ALASKA WILDLIFE MANAGEMENT PLANS

ARCTIC 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
Robert A. Rausch, Director

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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 reevaluation 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 Arctic 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.

BROWN BEARS IN ARCTIC ALASKA

Brown bears (*Ursus arctos*) were once classified into a large number of species and subspecies, but the brown bears of North America and Europe are now considered members of one species by most taxonomists. Bears over the greater part of North America fall under one subspecies, *U. a. horribilis*. No reproductively isolated populations are known to exist in Arctic Alaska. Most laymen and scientists designate bears found near coastal areas as brown bears, especially in the southern half of Alaska, while those found inland and in the northern half of Alaska and the remainder of North America are called grizzly bears.

Grizzly bears can be found throughout the Arctic Region from the crest of the Brooks Range north to the Arctic Ocean, although higher densities occur in the mountains, foothills and valley bottoms than on the flat coastal plain. The density of bears is low, varying from 1 bear per 50 square miles in localities of preferred habitat to 1 bear per 100 square miles when the entire habitat utilized is considered. Local abundance of bears may vary seasonally depending on available food sources. There is some evidence that grizzlies in this area are not as abundant now as they were in the early 1960's, based on population data from bears in a 5,000 square mile area in the eastern Brooks Range.

All habitat types on the north slope are used by grizzly bears but the most important are the alluvial valley bottoms near river courses. During the spring these areas are used as travel routes after the bears leave winter dens, especially by males in search of moose or caribou carrion. The soil thaws earliest in the mountains and foothills and bears forage along the valley bottoms for roots of Eskimo potato (*Hedysarum*) or other vegetation. Berries which remained intact through the winter are another spring food source in valley bottoms and slopes. From early summer until late August grizzlies tend to disperse from river valleys to the alpine, foothill and coastal plain areas where they feed on vegetation, primarily *Equisetum*, grasses and sedges. During late August to mid-September, the grizzlies return to the river valleys to search out berries and dig for roots. Although denning is not restricted to one particular habitat type in this area, most winter dens are found on south-facing slopes which are vegetated, well-drained and where permafrost is deep enough to allow den construction. Most den sites are dug in steep slopes although some can be found along river bottoms at higher elevations and on the coastal plain. Historical records indicate that the habitat in Arctic Alaska has changed little until recent times. However, there is a great potential for reduction of available habitat by oil and gas exploration and development, and resultant transportation corridors and construction activities.

Little information is available regarding natural controls on brown bear populations or the degree of population fluctuations. Except for dental and skeletal disorders, the diseases reported for brown bears are remarkably few. Brown bears apparently possess an unusual ability to withstand infections and to recover from fractures, many of which are caused by fighting. Cannibalism and other intraspecific strife may cause significant mortality. *Trichinella spirallis* is the parasite infecting bears, and is transmissible to man in raw or partially cooked bear meat; however, it is of minor significance to infected bears.

In Arctic Alaska, the grizzly bear is at the northern limit of its range; the period of food availability during the summer is short, and reproductive potential is low. This low production by the population coupled with the lack of escape cover in tundra habitat makes these grizzlies more susceptible to the pressures of human development and sport hunting than they are in some other regions.

In accessible, inhabited areas, human activities are the most significant source of mortality. Sport hunting is presently the most important mortality factor, but there is also a high mortality of nuisance bears near human habitations. Bears are killed in defense of life and property when they are attracted to camps or garbage dumps, eventually endangering human safety.

Recreational uses of brown bears predominate in Arctic Alaska although domestic utilization continues to some extent. Sport hunting is the primary use with the Brooks Range being the most important hunting area. Hunting in the Brooks Range was quite limited until the early 1960's. As hunting pressure increased, regulations affecting season lengths became more restrictive to avoid excessive harvests. Guided hunters have shown the highest success rates due to the efficiency in hunting methods developed by guides. It is expected that the trend of increased hunting pressure will continue. Nonconsumptive use will also increase if the proposed Gates of the Arctic National Park is established.

PROBLEMS

* Well-intentioned concern by a national public hampers effective management of the species and threatens future use by recreational hunters. One misconception is that because grizzly 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.

1. BROOKS RANGE BROWN BEAR MANAGEMENT PLAN

LOCATION

Game Management Unit 26; that portion of Game Management Unit 23 draining into the Noatak River above Maiyumerak Creek; and those portions of Game Management Units 24 and 25 lying north of a line from Norutak Lake due east to the Alatna River, down the Alatna River to its confluence with the Koyukuk River, up the Koyukuk and South Fork of the Koyukuk River to Fish Creek, up Fish Creek to the Game Management Unit 25 boundary to the headwaters of the West Fork of the Chandalar River, then down the West Fork of the Chandalar River to the confluence with the East Fork of the Chandalar River, then up the East Fork of the Chandalar River to its confluence with Lush Creek, then a direct line eastward to Bob Lake and the Christian River, down the Christian River to its confluence with Otter Creek, up Otter Creek to its headwaters, then south to the headwaters of Thluichohnjik Creek and down Thluichohnjik Creek to its confluence with the Sheenjek River, then up the Sheenjek River to the southern boundary of the Arctic Wildlife Range, then eastward along the Arctic Wildlife Range boundary to the Alaska-Canada border.

MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain brown bear hunting seasons.

2. Limit the harvest to less than the annual increment until the population can support a larger harvest.

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

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

THE SPECIES

The Brooks Range area supports fewer bears per unit of area than more favorable range situated to the south. The long winters and short, cool summers which occur in the region limit plant growth on which the bears depend. Growth rates of individual bears are slow and population production is relatively low. Rates of natural mortality in this region also appear to be low. Deaths in winter dens have been recorded as have deaths caused by other grizzlies, usually young animals or females which were attacked by adult males.

Brooks Range grizzly bears are relatively small and there are few "record class" bears in the population. However, the remote character of the region and the possibility of hunting in an area where few other persons are encountered definitely increase the appeal of the area to hunters.

Most bears reported killed by hunters in Game Management Units 23-26 are taken in the area included in this management plan. A possible exception may occur in Unit 23, where much of the harvest occurs along the Kobuk and lower Noatak River drainages. During 1975, sport hunters reported a

total kill of 69 grizzlies in Units 23-26. This figure has only been exceeded twice since 1961 when 74 were killed in 1970 and 89 were killed in 1973. Hunting pressure has steadily increased in the area since 1961. Season length has been shortened considerably, but the number of bears killed has remained static or increased. Despite closure of the spring season in 1974 and poor weather during the fall season, the number of bears presented for sealing (34), did not decrease appreciably from the mean hunter-take for the previous 10 years when generally longer seasons prevailed. During 1975, when both spring and fall seasons were open, harvest again increased to the high levels reached in 1970 and 1973.

Over the last 15 years, an average of 60 percent of the bears killed have been taken by nonresidents. This proportion has been increasing in recent years and in 1975 was 67 percent. Most of the remainder of the harvest is by non-local Alaska residents, primarily during the spring season. Area residents occasionally take bears for domestic use, but the reported kill for such purpose is low. Indirect commercial use, in the form of guiding hunters, is important in the Brooks Range and contributes to the livelihood of an increasing number of guides.

Hunting is distributed throughout the area during spring and fall seasons but overharvest may occur locally along well used routes of air travel. Domestic use by local residents occurs primarily near villages or along accessible rivers.

Although riverboats are utilized to some extent, aircraft provide the majority of the access to hunting areas. The availability of landing sites on gravel bars throughout the area has played an important role in the harvest of the grizzly population. During both spring and fall seasons, river valleys receive high use from grizzlies. Because the stunted vegetation in these areas provides little cover, and landing sites are abundant, the bears are very vulnerable.

PROBLEMS

* Easy access to the area by aircraft may result in overharvest in widespread areas and may not be consistent with the maintenance of aesthetic hunting conditions. Regulation of the number of hunters and methods of access may resolve these problems.

* Portions of the area will be selected under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. 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.

* Increased development associated with mineral extraction and exploration may increase access into the area and increase the possibility of bear-man encounters. Critical bear habitat should be identified and resource development planned to minimize bear-human contact.

IMPACTS

* Land use which would adversely affect critical habitat for grizzly bears or the wilderness character of the area may be restricted.

* Once the grizzly population reaches maximum density seasons may be liberalized to distribute hunting pressure throughout a longer period of time.

* The bear population will be maintained near the habitat carrying capacity.

* The number of hunters will be limited by permit.

* Controls on methods of hunter transport or areas of access will improve the aesthetic quality of hunters who do participate.

* Guiding operations will be affected by limits on hunter numbers and controls on access.

* Constraints on resource development and associated construction in critical bear habitat areas may increase costs of development.

WOLVES IN ARCTIC ALASKA

Wolves (*Canis lupus*) occur throughout Arctic Alaska as far north as the Beaufort Sea, although they are generally more abundant in the foothills and mountains of the Brooks Range in the southerly portion of the region. Since the turn of the century wolf abundance has varied a great deal in this area. Wolves were scarce during the early 1900's, reflecting low arctic caribou numbers. By the 1930's wolves and caribou increased in numbers. Wolves were moderately abundant during the 1940's, and reached a peak in the early 1950's. Extensive government control work as well as aerial hunting by private individuals during the 1950's and in subsequent years caused a sharp decline in the wolf population, and by the late 1960's the population in the Arctic area had reached a very low level. The wolf population increased following the closure of the area to aerial hunting in 1970. Presently the density of wolves in Arctic Alaska varies from approximately one wolf per 60 to one wolf per 120 square miles.

Wolves usually occur in packs which may consist of parents and pups of the year, young of the previous year and often other adult animals. The social order in the pack is characterized by a dominance hierarchy with a separate rank order among females and males. Fighting is uncommon within packs except during periods of stress. Dominance order is maintained largely through ritualized behavior. In the Arctic Region pack sizes usually range from 6 to 10, although packs of 20 individuals have been seen. The range of a pack may include over 1,000 square miles. However, where food resources are optimal wolves may subsist in areas as small as a few hundred square miles. During winter in the Arctic Region, packs may at times abandon their usual range due to the temporary absence of their major prey species, the migratory caribou. Even with adequate food the ranges of packs often overlap. During early summer when pups remain at dens, most adults center their activities around dens. This reduces their mobility although adults often travel 20 miles or more from dens while hunting. Active dens are usually at least 15, and often 25 or more miles apart. The diet of wolves in Arctic Alaska varies according to season, location, and prey species available.

Caribou are the major prey, although Dall sheep and moose are also taken. During winter these big game species constitute almost the entire diet of wolves. During summer, young ungulates make up the major portion of the diet. Small animals such as voles, lemmings, ground squirrels, and occasionally birds and fish are important supplements.

Generalizations about wolf-prey interactions are difficult to make because of differences between areas and prey species. Evidence from various studies of wolf-prey relationships suggests that the effect of wolf predation is largely conditional upon the relative densities of predators and prey, and the size and reproductive potential of the prey species populations. The effect of wolf predation can range from one of minor significance in which wolves remove far less than the annual recruitment to the prey population, to one in which wolves can retard prey population growth or reduce a prey population by removing the annual recruitment or more.

Studies of wolf populations indicate the high reproductive potential of wolves is seldom realized. Several factors may regulate wolf population levels either through reduced productivity or direct mortality. These include reduced fertility, social inhibition of breeding, malnutrition and starvation (especially among pups), cannibalism and the other forms of intra-specific strife, disease, accidents and predation. The importance of these factors varies. Various studies of wolf ecology suggest that food supply is a primary determinant of wolf densities. When prey are abundant or easily taken, wolves exhibit increased productivity giving

birth to more, larger litters of pups, and more pups survive their first year of life. Conversely, when food is scarce, fewer, smaller litters are produced, and mortality of pups to starvation and cannibalism increases. Natural mortality is greatest during the first year of life. Fifty to sixty percent of the pups born each spring die within eight months.

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 population. Excessive human exploitation, however, can reduce wolf populations. In Arctic Alaska, where wolves are vulnerable to aerial hunting techniques, intensive human exploitation in previous years was a major factor inhibiting the growth of wolf populations.

The treatment of wolves in Alaska has changed greatly during this century. In 1915, Alaska's first territorial legislature established a bounty on wolves. Prior to 1960 there were no restrictions on the taking of wolves. From 1948 until 1959 the federal government conducted intensive wolf control operations in many parts of Alaska using poisons, aerial shooting and trapping. In 1959 the State assumed management authority for wolves. In 1960 the use of poisons was discontinued. In 1963 the Board of Fish and Game classified wolves as both furbearers and big game animals. Regulations governing methods of harvest, seasons and bag limits, were promulgated, thus providing additional protection for wolves. In 1968 the legislature authorized the Board of Fish and Game to abolish bounties and bounty payments were suspended in all but three Game Management Units in Southeastern Alaska.

