ALASKA WILDLIFE MANAGEMENT PLANS

WESTERN ALASKA

Alaska Dept. of Fish and Game

ALASKA WILDLIFE MANAGEMENT PLANS

A PUBLIC PROPOSAL FOR THE MANAGEMENT
OF ALASKA'S WILDLIFE

STATE OF ALASKA
Jay S. Hammond, Governor

Department of Fish and Game
James W. Brooks, Commissioner

Division of Game
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FOREWORD

These Alaska Wildlife Management Plans are first and foremost proposals *for wildlife management developed by the Division of Game for consideration by the public. The many ideas contained in the plans are only a beginning - they form a basis upon which the public can comment and recommend. The plans are not inflexible, and even after they attain a more final form and are implemented, they will be subject to change as wildlife populations and public needs demand such changes.*

In addition to proposing management directions, the plans contain a wealth of information on the status and use of Alaska's wildlife populations. This valuable information was compiled from a number of widely scattered sources and much of it was not previously available in written form. These plans represent the most accurate assessment of wildlife status and use available to the Game Division at the time of writing in 1976. *However, wildlife populations are dynamic, and much of the information on population status will require revaluation with time.*

Virtually the entire Game Division staff participated in the preparation of these proposals. Coming as it did amidst many other important tasks of the Division, this planning effort was most demanding. I am gratified by my staff's cooperation and support in this endeavor; their accomplishment reflects their professionalism and dedication.

Robert A. Rausch

Robert A. Rausch, Director
Division of Game

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PART I:
WILDLIFE MANAGEMENT IN ALASKA

WILDLIFE MANAGEMENT IN ALASKA

THE PLANS, THE DEPARTMENT OF FISH AND GAME AND THE PUBLIC

Alaska's Wildlife Management Plans are the result of a long-term planning effort which first resulted in the development of the Alaska Game Management Policies in 1973. These plans are another step toward developing a program for wise husbandry of Alaska's wildlife resources and, basically, are recommendations to the public by the Department of Fish and Game for the management of all wildlife in the state.

The information and recommendations contained in these plans represent a concerted effort by Department staff to compile and review existing information on the status, distribution, and uses of Alaskan wildlife populations. Current and projected land use patterns and natural resource potentials and developments are also considered. Synthesis of these plans began at the field level where local needs and conditions were best understood.

The need for planning in the management of wildlife, and particularly in the allocation of use of wildlife, has become pressing in recent years. Alaska is experiencing unprecedented growth in human population at the same time that immense land areas, conveyed to private ownership or federal single-purpose classification, may be lost to multipurpose public use. Development and mobilization of resources are impacting wildlife and its habitat and are bringing more people into contact with once-remote wildlife populations. In simplest terms, Alaska faces a rapidly growing demand for wildlife use which is in sharp contrast to the shrinking resource area available to support such use. Moreover, as pressures on wildlife populations increase, there are increasing possibilities that any given use will have detrimental effects. There is, therefore, need for greater precision in management.

The complexity of resource allocations requires the systematic approach provided by planning. In keeping with mandates of Alaska's constitution, the Department's planning efforts are intended to eventually achieve optimum, diversified use of Alaska's wildlife throughout the forseeable future.

Publication and distribution of these recommendations mark the beginning of the second phase in this planning process: the public's review of the staff's recommendations and its involvement and participation in shaping the initial proposal into a statement of direction for wildlife management in Alaska.

The responsibility of the Department is to manage Alaska's wildlife resources for the benefit of the people. Therefore, it is incumbent on the Department to determine what the public wants from its wildlife resources. It is clear also that the Department will not be able to maintain the continuity of long-term management programs without the support of Alaska's people.

Development and implementation of the wildlife plans will affect Alaskans in several ways. First, the public will participate in the initial formulation of the basic long-term management direction. Second, the plans as presented for review will inform the public about Alaska's wildlife populations and their current and potential uses. They will also give the public a clearer understanding of the role and responsibilities of the Department of Fish and Game. Third, if implemented, the plans will provide Alaskans and other interested persons with an array of alternative uses of wildlife which can be maintained through purposeful management.

All interested people are invited to contribute to the wildlife management planning effort. The Division of Game recommendations contained in this and other booklets and maps are being distributed to the public throughout the state. Included is a questionnaire soliciting opinions about the management the Division is proposing. In addition to printed circulation of the proposed plans, the Division will hold public meetings in many Alaskan communities to obtain comment and discussion.

All public response will be considered in evaluating and modifying the proposed plans. Allocation of wildlife values among competing users and between conflicting uses is a complex problem which will have to be resolved through careful consideration of expressed public desires and the biological capabilities of the wildlife populations in question. Minority as well as majority demands should be accomodated if we are to retain the values afforded by a spectrum of wildlife-oriented experiences.

The Division will work closely with the Alaska Board of Game and with the Board's local advisory committees during the entire public review process. As the principal forum for the public's voice in Alaska's wildlife management, the Alaska Board of Game will modify and make the final determination on proposed wildlife plans. The Division of Game will assist the Board by providing a full report of the public review process and the response it engenders.

After the public review process, and revision and adoption by the Board of Game, the plans will be published and distributed to the public. Needless to say, the plans are not intended to be inflexible. Conditions change with time, and the plans will need to be adaptable. Revision of plans may occur as the result of periodic reviews or when individual situations require modification. Revision of plans will be made with participation by the public.

Implementation of the plans will begin as soon as practical after final acceptance by the Board of Game. Those areas or species now receiving the greatest use or in danger of losing those attributes called for by the plans should receive the earliest attention. Implementation will involve development of operational plans, formulation of regulations, internal Department actions such as research and management activities, and interagency cooperative actions as required.

Development and implementation of these management plans will be strongly affected by conveyance of 40 million acres of land into private ownership and by inclusion of up to 80 million acres of classified federal withdrawals into "Four Systems" federal management under terms of the Alaska Native Claims Settlement Act. Development of staff recommendations has proceeded with the knowledge that many changes in the contents of the final plans are inevitable. Management of wildlife on lands under federal jurisdiction or under private ownership will necessarily be commensurate with the land-use policies of the respective landowners. Important land-use decisions are being made now and in the next few years that will affect wildlife and its future use in the state. By developing wildlife plans now, we can improve the rationale by which land-use policies will be formulated.

WHAT THE PLANS CONTAIN

This regional booklet is only one portion of a comprehensive public proposal by the Division of Game, Department of Fish and Game, for the planned management of Alaska's wildlife resources. The proposal consists of: 1) seven regional booklets (of which this is one) containing recommendations for management of each species of wildlife, and 2) a set of eleven statewide maps outlining boundaries of individual species

management plan areas. The maps are intended to complement the material presented in the regional booklets. For complete understanding of the plans, the maps and appropriate regional booklets should be used together. These plans are for your review. Questionnaires have been included with the maps and booklets for your written comments. In addition, public meetings will be held throughout the state to explain plans and receive comment. You are invited to contact the Game Division staff to discuss these plans.

REGIONAL BOOKLETS

Each regional booklet is arranged in two parts. Part I contains an explanation of the planning effort and how the public will participate in the development of the plans. Included is an explanation of the management goals upon which the recommendations are structured. In addition, Part I presents a brief discussion of wildlife management in Alaska, reviewing the formal structure of management, the biological bases for wildlife use, and the problems encountered in managing wildlife. Part II contains the individual species/area management recommendations.

Each of the regional booklets corresponds to one of seven geographic regions of the state, depicted in the figure below.

All proposed management plans covering all or part of a region are included in the booklet for that region. The plans are arranged by species in Part II of each booklet, and each plan is titled and numbered to provide easy reference to the corresponding species map. Each individual plan includes:

1) A geographical description of the location of the area covered by the plan.

2) Goals - One primary goal and in some cases one or more secondary goals.

3) Examples of Management Guidelines - These are used to qualify or quantify in a more specific way the recommended management under a goal for any particular area.

   Management Guidelines are statements about:

   - the wildlife population: its size, sex and age structure and productivity.

   - use: season lengths and timing, bag limits, number or distribution of hunters or other users, access, transport, viewing, and aesthetic enjoyment.

   - habitat: alteration or protection.

4) A short summary of available information on the species and its use in the area to provide perspective for evaluation of the proposed management framework.

5) Statements of problems that may be encountered in managing for proposed goals. In general, problems deal with:

   - maintaining wildlife population levels: loss of animals or loss of habitat.

   - use of wildlife: exclusion of hunting, excessive access, noncompliance with regulations, state and federal legislation, and limitations on Department authority.

   - conflicts caused by wildlife: agricultural depredations, and safety of life and property.

6) A summary of the impacts of the proposed management in terms of its effects on the species in question, on characteristics of its use by man, on other species, and on other uses of the area.

MANAGEMENT GOALS

We have selected six management goals for these wildlife plan proposals. The goals are categories of use into which the various appropriate forms of human interactions with wildlife can be grouped. The goals provide direction for management with flexibility in mind. In most individual plans, multiple goals are assigned: a single primary goal and one or more secondary goals. Each goal emphasizes one general type of use opportunity. This does not necessarily mean that other uses will be excluded. Rather, it recognizes that if uses conflict, uses appropriate to the stated goals will receive preference. Furthermore, uses indicated by stated goals will be actively managed for. The overall content of each plan will further define goals for that specific area.

All proposed management goals are based on Alaska's constitutional mandate that its wildlife shall be reserved to the people for common use and shall be utilized and maintained on the sustained yield principle for the maximum benefit of the people. Use on a sustained yield basis for the maximum benefit of the people will take on different dimensions depending on individual situations. As an example, in rural Alaska the benefit of the people may, in large part, be concerned with the harvest of meat for domestic use, and yield would refer to pounds of meat or number of animals harvested. In another situation the greatest benefit to the people may accrue from only observing wildlife. Yield in this instance refers to the important but often intangible enjoyment derived from viewing or otherwise being aware of the presence of wildlife.

The choice of goals and their various combinations are intended to accommodate the variety of situations which exist in Alaska. The six wildlife management goals are:

1. TO PROVIDE AN OPPORTUNITY TO VIEW, PHOTOGRAPH AND ENJOY WILDLIFE.

2. TO PROVIDE FOR AN OPTIMUM HARVEST.

3. TO PROVIDE THE GREATEST OPPORTUNITY TO PARTICIPATE IN HUNTING.

4. TO PROVIDE AN OPPORTUNITY TO HUNT UNDER AESTHETICALLY PLEASING CONDITIONS.

5. TO PROVIDE AN OPPORTUNITY TO TAKE LARGE ANIMALS.

6. TO PROVIDE AN OPPORTUNITY FOR SCIENTIFIC AND EDUCATIONAL STUDY.

A thorough understanding of the goals is essential to understand and evaluate the plans. We urge you to study the following explanations of each goal.

1. TO PROVIDE AN OPPORTUNITY TO VIEW, PHOTOGRAPH AND ENJOY WILDLIFE.

This goal recognizes the great values of being able to see wildlife in a context not necessarily related to actual taking, and emphasizes yield in terms of aesthetic values. There are important areas where the combination of wildlife abundance, unique opportunity and human access result in this use accruing the maximum benefit to people. Emphasis is on viewing and photographing and may exclude all other uses. However, other uses including hunting may be allowed if compatible.

So-called "nonconsumptive" use of wildlife is popular in the state today. Viewing and photographing occur most frequently along the state's road and trail systems, areas which often receive heavy hunting use and which are most susceptible to human development. In some areas where unusual abundance, visibility, or accessibility of wildlife enable ready observation by the public without detrimental effects to wildlife, management for these purposes should be provided. Prompt identification, establishment and management of such areas is necessary to avoid losses to encroaching development and competing uses. Many of these areas have been previously identified.

Management which provides an opportunity to view, photograph, and enjoy a species is concerned with maintaining a sustained, observable population of that species. Human uses of wildlife or of the area supporting wildlife which significantly detract from the opportunity to observe the primary species may be regulated or restricted. Hunting for the primary species is generally excluded during the period when most observation takes place. Limitations on the number, distribution, or activities of viewers and photographers may be necessary where unlimited use would detract from the opportunity to observe wildlife or cause undue disturbance. Hunting may be allowed when year-round or area-wide observation does not occur. In some situations concurrent consumptive and "nonconsumptive" uses may be compatible.

Viewing and photographing are often compatible with other uses; this is reflected in the numerous plans where viewing and photography occur in combination with other goals. When applied as a secondary goal the emphasis on viewing and photographing is subdued, and uses addressed by primary goals may at times limit opportunities for observation. In some cases, however, management for other primary goals may enhance opportunities for observation of wildlife.

