the Susitna River, which suggests that the number of moose may exceed what the winter range can support. In severe winters such as 1971-72, several hundred moose are known to have died.

Productivity of moose in the Skwentna area has generally been good. In fall it is common to find 30 to 40 calves per 100 cows. However, severe winters may substantially impair productivity; in fall 1972, only 10 calves per 100 cows were observed, and yearlings were rare. Although production of calves is usually good, and in years when snow depths are moderate survival is also good, the occasional winter of very deep snow results in substantial mortality of calves, as well as of bulls and very old cows. The extent of predation is unknown, but currently it does not seem to be a serious problem.

The legal kill of moose in the Skwentna area has fluctuated over the years in response to hunter demand, hunting conditions in other areas, changes in hunting seasons, restrictions on transportation methods and means, and accessibility. For many years in the 1960's moose were abundant in other, more accessible areas, and hunting effort in the Skwentna area, which lacks easy access, remained relatively low, even though seasons and bag limits were liberal. As moose declined in other areas, hunting pressure increased in the Skwentna area. More hunters, better equipped with snowmachines and ski-equipped aircraft and unable to easily take moose elsewhere, rapidly developed techniques for killing large numbers of moose in the area. A commercialized aircraft transport system for hunting developed which led to large kills and reports of considerable waste in the early 1970's. Greater restrictions including the elimination of winter hunting seasons, the prohibition of hunting on the same day the hunter is airborne, and constraints on cow hunting all led to the current low harvests (250 moose in 1975).

Most hunters using the Skwentna area are Alaska residents. Fewer professional guides are active in the area than prior to enactment of the regulation prohibiting hunting on the same day the hunter is airborne. Trophy hunting occurs, and in past years a number of record-class moose trophies were taken in the area. In general, hunting is the most common use of

moose in the Skwentna area. Airplanes continue to be the favored transportation method; boats are second in popularity.

The proportion of bulls in the population seems to be declining as a result of hunter selectivity, possibly augmented by the greater susceptibility of bulls to winter mortality. The combination of limited harvests, limited winter range, a high proportion of cows, and periodic severe winters may perpetuate substantial periodic winter-kills.

PETERS-DUTCH HILLS MOOSE

LOCATION

Game Management Unit 16A.

THE SPECIES

Moose populations have declined in the Peters-Dutch Hills region since the 1950's. With the decrease in population size, moose productivity has increased. Currently 15 percent of the herd consists of calves as opposed to 13 percent in 1955. Bull/cow ratios have steadily declined since the 1950's when 80 males/100 females were seen. Presently there are 18 to 30 males per 100 females. Hunter preference for bulls is the primary reason for the declining bull:cow ratio, although winter kill situations favor females also. The number of moose counted in surveys since the early 1970's has remained relatively constant, varying between 600 to 850 animals. Actual numbers of moose present are greater than the number seen on surveys.

Little is known of natural mortality in this area except that moose have sustained heavy losses during severe winters. Wolves are present in moderate numbers, and wolf-killed moose are commonly seen during winter above timberline as well as along river bottoms. Black and brown bears occur in the area, but their influence on calf survival is unknown.

Little is known about the condition of moose habitat in the area. Many moose frequent an old burn area in the western foothills where browse appears in good condition. In other areas such as along the Tokositna River bottoms, moose browse is often covered by deep snow in winter and is unavailable.

Hunting seasons historically were liberal (2 month, split seasons) until 1971, after which seasons became shorter and more restrictive until 1975 when a September 1 to 20, bulls-only season was allowed. Antlerless moose hunts were allowed through 1974, and harvests of cows were approximately one third those of bulls. Total annual kills usually ranged between 40 and 100 moose. In 1974, 110 moose were taken, 33 of which were cows.

Most hunting in the area is for recreational meat purposes by Anchorage and Palmer area residents. Some guided nonresidents also hunt the area, but guiding is not extensive. Land adjacent to the road system receives most of the hunting pressure, even though the terrain does not lend itself to foot travel. The Cache Creek drainage is heavily hunted by miners who utilize a road leading into that portion of the area. Many hunters utilize the services of air taxi operators to reach less accessible areas. Riverboat access from the Sustina River is also utilized. In the past, winter seasons allowed for greater accessibility by ski-equipped aircraft and snowmachines. Late season moose movements also brought more animals within walking distance of the road.

CHELATNA LAKE-YENLO HILLS MOOSE

LOCATION

That portion of Game Management Unit 16 bounded by the Yentna River upstream from its confluence with the Kahiltna River to the East Fork of the Yentna River, up the East Fork of the Yentna River to Yentna Glacier, northeast along the Yentna Glacier to the Mt. McKinley Park boundary, east along the Park boundary to the Kahiltna Glacier, down the Kahiltna Glacier to the Kahiltna River, and down the Kahiltna River to the starting point.

THE SPECIES

Moose are generally abundant in the Chelatna Lake-Yenlo Hills area, particularly during fall and early winter. The area receives substantial snowfall which is an added stimulus to annual movement of moose to lowlands during winter. Deep snow may also be responsible for recent substantial declines in the proportion of calves observed during aerial composition surveys. In Sunflower Basin calf:cow ratios declined from 34:100 in 1973 to 27:100 in 1974 and to 19:100 in 1975. The proportion of bulls, however, has remained higher than in many other areas, with up to 40 bulls per 100 cows observed.

Winter ranges appears to be in limited supply, and in places browse species have been over-utilized. In severe winters the lack of good browse causes significant starvation losses and may also contribute to poor calf production the following spring.

Moose harvests currently are not large. In 1974, about 60 moose were taken, including 25 females. Most hunters are probably Alaska residents, but several guides operate in the area, and nonresident hunting is probably substantial. Trophy hunting occurs, but most Alaska residents probably seek recreation and meat. The area has produced large-antlered bulls, and should continue to do so. Hunting pressure has decreased due primarily to the no-hunting-same-day-airborne regulation. Gradual reductions in season lengths (to offset increased hunting effort resulting from restrictions in other areas) have also affected hunting pressure.

Access to the Chelatna-Yenlo Hills area is limited; aircraft are the preferred transportation, but boats, snow machines and all-terrain vehicles are also used. No roads and few trails exist. Under current regulations, access is sufficiently difficult to have held the harvest below what the area can sustain.

TALKEETNA MOUNTAINS MOOSE

LOCATION

Game Management Unit 14B except for the drainages into the Talkeetna River upstream from the confluence of the Talkeetna River and Iron Creek.

THE SPECIES

Moose populations in the Talkeetna Mountains are slowly declining. The number of animals seen during aerial surveys has generally ranged from 1,000 to 2,000. Only 550 moose were seen in 1974, but time spent surveying was also reduced. Moose were evidently much more numerous in the 1950's. Hunting has had little effect on the moose population; fluctuations in numbers of moose in the Talkeetnas are probably due to weather and habitat conditions. Calf survival until early winter has generally been good, with 30 to 40 calves per 100 cows observed during November surveys. The incidence of twin calves is low; in the last four years, the twinning rate has ranged from 2 to 8 percent. Bull-cow ratios have declined considerably, due to hunter selectivity for males.

Much of the area is either above timberline or is heavily timbered with birch, aspen, and small spruce trees. Several of the larger river valleys contain important moose winter habitat. Moose usually leave the area above timberline when snow depths increase. Although there are old burns in the area, fires in the past 10 years have been quickly controlled, thus limiting natural browse rehabilitation.

The use of moose in this area is primarily for recreational meat hunting. However, the area is lightly used by hunters, primarily because of limited access. Moose are located high in the mountains and foothills in September and are extremely difficult for hunters to reach. Snow conditions normally do not force moose down near the road system until January or February when hunting seasons are usually closed. Most hunters using this area are Alaska residents, primarily from the Matanuska Valley and Anchorage. Some nonresidents also hunt the area, usually with the aid of a guide; however, guiding operations are limited in the area, due to its inacessiblity. Guides that operate there have a reasonably high moose hunting success rate. Harvests in this area are much lower than the population could sustain. Although 312 moose were reported taken in 1971, the harvest averages close to 100 moose per year. Most moose harvested have been males, due to public resistance to antlerless moose hunts. Hunting season lengths have been reduced in recent years to a 20-day season in September, further lowering harvests. In 1974, 59 moose were harvested, 41 of which were males. Only 17 percent of 355 hunters were successful. Poor access limits hunter distribution to the vicinity of the Parks Highway and a few side roads, and to the Peters-Purches Creek Trail. The remainder of the area is virtually unhunted because few aircraft landing areas exist. Some winter observation of moose by highway travelers occurs in the area. Viewer success can be excellent in late winter-early spring, particularly when deep snows have forced moose into the lowlands.

TALKEETNA RIVER MOOSE

LOCATION

Those portions of Game Management Units 13 and 14 including the drainages of the Chickaloon River above its confluence with Boulder Creek; the Talkeetna River above its confluence with Iron Creek; all drainages into the north bank of the Talkeetna River downstream from its confluence with Iron Creek and all drainages into the south bank of the Susitna River, from its confluence with the Talkeetna River upstream to and including the drainage of Kosina Creek.

THE SPECIES

Approximately 1,000 moose occur in the Talkeetna River area. Aerial surveys in 1974 and 1975 located 535 moose, but not all the area was surveyed and not all moose present were seen. Ratios of 28 bulls per 100 cows and 16 calves per 100 cows were found for the area. Most bulls seen were large because calf survival has been low and relatively few young bulls enter the population each year. Little is known about past abundance of these moose. The number of moose seen on comparable portions of the Talkeetna River decreased between the 1974 and 1975 counts. It is possible that moose numbers in this area and in the adjacent Nelchina area are affected by similar factors. Calf survival may be too low to compensate for adult mortality. Hunting has never been a substantial mortality factor because of the area's remoteness.

Habitat quality has probably declined since no major recent forest fires have occurred here. However, much of the moose browse of this area is subalpine or riparian willow species and may change only with climatic changes. Lack of forage probably causes starvation of some moose during winters with deep snowfall, but this probably is not currently a major limiting factor to the moose in this area.

The harvest of moose is relatively light due mainly to the limited points of access available. Aircraft are the most important means of transportation; off-road vehicle trails are limited. The hunting season has allowed harvests of bulls only in recent years. Harvests from this area for 1974 and 1975 were 47 moose each year. Hunter success was 44 percent among 107 hunters hunting moose in the area in 1975, and 71 percent of the successful hunters were Alaskan residents. Most hunter effort has probably been recreational meat hunting combined secondarily with quests for trophies. Assuming that the number of nonresident hunters are indicative of professional guiding activity, the 36 percent nonresidents among successful and unsuccessful hunters in this area as compared to the 7 percent nonresident hunters for all of the adjacent Nelchina Basin area indicates that guiding in this area is relatively important. Because of the inaccessibility of the area little use of these moose by nonhunters occurs.

KLUTINA MOOSE

LOCATION

That portion of Game Management Unit 13D bounded on the south by the Game Management Unit 6 boundary; on the west by the Klutina Glacier and River, the eastern shore of Klutina Lake, St. Anne Creek and Lake, and a line due north from the outlet of St. Anne Lake to the Glenn Highway; on the north by the Glenn Highway; on the east by the Richardson Highway.

THE SPECIES

Moose in this rugged area are sparsely distributed and occur near the heads of larger valleys during hunting season. Inventory counts of most of this area during 1974 and 1975 yielded 615 moose. However, not all of the area was surveyed and not all of the moose were seen. Numbers of moose seen have been declining at an annual rate of four percent per year since 1967. Calf:cow ratios have been declining at an annual rate of five percent per year since 1967. The calf:cow ratio found in this area during 1975 was seven calves per 100 cows, well below the level necessary to maintain moose numbers. Bull:cow ratios were relatively high at 38 bulls per 100 cows during 1975. Some large-antlered bulls are present.

Moose were scarce when miners first came into the area in the early 1900's. The moose population increased when favorable habitat was created by fire, and achieved high levels in the late 1950's and early 1960's in response to excellent habitat conditions, relatively mild winters, and intensive federal predator control. Since the mid-1960's the population has declined. Factors contributing to the decline have included loss of productive browse habitat as a result of effective fire suppression over the past two decades, a rapid increase in predator populations following cessation of control efforts in the mid-1950's , and a number of severe winters with deep accumulations of snow.

Most use of moose in the Klutina area has been for recreational and trophy hunting. Hunting pressure has been relatively light due to the uneven moose distribution and poor hunter access. In 1974 and 1975, 39 and 25 moose, respectively, were taken from this area. There is only one secondary road into the area (the Klutina Lake Road) and a few trails used by off-road vehicles (Squirrel Creek Trail and Rock Creek Trail). Aircraft have been the most used form of hunter transport in recent years with six usable airstrips in the area. Listed in order of importance, boats, highway vehicles, off-road vehicles, and horses have also been used for transport. In 1974, the most recent year for which data are available, 39 percent of the hunters were successful. More than 80 percent were resident Alaskans. Two established guide operations are located at Manker Creek and High Lake. Other guides using the area have no permanent camps.

NORTHERN CHITINA MOOSE

LOCATION

In Game Management Unit 11, that portion of the Chitina Valley bounded on the south by the Chitina River, on the east by the Canadian border, on the north by the crest of the Wrangell Mountains, and on the west by Long Glacier and the Kotsina and Copper Rivers.

THE SPECIES

Moose are sparsely distributed in this area. Reports from guides and local residents indicate that moose have declined markedly during the past ten years. Aerial moose composition surveys initiated in the central portion of this area in 1973 indicate low calf survival is the problem. Fall calf:cow ratios have averaged less than 10 calves per 100 cows for the past three years. Most guides and local residents report wolves are abundant and grizzly bears are common. No recent exceptionally deep snow accumulations have been recorded, and moose browse along the Chitina valley appears abundant and only lightly utilized.

Legal harvests from this area have been small. No moose were reported taken from this area in 1974 and only eight bulls were taken in 1975. Because harvests have been light and young bulls are scarce, many of the bulls seen and taken by hunters have been older, trophy-size animals. In past years, guided nonresidents transported by light aircraft took most of the legal harvest. With increased numbers of resident hunters resulting from the opening of the Chitina-McCarthy Road and with the decrease in moose numbers, several guides now take their clients elsewhere for moose, and harvests by nonresidents have dropped to a low level. Because of a large increase in unemployed or seasonally employed residents living in the Chitina-McCarthy vicinity, the unreported, out-of-season moose harvest probably substantially exceeds the legal harvest. Legal and illegal harvests have probably had no substantial part in the decline of the moose population.

SOUTHERN CHITINA MOOSE

LOCATION

In Game Management Unit 11, that portion of the Chitina Valley bounded by the Copper River on the west, the Chitina River on the north, the Canadian border on the east, and the crest of the Chugach Mountains on the south.

THE SPECIES

Little is known about moose in this remote area. Two local guides that formerly hunted moose in the area indicated that moose were common during the early 1960's but are markedly fewer now. Moose composition counts have never been made in this area. Harvests have been very low, and most bull moose seen are relatively old; many of the bulls taken here by hunters have been trophy-size animals.

Use of these moose has been limited because of the area's remoteness. There are no roads, no villages, and no permanent residences in the area. Moose harvests during recent years have ranged from none to five moose and probably never exceeded ten moose since the gold mining era. Nonconsumptive use, other than that which is incidental to hunting or fishing is almost nonexistent. Access during summer is primarily limited to aircraft landing on unimproved airstrips. One guide keeps horses south of the Chitina River. The Chitina River can be crossed after freeze-up by snowmachines and tracked vehicles.

TONSINA MOOSE

LOCATION

That portion of Game Management Unit 13 bounded on the west by the Richardson Highway, on the north by the Edgerton Highway, on the east by the Copper River, and on the south by the north banks of the Tasnuna and Lowe Rivers.

THE SPECIES

Moose in this area were formerly plentiful, but high natural mortality, harvests by hunters using mechanized access, and low replacement levels reduced the population. Moose are now generally found in the upper portions of the drainages, usually out of reach of walk-in hunters.

Since regulations excluding use of mechanized vehicles and pack animals from August 5 to September 30 were implemented in 1974, sport hunting use of this area has been primarily by sheep hunters. Prior to establishment of the walk-in area, some moose hunters used all-terrain vehicles on the Bernard Creek Trail, Tonsina Trail and Tiger Mine Trail to reach hunting areas. Once hunters passed timberline, they were able to cover large areas easily with all-terrain vehicles. Hunters also used all-terrain vehicles to establish roads where possible in moose habitat and undoubtedly contributed significantly to the reduction of the moose population.

NELCHINA BASIN MOOSE

LOCATION

Game Management Units 11 and 13, excluding the Tonsina, Klutina, Northern Chitina, Southern Chitina, Matanuska Glacier, and the Talkeetna River Moose Management Plan areas.

THE SPECIES

Moose numbers in the Nelchina Basin have fluctuated widely since the early 1900's. Moose were scarce between 1890 and 1910. They became common by the 1930's, in part due to increased moose forage resulting from forest fires. Additionally, disease reduced wolf populations which lowered predation rates. Frequent forest fires maintained good moose range conditions through the 1950's, and in combination with mild winters and intensive Federal predator control provided favorable conditions for a rapid increase in moose numbers. The moose population reached a peak during the early 1960's, then began a decline that has continued to the present time. Factors contributing to the decline have included loss of productive browse habitat as a result of effective fire suppression over the past two decades, a rapid increase in predator populations following cessation of control efforts in the mid 1950's, and a number of severe winters with deep accumulations of snow. Hunting contributed to the decline in some portions of the area prior to 1972 when antlerless moose were harvested.

Recent estimates based on 1974 and 1975 aerial surveys, where 6,394 moose were seen, place the Nelchina population at from 10,000 to 15,000 moose. Among moose observed, there were 16 bulls per 100 cows and 21 calves per 100 cows. Most bulls seen were young; large-antlered moose were uncommon.

About 600 moose have been harvested from the Nelchina area annually during recent years. Bull-only hunting seasons have been in effect since 1972. With normal calf survival this level of harvesting would be considered relatively light. Because calf survival is so low, however, the proportion of bulls to cows has been declining steadily for many years. Before it was recognized that range conditions by themselves were not limiting calf survival, bull and cow seasons were in effect in this area, and part of the population decline in heavily hunted areas was due to hunting. Hunting under current restrictive seasons and bag limits has little long-term effect on the moose population's welfare so long as bull:cow ratios are sufficiently high to assure maximum and timely breeding. Bull:cow ratios have been declining, however, and it may be necessary in the near future to stop hunting.

Moose are generally most vulnerable to hunters after snowfall and least vulnerable when leaves are still on shrubs and trees. Transportation employed by hunters has varied with season lengths and regulations affecting aircraft-transported hunters. Most successful hunters used

off-road vehicles in 1974, although aircraft and highway vehicles were also commonly used. Relatively few hunters used boats, horses, motorbikes, or snowmachines. Seventy-five percent of the successful hunters were Alaska residents. Hunter success has dropped from 30 to 40 percent in the 1960's to 20 to 30 percent since 1971. The majority of hunters have been recreational meat hunters.

PAXSON MOOSE

LOCATION

In Game Management Unit 13B, the Paxson closed area including the eastern drainage of the Gulkana River lying west of the Richardson Highway and the western drainage of the Gulkana River between the Denali Highway and the north end of Paxson Lake where the Gulkana River enters Paxson Lake.

THE SPECIES

The abundance of riparian willow along the Gulkana River in the Paxson area has always attracted moose, especially during winters of heavy snow accumulation. During the 1974-75 winter approximately 75 moose utilized this small area. During the winter of 1975-76, with below normal snow accumulation, moose were less concentrated and generally wintered on the slope west of Paxson Lake, several miles to the south.

During summer months moose are not concentrated but visitors still have a high probability of viewing or photographing moose feeding in ponds along the highway.

This area has been of particular interest to many local resident and nonresident visitors due to the opportunity for viewing and photographing wildlife in its natural setting. The majority of the use is during the summer period when visitors are attracted to the area to view brown bear feeding on salmon in the Gulkana River.

MOOSE IN SOUTHWESTERN ALASKA

Moose (*Alces alces*) are found throughout most of the Southwestern Alaska mainland below elevations of 5500 feet. Prior to 1900 moose were rare in the southern part of the region, although they were beginning to filter south and west from the Lake Clark-Lake Iliamna region. During this early expansion moose reached the Katmai area by 1910 and extended south to Black Lake by the early 1940's. Nearly all suitable habitat on the Alaska Peninsula was occupied by the early 1950's, with major concentrations extending from Katmai Monument south to the Meshik River. South of the Meshik drainage to Port Moller moose populations have never become as dense as populations to the north. Few moose exist south of Port Moller. Cook Inlet drainages north of Katmai and those in the vicinity of Iliamna Lake and Lake Clark have fair numbers of moose, but substantially less than areas further south. Bristol Bay drainages from the Mulchatna River west have few moose; these are found primarily along stream bottoms and in the foothills of the Alaska Range.

Moose populations in the central Alaska Peninsula peaked during the mid-1960's and have declined from one third to one half since that time. Populations in Cook Inlet drainages and in the Iliamna Lake region north of Katmai are reduced from peak levels of the 1940's and 1950's and are presently stable at relatively low densities. Moose were relatively abundant in the Wood River-Tikchik Lakes area in the mid-late 1950's, but in other northern Bristol Bay drainages moose have not been abundant and are presently static at a low level.

Major factors causing the decline in the central Alaska Peninsula area are believed to be habitat related. Deficiencies in habitat are generally manifested by the scarcity of essential browse during the critical winter months. The lack of variety of browse species has historically limited the moose to two preferred species of willow. With those species presently greatly reduced due to prior over-utilization it is possible that food quality is now low even during the prewinter months of October and November. Consequently moose may not be in good condition at winter's onset and their condition then continues to decline until spring. Cows debilitated by poor nutrition may give birth to weakened offspring which they cannot adequately feed or that prove highly vulnerable to predators. Such is apparently the case on the central Alaska Peninsula since spring surveys indicate the lowest summer calf:cow ratios in the state. Mid-June averages over the past 5 years have been only 21 calves per 100 cows. Additional calf mortality throughout the first year of life, such as starvation, predation, and various other factors result in very few yearling moose being added to the population. Such extremely poor recruitment, in addition to natural losses and hunting mortality among adults, has resulted in significant population reductions.

Moose in the Cook Inlet drainages and the Iliamna Lake area north of Katmai have been utilized by local village residents since moose first became available. Recreational hunting for both meat and trophies by other than local residents has been popular since the mid-1950's. Several professional guides operate within the area. Annual harvests

over the past several years have averaged slightly less than 100 moose, 75 percent of which were bulls. In 1975 a shortened season and no antlerless hunting resulted in a harvest of only 34 bulls. Aircraft and boat travel are the most popular means of transport for hunters.

Moose in the Bristol Bay drainages from the Mulchatna River west have been harvested by local village residents over the past several decades. Only bull moose may be legally taken. Moose numbers in the vicinity of all villages are presently reduced as a result of overharvesting of all sex and age classes during the late winter and spring by local residents. This harvest goes unreported and is suspected to exceed the known reported sport harvest by several fold. During recent years recreational hunting by other than local residents has become increasingly popular and presently accounts for most of the reported harvest. Sport harvests have increased greatly in the past 2 years due to a shift in hunting pressure from the central Alaska Peninsula area, where a lack of trophy moose and shortened seasons forced hunters elsewhere. Between 1964 and 1973 an average annual harvest of only 34 moose were reported in the northern Bristol Bay area, with harvests never exceeding 42 per year. In 1974 and 1975, 69 and 115 moose, respectively, were taken. Actual harvest levels are substantially higher than records indicate because of the unreported kill by local villagers. Aircraft and boat travel are the most popular means of transport for sport hunting while snowmachines are important in the illegal winter harvest. Several professional guides are active in this area.

Moose populations from Katmai National Monument south to Port Moller have been heavily utilized by nonlocal hunters since the late-1950's. The area supports a substantial and very active guide industry, particularly south of King Salmon. Village residents also harvest some moose for domestic use, many of which are not reported. During the 1960's and early 1970's the area supported perhaps the finest trophy moose population in North America. Most of the largest antlered moose ever killed came from the Alaska Peninsula.

Greatly increased hunter pressure (over 800 hunters both in 1973 and 1974), with greater than 70 percent success, resulted in harvests averaging 650 moose (one-third females) during 1973 and 1974. Large harvests coupled with poor recruitment of adults has resulted in a marked reduction of moose. Ratios of bulls older than yearlings have declined from a high of 80 bulls per 100 cows in 1963 to a low of 17 bulls per 100 cows in 1974. Very few extremely large bulls have been harvested during the past 2 years. Recent prohibitions on hunting moose the same day airborne, shortened seasons, and restrictions on shooting moose with antler spreads less than 50 inches, should increase the availability of trophy bulls within the limits that poor recruitment allows. Aircraft are the most popular means of transport for sport hunting but some guide operations make extensive use of all-terrain vehicles.

KVICHAK-MULCHATNA MOOSE

LOCATION

That portion of Game Management Unit 9 north of the Egegik Bay drainages except Katmai National Monument, and all of Game Management Unit 17 except the Lower Nushagak-Wood River-Togiak Moose Management Plan area.

THE SPECIES

Moose numbers were reportedly high in the Lake Iliamna-Cook Inlet watershed during the 1940's. They have since declined and the area now (1976) has a low density population that appears to be relatively stable. Data are lacking on moose in the upper Nushagak and Mulchatna watersheds, but populations there also appear to be relatively stable at a low density. Areas of concentration have been located near Big Mountain, Chekok Creek, the Tikchik Lake system, and the upper Mulchatna-Chulitna Rivers area. The estimated population within the Kvichak-Mulchatna area is about 1,500 moose.

Both wolves and brown bears prey on moose. At the time of this report predation is not considered to have a significant impact on the population. However, residents of the Nushagak River drainage have expressed concern about the impact of wolf predation and have requested wolf control or more liberal harvest regulations on wolves.

The area is hunted primarily by Alaskan residents. Nonresidents have taken only 28 percent of the reported harvest since 1969. In recent years, the area has become more popular with hunters other than local residents, and harvests have been increasing. The annual kill in lower Cook Inlet has averaged 132 moose since 1969. Reduced seasons during the 1975-1976 regulatory year lowered the kill to only one-half that average. The upper Mulchatna River drainages had low annual harvests until 1975 when hunting pressure increased as a result of restrictive seasons elsewhere in the state. That year the reported harvest increased to 71 moose, a sharp increase from the 6 moose reported taken in 1974. Current harvests are probably approaching maximum levels.

The Kvichak-Mulchatna area has a well-established guiding industry, but emphasis is on sport fishing (23 active sport fishing lodges). Many guides also offer big game hunting to their clients. Pressure from nonresident hunters will increase in the future. In addition to moose, the area also has brown bears, black bears, caribou, and Dall sheep. Multi-species hunts are popular with both residents and nonresidents.

The majority of the reported harvest is by residents living in urban areas of the state. Additional moose are taken by local residents and never reported. The villages of Levelock, Igiugig, Newhalen, Kokhanok, Pedro Bay, and Nondalton reported a harvest of 98 moose for domestic use in 1973 according to a survey by the University of Alaska. Although not located entirely within the proposed boundaries of this management plan, the same survey indicated 113 moose were taken by villagers living along

the Nushagak River. The percentage of this harvest that occurred in the Mulchatna and upper Nushagak drainages is unknown. The importance of moose as a meat animal is clearly reflected by the high reported antlerless harvest for lower Cook Inlet: 36 percent of the animals reported harvested since 1969 have been antlerless.

Transportation within the area is primarily by light aircraft. Boats are used along the waterways and in the major lakes. During the winter, snow machines are widely used by local residents. The area is essentially wilderness. The impact of oil exploration and mineral development has been minimal. Test holes have been drilled at one location in Cook Inlet and a few small claims are being worked. It is probable that resources will be developed in the future and such development may affect moose habitat or hunting pressure. Roads within the area are now limited to local service roads and a single road connecting Lake Iliamna to Cook Inlet. Proposals to tie the existing system into the main state highway system could significantly alter the existing transportation patterns, cause an influx of people into the area, and drastically alter the economy and life style of the area.

LOWER NUSHAGAK-WOOD RIVER-TOGIAK MOOSE

LOCATION

In Game Management Unit 17, all drainages of the Togiak River, Wood River and Nushagak River below the confluence of the Mulchatna River and the Nushagak River.

THE SPECIES

Moose numbers within this area are quite low. Excellent habitat occurs along waterways and in the lower elevations of the Wood River Mountains. Surveys have not located sufficient concentrations of animals to gather usable data on numbers or composition. The estimated population of the entire area is less than 300 animals.

Moose hunting is almost entirely by local residents for domestic use. Although the Wood River Lakes system experiences heavy sport fishing use (four established guides plus additional pressure from nearby sport fishing lodges), the low density of moose has not encouraged guided sport hunting. The reported annual harvest for the past three years has averaged 24 moose. The majority of moose killed within this area are never reported. Most of the harvest by local residents occurs illegally in winter or early spring when access by snow machine makes hunting easy and moose are at lower elevations. In recent years, the intensity of this late winter harvest has increased as snow machines have proliferated. Sunshine Valley, for example, has decreased from 53 wintering moose in 1971-72 to only 14 during the winter of 1975-76. Nearly 20 illegal late-winter kills were located in the drainage during the winter of 1971-72. A survey of villages in Game Management Unit 17 by the University of Alaska in the summer of 1974 indicated a total harvest of 188 moose in the previous year. This exceeded the reported 1973 sport harvest for all of Unit 17 by 448 percent. Late winter harvesting of moose for domestic use by local residents has exceeded the reproductive capabilities of the moose population for several years. The moose population within this area has declined significantly and, unless the size of the illegal late winter-early spring harvest can be substantially reduced, the decline can be expected to continue.