The nature of human use of wolves in the Arctic Region has also changed a great deal during this century. Prior to the late 1930's there was little human activity in the inland portion of the area because of a prevailing scarcity of game, especially caribou. The harvest of wolves was correspondingly light, and was entirely subsistence use by residents. During the 1940's the Nunamiut Eskimo, who repopulated the northcentral Brooks Range, trapped and hunted wolves extensively for bounty and for use in clothing and in trade. The Nunamiut took from 50 to 150 wolves each year, with a smaller number being taken by residents of coastal villages. In 1952 the U. S. Fish and Wildlife Service conducted an intensive wolf control program in the central portion of the area. Following this, aerial bounty hunting by private individuals became extensive and large numbers of wolves were killed. Aerial hunting continued until prohibited in 1970. Resident trappers also took wolves during this period, and, until 1967, Nunamiut Eskimos searched for wolf dens during summer to obtain wolves for bounty. Since 1970, resident hunters and trappers have been the primary consumptive users of wolves during the winter months. A small number of wolves are taken each autumn by guided and unguided nonresident hunters incidental to hunts for other big game animals.

Wolf pelts remain important in the manufacture of various types of clothing worn by residents of the area, and, since the late 1950's, have been an important commodity in the handcrafting of caribou skin masks, a key industry in Anaktuvuk Pass and other villages.

In recent years an increasing number of hikers and other nonconsumptive users have frequented the northern Brooks Range during the warmer months. The open nature of the terrain enables ready observation of wolves and other wildlife and an increasing number of people are taking advantage of the excellent opportunities to observe wolves.

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 political 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 Arctic 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 ARCTIC ALASKA

Populations of barren ground caribou (*Rangifer tarandus granti*) in the Arctic Region of Alaska have fluctuated widely in numbers and distribution Currently, the region contains the year-round range of the Central Arctic (or Prudhoe herd). This herd contains 4,000-5,000 caribou and occupies the area east of the Kuparuk River, west of the Canning River and north of the crest of the Brooks Range. An additional small discrete herd of caribou ranges near the Colville River Delta and possibly another near Wainwright. Neither contains more than several hundred animals. The region also seasonally supports the bulk of the Western Arctic and Porcupine herds. The latter contains 100,000 or more caribou.

The Arctic Region lies north of the general tree line and has a fairly limited number of vegetation communities. Caribou movements and seasonal distribution can be correlated with different vegetation types. Normally, a rapid northward movement in April and May brings most of the cows to the dry tundra calving grounds in the foothills of the Arctic Slope at the time most snow has disappeared and the first green shoots and buds of cotton grass appear. The calves are born in late May and the first half of June. In late June and early July the population concentrates in the foothills and mountains where willows, birches and forbs first yield new growth. Most of the herd then disperses onto the coastal tundra where new growth of sedges and willows is beginning to develop. In late August and early September, most of the population moves south. In most winters some small segments of the herds spend the winter in windswept regions of the coastal tundra and foothills.

Because this region lies entirely north of treeline, the spruce-lichen community frequently used in other areas is not available, and animals wintering in the region are largely restricted to the wind-blown sedge-lichen areas. With teeth adapted for eating soft, leafy vegetation, caribou in winter are dependent on lichens, grasses, sedges, and decumbent shrub vegetation. Lichens are slow-growing plant forms requiring up to 100 years for development of stands that can provide forage in significant quantities. Caribou utilize extensive areas for winter range, often using different areas in successive years as an adaptation to the very slow regrowing capability of lichen ranges. The wide-ranging characteristic of caribou is one of the mechanisms evolved by the species to adapt to limitations of the arctic environment.

Caribou depend upon climax vegetation; conditions favoring progression of vegetation through the successional series to climax stages, or the maintenance of climax vegetation, favor caribou. Because fires rarely occur in this region, overgrazing by caribou and reindeer are the primary forces depleting ranges. Reindeer were present in the area primarily prior to 1940. Since then few have been in the area and little competition with caribou has resulted.

Despite their physiological and morphological adaptations for coping with the arctic environment, caribou populations have always fluctuated numerically. Some areas in the state with few or no caribou have well-worn trails of large populations in the past. Among many interrelated natural factors limiting caribou population growth, weather and predation are important factors operating directly on small populations, while weather, disease and emigration induced perhaps by social stress are important to large populations. If reproduction exceeds mortality, production of young can rapidly outstrip predation and spectacular herd growth may occur on good ranges. Equally spectacular declines may occur when the carrying capacity of the range is exceeded. Density related stress may cause emigration to new ranges, and reduced food quality and quantity and increased disease may serve to lower calf production and survival.

The most critical time for caribou is the period just prior to and during calving. For those caribou that have survived the winter, the availability of new forage is most important in meeting increased energy demands of migration to calving areas and of calving itself. Deep snow during spring can stress caribou. Newborn calves are susceptible to large scale mortality if severe weather strikes during the short one week period when most calves are born. Predation on calves and weather induced calf mortality, determine in large part whether populations increase or decrease. In infected populations, brucellosis and a retained placenta condition can reduce the number of viable young born.

Caribou in Arctic Alaska have long been important for domestic use by native residents. The abundance or scarcity of caribou has been suggested as the principal factor determining if early-day natives could live inland or if they had to retreat to the coast where the more stable marine resources could be utilized. Whalers in the late nineteenth century were the first persons other than natives of the area to make use of caribou. Even today domestic use of caribou by local residents accounts for over 95 percent of the use by humans. Sport harvest has been negligible to date because of the prohibitive transportation problems, but this deterrent is rapidly disappearing. Construction of the Trans-Alaska Pipeline has prompted the closure of a corridor five miles wide on either side of the pipeline and a closed area in the Prudhoe Bay development area.

Domestic users harvest most caribou with snow machines and boats. Although dog teams were the primary transportation means until the late 1960's, they are rarely used today. Most sport hunting relies on aircraft as the principal transportation means. There is presently much concern that the increasing human population and general use of snow machines is resulting in excessive utilization of caribou.

PROBLEMS

* Caribou in Arctic Alaska are faced by the effects of tremendous industrial growth from the petrochemical industry and a sizeable growth in human population. Aside from the inevitable increase in demands on the caribou resource by consumptive and nonconsumptive users, the most important consequence of development will be alteration of habitat and disturbance of caribou during critical periods. The long term effects of dissecting the caribou range with the Trans-Alaska pipeline, the inevitable construction of a gas pipeline from Prudhoe Bay and the strong possibility of development of oil production facilities in Naval Petroleum Reserve #4 with attendant oil and gas line construction or similar projects are impossible to predict, but almost certainly will mean constricted and reduced caribou populations in the future. Disturbance of calving caribou by resource development, construction or transportation activities may cause substantial mortality, and disruption of critical migrations may result in fragmenting of populations. Impacts of development and conflicting land uses on caribou must be minimized to the greatest extent possible by comprehensive land use planning and scheduling development activities where and when caribou are least affected.

* Consumptive use of Arctic caribou, historically below productive capacities of these populations, is now affecting the status of at least one important population, the Western Arctic herd. Although caribou populations must be maintained if domestic use of caribou is to be satisfied, excessive harvests and resistance to regulated use may result in substantial declines in caribou numbers. Recreational harvests in the region have been relatively minor but may increase as access improves and resource development brings new people into the area. Competition among consumptive users will increase, and

will be further intensified by creation of national parks or other management systems where consumptive use is excluded or limited. Use of Arctic caribou populations must be equitably allocated among the various users, and harvest levels must be controlled under the sustained yield principle if consumptive use is to be maintained.

* A revival of interest in domestic reindeer herding in Arctic 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.

1. PORCUPINE CARIBOU MANAGEMENT PLAN

LOCATION

That portion of Game Management Unit 25 east of a line drawn from the headwaters of Fish Creek due south to the Yukon River; that portion of Game Management Unit 26B lying east of the Dietrich Caribou Management Plan area; and Game Management Unit 26C.

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of caribou.

SECONDARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting caribou.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Regulate hunting seasons, bag limits and methods and means of taking caribou, if necessary, to provide for local use.
2. Limit harvests to the annual increment of caribou.
3. Encourage fire suppression on caribou winter ranges.
4. Discourage resource development that impedes free passage of migrating caribou.

THE SPECIES

The Porcupine herd currently ranks as one of Alaska's largest populations of barren-ground caribou. Although some animals probably remain in Alaska throughout the year, the majority of animals in the Porcupine herd spend only the spring and summer months in the state.

From 1900 to about 1940, the herd apparently increased in size and expanded its winter range westward into the central Brooks Range. A decline in numbers occurred following a population peak in the mid-1940's, probably due to emigration to the Arctic herd and/or across the Mackenzie into the Northwest Territories. Herd size probably increased in 1957 and 1964 with substantial immigrations of animals from the Fortymile herd involving some 20,000 caribou in 1964. Animals from the Porcupine and Arctic herd occasionally overlap on winter ranges in the vicinity of the Kanuti Flats and during spring migration in the Dietrich-Atigun area, indicating that Porcupine caribou may cross the pipeline corridor. Significant numbers of caribou from this herd sometime winter in the east-central Brooks Range, from the Colleen River to Chandalar. In addition, when caribou from the Porcupine herd winter near the Yukon River, there may be an interchange with the Fortymile herd. Calving occurs in the arctic foothills and coastal plain from the Canning River eastward into Canada.

Reliable estimates of herd numbers were not available until 1972, when a photo-census revealed a minimum herd size of 100,000 caribou. At that time initial calf production was a minimum of 55 calves:100 cows, and surveys the following October indicated a calf:cow ratio of 30:100. These figures indicated the herd was moderately productive and that in 1972 numbers were stable or increasing slightly. Surveys in July 1975 indicated excellent initial calf production with 53 calves:100 cows. In 1973 the bull:cow ratio was 57:100.

Historical records indicate that domestic (subsistence) utilization of this herd has been the primary use. No permanent settlements existed north of the Brooks Range between Barrow and Herschel Island prior to 1900, although temporary coastal settlements were common. Eskimos from villages at the eastern edge of the herd's range in Canada probably relied, at least partially, on caribou. Villagers along the Yukon River from Stevens Village to Eagle, as well as Arctic Village, Chandalar and Venetie utilized caribou but had alternate food sources (fish, moose and sheep).

The earliest non-native users of this herd were whaling crews in the Arctic Ocean. In the last half of the 19th century, whalers may have harvested 4,000-6,000 caribou annually when wintering groups of animals were available along the coast. Trappers, prospectors and traders moved into the upper and middle Yukon drainages during the early 1900's, but their impact on the caribou harvest was probably not as significant as the whalers'. Domestic use by whites was insignificant after the 1930's while harvest by natives was probably greatest in the late 1960's before dog teams were replaced by snow machines.

Liberal seasons and bag limits (no closed season, no limit) for the region north of the Yukon River have been maintained since statehood. Due to the remote areas from which current harvest occurs (both in Canada and Alaska) and the lack of harvest ticket reporting requirements, sport and domestic harvest data are difficult to obtain. Crude estimates derived from observations by biologists and interviews with resident hunters in 1972 and 1973 indicate a harvest of approximately 5,500 animals was taken from this herd between spring 1972 and spring 1973, of which 1,500 were taken by Alaskan village residents. Estimates for 1975 and 1976 indicate some 4,000-6,000 caribou may have been taken, 1,000 by residents of Arctic Village, Venetie and Chalkyitsik. Domestic needs of local users were apparently satisfied, as animals were being shipped to residents of Fort Yukon. At the current level of harvest, herd numbers will probably increase slightly with the rate of calf production and survival observed the past several years. There is no evidence that other mortality factors (disease, poor range condition and predation) are exerting a significant effect on this population.

PROBLEMS

* Four construction projects underway or proposed in Alaska or Canada (Trans-Alaska oil pipeline, El Paso natural gas line, Arctic Gas Natural gas line, Dempster Highway) may influence the movements, size and productivity of the porcupine caribou herd. The Department should monitor herd movements and make appropriate recommendations on construction modes and project activities to minimize adverse impacts on caribou. Major migration routes and calving grounds should be protected by critical habitat designation or other special land classification.

* Reliable harvest data are not presently available. Efforts should be made to periodically monitor the number of animals taken in Canada and Alaska. Status of the herd should be monitored through biennial sex and age composition surveys.

* Conflicts may develop between recreational and subsistence hunters if movement patterns of the herd place it in less remote areas. Restrictions on hunting seasons, bag limits and methods and means of taking caribou may be imposed to provide for local use.

* Lands withdrawn for native claims, Gates of the Arctic National Park, Yukon Flats National Wildlife Refuge and extension of the Arctic Wildlife Range may prohibit or severely restrict hunting opportunities over much of the herd's range. The Department

should seek agreements with appropriate agencies to allow hunting to continue on federal parks and refuge lands and it 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.

* Due to inadequate enforcement capability, there may be a lack of compliance with the current wanton waste law. The Department should play a more active role in regulation enforcement.

* With the decline in the Western Arctic caribou herd, more hunting pressure may be directed to the Porcupine herd. Increased restrictions on seasons, bag limits, and methods and means may be necessary to prevent overuse of this herd.

IMPACTS

* Domestic utilization of this herd is still the most important use, both in Canada and Alaska, and appropriate seasons and bag limits will be continued as long as harvests do not exceed the annual increment to the herd.

* Local domestic users of the resource will continue to take most of the harvest from this herd, specifically the villages of Venetie, Chalkyitsik, Barter Island and Arctic Village.