2. TO PROVIDE FOR AN OPTIMUM HARVEST.

This goal emphasizes yield of animals for human use. Within this goal are accommodated the needs for domestic utilization, especially by rural residents, but also by recreational hunters primarily interested in meat; commercial harvests; and situations involving maintenance of wildlife populations at specified levels. Aesthetic quality of experience and production of trophy animals may be compromised.

Direct domestic utilization of wildlife is important to many rural residents and is a valuable supplement to the larders of urban citizens. Emphasis of management will be to achieve an optimum harvest. This goal is also desirable in situations where excessive wildlife numbers develop and the welfare of wildlife populations or the safety of human life or property will require maintaining some lower optimum number of the species in question. Finally, management to provide for an optimum harvest is used where direct commercial utilization is warranted.

Optimum harvest can be defined as the amount or level of yield that is most favorable to some specified end result, whether it is productivity or density of a wildlife population, within the constraints of sustaining that population for future use. Such a harvest will differ from area to area, from species to species, and over time.

Management of populations under this goal will be intensive, involving manipulation of the numbers and/or sex and age structure of the population. Controls on methods and means of taking game, adjustments to lengths of

hunting seasons and bag limits and restrictions on the number of hunters are ways by which use will be regulated. In cases where production of food is important to local residents, the species may be managed to maximize sustained productivity, and use may be regulated to favor those people with the greatest dependency on the resource.

Management under this goal has wide latitude depending on the conditions and requirements of any particular area where it is employed. The goal is often compatible with the goal of providing the greatest opportunity to participate in hunting and with other goals by regulating the time and place of use. This goal may adversely affect aesthetic hunting considerations and the production of trophy class animals. "Nonconsumptive" uses may be available on an opportunistic basis.

This goal differs from the other five goals because it does not directly consider opportunity for use, but rather use itself. Perhaps the greatest similarity between this goal and other goals is with that of providing the greatest opportunity to participate in hunting. Under both goals the upper limit to consumptive use is the maximum harvest that a population can sustain. But whereas "greatest opportunity to participate in hunting" is dependent on the optimum harvest, attaining an "optimum harvest" is not dependent on providing the greatest opportunity to participate in hunting. Yield of the latter is participation. In the former, yield is in number of animals (biomass) that can be taken.

3. TO PROVIDE THE GREATEST OPPORTUNITY TO PARTICIPATE IN HUNTING.

This goal recognizes the recreational value of hunting and emphasizes the freedom of opportunity for all citizens to participate. In this case, the opportunity to participate is deemed more important than success or standards of quality of experience.

As Alaska moves away from the open frontier lifestyle, recreational hunting is an increasingly important use of wildlife in the state. Yet even as the demand for recreational hunting is growing, the area available for such use is decreasing. Extensive private land ownership and additional extensive parks, refuges and other lands designated for limited use will strongly affect recreational hunting opportunities in the state.

Providing the greatest opportunity to participate in hunting will not mean maximizing opportunity to kill. Management will consider participation more desirable than success. Opportunity must sometimes be limited to maintain harvests within the numbers that a wildlife population can sustain. Restricting harvest will usually involve altering methods and means of taking game, bag limits, and lengths and timing of seasons before limiting number of hunters. When participation must be limited, time allowed for a hunt will be limited before limiting number of hunters.

Management to provide the greatest opportunity to participate in hunting often will be similar to providing for an optimum harvest, because where demand to hunt is sufficient, full beneficial use of the resource will be allowed. Consequently these two goals are recommended in combination in many areas. Used as the only goal in an area, greatest opportunity to participate in hunting may compromise aesthetic considerations or reduce opportunity to take large (trophy) animals; "nonconsumptive" uses would be available on an opportunistic basis.

4. TO PROVIDE AN OPPORTUNITY TO HUNT UNDER AESTHETICALLY PLEASING CONDITIONS.

This goal emphasizes quality of hunting experience. To achieve it will often require limiting the number of people who may participate, as well as the means used to take game. Criteria for such areas include natural or wilderness character of the land, low hunter densities, and emphasis on hunting without the aid of mechanized vehicles.

Quality of experience is becoming increasingly important to a greater number of hunters, especially for those who value the aesthetics of the hunting experience as much or more than hunting success. For them the proliferation of off-road vehicles, riverboats, airplanes and the "hunter behind every bush" situation is distasteful. Under this goal, aesthetically pleasing conditions refers to a hunting experience which usually includes low hunter densities, controlled methods of transport, undisturbed wilderness character, and regulation of other conflicting uses, separately or in combination. Human activities which adversely affect the aesthetic quality of the hunting experience will be discouraged, limited, or prohibited. Opportunity as used here does not guarantee unlimited participation, and would normally imply limits on participation. Controls on hunter transport may reduce hunting success. This goal will not usually require large or dense populations of wildlife, nor will animals necessarily be of large (trophy) size. Harvests need not attain the highest levels that can be supported by the population.

The value of aesthetics is often considered when other goals are primary, and this goal is often used in combination with other goals to reflect the considerations of quality not explicitly stated in other goals. To the extent that other uses conflict with aesthetic values, timing and zoning of the area of use can be employed to obtain greater utilization of a wildlife population.

5. TO PROVIDE AN OPPORTUNITY TO TAKE LARGE ANIMALS.

This goal emphasizes the opportunity for hunters to take large animals. To accomplish this goal will usually mean that participation of hunters will be limited and the species population within the area may be manipulated to produce the maximum number of large animals.

Many recreational hunters are especially interested in taking a large animal. With development and increasing human pressures on wildlife resources, the opportunities for hunters to be selective for large animals are becoming fewer. Management under this goal may ensure that in some areas and for some species such opportunity will be retained. Areas recommended for management under this goal must have a reasonable number of large, old or trophy animals available or the potential to produce such animals. Opportunity as used here would not guarantee unlimited participation, but would provide a reasonable chance of success to those who do participate. Management will often be intensive, involving manipulation of the sex and age composition to produce large animals, and possible controls on number and distribution of hunters.

This goal and that of hunting under aesthetically pleasing conditions will often be compatible, and hunting both for large animals and under aesthetic conditions will be enjoyed simultaneously. Management for other goals is possible when the production of large animals is not affected. However, intensive management to produce large animals may

require taking other population segments by other users. For example, to produce large bull moose it may be necessary to harvest substantial numbers of female moose. This goal does not preclude "nonconsumptive" uses, and in fact may enhance "nonconsumptive" use experiences by providing improved opportunities to view large animals.

6. TO PROVIDE AN OPPORTUNITY FOR SCIENTIFIC AND EDUCATIONAL STUDY.

This goal recognizes the desirability and need to provide for scientific and educational use of wildlife to achieve a scientific basis for evaluating management options. Such management may require setting aside areas solely for this purpose, but in most cases, this use is compatible with other types of use.

The Alaskan wilderness, including its wildlife, is a unique natural laboratory for the scientific study of ecosystems and wildlife biology, and for the educational enrichment of the people. Scientific study and education have continually taken place in many areas of Alaska, reflecting the wide compatibility of such use with other uses of wildlife. Occasionally however, undisturbed or closely controlled conditions are necessary for study requirements and justify the designation of areas managed primarily for the scientific and educational study of wildlife. Study requirements would specify the extent to which other uses, both consumptive and nonconsumptive, would be allowed. In some cases, intensive population or habitat manipulation could be necessary to achieve study objectives. Participation could be limited.

This goal appears most often in combination with the goal of providing an opportunity to view, photograph and enjoy wildlife because they often have much in common. Educational studies are often enhanced by relatively undisturbed wildlife populations in areas established for viewing and photography. Providing for scientific and educational study is proposed as a primary goal in very few areas. Such limited direct application of this goal emphasizes the fact that opportunities for scientific and educational study exist throughout the state and special designation is unnecessary unless intensive population or environmental controls are required.

MANAGEMENT BACKGROUND

To properly evaluate the individual species plans presented in this volume, it is necessary to have some appreciation for the Alaska setting in which these plans are developed. There are, of course, biological or ecological characteristics of wildlife which affect its management. There are also a number of human institutions that affect management: constitutional and statutory authority, requirements, and constraints; policy; user requirements; and the demands of the "new Alaska." It is hoped that the following discussion touching on these considerations helps to place the plans in a more relevant perspective for public understanding.

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 if 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.

PART II:
INDIVIDUAL SPECIES MANAGEMENT PLANS

This section contains every individual species management plan located in the Western Alaska Region. The plans are arranged by species alphabetically, and each species is introduced by a general description of that species in the region.

All individual plans are titled and numbered for easy reference to the maps provided with this booklet. Use of the maps will help in locating the areas described under "Location" in each individual plan.

Because wildlife in Alaska has long been managed according to administrative regulatory units called "Game Management Units", familiar to many Alaskans, most location descriptions indicate which Game Management Unit or Units the plans are located in or use some Game Management Unit boundaries as individual plan area boundaries. A Game Management Unit map has been included with the color-coded wildlife plans maps to help in understanding the precise location of proposed areas.

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.

PROBLEMS

* Black bears rapidly accustom themselves to the presence of humans and the ready source of food that human habitations and activities provide. Open garbage dumps and the excesses or indulgences of humans at recreation sites and campgrounds quickly make nuisances of bears who become dependent on such sources of food. Many nuisance bears become a threat to human safety and property and must then be destroyed or otherwise removed. Proper garbage disposal and refraining from feeding "tame" bears are necessary to avoid eventual confrontations that endanger human life and lead to destruction of the bears.

1. INTERIOR-WESTERN ALASKA BLACK BEAR MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting black bears.

SECONDARY MANAGEMENT GOAL

To provide for an optimum harvest of black bears.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Encourage recreational hunting of black bears to achieve greater utilization of the black bear resource.

2. Regulate season timing, methods and means of taking and bag limits to provide for local use.

3. Regulate access and methods of hunter transport, if necessary, when in conflict with management objectives for other species.

4. Increase public awareness of black bear behavior to reduce adverse bear-human interactions.

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.

PROBLEMS

* Some private lands are currently posted against public trespass, and conveyance of land into private ownership under terms of the Alaska Native Claims Settlement Act may restrict public access for hunting in additional large tracts. The Department should solicit the cooperation of private landowners to facilitate progressive management of black bears. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

* The proposed additions of land into federally administered parks, wildlife refuges, wild and scenic rivers and national monuments under terms of ANCSA encompass substantial portions of black bear range and will affect state management of black bears in these areas. If these areas are established by congress, the Department should solicit cooperation of the respective land management agencies to allow public use of the lands for hunting.

* Continuing agricultural, industrial, energy and mineral resource development, along with urban and suburban expansion, will result in a loss of black bear habitat and cause an increase in bear depredations, with attendant increases in the destruction of animals in defense of life and property. The Department will identify important habitat areas and request habitat protection measures of the appropriate land management agencies. The Department will also insist on compliance with state regulations on sanitation and garbage disposal in remote camps.

* Due to manpower and funding restrictions, data on population status and harvest levels of black bears have been limited. As harvest levels and interest in black bears increase, the Department should expand the current limited sealing requirement to a greater area of the region.

IMPACTS

* Black bear populations will sustain greater harvests than in the past, and hunting effort and spatial distribution of the harvest may become more concentrated as a result of the Alaska Native Claims Settlement Act. More restrictions on access, seasons and bag limits may have to be imposed in local areas if overharvest occurs.

* Since many bears are taken incidentally to hunting for other species, management and regulations relating to these other species will impact the black bear harvest. It may become necessary to restrict black bear hunting in some areas to avoid conflicts with management priorities for other big game species.

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 spirallis* 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.

PROBLEMS

* Well-intentioned concern by a national public may hamper effective management of the species and threatens future use by recreational hunters. One misconception is that because brown bears are threatened in one portion of their range, they are threatened in all areas. Also, some people believe that distinct, and therefore unique,

subpopulations of brown bears exist which need absolute protection. Management of bear populations and use of bears must continue to be based on scientific evidence. True taxonomic relationships and the fact that brown bear in most parts of Alaska are still relatively abundant provide sound support for continued beneficial uses, both consumptive and nonconsumptive.

* The eventual survival of the brown bear does not depend on the designation of vast tracts of "unspoiled wilderness." Conflicts with bears in large national parks indicates that beyond merely providing space for bears, man must come to understand bears - their requirements, behavior and their place in ecosystems, and then apply this knowledge in land use decisions. The value of brown bears as a renewable resource should be acknowledged and considered in land use classification. Important brown bear habitats must be preserved by exclusion of incompatible development, and in areas where humans and bears co-exist, proper precautions should be observed to avoid confrontations. Proper disposal of garbage is of singular importance in this regard.