Predation by wolves and brown bears is known to occur. Because of the low density of moose present, predation is helping keep moose populations depressed. However, predator control would not be justified so long as illegal harvesting by local residents remains the primary factor affecting the decline of the moose population.

The area is essentially wilderness. Impacts of oil and mineral exploration have been minimal. Possibilities of future development of these resources exist and could have an effect on management, particularly on private lands. Transportation within the area is primarily by light aircraft. Boats are used along rivers and in lakes. During winter, snow machines are the primary method of transportation. A limited road system exists in the Dillingham-Aleknagik area, and there are local service roads in the vicinity of some villages.

BECHAROF LAKE-CINDER RIVER MOOSE

LOCATION

In Game Management Unit 9, all drainages into Bristol Bay south of and including the King Salmon River that flows into Egegik Bay to but not including drainages of Port Heiden.

THE SPECIES

The greatest densities of moose on the Alaska Peninsula occur within this area. The estimated population in the Becharof Lake-Cinder River area is about 2,000 moose. The largest concentrations are in the vicinity of Dog Salmon River, Mother Goose Lake, and Cinder River. Moose spend summer and fall in the lower elevations of the Aleutian Range. Winters are spent at slightly lower elevations; rarely do winter snow depths force moose far from the foothill areas.

Moose entered the area in the 1930's and gradually expanded their range south and west. Numbers increased until the mid-1960's when the population peaked. Since that time, numbers have declined as a result of poor reproductive success. The lack of calves appears related to past overuse of the range during the period of peak population. Since 1970, fall surveys have indicated less than 22 calves per 100 cows for any area. Counts have ranged as low as 8 calves per 100 cows, and the combined average for all count areas since 1970 is only 12 calves per 100 cows. Moose removed from the population by hunting, predators, disease, old age and accidents are not being replaced through calf production. Not all cows are successful in giving birth and there is also an evident decline in the abundance of calves immediately following parturition. Although predators have been observed in calving areas, their numbers appear too low to account for the calf loss observed. Both wolves and brown bears prey on moose, and predation, like sport hunting, is accelerating the decline; however, the herd would continue to decline in the absence of hunting and predation with the present rate of calf production. Predation and hunting may be beneficial since lowering the number of moose reduces browsing pressure and hopefully will speed recovery of the habitat. However, the herd may continue to decline and eventually reach a level where, even with sport hunting eliminated, predation would prevent moose numbers from recovering under favorable habitat conditions. Only in that situation would a limited predator control program be considered a justifiable management option.

Trophy hunting has long been recognized in the area, producing some of the largest Alaskan moose on record. Multi-species hunts for moose, brown bears, and caribou are popular with both residents and nonresidents. The area supports a highly competitive guide industry; 15 permanent guide camps are established. Harvests have averaged about 230 moose annually since 1969, with bulls comprising 74 percent of the harvest.

Resident and nonresident hunters use the area in about equal numbers (51 percent residents). Since 1969, the area has become increasingly popular with Alaskan residents for recreational/meat hunts. The magnitude of the antlerless moose harvest clearly reflects the impact of this category of hunter. This area has produced 51 percent of the total Alaska Peninsula antlerless moose harvest over the 1969-1974 period. Harvests have averaged 63 antlerless moose annually since 1969 with a peak of 117 antlerless moose in 1974. An increased harvest of bulls in the early 1970's also resulted from the influx of resident recreational/meat hunters. Harvests of bulls has had a significant effect on herd composition. In the popular hunting areas, such as Mother Goose Lake, the bull-cow ratio dropped from 30 bulls per 100 cows in 1970 to 16 bulls per 100 cows in 1975. The less heavily hunted Dog Salmon River dropped from 62 bulls per 100 cows in 1970 to 22 bulls per 100 cows in 1974. Similar declines were observed in other portions of the area. The most noticeable effect of the harvest by recreational/meat hunters was the decline in the availability of large-antlered bulls. While large-antlered bulls were receiving heavy hunting pressure by both trophy and recreational/meat hunters, recruitment of large bulls from the younger age classes was reduced because young bulls were also being heavily harvested by recreational/meat hunters. In 1976, only seven to ten percent of the population was composed of bulls capable of growing antlers exceeding 50 inches in spread the next year.

Harvest by local residents for domestic use has been small. A survey by the University of Alaska indicated the villages of Port Heiden, Pilot Point, Ugashik, and Egegik harvested 14 moose in 1973-74. This represented three percent of the 410 moose reported harvested for the area that season.

Transportation within the area is primarily by light aircraft with hunting then conducted on foot. Most guides operate with their own aircraft, and many resident hunters use private aircraft. All terrain vehicles are used by a few guides for transportation. Air charter services in King Salmon provide transportation for both guides and hunters. The area is basically wilderness little affected by human activity. Past oil exploration activities included test drillings and construction of large landing strips at four locations. Extensive seismic work was conducted with the use of all-terrain vehicles in the past; recent work has been with helicopters or conducted on frozen tundra in winter. Trails from past all-terrain vehicle use are readily visible from the air but less evident on the ground except in areas of concentrated use.

MESHIK-PACIFIC MOOSE

LOCATION

In Game Management Unit 9, all drainages into the Pacific Ocean from Katmai National Monument on the northeast to Cape Kumliam on the southwest and all drainages into Port Heiden Bay.

THE SPECIES

The estimated population for the entire Meshik-Pacific area is less than 500 moose. Greatest densities occur in the Meshik River and southernmost Pacific drainages. Lower densities of moose occur in the Pacific drainages north and east of Cape Kuyuyukak. Moose entered the area in the early 1940's and increased in numbers until the mid 1960's, when the population apparently peaked. Since that time numbers have been declining, apparently due to poor reproductive success related to past overuse of the range. No large winter mortalities have been observed and predators do not appear to be an important factor affecting the decline. Instead, it appears that not all cows are successfully giving birth and immediately following birth there is a high mortality of calves. Moose removed from the population by hunting or natural mortality are not being replaced through reproduction.

Results of surveys in the Meshik River since 1970 indicate a decline in both the number of moose and the bull-cow ratio. The Pacific side has been surveyed only twice, so trend data are lacking. In both areas, the bull-cow ratio is below 50 bulls per 100 cows. Although the existing ratios are more than adequate to provide for good reproductive success, only ten percent of the moose observed were calves.

The area is primarily wilderness little altered by humans. Large landing strips associated with oil or mineral exploratory work were constructed near the Meshik River and at Wide Bay. The use of tracked vehicles for hunting has been established only in the Meshik Valley, but similar vehicles have been used throughout most of the southern area in oil exploratory efforts. Tracks from these vehicles are readily visible for several years from the air, but less evident on the ground except in areas of concentrated use.

Sport hunting became increasingly important in the Meshik-Pacific area during the 1960's and early 1970's after hunting pressure on the Bering Sea drainages of the Alaska Peninsula had reduced the availability of trophy bulls. Seasons in the area were very liberal until 1975 when greatly reduced seasons were implemented. Over the past seven years, the annual harvest has averaged nearly 50 moose, but the peak period, 1972-1974, produced 60 percent of the reported harvest. In 1975, the harvest dropped to only one-half the seven-year average. Prior to 1972, Alaskan residents accounted for 63 percent of the harvest. Since 1972, with the first heavy trophy hunting pressure, nonresidents have taken more moose than residents. The importance of guiding is reflected in the increasing level of the nonresident harvest. Six permanent guide

camps are established, but most guiding still occurs from temporary camps. Multi-species hunts are popular with both Alaskan residents and nonresidents. Additional hunting pressure has been attracted to the areas because of the excellent brown bear population. The intensity of trophy hunting since 1972 has exceeded the capability of the moose population to produce a sustained harvest of large antlered bulls.

Most moose hunting is for trophies with only a few Alaska Peninsula residents or commercial fishermen hunting the area for meat. The expense of logistics to the area has discouraged extensive meat hunting by residents from other areas. The antlerless harvest has averaged only eight animals annually since 1969. A survey by the University of Alaska indicates villagers of Meshik took only three moose in 1973 for domestic use. An additional harvest by residents of the Chignik area may have occurred but is unreported.

Transportation for hunters is primarily by light aircraft with landings on intertidal beaches or on natural pumice-gravel strips. Hunting then occurs on foot. Track vehicles are banned for hunting in the Pacific Management Area which encompasses a portion of the proposed Meshik-Pacific area. The Pacific watersheds have a record of light hunting pressure because weather frequently makes travel to, from, and within the area difficult and, until recently, other lightly harvested moose populations with good trophies were more readily available. The Meshik River drainages have also had light hunting pressure because access, even by aircraft, is limited. Float landings are possible in some locations. Other access for aircraft is restricted to wheel landings on pumice patches or abandoned mining strips. The river, although shallow, can be floated by raft. Boats can be used on the lower river and a single air boat is present that can travel the river and many of its large tributaries. Competition for large-antlered bulls on the Alaska Peninsula has recently encouraged heavy hunting pressure in spite of these limitations.

PORT MOLLER-BLACK LAKE MOOSE

LOCATION

In Game Management Unit 9, the Bering Sea drainages north and east of Port Moller, to and including all drainages into Ilnik Lagoon, and all Pacific Ocean drainages into Chignik Bay.

THE SPECIES

Although moose occur throughout the area, they tend to concentrate along the stream bottoms and in the foothills of the Aleutian Range in the summer and fall. Winters are spent in areas of suitable habitat on the Bering Sea flats. The population apparently entered the area in the 1940's and increased in numbers until the late 1960's. Since that time, numbers have been declining, apparently in response to poor reproductive success resulting from overuse of the habitat that occurred during years of abundance. No moose surveys have been made in the area so data on population size or composition are lacking. The estimated population is about 500 animals.

Hunting is primarily by trophy hunters. Reported harvests have averaged nearly 40 moose annually during the past seven years. Bulls have comprised 84 percent of the harvest. In 1975, the harvest was half the seven-year average (20 moose) because the season length was greatly reduced. Successful nonresidents outnumber successful resident hunters by nearly two to one. The area has an active guide industry with seven permanent guide camps established. Additional seasonal guiding occurs from temporary camps. Multi-species hunts for moose with brown bears and caribou are popular with both residents and nonresidents. Residents of the Chignik area take a few moose each year for domestic use. Occasionally persons from Ivanof, Perryville, Nelson Lagoon, and Meshik also hunt the area. The greatest impact on the resource, however, comes from nonresidents and Alaskan residents living elsewhere in the state.

Transportation within the area is primarily by light aircraft with hunting then occurring on foot. Most guides have their own aircraft, and resident hunters use private airplanes or charter with air charter services in Naknek, King Salmon, or Bear Lake. Two all-terrain vehicles have been operated by guides and, in some winters, residents of Chignik make extensive use of snow machines. Boats are used for transportation along the Chignik River system.

The area is essentially wilderness in spite of numerous oil exploratory efforts in recent years. All-terrain vehicles trails, readily visible from the air, but less evident on the ground, mark the paths of extensive seismic work. Test holes were drilled and a large landing strip constructed in one location. A high possibility exists that the area will have oil and mineral development in the future.

SOUTHWESTERN ALASKA PENINSULA MOOSE

LOCATION

In Game Management Unit 9, the Alaska Peninsula south and west of a line drawn between the heads of Moller Bay and American Bay.

THE SPECIES

Only token numbers of moose exist within this area, probably less than ten individuals. Rugged terrain at the head of Port Moller Bay appears to prevent large numbers of moose from entering the area. Suitable habitat appears available, but too few moose have immigrated to establish a viable population.

Moose may become important for recreational hunters and as an additional meat source for local residents in the future. Presently, the area has excellent populations of brown bears and caribou; a local guide industry has been established on these species at five permanent guide camp locations. Residents of Nelson Lagoon, King Cove and Cold Bay hunt the area, but little big game hunting is done by residents from other areas of Alaska.

Most transportation is by light aircraft. Local residents use boats and four-wheel drive vehicles along beaches. Roads within the area are restricted to the immediate vicinity of settlements. Transportation by commercial fishing boats occurs along the coast line. Izembek National Wildlife Refuge occurs within the area. Access and transportation on the Refuge is restricted by regulations of the U.S. Fish and Wildlife Service. At this time, Izembek receives minimal recreational use other than seasonal waterfowl hunting. The southwestern Alaska Peninsula is essentially wilderness. Oil exploratory efforts have had local impacts, with test holes and large landing strips placed in five locations. A natural gas deposit was reportedly located in one drilling project. A mineral exploratory program is currently underway at Balboa Bay.

IVANOF-PERRYVILLE MOOSE

LOCATION

In Game Management Unit 9, all Alaska Peninsula drainages into the Pacific Ocean between American Bay and Castle Cape.

THE SPECIES

The recent volcanic nature of the area is evident, and vegetation has only been sparsely re-established. Moose within the area are not abundant, but may be expanding into unoccupied habitat. Data on population numbers, composition, reproductive success, harvest, and natural mortality are lacking.

Moose are used almost entirely by local residents for domestic use. A bull may be taken rarely in conjunction with a brown bear hunt. Guides have not established permanent camps, and few Alaskans, other than local residents, hunt the area for moose.

Harvest levels are low, but data are lacking. The occasional moose taken by residents of Perryville and Ivanoff are normally not reported. Moose are taken wherever available. Both sexes are taken and harvests have not necessarily been restricted to open seasons. Present use may be maintaining low population levels. Because of the scarcity of game in the area, some hunting for domestic use occurs on the Bering Sea side of the Aleutian Range.

The area is rugged wilderness with much of it in early successional vegetation stages. There has been little noticeable effect of human use except in the immediate vicinity of villages. Transportation to the area is primarily by light aircraft or by commercial fishing boat. Motor bikes and "Three Wheelers" are popular with residents for local transportation. These vehicles are also utilized as an aid in hunting.

MOOSE IN WESTERN ALASKA

Moose (*Alces alces*) were relatively unknown to most early residents of the Kuskokwim River drainage and were rarely seen along the Middle Yukon until the early 1900's. Prospectors and Native residents of the region, especially along the upper Kuskokwim, report few moose were present until after a series of wildfires burned vast areas of spruce forest between 1915 and 1920. During the 1920's and 1930's moose populations gradually expanded throughout the upper Kuskokwim and Middle Yukon. By the early 1940's moose were well established on the Yukon as far as Holly Cross and on the Kuskokwim downstream to the Aniak area. Moose populations reached their highest levels between 1950 and 1970. In the 1960's moose began to appear in many of the treeless areas along the lower Kuskokwim and Yukon Rivers, but they have been unable to permanently establish themselves in this habitat.

Moose habitat throughout the Western Region is generally in good to excellent condition. This is especially true of the willow stands along most of the river valleys. These stands are essential to spring survival, especially during years of heavy snowfall. Moose populations have not been dense enough over the past five years to have caused significant overutilization of this browse. In some areas such as the foothills near McGrath, habitat used by moose during late fall and early winter is rapidly maturing. Without the benefit of wildfire this browse will eventually be lost.

Reported harvests of moose in Western Alaska are small, usually less than 300 animals. However, many moose taken for domestic utilization by local residents are not reported. Much of the region has poor access and receives light hunting pressure. Most domestic use occurs near villages or along rivers that are accessible by riverboat. Recreational hunters also use riverboats and, in addition, use aircraft to gain access to the Alaska Range foothills and other remote hunting areas.

YUKON-KUSKOKWIM MOOSE

LOCATION

Game Management Units 18, 19 and 21 except for the Farewell Moose Management Plan area.

THE SPECIES

The moose population throughout the Yukon-Kuskokwim area apparently peaked between 1957 and 1970. This peak population was dramatically reduced by a moderately severe winter in 1970-71 and a very severe winter in 1971-72. Recovery from this die-off has been slow in some areas, such as the middle Kuskokwim, upper Innoko and Nowitna drainages. Moose populations in the McGrath area now are moderately abundant. Flooding, predation and heavy harvest continue to depress populations in the Middle Yukon, upper Kuskokwim and Holitna drainages.

Spring flooding, which normally occurs in late May and early June, is a major mortality factor in the middle Yukon section of the area. Floods are more apt to follow severe winters than mild ones, thus subjecting the moose population to "double jeopardy". Effects of flooding are apparent in data from spring counts conducted following such catastrophies. In 1972, a spring survey from Nulato to Holy Cross revealed that only 4.6 percent of the population were calves. A spring survey of the same area in 1976 following flooding again produced a low number of surviving calves (9.2 percent) in the population. These floods not only result in adult mortality but also drown many newborn calves.

Predation by wolves has been a major factor in delaying recovery of moose populations in the middle Yukon and middle and upper Kuskokwim River drainages. Wolf hunting by local residents in the McGrath area seems to have been effective in reducing predation by wolf packs within several hundred square miles of prime moose habitat. Except for the spring of 1972 when calf survival was very low following the severe winter, overwinter calf survival in the vicinity of McGrath has been good, with the proportion of calves in the spring averaging about 24 percent of the population. However, wolf hunting elsewhere is sporadic and relatively ineffective in reducing wolf populations. Some of the drainages that are heavily hunted for moose, such as the Holitna River, have supported dense wolf populations (one per 43 square miles on the Holitna) over the past several years. Calf survival in these areas has consistently been poor. With very little trapping pressure, and virtually no wolf hunting, wolves in this area continue to slow herd recovery. Predation by bears on moose occurs, especially during the calving period, occurs, but the impact of such predation is unknown.

Although large bull moose are common in the area, few drainages produce trophy size antlers. Exceptions to this are the Upper Innoko, Iditarod, and Nowitna Rivers and the Alaska Range foothills. Domestic hunting pressure is sufficient in many areas to reduce the proportion of large trophy bulls.

Harvests of moose in the area are light to moderate in most instances but heavy in the Holy Cross-Anvik-Shagaluk and Holitna River areas. The reported harvest of moose on the lower Yukon-Kuskokwim drainages has declined steadily since 1963 when 75 bulls and 3 cows were reported taken, to a low of 8 bulls in 1974. Reported harvests of moose from the middle Yukon and middle and upper Kuskokwim River drainages rarely exceeded 200 animals until the past few years. In general, the actual harvest in any part of the area is at least three times the reported harvest.

Because the Yukon-Kuskokwim area is largely rural and most of the harvest has been by local hunters, seasons and bag limits between 1963 and 1973 were liberal. Except for the lower Yukon-Kuskowim River drainages a bag limit of two moose (one of which could be antlerless) and an open season from August 10 to February 28 were in effect over most of the area. Population declines after 1972 required more restrictive regulations to allow moose stocks to recover. The area showed a definite decrease in kill in the fall of 1972 following the severe winter mortality of 1971-72. Presently the moose season extends from September 1 to November 30 with a bag limit of one bull moose for most of the area.

Most moose hunting activity occurs during the open water months of the fall moose season. Most residents travel the rivers by boat looking for a bull moose. Movement of bulls to the river bars during the rut offers an advantage to the waterborne hunters. In October and November relatively little hunting occurs out of villages except for occassional moose taken by trappers. Another flurry of hunting activity occurs in February as the days grow warmer and longer. Most hunters usually try to secure cow moose at this time, since cows are generally in better condition. In winters with deep snow, moose move to river bars where they are highly vulnerable to snowmachine and aircraft hunters.

Float equipped aircraft are utilized to some extent by residents to take moose along the larger rivers and lakes, but in general much of the aircraft harvest is by nonlocal recreational hunters, with the exception of air traffic out of Bethel into the middle Yukon and lower Innoko Rivers. Winter hunting is primarily with the aid of snowmachines, dogs and ski-equipped aircraft.

Present moose population levels are sufficient to accomodate the needs of most local residents. Competition between local and non-area residents has resulted in serious social problems, particularly concerning hunters from Bethel, Fairbanks and Anchorage. Regulations designed to accomodate the needs of persons residing within the area should not be changed. However, because these regulations have been designed for local domestic needs, they likewise have become attractive to residents of other areas with more restrictive regulations.

MOOSE IN INTERIOR ALASKA

Moose (*Alces alces*) are distributed throughout Interior Alaska, occurring in a wide variety of habitats, ranging from climax communities of upland shrubs and lowland bogs, to shrub communities in old burns and along streams. Stands of coniferous and deciduous trees also may be important in many areas.

Since their arrival in Interior Alaska more than 175,000 years ago, moose, like all species, have fluctuated in numbers. The status of moose populations during the early 20th century is uncertain. Historical records and comments by early hunters and trappers suggest that moose existed in at least low to moderate numbers. They gradually increased in abundance in the late 1940's, 1950's and early 1960's, reaching a maximum around 1965. Since that time their numbers have generally declined to the present low levels.

The growth of moose populations during the 1940's and 1950's was due to a combination of events. The most important factor was probably a large increase in habitat caused by a large number of natural and man-caused fires, and developments such as homesteading, mining and construction. Regrowth of shrubs important in the diet of moose in these disturbed areas greatly increased their food supply. Moose on a high quality diet frequently have high reproductive success, and during the years between 1956 and 1964, a high proportion of cows gave birth to calves which survived through the summer.

Two other factors contributed to population growth from late 1940 to early 1960. During this period, predator control reduced wolf populations and minimized wolf predation on moose. Secondly, relatively mild winters during this interval contributed to high overwinter survival of calves and adults during most years.

Since 1965, widespread and generally synchronous declines in moose populations have occurred throughout much of Interior Alaska, due to a low recruitment of young animals into the breeding adult population and to a continuous mortality among adults. Several factors have contributed to the declines. Severe winters during 1965-1966, 1966-67 and 1970-71 resulted in high mortality of moose. Deep winter snows aggravated shortages of available browse resulting from excessive moose population levels in prior years.

In addition to severe winters, predation was a major cause of reduced populations of moose and the principal mortality factor since 1971. Wolves have remained moderately abundant over the period of moose decline; wolf numbers were supported in part by abundant hare populations in the early 1970's. When hares declined in 1972-73, the impact of wolves on moose populations became progressively greater. Although wolves take adult moose, the effects of predation have been most marked by the loss of calves.

While hunting has been a significant cause of adult moose mortality in heavily hunted areas, it was not a major factor contributing to region-

wide declines. Moose populations in lightly hunted and even unhunted areas have experienced similar population reductions. For example, moose in large areas of the Chena River and Beaver Creek drainages are very lightly hunted, and they too have low numbers of calves and have experienced sharp population declines in recent years. Further, unhunted moose populations in McKinley Park are also apparently experiencing similar declines.

Although deteriorated range conditions were probably a major factor causing moose declines in the 1960's, neither poor range conditions nor disease are likely factors contributing to recent moose declines in Interior Alaska. Although quantity and quality of moose range are probably lower today than during the 1950's and 1960's, the habitat appears to be capable of supporting considerably more moose than are present today. Although the influence of disease on moose mortality has not been closely examined, general observations in Alaska and western Canada suggest that disease is not a significant mortality factor among either calves or adults in these areas.

Moose have long been one of the most important game species in Interior Alaska, initially providing for the subsistence needs of natives, early settlers, prospectors and explorers. For the past two decades they also have supported relatively intensive recreational utilization, and they remain an important source of meat for many bush residents.

Most recreational moose hunting occurs in those portions of Interior Alaska that are accessible by road or off-road vehicle trails, along major rivers with boat access or where suitable landing sites enable use of aircraft. Small harvests are reported for large areas with difficult access. Most of the reported harvest comes from the Tanana River drainage, particularly the foothills of the central Alaska Range and the Tanana Hills near Fairbanks. In the early 1970's about 2,000 moose were reported taken each year. Declines in moose populations, reductions in hunting seasons and elimination of antlerless moose hunts have reduced moose harvests. About three-fourths of the moose hunters in this area are Alaska residents. Nonresident hunters on guided hunts take moose in combination with other species. Most guiding activity is in the Alaska Range and the southern slope of the Brooks Range.

The numbers of moose taken for domestic utilization by bush residents is unknown since much of the harvest is not reported. Domestic use is localized near villages, such as along the Yukon and Koyukuk Rivers and near outlying bush residences.

LITTLE TOK MOOSE

LOCATION

In Game Management Unit 12, the drainages of the Little Tok River above its confluence with Trail Creek.

THE SPECIES

The moose population in the Little Tok management area appears stable, but little is known of its size. The proportion of bulls in relation to cows declined between 1968 and the mid-1970's. In 1974, the bull-cow ratio was 22 bulls per 100 cows. Calf-cow ratios obtained in late fall aerial surveys have ranged between 15 and 24 calves per 100 cows. The effect of predation and other causes of natural mortality is unknown. Wolf and grizzly bear populations are at moderate levels. Winter range is the most critical element of moose habitat in this area.

The annual harvest of moose has averaged about 35 animals. The area has produced large-antlered bulls in the past, but greater hunting effort in recent years has significantly reduced the number of large bulls. Nonresident use of the area has traditionally been high, but resident use, both local and nonlocal, has increased in recent years. Much of the nonresident moose hunting effort has been in conjunction with sheep and brown bear hunting. At least six guides or transporters make use of the area, and much of their business is with nonresidents.

Access to the Little Tok moose population is primarily by off-road vehicles via the Bear Valley Trail or Little Tok Trail. A few local residents use two unimproved airstrips near Birch Creek for access by light airplanes.

SIXTYMILE BUTTE MOOSE

LOCATION

In Game Management Units 12 and 20C, Township 21 North, Range 12 East; Township 21 North, Range 13 East; Township 20 North, Range 12 East, Section 1-18; and Township 20 North, Range 13 East Section 1-18, Tanacross Quadrangle.

THE SPECIES

The Sixtymile Butte area appears to be the preferred rutting habitat for moose inhabiting lowland country surrounding the Butte. The Butte is approximately 3500 feet in elevation, and subalpine willow is the dominant vegetation. The primary wintering area for this population is in the drainage of the West Fork of the Oennison, where dwarf birch and willows provide adequate winter browse on the valley bottom.

At the present time (1976) moose calf survival is low, resulting in little or no recruitment into the population. The reasons for poor calf survival are unknown but predation by wolves and brown bears is suspect.

Bull/cow ratios have declined in recent years.as a result of hunting, from approximately 45-50 bulls per 100 cows to the current ratio of 25-30 bulls per 100 cows. The population was virtually unhunted in the 1960's due to its inaccessibility, but in the early 1970's a Tok area guide built an all-terrain vehicle trail to the Butte and hunting pressure rapidly increased by both resident and nonresident hunters. Within two years, many of the large bulls were harvested.

FAREWELL MOOSE

LOCATION

In Game Management Unit 19 that area within a line drawn from the outlet of Telequana Lake north to Lone Mountain, east to Farewell, east northeast to the northwest corner of Mt. McKinley National Park, south to the Unit 19 boundary, along the Unit 19 boundary to Telequana Pass, then down the Telequana River to the starting point.

THE SPECIES

Little information on numbers of moose in the Farewell area is available. Population trends have been similar to those of the middle and upper Kuskokwim River drainages. Moose populations expanded during the 1920's and 1930's and reached high levels of abundance in the 1960's. Some reductions in numbers occurred in the early 1970's as a result of several severe winters, and currently the moose population is at a moderate level in the area. Moose habitat is in good to excellent condition.

Moose harvests have increased rapidly in the Farewell area since 1970. Hunters (largely guided nonresidents) are now taking about 100 bulls annually from the Alaska Range foothills. The Farewell area is favored by resident sport hunters and guides as a hunting area because the timberline habitat provides high visibility of moose and trophy bull moose are available. In addition, the presence of brown bears, dall sheep and caribou provides an opportunity for multispecies hunts. Most moose hunting occurs in September and October, with an occasional bull taken in November. Seasonal movements of bulls by mid-September into the upland areas during and after the rut increases accessibility of moose. Trophy hunters rarely pursue moose during the early winter months because the bulls begin to shed their antlers in November and December. Hunter selectivity for large bulls has reduced the proportion of large bulls in the population. Aerial surveys in 1973 and 1974 for a segment of the population (about 500 moose) indicated 25 to 28 bulls per 100 cows and an increase in small bulls.

Access to moose in the Alaska Range foothills is largely by aircraft or ATV. Wheel aircraft are used to some extent along the large river bars from the Stony River to the Tonsona River. Float equipped aircraft are popular in the lake areas southeast of Big River. Aircraft flying into this area are largely from the Anchorage vicinity. A few local hunters from McGrath, Red Devil, Sleetmute, Aniak and Bethel hunt this area for other species. Use of ATV's is expected to become more extensive with increased use of this area due to the terrain and access limitations on aircraft.

CHENA-SALCHA MOOSE

LOCATION

In Game Management Unit 20, the drainages of Birch Creek above the confluence of Birch Creek with the South Fork of Birch Creek, except for the drainages of the North Fork of Birch Creek and Harrison Creek; the drainage of Big Windy Creek; the drainage of the East Fork of the Chena River upstream from and including the Munson Creek drainage; and the drainage of the North Fork of the Salcha River.

THE SPECIES

This area consists of low rolling mountains topped by alpine habitat. Lower elevations are covered mostly with spruce forest except for bands of willow along the valley bottoms and deciduous regrowth in areas that have burned. Moose are seasonally abundant, occurring in greatest numbers during the fall and early winter. Highest densities are found on the old burns where browse is abundant. By late winter few moose remain in these headwater areas due to the deep accumulation of snow.

Survey data are available for only the East Fork of the Chena River (4 years) and the North Fork of the Salcha (1 year); consequently knowledge of the population status is limited. The number of moose seen per hour of aerial survey time in the East Fork has dropped progressively from 63 in 1970 to 10 in 1975, suggesting a declining population.