* Productivity and size of the population will not be adversely affected as long as major changes in the sex composition of the harvest do not occur and harvest levels do not increase appreciably.

* Hunter densities and aesthetic considerations will not receive priority consideration, as there will be minimal restrictions on methods and means of hunting.

* Where aesthetic goals for moose, sheep and grizzly bear in the Brooks Range are jeopardized by high caribou hunter density or unrestricted methods of hunter transport, further restrictions may be imposed on caribou hunters.

2. DIETRICH CARIBOU MANAGEMENT PLAN

LOCATION

In Game Management Units 24 and 25, the area bounded on the west by the south fork of the Koyukuk River from its confluence with Fish Creek to its confluence with John R. Creek, then northwest to the Middle Fork of the Koyukuk River to the North Fork of the Koyukuk River, then the North Fork of the Koyukuk River from its confluence with the Middle Fork of the Koyukuk River to its confluence with Glacier River, then by Glacier River, Roy Creek, Upper Hammond River, the Itkillik River to its confluence with the Colville River, and the Colville River to the Arctic Coast; on the north by the Arctic Coast; on the east by the Sagavanirktok River to its confluence with the Lupine River, then the Lupine River to the Game Management Unit 25 boundary, then west and south along the boundary to the headwaters of Fish Creek; on the south by Fish Creek.

PRIMARY MANAGEMENT GOAL

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

SECONDARY MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

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

2. Encourage public viewing and photography of caribou.

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

THE SPECIES

The number of caribou in this area has declined during recent years. Approximately 5,000 caribou are residents, although some migrating animals from the Western Arctic and Porcupine herds migrate through the area.

Factors regulating the population size are poorly understood. Sport and domestic hunting is light and predation is moderate at this time. In contrast, both hunting and predation have played a significant role in reducing the Western Arctic herd which in turn has decreased the total number of caribou utilizing the Dietrich area.

Presently, hunting pressure is light in this area since aircraft provide the only means of access for recreational hunting. Domestic use of caribou in the area by hunters from Wiseman, Nuiqsuit and Barrow is low.

PROBLEMS

* A significant loss of habitat is occurring in the area as a result of industrial development. Habitat loss occurs in two forms: 1) physical destruction or alteration by construction; and 2) avoidance

of potentially available habitat because of man-made structures and activities in the area.

* If the Alyeska Haul Road is opened to the public hunting pressure will increase sharply and overharvesting of caribou populations could result. Management of caribou must consider the status and requirements of both the resident herd and migratory animals from the Arctic or Porcupine herds. Limitations on numbers of hunters and restriction of roadside hunting may be necessary to maintain desired harvest levels.

* A portion of the management area lies within the proposed Gates of the Arctic National Park. If land ownership is transferred to the National Park Service, recreational hunting may be prohibited and domestic use of caribou restricted. However, management by the National Park Service will benefit the nonconsumptive users.

* The wilderness character of the area may easily be lost by development or unrestricted land use. Hunting regulations which influence the use of the land affect people only when hunting. Therefore, successful retention of wilderness characteristics depends primarily on land management policies adopted by other State and Federal land management agencies.

IMPACTS

* Methods of off-road transport will be restricted and numbers of hunters will be limited.

* Restrictions will be placed on numbers of hunters, bag limits, hunting seasons and forms of transportation to achieve a sustained harvest without adversely affecting the herd.

* Emphasis will shift toward recreational use of wildlife and away from domestic use.

* Nonconsumptive users will also be affected by off-road transport, restrictions, but greater aesthetic experiences will be available than in other roadside areas in the state.

* Restrictions on modes of transportation and limits on the numberof hunters will reduce guiding operations in the area.

3. WESTERN ARCTIC CARIBOU MANAGEMENT PLAN

LOCATION

That portion of Game Management Unit 22 lying north of the Shaktolik River; all of Game Management Unit 23; those portions of Game Management Units 24 and 26 lying west of the Dietrich Caribou Management Plan area; and that portion of Game Management Unit 25 lying west of a line drawn from the headwaters of Fish Creek due south to the Yukon River.

PRIMARY MANAGEMENT GOAL

To provide for an optimum harvest of caribou.

SECONDARY MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Harvest no more than 5% of the population until the Arctic herd reaches 200,000 animals; thereafter harvest the annual increment.

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

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

4. Discourage establishment of reindeer grazing on historical caribou range.

5. Discourage land use practices that adversely affect caribou habitat.

THE SPECIES

From the 1940's to the early 1970's the western arctic caribou herd was the largest in Alaska. In 1963, the herd was estimated at 300,000 animals. A photo-census conducted in 1970 resulted in a minimum estimate of 242,000 caribou. A 1975 survey of post-calving aggregations yielded a tentative estimate of 100,000 caribou. Although caribou may appear to be abundant seasonally in some portions of the herd's 140,000 square mile range, the population is continuing to decline. No single factor appears to be responsible for this decline, but one important contributing factor has been the low proportion of young which survive to become yearlings. This proportion has dropped from 19 percent in 1970 to 8 percent in 1975. Since it is these animals which replace the adults which are lost from the population through natural and hunting-related mortality, such a decrease in their numbers has had serious consequences. Without drastic changes in the factors which cause mortality, the herd will continue to decline. Even if the present rates of survival of calves to yearling age increases to the level observed in 1970, the present herd size would not be able to produce the number of caribou necessary to sustain the amount of predation and hunting which now occurs. Predation is believed to be the most important natural mortality factor. Wolves, bears, wolverines, golden eagles and foxes prey on caribou but the highest kill is probably by wolves. An estimated 15,000 caribou per year may be killed by wolves, based on wolf density estimates of one wolf per 110 square miles. Wolf densities and predation are

highest in the southern portion of the caribou range where the majority of the animals have wintered during the last two decades. If wolf predation does account for as many animals as these rough estimates project, it would be a significant contributing factor in the caribou herd decline.

Range conditions do not appear to be a limiting factor. The habitat utilized by caribou in both winter and summer ranges appears to be in good condition and still able to support greater numbers than now exist. In addition the physical condition of caribou taken by local residents has been good, and initial calf production has been high. Both of these factors indicate good habitat condition.

The western arctic herd has received heavy use by native residents throughout history. The average annual kill since 1963 has been about 25,000 caribou, varying from 20,000 to 29,000. Most of these animals are taken as they pass villages during the spring or fall migrations or when animals spend the winter near settlements. Since the kill is largely dependent upon availability of caribou close to villages which is in turn dependent on migration routes and wintering areas, the kill near any particular settlement may fluctuate widely from year to year. During fall migration prior to the rut, adult bulls are often preferred. After this time cows or young bulls are taken when a choice is available. The total effect on the population is a reduction in the proportion of bulls. Hunting by local residents is primarily done with the aid of snow machines, although boats are sometimes used. Dog teams were the primary means of transportation until the late 1960's, but are rarely used today.

Past regulations have reflected the dependency of local people upon caribou for domestic use. From 1959 to 1976, there were no closed seasons or bag limits. In 1976 a limit of 15 caribou per year, closure of short portions of the season and prohibition of commercial sale of caribou were imposed to reduce total hunter kill.

Recreational harvests by persons not living in the area have probably not exceeded 1,000 caribou in any one year, and a more realistic estimate probably would be 300 animals, in either case a negligble proportion of the total kill. A majority of recreational hunting has been by guided nonresidents, but within the last five years an increasing number of resident hunters have been traveling to the area to hunt. Most of the access to the area by recreational hunters has been provided by aircraft. Though adult bulls in this area do not have exceptionally large antlers, the remote character of the region and the possibility of selecting trophies from large numbers of caribou increase the appeal to recreational hunters of hunting in the area.

PROBLEMS

* Development of oil reserves on Naval Petroleum Reserve #4 may occur on or adjacent to the calving grounds of the western arctic herd. This could result in abandonment of this critical habitat or in disturbance which would adversely affect calf survival. These problems may be resolved by establishment of a critical habitat area including the calving grounds or by restriction of human activities to those times of the year in which caribou are not calving or migrating to or from the area. Resource development must be managed to prevent alteration of habitat which would adversely affect range conditions in the area.

* Construction of pipelines to transport oil from the area could result in the obstruction of free movement by migrating caribou. The state should establish and enforce stipulations assuring unimpeded movement of caribou.

* Interest in reindeer husbandry is increasing. Reindeer grazing is generally incompatible with maintaining free-roaming caribou. The Department should work closely with other State and Federal agencies involved and with Native groups to insure that reindeer grazing is limited to areas of no competition with caribou.

* With the decline in population size and reduced yearling recruitment, the present levels of hunting and predation will result in even lower population numbers. The amount of hunter-related mortality such as wounding could be reduced by the improvement of hunting practices and elimination of wastage, factors which may account for 20-30 percent of the total kill by domestic users. In addition, the total hunter kill will have to be reduced and some measures may have to be taken to reduce predation if the herd is to recover.

* Increased access into the area may result in additional harvests above sustainable levels. Restrictions of methods of access may be necessary.

* A portion of the area used by the western arctic caribou herd will be selected under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. 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.

IMPACTS

* Limitation of the caribou kill to 5 percent of the population until the herd again reaches 200,000 will result in a reduced number of animals which are available for domestic use by local residents. In part, this impact may be lessened if wounding and wastage rates are reduced.

* Resource development may be constrained in certain areas or during certain times of the year.

* Management to allow the herd to increase to its former abundance may require a temporary decrease in wolf numbers.

DALL SHEEP IN ARCTIC ALASKA

In Arctic Alaska Dall sheep (*Ovis dalli*) are continuously distributed along the north slope of the Brooks Range from the Canadian border as far west as the Wulik Peaks. Minimum estimates of sheep numbers in the region place the current population size at about 10,000 sheep. No well-documented population fluctuations have been observed in the sheep populations throughout Arctic Alaska. No populations are currently known to be expanding, and it is thought that sheep numbers in the region, while subject to fluctuations, are comparatively stable at about current numbers.

Dall sheep are usually found in alpine habitat. During summer, they occupy relatively large areas. Mineral licks are an important component of sheep habitat in summer. Many important mineral licks are known throughout the Brooks Range. Sheep, especially ewes with lambs, will frequently travel several miles to use mineral licks where they eagerly eat the mineral rich soil. The exact nature of sheep dependence on mineral licks is not fully understood. The use of mineral licks also serves to intermingle otherwise discrete populations and is of importance in maintaining genetically healthy herds.

Winter ranges are the third critical component of Dall sheep habitat. Winter ranges are characterized by windblown ridges or slopes. These ranges usually occur at the mouths of tributaries along major drainages where prevailing winds clear winter snow from forage. A herd occupying many square miles of summer habitat may be restricted to, and limited in size by a winter range of relatively few acres. Some herds occupy winter ranges which are several miles from their summer ranges and migrate between the two. These seasonal migrations often include side trips to utilize mineral licks, and are an ingrained tradition of each population. Sheep are extremely loyal to their traditional summer ranges, winter ranges and mineral licks and appear on these ranges at about the same time each year.

Predation in Arctic Alaska does not appear to be a major factor in limiting sheep numbers, however, occasional situations arise where predation may depress sheep numbers. Wolves are the main predator on sheep, but wolverines, bears and sometimes eagles have been known to take sheep.

Dall sheep in Arctic Alaska are used for nonconsumptive wilderness values and for comsumptive recreational and domestic utilization. Traditionally only rams with horns of 3/4 curl or greater have been legal game during an August-September season. For the last several years sheep hunters have spent an average of about 700 man days per year hunting for sheep in the region. The number of hunters has averaged about 150 and the number of rams harvested annually has averaged about 110 over this period. Resident hunters comprise about 65 percent of the hunter effort and have a success ratio of about 60 percent. Nonresident hunters have a success rate of about 85 percent, perhaps reflecting the benefit of the mandatory presence of a guide. Domestic utilization of Dall sheep has played a minor but continuing role in the Arctic Region. Kaktovik and Anaktuvuk Pass Eskimos take sheep, but these people have never been entirely dependent on sheep for food. It is difficult to assess the future trends of hunter pressure and harvest in the Arctic Region but hunter effort will probably be greater than it has been in the past.

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 some locations most legal rams are removed annually. In some 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.

1. NORTH SLOPE BROOKS RANGE SHEEP MANAGEMENT PLAN

LOCATION

Game Management Unit 26, the north slope of the Brooks Range.

MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control the number and distribution of hunters, if necessary, to maintain aesthetic hunting conditions.

2. Discourage land use practices that adversely affect the wilderness character of the area.

THE SPECIES

About 10,000 Dall sheep are currently estimated to occur north of the crest of the Brooks Range. No significant population fluctuations have been documented for sheep of this area.

Natural mortality rather than hunting is the primary source of mortality. Although predation may occasionally depress local sheep populations, it does not appear to be a major factor in limiting sheep numbers at this time. Wolves are the main predator on sheep, but wolverines, bears and sometimes eagles are occasional predators. Other causes of natural mortality such as accidents, disease, and starvation also limit population growth.