5. YUKON-KUSKOKWIM BROWN BEAR MANAGEMENT PLAN

LOCATION

Game Management Units 18 and 21 and that portion of Game Management Unit 19 lying north of the Kuskokwim River.

MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting brown bears.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain brown bear hunting seasons.

2. Encourage greater recreational harvest of brown bears in the area.

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.

PROBLEMS

* Public hunting may be denied on large tracts of land that will be selected by native village and regional corporations in the area under terms of the Alaska Native Claims Settlement Act. The Department should solicit the cooperation of private landowners to facilitate progressive management of brown bears. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

IMPACTS

* Hunters may have more liberal hunting seasons with less restrictive regulations than in many other areas of the state.

10. FAREWELL BROWN BEAR MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide an opportunity to hunt brown bears under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to maintain aesthetic hunting conditions.

2. Develop hunter access, if necessary, to distribute hunting pressure through the area.

3. Design brown bear hunting seasons to maintain a relatively large large proportion of older males in the population.

4. Discourage land use practices that adversely affect the wild character of the area.

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.

PROBLEMS

* Portions of the area may be included in the National Park system under proposals submitted to Congress by the Department of Interior. Under Park Service administration prohibition of hunting on National

Park lands and limitations of access across them may significantly affect hunter use of the Farewell area. The Department should seek management agreements with the National Park Service for park lands and adjacent lands which will minimize loss of hunting opportunity.

* Access is limited, tending to concentrate hunters in limited portions of the area. Airstrips should be developed to distribute hunting pressure.

* Illegal hunting of bears on the same day a hunter is airborne is still common. Increased enforcement efforts are necessary and more severe penalties for violators are needed.

IMPACTS

* If hunting pressure continues to increase the number and distribution of hunters may be controlled by permit. Under permit hunting conditions not all hunters wishing to hunt in the area would be allowed to hunt.

* Large male bears will continue to be available for hunters.

11. SOUTH KUSKOKWIM BROWN BEAR MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to take large brown bears.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to hunt brown bears under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Design brown bear hunting seasons to maintain a relatively large proportion of older males in the population.

2. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to distribute hunting pressure through the area and to maintain desired harvest levels.

3. Encourage land use practices that maintain the wild character of the 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.

PROBLEMS

* Future development of extensive copper ore and other mineral deposits may detract from the aesthetic quality of the area and may provide excessive access for hunters. The Department will encourage development of resources that has minimal impacts on the wild character of the area. Limitations on the number of hunters will be necessary if road access is developed.

IMPACTS

* Some restrictions on harvest may be imposed in the future to maintain large bears in the population. These restrictions may limit the number of hunters able to participate.

* Guides and transporters may realize more requests for hunts in this area due to the demand for trophy size bears.

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.

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 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. Prior to 1960 there were no restrictions of 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. Regulatons 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 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.

PROBLEMS

* Increasing human demands on moose and caribou populations that are declining or already at low levels and the effect of wolf predation in retarding recoveries of these populations creates a serious management dilemma. The reduction of wolf numbers to encourage an increase in the number of ungulates is not easily accomplished given the controversial nature of the wolf and the practical problems in achieving significant reductions in wolf populations. The wolf evokes powerful sentiment from both those who see it as a destroyer of game coveted by man and those for whom it is a symbol of wilderness. Both opinions are powerfully expressed through policital and legal channels and both influence the management of wolves in Alaska. Opposition to wolf control programs is widespread, especially on the national level, and it promises to remain a serious obstacle to wolf control programs, especially those involving aerial hunting, no matter how well the action is justified in terms of the future welfare of both ungulate and wolf populations. The role of wolves as predators and their effect on ungulate populations must be accurately conveyed to the public. Recent studies have shown many earlier assumptions regarding beneficial or inconsequential effects of wolf predation to be simplistic or limited in application. Responsible management of wolves must consider the complex interrelationships of predator and prey, the welfare of each, and the beneficial uses of both that can be derived by man.

* Illegal aerial hunting of wolves in Western Alaska continues to be a problem. Lack of escape cover for wolves and the high value of wolf pelts are incentives to illegal activity. In addition, the remote nature of the area makes enforcement of protective regulations difficult. Increased enforcement efforts and more severe penalties for the illegal use of aircraft in hunting could alleviate some of the problem.

1. ALASKA WOLF MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of wolves.

SECONDARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting and trapping wolves.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain wolf trapping seasons and bag limits consistent with suitable wolf population levels during periods of pelt primeness.

2. Maintain wolf hunting seasons not necessarily limited to the period of pelt primeness, with restrictive bag limits.

3. Promote efficient and humane trapping methods.

4. Maintain wolf:ungulate ratios that will allow for ungulate reproduction adequate to sustain ungulate populations, wolf populations and human utilization of each.

5. Promote public understanding of the interrelationships of wolves with other wildlife species in the northern environment.

6. Encourage public viewing, listening, and photography of wolves in a wilderness setting.

7. Increase public awareness of wolf behavior to reduce adverse wolf-human interactions.

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.

PROBLEMS

* A substantial portion of wolf range in Alaska has been selected by local residents under terms of the Alaska Native Claims Settlement Act. Once title to public lands is conveyed to private ownership, public use on such lands may be restricted or prohibited. The Department should solicit the cooperation of private landowners to facilitate progressive management of wolves. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

* Substantial land areas will be placed in parks, monuments, wild and scenic rivers, and wildlife refuges, all under federal jurisdiction, under terms of the Alaska Native Claims Settlement Act. Extensive portions of these federally-administered areas may be closed to hunting and trapping or such use may be limited by access restrictions. The Department should seek cooperation from the appropriate federal agencies to allow hunting and trapping to continue within these areas.

* Adverse wolf-human interactions have occurred more frequently in recent years, particularly at pipeline construction camps and along the Trans-Alaska Pipeline Haul Road. Several people have been bitten by wolves that have grown accustomed to humans. Most of these animals have subsequently been destroyed, primarily to test for rabies. In most instances, private company regulations specifically prohibit feeding wild animals and these regulations should be strictly enforced. The Department may consider additional regulations to discourage adverse interactions.

* Wolf prey populations over much of the state are declining or are currently at low levels. Predation by wolves may conflict with human use of prey species in some areas. Wolf hunting and trapping should continue with liberal seasons and bag limits. If it is established that predation is causing declines or maintaining low densities of prey species, the Department may consider more liberal methods and means of harvesting wolves. Should public hunting efforts prove incapable of lowering the wolf population to relieve predation pressure on prey species, the Department should consider direct control by Department employees for a limited specified period and to meet specific objectives.

* The reduction of wolf numbers to encourage an increase in the number of ungulates is not easily accomplished given the controversial nature of wolves and the practical problems associated with achieving significant reductions in wolf populations. All wolf control efforts by the Department should be justified on the basis of substantial data and only after it has been shown public hunting and trapping harvests will not achieve the stated management goals. The role of wolves as predators and their effect on prey populations must be accurately conveyed to the public. Recent studies have shown many earlier assumptions regarding the beneficial or inconsequential impacts of wolf predation to be simplistic or limited in application. The Department must convey to the public all aspects of wolf biology in an objective manner; the public must understand that responsible wolf management will consider the complex relationships between predator and prey, the welfare of each and the beneficial uses of all resources that can be derived by humans.

* Domestic livestock may be established or reintroduced by private landowners in areas that currently support wolves. Demands for predator control will be forthcoming from the domestic livestock industry. Hunting and trapping harvest should be the primary means of suppressing problem wolves, and control actions, if necessary, will be directed at specific animals. The cost and responsibility of such control will be the responsibility of the industry and only as authorized under conditions of the state-issued permit. The Department should indicate to persons contemplating introduction of domestic livestock that some level of wolf predation must be accepted as a normal operating risk.

* Wolves in parts of Interior and Arctic Alaska are subject to illegal aerial hunting, and a proportion of people inhabiting rural areas are not complying with sealing regulations. Such activities make it difficult to accurately assess annual harvests and population parameters. An increased enforcement effort by the Division of Fish and Wildlife Protection and a more active enforcement role by the Department of Fish and Game, coupled with more severe penalties for offenders, could alleviate some of the problems.

* Recurring wildfires are generally beneficial to browse plants important to wolf prey species. Fire suppression and prevention efforts by state and federal agencies have improved to the point that habitat quality and quantity for moose are declining in some areas. The Department should identify critical habitat areas and make recommedations to the appropriate agencies regarding the possible beneficial aspects of fires in specified regions.

* Extensive logging activities in Southeastern Alaska may result in a decline in deer and mountain goat populations with a subsequent decline in wolves. The Department should make recommendations and seek agreements with appropriate management agencies to minimize adverse logging impacts on wildlife.

IMPACTS

* Wolves will not be eliminated from any region and will continue to be a viable part of Alaska's wildlife.

* The reduction of wolf populations in some areas of Alaska by limited permit aerial hunting by the public or by organized control efforts by the Department will allow a faster recovery of depressed ungulate populations.

* Selective reductions of wolf populations will decrease the opportunity for use of wolves by hunters, trappers and nonconsumptive users in some areas.

* Regulations governing harvest will be manipulated to maintain desired population levels of wolves. In general, liberal hunting and trapping regulations and seasons will continue, although restrictions on sport hunting may be imposed to make wolf hunting compatible with hunting regulations stipulated for other big game species.

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.

PROBLEMS

* Increasing development and more intensive land use will also mean a greater probability of fire. Loss of caribou range due to fire may have serious adverse consequences for affected caribou populations. Important caribou ranges must be identified and prevention and suppression of fires must be given high priority in management of those lands.

* A revival of interest in maintaining domestic reindeer herds in Southwestern Alaska has the potential for serious conflicts with caribou in the region. The sedentary nature of reindeer can result in severe overutilization of ranges, reducing the carrying capacity of the area for both reindeer and caribou. In addition, unless closely herded, reindeer herds suffer attrition of animals which

run off with passing caribou, necessitating construction of fences or elimination of caribou to maintain the reindeer herds intact. Finally, feral reindeer which join caribou populations may serve as vectors of disease and when incorporated into caribou populations may introduce undesirable genetic characteristics into the wild caribou stocks. Experience of large-scale and largely unsuccessful reindeer herding attempts along much of northwestern, western and southwestern Alaska during the early to mid-1900's suggests that reindeer herding should be limited to areas where caribou and reindeer will not come into contact and where caribou will not need to forage in the forseeable future.

* Predation is at times detrimental to the welfare of caribou populations when caribou populations are small and predator populations are large or where human utilization of caribou populations requires restriction of take to annual surpluses or less, thereby bringing use by humans into competition with use by predators. To the extent that competing uses are not compensatory, predator populations must be managed in addition to human utilization to insure the maintenance and enhancement of caribou populations.

4. LOWER YUKON-KUSKOKWIM CARIBOU MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide for an optimum harvest of caribou.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain existing caribou populations and allow for their increase.

2. Regulate hunting seasons, bag limits and methods and means of taking caribou, if necessary, to provide for local use.

3. Encourage fire suppression on caribou calving grounds and selected wintering areas.

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.

PROBLEMS

* Wildfire is a chronic threat to caribou habitat. Most of the Kuskokwim Mountains are within a high risk fire zone since the area is subjected to frequent electrical storms during the dry summer months. Suppression of fires in this region is important to maintaining caribou winter range.

* Production and survival of calves has been low despite recent mild winters. Causes have not been identified. The Department should investigate the causes of low recruitment of Kuskokwim caribou and should apply remedial measures if possible.

IMPACTS

* Caribou populations will increase if factors currently depressing recruitment are identified and ameliorated.

* Control of access methods is not anticipated in the near future.

* Suppression of fires for the benefit of caribou may have adverse impact on moose populations in some areas.

11. FAREWELL CARIBOU MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide an opportunity to hunt caribou under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to maintain aesthetic hunting conditions and to maintain desired harvest levels.

2. Develop hunter access, if necessary, to distribute hunting pressure through the area.

3. Maintain or increase existing caribou populations.

4. Encourage fire suppression on caribou calving grounds and selected wintering areas.

5. Discourage land use practices that adversely affect the wild character of the area.

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.

PROBLEMS

* Portions of the area may be included in the National Park System under proposals submitted to Congress by the Department of Interior. Under Park Service administration prohibition of hunting on and

limitations of access across National Park Lands may significantly affect hunter use of the Farewell area. The Department should seek management agreements with the National Park Service which will minimize loss of hunting opportunity on park lands and adjacent lands.