Deep snow and wolf predation are the primary factors affecting the size of moose populations in interior Alaska. Unusually deep snow accumulation during the winter of 1970-71 resulted in poor overwinter survival in areas near Fairbanks. A sharp decline in the number of moose seen in the East Fork survey area suggested that high mortality occurred there also. Wolves prey on moose throughout this area, although their effect on the moose population is unknown. Systematic wolf surveys have not been conducted, and therefore density and distribution of wolves is unknown. Wolves have been seen, however, during moose surveys in the area and trappers report killing 51 wolves in the area over the past 5 years, 30 of which were taken during the 1974-75 season.

Productivity and survival of moose have not been assessed except for scattered fall composition counts. In November 1975 calves comprised 15-16 percent of the moose population in the East Fork of the Chena River and the North Fork of the Salcha River. Expressed as a calf/cow ratio, this represents approximately 26 calves per 100 cow moose. In the East Fork, where surveys have been conducted in prior years, this ratio has varied from 21 to 27 calves per 100 cows since 1971. The ratio was 32 calves per 100 cows in 1971, prior to the severe winter.

Research in the Tanana Flats, approximately 70 miles southwest of the Chena-Salcha area, revealed that up to 94 percent of the cow moose two

years of age or older were pregnant in May of 1975. If this figure applies to cow moose calving in the Tanana Hills, then roughly 73 percent of the calves were lost during the first six months. This would suggest that high calf mortality exists in the Tanana Hills, comparable to that documented for the Flats. Both areas have shown a steady decline in moose numbers.

Rejuvenation of moose browse is largely dependent on naturally occurring wildfires. A 90 square mile burn on the East Fork of the Chena River and a 110 square mile burn on the North Fork of the Salcha have provided excellent habitat for moose. Elsewhere there is little browse available; mature spruce forest predominates over most of the area.

Only two moose from the Tanana Hills have been entered in the Boone and Crockett record book. However, the area has potential for producing large moose, since antlers approach trophy size at 11-12 years of age. Since 1967, 10-20 percent of the harvest has consisted of bulls 10 or more years old. Some 6 year old males can be expected to have antler spreads in excess of 60 inches and by age 7 an occasional bull may reach 70 inches. However, over one-third of all 8 to 12 year old moose measured have had less than 55 inch antler spread and probably would not have grown large antlers.

Poor access has resulted in minimal hunting activity. Harvests have been very light, probably never exceeding more than six animals per year. Characteristics of the harvest, although not available specifically for the Chena-Salcha area, may have been similar to surrounding, more accessible areas where harvests and hunter success have declined 66 percent from 1969 levels. Ninety percent of the hunters have been residents and they have taken 85 percent of the harvest. No guiding operations are known to exist in the Chena-Salcha area proper. The area has been subject to season reductions on bulls and deletion of antlerless moose seasons applicable to surrounding areas, instituted in response to rapidly declining moose populations in much of interior Alaska. The present bulls-only season is September 1-20 and November 1-10.

Access has been limited due to the absence of off-road vehicle trails and landing strips for light aircraft. The area is far enough from existing roads that overland access is difficult and time consuming. A cat trail runs up the East Fork of the Chena River approximately 25 miles to the vicinity of Van Curlers bar, but before freeze-up it is passable only by tracked vehicles. A trail also follows the ridge parallel to the Salcha River for about 45 miles to the vicinity of The Butte. This trail is passable by 4-wheel drive vehicles most of its length, but terminates short of reaching the North Fork. There are no vehicles trails into upper Birch Creek, but highway access to the headwaters permits users to float the drainage by canoe. Aircraft access is extremely limited in the fall due to the shortage of gravel bars, lakes or airstrips. During the winter access is vastly improved; light aircraft on skiis can land in several areas and snow machines can easily traverse the back country.

CENTRAL ALASKA RANGE MOOSE

LOCATION

In Game Management Unit 20 the area bounded on the south by the crest of the Alaska Range, on the east by the Richardson Highway, on the north by the Tanana River, the North Star Borough southern boundary, and a line extending the North Star Borough boundary due west to the Nenana River, and on the west by the Nenana River.

THE SPECIES

Aerial moose surveys and general observations indicated increasing moose numbers in the late 1950's and large moose populations in the period 1960-1965. This rapid population growth resulted from favorable long-term effects of mild winters, abundant fall-winter range following wildfire, low hunting pressure, and predator control. Severe winters with long-lasting, deep snow in 1965-1966 and 1966-1967 may have reduced the moose population to less than 50 percent of the level present in 1964. Improved survival increased moose numbers in 1968 and 1969, but a substantial reduction in the population occurred during the severe winter of 1970-71. As a result of increased hunter harvest of moose from 1970-73 and low survival of calves resulting from predation and other natural mortality from 1971-75, the population has failed to increase to the level which the range could support. The density of wolves in the area has been high in recent years (one wolf per 23 square miles in 1975, prior to removal of wolves by trappers and by the Department), and wolves have probably been the primary factor responsible for observed low calf survival rates. Brown and black bears are also abundant in the area and have undoubtedly contributed to moose mortality. The moose population is currently maintained at a depressed level solely by non-hunting losses. Although precise estimates of moose numbers are unavailable, a "best guess" estimate of numbers, derived from aerial moose sex and age surveys, was about 2500 moose in 1975.

The Central Alaska Range has long been an important moose hunting area in Interior Alaska. The numbers of hunters increased rapidly from 639 in 1969 to 1515 in 1973. A shorter season with some restriction on the use of aircraft decreased the number of hunters to 1266 in 1974. Liberal hunting seasons on bulls and cows were in effect until 1974 when the season was reduced to 52 days for moose of either sex. In 1975 only a 10-day bulls-only season was allowed, substantially reducing hunting pressure. Although guides are active in the area, only about one fourth of all hunters are nonresidents. Most of the resident hunters come from the Fairbanks area.

Liberal hunting seasons, large numbers of hunters and high success rates resulting from good accessibility of the hunting area resulted in large harvests through 1974. From 1963 to 1970 an average of 222 moose were taken annually, of which 30 percent were females. From 1971 to 1974 the average kill rose to 478, of which 44 percent were females. Although

more than half the harvest occurred prior to freeze-up, increased use of mechanized transport after 1970 increased harvests during November and substantially raised total kills. About half the total reported harvest in 1973 and 1974 came from the Gold King-Japan Hills and the Wood River, although hunters were also able to travel over much of the Tanana Flats from access points at Fairbanks, Ft. Wainright, the Richardson Highway, Nenana and Clear.

Moose in this area must reach five or six years before they produce what would be considered "trophy" size antlers of 50 inches in spread. Those in the 10 to 12 year old category are probably of maximum trophy potential, after which antler size does not increase. Between 1949 and 1964, seven bulls which met minimum Boone and Crocket scores were harvested. The outlook now for trophy size animals recruited to the population is not promising, because calf production and survival since 1970 has been poor. Calves which would have reached trophy status from 1976-1980 have not survived in substantial numbers.

FAIRBANKS MOOSE

LOCATION

In Game Management Unit 20B, that portion of Goldstream drainage upstream from Spier Creek; that portion of the Chena drainage west of Dark Hollow and Smallwood Creeks, and downstream from the confluence of Smallwood Creek and the Little Chena River; the Chena drainage west of the Transmitter Site Road and south of the Chena Hot Springs Road; drainages of the north bank of the Tanana River from Rosie Creek to Moose Creek and along the north bank of Moose Creek to the Transmitter Site Road.

THE SPECIES

Observations of moose and the incidence of road kills and nuisance complaints indicate a minimum of 150 moose utilize the Fairbanks area in winter. Although habitat alteration resulting from road and trail development and expanding residential areas has temporarily increased the capacity of the area to support moose, the moose population is declining. Numbers of moose declined substantially following the 1970-71 winter when most of the calf crop and many adults succumbed to deep snow of long duration. Low increments to the population due to poor calf production and survival since 1971 have prevented the population from increasing. Predation by wolves has probably been the primary natural mortality factor affecting moose within and adjacent to the area. Wolves are regularly trapped or shot in defense of property on the lower Chena River, Rosie, Moose and Goldstream Creeks, and they have killed many dogs in the area in recent years.

The moose population has a low proportion of bulls (10 percent or less) as a result of the high rate of bull harvest, and most bulls remaining in the population are less than 5 years old. The area was closed to moose hunting in 1975 because of the low proportion of bulls and also because of extensive residential development. Reported harvests of bulls for 1974, 1973, and 1972 were 28, 68, and 35, respectively. Most moose were taken by local residents utilizing highway vehicles. Some moose were taken along the Chena River by hunters using boats.

Urban expansion of the Fairbanks area has changed use patterns from recreational hunting to nonconsumptive utilization. Roads and trails once used by hunters are now part of existing or planned subdivisions. Public safety requirements and demands for viewable wildlife as an integral part of the community preclude moose hunting except under closely controlled conditions.

CHARLEY RIVER MOOSE

LOCATION

In Game Management Unit 20C, all drainages of the Charley River below the confluence of its east and west forks.

THE SPECIES

Little data are available on this moose population. Only a few surveys have been conducted, usually in conjunction with counts on caribou. While the Charley River offers summer and fall moose habitat, winter range is lacking in both quality and quantity except in the lower 5 miles of the drainage. Moose which spend the summer and fall in the Charley River drainages winter along the Yukon River.

Hunter access to the Charley River is primarily by river boat. The river is difficult to negotiate in the upper reaches, particularly during times of low water flow, but access to the lower reaches is not particularly difficult for experienced boatmen using proper equipment. The harvest from this area is very small, with most animals coming from that portion of the drainage near the Yukon River. No airstrips or all-terrain vehicle trails are available on the lower half of the river and float planes are able to utilize only the lower few miles of river, and then only during years of adequate water flow. Usually the river is not suitable for float plane use.

KANTISHNA RIVER MOOSE

LOCATION

In Game Management Unit 20C, the drainages of the Kantishna River.

THE SPECIES

The density of moose in the Kantishna River area appears relatively low. Changes in moose abundance have probably followed a pattern similar to that of moose in adjacent areas where they have declined significantly during the past decade. No detailed studies on moose have been conducted in the Kantishna drainage, therefore little is known about the factors that influence them. The Kantishna drainage is generally low quality moose habitat composed primarily of spruce forest with some deciduous forest in areas that have recently burned.

In response to declining moose populations and increasing hunting pressure, moose hunting seasons in Interior Alaska have been shortened considerably in recent years. However, the harvest from the Kantishna River population has declined only slightly, due to increasing hunter interest in the area. Reported annual harvests for the area have averaged 19 moose since 1969 and ranged from 6 during 1972 to a high of 35 in 1973. The actual kill probably averages well in excess of 25 moose per year because harvest estimates based on voluntary reports substantially underestimate harvest by bush residents and do not include illegal take. Harvest levels are relatively light compared to the number of moose in the area. However, if the population is declining, the impact of present harvest rates on the population will increase.

Most hunters utilizing the area during the past six years have been Alaska residents, which suggests little big game guiding activity. The extent of domestic use of moose is unknown, although there are some residents in the area who probably utilize moose as their primary source of meat.

Riverboats and aircraft provide the primary means of access to the area. The Kantishna River and its major tributaries are ideal for boating. They offer about 300 miles of navigable waterway and many additional miles suitable for float trips. Numerous lakes and gravel bars provide for access by airplane.

BEAVER CREEK MOOSE

LOCATION

In Game Management Unit 20C, the drainages of Beaver Creek above its confluence with Moose Creek, including the drainage of Moose Creek.

THE SPECIES

The density of moose in the proposed management area is relatively low. An approximate estimate of the total number is 400-500. Aerial surveys indicate that mortality of calves is high. Conclusive evidence indicating the causes of low calf survival is not available. The abundance of wolves relative to moose suggests that predation is one of the major factors limiting calf survival. Recruitment of young animals to the Beaver Creek moose population appears lower than mortality of adults, resulting in a population decline.

The habitat is dominated by spruce forest with fairly extensive stands of willow along rivers and creeks which provide winter browse. Early successional stages of habitat following wildfires are commonly utilized by moose during early winter but represent only a small portion of the moose habitat in the area.

In response to declining moose populations and increasing hunting pressure, moose hunting seasons in Interior Alaska have been shortened considerably in recent years. However, the harvest from the Beaver Creek population has remained about the same because of increasing hunter interest in the area. Estimates of total harvest by hunters average 20-25 moose per year or approximately 5-7 percent of the estimated moose population. Moose of the Beaver Creek drainage appear to have average potential for producing trophy size antlers when compared with other areas in Alaska. The effect of hunting during recent years has been to accelerate the otherwise natural decline of moose in the area.

Hunters utilizing the area during the past six years have been almost exclusively residents. Little guiding activity occurs there. Access is gained primarily by aircraft and off-road vehicles utilizing trails from the Steese and Elliot Highways. Access points have tended to concentrate hunters in specific areas, resulting in high harvest rates in small areas. An example is the upper reaches of the Beaver Creek drainage accessible by the heavily used Nome Creek Trail leading off the Steese Highway.

GERSTLE RIVER MOOSE

LOCATION

In Game Management Unit 20D, the Gerstle River drainage above the Alaska Highway.

THE SPECIES

Up to 300 moose may occupy the higher inaccessible elevations of the Gerstle drainage. Moose surveys in the area indicated 6 calves per 100 cows, suggesting poor calf production or survival. Observed bull:cow ratios have been 34 bulls per 100 cows. Poor winter range condition and heavy predation are probably responsible for low numbers of calves. Winter range at lower elevations is intensively used. One large burn on the winter range is no longer productive for moose browse.

Current harvests are relatively light due to difficult access. Twelve bulls were taken in 1974 and 1975, while the hunting season was closed from 1971 to 1973. Hunter effort is heavy at lower elevations and along existing trails but hunter success is low. All hunting is recreational, with 80 percent of the hunters originating from the Delta Junction and Ft. Greely area. The remaining hunters are primarily residents from other parts of Alaska. Few nonresident hunters use the area, and little guiding activity occurs. Access is usually via the Alcan Highway, and all-terrain vehicles, four wheel drive vehicles, horses and aircraft are used for transportation in the area.

DONNELLY-CLEARWATER MOOSE

LOCATION

In Game Management Unit 20D, that area bounded on the west by the Delta River; on the north by the Tanana River; on the east by the west bank of Clearwater and Sawmill Creeks south to the Alaska Highway, then west along the Alaska Highway to the Richardson Highway, then south along the Richardson Highway to Jarvis Creek to the Game Management Unit 13 boundary; on the south by the Game Management Unit 13 boundary.

THE SPECIES

Moose densities in this area are unknown, but numbers of moose vary seasonally. An average of 40 moose were taken annually by hunters during the early 1960's, but the population declined in subsequent years, and hunting has been prohibited since 1971. The population decline was probably due to a decrease in quantity and quality of habitat resulting from land clearing for agriculture, roads and housing, and encroachment by spruce, mature aspen and birch on a burned area which was excellent moose winter range until the early 1960's. Predation is currently contributing to poor moose calf survival.

Most people viewing Donnelly-Clearwater moose are residents of the Delta and Ft. Greely area, but resident and nonresident use is increasing along the Richardson and Alcan Highways during summer.

GRANITE MT. MOOSE

LOCATION

In Game Management Units 22 and 23, the drainages of the Koyuk River above its confluence with Willow Creek, the drainages of the East Fork of the Koyuk River above its confluence with the Koyuk River, the drainages of the Buckland River above its confluence with Kilulikpuk Creek; the drainages of the Tagagawik River upstream of latitude 66° 10' 7".

THE SPECIES

The Granite Mountain moose population evidently originated from animals that immigrated to the area during the 1930's from drainages of the Yukon River. The population increased in subsequent years, reaching its greatest density during the early 1960's. Moose currently occupy all suitable habitat in densities approaching the maximum that the range can sustain. Aerial surveys in the spring of 1975 indicated at least 400 and possibly more than 600 moose occupy the area. Calf production and survival through the first year has been good; surveys indicate about 20 percent of the population is slightly less than 1 year old. Antler growth is rapid; bulls 6 years old often carry antlers with a spread of 60 inches. Nearly half of the bulls carry antlers with 40-inch spreads or larger. Rapid antler growth and a high proportion of young animals generally indicate excellent range condition. Moose winter habitat is restricted to major river valleys in the area and overbrowsing has occurred locally. Predators are scarce and are probably not causing significant moose mortality.

Moose harvest levels can only be estimated, but hunting pressure on the Granite Mountain moose population is low. No more than 50 moose are taken by hunters annually; calf production and survival rates indicate the population could sustain a harvest of at least 100 animals per year. Most moose are taken along rivers prior to freeze-up by hunters using light aircraft for transportation. Most animals are taken along the Buckland and Koyuk Rivers; the Tagagawik River is relatively inaccessible and seldom hunted. Shallow water generally precludes river boat travel. Residents of Buckland, Koyuk and Selawik occasionally hunt moose using snowmachines after freeze-up, but few animals are taken since the meat is considered less palatable after the breeding season.

YUKON-TANANA MOOSE

LOCATION

That portion of Game Management Unit 24 not included in the Southwestern Brooks and the Dietrich Moose Management Plan areas; that portion of Game Management Unit 20 not included in the Kantishna River, Beaver Creek, Fairbanks, Chena-Salcha, Charley River, Central Alaska Range, Donelly-Clearwater, and Gerstle Moose Management Plan areas; and that portion of Unit 12 not included in the Sixtymile Butte and Little Tok Moose Management Plan areas.

THE SPECIES

Moose populations in much of this large area are at relatively low levels and continue to decline from the higher numbers present in the late 1960's. The area has received only sporadic survey coverage. Data are not available on a detailed, comparative basis for the whole area or a long period of time. In general moose are most abundant where willow stands are plentiful as in recently burned areas on river bars. Islands in the Yukon River are important habitat. Much of the area is not good moose habitat and moose occur in low densities. Suppression of wildfires during the past decade has inhibited the creation of new moose browse habitat. Vegetational changes on existing moose ranges have reduced the carrying capacity of the habitat over wide areas and is the primary factor responsible for declining moose populations. Heavy, area-wide winter mortality of moose occurred during severe winters in 1970-1972. Wolf predation has depressed moose populations further in some portions of the area by greatly reducing calf survival. Heavy hunting pressure has also contributed to declines of moose in accessible areas.

In the drainage of the Koyukuk River, particularly downstream from Hughes where better moose habitat exists, periodic surveys from 1954 to 1968 indicated high proportions of calves (about 20 percent) in the population. Following severe winters and spring floods in 1970 and 1971, the population declined and the proportion of calves was reduced to 8 to 11 percent. Heavy hunting and trapping of wolves in the Koyukuk region has helped reduce calf mortality in recent years.

Because of less favorable habitat and greater human utilization by villagers along the river; moose populations along the Yukon River between Tanana and Eagle probably never approached those observed in the Koyukuk drainage. Limited surveys in 1975 along the Yukon River above Tanana indicated low moose densities and moderate to poor survival of calves. Moose were most abundant on the islands in the Yukon River. The best habitat along the Yukon was located between the Kandik and Nation Rivers. Very few moose were observed along the Porcupine, Sheenjek and Coleen Rivers.

Moose south of the Yukon River and in the Tanana River drainages show the same pattern of declining populations and low proportions of calves. To the east in the vicinity of the Taylor highway, populations are low in both hunted and unhunted areas. November surveys in recent years have indicated less than 25 calves per 100 cows and low percentages of yearlings. Bull/cow ratios have varied from 5 to 45 bulls per 100 cows, depending on the hunting pressure experienced in different places. Except for the lower Salcha river where high proportions of calves have stabilized the moose population, the Tanana River drainages and the country around Fairbanks have declining populations. Production and survival of calves has been low, resulting in insufficient recruitment to the population to replace losses to hunting and predation. Proportions of bulls in accessible populations show the effects of hunting, with sex ratios ranging from 14 to 37 bulls per 100 cows, down from 50-60 bulls per 100 cows in the 1960's.

Harvest information is based primarily on harvest reports received from hunters, but figures derived from harvest reports are minimal estimates because many rural residents fail to report their kills. In recent years from 500-1000 moose have been taken annually. In 1973 a record harvest of 1193 moose was reported. Harvests included antlerless moose in much of the area south of the Yukon until 1974 and north of the Yukon through 1975. Regulations have become more restrictive in recent years with reductions in hunting season length of 11 to 62 days and bag limits north of the Yukon from two moose to one per year. The greatest hunting activity and moose harvest has occurred in the drainages of the Tanana River and the Fairbanks vicinity where approximately 70 percent of the reported harvest has been taken. Harvests in rural areas has been light except near villages and along roads and major rivers. Hunter success has declined significantly in all locations south of the Yukon River as a result of reduced availability of moose, shortened hunting seasons, and increased numbers of hunters. Competition among hunters has been heavy in such traditional hunting locations as the Taylor highway, the Salcha, Goodpaster, and Yanert Rivers, Beaver Creek, Nome Creek, Minto Flats and the Stampede Trail. North of the Yukon River hunter success has remained relatively high (more than 50 percent successful). Harvests have been fairly well distributed through the upper Koyukuk and the Chandalar drainages and in recent years, the easternmost drainages of the upper Yukon River. The Sheenjek, Porcupine, Kandik and Nation Rivers have experienced increases in hunting pressure.

More than 75 percent of the hunters have been Alaska residents, and the majority of these residents have been from interior Alaska urban centers. Nonresidents have been most heavily represented north of the Yukon (19 to 24 percent of hunters) and in the vicinity of Fairbanks (about 20 percent of hunters). Little guiding activity directed specifically to moose has occurred. In the upper Tanana River drainages and in the Alaska range, guided hunters take moose in conjunction with their sheep hunts.

Much of the area has poor access. Hunting activity is concentrated along road and trail systems and on major rivers. Highway vehicles and

all-terrain vehicles are dominant methods of hunter transport in the vicinity of the Taylor Highway, and near the road system radiating from Fairbanks. Use of riverboats predominates along the Yukon River and major tributaries, and along portions of the Tanana River. Aircraft are an important means of access to the upper Koyukuk drainages and to some remote areas south of the Yukon, but their use is limited over large areas by the lack of suitable landing sites.

MOOSE IN NORTHWESTERN ALASKA

Moose (*Alces alces*) are distributed throughout Northwestern Alaska from the Brooks Range to Norton Sound and from Walker Lake to Point Hope and Cape Prince of Wales. In forested areas, such as the middle and upper Kobuk River and its tributaries, they are widely distributed during spring and summer. However, during winter they tend to congregate in shrub and tree stands along major rivers and streams. In treeless areas, such as most coastal areas and the western Seward Peninsula, moose are most closely associated with streamside shrub communities. During summer they may disperse onto the tundra and uplands where forage occurs. During fall and winter they are restricted to shrub communities along streams and rivers.

Moose were apparently rare in the Kobuk and Noatak River drainages and were definitely absent from the Seward Peninsula and coastal areas of the Chukchi Sea during the late 1800's and early 1900's. Their numbers have gradually increased along the Kobuk and Noatak Rivers during the past 50 years, corresponding roughly to their increase in the Brooks Range. Moose are recent inhabitants of the Seward Peninsula and northern coastal areas. They were occasionally seen in the western Seward Peninsula during the 1950's, and have become particularly numerous during the past 10 to 15 years. Over 3,000 moose currently occur on the Seward Peninsula. South of the Seward Peninsula small groups of moose have been resident for some time along streams where the treeline extends to the coast.

In the past, the moose harvest on the Seward Peninsula and in the Norton Sound area has been low. Between 1963 and 1972 the total annual reported kill was less than 70 animals, while between 1973 and 1975 the annual reported kill has ranged from 136 to 222. The moose harvest in the Kotzebue Sound area, including the Kobuk and Noatak drainages has also been low. Total reported harvest during 1974 and 1975 was 104 and 76 moose, respectively.

Many moose taken for domestic utilization by local residents are not reported. Consequently harvests by all hunters may approach 700 per year. Most recreational hunters are residents of Nome and Kotzebue. Riverboats are used extensively on the major rivers and aircraft provide access to more remote areas.

SEWARD-KOBUK-NOATAK MOOSE

LOCATION

Game Management Unit 22 except for the Nome Area and the Granite Mountain Moose Management Plan areas; Game Management Unit 23 except for the Granite Mountain and the Upper Noatak-Kobuk Moose Management Plan areas.

THE SPECIES

Recent historical records indicate moose did not occur in northwest Alaska prior to 1900. During the mid-1930's, a few moose moved into the area, probably originating from Yukon River drainages. Gradual increases in moose populations occurred, most noticably during the 1960's, concurrent with greater compliance with game regulations. By the 1970's, they had expanded into most areas of suitable habitat, and subpopulations increased dramatically. An example is the drainages of the Kuzitrin River on the Seward Peninsula where observed moose numbers increased from 142 in 1972 to 526 in 1975. In spring, most moose are found along the major river systems and it is possible to count a high percentage of the actual population. The minimum number of moose observed in a portion of the area in 1975 and 1976 was 1,630 moose, but the total may exceed 3,000 animals.

The average age of moose in this area is relatively low, but large older bulls are common in some areas, especially in the northern portion. In several survey areas bulls with antler spreads in excess of 40 inches represented nearly half the males present. Calf production and survival appear to be good. Winter and spring surveys indicate 25 percent of the population consists of moose less than 1 year old. With a population of about 3,000 animals, the area can support an annual harvest of at least 750 moose. Wolves are scarce on the Seward Peninsula and are not a significant mortality factor there. Elsewhere in the area the wolf population appears high and increasing. Wolves in this region prey largely on caribou, but some moose are also taken, and wolf predation on moose may increase in the future.

The winter browse in many river drainages will be unable to sustain further increases in moose numbers. Along such rivers as the American and Kougarok, overbrowsing is already a problem. Willow forage is limited to annual production, and some stands are overbrowsed to the point that annual growth has been reduced by half. There is ample willow browse in the foothills and higher elevations, but in late winter it is usually unavailable because of deep snows. Unless moose are carefully managed, serious range deterioration is likely, with long-term detrimental effects on moose populations.

Moose were unavailable to local hunters until recent years, and consequently they traditionally have not been hunted by natives residing in coastal villages. Recently, however, villagers, including those that have historically depended on marine mammals and caribou, are placing greater

reliance on moose for meat. The importance of moose for domestic use and for recreational hunting will undoubtedly increase.

The reported annual kill for the Seward-Kobuk-Noatak area has averaged about 140 moose in past years but recently has exceeded 200. The actual number killed is probably much higher, but the number is uncertain because of noncompliance with harvest reports. The total harvest is estimated at 600 or more annually. Longer seasons in 1973 and 1974 with liberal antlerless seasons resulted in greater hunter participation and larger harvests. Local residents kill 90 percent or more of all moose taken. More than 50 percent of the moose harvested on the Seward Peninsula are taken from one of three roads radiating from Nome. Road-based hunters take moose primarily in the drainages of the Kuzitrin, including the Kougarok, Pilgrim, and Noxapaga Rivers. Hunters also use the middle Kiukluk River for access. The most prevalent hunting method is to search for game while driving along roads. Off-road vehicles and river boats are also becoming popular as means of access. Hunters using aircraft (most based in Nome or Kotzebue) take about 20 percent of the harvest generally in areas inaccessible by other means. Aircraft hunters usually take moose from the upper Niukluk or American Rivers on the Seward Peninsula and from the Noatak River or Kobuk tributaries north and west of Kotzebue. Boat hunting is popular on the major river systems and half or more of the harvest is taken in this manner.

Most moose are killed from August through September prior to freeze-up. When access becomes more difficult with the approach of winter, the kill drops off sharply. A few moose are taken after November with the aid of snowmachines, but interest is not high because many residents do not find moose palatable after the onset of the rut. Although hunters are currently removing about 15 percent of the total population, hunting pressure is not evenly distributed throughout the area. Where access is difficult, hunters are taking less than 5 percent of the population. In other areas where access is easier, the harvest may be as high as 30 percent.

NOME AREA MOOSE

LOCATION

In Game Management Unit 22, all drainages into the Bering Sea west of Solomon on the south, and west of the White River drainage into the Imuruk Basin on the north.

THE SPECIES

Moose were scarce or absent in the Nome area prior to the 1930's. Since then a few animals have immigrated from adjacent regions, but numbers are still low due to limited habitat. The 1976 overwintering population in the area was 50 moose or less; more animals may be present during summer. The moose population consists primarily of young animals, and females considerably outnumber males.

Most hunting in the area occurs along roads, usually as a secondary activity or while hunters are enroute to other hunting areas. The annual kill has averaged 20 animals or less. Despite the low number of moose, this area is hunted intensively because it is so close to Nome. Most moose are taken after September 1.

Nome is visited by a large number of tourists during summer, and many are avidly interested in viewing wildlife. Viewing and photography are important uses whenever moose are accessible along the road system and reported locations of animals may attract scores of people.

UPPER NOATAK-KOBUK MOOSE

LOCATION

That portion of Game Management Unit 23 which includes the drainages of the Noatak River above its confluence with Maiyumerak Creek and the drainages of the Kobuk River above its confluence with the Mayneluk River.

THE SPECIES

Recent historical records indicate moose were absent in the area prior to 1930. The first animals probably emigrated from the Yukon River into the upper drainages of the Kobuk and then gradually spread to the Noatak river. They increased in the Kobuk area during the 1960's and appear to have stabilized in the last few years. The Noatak moose population increased more slowly, probably as a result of physical barriers to immigration and lack of suitable winter habitat. The moose population in the Noatak area is probably still below carrying capacity. An aerial survey in the spring of 1975 revealed 128 moose in the upper Kobuk. The following year 98 moose were seen after covering about 1/8 of the upper Noatak. The total moose population in both areas is estimated to exceed 400 animals, and may be as high as 1,000.

Calf production and survival appears reasonably good. Calves slightly less than 1 year old comprised about 19 percent of the spring, 1976 population. The area could probably support a harvest of at least 80 moose per year. Natural mortality factors are not well known. Winter habitat on the Kobuk appears secure due to the diverse distribution of browse species and abundant cover. Winter browse on the Noatak is generally limited to areas along rivers and streams and is subject to overutilization.