The condition of the Brooks Range Dall sheep habitat is not known, but stability of sheep numbers in recent years suggests that range conditions have remained unchanged. Because of the long winters and short cool summers, vegetation growth is slow and habitat is limited; further expansion of the sheep population is not anticipated.

Dall sheep in the Brooks Range are used both for nonconsumptive wilderness values and for recreational hunting. The wilderness character of the region and the opportunity to hunt in an area where chances of encountering other people are minimal are factors which draw many recreational hunters to the area.

About 150 hunters annually have hunted in the area in recent years, taking an average of 110 sheep each year. Residents comprise about 65 percent of the hunters and have a success ratio of about 60 percent. Nonresident hunters have a success rate of about 85 percent (the mandatory presence of a guide may result in higher success).

The use of Dall sheep for food by Kaktovik and Anaktuvuk Pass Eskimos has played a minor but continuing role. This use has been traditional, but these people have never been entirely dependent on sheep for food. The current use of the resource in late winter with the aid of aircraft and snow machines underscores the changing pattern of use from that of former years.

Although boats, horses and off-road vehicles are also employed, the large majority of sheep hunters in the Brooks Range use aircraft to

reach hunting areas. Since access by air is limited to suitable landing sites on lakes or gravel bars, overharvests may occur in those portions of drainages near such landing areas. As hunting pressure and demand for use of access points increases, it is expected that overharvest and hunter crowding will increase near these locations unless otherwise regulated.

PROBLEMS

* Harvest in the Brooks Range is not evenly distributed, but is concentrated around access points such as airstrips and lakes. Restrictions on access and the numbers of hunters in any one area may be required to maintain aesthetic hunting conditions.

* Taking of sheep for food by local residents frequently occurs out of season. Illegal practices should be stopped.

* A sizeable portion of the Brooks Range Dall sheep habitat is included in the proposed Gates of the Arctic National Park where hunting may be limited or prohibited. Increased hunting pressure in remaining portions of the Brooks Range could be alleviated by regulation of access and numbers of hunters.

* A portion of the Brooks Range Dall sheep habitat will be selected under the terms of the Alaska native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. The Department should solicit the cooperation of private landowners to facilitate progressive management of sheep. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

IMPACTS

* Restrictions on access and number of hunters will be necessary to disperse hunting pressure and to maintain aethetically pleasing conditions. Such restrictions may reduce guiding activity and hunter freedom in the area.

* Costs of resource development may be increased by constraints imposed to protect sheep habitat.

2. ATIGUN SHEEP MANAGEMENT PLAN

LOCATION

In Game Management Unit 26, T11S, R12E and T11S, R13E, Umiat Meridian.

MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Maintain a continuous closure to sheep hunting in the area.
2. Encourage public viewing and photography of sheep and enhance viewing facilities.
3. Control access and activities of viewers and photographers, if necessary, to reduce disturbance to sheep.

THE SPECIES

The Atigun Canyon area contains important sheep winter range, lambing areas and mineral licks. Reliable sheep survey data for the Atigun area are available for 1970 only. At that time 372 sheep were counted in the Atigun River drainage, 91 of which were in the Atigun Canyon area. The present status of Atigun Dall sheep is unknown, but there is no reason to suppose that substantial changes in numbers have occurred.

Data on natural mortality and condition of the range are lacking. Wolves are the most important predator and are abundant in the area. Grizzly bears and eagles also frequent the area and prey upon sheep or scavenge on sheep remains.

Hunting seasons and bag limits have been in effect in the area since 1925. Beginning with the 1951 season, hunters were restricted to taking rams with 3/4-curl horns or larger. Hunting seasons have varied between 11 days and 133 days; bag limits varied from 1 to 3 sheep. Current regulations allow hunting from August 10 through September 20 with a bag limit of 1 three-quarter curl ram.

Sheep harvests are reported by drainage, and hunting pressure in the Atigun Canyon can be inferred only from returns for the whole of the Atigun River drainage. Twenty-nine sheep have been reported killed by hunters from 1968 through 1975 for the Atigun River drainage. Sixty-one percent of the hunters who reported hunting in the Atigun drainage were nonresidents, a higher figure than for the Brooks Range as a whole (35-50 percent). Harvests have probably not affected population size or structure.

Prior to 1974, sole access to the Atigun Canyon area was by light aircraft. Wheel-equipped aircraft were able to land on gravel bars along the Atigun and Sagavanirktok Rivers and float-equipped aircraft could land on Galbraith Lake. The service road for the Trans-Alaska Pipeline now traverses the length of the Atigun River except for Atigun Canyon and, when opened to public use, will allow people to drive to the upper end of the canyon. In addition, a 5,200 foot permanent airstrip now exists near the north end of Galbraith Lake. The Atigun Canyon area will be easily accessible once these facilities are open to the public.

PROBLEMS

* Greatly improved public access to the Atigun area will occur when the North Slope Haul Road is opened to the public. Without adequate planning this may result in disturbance of sheep on lambing grounds and mineral licks, interference with traditional sheep movements, and damage to tundra from off-road vehicles. Closure of the Atigun area to sheep hunting and controls on numbers and activities of visitors should minimize adverse impacts of increased public use. Cooperative actions with the appropriate land management agency would enhance nonconsumptive use opportunities through the restriction of conflicting human activities.

IMPACTS

* Opportunity to hunt in the area will be excluded, affecting a limited number of hunters and guides.

* Considerable nonconsumptive use of sheep will be possible.

* Important sheep habitat will be protected from detrimental effects of human activity.

MOOSE IN ARCTIC ALASKA

Moose (*Alces alces*) occur throughout Arctic Alaska from the Chukchi Sea to the Canadian border, and from the Brooks Range to the Arctic Ocean. The major factor influencing distribution of moose in this region is the availability of suitable habitat. Streamside shrub communities, consisting of willows, alders, and cottonwoods, are used throughout the year, and are the most important foraging areas for moose in northern Alaska. These areas are the primary winter range available to moose and they are also used for breeding and calving.

The northward expansion of moose into Arctic Alaska has apparently occurred during the past 100 years. Nunamiut Eskimos relate that moose were unknown north of the Brooks Range before 1870 to 1880. However, beginning in 1880, moose were occasionally killed by Nunamiut on the Colville River. The scarcity of moose in northern Alaska prior to 1900 is further supported by their absence from written accounts of naturalists and explorers traveling north of the Brooks Range during this time.

Nunamiut began observing occasional young adult moose moving north through the Brooks Range about 1900, and moose probably existed in low numbers on several major North Slope rivers throughout the early 1900's. Native hunting and predation along the Colville River and its tributaries may have retarded growth of some populations during this time. Moose apparently began to increase in numbers and to expand their range in Arctic Alaska in the late 1940's and early 1950's. A reduction of native hunting and expansion of predator control during this time probably facilitated growth of moose populations and dispersal of animals along streams throughout most of the region.

The present status of moose populations in Arctic Alaska is very good. Moose probably reach their greatest densities along the middle Colville River and its tributaries. Winter densities of approximately two moose per square mile have been observed on the Colville River between the Killik and Anaktuvuk Rivers, and on the Chandler and Anaktuvuk Rivers. Moose also occur along rivers and streams to the west, north and east of this area, although densities are not as great. They are occasionally observed as far west as Cape Lisburne and as far north as Barrow. However, they are probably migrants in these coastal areas, and winter along rivers further inland.

Annual reported moose harvests in Arctic Alaska are low, ranging from one to 57 between 1963 and 1975. A considerable portion of the harvest is reported by hunters who reside elsewhere in Alaska. However, a large but unknown number of moose are killed, but not reported, by residents of the region.

PROBLEMS

* The certainty of increased hunting and the extreme vulnerability of moose to hunters could easily result in overharvest. A persistent effort to monitor harvest, and to set and enforce appropriate hunting regulations will be required to protect these moose populations.

* 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 of moose populations in some areas of Alaska 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.

* Resource exploration and development causing a decrease of limited critical riparian habitat is of major consequence to moose. Efforts must be made to protect critical habitat and assure free access by moose to these habitats.

1. NORTHEAST ARCTIC MOOSE MANAGEMENT PLAN

LOCATION

That portion of Game Management Unit 26 lying east of the Dietrich Moose Management Plan area.

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting moose.

SECONDARY MANAGEMENT GOAL

To provide for an optimum harvest of moose.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Harvest less than the annual increment of moose until the moose population approaches the carrying capacity of the habitat.

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

3. Maintain a post-hunting season population sex ratio of no less than 20 bulls per 100 cows.

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

THE SPECIES

Moose density in this area is low, and it has probably never been high. Based on limited surveys, production of calves is good, and population numbers are probably stable or increasing slightly. As in most of the North Slope, the expansion of moose into this area probably began about 1880 and increased rapidly during the 1950's and 1960's.

The most important moose habitat in this area are shrub communities of willows, alders, and cottonwoods, which are found along rivers. This is the only habitat available to moose during the winter and it is also used heavily during breeding and calving seasons. Because moose are dependent on the limited shrub communities along rivers, their vulnerability to habitat destruction, alteration, and human disturbance is great.

The annual hunter harvest in this area is probably no more than 10-15. This figure could increase to 30 with little effect on population size if neither productivity nor survival of calves decline. Hunting pressure throughout the North Slope has been light but a trend toward increasing hunting effort began in 1968 and is expected to continue. To date, hunting has not adversely affected population size or composition.

The majority of use in this area has been by recreational hunters from urban areas in the Interior. The number of guided moose hunters annually is small, but the interest by guides in this area is increasing. The taking of moose for domestic use by local residents has been low. With the possible exception of occasional snow machine use, hunter access to this area has been entirely by aircraft. Aircraft are presently the only feasible means of access to the area and will remain so unless road systems are developed.

PROBLEMS

* Portions of the area will be selected under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. 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.

* Increased development associated with resource extraction and exploration may result in the destruction of habitat along rivers. Critical moose habitat should be protected and construction or other development directed to areas of the least potential impact.

* Increased access into the area might result in excessive harvest levels. Restriction of hunter numbers or method and means may be necessary.

IMPACTS

* Constraints on resource development and associated construction in critical moose habitat areas may increase costs of development.

2. DIETRICH MOOSE MANAGEMENT PLAN

LOCATION

In Game Management Units 24 and 25, the area bounded on the west by the south fork of the Koyukuk River from its confluence with Fish Creek to its confluence with John R. Creek, then northwest to the Middle Fork of the Koyukuk River to the North Fork of the Koyukuk River, then the North Fork of the Koyukuk River from its confluence with the Middle Fork of the Koyukuk River to its confluence with Glacier River, then by Glacier River, Roy Creek, Upper Hammond River, the Itkillik River to its confluence with the Colville River, and the Colville River to the Arctic Coast; on the north by the Arctic Coast; on the east by the Sagavanirktok River to its confluence with the Lupine River, then the Lupine River to the Game Management Unit 25 boundary, then west and south along the boundary to the headwaters of Fish Creek; on the south by Fish Creek.

PRIMARY MANAGEMENT GOAL

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

SECONDARY MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Control access and methods of hunter transport to maintain aesthetic hunting conditions.

2. Control the number and distribution of moose hunters, if necessary, to distribute hunting pressure through the area.

3. Encourage public viewing and photography of moose.

4. Discourage land use practices that will excessively disturb the wilderness character of the area.

THE SPECIES

Moose are not particularly abundant in this area. On the north side of the Brooks Range small, isolated moose populations exist in the larger drainages where streamside willow is abundant. These populations range in size from 35 to 150 moose and total only 300-400 moose. Observations suggest these populations are doing well, but because of restricted habitat they are not expected to increase. On the south side of the Brooks Range moose are widespread in all drainages but exist in low densities. Based on limited data collected by game biologists and hunters, the survival of calves appears poor, which suggests that the moose population. may be declining.

The trophy potential of bull moose in the Dietrich area is relatively high. Presently, there is a high proportion of old bulls in the population. Antler growth rates of these bulls is near the average for Alaskan moose.

Accurate estimates of harvest are not available because of the ineffectiveness of the harvest reporting system in the bush. Although in some portions of the area the harvest relative to the population size may be fairly high, the total harvest is considered low.

Recently the reported kill for the Brooks Range has steadily increased despite reduced hunting seasons and bag limits. Industrial development in northern Alaska continues to attract attention and people to this area. The residency of hunters currently utilizing the Dietrich area is not available, but for the much larger northern Alaska area about 75 percent of the hunters have been Alaskans and 25 percent non-Alaskans. The substantial number of nonresidents reflects the importance of guiding in the area. Domestic use of moose in the Dietrich area is low since few people reside there. There is some nonconsumptive use of wildlife, primarily during summer in the mountainous portion. Present public access is limited to aircraft and boats.

PROBLEMS

* Resource development will cause new problems for moose populations. Habitat loss is occurring from Prudhoe Bay oil development and its associated pipeline through the Brooks Range. Direct habitat destruction results from roads, pipe pads, and construction camps, though these disturbances may create new range. Indirect loss of habitat may occur if potentially available range is not utilized because of avoidance to man-made structures or activities. Additionally, secondary development of other industries will occur when the road is opened to the North Slope, further contributing to habitat degradation. Development should be regulated to minimize adverse impacts on moose.