* Illegal harvest of caribou by hunters using ski-equipped aircraft in the winter and spring amounts to a large portion of the total kill. Strict enforcement of the restriction to hunting the same day airborne is necessary and if increased enforcement efforts are impractical, then the problem could be alleviated by opening the season only during the snowfree fall months.

* A proposed road connecting Anchorage to McGrath through Rainy Pass and the South Fork of the Kuskokwim would result in increaseed hunting pressure for all game species in the area. If the road is constructed, additional restrictions on caribou hunters will become necessary, including limitations on access and methods of transport.

IMPACTS

* Regulation of hunter density on certain portions of the proposed management area will limit the number of hunters.

* Bag limits will probably be reduced in the near future due to increased hunting pressure and the small size of the herd involved.

* Development of additional aircraft landing strips will reduce congestion of hunters at existing limited points of access.

12. MULCHATNA CARIBOU MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting caribou.

SECONDARY MANAGEMENT GOAL

To provide for an optimum harvest of caribou.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control hunter distribution and methods of hunter transport, if necessary, to distribute hunting pressure through the area and to maintain desired harvest levels.

2. Regulate hunting seasons, bag limits and methods and means of taking caribou, if necessary, to provide for local use.

3. Maintain a minimum post-hunting season population sex ratio of 25 bulls per 100 cows.

4. Encourage fire suppression on caribou calving and wintering areas.

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.

PROBLEMS

* Development of hard mineral or oil resources within the range of the Mulchatna herd may prove detrimental to habitat or block traditional migration routes. The size of the population which would be compatible with remaining habitat could be lowered. The numbers of caribou then available for use by various segments of the public would be reduced. The Department should discourage development in all areas of critical habitat; large development elsewhere should be modified to minimize adverse effects on caribou.

* Harvest pressure can be expected to increase and may reach a level detrimental to the population. Restrictive big game seasons and bag limits in other areas of the state will encourage increased sport hunting of this herd. Continued human population growth, particularly if a large influx of persons enter the area as a result of mineral development, will also place a larger demand on the resource. The Department will then recommend that seasons, bag limits, and methods of hunting be altered to maintain the desired level and allotment of the harvest. The optimum population size for the Mulchatna herd should be identified and necessary adjustments in regulations should be made to achieve the desired level. A relatively stable population should be maintained with the reproductive capacity to provide for a liberal harvest.

* Continued growth of this population may eventually exceed the carrying capacity of the range. Emigration to other areas or

actual loss of animals to disease or starvation may occur. The Department will recommend that seasons, bag limits, and methods and means be regulated to produce a harvest level that will maintain the herd in balance with its habitat.

* A proposal to establish reindeer grazing in portions of this area might remove critical habitat from use by the Mulchatna caribou herd depending on where the reindeer were grazed. Free-ranging caribou may attract reindeer, causing losses to the reindeer herd. Such action would also cause dilution of the caribou gene pool. Past incompatibility of caribou with reindeer grazing has been documented in other areas of the state. Depending upon the areas utilized by the reindeer industry, the carrying capacity of the Mulchatna herd may be reduced and lower population size result. In addition, hunting of caribou in areas of reindeer grazing may be prevented, resulting in lower harvest and/or congestion of hunters in remaining areas. Efforts should be made to prevent reindeer grazing from being established in areas critical to the well-being of the caribou herd. Reindeer would also have to be carefully herded to prevent mixing of domestic stock with caribou. In addition, herds should be maintained at a level that will not result in deterioration of range. The Department should recommend that the reindeer be marked in a manner as to differientiate them from caribou. To implement these conditions, good liason and cooperation will have to be maintained with the reindeer industry.

* The transfer of lands to private ownership as a result of the Native Claims Settlement Act may seriously affect access or reduce the areas available for the public to hunt. As a result, hunting may be concentrated on remaining public lands. Concentration of hunters may result in local overharvest of some segments of the herd. The Department should solicit the cooperation of private landowners to facilitate progressive management of caribou. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act. Appropriate restrictions on harvests will be implemented to prevent overharvests.

* The recreational harvest may reach a level that is incompatible with the needs of local residents to take caribou for domestic use. The Department will recommend that limits, or methods and means of hunting be altered to give local residents the most favorable opportunity to compete for the resource. Such regulations would be maintained so long as the demand for local use remains justified and the harvest level is not detrimental to the resource. However, demands for exclusive local use of the resource will not be met.

IMPACTS

* No deterioration of the range is expected if herd size can be regulated.

* Both domestic and recreational use of the resource will continue.

* Uncontrolled reindeer grazing will be discouraged in areas that would prove incompatible with caribou.

* Operational costs of resource development may be increased by stipulations imposed to protect caribou.

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.

PROBLEMS

* Suitable year-round bison range is extremely limited in Western Alaska. Bison numbers must be managed to maintain the herd in balance with the long term productivity of winter habitat.

2. FAREWELL BISON MANAGEMENT PLAN

LOCATION

In Game Management Unit 19, drainages of the South Fork of the Kuskokwim River.

MANAGEMENT GOAL

To provide an opportunity to hunt bison under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a post-hunting season population of 80 bison.

2. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to maintain aesthetic hunting conditions.

3. Encourage hunter harvest of lone bulls.

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.

PROBLEMS

* Fire suppression activities by land managing agencies reduce the frequency and extent of wildfires which are beneficial to bison range. Wildfire regenerates grass and forb vegetation important as bison forage. Fires in selected areas of the Farewell bison range should be allowed to burn. If necessary, controlled burns should be used to improve the range.

* Development of extensive mining claims in the area may create a greater need for an access road from Anchorage to McGrath through Rainy Pass or Ptarmigan Pass. Such an access road would cut through the South Fork bison range. The Department must work closely with other state agencies and with private developers to ensure minimum damage is done to bison habitat.

IMPACTS

* Herd productivity and survival rates should remain at high levels.

* The number of hunters and conditions of the hunt will continue to be controlled by permit.

* No deleterious effects on other species are expected through the controlled management of bison on this range.

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.

PROBLEMS

* Expanding human land use may adversely affect sheep through the alteration of important habitat or through disturbance of sheep use of critical areas. Mineral licks, winter ranges, lambing areas, and migration routes are particularly susceptible to damage or interference from such activities as mining, construction in transportation and utility corridors, and development of alpine recreation sites. Critical habitats must be protected from alteration or undue disturbance.

* Increases in numbers of hunters, development of access, and improved transport methods have reduced availability of legal rams, even in once-remote and lightly hunted areas. In most areas the average size of rams available to hunters has decreased. In addition to reduced hunter success, increased hunting pressure has lowered the quality of the hunting experience. Management measures to regulate hunter density and distribution, and to increase the number of legal rams available to hunters should receive greater emphasis.

* Limitation of use to rams of 3/4 curl or larger has had little significant effect on population size or trend, even in herds in other regions of Alaska where most legal rams are removed by hunters. Thus, ram harvests are of little utility to management where population control or productive manipulation is desirable. The effect of 3/4 curl management has been to create an imbalance in sheep sex ratios in many herds. Since sheep populations may be near the carrying capacity of the range and may be declining in some areas, the imbalance in sex ratios coupled with heavy hunting pressure results in less rams being available to hunters. Additionally, since relative densities of sheep populations are probably high, the production and survival of lambs is probably low as it is elsewhere in Alaska under similar conditions. Low lamb survival results in relatively few legal rams being recruited into the population. Management of harvests providing the option for either sex hunting would benefit use significantly as well as benefit the resource. Harvests of either sex would allow more animals to be taken. Reduction in population density would improve lamb production and survival, as well as possibly decreasing potential adverse impacts of severe winter weather on the total population. Increased production and survival of lambs would offset larger harvests and would increase the recruitment of rams to the population.

12. FAREWELL SHEEP MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide an opportunity to hunt sheep under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to maintain aesthetic hunting conditions.

2. Develop hunter access, if necessary, to distribute hunting pressure through the area.

3. Discourage land use practices that adversely affect the wild character of the area.

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.

PROBLEMS

* Much of the Farewell area is highly mineralized and will be subject to increased prospecting and mining activities in the near future. The Sheep Creek area, an important sheep lambing and wintering area, has been heavily staked with discoveries of extensive ore bodies. In addition to disturbance of sheep in critical habitats, mining activity may increase access into the Farewell area, and will result in a deterioration of the wild character of the area. Important sheep habitat within the Farewell area should be identified and mining activities should be regulated to minimize disturbance to sheep. Restrictions on developmental activities may be necessary to minimize environmental degradation.

* Hunting pressure has been concentrated near relatively few unimproved bush airstrips. Availability of rams in proximity to access points is reduced and crowding of hunters detracts from aesthetic enjoyment of hunters. The Department may develop additional access strips to reduce hunter crowding and to distribute the harvest through the area.

* Development of a proposed road from Anchorage to McGrath through Rainy Pass and down the South Fork of the Kuskokwim River would open the area to increased hunting pressure and use of all-terrain vehicles. The number of hunters in heavily hunted portions of the area will be controlled by permit. Off-road vehicle restrictions would be necessary in areas accessible by road.

* Portions of the upper Tonzona River drainages have been recommended for inclusion in the proposed Mt. McKinley National Park extension. The Tonzona drainage is an important lambing area in addition to supporting a significant population of sheep, and its inclusion into a national park will substantially reduce hunting opportunity in the Farewell area.

IMPACTS

* Permits will be used to control hunter density.

* Productivity and survival of lambs should improve as range conditions improve.

* Restrictions in some drainages on mechanized transport while hunting will improve aesthetic hunting conditions.

* Guides and outfitters may be affected by restrictions on numbers of hunters and controls on hunter transport.

* Development of more aircraft access strips should help relieve the present problem of hunter concentration around a few localized areas.

* Some seasonal or spatial limitations on mining activity in important sheep habitat may be recommended.

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.

Problems

* Resource exploration and development and growth of human populations will continue to restrict moose habitat. Efforts must be made to protect critical habitat and assure free access by moose to these habitats. Further, the ecological value of wild fire must be more widely accepted, and fires in suitable areas which may result in new moose range should not be suppressed.

* Opposition to female moose hunting has existed in Alaska for several years. Antlerless moose hunts by permit or during a special season have been conducted with varying degrees of acceptance and criticism. Unfortunately, recent declines in moose populations strengthened opposition to antlerless hunts and culminated in passage of a bill preventing antlerless hunts unless otherwise authorized by the local advisory committee. Antlerless hunting is, however, a useful management tool, and efforts must be continued to explain the benefits of retaining this management option.

11. YUKON-KUSKOKWIM MOOSE MANAGEMENT PLAN

LOCATION

Game Management Units 18, 19 and 21 except for the Farewell Moose Management Plan area.

MANAGEMENT GOAL

To provide for an optimum harvest of moose.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a moose hunting season and bag limit consistent with moose population levels.
2. Adjust bull:cow ratios to provide for maximum productivity of the moose population.
3. Regulate hunting seasons, bag limits and methods and means of taking moose, if necessary, to provide for local use.
4. Control methods of hunter transport, if necessary, to prevent overutilization of local moose populations.
5. Harvest antlerless moose, if necessary, to attain the desired moose population size and structure.
6. Discourage fire suppression on potential moose habitat.
7. Increase carrying capacity of selected areas for moose through habitat improvement.

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.

PROBLEMS

* Wildfire is the single most important factor renewing moose habitat in the area. Continued fire suppression on moose range will result in a decrease of the available browse through the maturation and decadence of moose browse species and the successional invasion of nonbrowse plants. All resource values should be considered in determining the desirability of control of wildfires. In areas where benefits of rehabilitated moose habitat compare favorably with other land management objectives, fires should not be suppressed. Additional use of fire in the form of controlled burns may become an important mangement tool for range rehabilitation.

* Hunter access within the Yukon-Kuskokwim area will be affected by Native land claims selections, federal refuge proposals and National Forest proposals. Public hunting on native lands will be possible only with the permission of the landowners. Management policies and practices of federal agencies administering lands within the area may limit the degree and character of use by the public. The Department should solicit the cooperation of private landowners to facilitate progressive management of moose. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

* Violations of current moose hunting regulations are common. Most noncompliance is by local residents, but non-area residents are also responsible. Hunting moose the same day the hunter is airborne and killing moose for hunters not present in the field are probably the most common infractions. Increased enforcement effort is necessary to reduce illegal activities.

* Conflicts between local hunters and non-area residents will increase as increased restrictions reduce hunting opportunity in other areas. Exclusion of public hunting on private lands may result and increased restrictions on areas remaining open to public hunting may be necessary. If possible, regulation of hunting should proceed in a manner that will minimize exclusion of public access while providing for the needs of local residents.