Hunting pressure is light. Less than 40 moose are taken annually despite liberal hunting seasons, which generally extend from August through December. The area could support a substantial increase in harvests with no detrimental effects to the population. Most of moose are probably taken by the use of aircraft, but float trips are popular on the Kobuk and a few are taken in this manner. Most of the harvest occurs during the first two months of the season. However, a few moose are killed by hunters using snowmachines following freeze-up. Due to the area's remoteness, few meat hunters use the area on a regular basis. Most of the annual harvest is taken by recreational hunters.

SOUTHWESTERN BROOKS MOOSE

LOCATION

That portion of Game Management Unit 24 lying west of the Dietrich Moose Management Plan area, and north of a line beginning at Norutak Lake due east to the Alatna River, down the Alatna River to its confluence with the Koyukuk River, up the Koyukuk and South Fork of the Koyukuk River to Fish Creek.

THE SPECIES

Based on limited survey data in the upper Koyukuk drainage and reports of residents in the area, a low density of moose probably exists west of the pipeline corridor. Calf survival appears to be low compared with the North Slope of the Brooks Range; calf percentages in the population are comparable to low proportions observed along the upper Yukon and Tanana drainages.

The total Unit 24 harvest has averaged 70 moose for the period 1970 to 1974. The harvest is well distributed throughout the upper Koyukuk drainage, with the majority of the harvest occurring near timberline. Some domestic hunting occurs, primarily from Bettles and Anaktuvuk Pass, but the area overall is used little by domestic hunters because few people live in the area. Guiding activity in this region is directed primarily toward Dall Sheep and grizzly bear, although some moose hunts are conducted. Several guides are currently active in the area, and their numbers will probably increase as Brooks Range hunts become more popular.

Access is primarily by aircraft, although snow machines and river boats or canoes could be utilized in certain instances. Few established airstrips are available, although sand and gravel bars provide some landing areas.

LOCATION

That portion of Game Management Unit 25 lying north of the West Fork of the Chandalar River to its confluence with the East Fork of the Chandalar River, the East Fork of the Chandalar River to its confluence with Lush Creek then a direct line eastward to Bob Lake and the Christian River, the Christian River to its confluence with Otter Creek, Otter Creek, Thluichohnjik Creek to its confluence with the Sheenjek River, the Sheenjek River to the southern boundary of the Arctic National Wildlife Range, and the Arctic National Wildlife boundary to the Alaska-Canada border.

THE SPECIES

Reports from guides who utilize the area east of the pipeline indicate moose are sparsely distributed within a 70 mile radius of Arctic Village. On the upper Coleen, Wind, and Sheenjek Rivers from Shoulder Mountain to its headwaters, moose are relatively abundant during fall. On the Koness River moose appear to be sparsely distributed. In the East Fork Chandalar drainage moose are relatively sparse north of Wichenthraw Mountain. Data regarding sex and age composition, productivity and mortality are lacking. Due to the limited habitat, [available] moose populations in this area probably cannot withstand a high degree of exploitation. The total reported harvests in Game Management Unit 25 have varied from 58 to 153 moose. The actual harvest has probably been considerably larger because many rural residents fail to report their moose kills. However, most of the moose taken in Unit 25 are killed south of the Southeastern Brooks Area. Some domestic hunting occurs, primarily from Arctic Village, but the area overall is used little by domestic hunters because few people live in the area. Guiding activity in this region is directed primarily toward Dall Sheep and grizzly bear, although some moose hunts are conducted. Several guides are currently active in the area, and their number will probably increase as Brooks Range hunts become more popular.

Access is primarily by aircraft, although snow machines and river boats or canoes could be utilized in certain instances. Few established airstrips are available, although sand and gravel bars provide some landing areas.

MOOSE IN ARCTIC ALASKA

Moose (*Alces alces*) occur throughout Arctic Alaska from the Chukchi Sea to the Canadian border, and from the Brooks Range to the Arctic Ocean. The major factor influencing distribution of moose in this region is the availability of suitable habitat. Streamside shrub communities, consisting of willows, alders, and cottonwoods, are used throughout the year, and are the most important foraging areas for moose in northern Alaska. These areas are the primary winter range available to moose and they are also used for breeding and calving.

The northward expansion of moose into Arctic Alaska has apparently occurred during the past 100 years. Nunamiut Eskimos relate that moose were unknown north of the Brooks Range before 1870 to 1880. However, beginning in 1880, moose were occasionally killed by Nunamiut on the Colville River. The scarcity of moose in northern Alaska prior to 1900 is further supported by their absence from written accounts of naturalists and explorers traveling north of the Brooks Range during this time.

Nunamiut began observing occasional young adult moose moving north through the Brooks Range about 1900, and moose probably existed in low numbers on several major North Slope rivers throughout the early 1900's. Native hunting and predation along the Colville River and its tributaries may have retarded growth of some populations during this time. Moose apparently began to increase in numbers and to expand their range in Arctic Alaska in the late 1940's and early 1950's. A reduction of native hunting and expansion of predator control during this time probably facilitated growth of moose populations and dispersal of animals along streams throughout most of the region.

The present status of moose populations in Arctic Alaska is very good. Moose probably reach their greatest densities along the middle Colville River and its tributaries. Winter densities of approximately two moose per square mile have been observed on the Colville River between the Killik and Anaktuvuk Rivers, and on the Chandler and Anaktuvuk Rivers. Moose also occur along rivers and streams to the west, north and east of this area, although densities are not as great. They are occasionally observed as far west as Cape Lisburne and as far north as Barrow. However, they are probably migrants in these coastal areas, and winter along rivers further inland.

Annual reported moose harvests in Arctic Alaska are low, ranging from one to 57 between 1963 and 1975. A considerable portion of the harvest is reported by hunters who reside elsewhere in Alaska. However, a large but unknown number of moose are killed, but not reported, by residents of the region.

DIETRICH MOOSE

LOCATION

In Game Management Units 24 and 25, the area bounded on the west by the south fork of the Koyukuk River from its confluence with Fish Creek to its confluence with John R. Creek, then northwest to the Middle Fork of the Koyukuk River to the North Fork of the Koyukuk River, then the North Fork of the Koyukuk River from its confluence with the Middle Fork of the Koyukuk River to its confluence with Glacier River, then by Glacier River, Roy Creek, Upper Hammond River, the Itkillik River to its confluence with the Colville River, and the Colville River to the Arctic Coast; on the north by the Arctic Coast; on the east by the Sagavanirktok River to its confluence with the Lupine River, then the Lupine River to the Game Management Unit 25 boundary, then west and south along the boundary to the headwaters of Fish Creek; on the south by Fish Creek.

THE SPECIES

Moose are not particularly abundant in this area. On the north side of the Brooks Range small, isolated moose populations exist in the larger drainages where streamside willow is abundant. These populations range in size from 35 to 150 moose and total only 300-400 moose. Observations suggest these populations are doing well, but because of restricted habitat they are not expected to increase. On the south side of the Brooks Range moose are widespread in all drainages but exist in low densities. Based on limited data collected by game biologists and hunters, the survival of calves appears poor, which suggests that the moose population. may be declining.

The trophy potential of bull moose in the Dietrich area is relatively high. Presently, there is a high proportion of old bulls in the population. Antler growth rates of these bulls is near the average for Alaskan moose.

Accurate estimates of harvest are not available because of the ineffectiveness of the harvest reporting system in the bush. Although in some portions of the area the harvest relative to the population size may be fairly high, the total harvest is considered low.

Recently the reported kill for the Brooks Range has steadily increased despite reduced hunting seasons and bag limits. Industrial development in northern Alaska continues to attract attention and people to this area. The residency of hunters currently utilizing the Dietrich area is not available, but for the much larger northern Alaska area about 75 percent of the hunters have been Alaskans and 25 percent non-Alaskans. The substantial number of nonresidents reflects the importance of guiding in the area. Domestic use of moose in the Dietrich area is low since few people reside there. There is some nonconsumptive use of wildlife, primarily during summer in the mountainous portion. Present public access is limited to aircraft and boats.

COLVILLE MOOSE

LOCATION

In Game Management Unit 26, the drainages of the Colville River excluding the Dietrich Moose Management Plan area.

THE SPECIES

Present moose numbers along the Colville River and its tributaries are as high as they have ever been and may include nearly 1000 animals. Moose probably reach their greatest densities along the middle Colville River and its tributaries. Densities of approximately two moose per square mile have been observed on the Colville between the Killik and Anaktuvuk Rivers, and on the Chandler and Anaktuvuk Rivers. Moose also occur along rivers and streams to the west, north and east of these rivers, although densities are not as great.

The expansion of the moose population in this area began about 1880 but numbers have probably shown their greatest increase since the early 1950's. Production and survival of calves is high, and the population may be increasing slowly. Surveys conducted in spring 1976 along portions of the Colville drainage indicated 22 percent of 743 animals seen were calves. The area does not produce bulls with exceptionally large antlers nor does it appear to have the potential for doing so; however, except in localized areas of high hunting pressure, the proportion of bulls in the population is about 50 bulls per 100 cows.

The habitat crucial to moose populations in this area and throughout the north slope are shrub communities of willows, alders, and cottonwoods along rivers. This is the only habitat available to moose during the winter and is also used heavily during breeding and calving seasons. Although this riparian habitat is extensively used, at the present time no indications of overbrowsing by moose have been observed. Because moose are dependent on the limited shrub communities along rivers, their vulnerability to habitat destruction and alteration, or to human disturbance caused by resource development is clearly great.

Most of the moose hunting on the North Slope occurs along the Colville River and its tributaries. Only 60-80 moose are killed annually in this drainage but up to 150-180 could be taken without affecting the population size if hunting were dispersed throughout the river system and productivity and survival of moose remain unchanged. Hunting pressure in the area has been light in the past with locally heavy harvests near Umiat. However, a trend towards increasing hunting effort began in 1968 and is expected to continue. At this time, the increased kill has not adversely affected population size or composition. From 1968 to 1974, an average of 84 percent of the hunter kill consisted of bulls, but the proportion of bulls in the population remains high.

The length of the season, from August 20 to December 31, is designed to accommodate hunting for domestic use by local residents. Most of the reported kill takes place within the first 30 days. The majority of use in this area has come from recreational hunters. From 25-30 percent of the moose hunters in the area are nonresidents, about 20 percent reside within the area and the remainder are Alaskan residents, mostly from urban areas in the Interior. The number of guided hunters is low compared to other parts of the state but this use is increasing. Killing moose for domestic use by local residents has been low in the past. Since the establishment of Nuiqsut in 1973, this use has and will probably continue to increase.

Hunter access to the Colville River drainage has been primarily by aircraft; gravel bars suitable for landing light planes are numerous along rivers. Boats and off-road vehicles have been used in conjunction with aircraft, and a small amount of hunting takes place solely with the aid of boats.

NORTHWEST ARCTIC MOOSE

LOCATION

Game Management Unit 26A excluding the drainages of the Colville River.

THE SPECIES

While the abundance of moose in this area is low, it is probably as high as it has ever been. From the limited survey results available, it appears that although production of calves appears to be very good, the population growth is probably static or increasing only slightly. As in most of the North Slope, the expansion of the moose population in this area probably began about 1880 and has undergone the greatest increase since the early 1950's.

The habitat most important to moose in this area and throughout the North Slope are those shrub communities, including willows, alders, and cottonwoods, which are found along river courses. This is the only habitat available to moose during the winter and it is also used heavily during breeding and calving seasons. Because moose are dependent on the limited shrub communities along rivers, their vulnerability to habitat destruction, alteration, or to human disturbance caused by resource development is great.

Including unreported kills, the annual take by hunters in this area is probably no more than 10-15. The harvest could increase to 30 animals with little effect on population size if neither productivity nor survival of calves decline. Hunting pressure throughout the North Slope has been light in the past, but a trend toward increasing hunting effort began in 1968 and is expected to continue. Thus far, hunting has not adversely affected population size or composition. The majority of use in this area has been by recreational hunters from urban areas in the Interior. The area has rarely been used by guided hunters in the past but this use may increase. The taking of moose for domestic use by local residents has also been low. With the exception of occasional use of river boat or snow machines, hunter access to this area has been entirely by aircraft. These access patterns are not expected to change unless extensive road systems are developed.

NORTHEAST ARCTIC MOOSE

LOCATION

That portion of Game Management Unit 26 lying east of the Dietrich Moose Management Plan area.

THE SPECIES

Moose density in this area is low, and it has probably never been high. Based on limited surveys, production of calves is good, and population numbers are probably stable or increasing slightly. As in most of the North Slope, the expansion of moose into this area probably began about 1880 and increased rapidly during the 1950's and 1960's.

The most important moose habitat in this area are shrub communities of willows, alders, and cottonwoods, which are found along rivers. This is the only habitat available to moose during the winter and it is also used heavily during breeding and calving seasons. Because moose are dependent on the limited shrub communities along rivers, their vulnerability to habitat destruction, alteration, and human disturbance is great.

The annual hunter harvest in this area is probably no more than 10-15. This figure could increase to 30 with little effect on population size if neither productivity nor survival of calves decline. Hunting pressure throughout the North Slope has been light but a trend toward increasing hunting effort began in 1968 and is expected to continue. To date, hunting has not adversely affected population size or composition.

The majority of use in this area has been by recreational hunters from urban areas in the Interior. The number of guided moose hunters annually is small, but the interest by guides in this area is increasing. The taking of moose for domestic use by local residents has been low. With the possible exception of occasional snow machine use, hunter access to this area has been entirely by aircraft. Aircraft are presently the only feasible means of access to the area and will remain so unless road systems are developed.

MUSKOXEN IN WESTERN ALASKA

Populations of muskoxen (*Ovibos moschatus*) in Western Alaska are presently found only on Nunivak Island and Nelson Island. This species, extirpated from its original range on Alaska's Arctic Slope in the mid-1800's, was re-introduced into Alaska with a transplant of 31 Greenland muskoxen to Nunivak Island in 1935 and 1936. The purpose of the transplant was to provide a nucleus herd from which muskoxen could be taken to re-establish populations over their historic ranges in Alaska, as well as to provide for recreational, scientific and agricultural utilization of the animals.

Following slow initial increases, the population began increasing rapidly after 1950, growing to about 500 in 1965. Despite the removal of 33 calves in 1964 and 1965 for domestication experiments and a transplant of 23 animals to Nelson Island in 1967 and 1968, the population reached a level of about 750 animals in 1968. Concern was expressed by both State and Federal biologists that the population must be reduced to balance the herd with the available winter habitat. As a consequence, a management plan which included both transplanting and hunting was approved by the Alaska Board of Fish and Game in 1968. Although sport hunting of excess bull muskoxen was delayed until 1975 by political opposition, the State, in cooperation with the U.S. Fish and Wildlife Service, was successful in transplanting a total of 136 muskoxen to several Northwestern and Arctic Alaska sites in 1969 and 1970. In 1975, 40 animals were transplanted to Siberia in a cooperative program between the Federal government and the Soviet government. On Nelson Island, the population has experienced very rapid growth with a total population of 66 animals by fall, 1975.

Both Nunivak Island and Nelson Island are far south of the normal range of muskoxen, whose historic range in the state probably included the Arctic Slope westward to the Colville River. The primary winter habitat requirements for muskoxen seem to be windblown tundra areas with very light snowfall which permits them to feed on the grasses and sedges throughout the winter. Both Nelson Island and Nunivak Island have areas meeting these requirements for acceptable muskox habitat. Frequent high winds expose the vegetation on coastal sand dunes and hills, providing easy access to forage during the winter.

Unlike mainland habitats, Nunivak and Nelson Islands lack large predators. On Nunivak Island, the chief causes of mortality to muskoxen are insufficient food, accidents and old age. Animals also wander off the island in winter and are unable to return when the ice shifts or melts.

Public use of muskoxen has been very limited. Both Nunivak and Nelson Islands are remote, expensive areas for people to visit. A few sightseers and photographers have visited Nunivak and perhaps more will in the future. Just knowing muskoxen are present in the state is satisfying to many people. In 1975, the hunting public was able to begin to obtain beneficial use of the muskox through carefully regulated sport hunting of mature bulls. These animals provide a unique and valuable trophy and it is the first opportunity for hunters to be able to take this species in the United States.

NUNIVAK MUSKOX

LOCATION

In Game Management Unit 18, Nunivak Island.

THE SPECIES

Muskoxen were established on Nunivak Island in 1935 and 1936 by an introduction of 31 Greenland muskoxen. The herd increased rapidly and numbered 750 in 1968. However, this was a larger population than the winter range could support and over 150 animals died. By 1970, 236 muskoxen had been removed by transplants, transplant mortality or shooting. In 1975-76 hunters took an additional 50 bull muskoxen. Presently there are about 500 muskoxen on Nunivak Island and the herd is increasing slowly.

Much of the important dune winter range on the island is of poor quality, having deteriorated as a result of years of overuse. Recent range utilization studies suggest the Nunivak habitat can support 500 or less muskoxen during a normal winter. However, forage availability and consequently range carrying capacity are strongly influenced by snowfall and mid-winter thaws and rains which cause ice layers on the snow and ground.

Permit hunts for Nunivak muskoxen began in September 1975. Ten permittees, selected by drawing, were successful in taking muskoxen. Local residents acted as assistants and charged fees for their services. Hunting was conducted from open boats piloted by Mekoryuk residents. A second hunt was held in February-March 1976. Forty hunters, including 19 nonresidents, killed muskoxen. Hunters were transported by snowmachine. The Nunivak Island muskox herd has produced some of the largest Greenland muskoxen on record and it should continue to produce large animals. However, continued selective harvest of bulls will reduce the number of larger bulls available to the hunter.

Primary access to Nunivak Island is by air to the Mekoryuk air field. However, refuge regulations prohibit the use of aircraft in hunting muskoxen. Transportation to the hunting areas from Mekoryuk requires boats or snowmachines. Access by foot is impractical considering the difficult terrain, the distances of travel, and the size of the animal to be handled. Weather conditions in the fall and spring can halt both boat and snowmachine operation for many days.

NELSON ISLAND MUSKOX

LOCATION

In Game Management Unit 18, Nelson Island.

THE SPECIES

Transplants of muskoxen from Nunivak Island to Nelson Island were conducted in 1967 and 1968. In March of 1967 six yearling males, and 2 yearling females were released on the north flats of Nelson Island. In March, 1968, 5 yearling males, 9 yearling females and one sub-adult male were released near Tununuk. A thorough search of Nelson Island in May, 1973 revealed 38 adults and 6 yearling muskoxen. A census count in May, 1975 revealed 65 animals including 53 adults, 9 yearlings, and 4 newborn calves. These counts suggest the Nelson Island herd has increased at an average rate of approximately 20 percent annually since 1968, a high rate of increase considering that many of the transplanted muskoxen would not have reached breeding age until 1970.

Some mortality to Nelson Island muskoxen has been reported. Falls off cliffs seem to have been involved in most instances. Habitat deterioration has not been detected on Nelson Island, nor has herd productivity declined. Habitat conditions on Nelson Island are similar to those on Nunivak, but dune and cliff habitat is not as extensive. Possibly a generally higher relief results in more available winter forage on south-facing slopes. However, estimates of carrying capacity on Nelson Island are much lower than on Nunivak Island. Because opportunity for expansion off Nelson Island is limited the herd size should not exceed 75 animals until definitive range studies are completed. This population level seems well within the carrying capacity of the island habitat.

MUSKOXEN IN NORTHWESTERN ALASKA

Populations of muskoxen (*Ovibos moschatus*) in Northwestern Alaska are limited to the Seward Peninsula and to the coastal area in the Cape Thompson-Pt. Hope vicinity. This species, extirpated from its original range on Alaska's Arctic Slope in the mid 1800's was reintroduced into Alaska with a transplant of 31 Greenland muskoxen to Nunivak Island in 1935 and 1936. The purpose of the transplant was to provide a nucleus herd from which muskoxen could be taken to reestablish populations over their historic ranges in Alaska, as well as to provide for recreational, scientific and agricultural utilization of the animals.

In March 1970, 72 muskoxen were transported from Nunivak Island to Northwestern Alaska and released, 36 on the Seward Peninsula near the Feather River and 36 at Cape Thompson. The animals released on the Feather River divided into small groups and remained in the general area of the release for several months and then started a northward movement. By 1974 most of these muskoxen had established themselves on the northern part of the Seward Peninsula between Teller and Shishmaref. These animals have apparently divided into two main groups, one of about 12 animals using the area between Brevig and Wales, the other of about 17 animals occupying an area near Ear Mountain. Observations indicate that several other smaller groups and a few single animals may be in this area. By 1974 it appeared that these animals were holding their own with no apparent increase in numbers.

Less is known about the animals released at Cape Thompson. This vast and remote area is difficult to survey. A few observations by Eskimos at Pt. Hope and Kivalina placed this herd at about 17 adults and 3 calves by 1974. Four of these animals were sighted near Kivalina, the remainder in the Pt. Hope area. In 1976 the population numbered 25 animals.

NORTHWESTERN ALASKA MUSKOX

LOCATION

All of Game Managment Units 22 and 23.

THE SPECIES

Muskoxen were introduced into the area in 1970 when 36 animals were released near the Feather River on the Seward Peninsula and an additional 36 muskoxen were released near Cape Thompson, southeast of Pt. Hope. Success of the transplants was hampered by several factors. Most of the animals were immature and therefore not immediately capable of producing young. The absence of older animals also reduced potential herd stability. At the time of release holding pens were not available, consequently the muskoxen had no opportunity to become conditioned to their surroundings nor to form any sort of herd bond; many animals wandered off by themselves. Of the original 72, nearly half disappeared. At least one was killed by a grizzly bear and four others fell through ice and drowned.

Muskoxen have become established in two areas. In 1976, one herd to the east of Pt. Hope contained 25 animals; the second, on the western end of the Seward Peninsula contained 30 muskoxen. Taking into account stragglers that have been reported at other distant locations, the total estimated population may exceed 70 animals. Approximately 25 calves have been produced since the introduction, but attrition seems to nearly equal reproduction. Although it appears the introduction may be successful, additional transplants are planned to boost the population above the critical "threshold" level.

Presently there is no legal hunting of muskoxen allowed in the area and none is likely for the next few years. Use of muskoxen for the most part has been limited to viewing by local residents who are curious about the unfamiliar animals. Initially, use of snowmachines to approach muskoxen contributed to the wide dispersal of the animals. At least two muskoxen were killed by hunters when they were apparently "mistaken" for some other animal, one near Kiana in 1972 and one near Selawik in 1975. Until the muskox population attains a sufficiently large size to support hunting, nonconsumptive uses will predominate.

MUSKOXEN IN ARCTIC ALASKA

Populations of muskoxen (*Ovibos moschatus*) in Arctic Alaska are presently found on the North Slope between the Sagavanirktok River on the west and the Canadian border on the east. They are normally found between the coast and the foothills of the Brooks Range. Occasionally lone animals or small groups will wander long distances outside of these limits.

This species, extirpated from its original range on Alaska's Arctic Slope in the mid-1800's, was reintroducted into Alaska with a transplant of 31 Greenland muskoxen to Nunivak Island in 1935 and 1936. The purpose of the transplant was to provide a nucleus herd from which muskoxen could be taken to reestablish populations over their historic ranges in Alaska as well as to provide for recreational, scientific and agricultural utilization of the animals.

The first transplant to the Arctic was made from the Nunivak herd in March and April 1969 when 51 muskoxen were released in the vicinity of Barter Island. At first the animals divided into small groups and wandered in different directions, a few migrating into Canada and one moving through the Brooks Range to the Chandalar River. Seven were known to have died within three months. The stress associated with capture and the confinement in small crates for many hours contributed to this initial mortality. A second transplant to the North Slope was made in 1970 with the release of 13 animals on the Kavik River.

During the next few years the muskoxen in the Arctic divided into three well-defined groups each ranging in a different area. One group, consisting of about 16 animals, now occupies the area along the Canning River between the coast and the foothills of the Brooks Range. They rarely move more than 20 miles from the river. A survey in 1974 revealed nine adults and five calves in this group. A second group ranges along the Sadlerochit River. This group contained nine adults and three calves in 1974. A third group has settled between the Jago River and the Kongakut River. This group consisted of eight adults and six calves in 1974. Because of the large area inhabited by the muskoxen and the difficulty of making surveys, those muskoxen observed represent a minimum estimate of numbers.

The muskoxen appear to be healthy and are reproducing, however, no significant increases in the total number has been noted. The exact cause of the mortality that does occur is unknown but it is probably associated with animals wandering into areas of limited winter food or it may be attributed to predation.

The winter habitat requirements for muskoxen seem to be windblown tundra areas with very light snowfall which permits them to feed on grasses and sedges throughout the winter. The North Slope meets these requirements in many areas.

Public observation of muskoxen in the Arctic has been very limited, because of the remoteness of the area, and the expense required to reach it.

ARCTIC SLOPE MUSKOX

LOCATION

Game Management Unit 26.

THE SPECIES

Although muskoxen once ranged from Greenland through the Canadian Arctic Archipelago to the coastal plain of Arctic Alaska, the last native animals in Alaska were killed between 1850 and 1860. In 1969 and 1970, a total of 64 muskoxen were transplanted to the eastern North Slope and released at Barter Island and on the Kavik River. Since that time most of the muskox sightings have occurred on the Arctic National Wildlife Range, although a few individuals have been seen outside of its boundaries. There was substantial mortality or movement and loss to the herd and by 1971 a minimum estimate of 24 muskoxen was made, though the total number was believed to be higher. By 1974, a total of 39 were seen in the area, including 12 calves. A slow but steady increase of the herd is anticipated.

Factors causing mortality among muskoxen are usually predation, old age, or lack of forage during winter. The initial high mortality of these animals after the transplant was undoubtedly partially due to stress caused by physical handling and moving; in addition some single and small groups of animals moved out of the area or were killed by hunters unfamiliar with them. The level of mortality has probably stabilized at this time and consists mostly of the death of old or immature animals.

Muskox habitat does not appear to be a limiting factor to their population growth in this area. If, as records suggest, muskoxen once roamed throughout the region, the habitat available should still be able to support them, since it has not undergone any known alterations. The preferred food species of Labrador tea, crowberry, lingonberry, dwarf birch, willows, sedges, grasses, and horsetails are all found along the coastal plain in Arctic Alaska.

At present no hunting of these animals is allowed and none is anticipated until the population is more firmly established, although the few adult bulls which leave the herds could be hunted without affecting herd integrity. Hikers and photographers rarely encounter muskoxen in Arctic Alaska, even though the use by these groups of the Arctic National Wildlife Range is high relative to the remainder of the North Slope. Nevertheless, the fact that muskoxen inhabit the area and that there is a possibility of encountering them undoubtedly increases the appeal of the area.

Most of the nonconsumptive use of the area occurs during summer and early fall. There is no domestic use of the muskox by the people of Kaktovik, although they may desire to act as guides for hunters once a population

surplus exists to allow hunting. The same use pattern would be expected if more transplants are made or the population grows and begins to expand onto other locations along the coastal plain.

The difficulties of access and the small numbers of muskoxen result in few human encounters with these animals. Access is restricted by the character of the environment: local residents from Kaktovik use snow machines throughout the area; ski-equipped aircraft can land in many locations during the winter, but summer access by air is limited to gravel bars and coastal abandoned DEW sites for wheel-planes and lakes and coastal areas for float planes. The country is difficult to hike through during the summer and most hikers travel along the rivers.

ALASKA WOLF

LOCATION

Entire state except Game Management Units 7, 14C (see West Chugach Wolf Plan location description), 15, and national parks or other areas closed to all hunting and trapping.

THE SPECIES

Wolves occur throughout mainland Alaska and on many islands in Southeastern Alaska. Although wolf abundance varies greatly between areas and from year to year, Department estimates indicate a statewide fall wolf population of 8,000 or more. Southeastern Alaska has historically supported the greatest wolf densities in the state. Wolves are common or abundant on the Southeastern mainland coast from Yakutat Bay south and moderate on islands south of Cape Fanshaw. Track sightings and wolf-killed deer on 1,168 square-mile Revillagigedo Island between 1970 and 1972 indicated about 125 wolves, approximately 1 wolf per 10 square miles. Wolf numbers there have since declined; winter aerial surveys between 1973 and 1975 indicated a winter population of between 30 and 40 animals. Wolves are rare on the mainland coast between Icy Cape and Yakutat Bay and absent from Admiralty, Baranof and Chichagof Islands. Wolves in Southeastern Alaska generally reach greater densities on islands, perhaps because deer are important wolf prey on islands and are more abundant and vulnerable than mountain goats, the primary mainland wolf prey.

South of the Alaska Range, historical accounts of wolf numbers in the Nelchina and Copper River Basins date from the early 1900's. Wolves were reported to be abundant around 1900 but declined to low numbers by 1907 and were uncommon until the late 1920's. Wolves were apparently numerous during the 1930's and 1940's until a federally-administered wolf control program reduced wolf numbers considerably. This program lasted from 1948 until 1953 in the Nelchina Basin and until 1955 in the Copper River Basin. An estimated 12 wolves remained in the Nelchina Basin in 1953. Wolf hunting and trapping were prohibited in the Nelchina Basin between 1957 and 1965-66. Wolves in the Nelchina had increased to approximately 450 animals by 1965, a density of 1 wolf per 55 square miles. Wolves were less numerous in the late 1960's but had again increased by 1972. In 1976, estimates of wolf density in the Nelchina Basin are approximately 1 wolf per 70 square miles, and densities in the Copper River Basin may be comparable. Wolves are much less numerous in the Copper River Delta, and a resident population did not become established there until about 1971. By 1975 an estimated 20 wolves occupied an area east of the Copper River. Wolf numbers in the Matanuska and lower Susitna River Valleys are unknown, although wolf pack sizes, which may be directly related to abundance, have increased from an average of 2.5 wolves per pack in 1972-73 to 4.4 in 1973-74 and 5.2 in 1974-75. Packs west of the lower Susitna River averaged 4.4 wolves in 1972-73, 2.0 in 1973-74 and 5.9 in 1974-75. The general increase in average pack size suggests an increasing number of wolves, but these data are inconclusive because few packs were counted in some years.