* Moose in the area are particularly vulnerable to hunting because of the relatively open habitat and their tendency to concentrate along rivers and creeks during fall and winter. If Alyeska's Haul Road is opened to the public the pattern of access and the number of hunters will change dramatically, and harvests could easily become excessive. Regulations commensurate with expected changes in hunter distribution and numbers are necessary.

* Many land use practices that adversely affect the wilderness character of the area are not subject to regulation by the Department. Hunting regulations which influence the use of the land affect people only when hunting. Successful retention of wilderness characteristics depends primarily on land management policies adopted by other State and Federal land managing agencies.

IMPACTS

* Quality hunting experiences will be maintained, but the number of hunters participating will be limited.

* Opportunities for observing moose in an accessible wilderness setting will be maintained.

* Hunting seasons will be relatively long and mechanized off-road vehicles will be restricted. For the immediate future the number of hunters will be limited by their success in taking moose and by the allowable harvest of moose.

* Restrictions on modes of transportation and limits on the number of hunters will reduce guiding operations in the area.

3. COLVILLE MOOSE MANAGEMENT PLAN

LOCATION

In Game Management Unit 26, the drainages of the Colville River excluding the Dietrich Moose Management Plan area.

PRIMARY MANAGEMENT GOAL

To provide for ~~an optimum~~ the sustained use of wildlife harvest of moose.

SECONDARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting moose.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Harvest the annual increment to the moose population.
2. Maintain a post-hunting season population sex ratio of at least 20 bulls per 100 cows.
3. Regulate hunting seasons, bag limits and methods and means of taking moose, if necessary, to provide for local use.
4. Control the number and distribution of hunters, if necessary, to distribute hunting pressure through the area.
5. Harvest antlerless moose, if necessary, to attain the desired population size and structure.
6. Discourage land use practices that adversely affect moose habitat.

THE SPECIES

Present moose numbers along the Colville River and its tributaries are as high as they have ever been and may include nearly 1000 animals. Moose probably reach their greatest densities along the middle Colville River and its tributaries. Densities of approximately two moose per square mile have been observed on the Colville between the Killik and Anaktuvuk Rivers, and on the Chandler and Anaktuvuk Rivers. Moose also occur along rivers and streams to the west, north and east of these rivers, although densities are not as great.

The expansion of the moose population in this area began about 1880 but numbers have probably shown their greatest increase since the early 1950's. Production and survival of calves is high, and the population may be increasing slowly. Surveys conducted in spring 1976 along portions of the Colville drainage indicated 22 percent of 743 animals seen were calves. The area does not produce bulls with exceptionally large antlers nor does it appear to have the potential for doing so; however, except in localized areas of high hunting pressure, the proportion of bulls in the population is about 50 bulls per 100 cows.

The habitat crucial to moose populations in this area and throughout the north slope are shrub communities of willows, alders, and cottonwoods along rivers. This is the only habitat available to moose during the winter and is also used heavily during breeding and calving seasons. Although this riparian habitat is extensively used, at the present time no indications of overbrowsing by moose have been observed. Because

moose are dependent on the limited shrub communities along rivers, the vulnerability to habitat destruction and alteration, or to human disturbance caused by resource development is clearly great.

Most of the moose hunting on the North Slope occurs along the Colville River and its tributaries. Only 60-80 moose are killed annually in this drainage but up to 150-180 could be taken without affecting the population size if hunting were dispersed throughout the river system and productivity and survival of moose remain unchanged. Hunting pressure in the area has been light in the past with locally heavy harvests near Umiat. However, a trend towards increasing hunting effort began in 1968 and is expected to continue. At this time, the increased kill has not adversely affected population size or composition. From 1968 to 1974, an average of 84 percent of the hunter kill consisted of bulls, but the proportion of bulls in the population remains high.

The length of the season, from August 20 to December 31, is designed to accommodate hunting for domestic use by local residents. Most of the reported kill takes place within the first 30 days. The majority of use in this area has come from recreational hunters. From 25-30 percent of the moose hunters in the area are nonresidents, about 20 percent reside within the area and the remainder are Alaskan residents, mostly from urban areas in the Interior. The number of guided hunters is low compared to other parts of the state but this use is increasing. Killing moose for domestic use by local residents has been low in the past. Since the establishment of Nuiqsut in 1973, this use has and will probably continue to increase.

Hunter access to the Colville River drainage has been primarily by aircraft; gravel bars suitable for landing light planes are numerous along rivers. Boats and off-road vehicles have been used in conjunction with aircraft, and a small amount of hunting takes place solely with the aid of boats.

PROBLEMS

* Because moose distribution is centered along rivers where moose are highly visible and access by aircraft or riverboat is excellent, moose are very vulnerable to hunters, and the potential for overharvest is great. This will be especially true near established airstrips and camping sites. To maintain population productivity and avoid local overharvest, the number and distribution of hunters may have to be controlled.

* The development of energy resources, construction of roads, or the placement of pipelines could result in the destruction of critical habitat or disturbance detrimental to the moose population. These types of activities should be discouraged along river courses and if construction is allowed, it should be scheduled during those portions of the year when adverse effects would be minimized.

* A portion of this area will be selected for private ownership under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. 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.

* Portions of the Anaktuvuk River and all of the Killik and Okokmilaga Rivers are included in the proposed Gates of the Arctic National Park where hunting may be limited. This could increase hunting pressure in the remaining portions of the Colville River drainage. This situation could be alleviated by regulation of access and numbers of hunters.

IMPACTS

* The moose population in the Colville River drainage will maintain its present numbers or may grow slowly and expand into adjacent suitable habitat. The proportion of bulls in the population may decrease but should not affect the productivity of the population.

* The hunter kill of moose will be distributed over a wider area and may be limited to between 150-180 animals.

* Protection of moose habitat along rivers may result in constraints on resource development or construction activities in some areas.

4. NORTHWEST ARCTIC MOOSE MANAGEMENT PLAN

LOCATION

Game Management Unit 26A excluding the drainages of the Colville River.

PRIMARY MANAGEMENT GOAL

To provide the greatest opportunity to participate in hunting moose.

SECONDARY MANAGEMENT GOAL

To provide for an optimum harvest of moose.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Harvest less than the annual increment of moose until the moose population approaches the carrying capacity of the habitat.

2. Maintain a post-hunting season population sex ratio of no less than 20 bulls per 100 cows.

3. Regulate hunting seasons, bag limits and methods and means of taking moose to provide for local use.

4. Harvest antlerless moose to attain the desired population size and structure.

THE SPECIES

While the abundance of moose in this area is low, it is probably as high as it has ever been. From the limited survey results available, it appears that although production of calves appears to be very good, the population growth is probably static or increasing only slightly. As in most of the North Slope, the expansion of the moose population in this area probably began about 1880 and has undergone the greatest increase since the early 1950's.

The habitat most important to moose in this area and throughout the North Slope are those shrub communities, including willows, alders, and cottonwoods, which are found along river courses. This is the only habitat available to moose during the winter and it is also used heavily during breeding and calving seasons. Because moose are dependent on the limited shrub communities along rivers, their vulnerability to habitat destruction, alteration, or to human disturbance caused by resource development is great.

Including unreported kills, the annual take by hunters in this area is probably no more than 10-15. The harvest could increase to 30 animals with little effect on population size if neither productivity nor survival of calves decline. Hunting pressure throughout the North Slope has been light in the past, but a trend toward increasing hunting effort began in 1968 and is expected to continue. Thus far, hunting has not adversely affected population size or composition. The majority of use in this area has been by recreational hunters from urban areas in the Interior. The area has rarely been used by guided hunters in the past but this use may increase. The taking of moose for domestic use by local residents has also been low. With the exception of occasional use of river boat or snow machines, hunter access to this area has been entirely by aircraft. These access patterns are not expected to change unless extensive road systems are developed.

PROBLEMS

* Portions of the area will be selected under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting. 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.

* Increased development associated with resource extraction and exploration may result in the destruction of habitat along rivers. Critical moose habitat should be protected and construction or other development directed to areas of the least potential impact.

* Increased access into the area might result in excessive harvest levels. Restriction of hunter numbers or method and means may be necessary.

IMPACTS

* Constraints on resource development and associated construction in critical moose habitat areas may increase costs of development.

MUSKOXEN IN ARCTIC ALASKA

Populations of muskoxen (*Ovibos moschatus*) in Arctic Alaska are presently found on the North Slope between the Sagavanirktok River on the west and the Canadian border on the east. They are normally found between the coast and the foothills of the Brooks Range. Occasionally lone animals or small groups will wander long distances outside of these limits.

This species, extirpated from its original range on Alaska's Arctic Slope in the mid-1800's, was reintroducted into Alaska with a transplant of 31 Greenland muskoxen to Nunivak Island in 1935 and 1936. The purpose of the transplant was to provide a nucleus herd from which muskoxen could be taken to reestablish populations over their historic ranges in Alaska as well as to provide for recreational, scientific and agricultural utilization of the animals.

The first transplant to the Arctic was made from the Nunivak herd in March and April 1969 when 51 muskoxen were released in the vicinity of Barter Island. At first the animals divided into small groups and wandered in different directions, a few migrating into Canada and one moving through the Brooks Range to the Chandalar River. Seven were known to have died within three months. The stress associated with capture and the confinement in small crates for many hours contributed to this initial mortality. A second transplant to the North Slope was made in 1970 with the release of 13 animals on the Kavik River.

During the next few years the muskoxen in the Arctic divided into three well-defined groups each ranging in a different area. One group, consisting of about 16 animals, now occupies the area along the Canning River between the coast and the foothills of the Brooks Range. They rarely move more than 20 miles from the river. A survey in 1974 revealed nine adults and five calves in this group. A second group ranges along the Sadlerochit River. This group contained nine adults and three calves in 1974. A third group has settled between the Jago River and the Kongakut River. This group consisted of eight adults and six calves in 1974. Because of the large area inhabited by the muskoxen and the difficulty of making surveys, those muskoxen observed represent a minimum estimate of numbers.

The muskoxen appear to be healthy and are reproducing, however, no significant increases in the total number has been noted. The exact cause of the mortality that does occur is unknown but it is probably associated with animals wandering into areas of limited winter food or it may be attributed to predation.

The winter habitat requirements for muskoxen seem to be windblown tundra areas with very light snowfall which permits them to feed on grasses and sedges throughout the winter. The North Slope meets these requirements in many areas.

Public observation of muskoxen in the Arctic has been very limited, because of the remoteness of the area, and the expense required to reach it.

PROBLEMS

* Construction of a proposed natural gas pipeline and a road connecting the pipeline haul road to the village of Kaktovik could create a problem for muskoxen if it blocked their movements or if disturbances were of the magnitude to drive muskoxen from their winter range or calving areas. More information about muskoxen habitat requirements in the Arctic is required in order to make rational recommendations to minimize disturbance of muskoxen or the alteration of important habitat by resource development or construction activities.

* Predation by wolves and brown bears may be a factor in preventing the increase of this small nucleus population.

1. ARCTIC SLOPE MUSKOX MANAGEMENT PLAN

LOCATION

Game Management Unit 26.

MANAGEMENT GOAL

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

EXAMPLES OF MANAGEMENT GUIDELINES

1. Establish a viable population of muskoxen on historic mainland Alaska ranges.

2. Allow removal of bull muskoxen that are in excess to those required for continued population expansion.

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

4. Encourage scientific studies of muskoxen.

THE SPECIES

Although muskoxen once ranged from Greenland through the Canadian Arctic Archipelago to the coastal plain of Arctic Alaska, the last native animals in Alaska were killed between 1850 and 1860. In 1969 and 1970, a total of 64 muskoxen were transplanted to the eastern North Slope and released at Barter Island and on the Kavik River. Since that time most of the muskox sightings have occurred on the Arctic National Wildlife Range, although a few individuals have been seen outside of its boundaries. There was substantial mortality or movement and loss to the herd and by 1971 a minimum estimate of 24 muskoxen was made, though the total number was believed to be higher. By 1974, a total of 39 were seen in the area, including 12 calves. A slow but steady increase of the herd is anticipated.

Factors causing mortality among muskoxen are usually predation, old age, or lack of forage during winter. The initial high mortality of these animals after the transplant was undoubtedly partially due to stress caused by physical handling and moving; in addition some single and small groups of animals moved out of the area or were killed by hunters unfamiliar with them. The level of mortality has probably stabilized at this time and consists mostly of the death of old or immature animals.

Muskox habitat does not appear to be a limiting factor to their population growth in this area. If, as records suggest, muskoxen once roamed throughout the region, the habitat available should still be able to support them, since it has not undergone any known alterations. The preferred food species of Labrador tea, crowberry, lingonberry, dwarf birch, willows, sedges, grasses, and horsetails are all found along the coastal plain in Arctic Alaska.

At present no hunting of these animals is allowed and none is anticipated until the population is more firmly established, although the few adult bulls which leave the herds could be hunted without affecting herd integrity. Hikers and photographers rarely encounter muskoxen in Arctic Alaska, even though the use by these groups of the Arctic National

Wildlife Range is high relative to the remainder of the North Slope. Nevertheless, the fact that muskoxen inhabit the area and that there is a possibility of encountering them undoubtedly increases the appeal of the area.