IMPACTS

* Hunters can expect more liberal seasons and bag limits consistent with the capability of local moose populations to sustain increased harvests.

* Permit hunts for antlerless moose on an area quota system will become more common.

* Regulations will be designed to better fit local domestic needs. Hunters from adjacent areas may be disadvantaged by season length and timing, and methods of transport restrictions.

* Trophy animals may not be available at all times, since management of harvests to increase productivity will reduce the average age of moose in the population.

* Habitat conditions should be improved with use of controlled burns and other techniques. Rehabilitation of moose habitat may result in some loss of caribou habitat.

12. FAREWELL MOOSE MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to take large-antlered moose.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to hunt moose under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a post-hunting season population sex ratio of 35-40 bulls per 100 cows.

2. Harvest antlerless moose, if necessary, to attain the desired moose population size and structure.

3. Control access, number and distribution of hunters and methods of hunter transport, if necessary, to maintain desired harvest levels and to maintain aesthetic hunting conditions.

4. Develop hunter access, if necessary, to distribute hunting pressure through the area.

5. Discourage fire suppression on potential moose habitat.

6. Increase carrying capacity of selected areas for moose through habitat improvement.

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.

PROBLEMS

* A proposed road connecting Anchorage to McGrath through Rainy Pass and down the South Fork of the Kuskokwim would result in a large increase in hunting pressure for all species in the area. If the road is constructed additional restrictions on moose hunters will become necessary including access and methods of transport limitations.

* Portions of the area may be included in the National Park System under proposals submitted to Congress by the Department of Interior. Under Park Service administration prohibition of hunting on and limitations of access across National Park Lands may significantly affect hunter use of the Farewell area. The Department should seek management agreements with the National Park Service for park lands and adjacent lands which will minimize loss of hunting opportunity.

IMPACTS

* Manipulation of the moose population sex and age structure will result in a greater proportion of large bulls in the population.

* Permit hunts for bulls will be necessary in heavily hunted portions of the area.

* Guides and outfitters may realize an increased demand for services.

* Additional aircraft landing strips may be developed, improving distribution of hunters.

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.

PROBLEMS

* Muskox in western Alaska are currently confined to islands where natural predators are absent and winter habitat is limited to coastal dune and bluff areas where winds keep the vegetation relatively snow-free. Under these conditions the populations must be intensively managed to maintain the herds in balance with the available habitat. Since the number of animals that can be

transplanted to other areas is limited by the amount of good muskox habitat elsewhere and by the extremely high cost of transplanting, other forms of removal must be considered including hunting for both sexes, capture for scientific and educational purposes, and if necessary, controlled slaughter.

* Hunting is an effective tool for the management of muskox populations, providing for substantial beneficial public use and economic benefits to local communities. However, hunting of muskoxen may be opposed by various anti-hunting groups on the basis of the relative scarcity of the species in Alaska and on the alleged lack of sporting quality to the hunt. It is important that the values of hunting be demonstrated and that a recurrence of unnecessary losses and wastage of muskoxen resulting from political opposition to hunting of Nunivak muskoxen during 1968-1974 be avoided.

3. NELSON ISLAND MUSKOX MANAGEMENT PLAN

LOCATION

In Game Management Unit 18, Nelson Island.

MANAGEMENT GOAL

To provide an opportunity to hunt muskoxen under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a maximum population of 75 adult muskoxen until definitive range studies show that more can be supported by the range.
2. Maintain the population sex ratio at 40 bulls per 100 cows.
3. Harvest the annual increment by hunting.
4. Control access, number and distribution of hunters and methods of hunter transport to maintain aesthetic hunting conditions.

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.

PROBLEMS

* Most of Nelson Island will be owned by Natives under provisions of the Alaska Native Claims Settlement Act and the public may be denied access for hunting. In addition, land use activities by private landowners may affect aesthetic considerations promoted by this plan. Demands for local exclusive domestic use of the muskox population will further complicate allocation of use of this public resource. Close cooperation and development of mutually acceptable

management objectives will be necessary to assure maximum benefits to public and private interests alike.

* High trophy fees for muskoxen would discourage participation by local residents. Removal of trophy fees for cow muskoxen would allow for greater participation by local residents in hunts involving either-sex animals.

IMPACTS

* Population size will be maintained by removal of annual increments through controlled permit hunts.

* Productivity of the population will remain high.

* Winter range quality will remain high.

* Harvest of bulls will reduce the availability of trophy animals.

* Hunters will be restricted to use of boats or snowmachines for transport.

* Nonconsumptive users can expect few if any restrictions concerning viewing or photography except during calving. Heavy utilization of this herd by nonconsumptive users is not expected, but excessive use may require permitting.

* Local residents will receive economic benefits associated with providing facilities and services for hunters.

4. NUNIVAK MUSKOX MANAGEMENT PLAN

LOCATION

In Game Management Unit 18, Nunivak Island.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to hunt muskoxen under aesthetically pleasing conditions.

SECONDARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of muskoxen.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a maximum population of 400 adult muskoxen with a sex ratio of 40 bulls per 100 cows.

2. Harvest a portion of the annual increment by hunting.

3. Control access, number and distribution of hunters and methods of hunter transport to maintain aesthetic hunting conditions.

4. Encourage scientific studies of muskoxen and make specimens available to qualified public educational institutions.

5. Utilize appropriate segments of the annual increment for transplanting to areas of muskox habitat in northern and western Alaska.

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.

PROBLEMS

* Public and political opposition to muskox hunting prevented herd reductions in the late 1960's when an excessive muskox population was overutilizing its range, and losses to malnutrition were significant. Although recreational hunting was allowed in 1975 and 1976, there may be segments of the public that oppose muskox hunting on the basis of the relative rarity of the species in the state and the alleged lack of sporting qulity in the hunt, and the possibility exists that hunting may be prohibited in the future. The Department should publicize the benefits of recreational hunting as part of a management approach that integrates a variety of uses of muskoxen while maintaining the population in balance with its habitat.

IMPACTS

* The muskox population will be reduced to range carrying capacity. Annual increments will be harvested with stabilization of the herd.

* The proportion of old bulls in the population will be reduced.

* Hunts will continue to be on a permit basis with varying degrees of local, non-local, and nonresident participation.

* Guides and local outfitters will realize substantial economic benefit from provisioning and guiding hunters. Direct and indirect revenue derived from muskox hunts will benefit local economies. Continued hunting should also encourage the improvement of local facilities and services.

* Opportunity for the non-hunter to view, photograph and study the muskox should not be hampered.

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 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

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

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.

PROBLEMS

* Pressure to ban leg-hold traps has come about as a result of public awareness of the inhumane potential of these devices when improperly set and infrequently checked. Prohibitive legislation may result in the loss of important commercial and recreational utilization of the furbearer resource. The Department should promote efficient and humane trapping methods to ensure the opportunity to participate in trapping.

* Beavers chronically cause problems by blocking road culverts with dams or by flooding or cutting down trees on private property. Blockage of some streams by beaver dams also presents barriers to migrating fish which may affect their survival or reduce salmon escapements. The Department should encourage trapping of beavers in areas where damage to public and private property is chronic, and where streams important to spawning salmon or other species of fish are blocked. The Department should also encourage appropriate design and construction considerations in public and private road building projects.

* Underharvested furbearer populations are a significant economic loss to the area. Efforts to properly utilize all furbearers populations could provide substantial economic benefits.

* The proliferation of reindeer grazing may stimulate the demand for fox control. The influence of foxes on reindeer fawn survival should be evaluated to establish criteria for control efforts.

* Development activities may occur at a rapid rate in Western Alaska. It is impossible to predict long term trends in furbearer populations or their utilization by humans. Development activities should be monitored to prevent unnecessary destruction or loss of furbearer habitat.

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*

LIST OF FURBEARERS IN WESTERN ALASKA

	Common Name	Scientific Name
	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*

1. GREATER ALASKA FURBEARER MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of furbearers.

SECONDARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting and trapping furbearers.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Promote efficient and humane trapping methods.
2. Maintain trapping seasons and bag limits during periods of pelt primeness, consistent with population levels.
3. Maintain hunting seasons on selected furbearer species, with seasons not necessarily limited to the period of pelt primeness and with restrictive bag limits.
4. Maintain restrictive trapping seasons and bag limits on beaver based upon current beaver population levels.
5. Encourage proper preparation and handling of furbearer pelts to maximize fur values.
6. Close areas well suited for viewing and photography of furbearers to hunting and trapping or otherwise restrict use, if necessary.
7. Discourage land use practices that adversely affect furbearer habitat.

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.

PROBLEMS

* Pressure to ban leg-hold traps has come about as a result of public awareness of the inhuman potential of these devices when improperly set and infrequently checked. Prohibitive legislation may result in the loss of important commercial and recreational utilization of the furbearer resource. The Department should promote efficient and humane trapping methods to ensure the opportunity to participate in trapping.

* Loss of habitat is potentially a serious problem for furbearers. Presently the most significant loss is that occurring through successional changes in vegetation resulting from fire suppression activities. Normally wild fires benefit furbearers by creating favorable habitat for prey species such as snowshoe hare and microtine rodents. Establishment of hardwood species along waterways after coniferous vegetation is burned is also a significant benefit to beavers. The control of wildfire should be discouraged except when resources with a superior value will be destroyed by the wildfire or where domiciles or property damage are the major consideration. Close liaison should be maintained with the various fire control agencies to assure that public energies are not expended unnecessarily in the control of wildfire.

  Oil pollution has not affected habitat on a significant scale but it has the potential of serious and extensive damage to aquatic, riparian, and marine coastal furbearer habitats. Outer Continental Shelf oil extraction and transport will almost certainly result in some detrimental pollution of coastline habitats, and accidental onshore spills will impact riparian habitats. Stringent precautions must be observed in oil development activities to minimize adverse impacts. Oil spill containment and cleanup capabilities must be improved.

  Other resource and human development activities also result in loss of furbearer habitat. Large scale water impoundments and clearcut logging affect large areas and important habitats for some species. Placer mining and dredging, gravel removal, urbanization and construction of transportation and utility corridors all have localized impacts which when taken together add up to significant long-term habitat alteration. Important furbearer habitats should be identified in conjunction with proposed developmental activities so that possible may be considered which minimize detrimental effects to furbearers.

* The generally underharvested fur populations in the northern portion of Alaska are a significant economic loss to the state. Many furbearer populations are capable of much larger harvests than they are now sustaining. Some species of furbearers are not harvested because there is no traditional use of a particular species. The formation of marketing associations would tend to provide a higher and more stable market for all furs and offset the unstable marketing conditions which now result in substantial economic loss. Development of an extension training program directed to the proper care and handling of pelts would also tend to increase the value of the harvest and increase utilization of furbearer populations. The Department probably would not initiate fur marketing associations or furbearer extension programs, but would cooperate with educational and other agencies to enhance the value of furbearers.

* Overharvesting of the furbearer resource occurs primarily on beaver and wolverine. There is a potential for overharvest of other species (possibly otter, mink and marten), but the high market conditions which would stimulate an overharvest are not likely to occur. Beaver are easily overharvested because they establish fixed colonies which are accessible and susceptible to repeated

trapping. Overtrapping of beaver is a recurring problem in some areas, particularly the lower Yukon-Kuskokwim River drainages and the northern Bristol Bay drainages. Wolverine are particularly vulnerable in the Northwestern and Arctic regions in the winter when they are easily tracked and pursued on snowmachines. High pelt prices and a strong domestic demand provide incentive for heavy trapping and hunting pressure on wolverine. Restrictive regulations where required to protect the resource should be implemented. Season closures in some areas may be the only viable solution to the overharvest of wolverine. Successful implementation of harvest restrictions will depend on the cooperation of resource users and on increased enforcement of regulations.

* Significant loss of public trapping opportunity may occur from the exclusion or prohibition of public trapping on extensive land areas conveyed to private ownership or federal limited use status under terms of the Alaska Native Claims Settlement Act. The Department should advocate strong consideration of continued consumptive use of furbearers on all categories of federal lands and should solicit the cooperation of private landowners to facilitate progressive management of furbearers. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

* As land available for public trapping diminishes, competition for available areas will increase, resulting in increased conflicts between trappers as well as heavy pressure on furbearer resources. Some restrictions on harvest may be necessary to protect the resource. Some trapper conflicts may be alleviated through better communication and agreements among trappers, and through trapper education efforts. Theft of traps and trapped animals may be curbed to some extent by enforcement activities, but trappers themselves must aid in the policing of their own activities.