Wolves occur throughout lower Cook Inlet and the drainages of Bristol Bay, including Unimak in the Aleutian Islands. Wolf densities in Southwestern Alaska are unknown, but populations appear to be comparatively low on the Alaska Peninsula. Wolves are more numerous from the Lake Clark area west to the foothills of the Kilbuck Mountains. Wolves are most abundant where both caribou and moose occur, and in these areas appear to be increasing in numbers.

The broad expanse of Interior Alaska north of the Alaska Range to the Brooks Range is probably the most important wolf habitat in the state. Although there are few wolves in the Yukon-Kuskokwim Delta and on the Seward Peninsula, wolf densities in the rest of the region are the greatest in the state, except for Southeastern Alaska. Wolf densities from the middle Koyukuk River south to and including the drainages of the Kuskokwim River ranged between 1 wolf per 40 square miles to 1 per 80 square miles during 1971 through 1975. The Holitna River area and tributaries of the upper Kuskokwim support the greatest number of wolves in the southern part of the region. Wolves are also abundant in areas of the Nowitna and Innoko Rivers and along the middle Yukon. Although far less numerous on the Yukon-Kuskokwim Delta, wolves have been recorded within the city limits of Bethel in recent years. Wolf populations in the Koyukuk, Tanana and Upper Yukon drainages are in excellent condition, presumably because the region supports diverse ungulate populations. Within this broad interior region, wolves have increased since the late 1950's when control activities, including shooting from aircraft and poisoning, were discontinued. Intensive wolf surveys have been done only in a 7,000 square-mile area south of Fairbanks to the Alaska Range which corresponds to Game Management Subunit 20A, and there only since 1973. Surveys in the winter of 1975-76 indicated a wolf population in excess of 200 animals prior to removal of wolves from the area, a density of 1 wolf per 35 square miles. Whether wolf density estimates derived from Subunit 20A can be applied to the rest of the area is uncertain, although wolves south of Delta Junction have also been increasing in recent years and current densities probably equal those recorded for Subunit 20A. Wolves also appear numerous in the Tanana Hills and from the White Mountains north to the southern slopes of the Brooks Range, but densities have not been documented.

Northwestern Alaska and the North Slope also support wolves, but densities are generally lower than south of the Brooks Range. Wolves occur as far north as the Beaufort Sea, reaching greatest abundance in the foothills and mountains of the Brooks Range in the southern portion of the region. Wolves were scarce in the Arctic in the early 1900's, perhaps a reflection of low caribou numbers. By the 1930's, both caribou and wolves had substantially increased and continued to increase until the early 1950's. Federal wolf control efforts and public aerial hunting resulted in a sharp decline in the wolf population, and by the late 1960's wolves again became scarce in the Arctic. Wolves have subsequently increased following closure of the area to public aerial hunting in 1970. Wolf densities in 1975 varied from 1 wolf per 60 square miles to 1 wolf per 120 square miles for a total North Slope wolf population of approximately 600 animals. Populations in Northwestern Alaska are less well known, but are probably similar to North Slope densities. Wolves are most

abundant in this region in the drainages of the Koyuk, Shaktoolik, Ungalik, and Unalakleet Rivers. They also appear to be increasing in number in this region.

Little is known of wolf natural mortality except in a general way and in localized areas where wolves have been studied intensively. Natural controls of wolf numbers seem to stem mainly from vagaries of prey abundance and availability. Low prey abundance leads to poor wolf pup survival and perhaps a decline in the proportion of breeding females. Natural mortality rates may be affected considerably by human exploitation. Canadian investigations of nonhunted wolves reported lower pup survival and a lower proportion of females producing pups in comparison to Alaska's wolves, indicating that increased mortality due to one factor may be compensated for by lower losses to other causes. Some wolves undoubtedly suffer injuries, perhaps occasionally death, while pursuing large ungulates. A substantial decline in wolf populations between 1907 and 1925 throughout Interior Alaska has been attributed to diseases such as mange, rabies and distemper, reportedly introduced by domestic sled dogs.

The status of wolf habitat can presently be viewed only in terms of the habitat of important wolf prey species. Hooved mammals are the major source of food for wolves over much of Alaska, although small mammals, such as voles, lemmings, ground squirrels, hares, and beavers are occasionally important dietary supplements in summer. Moose are the most important prey species in much of Interior Alaska although wolves also take caribou and Dall sheep. Wolves on the North Slope rely heavily on caribou, with moose and Dall sheep being less important. Deer and mountain goats are the most important prey species in Southeastern Alaska: deer on islands and mountain goats on the mainland. Moose have been declining in numbers over much of Alaska as a result of a decade of recurring harsh winters and decreasing quality and quantity of moose browse. Caribou, also important in wolf diets, have decreased in some areas from high population levels in the mid-1960's. These declines have occurred in some areas as a result of range overuse due to trampling and overgrazing. Improved techniques in fire suppression and prevention by state and federal agencies have probably been detrimental to moose but have probably aided caribou. In Southeastern Alaska, clearcut logging practices are altering much of the climax deer winter range and may result in fewer deer and ultimately fewer wolves. U.S. Forest Service plans call for logging almost all commercial grade timber in Southeastern Alaska, and the second-growth, closed-canopy vegetation that will follow will decrease the quality of wolf habitat. Wolf habitat has been little altered by human expansion in the remainder of Alaska, except in the vicinity of settlements. Much of the Interior is currently economically unsuitable for industrial or agricultural development. Despite the recent and perhaps continuing increase in the number of wolves over the much of the state in the last decade, the status of ungulate populations indicates that wolf numbers will decline somewhat over the next few years. Moose populations seem to be increasing along the lower reaches of the Yukon and Kuskokwim Rivers, and wolves there are likely to become more common. The increases in wolves during the past decade are probably related to a substantial reduction in efforts at organized predator control, bans on poisons, and more restrictive regulations on wolf hunting, specifically on shooting wolves from the air with shotguns.

Wolf harvest data are derived from a combination of bounty records, aerial permit reports, and since 1971, a mandatory sealing requirement on all wolves taken. The harvest data are considered reasonably complete although some people have taken wolves without collecting bounties and others may not comply with sealing requirements. A gap in data exists from 1969 when bounties were largely discontinued to 1971 when the sealing requirement was initiated. The known wolf harvest by hunters and trappers in Alaska has averaged 921 wolves annually since 1959. The fewest wolves reported taken were 221 in 1959-60 and the most were 1711 in 1967-68. A reported 1,090 wolves were killed during the 1974-75 regulatory year. About 38 percent of the wolves harvested since statehood were taken in east-central Alaska. Southeastern Alaska from Icy Bay south, comprising about 6 percent of the state's land area, has produced more than 13 percent of the reported annual harvest. The wolf harvest has generally consisted of slightly more males than females. Pups comprise 40 to 50 percent of the kill each year.

Snow must be deep enough to allow tracking of wolves from the air and for aircraft landings if wolf harvests are to be significant. There is an unknown degree of noncompliance with the statewide wolf sealing requirement. In remote areas less than half of the wolves taken in some years may be reported, often because pelts are used locally. Illegal aerial hunting also occurs except in Southeastern Alaska where it is impractical due to the heavy forest cover. Since bounties are still paid on wolves from Icy Bay south, the unreported harvest there is probably small, although some bounty collectors may falsely state where the animals were taken.

The intensity of consumptive use of wolves varies considerably. Hunting and trapping pressure is comparatively light in the western portion of the state. Hunting pressure on wolves seems high in eastern and central Alaska, but it is doubtful whether the current kill is significantly impacting wolf numbers. Wolves in eastern Alaska have apparently increased since aerial hunting was prohibited in 1971 despite growing public interest in trophy wolf hunting and rising value of wolf pelts. Wolf numbers in the Nelchina and Copper River Basins appear to have fluctuated independently of harvests. Ground hunting and trapping are the only feasible methods of taking wolves in Southeastern Alaska. Harvests may, at times, have exceeded 50 percent of the population on Revillagigedo Island, but there is no evidence that the harvests have permanently reduced wolf numbers. On the North Slope, wolves were significantly suppressed by aerial hunting until the region was closed to aerial hunting in 1970. Wolf numbers north of the Brooks Range subsequently increased. It appears that continued aerial wolf hunting can reduce wolf numbers where open terrain affords the animals little escape cover. The number of wolves taken annually statewide is generally dependent on winter snow conditions.

Hunting and trapping seasons for wolves have remained liberal since statehood. Poisons were banned in 1960, and with their classification as big game animals in 1963, wolves received additional protection from regulations on seasons and bag limits. Aerial hunting permits were issued during the 1960's and early 1970's, but were suspended in 1972.

Wolves in the Nelchina Basin were protected from 1957 through June, 1966. Current hunting regulations stipulate a limit of two wolves over most of the state with an August through April season; there is no closed season or limit on wolves in Southeastern Alaska. Trapping seasons generally extend from October or November through March or April with no limit on the number that can be taken. Since 1972 most wolves have been taken by ground shooting (44 percent) or by trapping (41 percent). Trapping success by individuals is generally low since many are inexperienced trappers. The majority of wolves harvested are taken by comparatively few people. A combination of aerial spotting and shooting after landing is becoming increasingly common. A few wolves are killed by hunters incidentally to hunting for other big game species. Most are harvested between December and March, with March the most important month. Most people taking wolves are resident Alaskans. While nonresident guided hunts are becoming more popular, and nonresident trapping occurs extensively on military lands, the number of wolves taken by nonresidents is small. Wolves are sought primarily for the commercial value of the pelts in northern and western Alaska. Over the rest of the state a combination of recreation and commerce motivates wolf hunters and trappers. In Southeastern Alaska, trapping and hunting of wolves seems to occur primarily for recreational purposes, since wolf fur quality there is generally poor. Access to wolf hunting areas is primarily by airplane. Snowmachines, both for hunting and checking traplines, are important means of access in areas without roads and near remote villages. Most wolves in Southeastern Alaska are taken with traps set along beaches where the lines can be checked by boat or plane.

East-central Alaska, bordered on the north by the Brooks Range and on the south by the Alaska Range, produces the most desirable trophy wolves in the state. Wolves there are generally larger, and their pelts are often light gray, the color most preferred for trophies and by furriers. Wolves in Southeastern Alaska, though still sought for trophies, are generally smaller and darker and have shorter, more coarse and less dense fur than Interior wolves.

The number of people that enjoy seeing, hearing, or otherwise experiencing wolves in Alaska each year is unknown. Relatively few people see wolves except from aircraft. A growing number of people are frequenting remote areas during summer months, however, and incidental nonconsumptive use may be increasing. The northern Brooks Range, where the open terrain facilitates long-distance observation, may offer some of the best opportunities for the nonconsumptive use of wolves in Alaska.

WOLVES IN SOUTHEASTERN ALASKA

Wolves (*Canis lupus*) are present throughout Southeastern Alaska with the exception of Admiralty, Baranof and Chichagof Islands and some of the smaller islands where insufficient food is available to sustain wolves. Within historical time populations have varied considerably depending on food availability. Because of the dense forest cover and the elusive habits of the wolf, it is difficult to accurately determine population status. Even though they have a high reproductive potential, wolves are never abundant compared to most other game species.

Mainland populations south of Glacier Bay have remained relatively stable over the past 15 years with numbers in the southern half of the area holding at moderate to high levels. On the islands in Southeastern Alaska where wolves occur fluctuations in populations have been evident. Low population levels in the early 1960's increased to a peak between 1967 and 1970. Populations then began declining and are now again quite low. The trends have followed those of deer. Wolves have only recently inhabited the area north of Glacier Bay. The first wolf bountied there was in 1963-64. Wolf populations increased in the area since their establishment and were present at relatively high levels in 1976.

Wolves usually occur in packs which may consist of parents and pups of the year, young of the previous year, and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In Southeastern Alaska pack sizes usually range from 3 to 5, although packs of 15 individuals have been seen. The range of a pack may include over 1,000 square miles, but their range is often restricted by the size of the island occupied. During early summer when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults may travel 20 miles or more from dens while hunting.

When available, moose, deer and mountain goat are the major food sources for wolves in Southeastern Alaska. During winter, these species constitute almost the entire diet of wolves. Beaver are also a preferred food, but are never available in sufficient quantity to be a major food source. During summer, and when big game species are not available, wolves will utilize almost any food source including small mammals, birds, fish and even many of the sea invertebrates found in the intertidal zone. When prey species are very scarce, wolves become scavengers, finding much of their food along the beach. Carrion, as well as anything edible, will be utilized.

Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests that the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The effect of wolf

predation can range from one of minor significance in which wolves remove far less than the annual recruitment to the prey population, to one in which wolves can retard prey population growth or reduce a prey population by removing the annual recruitment or more.

Studies of wolf populations indicate the high reproductive potential of wolves is seldom realized. Several factors may regulate wolf population levels either through reduced productivity or direct mortality. These include reduced fertility, social inhibition of breeding, malnutrition and starvation (especially among pups), cannibalism and the other forms of intra-specific strife, disease, accidents and predation. The importance of these factors varies. Various studies of wolf ecology suggest that food supply is a primary determinant of wolf densities. When prey are abundant or easily taken wolves exhibit increased productivity giving birth to more, larger litters of pups, and more pups survive their first year of life. Conversely, when food is scarce, fewer, smaller litters are produced, and mortality of pups because of starvation and cannibalism increases. Natural mortality is greatest during the first year of life. Fifty to sixty percent of the pups born each spring die within eight months.

Wolves may compensate for human utilization by increased production and survival of young. In some cases wolves can compensate for a harvest of 50 percent of the autumn population. Excessive human exploitation, however, can reduce wolf populations.

The treatment of wolves in Alaska has changed greatly during this century. In 1915, Alaska's first territorial legislature established a bounty on wolves, which has persisted in Southeastern Alaska. Prior to 1960 there were no restrictions on the taking of wolves. From 1948 until 1959 the federal government conducted intensive wolf control operations in many parts of Alaska using poisons, aerial shooting and trapping. In 1959 the State assumed management authority for wolves. In 1960 the use of poisons was discontinued. In 1963 the Board of Fish and Game classified wolves as both furbearers and big game animals. Regulations governing methods of harvest, seasons and bag limits were promulgated, thus providing additional protection for wolves. In 1968 the legislature authorized the Board of Fish and Game to abolish bounties and bounty payments were suspended in all but Game Management Units 1, 2 and 3 in Southeastern Alaska.

In Units 1, 2 and 3, the wolf has always been considered by most residents as a predator competing for game species, particularly deer. There has never been a closed season or a bag limit for wolves in these Units and they are normally taken when opportunity permits. In spite of no hunting restrictions, human use has had little impact on wolf populations. Presently, the area with the largest wolf population (Unit 1A) also supports the most intensive human use. Southeastern wolf pelts have never had a high commercial value, although, when added to the fifty dollar bounty, they are sufficient incentive for some trappers to actively attempt to take wolves when they are reasonably abundant. Today, most wolves are taken in the southern mainland area. At the present time most professional trappers do not consider it worth their time to trap on the islands.

WOLVES IN SOUTHCENTRAL ALASKA

Wolves (*Canis lupus*) occur throughout Southcentral Alaska except the coastal area from Kachemak Bay to Cordova and the Islands of Prince William Sound. They are abundant over most of their range but occur in lower numbers in the heavily populated Matanuska Valley and Anchorage areas. Limited information suggests that wolf numbers have varied in accordance with prey availability.

Two new wolf populations have become established in the past decade. Wolves disappeared from the Kenai Peninsula in the 1910's, about the same time that caribou disappeared. In the early 1960's wolves naturally immigrated to the Kenai Peninsula and have since become well established. On the Copper River and Bering River deltas wolves were rare visitors prior to the establishment of a moose population in the 1950's. Since the late 1960's a sizable wolf population has become established.

In the past, extensive poisoning of wolves over most of Southcentral Alaska by the U.S. Fish and Wildlife Service caused drastic reductions in wolf numbers. Control work in the Nelchina Basin between 1948 and 1953 reduced the population to an estimated 12 or fewer wolves. In 1957 wolves in the Nelchina basin received complete protection and by 1967 the population had completely recovered and aerial hunting and trapping were again allowed.

In most of Southcentral Alaska, wolf populations in the 1960's were moderately high. Aerial wolf hunting appears to have reduced wolf numbers in certain areas where they were vulnerable to this hunting technique. Following the cessation of aerial wolf hunting in 1972, wolf populations increased to high levels in many areas.

Wolves are presently abundant over most of Southcentral Alaska and show signs of increasing even in the heavily populated Anchorage and Matanuska Valley areas.

Wolves usually occur in packs which may consist of related individuals including parents and young of the year, young of the previous year and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Southcentral Region pack sizes usually range from 5 to 12, although packs of 36 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. Even with adequate food, the ranges of packs often overlap. During early summer when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults may travel 20 miles or more from dens while hunting. Active dens are usually at least 15, and often 25 or more miles apart.

The diet of wolves in Southcentral Alaska varies according to season, location, and prey species available. Moose and caribou are the major prey, although Dall sheep are also taken. During winter these big game species constitute almost the entire diet of wolves. Snowshoe hares are an important supplement during some years. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, snowshoe hares, beaver, and occasionally birds and fish are important supplements.

Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests that the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The effect of wolf predation can range from one of minor significance in which wolves remove far less than the annual recruitment to the prey population, to one in which wolves can retard prey population growth or reduce a prey population by removing the annual recruitment or more.

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The nature of human use of wolves in the Southcentral Region has also changed during this century. Prior to the 1960's the major incentive for wolf hunters and trappers was the bounty because wolf hides were of relatively low value. During the 1960's the value of pelts increased markedly and, in combination with bounty payments, resulted in increased efforts to take wolves. Even with the elimination of the bounty in 1968, the value of pelts, which has continued to increase, has provided a significant economic incentive for people to hunt and trap wolves. Since 1962 the reported annual harvest of wolves in Southcentral Alaska averaged 190 and ranged from 53 to 376 wolves with the largest numbers taken during the winters of 1965-66, 1967-68 and 1974-75. Prior to the elimination of aerial hunting in 1972 aerial hunters accounted for about 61 percent of the harvest each year. Trapping is presently the most important consumptive use of wolves. A small number are also taken each autumn by guided and unguided nonresident hunters incidental to hunts for other big game animals. The trophy value of wolves continues to gain importance.

Wolf pelts continue to be an important item for many Alaska natives who manufacture items for sale from them. A portion of the wolf pelts harvested in Southcentral Alaska are sold to natives in Northern Alaska for use as parka trims and items of trade.

In recent years nonconsumptive use has increased in Southcentral Alaska. Much of the area is forested, limiting the opportunity to view wolves, but listening for wolves is becoming increasingly popular. The value of hearing wolves howl surpasses that of actually observing them to some people. Opportunities for viewing wolves in McKinley Park are good and some people are successful in seeing them there. The Denali Highway also offers many people the opportunity to see or hear wolves.

WEST CHUGACH WOLF

LOCATION

Game Management Unit 14C and in Game Management Unit 7, the drainages of Glacier Creek and Twenty-Mile River.

THE SPECIES

Wolves are not abundant within the 2000 square-mile West Chugach area because much of it lacks the wilderness characteristics wolves require. Incidental observation during Game Division moose surveys, together with sightings by private individuals, indicate there are only 3 or 4 packs of wolves in this area. Prior to substantial human population increases, wolves were probably more abundant. In wilderness sections of the area, habitat requirements are thought to be adequate. A moderate ungulate population, consisting of moose, sheep, and goats, in addition to several small game species, is sufficient to support the present population of resident wolves.

Wolves have been hunted and trapped in the area for at least the past 60 years. Past harvest levels are unknown, but are not thought to have been greater than 5 or 6 per year. Present use of wolves within the area is light. Hunting and trapping are prohibited throughout most of the area. Since 1971, when the Department initiated a mandatory wolf sealing program, only four wolves, 3 males and 1 female, have been legally harvested. All wolves were taken by local residents. Chances of taking a wolf by either hunting or trapping are very slight. Ignorance of existing regulations and/or accidental trapping may have resulted in some wolf fatalities unknown to the Department. Present harvest levels are not thought to be detrimental to the population.

Nonconsumptive use of wolves throughout the year has involved viewing, listening, photography and sign observation by hunters, hikers and skiiers in wilderness sections of the area. Favorite routes into areas where wolves may be seen or heard include the Arctic Valley road, the Ship Creek trail, the Eagle River road and trail, and the Eklutna road and trail. Winter access via snowmachine or cross-country skis allows greater mobility, therefore increasing the probability of observing wolves or their sign.

KENAI WOLF

LOCATION

Game Management Units 7 and 15, the Kenai Peninsula.

THE SPECIES

Wolves were absent from the Kenai Peninsula for a period of time extending from prior to 1930 until the early 1960's when the first reports of an occasional wolf were verified. The first pack sighting (10 wolves) was made in 1968 and the wolf population has since grown rapidly. In 1968 the center of distribution of Kenai wolves was Tustumena Lake, but wolves have since spread to all parts of the Kenai Peninsula except the coastal area from Seldovia to Cape Fairfield. Wolves are now abundant over most of the Kenai Peninsula. A census conducted in March of 1975 resulted in a population estimate of 90-105 wolves, but the actual population level may be as high as 150. Considering the growth rate of the wolf population on the Kenai Peninsula, natural mortality rates have been low. The high losses of moose calves to malnutrition and the weakened condition of adult moose resulting from severe winters from 1972-75 made food highly available, thereby benefiting the wolf population. Wolf habitat has been affected very little by man on the Kenai Peninsula. Wolves seem well able to live in close proximity to man so long as they are not persecuted. A sharp decline in moose, the prime prey species of wolves in this area, may eventually adversely effect the welfare of wolves but these effects have not yet been seen.

Harvesting of wolves on the Kenai Peninsula was initiated by a permit hunt in 1974. Six wolves were taken. In 1975 both hunting and trapping were allowed and the harvest increased to 15 with 6 wolves taken by traps and 9 by shooting. Although the 5 month season was liberal the harvest of wolves was much below the level required to stabilize the population.

In excess of 90 percent of the wolves harvested on the Kenai Peninsula were taken by residents of the Peninsula in the vicinity of their residence. The remainder were taken by residents of Anchorage.

Over 50 percent of the wolves harvested were taken for trophies with the remainder being sold to fur buyers. Almost all wolves were taken for recreational purposes. Those that were trapped and the pelts sold were taken for recreation, with the value received for pelts being a secondary benefit. Most wolves are taken by hunters and trappers utilizing snowmachines or operating from the road system. Some wolves have been taken by trappers utilizing aircraft for running their traplines. Harvesting of wolves occurs from November through March while most nonconsumptive uses occur in the summer and early fall.

Because wolves are seldom seen they do not lend themselves well to viewing. They are however, occasionally seen along the roadside or incidental to hunting and other recreational pursuits. Although wolves are seldom seen they are often heard howling at night and campers derive considerable aesthetic benefit from hearing them.

WOLVES IN SOUTHWESTERN ALASKA

Wolves (*Canis lupus*) occur throughout most of Southwestern Alaska, but are absent on Kodiak Island and the Aleutian Islands west of Unimak. Generally they appear most abundant in the eastern portion of the region. Since the turn of the century wolf abundance has apparently varied, probably in response to numerical changes in big game prey species. Limited government control work occurred during the 1950's and undoubtedly affected local wolf populations. Aerial hunting has never had a sustained impact on Alaska Peninsula wolves because winter snow conditions seldom favor extensive use of this technique. It has, however, been both popular and effective in the upper drainages of the Nushagak and Mulchatna Rivers. Wolves are commonly observed throughout most areas of Southwestern Alaska, but estimates of wolf densities in specific areas are lacking.

Wolves usually occur in packs which may consist of parents with pups of the year, young from the previous year and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In Southwestern Alaska pack sizes usually range from 5 to 8, although packs of 18 individuals have been observed. The range of a pack may include a sizeable area, but where optimal food resources exist wolves may utilize areas as small as a few hundred square miles. Even with adequate food, ranges of packs often overlap. During early summer, when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults may travel 20 miles or more from dens while hunting.

The diet of wolves in Southwestern Alaska varies according to season, location, and prey species available. Caribou are the major prey in most of the Southwestern Region although moose are also important where they occur. During winter, these species constitute nearly the entire diet of wolves. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, beaver and occasionally birds and fish are important supplements.

Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The effect of wolf predation can range from one of minor significance in which wolves remove far less than the annual recruitment to the prey population, to one in which wolves can retard prey population growth or reduce a prey population by removing the annual recruitment or more.

Studies of wolf populations indicate the relatively high reproductive potential of wolves is seldom realized. Several factors may regulate wolf population levels either by reduced productivity or direct mortality.

These include reduced fertility, social inhibition of breeding, malnutrition and starvation (especially among pups), cannibalism and other forms of intra-specific strife, disease, accidents and predation. The importance of these factors varies. Various studies of wolf ecology suggest that, food supply is a primary determinant of wolf densities. When prey are abundant or easily taken, wolves exhibit increased productivity, giving birth to more, larger litters of pups, and more pups survive their first year of life. Conversely, when food is scarce, fewer, smaller litters are produced, and mortality to pups because of starvation and cannibalism increases. Natural mortality is greatest during the first year of life. Fifty to sixty percent of the pups born each spring die within eight months.

Wolves may compensate for human utilization by increased production and survival of young. In some cases wolves can compensate for a harvest of 50 percent of the autumn population. Excessive human exploitation, however, can reduce wolf populations.

The treatment of wolves in Alaska has changed greatly during this century. In 1915, Alaska's first territorial legislature established a bounty on wolves. Prior to 1960 there were no restrictions on the taking of wolves. From 1948 until 1959, the federal government conducted intensive wolf control operations in many parts of Alaska using poisons, aerial shooting and trapping. In 1959 the State assumed management authority for wolves. In 1960 the use of poisons was discontinued. In 1963 the Board of Fish and Game classified wolves as both furbearers and big game animals. Regulations governing methods of harvest, seasons and bag limits were promulgated thus providing additional protection for wolves. In 1968 the legislature authorized the Board of Fish and Game to abolish bounties and bounty payments were suspended in all but three Game Management Units in Southeastern Alaska.

The nature of human use of wolves in Southwestern Alaska has also changed during this century. Early harvests were primarily by trapping or occasional ground shooting, and harvest levels were low. This pattern gradually shifted to aerial hunting and somewhat increased harvest until the practice was discontinued in the early 1970's. Presently most wolves are taken by ground shooting, either by sport hunters or trappers. Harvest is almost entirely by residents. Occasionally animals are taken by nonresidents. Pelts are sold primarily to the fur market with only a few used for local clothing or handicraft. Some of the animals harvested are sold to hunters or taxidermists to be mounted as trophies.

WOLVES IN WESTERN ALASKA

Wolves (*Canis lupus*) can be found throughout Western Alaska but are uncommon on the coastal wetlands. Although information regarding the distribution and abundance of wolves during the early part of this century is limited, evidence suggests that wolves were relatively abundant prior to about 1920. Between 1920 and 1925 wolves were apparently rare, and it is thought that disease was the most likely cause for the decline. Wolves gradually increased after 1925 and have continued to be moderately abundant in most parts of Western Alaska. Predator control and aerial hunting by private individuals during the 1950's and 1960's maintained relatively low local populations during this period. Presently the density of wolves in Western Alaska varies from approximately one wolf per 45 to one wolf per 100 square miles.

Wolves usually occur in packs which may consist of kindred individuals including parents and pups of the year, young of the previous year, and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Western Region pack sizes usually range from 6 to 10, although packs of 20 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. Even with adequate food, the ranges of packs often overlap. During early summer when pups remain at dens, most adults also center their activities around dens. This reduces their mobility, although adults may travel 20 miles or more from dens while hunting. Active dens are usually at least 15 and often 25 or more miles apart.

The diet of wolves in the Western Region varies according to season, location, and moose are the major prey for wolves in the Western Region although Dall sheep and caribou are important prey in certain areas. During winter these big game species constitute almost the entire diet of wolves. Snowshoe hares are an important supplement at times. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, snowshoe hares, beaver, and occasionally birds and fish are important supplements.

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The nature of human use of wolves in Western Alaska has also changed considerably during this century. Prior to the 1920's trapping by residents was the primary method used to take wolves. The pelts were used locally to manufacture clothing. Aerial gunning by private citizens became popular during the last 2 decades, but permits for this type of hunting were terminated in 1972. Trapping and snariang are the primary means now used to take wolves.

Since 1962 the reported annual harvest of wolves in Western Alaska has averaged about 140 wolves and has ranged from 44 to 336 with most of the harvest coming from the area east of the Yukon-Kuskokwim Delta. Presently most wolf pelts enter the commercial market. Some pelts are used locally in the manufacture of clothing.

WOLVES IN INTERIOR ALASKA

Wolves (*Canis lupus*) have been recorded throughout Interior Alaska at varying levels of abundance from the days of early settlement. Although information reflecting wolf occurrence during the early part of this century is limited, evidence suggests that wolves were abundant prior to about 1920. Between 1920 and 1925 wolves were extremely scarce over much of the Interior, and it is thought that disease was the most likely cause for the decline. Wolves gradually increased after 1925 and have continued to be moderately abundant in most parts of the Interior. Predator control and aerial hunting by private individuals during the 1950's and 1960's maintained relatively low local populations during this period. Presently the density of wolves in Interior Alaska varies from approximately one wolf per 40 to one wolf per 100 square miles.