Most of the nonconsumptive use of the area occurs during summer and early fall. There is no domestic use of the muskox by the people of Kaktovik, although they may desire to act as guides for hunters once a population surplus exists to allow hunting. The same use pattern would be expected if more transplants are made or the population grows and begins to expand onto other locations along the coastal plain.

The difficulties of access and the small numbers of muskoxen result in few human encounters with these animals. Access is restricted by the character of the environment: local residents from Kaktovik use snow machines throughout the area; ski-equipped aircraft can land in many locations during the winter, but summer access by air is limited to gravel bars and coastal abandoned DEW sites for wheel-planes and lakes and coastal areas for float planes. The country is difficult to hike through during the summer and most hikers travel along the rivers.

PROBLEMS

* Construction of a proposed natural gas pipeline and related development could create disturbance or an impediment to movement which would adversely affect muskox population growth or survival. Construction of the proposed road which would connect the Pipeline Haul Road to Kaktovik could provide a barrier to free passage of muskoxen in this area. Traffic on the road and increased access into the area could also affect population movement or habitat use. Existing and proposed developments throughout the coastal plain may effect similar constraints on further expansion of muskoxen populations. Careful monitoring of any such development and firm stipulations which minimize man-caused disturbance should be made before any construction begins. Designation and protection of areas important to muskox populations such as wintering and calving areas may minimize the effects of road construction; limitation of access into areas of critical habitat may also be necessary.

* A portion of the coastal plain where future expansion of the muskox population may occur will be selected under the terms of the Alaska Native Claims Settlement Act. Private landowners may prohibit public trespass for hunting and viewing. The Department should solicit the cooperation of private landowners to facilitate progressive management of muskoxen. Easements across private lands to public lands will be sought as provided for in the Alaska Native Claims Settlement Act.

IMPACTS

* The population of Arctic Alaska muskoxen will increase slowly. It will be some time before muskoxen are again established throughout the coastal plain. However, a limited amount of hunting of solitary bulls may be allowed during this period without affecting herd expansion.

* Restrictions on number of hunters and on access and method and means of hunting will be necessary to maintain aesthetically pleasing conditions, but will limit participation of hunters.

* Constraints on construction or transportation activities imposed to protect important muskoxen habitat may increase costs of such operations.

* Guiding or providing services for hunters or nonconsumptive users may provide some coastal villagers with an additional source of income.

FURBEARERS IN ARCTIC ALASKA

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

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

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

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

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

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

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

but generally extends from November through April. Ground squirrels and marmots hibernate and are not available from November to April.

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

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.

* Diseases carried by foxes which are transmittable to man have been a long-standing problem throughout North America. Control efforts have been initiated in the Arctic in the past. Specific conflicts between rabid animals and humans are a recent problem which may necessitate continued efforts to keep fox populations at low levels around communities or development sites.

* Development activities are occurring at such a rapid rate in the Arctic that it is impossible to predict long term trends in furbearer populations or their utilization by humans. The nation's energy needs have apparently dictated low priorities to wild lands and wildlife populations. Development activities should be monitored to prevent unnecessary destruction or loss of furbearer habitat.

LIST OF FURBEARERS IN ARCTIC ALASKA

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

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 sourc 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 availability. 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 ARCTIC ALASKA

GROUSE AND PTARMIGAN

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

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

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

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

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

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

HARES

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

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

PROBLEMS

* Almost nothing is known regarding small game hunting pressure and success in the Arctic Region. With the dramatic increase in human activity in this region hunting pressure is certain to increase in the future, therefore programs designed to yield information on hunting pressure and success should be instituted.

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 ARCTIC ALASKA

Arctic Alaska annually supports hundreds of thousands of breeding and molting waterfowl* plus several million birds going to and from Arctic Canada nesting grounds. Primary breeding habitats occur north of the Brooks Range on the coastal plain, generally below 600' elevation. Coastal barrier islands are also important for eiders and other nesting birds. River deltas are especially important for migrants as they are the first areas to have open water in the spring. The large lakes in the Lonely-Cape Halkett area are heavily used by molting white-fronted and Canada geese, black brant and snow geese. Large concentrations of molting old squaw ducks and other birds are found on coastal lagoons between the barrier islands and the mainland.

Aquatic habitat in this region is extensive but does not procure great numbers of waterfowl. Even with long periods of continuous sunlight, the waters are cold and plant productivity is lower than other Alaskan waterfowl habitats. Snow cover and cold weather virtually preclude waterfowl production during some years. Productivity in coastal estuarine habitat is limited because low tides in Arctic Alaska are insufficient to create wide and productive intertidal flats. Except for coastal barrier islands waterfowl habitat in this region is quite stable and is generally in good condition. Barrier islands gradually change because of tidal action and severe storms. These islands are essential to creating inshore lagoons and associated waterfowl habitat.

Extensive breeding duck surveys, conducted over most of Alaska, have not been made in Arctic Alaska. However, results of some intensive aerial and ground surveys indicate average breeding duck populations over the 23,000 square miles of nesting habitat are: dabbling ducks - 228,300; divers - 20,400 and nongame ducks - 309,500. Collectively, these ducks are estimated to produce 248,800 young. The average fall flight of geese from the region is estimated at: white-fronted - 175,000, Canada - 35,000, black brant - 10,000, emperor - 2,000, and snow - 500. The flight of white-fronted geese represents over half of the Mid-continent Population. The only known snow goose colony in Alaska occurs on Howe Island in the Sagavanirktok River Delta.

An estimated average of 10,000 whistling swans originate from the Arctic Region and migrate primarily to Chesapeake Bay and other East Coast wintering areas. Trumpeter swans are rare and probably do not nest in the region.

Waterfowl in Arctic Alaska are utilized primarily for domestic consumption, with most of the harvest occurring outside of the legal hunting season. Most harvest occurs at Barrow, but birds and eggs are taken at all towns and villages, especially those along the coast. Two estimates of eider harvest at Barrow are available. In 1954 the kill was estimated to be 11,000 and in 1970 8,800 birds. A 1974 Land Use Planning Commission study estimated the total native subsistence harvest on the Arctic Slope to be: ducks - 16,600; geese - 960; and eggs collected (all species) - 45,000. The spring take depends a great deal on the success of whale hunts. Domestic utilization in Arctic Alaska is not known to adversely affect any waterfowl species.

Sport hunting for waterfowl is limited primarily to the Barrow area and only a few hundred birds are taken annually. Very few people travel to the Arctic for waterfowl hunting primarily because of the cost, lack of accommodations and the short season. Many birds leave the region by September 1 and by mid-September all birds are gone, except for eiders and old squaws along the coast.

Nonconsumptive use of waterfowl is low and is limited primarily to areas near towns, villages, DEW line sites and oil drilling camps. Neither

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

sport hunting, domestic utilization or nonconsumptive use of waterfowl is expected to appreciably increase in the forseeable future.

PROBLEMS

* Pollution of coastal waters by oil or oil industry-related contaminants poses a serious threat to waterfowl and waterfowl habitat in Arctic Alaska. Both Outer Continental Shelf (OCS) 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, bird numbers and relationships between birds and habitat 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 purposes. Ongoing federally funded state and federal O.C.S. bird studies are designed to identify and quantify the effects of these problems.

* Oil and gas drilling activities on barrier islands and onshore sites pose a serious threat to waterfowl. The removal of gravel from islands for drilling pads could cause a loss of nesting habitat and a loss of protection for the inshore lagoons. Equipment noise and increased aircraft use in support of 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 from human disturbance are needed to provide rational recommendations and stipulations on land use to protect waterfowl resources.

* Although killing waterfowl during spring is prohibited under provisions of the Migratory Bird Treaty Act, much of the domestic use by local residents of the region is during spring. Federal and state enforcement agencies have been lenient, because of traditional Native dependency on the 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.

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*

LIST OF WATERFOWL SPECIES IN ALASKA

	Common Name	Scientific Name
	Garganey	*Anas querquedula*
	Green-Winged Teal	*Anas crecca carolinensis*
	Mallard	*Anas platyrhynchos*
	Pintail	*Anas acuta*
	Wood Duck	*Aix sponsa*
Diving Ducks	American Goldeneye	*Bucephala clangula americana*
	Barrow's Goldeneye	*Bucephala islandica*
	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Pochard	*Aythya ferina*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Redhead	*Aythya americana*
	Ringneck	*Aythya collaris*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck	*Aythya fuligula*
Sea Ducks and Mergansers	American Common Merganser	*Mergus merganser*
	American Common Scoter	*Oidemia nigra*
	Harlequin	*Histrionicus histrionicus*
	Hooded Merganser	*Lophodytes cucullatus*
	King Eider	*Somateria spectabilis*
	Old Squaw	*Clangula hyemalis*
	Pacific Common Eider	*Somateria mollissima*
	Red-Breasted Merganser	*Mergus serrator*
	Smew	*Mergus albellus*
	Spectacled Eider	*Lampronetta fischeri*
	Steller's Eider	*Polysticta stelleri*
	Surf Scoter	*Melanitta perspicillata*
	Western White-Winged Scoter	*Melanitta deglandi*
Geese	Aleutian Canada	*Branta canadensis leucopareia*
	Cackling Canada	*Branta canadensis minima*
	Dusky Canada	*Branta canadensis occidentalis*
	Lesser Canada	*Branta canadensis parvipes*
	Vancouver Canada	*Branta canadensis fulva*
	Bean	*Anser fabalis*
	American Brant	*Branta bernicla*
	Black Brant	*Branta nigricans*
	Emperor	*Philacte canagica*
	Ross's	*Chen rossi*
	Lesser Snow	*Chen hyperborea*
	White-Fronted	*Anser albifrons*
Swans	Trumpeter	*Olor buccinator*
	Whistling	*Olor columbianus*
	Whooper	*Olor cygnus*

1. 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.

MARINE MAMMALS IN ARCTIC ALASKA

Arctic Alaska is bordered by two markedly different marine systems: The northern Chukchi Sea and the Beaufort Sea. The former is characterized by relatively high biological productivity and the latter by low productivity. Diversity and numbers of marine mammals* correspond accordingly. The Chukchi Sea derives its productivity from the nutrient-rich water that flows north from the Bering Sea. Distributed north by prevailing currents, this water provides the initial key for supporting a myriad of marine organisms in a complex food web, with marine mammals at or near the top. Nutrient-rich water does not usually extend east of Barrow, although the Colville and Mackenzie Rivers contribute significant material. The productivity of the Beaufort Sea is comparatively low.

Many species of marine mammals are found in Arctic Alaska, but only a few inhabit the area on a year-round basis. Most marine mammals are migratory, moving north in spring and retracing their path in fall to suitable winter habitat in southern waters. Principal species found in the Arctic area during some time in their annual cycles are walrus, polar bear, four species of ice-associated phocid seals (ringed, bearded, spotted and ribbon), bowhead, grey, and belukha whales, and porpoises. The area is estimated to support in excess of two million marine mammals during summer.

Shortly after Alaska was colonized by Europeans in the 1700's, concentrations of marine mammals attracted commercial hunters. The history of early utilization is one of unchecked exploitation rather than conservation. Many species were reduced to low numbers, particularly whales and walrus, and some species were extirpated in local areas. Within the last fifty years, most have again become abundant following reduced harvests and better protection.

Residents living along the arctic coast traditionally have depended on marine mammals for their essential domestic needs. Although Eskimo cultures have changed markedly in the last few decades, marine mammals still play an important role in the local economy; they are used for food and provide a variety of raw products for the arts and crafts industry.

Passage of the Marine Mammal Protection Act in 1972 limited all marine mammal hunting to Alaska Natives and imposed a moratorium on non-native users. The Act remains in effect today, but restrictions on use are being reviewed on a species by species basis as each marine mammal population is fully enumerated and proposed use is justified biologically. In April 1976, walrus became the first species for which management authority was returned to the State of Alaska, and for which use by non-natives was again allowed. In the future other marine mammals of the area may be used in more diversified ways.

WALRUS

Historically, the Bering, Chukchi, Beaufort, and east Siberian Seas supported about 200,000 walruses. They were first hunted heavily on a commercial basis by whalers, starting around 1868. At one point in the early 20th century there may have been less than 50,000 walrus remaining in the population. Following cessation of commercial hunting at the turn of the century, and increased protection in the 1960's, the walrus population increased significantly. Today it is estimated at 200,000 animals. Despite an apparent decline in productivity and a Soviet-American kill in excess of 5,000, the population seems to be increasing slowly.

Wintering largely in the central and southeastern Bering Sea, generally many miles from the Alaskan mainland, the majority of the population begins a northward migration in late March and April. Females with

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

young are usually the vanguard, followed later by bulls and barren cows. The height of the nursery herd migration enters Bering Strait in late May and early June, and reaches the Northern Chukchi Sea by mid-July. Most of the bulls pass into the Chukchi Sea by the last of June. Most of the population goes west along the Soviet coast, and the remainder moves northward toward Point Hope. Eventually the walrus disperse along the southern polar ice in the east, and frequently congregate in large herds, on land, in the west. Some travel into the Beaufort Sea as far east as the Canadian border. In September or early October the most northern migrants begin moving south. Walrus arrive near St. Lawrence Island in November. Some walruses remain in the Bering Sea, particularly in Bristol Bay and the Gulf of Anadyr, throughout the summer months.