* High market values for several species of furbearers will stimulate increased trapping effort. Existing information on distribution, population trends and habitat requirements for many furbearers is inadequate for management at higher intensities of trapping pressure or for assessment of the consequences of habitat alteration. The Department should seek adequate funding and attempt to develop needed inventory techniques.

* Accidental trapping of dogs near populated areas results in posting of private land against trespass and increases public anti-trapping sentiment. Increased awareness of the problem by trappers should be encouraged as well as increased community controls on free-roaming dogs.

* Some furbearers, particularly foxes, are known to carry diseases which are harmful or lethal to other wildlife and humans. Rabies is the most common disease which reaches epidemic proportions. *Echinococcus multilocularis* is carried by the foxes on St. Lawrence Island and Trichinosis is also carried by several species of furbearers. Trapping and hunting of both red and white fox should be encouraged in areas which have a potential to produce high fox populations which are prone to rabies outbreaks. Hygenic techniques should be encouraged to prevent the transmission of parasites and diseases from furbearers to humans, particularly in areas where these problems are known to exist. To prevent Trichinosis proper handling and cooking of all furbearer meat to be consumed by humans and domestic animals should be encouraged.

* Beaver chronically cause problems by blocking road culverts with dams and by flooding or cutting down trees on private property. Blockage of streams by beaver dams also prevents movements of

spawning anadromous fish. The Department should encourage public trapping of beaver in areas where damage to public and private property is chronic, and where important salmon spawning streams are blocked. Public utilization of beaver in problem areas is preferable to Departmental control efforts. The Department should also encourage appropriate design and construction considerations in public and private road building projects.

* Red squirrels cause more damage to human property than any other furbearer by destroying insulation, damaging human food caches and general destruction of many different items such as mattresses, sleeping bags, etc. Information on controlling squirrel damage should be consolidated into a publication which would be made available to anyone needing assistance.

IMPACTS

* Furbearer population levels will continue to fluctuate, primarily in response to prey availability and quality of habitat.

* Abundant trapping opportunities for local residents will continue to be available. Some trapper congestion and competition may occur in easily accessible areas.

* Increased harvests of available furbearer populations, improved handling, and improved marketing in the Interior and northern areas of the state could increase the economic value of the fur harvest 50 percent above the present economic value, or about $500,000.

* It may be necessary to close the beaver trapping season entirely in areas of overharvest or effectively enforce a very restricted season. This would eliminate or reduce the present harvest level by 50 percent depending upon the degree of restriction imposed. Within three to five years the harvest could be increased, compensating for the loss of harvest in years of severe restriction or total closure.

* A total closure on wolverine may be initiated in large areas of Northwestern and Arctic Alaska until populations increase to the point where they can sustain larger harvests. Future harvests would be conducted under conditions which are more rigidly controlled than at present.

* Sealing requirements for beaver and wolverine will continue and harvest reports or sealing requirements for additional species will probably be implemented.

* Loss of trapping opportunity in areas established exclusively for nonconsumptive use will be insignificant.

* Dissemination of information to prevent beaver and squirrel damage could result in a considerable savings to the public.

* Beaver populations in urban areas will be reduced below the carrying capacity of the habitat to prevent property damage.

* Knowledge of furbearer population status, habitat requirements, and utilization will increase.

* Coordination of development activity with various conservation agencies would minimize the adverse impacts of development on furbearer habitat.

* No loss of nonconsumptive use opportunity will occur, nor will proposed management adversely affect existing habitat, other species in the area or other recreational uses of the land.

SMALL GAME IN WESTERN ALASKA

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. arctious*) 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.

PROBLEMS

* Very little is known regarding hunting effort and harvests of small game in the Western Region. Tundra hare populations are much more limited than snowshoe hare populations and may be subject to overharvests. Information on tundra hares and other small game species is needed to evaluate the effects of hunting pressure on these animals and to regulate such pressure if necessary.

1. ALASKA SMALL GAME MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting small game.

SECONDARY MANAGEMENT GOALS

To provide for an optimum harvest of small game.

To provide an opportunity to view, photograph and enjoy small game.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Achieve greater utilization of the small game resource by encouraging wider distribution of hunting pressure and identifying species that are lightly utilized.

2. Encourage public viewing and photography of small game.

3. Regulate or eliminate hunting seasons to minimize disturbance in areas especially suited for viewing or photographing small game.

4. Discourage land use practices that adversely affect small game habitat.

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.

PROBLEMS

* Much of the small game habitat bordering the state's highway system has been selected by Alaskan natives under terms of the Alaska Natives Claims Settlement Act. Once title to public lands is conveyed to private ownership, public use of such lands may be prohibited. The Department should solicit the cooperation of private landowners to facilitate progressive management of small game. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act. The Department should also maintain close liaison with native corporations and make recommendations on land use practices which benefit wildlife.

* The proposed inclusion of land, about 80 million acres, into Federally-administered parks, wildlife refuges, wild and scenic rivers, and national forests under the terms of the Alaska Native Claims Settlement Act will affect public use and state management of small game in

these areas. Hunting may be prohibited, limited or otherwise these areas. Hunting may be prohibited, limited or otherwise affected. If these areas are established by Congress, the Department should solicit cooperation of the respective land management agencies to allow public use of the lands for hunting. Seasons and bag limits and methods and means of hunting may require adjustment to conform with federal regulations.

* Alteration or loss of small game habitat due to logging, expansion of residential areas, industrial and mineral development and fire suppression will affect numbers of small game in some accessible areas that receive heavy hunter use. The Department should identify important small game habitat and make recommendations on land use practices. The Department will also propose and encourage habitat improvement by the various land management agencies.

* Many areas of the state receive little or no use due to problems of access. The Department may consider encouraging wider distribution of use by providing information to the public regarding small game populations that are not being utilized. In some cases, the Department may recommend providing additional routes of access.

* Due to manpower and funding restrictions, data on population status and harvest levels of small game are not gathered. In some cases, no methodology exists for the routine censusing of small game. The Department should seek adequate funding to develop needed inventory techniques.

* Hunting adjacent to roads and near urban centers may pose public safety hazards, and local opposition to hunting may develop and result in restrictions such as closed areas. The Department should anticipate such conflicts and, where appropriate, limit hunting by time and space zoning. The Department will generally oppose efforts to effect closures except where a clear need exists.

* As small game hunting near urban centers increases, conflicts with nonconsumptive users will occur in a few accessible locations where small game are traditionally observed. Intensive local harvests of ptarmigan in the spring can reduce the summer population of birds available for observation. Three areas of potential conflicts are the Eagle and Twelvemile summits on the Steese Highway north of Fairbanks, the Mt. Fairplay area on the Taylor Highway, and the Donelly Dome - Paxson area along the Richardson Highway. Restrictions on hunting in these areas may be necessary, especially in the spring, if hunting significantly reduces the birds available for nonconsumptive use during the summer.

* Although small game populations generally increase or decrease independently of hunting, many people believe that population lows are caused by overharvest. The Department should inaugurate an active educational program on small game population cycles and dynamics.

* Many small game hunters regularly dress and clean the animals they have bagged along highways and leave the offal and skin or feathers on the road right-of-way. Other people often find such practices offensive. The Department should discourage such practices by an active and vigorous educational program or, if appropriate, consider regulations that would prohibit careless and thoughtless disposal of animal remains.

IMPACTS

* Small game populations will continue to fluctuate with or without hunting.

* Some hunter congestion and competition may occur in easily accessible areas.

* Restrictions on hunters may be imposed in areas of high nonconsumptive use of small game.

* Distribution of hunting pressure and harvest may be improved.

* No loss of nonconsumptive use will occur, nor will proposed management adversely affect existing habitat, other species in the area, or other recreational uses of the land.

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.

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.

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

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.

PROBLEMS

* Pollution of coastal and upland areas by oil or oil industry-related contaminants poses a serious threat to waterfowl and waterfowl habitat. Outer Continental Shelf (OCS), near shore and onshore drilling and offshore tanker traffic could result in oil spills which would devastate habitat and bird populations. Baseline quantitative and qualitative data on coastal bird habitats, bird numbers and relationships between birds and habitat are needed before oil impacts occur to provide rational recommendations for future OCS lease areas, recommendations for future oil spill cleanup facilities and to document the effect of contamination for mitigation purposes. Ongoing federally funded state and federal OCS bird studies are designed to identify and quantify the effects of these problems.

* Illegal native domestic utilization of waterfowl on the Y-K Delta appears to be adversely affecting the black brant and Pacific Flyway white-fronted goose populations. Domestic utilization elsewhere in Alaska (and probably Canada) is also contributing to the brant population decline. Although spring use of waterfowl is prohibited under provisions of the Migratory Bird Treaty Act, federal and state enforcement agencies have been lenient, because of traditional Native dependency on this resource. Enforcement of federal and state laws should be concentrated on species requiring protection, and cooperation of local residents should be sought to direct domestic utilization away from species whose stocks are declining. Annual determination of domestic harvest levels is desirable for all waterfowl species and necessary for selected species. Renegotiation of the Treaty with Canada and Mexico to provide for recognition of traditional domestic use of waterfowl, where biologically justified, is a possible solution to the dilemma. However, undesirable aspects of renegotiation and reluctance of Canada to open renegotiations make such action improbable.

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*

I. NORTHERN ALASKA WATERFOWL MANAGEMENT PLAN

LOCATION

Game Management Units 18 and 21-26 except the Paimut Waterfowl Management Plan area.

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting waterfowl.

SECONDARY MANAGEMENT GOAL

To provide for an optimum harvest of waterfowl.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain waterfowl hunting seasons and bag limits that reflect climatic conditions.

2. Regulate, within the constraints of federal regulations, methods and means of taking, season timing and bag limits, if necessary, to provide for local use of waterfowl.

3. Obtain, maintain and improve hunter access to waterfowl hunting areas.

4. Encourage viewing and photography of waterfowl.

5. Discourage human activities that disturb or harass waterfowl during critical nesting or migration periods.

6. Enhance waterfowl habitat in high use areas to increase utilization of habitat by waterfowl, and discourage land use practices that are detrimental to waterfowl habitat.

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.

	Management Guideline No.					
Area	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

PROBLEMS

* Pollution of coastal waters by oil or oil industry-related contaminants poses a serious threat to waterfowl and waterfowl habitat in northern Alaska. Both Outer Continental Shelf and near-shore drilling could result in spills which would devastate waterfowl habitat and bird populations. Baseline quantitative and qualitative data on coastal bird habitats and bird numbers, and relationships between them are needed to provide rational recommendations for O.C.S. lease areas and oil spill cleanup facilities and to document the effect of habitat contamination for mitigation measures. Ongoing federally funded state and federal O.C.S. bird studies will identify and quantify the effects of these problems.

* The removal of gravel from Arctic Coast barrier islands for roads or drilling pads could cause a loss of nesting habitat and a loss of protection for the inshore lagoons if the islands are destroyed. Equipment noise and increased aircraft use in construction or drilling activities may adversely affect nesting and staging of waterfowl. The use of rolligons and similar A.T.V.'s during periods of thaw will alter water run-off patterns and could result in pollution of rivers and lakes. Better quantitative and qualitative data on bird concentration areas, effects of gravel removal from islands, and other effects of human disturbance are needed to provide rational recommendations and stipulations on land use to protect waterfowl resources.

* Native domestic utilization of waterfowl on the Y-K Delta and in Northwestern Alaska appears to be adversely affecting black brant and Pacific Flyway white-fronted goose (Y-K Delta only) populations. Domestic utilization elsewhere in Alaska and probably Canada is also contributing to the brant population decline. Although spring use of waterfowl is prohibited under provisions of the Migratory Bird Treaty Act, federal and state enforcement agencies have been lenient, in recognition of traditional Native dependency on this resource. Enforcement of federal and state laws should be concentrated on species requiring protection. Cooperation of local residents should be sought to direct domestic utilization away from species whose stocks are declining. Domestic harvest figures on an annual basis are desirable for all waterfowl species and necessary for declining species. Renegotiation of the treaty with Canada and Mexico to provide for recognition of traditional domestic use of waterfowl, where biologically justified, is a possible solution to the dilemma created by the Migratory Bird Treaty Act. However, undesirable aspects of renegotiation and reluctance of Canada to open renegotiations make such action improbable.

IMPACTS

* On all areas waterfowl bag and possession limits commensurate with local climatic conditions will be pursued, and methods to achieve additional harvest of selected species during the spring and summer months will be investigated.

* All areas listed are recognized as important waterfowl use and/or human use areas and any future development or habitat alteration must recognize waterfowl requirements.

* Control of use will generally be greater in high use areas rather than low use areas. However, in all cases the minimum controls possible will be applied to achieve the desired balance between the resource and different user groups.