Wolves usually occur in packs which may consist of parents and pups of the year, young of the previous year, and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Interior Region pack sizes usually range from 6 to 10, although packs of 20 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. Even with adequate food, ranges of packs often overlap. During early summer when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults may travel 20 miles or more from dens while hunting. Active dens are usually at least 15, and often 25 or more miles apart.

The diet of wolves in the Interior Alaska varies according to season, location, and prey species available. Moose are the major prey, for wolves in much of the Interior Region although Dall sheep and caribou are also taken, the latter being especially important in the northern and eastcentral portions of the region. During winter, these big game species constitute almost the entire diet of wolves. Snowshoe hares are an important supplement during some years. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, snowshoe hares, beaver and occasionally birds and fish are important supplements.

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The nature of human use of wolves in the Interior Region has also changed during this century. Prior to the 1960's the major incentive for wolf hunters and trappers was the bounty, because wolf hides were of relatively low value. During the 1960's the value of pelts increased markedly and, in combination with bounty payments, resulted in increased efforts to take wolves. Even with the elimination of the bounty in 1968, the value of pelts, which has continued to increase, has provided a significant economic incentive for people to hunt and trap wolves. Since 1962 the reported annual harvest of wolves in the Interior has averaged 385 and ranged from 214 to 746 wolves with the largest numbers taken during the winters of 1966-67, 1967-68 and 1971-72. Prior to the elimination of aerial hunting in 1972 aerial hunters accounted for about 40 percent of the harvest each year, with trappers taking the majority of wolves. Trapping is presently the most important consumptive use of wolves. A small number are also taken each autumn by guided and unguided nonresident hunters incidental to hunts for other big game animals.

Most wolf pelts from the Interior enter the commercial fur market, although many are used domestically in the manufacture of various types of clothing, or are sold locally, often to tourists.

WOLVES IN NORTHWESTERN ALASKA

Wolves (*Canis lupus*) occur throughout Northwestern Alaska although they are more abundant in the eastern portion of the region. Information regarding the distribution and abundance of wolves during the early part of this century is limited, but evidence suggests that wolves were present at lower densities prior to 1940 than those presently observed. This is probably due in large part to the absence of moose, which did not establish significant populations in the area until about 1930, and also to the low numbers of caribou present during this time. Since the 1930's wolves have been relatively abundant in the region east of the Seward Peninsula. During the late 1940's and 1950's the U. S. Fish and Wildlife Service conducted extensive wolf control programs in Northwestern Alaska to protect domestic reindeer herds. These programs reduced numbers of wolves over much of the area. Control efforts were much reduced in the late 1950's but have continued through the present on the Seward Peninsula. As a result wolves are rare in this area. Wolves are present in the remainder of the region at densities ranging from about one wolf per 50 to one wolf per 100 square miles.

Wolves usually occur in packs which may consist of parents and pups of the year, young of the previous year, and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Northwestern Region pack sizes usually range from 6 to 10, although packs of 20 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. During winter in the Northwestern Region, packs may at times abandon their usual range due to the temporary absence of their major prey species, the migratory caribou. Even with adequate food, ranges of packs often overlap. During early summer when pups remain at dens most adults center their activities around dens. This reduces their mobility although adults may travel 20 miles or more from dens while hunting. Active dens are usually at least 15, and often 25 or more miles apart.

The diet of wolves in Northwestern Alaska varies according to season, location, and prey species available. Caribou are the major prey although moose are important in some areas and Dall sheep are occasionally taken in the northern part of the region. During winter these big game species constitute almost the entire diet of wolves. During summer young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, snowshoe hares, beaver, and occasionally birds and fish are important supplements. Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests that the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The

abundant or easily taken wolves exhibit increased productivity, giving birth to more, larger litters of pups, and more pups survive their first year of life. Conversely, when food is scarce, fewer, smaller litters are produced, and mortality of pups because of starvation and cannibalism increases. Natural mortality is greatest during the first year of life. Fifty to sixty percent of the pups born each spring die within eight months.

Wolves may compensate for human utilization by increased production and survival of young. In some cases wolves can compensate for a harvest of 50 percent of the autumn population. Excessive human exploitation, however, can reduce wolf populations. In Northwestern Alaska, where wolves in many areas are vulnerable to aerial hunting techniques, intensive human exploitation in previous years was a major factor affecting wolf population levels.

The treatment of wolves in Alaska has changed greatly during this century. In 1915, Alaska's first territorial legislature established a bounty on wolves. Prior to 1960 there were no restrictions on the taking of wolves. From 1948 until 1959 the federal government conducted intensive wolf control operations in many parts of Alaska using poisons, aerial shooting and trapping. In 1959 the State assumed management authority for wolves. In 1960 the use of poisons was discontinued. In 1963 the Board of Fish and Game classified wolves as both furbearers and big game animals. Regulations governing methods of harvest, seasons and bag limits were promulgated, thus providing additional protection for wolves. In 1968 the legislature authorized the Board of Fish and Game to abolish bounties and bounty payments were suspended in all but three Game Management Units in Southeastern Alaska.

The nature of the human use of wolves in Northwestern Alaska has also changed a great deal during this century. Prior to the 1930's a relatively small number of wolves was taken by residents for domestic use in the manufacture of various types of clothing. In recent years the number of wolves harvested has increased due to the use of aircraft and snow machines in hunting and also because of some increase in the number of wolves in the area. Since 1962 the reported annual harvest for the region has averaged about 100 wolves and ranged from 29 to 205, with the largest harvest occurring in 1967-68. Prior to the elimination of aerial hunting in 1972, the majority of wolves were taken with the aid of aircraft. Many wolves are now taken by hunters who use aircraft to land near them to shoot with a rifle. Many wolves are also taken by hunters who use snow machines to track the animals. The open nature of much of the terrain in Northwestern Alaska makes these techniques very effective. At present many wolf pelts enter the commercial market, but a large number are also used domestically for parka ruffs, boots, mittens and trim.

WOLVES IN ARCTIC ALASKA

Wolves (*Canis lupus*) occur throughout Arctic Alaska as far north as the Beaufort Sea, although they are generally more abundant in the foothills and mountains of the Brooks Range in the southerly portion of the region. Since the turn of the century wolf abundance has varied a great deal in this area. Wolves were scarce during the early 1900's, reflecting low arctic caribou numbers. By the 1930's wolves and caribou increased in numbers. Wolves were moderately abundant during the 1940's, and reached a peak in the early 1950's. Extensive government control work as well as aerial hunting by private individuals during the 1950's and in subsequent years caused a sharp decline in the wolf population, and by the late 1960's the population in the Arctic area had reached a very low level. The wolf population increased following the closure of the area to aerial hunting in 1970. Presently the density of wolves in Arctic Alaska varies from approximately one wolf per 60 to one wolf per 120 square miles.

Wolves usually occur in packs which may consist of parents and pups of the year, young of the previous year and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Arctic Region pack sizes usually range from 6 to 10, although packs of 20 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. During winter in the Arctic Region, packs may at times abandon their usual range due to the temporary absence of their major prey species, the migratory caribou. Even with adequate food the ranges of packs often overlap. During early summer when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults often travel 20 miles or more from dens while hunting. Active dens are usually at least 15, and often 25 or more miles apart. The diet of wolves in Arctic Alaska varies according to season, location, and prey species available.

Caribou are the major prey, although Dall sheep and moose are also taken. During winter these big game species constitute almost the entire diet of wolves. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, and occasionally birds and fish are important supplements.

Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests that the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The effect of wolf predation can range from one of minor significance in which wolves remove far less than the annual recruitment to the prey population, to one in which wolves can retard prey population growth or reduce a prey population by removing the annual recruitment or more.

Studies of wolf populations indicate the high reproductive potential of wolves is seldom realized. Several factors may regulate wolf population levels either through reduced productivity or direct mortality. These include reduced fertility, social inhibition of breeding, malnutrition and starvation (especially among pups), cannibalism and the other forms of intra-specific strife, disease, accidents and predation. The importance of these factors varies. Various studies of wolf ecology suggest that food supply is a primary determinant of wolf densities. When prey are abundant or easily taken, wolves exhibit increased productivity giving birth to more, larger litters of pups, and more pups survive their first year of life. Conversely, when food is scarce, fewer, smaller litters are produced, and mortality of pups to starvation and cannibalism increases. Natural mortality is greatest during the first year of life. Fifty to sixty percent of the pups born each spring die within eight months.

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The nature of human use of wolves in the Arctic Region has also changed a great deal during this century. Prior to the late 1930's there was little human activity in the inland portion of the area because of a prevailing scarcity of game, especially caribou. The harvest of wolves was correspondingly light, and was entirely subsistence use by residents. During the 1940's the Nunamiut Eskimo, who repopulated the northcentral Brooks Range, trapped and hunted wolves extensively for bounty and for use in clothing and in trade. The Nunamiut took from 50 to 150 wolves each year, with a smaller number being taken by residents of coastal villages. In 1952 the U. S. Fish and Wildlife Service conducted an intensive wolf control program in the central portion of the area. Following this, aerial bounty hunting by private individuals became extensive and large numbers of wolves were killed. Aerial hunting continued until prohibited in 1970. Resident trappers also took wolves during this period, and, until 1967, Nunamiut Eskimos searched for wolf dens during summer to obtain wolves for bounty. Since 1970, resident

hunters and trappers have been the primary consumptive users of wolves during the winter months. A small number of wolves are taken each autumn by guided and unguided nonresident hunters incidental to hunts for other big game animals.

Wolf pelts remain important in the manufacture of various types of clothing worn by residents of the area, and, since the late 1950's, have been an important commodity in the handcrafting of caribou skin masks, a key industry in Anaktuvuk Pass and other villages.

In recent years an increasing number of hikers and other nonconsumptive users have frequented the northern Brooks Range during the warmer months. The open nature of the terrain enables ready observation of wolves and other wildlife and an increasing number of people are taking advantage of the excellent opportunities to observe wolves.

DALL SHEEP IN SOUTHCENTRAL ALASKA

Dall sheep (*Ovis dalli*) occupy alpine portions of all major mountain ranges in Southcentral Alaska. An estimated 2,000 sheep inhabit the Kenai Mountains north of Kachemak Bay and west of the Sargent Ice Field. About 3,000 sheep occupy the northwest and north slopes of the Chugach Mountains between Anchorage and the Canadian border, while another 3,000 are found in the Talkeetna and Watana Mountains. About 10,000 sheep inhabit the Wrangell Mountains, of which only the southwestern slopes are included in the Southcentral area. Approximately 2,000 sheep reside in the Alaska Range southwest of McKinley Park, however, only a relatively small part of this herd occupies the southeastern slopes which are included in the Southcentral region. These sheep are found primarily west of the Skwentna River and from Lake Clark Pass north to the Yentna River in those mountains protected from the heavy coastal snowfall by intermediate ranges. Sheep generally do not occupy the remaining south slopes of the Alaska Range, the south slopes of the Chugach Range, nor the eastern Kenai Mountains due to heavy accumulation of snow.

Like most northern ungulates, Dall sheep populations are subject to fluctuations in abundance. Numbers were reportedly high in the early part of this century. A major decline occurred in the 1930's and early 1940's, probably as a result of unusually severe winters, which left sheep herds throughout the state at low levels. Herds increased again throughout the 1950's and 1960's. Although data are not available for all populations, it appears that sheep numbers in Southcentral Alaska peaked in about 1968 and have been stable or declining slowly since then. Sheep populations are probably near the carrying capacity of winter ranges and may be expected to remain relatively stable or to decline with the occurrence of abnormally severe winters.

Dall sheep usually occupy alpine habitats. During summer, they occupy relatively large areas of their annual range and remain almost entirely above brushline. Alpine meadows and slopes are used for feeding and resting, while nearby cliffs or large rocky outcrops are required for escape cover. By early November, sheep begin to congregate on their winter ranges. These are areas of limited size where forage is available throughout the winter on windblown ridges or slopes, and where cliffs and outcrops are available to enable escape from predators. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by, a winter range of relatively few acres. Some herds occupy winter habitats several miles removed from their summer range and migrate between the two, sometimes following traditional routes leading across timbered valleys. Breeding takes place from mid-November through early December.

With the beginning of snow melt in spring, most sheep move down from their windswept wintering grounds to the lower, south-facing slopes where green plants first emerge. At this time, they may be found down in alders and near the upper limits of timberline, much lower than at any other season.

Lambing occurs in May and early June. Parturient ewes seek isolation in the most rugged cliffs available to give birth to their single lambs. Escape terrain is particularly vital at this time to protect the comparatively immobile mothers and newborn young from disturbance and predator attack. Upon completion of lambing, the ewes and young follow the retreating snowline upward and move onto summer ranges. Rams may preceed ewes by several weeks in moving to summer range.

Subsequent to lambing, sheep use natural mineral licks extensively. A number of such licks are well known in this region and others undoubtedly exist. Sheep, especially females and young, will frequently travel several miles over well-worn trails to congregate in mineral licks where they spend hours eating the mineral-rich soil. Use of licks is heavy in early summer and gradually lessens as summer advances. Natural mineral licks are apparently of extreme importance to many sheep, although mineral requirements are not yet clearly understood. Some herds apparently do not have access to mineral licks and may substitute the use of certain plant species to obtain the required minerals.

Dall sheep are primarily grazing animals; bunchgrasses, particularly alpine fescue, and sedges make up the majority of their annual diet. These are supplemented by smaller amounts of browse such as alpine willow. Various forbs are consumed during summer, while lichens become important quantitatively in winter.

Climate is the most important factor regulating sheep numbers and distribution. Deep, dense snows prevent sheep from reaching winter forage and are important in limiting sheep distribution, particularly in the southern limits of Dall sheep range where heavy snow accumulations occur due to maritime influences. Sheep require relatively light snowfall and wind to survive during winter. Cold temperatures keep the snow powdery and soft, allowing winds to remove it from ridgetops and slopes, exposing winter forage. Warm winters or thaws result in dense, crusted snow which the sheep cannot dig through nor the wind remove. By late winter, sheep are often restricted to small areas of exposed, wind-scoured, low-quality vegetation which provides less nourishment than is used in daily activities. Sheep then survive partially by metabolism of stored body fat and tissue. If spring arrives late, body reserves may be used up and mortality occurs. Exceptionally severe winters, such as those which occurred in the early 1940's, have been the only factor known so far to have caused major "crashes" in Dall sheep.

Overwinter survival of lambs is normally low in comparison to adult sheep and severe winters depress it further. Newborn lambs are particularly susceptible to adverse spring weather such as cold wind, rain, or snow during the critical lambing period. Summer weather, while not as critical as that in winter, is also important in providing an adequate growing season and enough forage to enable sheep to store sufficient body fat for survival during winter.

Predation does not appear to be important in population control except under exceptional circumstances, such as when deep snows force sheep to feed far from protective cliffs. Parasites, diseases and accidents also take their toll, but apparently are usually of minor importance.

Sheep were originally hunted for subsistence and the market during the early days of Alaska's settlement but they now are taken primarily by recreational hunters. Traditionally, only mature rams with horns of 3/4 curl or greater configuration have been legal game during an August-September season. Dall sheep are recognized worldwide as one of North America's outstanding trophy animals, and they are an important sport-hunted species in Southcentral Alaska.

Sheep harvests in the area have been characterized by increases in numbers of hunters (about 1,890 in 1974) and slight decreases in number of rams taken (1967-1974 average of 463 rams). Success has slowly decreased with 27 percent of sheep hunters successful in 1974. About 30 percent of the harvest has been taken by nonresidents, who presently make up only 20 percent of the hunters. Their greater hunting success is probably attributable to the requirement that nonresidents must be accompanied by a guide while sheep hunting. Success of all hunters would undoubtedly be lower, were it not for the use of mechanized off-road vehicles, including aircraft, that are used for transport to otherwise inaccessible hunting areas.

The hunting pressure in Southcentral Alaska is causing a decline in the number of large rams in some herds even though adequate breeding stocks remain. Increasing numbers of hunters are competing for a relatively stable or declining number of legal rams. Under these circumstances decreasing size and numbers of trophies taken and reduced hunter success can be expected.

While ram-only hunting harvests do not control sheep populations, carefully regulated, experimental either-sex hunts have proven feasible in controlling herd numbers. These provide more animals for harvest while apparently increasing lamb production and survival. Such intensive management may become necessary as hunting pressure increases.

Nonconsumptive uses of Dall sheep also are important. Two areas in the region are currently protected from all sheep hunting in order to provide easily accessible and relatively natural sheep herds for public viewing, photography and scientific study. These are at Sheep Mountain on the Glenn Highway and Cooper Landing on the Kenai Peninsula. Both are popular with tourists and residents alike.

KENAI LAKE SHEEP

LOCATION

That portion of Game Management Unit 7 bounded on the northwest by the Kenai River and the Sterling Highway; on the northeast and east by the Anchorage-Seward Highway; on the south by the north shore of Kenai Lake between the Anchorage-Seward Highway and Porcupine Island and a line extending from Porcupine Island to the south end of Upper Russian Lake; and on the west by the Russian River and Upper and Lower Russian Lakes.

THE SPECIES

Aerial trend surveys indicate that Dall sheep populations over most of the eastern Kenai Peninsula, including the Kenai Lake area, increased steadily from the early 1940's through the late 1960's and early 1970's. Since then most populations have declined. Within the Kenai Lake area, the Crescent Lake sheep population experienced a similar trend except that the population was purposely reduced in 1971. Since 1971 the Crescent Lake population has been maintained at a fixed level through either-sex sport hunting. The other sheep population in the Kenai Lake area, the Cooper Mountain herd, has continued to decline under ram-only hunting.

In 1970 the Department initiated a sheep research program to assess the impacts of various types of management. The Crescent Lake program consisted of harvesting ewes and some full-curl rams in an attempt to maintain the population below habitat carrying capacity. Between 1970 and 1974 a total of 124 sheep, including rams, ewes and lambs were taken by recreational hunters under permit conditions. Population statistics collected since initiation of this program indicate that the herd has suffered lower mortality and higher lambing success than found in adjacent unhunted sheep populations. In essence, the Crescent Lake sheep population has provided a considerable number of sheep for consumptive use while maintaining the population at a stable level compared with herds found on nearby areas under no hunting or ram-only hunting regimes.

Participation in the limited ewe and full-curl hunts thus far has been almost exclusively by Alaska residents. Most sportsmen interested in pursuing ewe sheep are meat hunters, and this type of use is not attractive to nonresident trophy hunters. This pattern of use is expected to continue indefinitely. On the other hand, permit hunts for full-curl rams are expected to generate considerable enthusiam from both resident and nonresident hunters.

The Kenai Lake sheep population has long been available for nonconsumptive use. The area is bordered by roads on two sides and Kenai Lake provides boat access. Seasonal viewing along the highway is a popular pursuit by all classes of recreationists. The best opportunities to photograph sheep probably require overnight camping in alpine conditions.

COOPER LANDING SHEEP

LOCATION

In Game Management Unit 7, that portion of the existing Cooper Landing closed area lying north of the Sterling Highway.

THE SPECIES

The Cooper Landing sheep population gradually increased from a low point in the early 1940's to a peak of 312 animals in 1973. Since then, it has slowly declined. The current population appears to be at the upper limits of the range carrying capacity. Adverse winter weather and crowded range conditions appear to be the predominant population limiting factors.

The area has been closed to both goat and sheep hunting since before statehood. The Sterling Highway bordering one side provides excellent year-round viewing opportunities, but most use occurs during the summer. One roadside pulloff area has posted notices calling attention to these opportunities. In addition, two well-developed trails provide year-round access through the area. A majority of the users are non-Peninsula residents. Wildlife photography, a popular pursuit in Alaska, occurs in the area to a limited but increasing extent. In recent years the area has served as a sheep research control area.

EASTERN KENAI PENINSULA SHEEP

LOCATION

Game Management Units 7 and 15 except the area within the Cooper Landing, Kenai Lake, and Tustumena Sheep Management Plan areas.

THE SPECIES

Approximately 250 sheep inhabit this area. Sheep numbers increased steadily from the early 1950's through 1968 but have since fluctuated. The population is presently below the 1968 level. A major die-off of sheep occurred on Surprise Mountain in the winter of 1970-71 and that population has slowly declined since that time.

Lamb mortality at birth appears to be the major mortality factor limiting sheep numbers. Lamb mortality appears to be directly related to range condition but weather conditions at lambing time are also important. Winter losses of adult and subadult sheep have occurred when snow conditions prevented sheep from pawing through the snow to reach food. Such a die-off occurred on Surprise Mountain in the winter of 1969-70. Coyote and wolf predation occurs in this area, but its extent and effects are unknown.

Sheep ranges have been altered little by human activity in this area but range conditions are thought to be generally poor as the result of prior overutilization. The overutilized range condition existing on Surprise Mountain is probably representative of the area and is the primary factor limiting lamb survival. Parts of this area are also on the edge of Dall sheep distribution, and other factors, particularly weather cycles, may affect range and the availability of winter feed.

Large trophy sheep have been produced in this area in the past and large trophies are still taken occasionally. However, for the most part hunting pressure is so intense that rams are harvested the first year they become legal. Very few rams reach large trophy size. Between 20 and 25 rams have been harvested annually since 1962.

The hunting season has traditionally been August 10-September 20 with only rams with 3/4-curl or larger horns being legal. Most hunting occurs during the first two weeks of the season and most sheep are taken during that period.

Most hunters who pursue sheep on the Kenai Peninsula are either Anchorage area or Kenai Peninsula residents. Very few nonresidents or hunters from other areas of the state hunt in this area. Nearly all hunting is recreational, primarily in pursuit of a trophy. A few people hunt sheep primarily for the meat with trophies being of secondary importance. Very little guiding occurs in this area. Most hunters reach their hunting areas by hiking in from the road system. A few hunters fly into lakes to reach their hunting area.

Harvesting of rams only has greatly distorted the sex ratio of the populations and limited the availability of large rams.

A minor amount of viewing takes place along the road system, particularly in May and June when sheep are visible in several areas. Some viewing also occurs incidental to hunting for other species and hiking in the area. Opportunities for roadside viewing are much better in the nearby Cooper Landing Sheep Management Area.

TUSTUMENA SHEEP

LOCATION

That portion of Game Management Unit 15 south of Skilak Glacier, River and Lake and within the Kenai National Moose Range boundary.

THE SPECIES

The Tustumena area presently contains 700 to 800 sheep. The population peaked in 1968 when 989 sheep were observed on surveys and then declined until about 1974. A survey of a portion of the area in 1975 indicated that sheep may again be increasing.

Lamb mortality at birth appears to be the major factor limiting sheep populations in this area. Lamb mortality is a function of range quality and quantity and inclement weather at lambing time. Mortality of adults from malnutrition occurs when snow conditions are such that sheep can not paw through snow to reach forage. A sheep die-off was documented on Surprise Mountain in the winter of 1969-1970 and is thought to have occurred in the Tustumena area also. Predation by wolves and coyotes occurs, but it is not considered a limiting factor on the sheep population at this time.

Sheep ranges in this managment area have been unaffected by human activities. There are no developments in the area, and the only use has been recreational. The quality of the habitat may have been damaged by excessive sheep use in the late 1960's. Fewer sheep in the early 1970's may have allowed at least a partial recovery of the range.

The Tustumena area has produced trophy rams in past years, but heavy hunting pressure has reduced the availability of large trophies. About 10 percent of the legal rams in the area are full-curl or larger. Most rams are harvested the first year they reach legal size.

Hunting pressure is heavy and concentrated in the northern half of the area and is moderately heavy in the southern half. The annual harvest of sheep has averaged between 30 and 35 3/4-curl or larger rams. Most of the harvest and hunting pressure occur during the first two weeks of the season, but in recent years hunter effort has increased in the later part of the season. Hunting seasons and bag limits have not changed since statehood. Hunters pursuing sheep in this area are almost entirely Kenai Peninsula and Anchorage area residents. Few hunters from other areas pursue sheep in this area because of the crowded hunting conditions. Hunting is mostly recreational hunting for trophies. A few individuals hunt primarily for recreation and meat. All animals killed are used for food. Harvesting of 3/4-curl and larger rams has distorted the sex ratio in favor of ewes with an increased potential population productivity.

Access to the north half of the area is by floatplanes landing on mountain lakes, by horse trails and by boat and foot trails from Skilak and Tustumena Lakes. Access is more restricted in the south half, being limited to boats from Tustumena Lake, with no established trails. In the northern half of the area, most hunting occurs within a few miles of the access lakes. Hunters willing to hike long distances from the lakes are much more likely to be successful.

FAREWELL SHEEP

LOCATION

That portion of Game Management Unit 9 draining into Lake Clark east of and including the Tanalian River, and draining into Cook Inlet north of the Johnson River; that portion of Game Management Unit 17 drained by the Chilikadrotna and Mulchatna Rivers east of the outlet of Turquoise Lake; and that portion of Game Management Unit 19 including the area lying east of a line drawn from the northwest corner of Mt. McKinley National Park west southwest to Farewell, west to Lone Mountain, and south southeast to the confluence of the Telaquana River and Trail Creek, and the area drained by Trail Creek.

THE SPECIES

Little information is available regarding past sheep populations in this area. Local residents report sheep were not abundant during the 1940's, but became more numerous during the 1950's and 1960's. After 1968 the sheep population declined somewhat during a series of severe winters. The Farewell sheep population shows signs of good recovery from this setback. Aerial surveys of sheep in this area during the summers of 1972 and 1973 suggested the population may exceed 2,000 animals. Composition data from both years indicated rams composed about 25 percent of the herd. Roughly 10 percent of the sheep observed were 3/4 curl rams or larger. Summer lamb:ewe counts in 1972-75 ranged from 20 lambs to 60 lambs per 100 ewes, with low values in 1972 and 1973 following severe winters and delayed springs. Range conditions in the Farewell area are poorly understood, but a ground reconnaissance of the heavily used lambing and wintering area in the Sheep Creek drainage indicated there has been some range damage occurring from heavy use. Another important lambing and wintering area occurs along the headwaters of the Tonzona River. Range conditions in this section are not presently known.

Sheep hunting became popular in the Farewell area in the early 1960's, and hunting pressure has increased to moderate or heavy levels in much of the area. Harvests have ranged from 24 sheep in 1962 to 119 in 1974. Since 1973 more than 200 hunters have hunted in the area each year. The harvest is fairly evenly distributed through the 42-day season.

Hunter success has ranged from 70 to 49 percent, depending on weather conditions. Although resident hunters outnumber nonresident in most years, more than half the harvest is taken by nonresidents. Higher success by nonresidents results from the requirement that they be accompanied by guides. About 15 guides operate in the area.

The sheep harvest has not significantly reduced the availability of legal rams except in some heavily hunted drainages. Sheep in some drainages rarely see hunters due to problems of access. Hunters have

taken many trophy sheep from the area, including several rams exceeding 42 inches in horn length. Horn curl sizes have averaged about 34.0 inches over the past 10 years.

Access into the area has been primarily by aircraft, with 90 percent of the sheep being taken by airborne hunters. A few hunters utilize horses, boats, and all-terrain vehicles. There are few differences between local, nonlocal, and nonresident means of access.

Domestic use of the Alaska Range sheep was important to villagers of Nikolai and Telida prior to 1955. Hunting usually took place after the first snowfalls in mid-October or early November. Travel was by dog team and the meat was hauled back to the villages by sled.

UPPER CHITINA VALLEY SHEEP

LOCATION

That portion of Game Management Unit 11 in the upper Chitina Valley, bounded on the west by the Tana and Nizina Rivers, on the north by the crest of the Wrangell Mountains, on the east by the Canadian border, and on the south by the crest of the Chugach Mountains.

THE SPECIES

An aerial count of most of the Upper Chitina Valley area during 1973 disclosed 758 sheep of which 13 percent (96) were legal rams. Some of the best of this sheep habitat was not surveyed during 1973, and not all of the sheep in the surveyed areas were seen. The area probably contains 1,000 to 1,500 sheep, including 120 to 190 legal rams. Trend counts in portions of the upper Chitina Valley show that sheep populations have been relatively stable since at least the mid-1960's. Although relatively low lamb crops have been frequently seen, causes of lamb mortality and the condition of the range are unknown. This area has great potential for producing large-horned Dall rams. Not only have some of the largest sheep come from this area, but they attain their horn growth at an early age. On the average rams from this area attain three-quarter-curl by 5 years of age and full-curl by 7 years of age.

Current sheep hunting regulations limit hunters to one three-quarter-curl ram or larger during an annual 42-day season. Ram harvests from the Wrangell Mountains portion of this area for the 1972-75 seasons have annually averaged 84 rams. Harvests from the Chugach Mountains portion of this area have annually averaged 3 rams during the same period. Sheep density in the Chugach portion is much lower and access is difficult. Presently fewer large rams are available in the Wrangell Mountains than several years ago, although the total number of legal rams harvested has not changed appreciably. Seventy percent of the hunters since 1971 have been residents of Alaska, but most rams have been killed by nonresidents. Nonresidents are twice as likely to kill a sheep as are residents, reflecting the advantages of hiring a guide. Most sheep hunting in this area has been for trophies. Hunter access has been almost exclusively by aircraft.

WRANGELL-MENTASTA MOUNTAINS SHEEP

LOCATION

The Wrangell and Mentasta Mountains in Game Management Unit 12 and that portion of Game Management Unit 11 lying to the east of Boulder Creek and north of Mt. Wrangell.

THE SPECIES

The Wrangell-Mentasta Mountains contain some of the best sheep habitat in Alaska, and as a result some of the largest sheep populations are located in this area. An estimated minimum population of 6,500 sheep inhabit the area. Sheep populations of highest density appear to occur near Wiki Peak near Ptarmigan Lake in the Wrangells and from Noyes Mountain southeast to the Nabesna River in the Mentasta Mountains.