The annual retrieved harvest of walruses by Alaskans has averaged about 1,600, but has shown a marked increase since passage of the Marine Mammal Protection Act which eliminated protective measures on females. Because most of the walrus population funnels through Bering Strait, villages in that vicinity often take more than one-half of the annual harvest.

The residents of Arctic Alaska kill only about 100 walrus a year because most communities satisfy their sustenance needs from whaling and are not usually interested in walrus. Also, walrus disperse rather widely in the northern Chukchi and Beaufort Seas, and are not always accessible. Ivory is of some importance to the northern Eskimo villages, but few residents in the far north depend on it as a major source of income. Walrus are used mainly for human and dog food.

In April 1976, the U.S. Fish and Wildlife Service waived the moratorium on walruses and returned management to the State of Alaska. Under State regulations nonnatives will be eligible to take walrus on a permit basis. Prior to 1972, guiding of sport hunters was a source of revenue in some villages. In the future, sport hunting for walrus may become more important in Arctic Alaska.

PACIFIC BEARDED SEAL

Exact determination of the size of the bearded seal population is difficult because like other ice-associated phocid seals, they are widely distributed and difficult to enumerate.

The population currently appears to be stable and near carrying capacity. The total Bering Sea-Arctic Ocean population is estimated to be 300,000. Soviet estimates place the population at over 450,000 bearded seals including the entire Pacific population.

Adult bearded seals rarely venture far from ice, but juveniles often remain in ice-free areas during the summer. In late winter and early spring, bearded seals occur from the southern edge of the ice pack in the Bering Sea north to the solid cover of the polar pack ice. Most, however, are south of Bering Strait. Seldom do they use shore-fast ice. They prefer the moving pack ice and undertake a general movement away from land with the onset of winter. Bearded seals commonly haul-out on ice, but do not normally come ashore. As the ice disintegrates and moves northward, bearded seals follow its retreat and by late summer are distributed along the edge of the polar pack ice. Most of the population summers along the southern edge of the Polar ice pack. They move south in the fall, and usually enter the Bering Sea, starting in November. Because they prefer bottom dwelling organisms such as crabs, shrimps, clams, and amphipods, bearded seals do not compete with man for commercially valuable fishes, crustaceans, or mollusks.

The crude birth rate for bearded seals is 22 percent. Annual recruitment to age one is at least one half of this figure. Conservatively, the

population probably can withstand a harvest of 6 to 7 percent per year, or 18,000 seals. Present take by Soviet and Alaskan hunters is about 4,000 bearded seals, but hunting loss is high and probably the true kill is more than double the number actually retrieved. The population appears to be stable, indicating that the total annual mortality, including harvesting, is about equal to recruitment.

Because of their large size, high quality meat and blubber, and strong durable skin, the bearded seal has always been important in the economy of coastal residents. In the last few years, many changes have occurred in the Eskimo's way of life as they move closer to a cash oriented economy. The necessity for taking marine mammals has decreased, but hunting bearded seals is a tradition still pursued with enthusiasm in many communities. After spring whaling, hunters in Arctic Alaska look forward to the "oogruk" season, hoping to acquire enough meat to last them through the entire year. The annual harvest from this area is 500 bearded seals or less. Residents of Wainwright and Pt. Lay generally take the most bearded seals per person and are most dependent on meat of these seals.

Shorebased hunting is not likely to seriously affect population status. The greatest threat to the security of the bearded seal stems from environmental pollutants as a result of off-shore mineral and energy resource development.

RINGED SEAL

The ringed seal is the most widely distributed ice-inhabiting seal of arctic and sub-arctic Alaska. Although population status is difficult to determine exactly, its habit of utilizing land-fast ice and its behavior of hauling out on ice during long spring days helps determine relative abundance of animals. Minimum average density in the Beaufort Sea on land-fast ice was found to be 2 per square mile. In the Chukchi Sea it was 5 per square mile. Overall, the average density on drifting ice during winter is probably less than 2 per square mile. The population appears to be high and stable. It is estimated to contain a minimum of 250,000 animals in areas of land-fast ice alone. The total ringed seal population of the Chukchi and Beaufort Seas exceeds one million.

In Arctic Alaska adult ringed seals prefer land-fast ice in winter, although it is not uncommon to find them anywhere in ice covered areas. Ringed seals migrate in the spring, following the retreat of the pack ice. Seals wintering in the Chukchi Sea travel longer distances; movements of seals in the Beaufort Sea are probably of short distance.

The diet of ringed seals is variable depending on season, location, and depth of water, but the predominant items consumed are zooplankton in the form of mysids, amphipods, euphausids and shrimps. They seldom compete with man for food, but commonly take small fish such as saffron cod, polar cod and sculpin.

Recent harvests by Alaskan hunters have been around 5,000 seals annually, and the total harvest including the Soviet kill is estimated to be between 8,000 and 10,000. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest.

Because the ringed seal is seasonally the most numerous species of seal, it is the mainstay in the diet of coastal Eskimos. While archaeological evidence points to the reliance of many Eskimo settlements on a diversity of marine mammals, the ringed seal was probably the key element in supporting people during winter. Ringed seals provided not only meat, but oil for heat and light, and skins for warmth. Since coastal residents have adopted a cash oriented economy and are now able to obtain non-

native food through the winter, the importance of ringed seal has decreased. The current annual harvest is only 1/2 to 1/4 of the harvest in the early 1960's.

Today seals are used mainly as a food and clothing supplement. Few residents make a concerted effort to hunt them in winter, and most seals are taken in spring when weather conditions are better. Of the four species of seals taken in Arctic Alaska, ringed seals account for more than half the annual harvest.

To date, man has not altered ringed seal habitat greatly. While some contamination of food webs by pesticides and heavy metals has been documented, the effects have apparently been minimal, and probably have not altered carrying capacity of habitat in recent years. However, 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 the ringed seal population.

SPOTTED SEAL

The spotted seal is found seasonally from the Aleutian Islands north to the Beaufort Sea. The population is estimated at 200,000 to 250,000 individuals, but the census technique is based largely on indirect methods. Soviet biologists feel the actual number is closer to 450,000, including the population of the Okhotsk Sea.

Spotted seals are seasonally dependent upon sea ice for the birth and nurture of their pups. Prior to parturition in late winter, the entire population inhabits the southern edge of the pack ice, usually in the central Bering Sea. As spring break-up progresses, most seals follow the northward retreat of the pack ice, and gradually move toward land (including islands) where intermittent rest and feeding may occur. During the ice-free summer and early fall, they are found along the entire coast of northern Alaska. A substantial portion of the population spends all or part of the summer in northern waters. With the approach of winter they begin moving south, usually preceding the formation of heavy pack ice.

Diet of the spotted seal varies depending on season and location; primary food species are pelagic, demersal and anadromous fishes. Because spotted seals often feed on fish sought for commercial purposes, notably salmon, problems have occurred with fishermen who compete for the same resource. Due to their migratory nature, the impact of spotted seal predation is minimized somewhat when the seal moves north in the late spring. Natural mortality among adults is probably low. They are infected by a variety of internal and external parasites, but the effects of this form of pathology are unknown. Some spotted seals are undoubtedly taken by killer whales and polar bear, but hunting by humans is probably the greatest single mortality factor.

The annual harvest of spotted seals by both American and Soviet hunters is 7,000 or less, more than one-half of which are taken by Soviets. Annual gross recruitment to the population is about 25 percent. Seven to eight percent would constitute a safe level for a sustained yield harvest of up to 17,500 spotted seals annually. However, there are presently no reasons which warrant a harvest of this magnitude. Since spotted seals spend winters in the Bering Sea, residents of Arctic Alaska can only hunt them successfully in summer and early fall. Most are taken in July shortly after break-up of sea ice and during the northward migration. Fall hunting is popular, but few seals are killed. Spotted seals are considered less palatable than ringed or bearded seals and are usually used for dog food. The skins are often made into pokes (floats), and are also prized for making garments. Spotted seals were

eagerly sought in the 1960's when fur prices were high and the State offered a bounty. The harvest then was three to four times its present level. A reduction in the price of seal skins and passage of the Marine Mammal Protection Act greatly reduced the harvest.

RIBBON SEAL

Based on relative indices of abundance, the Bering-Chukchi population of ribbon seals is currently less than maximum, this results from a brief period of intensive commercial exploitation by Soviets during the 1960's. Recovery has taken place due to the implemention of restrictive quotas, and recent estimates indicate the population is now between 80,000 and 100,000 seals. The total Alaskan harvest is usually 100 seals or less.

Ribbon seals are seasonally pelagic, but depend on the sea ice for birth and nuture of their pups. In the late winter and early spring, the entire population is concentrated along the southern edge of the pack ice in the Bering Sea. Following spring break-up of sea ice there is a moderate movement north associated with dispersal of the pack ice. However, few seals pass north of Bering Strait; most remain in the Bering Sea during the summer. The principal foods are pelagic and demersal fishes, but also include small marine organisms, such as shrimp.

Although ribbon seals were hunted extensively by the soviets for their skins, they have played a minor role in the Alaskan economy. Due to their pelagic nature and limited distribution, the harvest of ribbon seals seldom exceeds 10 animals in Arctic Alaska. Because of their distinctive markings most ribbon seals are used for clothing; meat has usually been of secondary importance. Since the population is relatively low and their distribution does not favor an extensive shore-based harvest, it is unlikely these seal will be taken in large numbers by Alaskan hunters in the near future. However, increased commercial sealing by foreign governments could again depress the population. The main threat in the immediate future seems to be environmental pollution from the development of off-shore mineral and energy resources.

WHALES AND PORPOISES

The belukha is the most abundant whale species occurring in the Arctic Ocean, although its population status is not well known. The total Alaskan population is estimated to be at least 16,000 animals and probably more than 5,000 whales migrate seasonally to the Chukchi and Beaufort Seas. Belukhas are gregarious animals both when traveling and feeding. Herds of 100 are common and as many as 1,000 in a single group have been observed during migration. Small groups of 2 to 15 whales, usually led by a large male seem to be the most common group size. Some belukhas may winter in arctic waters, but most migrate from southern areas during the spring. Timing of migration is dependent on ice conditions, but belukhas usually arrive in the Arctic during April, and by late May most migrants will have moved into the Chukchi Sea. It is not uncommon for some groups to travel over 1,000 miles to reach their summering areas. Some groups may return to the same local area in ice-free portions of the Arctic Ocean each summer. Young are born from May through July, often during migration. Some belukhas may return to the same calving area each year, and this homing behavior may have led to the extirpation of local groups in the past. As waters freeze in the fall belukhas migrate south where leads are abundant or the area is ice free.

Belukhas concentrate in estuaries when food species such as smelt or salmon smolt are abundant. Salmon predation by belukhas in the Arctic Region is probably of little importance, although belukhas may eat commercially valuable fish in their wintering areas.

Belukhas were historically taken by arctic coastal Eskimos for meat, oil, muktuk and other domestic needs. However, due to the relatively

small, dispersed population (compared to other marine mammal species) and because these whales were only available on a seasonal basis, the annual harvest was never high. Hunters from Wainwright and Barrow took some belukhas in conjunction with other whaling activities, and continue to do so today. The current annual harvest in arctic Alaska is estimated to be 50 animals or less. Dependency on belukhas is decreasing due to the transition to a cash economy, as well as other forms of cultural change. Muktuk, dried meat and oil of Belukhas are used primarily as dietary supplements.

Several other species of whales and porpoises are found in Arctic Alaska, but most occur only on a seasonal basis. During the last half of the 19th century a commercial whaling industry thrived on the larger whales, primarily the bowhead, although minke, grey and sei whales were also taken.

From 1867 to 1929 Alaska exported over $14 million dollars of whale oil and whalebone (baleen), most of which came from the Arctic. Because of unregulated harvests, whale stocks were significantly reduced by 1900, and the United States whaling industry in the Bering Sea declined as a result. However, commercial whaling by foreign countries continues on a reduced scale today. Increased protection has resulted in population increases of most species, although they have not attained their former numbers.

Coastal Eskimos killed whales prior to the advent of the American whaling industry, and they intensified their efforts when whale products brought high prices in the late 1800's. After the decline of the commercial industry, whaling by Eskimos continued, and some whales have been taken every year since the turn of the century.

Natives residing in arctic Alaska kill 15-30 bowhead whales annually. Barrow hunters have the most sophisticated equipment and that village is the most successful whaling community. Oil, muktuk, and meat are the products utilized, but recently the increased demand for articles of native handicraft has increased the value of baleen and whale bones. Further, whales are sold on a limited commercial basis when muktuk and meat is obtained in excess of community needs.