2. SOUTHERN ALASKA WATERFOWL MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting waterfowl.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain waterfowl hunting seasons and bag limits that reflect climatic conditions.

2. Control waterfowl hunting seasons and bag limits, methods and means of taking, and methods of hunter transport, if necessary, to distribute hunting pressure.

3. Control hunter access and methods of transport, if necessary, to minimize disturbance or harassment of waterfowl.

4. Obtain, maintain and improve hunter access to waterfowl hunting areas.

5. Encourage viewing and photography of waterfowl.

6. Discourage human activities that disturb or harass waterfowl during critical nesting or migration periods.

7. Enhance waterfowl habitat in high use areas to increase utilization of habitat by waterfowl, and discourage land use practices that are detrimental to waterfowl habitat.

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.

PROBLEMS

* Pollution of coastal tidelands and estuaries and other pelagic areas by oil or oil industry-related contaminants poses a serious threat to waterfowl and waterfowl habitat in all coastal areas of Southern Alaska. Spills from massive Outer Continental Shelf (OCS) oil development, onshore support facilities, and tanker traffic along the coast could devastate coastal waterfowl habitats and result in the loss of hundreds of thousands of waterfowl if all possible precations are not taken. Baseline quantitative and qualitative data on coastal bird habitats are needed before oil impacts occur to provide rational recommendations for future OCS lease areas, recommendations for future oil spill cleanup facilities and to document the effect of estuary contamination for mitigation measures. Ongoing federally funded OCS bird projects by the Department and the U.S. Fish and Wildlife Service are designed to identify and quantify the effects of these potential problems.

* Construction of dams could eliminate important waterfowl habitat in interior Alaska. For example, a dam at Rampart would eliminate habitat for over 2 million ducks and geese. Dams on other streams would be less devastating but could result in significant losses, depending on the area. The Department must work closely with the U.S. Fish and Wildlife Service and other resource management agencies to insure that waterfowl resources are adequately considered in review of dam proposals and that all feasible mitigation measures are assured if dams are constructed. In some cases, such as Rampart Dam, the Department should oppose construction on the basis of wildlife damage.

* Timber cutting adjacent to sedge-tideland habitats and log storage near these areas may adversely affect waterfowl and waterfowl habitat. An apparent decrease in waterfowl food production results from bark decomposition in log storage areas. Waterfowl losses have also occurred from pulp mill effluents. Baseline quantitative and qualitative data on coastal bird habitats and bird numbers, and relationships between them are needed to provide rational recommendations to the U.S. Forest Service and logging companies to insure minimum habitat damage.

* Local encroachment on waterfowl habitat is probable through highway and airport construction, industrial and urban development, upland oil and gas exploration and subsequent development. Key waterfowl and human use areas must be given adequate protection through land use regulations, safeguards in development, or mitigation measures.

* The black brant population has been declining for about 15 years. A substantial increase in the harvest of brant is not desirable in the forseeable future. As hunting pressure increases in Southwestern Alaska, restrictions on brant harvests may be necessary.

* New native landowners and other private landowners will probably impose varying degrees of trespass restrictions on hunters. The

Minto Flats, Delta area, Yukon Flats, and Tetlin area will be the most affected. The Department should solicit the cooperation of private landowners to facilitate progressive management of waterfowl. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act. The State should secure ownership of as much of the best waterfowl land and access to it to insure good waterfowl hunting opportunities in the future.

* Use of waterfowl by hunters and nonconsumptive users will continue to increase, especially near urban centers. To prevent corresponding increases in user conflicts, crowding and reduced success, measures must be initiated to enhance habitat, increase access and control user numbers.

* Except for hunting areas in Southeastern Alaska and some lightly hunted coastal areas in Prince William Sound and Kachemak Bay, freezeup limits hunters to 50 days or less of hunting out of a possible 107 day season. Liberalized duck bag limits should be allowed to partially offset reductions in hunting opportunity imposed by climate.

* Ingestion of lead shot by waterfowl in a few areas may be causing substantial loss of birds from lead poisoning. Efforts must continue to identify these areas, measure the impact, and take corrective action if necessary.

IMPACTS

* Appropriate waterfowl seasons and bag limits will be maintained on all areas.

* All listed areas are recognized as important waterfowl use and/or human use areas; future development resulting in habitat alteration may be curtailed in recognition of the waterfowl values.

* Control of use will generally be greater in high use areas rather than low use areas. However, in all cases the minimum controls possible will be applied to achieve the desired balance between the resource and different user groups.

4. PAIMUT SLOUGH WATERFOWL PLAN

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.

MANAGEMENT GOAL

To provide an opportunity to hunt waterfowl under aesthetically pleasing conditions.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain waterfowl hunting seasons and bag limits that reflect climatic conditions.

2. Control access, number and distribution of hunters, and methods of hunter transport, if necessary, to maintain aesthetic waterfowl hunting conditions.

3. Obtain, maintain and improve hunter access to waterfowl hunting areas.

4. Discourage human activities that disturb or harass waterfowl during critical nesting or migration periods.

5. Discourage land use practices that are detrimental to waterfowl habitat.

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.

PROBLEMS

* Under D-1 Federal classification the Paimut Slough area is managed by the Bureau of Land Management for all resource values without emphasis on the outstanding waterfowl use values of the area. The State should select lands in the Paimut Slough area as part of its

entitlement under the Statehood Act because of the area's value to waterfowl and to the potential recreational use of waterfowl by Alaskans.

* Public use is limited by the lack of designated safe floatplane landing areas, campsite and other use facilities and good fresh water supplies. If the state acquires ownership of the area a limited number of public accommodations could be developed to increase public use.

IMPACTS

* Public hunting and waterfowl habitat protection would be assured in the future on 228 square miles of excellent waterfowl habitat.

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 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

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

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 offshore 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.

PROBLEMS

* The problem of environmental contaminants and their impacts on the marine ecosystem is a major concern for all species of marine mammals and will certainly become more critical as resource development progresses in the north. The threat posed by petrochemical pollution resulting from the exploration, extraction and transportation of oil and natural gas is of primary concern. Marine mammal populations may be seriously impacted by reduction of primary production and its effects on marine food webs, by direct losses of invertebrate and vertebrate food species, by direct ingestion of toxic substances and by loss of insulative quality of fur. Other contaminants have entered the northern marine ecosystem primarily from sources outside of Alaska. Significant accumulations of several pesticide residues and of mercury have been detected in several species of marine mammals. The effects of these contaminants on marine mammals are unknown. Based on the observed effects on humans, the impact could be very serious. All resource development and utilization with the potential for contamination of the marine ecosystem must be carefully regulated to minimize introduction of pollutants and consequent effects on marine food systems. Use of pesticides and industrial waste processing in Alaska must also be closely controlled.

* The Marine Mammal Protection Act of 1972 established a moratorium on all consumptive use of marine mammals except for traditional uses by Alaskan Natives. It also removed management authority for marine mammals from the State of Alaska. The Act in effect eliminated some rational, beneficial human uses of marine mammals. Marine mammals have the capability to support significant, beneficial, sustained use. All species utilized by United States Nationals and managed by the State of Alaska prior to 1972 existed as healthy, productive stocks. In April of 1976 walrus management was returned to the State. This sets an important precedent for the return of other marine mammals to State management. The State should continue to press for return of management authority for those species which it has the capability to manage.

* Several species of marine mammals compete with man for fisheries resources. To date, such competition has taken the form of depredations on netted fish and also has resulted in the destruction of some fishing gear. Conflicts between fishermen and marine mammals are likely to increase as human utilization of fisheries intensifies. Reduction of fish stocks is certain to impact populations of marine mammals which are approaching or have achieved carrying capacity levels. Development of new or expanded fisheries will affect some species not now impacted. The reverse is also true: levels of human utilization of fisheries may be limited by intensive use of fish stocks by marine mammals. Since affected species of marine mammals are limited to shallow waters in their foraging activities, much potential conflict may be eliminated by zoning certain commercial fishing activities to

deeper waters. In some situations, conflicts may require reduction of some marine mammal populations in specified areas.

* Human activity including movement of people, operation of equipment or harassment by low-flying aircraft can result in desertion of traditional haul-out areas. Of particular importance is disturbance during critical pupping periods which can result in abandonment of pups. Areas of importance to marine mammals for hauling out or pupping need to be protected by regulations which will minimize disturbance.

* Coastal residents do not depend on marine mammals to the extent they once did; nevertheless, it is necessary to recognize that a partial subsistence economy still exists of which marine mammals are an integral part. Management programs must be designed that insure marine mammals are allocated in sufficient numbers to satisfactorily meet subsistence requirements.

* Marine mammals occurring in the Bering-Chukchi Sea are harvested by several foreign countries, whose management policies may differ from those of the United States. If marine mammals species are to be managed on a truly comprehensive, coordinated basis, international cooperative agreements will have to be formulated between all parties concerned.

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 monocarus*
	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*

1A. BERING-CHUKCHI-BEAUFORT SEAS SEAL MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of seals.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy seals.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Harvest seals in numbers which will meet the requirements of coastal residents.
2. Regulate hunting seasons, bag limits, and methods and means of taking seals to provide for local use.
3. Accomodate the desire for recreational hunting for seals.
4. Encourage viewing and photography of seals.
5. Protect seals from adverse impacts of resource development.
6. Minimize disturbance on seal hauling grounds.
7. Encourage consideration of the requirements of seals in the management of seal food species.

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.

PROBLEMS

* Activities associated with oil and gas exploration, extraction, transportation, and refining and other industrial activities may alter seal habitat or result in direct mortality of seals. Excessive disturbance can cause abandonment of hauling areas. Several scheduled Outer Continental Shelf oil and gas lease areas are situated within important seal habitats. The Department should identify areas of critical seal habitat and encourage studies of habitat requirements and food chain relationships of seals. The Department should encourage regulation of industrial activities to minimize impacts on seals.

* Foreign fishing fleets may compete with seals for certain fish stocks. Excessive fishing may lower seal carrying capacity. The Department should encourage population studies of major seal food species and request that those stocks be managed in a manner that will maintain the seal population.

* The wide distribution of seals and the environment in which they live make population censuses difficult. The Department should continue to promote research programs which will provide this information.

* Regulations of the U. S. Department of Commerce, under the Marine Mammal Protection Act of 1972, prohibit the taking of seals by nonnatives and restrict commercial uses. This has resulted in the unnecessary loss of income to coastal residents. The Department should continue to press for return of seal management authority to the State of Alaska and reinstate regulations allowing all citizens who have a need to take seals and to sell the byproducts, rather than encourage their waste.

IMPACTS

* The sustenance requirements of coastal residents will be met.

* If management authority for seals is returned to the State, recreational hunters will probably share in the harvest in the future.

* Some increase in the harvest can be expected.

* Access and number of users may be limited in sensitive areas such as hauling grounds.

* Guiding services may increase in coastal villages.

* The sale of seal products may increase.

1B. BERING-CHUKCHI-BEAUFORT SEAS WALRUS MANAGEMENT PLAN

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.

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of walrus.

SECONDARY MANAGEMENT GOAl

To provide an opportunity to take large walrus.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a maximum annual retreived harvest of 3,000 walrus or less, of which the majority will be allocated to local residents dependent on walrus for food.
2. Regulate hunting seasons, bag limits and method and means of taking walrus to provide for local use.
3. Achieve less wasteful use of walrus and walrus products.
4. Accomodate the desire for recreational hunting for walrus.
5. Encourage viewing and photography of walrus.
6. Discourage off-shore development that might adversely impact walrus.

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.

PROBLEMS

* The number of ivory carvers is increasing every year in response to demand for ivory products. This encourages wasteful hunting practices. The Department should maintain strict control on the purchase and sale of raw ivory, discourage wasteful hunting practices and encourage

alternate income-producing uses of walrus such as guiding sport hunters and photographers.

* The high wounding and sinking loss is a waste of a valuable resource. The Department will encourage improvement of hunting methods to reduce loss.

* Offshore oil development may adversely impact the marine ecosystem. The Department should identify areas of critical walrus habitat and encourage studies of habitat requirements of walrus and elements in their food chain. The Department should encourage regulation of offshore activities to minimize impacts on walrus.

IMPACTS

* The walrus population will probably continue to grow slowly until it reaches or exceeds the carrying capacity of its habitat.

* Regulations will be established providing preference of use for coastal residents depending on walrus for food.

* More restrictions may be placed on hunting methods and means, seasons and bag limits as required for the conservation of walruses.

1c. BERING-CHUKCHI-BEAUFORT SEAS BELUKHA MANAGEMENT PLAN

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.