Production of lambs appears to be high throughout the Wrangell-Mentasta Mountains, although survival rates to two years of age are generally unknown. Limited surveys indicate fluctuations in lamb survival rates from year to year. Recognizable rams comprise between 17 and 32 percent of various populations in the area.

The Wrangell and Mentasta Mountains have long been popular sheep hunting locations. Annual harvests have ranged from about 120 to 225 sheep, with about 70 percent of the kill occuring in drainages of the Nabesna River and in the vicinity of Ptarmigan Lake. In recent years approximately 400 hunters have reported hunting in the area. Three-fourths of the hunters are residents, and their success rate is about 33 percent. Nonresident hunters who are required to employ guides, have a hunting success of 75 percent.

Harvests have reduced the percentage of legal rams in the population and the availability of large horned rams. This is particularly obvious in the Nabesna River drainage and part of the Wiki Peak area, both of which support most the sheep harvest. However, there are portions of the area that receive little hunting pressure and have a relatively large number of large horned rams in the population. As hunting pressure increases it is expected such areas will receive more hunter effort and will exhibit corresponding reductions in proportions of large rams.

Hunter access is primarily by means of aircraft and all terrain vehicles, although horses are used in the Chisana and White River drainages and, around Beaver Creek. All terrain vehicles are used in the Mentasta Mountains, particularly on the southwest side; aircraft are the common access vehicle in other areas. A limited number of airstrips are available in the Wrangell-Mentasta Mountains, although some gravel bars are adequate for airstrips. Access in some areas, such as glacial regions and much of the Wrangells north of Beaver Creek, is limited to walking. Access from the road system is confined to the Mentasta Mountains where hunters walk from the Nabesna Road.

TONSINA SHEEP

LOCATION

In Game Management Unit 13, that area bounded on the west by the Richardson Highway, on the north by the Edgerton Highway, on the east by the Copper River, and on the south by the north bank of the Tasnuna and Lowe Rivers.

THE SPECIES

Dall sheep in this area may number 200. Quantitative data on sheep population status and on sheep range conditions are not available.

Prior to 1973 sheep hunters made relatively light use of the Tonsina area. Although all-terrain vehicle access was possible via the Bernard Creek, Tiger Mine and Tonsina Trails, the number of hunters was small. Airstrips were not available and the lakes near sheep habitat were too small for safe aircraft landings. In 1968, 1970 and 1972 no sheep were reported harvested in the area. Aircraft landing strips were established and two guides operating with aircraft and a few local residents using pack animals started using the area in 1973 and 1974. Of the 24 legal rams reported taken in the area since 1968, eleven were killed in 1974. The area was designated a walk-in area (no mechanized vehicles or pack animals from August 5 to September 30) during 1975. Five legal rams were reported taken in 1975, four by Alaskan residents and one by a nonresident hunter.

NELCHINA BASIN SHEEP

LOCATION

Game Management Unit 13 except for the areas included in the Tonsina and Sheep Mtn. Management Plans; that portion of Game Management Unit 11 lying to the west of Boulder Creek and the crest of the Wrangell Mtns; and that portion of Game Management Unit 14A lying south of the Matanuska River.

THE SPECIES

The Nelchina Basin has had fairly abundant sheep populations since at least the mid-1950's. Inventory counts have been made of portions of this area at various times in the past decade. In 1969, 833 sheep were counted in the Chugach Mountains east of Coal Creek. In 1973 counts in the Chugach Mountains west of Coal Creek totalled 475 sheep. Also in 1973, 176 sheep were counted in the Watana Hills, and 1542 sheep were seen in the Wrangell Mountains portion of the area. In 1974, 1558 sheep were counted in the Talkeetna Mountains portion of the area. The northern Talkeetna Mountains may contain an additional 1000 sheep. A total estimate of 5600 sheep in the Nelchina Basin area is conservative. Of the sheep that were classified, 9 percent were legal rams and 14 percent were lambs.

Major natural mortality factors include severe winters and wolf predation. Sheep habitat in this area has not been studied. Compared to other areas in the state, this area has only a moderate potential for producing large-horned sheep. Sheep here generally have 3/4-curl horns at 5 years of age and full curl at 8 years.

The average annual harvest from the Wrangell Mountains portion of the area has been approximately 71 rams. Harvests in the remainder of the area have averaged 152 rams annually. The current proportion of legal rams in the population, 9 percent, indicates that the combined annual harvest of 223 rams has not been excessive for this area. Hunter success has averaged 44 percent, being highest in the Wrangell Mountains and lowest in the eastern Talkeetna Mountains. Seventy-five percent of the hunters have been Alaskan residents, with the eastern Talkeetna Mountains most used by residents. A smaller proportion of Alaskan hunters use the Wrangell Mountains. Most sheep hunting is a combination of trophy and recreational use, although domestic use of the meat is important to many hunters. Most sheep hunting takes place early in the season. Early arrival of winter snow cover has markedly reduced harvests in the past. Most hunters use air transportation for access to the hunting areas. Horses, off-road vehicles, and foot travel from nearby highways are other less used means of transportation.

SHEEP MOUNTAIN SHEEP

LOCATION

In Game Management Unit 13, the Sheep Mountain Closed Area: the boundary beginning at Caribou Creek, Milepost 107 Glenn Highway, thence easterly along the Glenn Highway to Milepost 123, thence along a line north to Squaw Creek, thence downstream to Caribou Creek and to the point of beginning.

THE SPECIES

Observations from local pilots and guides in addition to Alaska Department of Fish and Game counts suggest that Sheep Mountain sheep are part of a more extensive subpopulation extending to the north and possibly to the south as well. Strong winds along the Matanuska River make portions of Sheep Mountain snow free and usable as winter range. In addition, the southern exposures of Sheep Mountain provide an area where grasses and forbs leaf out early in the spring. Sheep Mountain is probably an attractive core area of a much larger sheep range. Past total counts have varied from 84 to 227 sheep with legal rams usually comprising 20 to 25 percent. This is a substantially higher proportion than adjacent areas in the southern Talkeetna Mountains; however, percentages of lambs have been substantially less than in adjacent areas. A combination of protection from hunting plus segregation of the sheep population probably accounts for these composition differences. No habitat studies have been made on Sheep Mountain.

Sheep Mountain has been closed to sheep hunting since statehood. Past use has been mainly recreational viewing and photography. A large number of people look for sheep while driving past Sheep Mountain, a smaller number view sheep from roadside pull-outs, and a few people climb Sheep Mountain for close range viewing and photography. Sheep are usually close to the road and easily viewed during the spring, but they are usually higher on the mountain and less viewable during the remainder of the year. The lower portion of Sheep Mountain is not too difficult for humans to climb given sufficient time and stamina.

WESTERN TALKEETNA MOUNTAINS SHEEP

LOCATION

Those portions of Game Management Units 13 and 14 enclosed by a line drawn from the Chickaloon River headwaters to Kosina Creek, down Kosina Creek to the Susitna River, down the Susitna River to Cook Inlet, then up the Matanuska River and the Chickaloon River to the starting point.

THE SPECIES

Approximately 80 percent of the sheep habitat in this area was surveyed by aircraft in 1974. A total of 423 sheep were seen including 114 rams, 246 ewes (and young rams) and 63 lambs. Little is known about sheep population size prior to the survey. It is probable that numbers were higher in the past than they are now.

Wolves, eagles, grizzlies, black bears and coyotes are all present in the area and are potential predators of sheep; however, their impact is unknown. Weather may be an important factor in population regulation; icing conditions are known to have caused declines in several sheep populations around the state. Little is known about the condition of the sheep range in this area; however, the ewe:lamb ratio is probably an indicator of fair to good range condition. No known extensive fires have taken place on the sheep range.

Hunter interest in the area seems to be low. This lack of interest may be due to the comparative difficulty in getting to most of this sheep habitat compared to other more accessible areas that have higher density sheep populations. Ram harvests in this area averaged 13 per year from 1970 through 1975 with about one-third of this harvest occurring in the Chickaloon River drainage. The proportion of legal rams in the population has been reduced by hunting in easily accessible areas. Most hunters in this area fly to camps and then hunt on foot, but this form of access is limited to a few suitable landing sites. Nearly all sheep hunting is recreational, although some hunters may hunt primarily for meat. Guided hunts are infrequent in the area. Sheep hunting seasons have traditionally been from August 10 through September 20 for 3/4 curl or larger rams only.

WEST CHUGACH SHEEP

LOCATION

Game Management Unit 14C, and in Game Management Unit 7, the drainages of Glacier Creek and Twentymile River.

THE SPECIES

Sheep are found throughout the mountainous portions of the area excluding Portage Creek and Twentymile River drainages and land east of Lake George and Lake George Glacier. Aerial surveys conducted in 1951, 1968 and 1972 resulted in counts of 477, 868 and 1050 sheep, respectively. A 1975 survey of selected areas showed concentrations similar to those of 1972. These surveys, coupled with the Peters Creek trend area counts (the lands between Eagle River and Eklutna River), which have been sporadically conducted since 1950, indicate that sheep numbers increased during the 1950's and have remained fairly constant since then. Depending on time of year and weather conditions, aerial survey counts are thought to represent 70-90 percent of the actual population.

Fairly extensive natural mortality among sheep in the area has been documented. Hunters and hikers have reported finding remains of both young and adult sheep in old snowslide sites or on wintering grounds. Natural mortality factors have probably not adversely affected current population levels.

Habitat conditions within drainages containing major sheep concentrations are considered excellent. Important drainages include Ship Creek, Eagle River, Peters Creek, Thunderbird Creek, Eklutna River, Goat Creek and Hunter Creek. Habitat conditions in Campbell Creek, Indian Creek, and Bird Creek are considered fair. Sheep habitat is limited in the Lake George area and from Glacier Creek south to Portage.

Sheep have been hunted in the area for many years, although harvest levels prior to 1962 are unknown. Between 1962 and 1967, approximately 35-40 sheep were killed annually. Since 1968, a yearly average of 30 three-quarter curl and larger rams have been taken. A high of 50 were harvested in 1969 and a low of 12 in 1973. In 1975, 29 were taken. Several extremely large sheep have been taken from the area, although it is not known for producing exceptional trophies on a regular basis. In 1975, all sheep legally harvested were taken by local residents, and all but 5 of 80 unsuccessful hunters were also local residents. Only 2 hunters were nonresidents. In addition to legal kills, several illegal kills have been reported annually in the accessible sections of the area.

During the period 1968 to 1972 an annual average of 298 persons reported hunting sheep in the area. From 1973 to 1975, the average was 118. The

decrease in hunter pressure is mainly attributable to a shortened season throughout most of the area. The hunting season extended from August 10 to September 20 from statehood until 1972. Since 1973 the season has been from the day after Labor Day until September 20 in most of the area where sheep are found. Hunter success has fluctuated between 10 and 27 percent over the past 8 years. Higher success has been achieved in recent years with reduced hunter pressure.

Access to hunting sites is via several major roads and numerous connecting trails. Hunter transport is restricted to foot travel and horseback. Because of access and transport limitations, hunting pressure and harvests have been fairly well distributed throughout the areas of major sheep concentrations. Harvests over the past 25 years have reduced the proportion of legal rams in the population from approximately 13 percent in 1950 to 7 or 8 percent during the past decade with no significant effect on population productivity or total numbers.

Other uses of sheep in the area include viewing and photography. Bands of 10 to 50 sheep are visible from the Seward Highway near Indian, the Eagle River Road and trail and the Eklutna road. No roadside viewing sites comparable to Sheep Mountain or the Cooper Landing Closed Areas are found within the West Chugach area, but several excellent viewing sites in proximity to mineral licks are located near the headwaters of Peters and Ship Creeks. Few people utilize these sites specifically for viewing. Opportunities for viewing and photography in accessible locations are best in late spring when sheep are at lower elevations on their winter and lambing ranges. Such opportunities diminish in summer and fall and are almost nonexistent during winter. Viewing and photography access restrictions are only slightly more lenient than those for hunting. Winter travel limitations for snowmachines have in some areas reduced opportunities to view and photograph sheep.

RAINY PASS SHEEP

LOCATION

Game Management Unit 16.

THE SPECIES

In June 1970, the only aerial survey conducted on sheep in Game Management Unit 16 was completed. One-hundred and forty-eight sheep were seen, most of them from the Happy River drainage to the west and south. No subsequent surveys have been made. Although not all sheep seen were categorized, 105 adults were seen of which 27 were rams; 18 others were lambs. It is unknown if the present population is lower or higher than it has been in the past. No habitat studies have been conducted. Predation by wolves, wolverine, eagles, and possibly bears occurs, but its importance is unknown. Winters are severe in the area and are probably the primary limiting factor to extended population growth.

Hunter pressure is light, but increasing. Two-hundred and thirteen sheep hunters were reported in the Rainy Pass area in 1974, and they harvested 21 sheep, while the average for the previous seven years was 151 hunters and 12 sheep. Since 1973, twice as many residents as nonresidents have hunted in the area. Guides have hunted sheep in this area for many years, particularly in the immediate vicinity of Rainy Pass. Most sheep are taken as trophies, but horn sizes have not been exceptional. Most hunters use aircraft to get into the area, then hike and camp out to take sheep. The only known trail in the area is the Iditarod dog sled trail and it is doubtful that sheep hunters use it.

DALL SHEEP IN SOUTHWESTERN ALASKA

In Southwestern Alaska, Dall sheep (*Ovis dalli*) occupy alpine portions of the western slope of the Alaska Range from the head of Lake Clark northward. Population surveys have been limited in this area, but a count conducted in 1967 showed a minimum of 258 sheep between Lake Clark and Two Lakes.

Dall sheep were introduced to Kodiak Island with releases of 13 sheep in 1965 and 2 sheep in 1967. Initial heavy mortality and subsequent lack of observations suggested the transplant attempt had failed. However, in the winter of 1974, seven sheep, including one adult ram, two lambs, and four ewes, were observed near the head of Zacher Bay. Habitat on Kodiak Island is believed to be marginal for sheep due to unfavorable snow accumulation, and it remains to be seen whether a viable sheep herd will become established.

Like most northern ungulates, Dall sheep are subject to fluctuations in abundance. Numbers were reportedly high in the early part of this century. A major decline occurred in the 1930's and early 1940's, probably as a result of unusually severe winters, which left sheep herds throughout the state at low levels. Herds increased again throughout the 1950's and 1960's. It is probable that herds in Southwestern Alaska reached a peak in the late 1960's, as did sheep herds elsewhere in the state. Since this region contains the southernmost limit of Dall sheep habitat in the Alaska Range, a limit probably imposed by snow depth, it is expected that sheep numbers would fluctuate more than in more suitable habitats to the north. Reports by local residents suggest the population in the Lake Clark-Twin Lakes area may have been reduced during the severe winter of 1969-70. Additional population data are unavailable, but harvest information suggests that the population is again increasing in the area.

Dall sheep are largely animals of alpine habitat. During summer, they occupy relatively large areas of their annual range and remain almost entirely above brushline. Alpine meadows and slopes are used for feeding and resting, while nearby cliffs or large rocky outcrops are required for escape cover. By early November, sheep begin to congregate on their winter ranges. These are areas of limited size where forage is available throughout the winter on windblown ridges or slopes, and where cliffs and outcrops are available to enable escape from predators. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by, a winter range of relatively few acres. Some herds occupy winter habitats several miles removed from their summer range and migrate between the two, sometimes following traditional routes leading across timbered valleys. Breeding takes place from mid-November through early December.

With the beginning of snow melt in spring, most sheep move down from their windswept wintering grounds to the lower, south-facing slopes

where green plants first emerge. At this time, they may be found down in alders and near the upper limits of timberline, much lower than at any other season.

Lambing occurs in May and early June. Parturient ewes seek isolation in the most rugged cliffs available to give birth to their single lambs. Escape terrain is particularly vital at this time to protect the comparatively immobile mothers and newborn young from predator attack. Upon completion of lambing, the ewes and young follow the retreating snowline upward and move onto summer ranges. Rams may preceed ewes by several weeks in moving to summer range.

Subsequent to lambing, sheep use natural mineral licks extensively. Several such licks are known in this region and others undoubtedly exist. Sheep, especially females and young, will frequently travel several miles over well-worn trails to congregate in mineral licks where they spend hours eating the mineral-rich soil. Use of licks is heavy in early summer and gradually lessens as summer advances. Natural mineral licks are apparently of extreme importance to many sheep, although mineral requirements are not yet clearly understood. Some herds apparently do not have access to mineral licks and may substitute the use of certain plant species to obtain the required minerals.

Dall sheep are primarily grazing animals; bunchgrasses, particularly alpine fescue, and sedges make up the majority of their annual diet. These are supplemented by smaller amounts of browse such as alpine willow. Various forbs are consumed during summer, while lichens become important quantitatively in winter.

Climate is the most important factor regulating sheep numbers and distribution. Deep, dense snows prevent sheep from reaching winter forage and are important in limiting distribution, particularly in the southern limits of Dall sheep range where heavy snow accumulation occurs due to maritime influences. Sheep require relatively light snowfall and wind to survive during winter. Cold temperatures keep the snow powdery and soft allowing winds to remove it from ridgetops and slopes, exposing winter forage. Warm winters or thaws result in dense, crusted snow which the sheep cannot dig through nor the wind remove. By late winter, sheep are often restricted to small areas of exposed, wind-scoured, low-quality vegetation which provides less nourishment than is used in daily activities. Sheep then survive partially by metabolism of stored body fat and tissue. If spring arrives late, body reserves may be used up and mortality occurs. Exceptionally severe winters, such as those which occurred in the early 1940's, have been the only factor known so far to have caused major "crashes" in Dall sheep populations.

Overwinter survival of lambs is normally low in comparison to adult sheep and severe winters depress it further. Newborn lambs are particularly susceptible to adverse spring weather such as cold wind, rain, or snow during the critical lambing period. Summer weather, while not as critical as that in winter, is also important in providing an adequate growing season and enough forage to enable sheep to store sufficient body fat for survival during winter.

Predation does not appear to be important in population control except under exceptional circumstances, such as when deep winter snows force sheep to feed far from protective cliffs. Parasites, diseases and accidents also take their toll, but apparently are usually of minor importance.

Sheep were originally hunted for subsistence and the market during the early days of Alaska's settlement, but they now are taken primarily by recreational hunters. Traditionally, only mature rams with horns of 3/4 curl or greater configuration have been legal game during an August-September season. Dall sheep are recognized worldwide as one of North America's outstanding trophy animals, and they are an important sport-hunted species in Southwestern Alaska.

Sheep harvests in this relatively small portion of Alaska's sheep range have increased gradually over the past 13 years during which harvest data have been available. Although sheep harvests have often fluctuated in relation to weather during sheep hunting seasons, a distinct peak was reached in this region in 1968, followed by a decline in 1970 and then a steady rise until 1975. This pattern possibly reflects the 1969-70 population decline as well as increasing hunting pressure in the region. The average annual harvest over the past 13 years was 11 rams, while 18 were taken in 1975. Nonresident hunters took 59 percent of the harvest in 1975 although they constituted only 34 percent of the hunters. Their greater hunting success is probably attributable to the requirement that nonresidents must be accompanied by a guide while sheep hunting. Success of all hunters would undoubtedly be lower, were it not for the use of mechanized off-road vehicles, including aircraft, that are used for transport to otherwise inaccessible hunting areas.

The number of hunters utilizing the Alaska Range west of Mt. McKinley National Park has been increasing steadily, while hunting success has been decreasing. This increased hunting pressure may possibly cause the number of large rams to decline in some herds even though adequate breeding stocks remain. Increasing numbers of hunters are competing for a relatively stable or declining number of legal rams. Under these circumstances decreasing size and numbers of trophies taken and reduced hunter success can be expected. However, the average age of rams taken in recent harvests remains above the average age required to reach full-curl in this region. This indicates that sufficient older rams still remain to allow hunters to be selective for large animals rather than merely taking the minimum legal size.

While ram-only hunting harvests do not control sheep populations, carefully regulated, experimental either-sex hunts have proven feasible in controlling herd numbers. These provide more animals for harvest while apparently increasing lamb production and survival. Such intensive management may become necessary as hunting pressure increases.

Although nonconsumptive uses of Dall sheep are important in other areas of Alaska, little such use occurs in Southwestern Alaska due to its inaccessibility to the general public.

DALL SHEEP IN WESTERN ALASKA

Dall sheep (*Ovis dalli*) occupy alpine portions of the Alaska Range north and east from Lake Clark, primarily on the western and northern slopes. An estimated 2,000 sheep occupy the Alaska Range west of Mt. McKinley National Park. About 1,000, reside in that portion of the Alaska Range included in the Western Region. Surveys in this area have been limited and population estimates are only approximate.

Like most northern ungulates, Dall sheep populations are subject to fluctuations in abundance. Numbers were reportedly high in the early part of this century. A major decline occurred in the 1930's and early 1940's, probably as a result of unusually severe winters, which left sheep herds throughout the state at low levels. Herds increased again throughout the 1950's and 1960's. Although data are not available for all populations, it is probable that sheep numbers in Western Alaska reached a peak by the late 1960's as they did elsewhere in the state, and have been stable or declining slowly since then. Sheep populations are probably near the carrying capacity of winter ranges and may be expected to remain relatively stable or to decline with the occurrence of abnormally severe winters.

Dall sheep are largely animals of alpine habitat. During the summer, they occupy relatively large areas of their annual range and remain almost entirely above brushline. Alpine meadows and slopes are used for feeding and resting, while nearby cliffs or large rocky outcrops are required for escape cover. By early November, sheep begin to congregate on their winter ranges. These are areas of limited size where forage is available throughout the winter on windblown ridges or slopes, and where cliffs and outcrops are available to enable escape from predators. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by, a winter range of relatively few acres. Some herds occupy winter habitats several miles removed from their summer range and migrate between the two, sometimes following traditional routes leading across timbered valleys. Breeding takes place from mid-November throughout early December.

With the beginning of snow melt in spring, most sheep move down from their windswept wintering grounds to the lower, south-facing slopes where green plants first emerge. At this time, they may be found down in alders and near the upper limits of timberline, much lower than at any other season.

Lambing occurs in May and early June. Parturient ewes seek isolation in the most rugged cliffs available, to give birth to their single lambs. Escape terrain is particularly vital at this time to protect the comparatively immobile mothers and newborn young from disturbance and predator attack. Upon completion of lambing, the ewes and young follow the retreating snowline upward and move onto summer ranges. Rams may precede ewes by several weeks in moving to summer range.

Subsequent to lambing, sheep use natural mineral licks extensively. Although such licks have not be charted in this region, some undoubtedly exist. Sheep, especially females and young, will frequently travel several miles over well-worn trails to congregate in mineral licks where they spend hours eating the mineral-rich soil. Use of licks is heavy in early summer and gradually lessens as summer advances. Natural mineral licks are apparently of extreme importance to many sheep, although mineral requirements are not yet clearly understood. Some herds apparently do not have access to mineral licks and may substitute the use of certain plant species to obtain the required minerals.

Dall sheep are primarily grazing animals; bunchgrasses, particularly alpine fescue, and sedges make up the majority of their annual diet. These are supplemented by smaller amounts of browse such as alpine willow. Various forbs are consumed during summer, while lichens become important quantitatively in winter.

Climate is the most important factor regulating sheep numbers and distribution. Deep, dense snows prevent sheep from reaching winter forage and are important in limiting sheep distribution, particularly in the southern limits of Dall sheep range where heavy snow accumulations occur due to maritime influences. Sheep require relatively light snowfall and wind to survive during winter. Low temperatures keep the snow powdery and soft, allowing winds to remove it from ridgetops and slopes, exposing winter forage. Warm winters or thaws, result in dense, crusted snow through which the sheep cannot easily dig nor the wind remove. By late winter, sheep are often restricted to small areas of exposed, wind-scoured, low-quality vegetation which provides less nourishment than is used in daily activities. Sheep then rely, in part, on metabolism of stored body fat and tissue. If spring arrives late, body reserves may be used up and mortality occurs. Exceptionally severe winter, such as those which occurred in the early 1940's, have been the only factor known so far to have caused major "crashes" in Dall sheep populations.

Overwinter survival of lambs is normally low in comparison to that of adult sheep and severe winters depress it further. Newborn lambs are particularly susceptible to adverse spring weather such as cold wind, rain, or snow during the critical lambing period. Summer weather, while not as critical as that in winter, must provide an adequate growing season for forage to enable sheep to store sufficient body fat for survival during winter.

Predation does not appear to be important in population control except under exceptional circumstances, such as when deep winter snows force sheep to feed far from protective cliffs. Parasites, and diseases also take their toll, but their importance in Alaska is not well understood. Accidents are probably uncommon.

Sheep were originally hunted for subsistence and the market during the early days of Alaska's settlement, but they now are taken primarily by recreational hunters. Traditionally, only mature rams with horns of 3/4 curl or greater configuration have been legal game during an August-

September season. Dall sheep are recognized worldwide as one of North America's outstanding trophy animals, and they are an important sport-hunted species in Western Alaska.

Sheep harvests in the area have been characterized by increases in numbers of hunters (about 115 in 1975) and in number of rams taken (1967-1975 average of 66 rams with 69 taken in 1975). Success is slowly decreasing with 60 percent of 1975 hunters successful. About 54 percent of the 1975 harvest was taken by nonresidents, who made up only 36 percent of the hunters. Their greater hunting success is probably attributable to the requirement that nonresidents must be accompanied by a guide while sheep hunting. Success of all hunters would undoubtedly be lower, were it not for the use of mechanized off-road vehicles, including aircraft, that are used for transport to otherwise inaccessible hunting areas.

The increasing hunting pressure in Western Alaska will probably cause the number of large rams to decline in some herds even though adequate breeding stocks remain. Increasing numbers of hunters are competing for a relatively stable or declining number of legal rams. Under these circumstances decreasing size and numbers of trophies taken and reduced hunter success can be expected. However, the average age of rams taken in recent harvests remains above the average age required to reach full-curl in this region. This indicates that sufficient older rams still remain to allow hunters to be selective for large animals rather than merely taking the minimum legal size.

While ram-only hunting harvests do not control sheep populations, carefully regulated, experimental either-sex hunts have proven feasible in controlling herd numbers. These provide more animals for harvest while apparently increasing lamb production and survival. Such intensive management may become necessary as hunting pressure increases.

Although nonconsumptive uses of Dall sheep are important in other areas of Alaska, little such use occurs in Western Alaska due to its inaccessiblity to the general public. Adjacent Mt. McKinley National Park contains a large number of sheep and provides considerable opportunities for nonconsumptive use of sheep.

DALL SHEEP IN INTERIOR ALASKA

In Interior Alaska Dall sheep (*Ovis dalli*) are found in the Tanana Hills, White Mountains, Mentasta Mountains and the north side of the Alaska Range and
Wrangell Mountains. Sheep are also continuously distributed along the south slope of the Brooks Range from the Canadian border west to the Schwatka Mountains. Alaska Range sheep are continuous in their distribution from the Muldroe Glacier in Mt. McKinley National Park eastward to the Mentasta Mountains and along the north side of the Wrangell Mountains to the Canadian border. In the Tanana Hills sheep occupy the alpine areas of Glacier Mountain, the headwaters of the Charley River, Twin Mountain, West Point, Mount Sorenson and the headwaters of the Salcha and East Fork of the Chena Rivers. In the White Mountains sheep are found in the vicinity of Mount Victoria, Mount Schwatka, Mount Prindle and Lime Peak.

Recent surveys have established minimum numbers of Dall sheep in Interior Alaska as follows: Mt. McKinley Park 900, the Alaska Range from McKinley Park to the Delta River 4200, the Alaska Range from the Delta River to the Tok-Slana cutoff 2300 and the Mentasta Mountains and north side of the Wrangell Mountains 3700. The south slope of the Brooks Range is thought to contain at least 7500 sheep.

No well documented population fluctuations have been observed in Interior sheep populations except for those in Mt. McKinley Park. Park populations experienced drastic reductions in 1929 and 1932 as a result of unusually severe winters. Since that time the population appears to have fluctuated about a mean of about 1000 sheep. No Interior sheep populations are currently known to be expanding, and it is thought that sheep numbers in the region, while subject to fluctuations, are comparitively stable at about current numbers.

Dall sheep are usually found in alpine habitat. During summer, they occupy relatively large areas of their annual range and remain almost entirely above brushline. Sheep in the Tanana Hills and White Mountains, however, occupy habitat which is lower in elevation. These sheep are often seen near spruce forests and apparently descend to valley bottoms in order to obtain water. Mineral licks are an important component of sheep summer habitat on many Interior sheep ranges. Many important mineral licks are known throughout the Alaska Range and Brooks Range. Some have been located in the White Mountains and northern Wrangells. Sheep, especially ewes with lambs will frequently travel several miles to use mineral licks where they eagerly eat the mineral rich soil. The exact nature of Dall sheep dependence on mineral licks is not fully understood. The use of mineral licks also serves to intermingle otherwise discrete populations and is of importance in maintaining genetically healthy herds.

Winter ranges are the third critical component of Dall sheep habitat. Winter ranges are characterized by windblown ridges or slopes. These ranges usually occur at the mouths of tributaries along major drainages

where prevailing winds clear winter snow from forage. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by, a winter range of relatively few acres. Some herds occupy winter ranges which are several miles from their summer ranges and migrate between the two. These seasonal migrations often include side trips to utilize mineral licks, and are the ingrained tradition of each population. Dall sheep are extremely loyal to their traditional summer ranges, winter ranges and mineral licks and appear on these ranges at about the same time each year.