Since most species of the larger whales feed on plankton or ocean fishes not currently of interest to man, few human conflicts have occurred. Porpoises feed on several species of commercially valuable fish such as cod, herring and flounder, in Alaska. Competition between porpoises and man has been greatest on the high seas fisheries, and many are killed accidentally when they become tangled in fishermen's nets.

Because of their pelagic habits and seasonal distribution small whales (other than belukha) and porpoises have been of little importance in supplying food for coastal residents. A few are taken annually, usually on an incidental basis.

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

POLAR BEAR

Polar bears in Arctic Alaska are seasonally distributed throughout the Beaufort and Chukchi Seas, including the coastal areas. Bears occurring from the eastern Beaufort Sea westward to a line extending northwest from Pt. Lay are considered to be one population of approximately 2,500

animals. Within this area, distribution and abundance varies seasonally in response to changing ice conditions. Populations are probably stable and near the maximum level that the habitat can support.

Polar bears concentrate in areas of available food, often where currents keep ice in motion causing open leads or newly frozen leads. Seals congregate in these leads where they maintain breathing holes and are vulnerable to bear predation. New leads are more common within 100 to 200 miles of the coast than further north in heavy pack ice.

North of Pt. Barrow polar bears move east during late April, toward Barter Island where ice is more stable. The southern edge of the ice pack varies in position during summer, depending upon the winds. It can be lodged against the shoreline from Pt. Barrow eastward or can be as far north as 100 miles off shore. Polar bears generally stay with the moving ice during the summer and concentrate on its southern edge where seals are more abundant.

Denning areas are critical habitats for polar bears. Present information indicates that some of the most intensive denning on the Alaskan coast takes place from the Colville River east to the Canadian border. This zone is approximately 50 miles wide and includes a corridor of land extending about 25 miles from the coast and the strip of adjoining shorefast ice. Some denning also takes place on the drifting sea ice, but these dens are subject to ice breakup. The land and shorefast ice provide stable conditions for denning. Bears denning on land tend to select snow-filled gullies and cutbanks as desirable den sites.

Very little information on natural mortality factors is available. Polar bears have no natural predators and no known diseases or serious parasites. Few bears in the wild live beyond 25 years of age.

Historically, Eskimos from all coastal villages killed polar bears. Some skins were used for sale or barter and others, particularly cubs, yearlings and two-year-olds, were used for garments. In the late 1950's and early 1960's sport hunters using aircraft began to kill significant numbers of polar bears. Most hunts in this area were based in Barrow. Aerial hunting was curtailed by the requirement for permits in 1971 and 1972 and in November of 1972 the passage of the Marine Mammal Protection Act (MMPA) banned all hunting of polar bears except by Alaskan natives. The average annual harvest of polar bears in Alaska during the late 1960's was about 250 per year with about one-third coming from the Beaufort Sea population. Fifty to 60 bears have been taken annually by natives in Alaska since 1972 and in most cases the meat was consumed. Until 1974 regulations promulgated under terms of the MMPA did not permit polar bear skins to be tanned commercially. Because Natives did not have a ready market for the sale of raw products, some waste occurred. Presently the MMPA does not place restrictions on number, age or sex of polar bears taken by Natives for subsistence purposes. The number of bears taken annually by Natives varies widely depending upon the distribution of bears in response to changing ice conditions. Although data do not indicate an increase in bear populations since passage of the MMPA, some change in distribution of bears in the last two years has occurred. More bears occur near shore. This may be related to cessation of aerial hunting, resulting in an increase in the number of bears or a tendency for bears to move closer to coastal villages. However, the most important factor seems to be the recent changes of sea ice conditions.

The State of Alaska has requested the return of management jurisdiction over nine species of marine mammals including polar bears. Until this occurs the use of bears will continue to be restricted to natives residing along the north coast. The harvest is not expected to vary appreciably from the present pattern. If management of polar bears is returned to the State of Alaska, the State would probably allow recreational hunting

by ground transportation only. Sport hunting under these controls would not remove as many bears as were previously taken with the aid of aircraft. Less than 50 bears per year would probably be taken in this region by recreational hunters. Return to State management would have the additional advantage of allowing Natives to realize economic return from animals and from services furnished to the recreational hunter.

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.

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

* Dependency on marine mammals by coastal residents is decreasing. Nevertheless, it is necessary to recognize that a partial subsistence economy still exists, of which marine mammals are an integral part. Management programs must insure that marine mammals are allocated in sufficient numbers to meet subsistence requirements.

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

LIST OF MARINE MAMMAL SPECIES IN ARCTIC ALASKA

	Common Name	Scientific Name
Seals	Bearded Seal	*Erignathus barbatus*
	Spotted Seal	*Phoca vitulina*
	Northern Fur Seal	*Callorhinus ursinus*
	Ringed Seal	*Phoca hispida*
Whales	Belukha Whale	*Delphinapterus leucas*
	Bowhead Whale	*Balaena mysticetus*
	Finback Whale	*Balaenoptera physalus*
	Gray Whale	*Eschrichtius gibbosus*
	Humpback Whale	*Megaptera novaeangliae*
	Killer Whale	*Orcinus orca*
	Minke Whale	*Balaenoptera acutorostrata*
	Narwhal	*Monodon monoceros*
Porpoises	Dall Porpoise	*Phocoenoides dalli*
	Harbor Porpoise	*Phocoena phocoena*
Other Marine Mammals	Pacific Walrus	*Odobenus rosmarus*

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

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

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

SEABIRDS

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

Resident Arctic populations of seabirds are limited in number and widely dispersed. Shearwaters, fulmars, black-legged kittiwakes, Sabine's gulls and arctic terns either feed or breed in the Arctic and move south with cold weather. Ivory and Ross' gulls disperse or migrate in east-west directions, and probably winter near open leads in the pack ice of the Chukchi and Beaufort seas. Post-breeding dispersal of adults and

young brings glaucous gulls, murres, guillemots, horned puffins, and parakeet and crested auklets north to the Chukchi Sea in the fall. These birds migrate south with the onset of winter.

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

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

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

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

RAPTORS

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

Resident raptor populations appear to be at moderate densities, although marked fluctuations in abundance occur over time. These fluctuations are thought to occur in response to changes in prey abundance. Snowy owls, short-eared owls, and rough-legged hawks fluctuate in response to cyclic rodent populations and gyrfalcons fluctuate with changes in ptarmigan abundance. Although comparative data from earlier periods are not available, general observations suggest that, except for the endangered subspecies of peregrine falcon, migratory species occurring in the Arctic are at moderate levels of abundance. Peregrine falcon numbers

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

have declined in the arctic over the last 20 years; only remnants of former populations exist. Breeding densities and productivity continue to decline. This decline has coincided with the documented declines of peregrine falcons throughout the world and is thought to be primarily the result of chemical contamination. Because of marked declines in other portions of the continent, peregrine populations of Alaska are of key importance.

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

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

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

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

SMALL MAMMALS

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

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

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

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

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. Other migrant species may also be experiencing similar declines, while resident populations do not currently appear to be seriously affected by chemical residues. 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.

* Oil-related development in arctic coastal areas may significantly impact nesting seabird populations in the region. Pollution from offshore drilling and production facilities may affect seabirds directly through "oiling" of birds or indirectly by altering the abbreviated arctic food webs. Construction of causeways and artificial reefs or use of barrier islands for gravel sources may result in siltation of estuaries and loss of valuable nesting habitat. Baseline data on coastal seabird habitat and breeding and feeding locations are required to interpret population fluctuations and oil related impacts. Surveys of dead or affected birds on beaches should also be conducted.

* 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 seasons such as the 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 and foraging areas including breeding 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 ARCTIC ALASKA

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

LIST OF SMALL MAMMALS IN ARCTIC ALASKA

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

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.

2. FRANKLIN BLUFFS PEREGRINE FALCON MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of peregrine falcons.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy peregrine falcons.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Protect peregrine falcon populations from unnatural disturbance and harassment.

2. Discourage land use practices which are detrimental to peregrine falcon nesting habitat.

3. Conduct and encourage scientific and educational studies of peregrine falcons.

4. Allow limited viewing of peregrine falcons when it does not affect nesting success and when it is not in conflict with scientific studies.

THE SPECIES

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

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

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

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

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

PROBLEMS

* Continued chemical contamination of peregrine falcon food sources may preclude local efforts to maintain viable peregrine populations. Intensive monitoring of peregrine populations and of contaminant levels in prey species should be conducted, and national and international efforts to reduce environmental burdens of implicated chemical contaminants must be encouraged.

* In view of the precarious balance of production and mortality of peregrine falcons, the consequences of disturbance and habitat alteration are critical to the survival of peregrine populations. Strict stipulations governing human activities of all kinds in important peregrine falcon nesting areas must be established and enforced. Even scientific studies must be carefully designed to avoid inadvertent losses of birds.

* Until construction of the North Slope Haul Road, the Franklin Bluff peregrines were relatively isolated from any type of use or disturbance. If the Haul Road is opened to the public and as interest in peregrines increases, nonconsumptive use of the birds is expected to increase. Use of the area will have to be increasingly monitored to prevent human disturbance of nesting sites.

IMPACTS

* As scientific knowledge of peregrine ecology expands, a comprehensive management program will be developed.

* Controls on public observation and photography of peregrines will increase and opportunities for such uses will be limited to situations which clearly pose no threat to the welfare of peregrine falcon populations.

* Resource development activities will be restricted where they impact peregrine populations either through disturbance of nesting and brooding or alteration of important habitat.

3. SAGWON BLUFF PEREGRINE FALCON MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of peregrine falcons.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy peregrine falcons.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Protect peregrine falcon populations from unnatural disturbance and harrassment.

2. Discourage land use practices which are detrimental to peregrine falcon nesting or foraging habitat.

3. Conduct and encourage scientific and educational studies of peregrine falcons.

4. Allow limited viewing when it does not affect nesting success and when it is not in conflict with scientific studies.

THE SPECIES

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

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

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

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

of the North Slope Haul Road, the Sagwon Bluff peregrines were relatively isolated from any use or disturbance. If the Haul Road is opened to the public and as interest in peregrines increases, nonconsumptive use of the birds is expected to increase.

PROBLEMS

* Continued chemical contamination of peregrine falcon food sources may preclude local efforts to maintain viable peregrine populations. Intensive monitoring of peregrine populations, and of contaminant levels in prey species should be conducted, and national and international efforts to reduce environmental burdens of implicated chemical contaminants must be encouraged.

* In view of the precarious balance of production and mortality of peregrine falcons, the consequences of disturbance and habitat alteration are critical to the survival of peregrine populations. Strict stipulations governing human activities of all kinds in important peregrine falcon nesting areas must be established and enforced. Even scientific studies must be carefully designed to avoid inadvertent losses of birds.

IMPACTS

* As scientific knowledge of peregrine ecology expands, a comprehensive management program will be developed.

* Controls on public observation and photography of peregrines will increase, and opportunities for such uses will be limited to situations which clearly pose no threat to the welfare of peregrine falcon populations.

* Resource development activities will be restricted where they impact peregrine populations through disturbance of nesting and brooding or alteration of important habitat.

4. COLVILLE RIVER PEREGRINE FALCON MANAGEMENT PLAN

LOCATION

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

PRIMARY MANAGEMENT GOAL

To provide an opportunity for scientific and educational study of peregrine falcons.

SECONDARY MANAGEMENT GOAL

To provide an opportunity to view, photograph and enjoy peregrine falcons.

EXAMPLES OF MANAGEMENT GUIDELINES

1. Protect peregrine falcon populations from unnatural disturbance and harassment.

2. Discourage land use practices which are detrimental to peregrine falcon nesting habitat.

3. Conduct and encourage scientific and educational studies of peregrine falcons.

4. Allow limited viewing when it does not affect nesting success and when it is not in conflict with scientific studies.

THE SPECIES

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

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

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

PROBLEMS

* Continued chemical contamination of peregrine falcon food sources may preclude local efforts to maintain viable peregrine populations. Intensive monitoring of peregrine populations and contaminant levels in prey species should be conducted, and national and international efforts to reduce chemical contaminants must be encouraged.

* In view of the precarious balance between production and mortality, the consequences of disturbance and habitat alteration are critical to the survival of peregrine populations. Extraction of gravel in the Colville drainage may alter stream gradients in the vicinity of some eyries, resulting in land slides and loss of nest sites. Use of the Colville River and its tributaries as travel routes for air cushion vehicles will cause abandonment of nests or young if such use occurs during nesting or brooding periods. Additional sources of disturbance include recreational boaters, mineral exploration activities (especially those utilizing helicopters), and low overflights by aircraft. Strict stipulations governing human activities of all kinds in important peregrine falcon nesting areas need to be established and enforced. Even scientific studies must be carefully designed to avoid inadvertent losses of birds.

IMPACTS

* As scientific knowledge of peregrine ecology expands, a comprehensive management program will be developed.

* Controls on public observation and photography of peregrines will increase, and opportunities for such uses will be limited to situations which clearly pose no threat to the welfare of peregrine falcon populations.

* Resource development activities will be restricted where they impact peregrine populations through disturbance of nesting and brooding, or alteration of important habitat.

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.