MANAGEMENT GOAL

To provide for an optimum harvest of belukha whales.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain belukha hunting seasons and bag limits to accomodate local needs.

2. Minimize conflicts with fisheries by use of nonlethal techniques of belukha control.

3. Where appropriate limit human activity that might cause abandonment by belukhas of critical habitat.

4. Encourage consideration of the food requirements of belukhas in fisheries management.

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.

PROBLEMS

* Activities associated with resource development, industry and concentrated human settlement may result in direct mortality of belukhas, or they may alter beluga habitat. The Department should identify areas of critical belukha habitat and encourage studies of habitat requirements of belukhas and elements in their food chain. The Department should encourage regulation of human activities to minimize impacts on belukhas.

* Conflicts between belukhas and commercial fisheries may occur. Where such conflicts are clearly demonstrated and significant, the Department should use nonlethal methods (such as the use of underwater sound transmissions) to minimize these conflicts.

* The Marine Mammal Protection Act of 1972 prohibited the taking of belukhas by all individuals except Eskimos, Indians and Aleuts. The Department should continue to press for return of belukha management authority to the State of Alaska and promote regulations that would permit all individuals to harvest belukhas.

IMPACTS

* Opportunities to harvest belukhas will probably continue to exceed the demand.

* Belukha populations will remain at or near carrying capacity.

* Opportunities to view and photograph belukhas will remain high.

* Conflicts with fisheries should be minimized with little impact on the belukha population.

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 blackpolled 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.

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

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 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 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.

PROBLEMS

* Many migratory bird species are exposed to contamination by chemical pollutants, especially insecticides and herbicides. Such compounds may seriously affect populations, either by causing direct mortality or by lowering reproductive success. Decreased populations of peregrine falcons resulting from chemical residues found outside Alaska are well documented. While other Alaskan raptors, seabirds and other nongame bird species do not currently appear to be seriously affected by chemical residues, migrant species may experience similar declines in the future. Use of pesticides and other potentially harmful compounds is limited in Alaska at this time. Strict measures should be taken to control the future use of such chemicals within the State.

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

* A potential exists for pollution of seabird feeding grounds and adjacent nesting from oil-related activities. Chronic pollution from offshore drilling and production platforms may impact the food web. Baseline data on colonies should be gathered and surveys of dead or affected birds on beaches conducted to provide comparative data for assessment of oil impacts.

* Commercial fishing has an unknown impact on marine ecology with potentially adverse consequences for seabirds. Some seabirds prey on commercially-valuable stocks, and competition between seabirds and commercial fishermen may increase. Excessive exploitation by foreign fishing fleets may have reduced the range of at least one seabird species (ancient murrelet). Japanese gillnet fisheries have directly caused substantial seabird losses through entanglement in nets. Local seabird populations may be unable to sustain such losses indefinitely. The 200-mile foreign fishery limit recently passed by Congress will substantially reduce seabird loss, especially during the breeding season.

* Seabirds are susceptible to disturbances that cause nest abandonment or egg loss. Nonconsumptive use of seabirds will continue to increase with a corresponding increase in disturbance. Reduced reproductive success and a chronic decline in colony sizes, especially near population centers, may result unless measures are taken to protect habitat and to control numbers and activities of humans near seabird colonies.

* Critical nesting habitat must be preserved if raptor populations are to be maintained in the future. Disturbances at nest sites during critical stages of the nesting season such as egg laying, incubation and early brooding phases, have probably been the major cause of direct, human-induced reproductive failure. Therefore, protection of raptor nesting habitat must include the following: 1) physical preservation of the nest sites; 2) preservation of the general nesting areas including feeding habitat; and 3) protection of the nesting areas from excessive human disturbance.

* The extremely high value placed on the endangered peregrine falcon and on gyrfalcons by falconers and collectors around the world creates an incentive for illegal traffic in these birds. Laws and regulations must be stringently enforced to minimize illegal use of raptors. Falconry is a legitimate and sporting method of hunting, and its practice poses no threat to the raptor resource when decisions regarding the number of raptors to be used annually for this purpose are based on the sustained yield principle.

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*
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*
	Rat	*Rattus norvegicus*
	Porcupine	*Erethizon dorsatum*

1a. ALASKA RAPTOR MANAGEMENT PLAN

LOCATION

The entire state of Alaska.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy raptors.

SECONDARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of raptors.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Protect raptor populations from unnatural disturbance and harassment.
2. Discourage resource utilization that may adversely impact raptor nesting, roosting and feeding areas.
3. Develop public appreciation of raptor importance in the ecosystem.
4. Encourage viewing and photography of raptors.
5. Promote scientific studies of raptors.
6. Provide for limited utilization of selected raptor species for falconry.

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.

PROBLEMS

* Disturbances at nest sites during critical stages of the nesting season such as egg laying, incubation and early brooding stages, have probably been the major cause of direct, human induced reproductive failure. In view of increased human activity throughout the state, critical habitat, particularly that associated with nesting raptors, must be preserved if raptor populations are to be maintained in the future. Identification of important raptor habitats and quantitative population information are required for meaningful management decisions. Multi-agency collaboration would be the most effective approach.

* Of special concern is the accumulation of pesticide residues in raptors and their prey. Although pesticides are used to a very limited extent in Alaska, raptors are subjected to contamination from contaminated prey that migrates into Alaska and from contaminated prey consumed in southern wintering areas. Over a period of time these residues concentrate within raptor tissues and eventually reach levels sufficient to reduce reproductive success. Decrease in eggshell thickness, a symptom of such contamination, has been documented for peregrine falcons nesting in Arctic Alaska. National and international efforts to reduce environmental burdens of implicated chemical contaminants must be encouraged.

* Indiscriminate shooting of raptors occurs near human population centers. Public attitudes toward raptors must be improved by increasing public awareness of the value of raptors.

IMPACTS

* Increased interest in raptors by nonconsumptive users may necessitate strict controls governing the season, duration and types of activities during periods of use. This may be especially true when photography or viewing of nesting raptors is involved.

* Falconry will continue to be allowed on selected species under provisions of a closely controlled permit program. The delineation or management of critical habitat for raptors may alter managment of other wildlife species and restrict or inhibit resource development in selected areas.

* Critical nesting habitat will be protected through specific land classification procedures.

1B. ALASKA BALD EAGLE MANAGEMENT PLAN

LOCATION

Entire state of Alaska.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy bald eagles.

SECONDARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of bald eagles.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Encourage public awareness of bald eagle ecology.
2. Discourage resource utilization that may adversely impact bald eagle nesting, roosting and feeding areas.
3. Protect bald eagles from unnatural disturbance and harassment.
4. Identify areas best suited for viewing, photography and scientific study of eagles and encourage their wise use.
5. Discourage viewing and photography during critical nesting periods.

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.

PROBLEMS

* With increasing recreational viewing and photography of eagles, greater disturbance and harassment can be expected. Nonconsumptive use that is not detrimental to bald eagles should be encouraged, but at the same time measures should be taken to limit numbers and activities of users during critical nesting periods.

* Pollution of coastal tidelands and estuaries by oil or oil industry-related contaminants poses a critical threat to bald eagles and their habitat. Massive Outer Continental Shelf oil development and tanker traffic in Prince William Sound, Bristol Bay and the Aleutian Islands could devastate coastal habitat in the state if all possible precautions are not taken. Baseline quantitative and qualitative data on coastal bird habitats are needed before oil impacts are made in order to provide rational recommendations for future oil spill cleanup procedures and to document the effects of estuary contamination for mitigation measures. Continued efforts by the State, U.S. Forest Service and U.S. Fish and Wildlife Service will identify and quantify the effects of these potential problems.

* Although bald eagles are protected by law, many are killed by ignorant or misinformed people. The Department should encourage greater public understanding and appreciation of the values of eagles. Strict enforcement of existing protective laws by federal and state agencies should be maintained.

* Logging of forests on private lands, not subject to Forest Service requirements protecting eagle nest trees in national forests, may result in the loss of nesting habitat in some areas. Private logging interests should be encouraged to safeguard eagle nest trees on private lands. The Department should cooperate with federal agencies in identifying existing eagle nest sites.

* Alaskan bald eagles, like other raptors, are susceptible to chemical contamination of the environment. Those eagles which migrate south for the winter are subject to greater contamination than birds resident within Alaska. Although present levels of contaminants are probably low in Alaskan birds, increased use of pesticides or herbicides in the state could have serious detrimental effects on eagles. Future use of such chemicals in Alaska should be closely controlled.

IMPACTS

* Delineation and management of critical eagle habitat areas may restrict resource development activities within such areas.

* Controls on numbers and activities of nonconsumptive users will become necessary to protect eagles in some areas as user numbers increase.

9. HOLITNA RIVER OSPREY MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of ospreys.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy ospreys.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain undisturbed character of osprey nesting, roosting and feeding habitat.

2. Encourage viewing and photography of ospreys.

3. Limit access and numbers of users, if necessary, to reduce disturbance and harassment to ospreys.

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.

PROBLEMS

* Little knowledge exists about the history and ecology of ospreys in the Holitna River area. Studies should be encouraged to obtain information on natural changes in nesting habitat, competition with eagles for nest sites and other facets of osprey ecology to provide baseline data for evaluating impacts of human activities on ospreys.

IMPACTS

* An increase in human nonconsumptive use of ospreys in the area is expected as a result of interest generated through an active management program.

* Some controls of other uses in the area such as sport fishing during nesting periods, or habitat alteration activities, may be necessary if adverse effects of such use are probable.

16. ALASKA SEABIRDS MANAGEMENT PLAN

LOCATION

Entire state of Alaska.

PRIMARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy seabirds.

SECONDARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of seabirds.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Encourage public viewing and photography of seabirds.
2. Encourage scientific and educational studies of seabird ecology.
3. Discourage resource utilization practices and human activities that adversely impact seabird nesting, roosting and feeding habitat.
4. Develop public awareness of seabird ecology.
5. Protect seabirds from unnatural disturbance and harassment, particularly at colonies during critical nesting periods.
6. Allow utilization of seabirds for traditional domestic use.

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.

PROBLEMS

* Pollution by petroleum related contaminants poses a serious threat to seabirds using Alaska's coastline and marine waters for nesting, feeding or resting. Outer Continental Shelf (OCS) oil development and tanker traffic could result in large oil spills or chronic pollution which would devastate seabird habitat and kill millions of seabirds. Baseline quantitative and qualitative data on coastal seabird habitats and colony location, size and composition are needed to properly interpret population fluctuations and impacts of oil development. These data are necessary to provide rational recommendations for future OCS lease areas, recommendations for future oil spill cleanup facilities and to document the effect of estuary contamination. Stringent controls on oil development and associated human activities will be necessary to minimize environmental hazards.

* Commercial fishing is an unknown factor with potentially adverse consequences for seabirds. Some seabirds prey on commercially-valuable fishery stocks, and conflict and competition between seabirds and commercial fishermen may become intense. Excessive exploitation by foreign fishing fleets may have reduced the range of at least one species (ancient murrelet). Japanese gillnet fisheries have directly caused seabird losses as high as 10,000 birds per day from birds being entangled in nets. Local seabird populations may be unable to sustain such losses indefinitely. The 200-mile foreign fishery limit recently passed by Congress should substantially reduce seabird loss, especially during the breeding season.

* Seabirds are susceptible to disturbances that lead to nest abandonment and nestling or egg loss. Nonconsumptive use of seabirds will continue to increase with a corresponding increase in disturbance. Reduced reproductive success and a decline in colony sizes, especially near urban centers, may result unless measures are taken to protect habitat and to control numbers and activities of human visitors.

* Introduction of furbearers and rats on Alaska islands has resulted in the elimination or serious reduction of seabirds nesting on those islands. Future proposals for introductions of any exotic animals to any islands must be carefully evaluated for possible consequences to indigenous wildlife.

* In some areas, ocean floor mining, coastal dredging, or gravel removal may alter coastline habitat or alter productivity of near shore waters through siltation, adversely affecting seabirds and other marine life. Mining and dredging or gravel removal activities should be regulated to minimize adverse impacts on the marine ecosystem.

IMPACTS

* Some limitations on access, periods of use, and activities of visitors to seabird colonies will be required to reduce disturbance to colonies subject to frequent human visitation.

* Traditional consumptive domestic use will continue but is expected to decrease as lifestyles change.

* Expansion of biological knowledge of seabird species will provide an additional monitoring tool for interpreting man's impact upon the marine environment. Such capabilities may dictate changes in the patterns of use of other resources.

* Increased demands for nonconsumptive use may foster development of interpretive and user transport services.