Predation in the Alaska Range and Wrangells does not appear to be a major factor in limiting sheep numbers, however, occasional situations arise where predation may depress sheep numbers. Wolves are the main predator on sheep, but wolverines, bears, lynx and sometimes eagles have been known to take sheep. The terrain of the Tanana Hills and White Mountains is less rugged than that of the Alaska Range and Wrangell Mountains and consequently may not provide sheep with frequent escape possibilities. Consequently, it is thought that predation, particularly by wolves, may play a more important role in these areas than further south. Little is known of predation in the Brooks Range.

Sheep were formerly hunted for market in the Alaska Range, but the current uses of sheep are primarily for recreation. Sheep in Mt. McKinley Park in the Alaska Range are used exclusively for viewing, photography and associated nonconsumptive wilderness values. In other parts of Interior Alaska sheep are used for recreational hunting as well as for nonconsumptive values. Traditionally only rams with horns of 3/4 curl or greater have been legal game during an August-September season. For the last 4 years sheep hunters have spent an average of about 5,000 man days per year hunting for sheep in Interior Alaska. The number of hunters has averaged about 1,150 and the number of rams harvested has averaged about 450 over this period. Resident hunters comprise about 77 percent of the hunter effort and have a success ratio of about 31 percent. Nonresident hunters have a success rate of about 67 percent, perhaps reflecting the benefit of the mandatory presence of a guide. Recreational hunting pressure in the Interior is expected to increase in proportion to increases in human populations. Domestic use of Dall sheep has never played a significant role in the Interior Region. Some domestic use is traditional in the Brooks Range, but sheep are not a major food item.

TOK SHEEP

LOCATION

In Game Management Units 12 and 20, the area known as the Tok Management Area.

THE SPECIES

An estimated 1650 sheep inhabit the Tok area. Productivity of the population and survival of lambs are high. Surveys in 1975 indicated 40 lambs per 100 ewes and 32 yearlings per 100 ewes. Rams with three-quarter curl horns or larger comprise about nine percent of the population (150). The population is capable of producing large numbers of large rams in a relatively short time. It is not unusual to find eight-year-old rams that have full-curl horns. Based on studies of other Alaskan sheep populations, about 50 rams may enter the full-curl category annually. Little is known of the relative importance of natural mortality factors or condition of the range. Based on observed lamb production and survival rates, the range seems in good condition. The sheep population is probably increasing throughout the Tok area.

The Board of Fish and Game created the Tok Management Area in 1974 to provide hunters with an area containing large-horned sheep and uncrowded, high-quality hunting conditions. The eastern end of the Alaska Range was chosen for its healthy, growing sheep population, good accessibility by various transportation modes including walking, and a low number of guides using the area. The regulations included ewe hunting to provide for control of the sheep population size and adjustment of the sex ratio. The population appeared capable of producing 30 full-curl rams annually and regulations were promulgated to achieve this harvest. In 1974, 60 permits were issued for rams and 60 were issued for ewes. Only five rams and nine ewes were taken, a success of 8 and 15 percent, respectively. In 1975, 120 ram permits were issued, resulting in 29 successful hunters out of 67 permittees who actually hunted. No ewes were harvested during 1975, although 10 permittees reported hunting.

Transportation into the area has been by air, foot, off-road vehicles and horses, with most people using aircraft or walking. Off-road vehicles have been popular along the Tok River, where horses have also been used to a limited extent. Some small, gravel bar airstrips are present in the Robertson and Johnson Rivers; in the Tok drainage only 2 or 3 such strips are present. There are no landing areas (for wheel-equipped planes) in the Dry Tok River drainage. Burnt Lake, in Sikosina Pass, can also be used by float planes. Most walk-in hunters use the Yerrick Creek-Sheep Creek-Clearwater Creek areas. This section receives fairly heavy foot traffic along with pressure from off-road vehicle and aircraft users via the Tok River. Hunters in the Dry Tok must hike from Burnt Lake or use horses or off-road vehicles. The Tok area has traditionally been used by Alaska residents. Four guides used the area prior to establishment of permit restrictions. Now only one guide regularly

hunts there, although others are free to do so provided their clients possess permits. Nonresidents are restricted to no more than 10 percent of the available permits under current regulations.

Sheep can frequently be observed during May and early June from the Tok Cutoff between Mile 91 and Mile 85 as the animals feed on new vegetation along the cliffs bordering the highways. Few animals are located here at other times of the year, however.

WHITE MOUNTAINS SHEEP

LOCATION

In Game Management Unit 20, that area included in the drainages of Preacher Creek upstream from its confluence with the north fork of Preacher Creek, Beaver Creek upstream from its confluence with Moose Creek, and all drainages into Beaver Creek which lie south of a line drawn from Why Lake to Three Sleep Point.

THE SPECIES

In the White Mountains area Dall sheep occupy approximately 534 square miles of alpine habitat in the vicinity of Mount Victoria, Mount Schwatka, Mount Prindle, Lime Peak, Cache Mountain and the White Mountains. The population numbers about 285 animals and is geographically isolated from other sheep populations. Sheep occur in small, widely scattered groups throughout the range.

Habitat is limited by the low elevations and encroachment of surrounding spruce forests on the alpine tundra. Sheep often travel through forested areas either to reach water in the valley bottoms or to reach other suitable sheep habitat. The necessity of traversing forested areas, as well as the scarcity of rugged escape terrain in the alpine areas, makes these sheep more vulnerable to predators; however, data on mortality factors and rates are not available. The area is drier than other sheep range due to the light annual snowfall and dry Interior climate and the rapid drainage provided by the porous sandstone and limestone substrate. Two other requisites for sheep habitat are available: mineral licks and windblown slopes during the winter. The Tanana Hills-White Mountains area has potential for sustaining high densities of sheep; however, the present density of 0.5 sheep per square mile is among the lowest in Interior Alaska. There is no indication that sheep have overutilized the range. Although annual survey data are lacking, observations indicate that the population is stable.

Composition and productivity information was gathered at the Mt. Schwatka mineral lick during 1973 and 1974. Productivity was low with only 33 lambs per 100 ewes in 1973 and 23 per 100 in 1974. However, lamb survival in 1973 was excellent; there were 30 yearlings per 100 ewes in 1974. Information on productivity is not available either for preceding years at Mt. Schwatka or for the rest of the area. The small amount of hunting that has taken place during recent years has probably not affected productivity or availability of legal rams. Human exploitation and development have not occurred to any appreciable extent, providing a wilderness situation that is virtually undisturbed. However, some loss of sheep habitat may be occurring due to natural plant succession.

The area has the potential for producing trophy sheep. The average ages when rams attain 3/4-curl and full-curl horns are 5.7 years and 8.8 years,

respectively. Average horn measurements at these ages are 27.0 inches and 35.9 inches, respectively. Horn growth data from throughout Interior Alaska suggest that low sheep density may correlate with high trophy quality.

Human use of this sheep population has been light. Harvest reports for which specific locations are noted show that only three sheep were taken in 1975, three in 1974 and one in 1973. The numbers of hunters afield were 10, 5 and 8, respectively. Thus, hunter success varied greatly, ranging from 12 to 60 percent. Most hunters have been residents and 90-100 percent of the harvest is taken by residents.

Liberal hunting seasons and bag limits prior to 1942 were followed by progressive restrictions which closed the area to sheep hunting from 1949 through 1954. In 1955 the present season of August 10 through September 20 was initiated. The legal bag limit since then has remained one 3/4-curl or larger ram per year.

User access is primarily by aircraft, despite the scarcity of landing sites. One unimproved strip near Lime Peak provides the closest access to sheep. Two private strips and several gravel bars along Beaver Creek are within walking distance of sheep habitat. In addition, float planes can land on small lakes north of Mt. Schwatka or on Beaver Creek near Victoria Creek during some years. Ground access is primarily from the Steese Highway; however, it is possible to approach the area via two trails to Beaver Creek from the Elliott Highway. The Steese Highway is closer to sheep range and has three mining access roads suitable for off-road vehicle use.

TANANA HILLS SHEEP

LOCATION

In Game Management Unit 20, all drainages flowing into the south bank of the Yukon River between Circle and Eagle, all drainages of the North fork of the Fortymile River above its confluence with the Middle Fork of the Fortymile River, all drainages of the Salcha River above its confluence with Stone Boy Creek, all drainages of the North Fork of the Salcha River above its confluence with Rick's Creek, all drainages of the Chena River above its confluence with Wolf Creek, and all drainages into the South bank of the Coulombes Fork of Birch Creek and Birch Creek, south of the Steese Highway crossing and south of the Steese Highway between that point and Circle.

THE SPECIES

Dall sheep occupy about 1,420 square miles of alpine habitat in the Tanana Hills of eastern Interior Alaska. The most important sheep range is near the headwaters of the Charley and Seventymile Rivers, the East Fork of the Chena River, Birch Creek and the North Fork of the Fortymile River. About 285 Dall sheep occur in the Tanana Hills in small, scattered bands. There is evidently little interchange between sheep bands, and the population as a whole is isolated from other Alaska sheep populations. Local sheep bands often have distinctive coloration. Glacier Mountain sheep have black or dark-colored tails and frequently have dark hairs interspersed in their otherwise white coats. The genetic history of these populations and reasons for their distinct coloration are unknown. Tanana Hills Dall sheep habitat is limited because of the area's comparatively low elevation. Spruce forests encroach on sheep alpine habitat, and there are few rugged and steep rock outcrops typical of sheep range elsewhere in Alaska. Sheep often travel through timber to water and adjacent alpine areas. Numerous mineral licks and broad expanses of mountain slopes that are blown free of snow in winter, provide sheep easy access to forage. The area generally receives less precipitation than most other sheep ranges in Alaska. The effects of human activities in the Tanana Hills have been insignificant, and the area remains virtually an undisturbed wilderness. Some loss of sheep habitat may be occurring as a result of natural vegetation succession.

Although survey data are generally lacking, sheep numbers appear to be stable in the Tanana Hills, and there is no indication that the range is overgrazed. Aerial surveys of Glacier Mountain sheep indicate that rams with horns of three-quarter curl or larger constitute about 20 percent of the population. An average of 18 percent of ewes have been accompanied by lambs in mid-summer on Glacier Mountain. The Tanana Hills area in general appears capable of sustaining high sheep densities, although current estimates of sheep per square mile of habitat (0.20) is the lowest on record for interior Alaska.

The rate of ram horn growth in the Tanana Hills indicates that the area is potentially capable of producing trophy sheep. Horn growth rate, although slower than for Wrangell Mountains sheep, is faster than for rams occupying the Brooks Range. The ages of ram with three-quarter and full-curl horns average 5.7 and 8.8 years, respectively, in the Tanana area. Horn measurements at these ages average 26 and 35 inches, respectively. Studies elsewhere in Alaska indicate that rapid horn growth is correlated with low sheep density.

Sheep losses to natural causes are unknown. Tanana Hills sheep may be vulnerable to predators due to the scarcity of steep slopes for escape and because they must traverse wooded areas.

Human use of Tanana Hills Dall sheep has been limited. An average of about 17 hunters per year reported killing three rams in 1975, nine in 1974 and none in 1973. Hunting success has varied from 0 to almost 50 percent. Sheep in the Tanana Hills occasionally move long distances and may not return to the same areas in successive years. These erratic movements may account partially for the considerable annual variation in hunting success. Most sheep hunters who use the Tanana Hills are Alaskan residents. Ninety percent or more of the Dall sheep harvest has been by residents. Planes are the most common means of access to the Tanana Hills, but few landing sites are available. There are improved airstrips along rivers, but these are generally too far from the sheep bands for practical use by hunters. Light aircraft can land on some ridges. Hunters also enter the area via the Charley River and by walking from the Taylor Highway starting at American Summit. Use of motorized vehicles or pack animals for transportation of hunters, hunting gear or game taken has been prohibited in the Glacier Mountain Management Area since 1971. Most hunters reach Glacier Mountain by embarking at Mile 140 of the Taylor Highway and walking ridgetops to the Management Area, a distance of about 20 miles. The current season of August 10 through September 20 and bag limits of one ram with three-quarter curl horns or larger date from 1955. The limited number of sheep taken from the area has had an insignificant impact on herd productivity. The number of three-quarter curl and larger rams has been significantly reduced in some local areas, such as Twin Mountain.

CENTRAL ALASKA RANGE SHEEP

LOCATION

That portion of Game Management Units 20A and 20C bounded on the east by the Delta River downstream from McGinnis Creek, on the north by the Tanana River, on the west by the Nenana River and on the south by the crest of the Alaska Range as far east as McGinnis peak down the western limit of the McGinnis Glacier and the north bank of McGinnis Creek to the Delta River.

THE SPECIES

Sheep which inhabit the Central Alaska Range exist in discrete populations, each of which has its well-defined traditional ranges. Based on aerial surveys, the number of sheep in the area is estimated to exceed 5,000. In the past numbers of sheep were probably much lower than they are now. Sheep populations in the area probably followed similar patterns of fluctuation to those of McKinley Park sheep which experienced drastic reductions in 1929 and 1932. Current densities of Dall sheep are high but the sheep are lower in vigor and size than almost anywhere else in the state. It is not known whether this is inherent in the sheep or a result of poor range conditions. At the present time populations are either stable or in a slight decline which is probably related to weather patterns of recent years. The sheep-habitat interactions present in the Central Alaska Range are not ideal for producing trophies; in fact, this area is among the poorer trophy production areas in Alaska.

Most natural mortality of sheep is caused by weather, predation, and disease. Predation influences are not known, but are thought to be minimal under normal conditions. The influences of weather are most apparent in production of lambs, and sometimes adverse winters result in the loss of a lamb crop. Population structure and the number of harvestable rams in the population are influenced by the weather events of five to six years before. It is not unusual to have poor lamb survival every five or six years.

Sheep in the central Alaska Range have been heavily hunted for the last nine years. Hunter numbers have ranged from 220 in 1968 to 312 in 1972 and have averaged about 225. An average of about 110 sheep are killed each year. This harvest is about two percent of the total population. Recently the percent of legal rams in the herd has been low, near three percent. Horn length has decreased over the last 8 years from an average of 34 inches to an average of 32 inches, and average age of sheep harvested has declined from about 8 years of age to about 6 years of age. All these measures indicate that hunter pressure in the area is intense.

About 1600 man days of recreation are expended annually by sheep hunters in this area and the average man days for each sheep harvested is 13.1 days. Use of the hunting area is primarily by resident hunters (about 80 percent) who reside in interior Alaska. Guiding effort is significant in the area and guided hunters usually take about 30 percent of the harvest

even though they comprise only about 20 percent of the hunters. There is little nonconsumptive use of Dall sheep in the area except for the Healy-Lignite closed area. The hunting season has been unchanged in the area since statehood, and most of the harvest occurs early in the hunting season. There is no subsistence hunting in the area although some users hunt primarily for sheep meat. The heavy exploitation of rams in this area has lead to fewer available trophies, compounded in recent years by the poor lamb production of five to seven years ago. Virtually all sheep hunting is with the aid of aircraft. Some guides use horses, but clients usually are flown to base camp. Some off-road vehicles are used and established trails exist.

DELTA SHEEP

LOCATION

Game Management Unit 20D and that portion of Game Management Unit 20A lying east and south of McGinnis Glacier and Creek.

THE SPECIES

Dall sheep in the Delta area number approximately 1500 animals. The population size appears stable, despite high production and good survival of lambs to yearling age (usually indicative of a growing population). Sheep habitat is apparently in good condition. Predation may be limiting population growth in the area. The proportion of rams in the population has been reduced by hunting and now stands at about 7 percent. Legal ram recruitment may be reduced, at least for the 1976 season, due to the severe winter of 1970-71.

Since 1968 an average of 191 hunters have taken an average of 51 sheep per year in the Delta area. Hunting success has averaged 27 percent annually. More than 90 percent of the hunters are Alaskan residents. About half of the hunters come from Fairbanks, 20 percent from Delta Junction, and 20 percent from other areas in Alaska. From 1971 to 1974 use of the area was equally distributed between walk-in hunters and vehicular users by imposing restrictions on the use of vehicles during the latter part of the season. In 1975 vehicular access was prohibited and only walk-in hunters now use the area. Currently sheep in the remote and inaccessible areas such as July Creek and the Johnson, Gerstle and Little Gerstle Rivers sustain only 19 percent of the harvest while sheep in the accessible Granite Mountains and the Alaska Range adjacent to the Richardson Highway support 81 percent.

Hunting has affected the availability and size of rams in the population. Average horn size of rams harvested has declined from 35.2 inches in 1968 to 30.6 inches in 1975. Hunting effort or success would have to be reduced if an increased proportion and size of rams in the population is desired.

DALL SHEEP IN NORTHWESTERN ALASKA

In Northwestern Alaska Dall sheep (*Ovis dalli*) inhabit the Delong Mountains from Howard Pass to the western Wulik Peaks. Distribution is not continuous and sheep populations may be separated by several drainages. The influences of coastal weather may make habitat in Northwestern Alaska marginal for Dall sheep. The total population in the region is estimated to be about 1,500 sheep.

Dall sheep are usually found in alpine habitat. During summer they occupy relatively large areas. Mineral licks are an important component of sheep habitat in summer. Many important mineral licks are known throughout the Brooks Range, but few have been identified in Northwestern Alaska. Sheep, especially ewes with lambs, will frequently travel several miles to use mineral licks where they eagerly eat the mineral rich soil. The exact nature of sheep dependence on mineral licks is not fully understood. The use of mineral licks also serves to intermingle otherwise discrete populations and is of importance in maintaining genetically healthy herds.

Winter ranges are the third critical component of Dall sheep habitat. Winter ranges are characterized by windblown ridges or slopes. These ranges usually occur at the mouths of tributaries along major drainages where prevailing winds clear winter snow from forage. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by, a winter range of relatively few acres. Some herds occupy winter ranges which are several miles from their summer ranges and migrate between the two. These seasonal migrations often include side trips to utilize mineral licks, and are the ingrained tradition of each population. Sheep are extremely loyal to their traditional summer ranges, winter ranges and mineral licks and appear on these ranges at about the same time each year.

Predation in Northwestern Alaska does not appear to be a major factor in limiting sheep numbers, however occasional situations arise where predation may depress sheep numbers. Wolves are the main predator on sheep, but wolverines, bears and sometimes eagles have been known to take sheep.

Dall sheep in Northwestern Alaska are used for nonconsumptive wilderness values and for consumptive recreational and domestic utilization. In recent years the recreational harvest in Northwestern Alaska has averaged less than 20 rams and hunter success has averaged about 50 percent. About half of the harvest has been by nonresident hunters. Domestic use of Dall sheep has played a minor but continuing role; such use has been limited and nontraditional. It is difficult to assess the future trends of hunter pressure and harvest in Northwestern Alaska, but hunter effort will probably increase.

DALL SHEEP IN ARCTIC ALASKA

In Arctic Alaska Dall sheep (*Ovis dalli*) are continuously distributed along the north slope of the Brooks Range from the Canadian border as far west as the Wulik Peaks. Minimum estimates of sheep numbers in the region place the current population size at about 10,000 sheep. No well-documented population fluctuations have been observed in the sheep populations throughout Arctic Alaska. No populations are currently known to be expanding, and it is thought that sheep numbers in the region, while subject to fluctuations, are comparatively stable at about current numbers.

Dall sheep are usually found in alpine habitat. During summer, they occupy relatively large areas. Mineral licks are an important component of sheep habitat in summer. Many important mineral licks are known throughout the Brooks Range. Sheep, especially ewes with lambs, will frequently travel several miles to use mineral licks where they eagerly eat the mineral rich soil. The exact nature of sheep dependence on mineral licks is not fully understood. The use of mineral licks also serves to intermingle otherwise discrete populations and is of importance in maintaining genetically healthy herds.

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Predation in Arctic Alaska does not appear to be a major factor in limiting sheep numbers, however, occasional situations arise where predation may depress sheep numbers. Wolves are the main predator on sheep, but wolverines, bears and sometimes eagles have been known to take sheep.

Dall sheep in Arctic Alaska are used for nonconsumptive wilderness values and for comsumptive recreational and domestic utilization. Traditionally only rams with horns of 3/4 curl or greater have been legal game during an August-September season. For the last several years sheep hunters have spent an average of about 700 man days per year hunting for sheep in the region. The number of hunters has averaged about 150 and the number of rams harvested annually has averaged about 110 over this period. Resident hunters comprise about 65 percent of the hunter effort and have a success ratio of about 60 percent. Nonresident

hunters have a success rate of about 85 percent, perhaps reflecting the benefit of the mandatory presence of a guide. Domestic utilization of Dall sheep has played a minor but continuing role in the Arctic Region. Kaktovik and Anaktuvuk Pass Eskimos take sheep, but these people have never been entirely dependent on sheep for food. It is difficult to assess the future trends of hunter pressure and harvest in the Arctic Region but hunter effort will probably be greater than it has been in the past.

WESTERN BROOKS RANGE SHEEP

LOCATION

The portion of Game Management Unit 23 draining into the Kobuk River and the drainages into the Noatak River below Mayumerak Creek.

THE SPECIES

Sheep in this area can be separated into three distinct geographical populations: those in the drainages of the upper Kobuk River; those in the Baird Mountains south of the Noatak River; and those in the Delong Mountains, north of the Noatak River. The total sheep population in the area is estimated to be 700. While the Kobuk drainage appears to be good habitat, it contains relatively few sheep. The area has not been thoroughly surveyed, but it is estimated to support only 150 animals. The Baird Mountain region is sparsely populated, with most sheep occurring in the western portion. A cursory survey in 1974 revealed 44 sheep, but the area is estimated to contain 150. Sheep inhabit a relatively large area in the Delong Mountains from the Wulik River in the west to the Nimiuktuk River in the east, but density is low. The area is estimated to contain 400 animals.

Presently sheep are about one-half their former numbers in the Western Brooks Range. Information indicates that the sheep population began to decline in the early to mid-1960's and has continued to do so. The decrease does not seem to be a result of hunting alone, but more likely is a combination of several factors. These include range conditions, weather, predation and subsistence hunting.

A fall survey in 1974 revealed that lambs comprised about 24 percent of the population in the Western Brooks Range and 17 percent in an area near the upper Kobuk River. For the population as a whole natural mortality is estimated to be about 6 to 9 percent annually.

It appears that sheep distribution has shrunk during the last three decades. Although the causes are uncertain, sheep habitat in the Western Brooks Range is marginal, perhaps because of its proximity to the arctic coastal environment. When sub-populations are extirpated, recolonization apparently occurs very slowly. Even with good lamb survival it is not likely that the population will expand quickly.

Considering the size of the land mass, hunting pressure has been relatively light, but due to the limited number of aircraft landing sites, pressure has been high in localized areas. The greatest number of hunters have concentrated on the main tributaries of the Noatak River in drainages of the Eli, Kelly and Kugururok Rivers. Reported annual harvests in the area have averaged about 8 rams for the last 10 years. In recent years

there has been a slight increase in hunting pressure which is not entirely reflected in the harvest statistics because hunter success has been lower. Local residents have taken most of the harvest, but a few nonnatives using the services of a guide have also been successful. Wheeled or float-equipped aircraft have been the transporation means used most often, in about equal proportions. Average walking distance from the point of landing to where the sheep were killed has probably averaged less than five miles. Hunter success has been greater than 60 percent for both residents and nonresidents.

Twenty or thirty years ago local hunters probably killed 3 to 4 times (or more) as many sheep as did recreational hunters. With few exceptions this kill occurred outside the legal hunting season and included all sheep regardless of age or sex. This practice continues today but now domestic use more nearly equals the recreational harvest. The vast majority of this kill still occurs outside the open season, usually when the sheep are on their wintering grounds and can be reached with the aid of a snowmachine. The greatest number of sheep taken by domestic hunters come from the drainages of the Wulik, Kivalina, and lower Noatak Rivers.

SOUTHERN BROOKS RANGE SHEEP

LOCATION

Game Management Units 24, 25 and that portion of 23 which includes the drainages of the Noatak River above its confluence with Mayumerak Creek.

THE SPECIES

Sheep which inhabit this large area exist in discrete populations each of which has its well-defined traditional ranges. The entire extent of the area included in this plan has never been completely surveyed for Dall sheep so the actual number of animals present is not known. Based on limited aerial surveys, the number of Dall sheep in this area is estimated to be at least 7,500. There is little doubt that Dall sheep numbers fluctuate and that there may be declines or increases in the future, but these fluctuations are not expected to be extreme. Unless exceptionally adverse conditions occur, sheep population numbers will probably continue to fluctuate near present levels.

Most natural mortality is caused by weather and predation. The influences of predation are not known, but are thought to be minimal under normal conditions. The influences of weather are most apparent in lamb production and sometimes result in the loss of a lamb crop. Where hunter pressure is light, as it has been in much of the southern Brooks Range, weather influences on trophy production are not readily seen because of the standing stock of trophies on the range. In much of the southern Brooks Range trophy availability is good. This high availability of trophies results from the presence of lightly hunted populations containing relatively large numbers of old rams. A few areas with good access have received high hunter pressure in the last few years.

The southern Brooks Range has received an increased amount of use in the 1970's, but the number of hunters appears to have leveled off in the past 2 to 3 years at about 200 hunters per year. These hunters harvest about 115 rams per year. About 65 percent of the hunters are residents and they take about 55 percent of the harvest. In the past few years there has been a trend toward increased hunting by residents in the area. About 1,000 man days are spent hunting sheep in the southern Brooks Range each year. Some domestic utilization by local residents occurs in the area, but it is limited and represents the opportunistic taking of sheep rather than an actual dependence on them as a food item. Nonconsumptive utilization of sheep in the southern Brooks Range occurs, but the extent to which it is incidental to other activities is not known. Many big game guides and outfitters have interests in this vast area. They are responsible for about 45 percent of the Dall ram harvest each year. Some guide operations have permanent facilities in the area.

ATIGUN SHEEP

LOCATION

In Game Management Unit 26, T11S, R12E and T11S, R13E, Umiat Meridian.

THE SPECIES

The Atigun Canyon area contains important sheep winter range, lambing areas and mineral licks. Reliable sheep survey data for the Atigun area are available for 1970 only. At that time 372 sheep were counted in the Atigun River drainage, 91 of which were in the Atigun Canyon area. The present status of Atigun Dall sheep is unknown, but there is no reason to suppose that substantial changes in numbers have occurred.

Data on natural mortality and condition of the range are lacking. Wolves are the most important predator and are abundant in the area. Grizzly bears and eagles also frequent the area and prey upon sheep or scavenge on sheep remains.

Hunting seasons and bag limits have been in effect in the area since 1925. Beginning with the 1951 season, hunters were restricted to taking rams with 3/4-curl horns or larger. Hunting seasons have varied between 11 days and 133 days; bag limits varied from 1 to 3 sheep. Current regulations allow hunting from August 10 through September 20 with a bag limit of 1 three-quarter curl ram.

Sheep harvests are reported by drainage, and hunting pressure in the Atigun Canyon can be inferred only from returns for the whole of the Atigun River drainage. Twenty-nine sheep have been reported killed by hunters from 1968 through 1975 for the Atigun River drainage. Sixty-one percent of the hunters who reported hunting in the Atigun drainage were nonresidents, a higher figure than for the Brooks Range as a whole (35-50 percent). Harvests have probably not affected population size or structure.

Prior to 1974, sole access to the Atigun Canyon area was by light aircraft. Wheel-equipped aircraft were able to land on gravel bars along the Atigun and Sagavanirktok Rivers and float-equipped aircraft could land on Galbraith Lake. The service road for the Trans-Alaska Pipeline now traverses the length of the Atigun River except for Atigun Canyon and, when opened to public use, will allow people to drive to the upper end of the canyon. In addition, a 5,200 foot permanent airstrip now exists near the north end of Galbraith Lake. The Atigun Canyon area will be easily accessible once these facilities are open to the public.

NORTH SLOPE BROOKS RANGE SHEEP

LOCATION

Game Management Unit 26, the north slope of the Brooks Range.

THE SPECIES

About 10,000 Dall sheep are currently estimated to occur north of the crest of the Brooks Range. No significant population fluctuations have been documented for sheep of this area.

Natural mortality rather than hunting is the primary source of mortality. Although predation may occasionally depress local sheep populations, it does not appear to be a major factor in limiting sheep numbers at this time. Wolves are the main predator on sheep, but wolverines, bears and sometimes eagles are occasional predators. Other causes of natural mortality such as accidents, disease, and starvation also limit population growth.

The condition of the Brooks Range Dall sheep habitat is not known, but stability of sheep numbers in recent years suggests that range conditions have remained unchanged. Because of the long winters and short cool summers, vegetation growth is slow and habitat is limited; further expansion of the sheep population is not anticipated.

Dall sheep in the Brooks Range are used both for nonconsumptive wilderness values and for recreational hunting. The wilderness character of the region and the opportunity to hunt in an area where chances of encountering other people are minimal are factors which draw many recreational hunters to the area.

About 150 hunters annually have hunted in the area in recent years, taking an average of 110 sheep each year. Residents comprise about 65 percent of the hunters and have a success ratio of about 60 percent. Nonresident hunters have a success rate of about 85 percent (the mandatory presence of a guide may result in higher success).

The use of Dall sheep for food by Kaktovik and Anaktuvuk Pass Eskimos has played a minor but continuing role. This use has been traditional, but these people have never been entirely dependent on sheep for food. The current use of the resource in late winter with the aid of aircraft and snow machines underscores the changing pattern of use from that of former years.

Although boats, horses and off-road vehicles are also employed, the large majority of sheep hunters in the Brooks Range use aircraft to reach hunting areas. Since access by air is limited to suitable landing sites on lakes or gravel bars, overharvests may occur in those portions of drainages near such landing areas. As hunting pressure and demand for use of access points increases, it is expected that overharvest and hunter crowding will increase near these locations unless otherwise regulated.