TANANA BASIN AREA PLAN

FISH AND WILDLIFE ELEMENT

STATE OF ALASKA
Department of Natural Resources
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STATE OF ALASKA
Department of Fish and Game

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

EXECUTIVE SUMMARY

This element paper represents the Department of Fish and Game's contribution to the pool of information to be used in making land allocation decisions under the Tanana Basin Area Plan. It documents the value and location of wildlife resources, as well as the decisions made in prioritizing land for retention in public ownership and in formulating a planning alternative emphasizing wildland resource values.

The first two chapters were produced by the Department of Natural Resources' Tanana Basin staff, and have been included here after review and comment by the Department of Fish and Game. Chapters 3 through 9 are products of the Department of Fish and Game.

In the course of compiling this paper, the value of wildlife resources became apparent in several ways: First, public meetings at all stages of the planning process revealed wildlife issues to be extremely important to the residents of the Basin (Chapter 2). Second, demand for these resources indicates that Alaskans exhibit significantly higher rates of participation in wildlife-related activities than residents in any other region of the United States (Chapter 3). Third, the valuation of resources based upon documentable consumptive uses estimates that the economic activity resulting from these uses lies at $79.9 million (1983 dollars) annually. In addition, the equivalent of 1,699 fulltime jobs are provided by the wildlife economy of the Basin. Not included in these figures are values for which no documentation exists or for values that cannot be expressed in terms of dollars. Non-consumptive and subsistence uses are the most significant of these.

While it has not been possible to directly compare supply of wildlife resources with demand, several conclusions about this relationship are made. First, it is clear that supply is not evenly distributed over the Tanana Basin, but is concentrated in a limited system of lands with high habitat values and/or good accessibility. Second, allocations of these lands to incompatible resource uses have the potential for degrading and/or eliminating wildlife values, which cannot be displaced to lower-quality areas. Last, there are indications that demand already exceeds supply for many species, and that reduction in the Basin's habitat base will aggravate this situation (Chapter 6).

Based on information gathered for this planning effort, a hierarchy of priorities for retaining land as publicly-owned wildlife habitat was developed. Using this system, the lands in the Basin were stratified into five levels of importance. This process and a summary of the values within each unit are discussed in Chapter 7.

In Chapter 8, the development of the planning alternative emphasizing wildland values is documented. This was accomplished by evaluating land allocation proposals made in other elements in light of the wildlife resource values identified in the previous work, and including them to the extent, and in locations, that they do not significantly detract from the primary goals identified by the Department of Fish and Game for wildlife

resources. These goals were: 1) to maintain intact a land base of habitat that can continue to produce wildlife resources for use and enjoyment, 2) to maintain access to these resources, and 3) to mitigate losses of fish, wildlife and their habitats. A fourth goal promoting economic diversity was introduced by the Department of Natural Resources and also is served by this alternative.

Once the planning alternative was completed, management guidelines for the various wildlife habitat categories proposed in this element were prepared. These are outlined in Chapter 9.

Information presented in the Fish and Wildlife Element Paper demonstrated that these resources provide the base for highly demanded, high benefit activities to residents and visitors in the Tanana Basin. Recognizing the low cost and renewable nature of these resources, it is obvious that habitat lands deserve strong consideration during the land allocation process.

CONTENTS

Chapter 1

Introduction

This report summarizes the information gathered by the Tanana Basin Area Planning staff and the Alaska Department of Fish and Game concerning the fish and wildlife resources of the Tanana Basin. It is part of a resource inventory of seven resources including fish and game, agriculture, forestry, minerals, outdoor recreation, settlement and water.

The purpose of the paper is to present the information on fish and wildlife in the Basin in a concise form for use during preparation of the Tanana Basin Area Plan. This plan will allocate state-owned land in the Basin to different uses and will stipulate management guidelines for each allocation. The Final Plan is due for completion in March, 1984.

The first two chapters were prepared by the Department of Natural Resources and Chapters 3 through 9 were prepared by the Department of Fish and Game.

Chapter 2

Issues and Local Preferences

I. INTRODUCTION

Issues and local preferences are important pieces of information which must be incorporated into the planning process. Issues concerning the use of a specific resource provide a focus and framework for the planning process; local preferences show how the public feels these issues should be resolved. In this section of this report, issues and local preferences are documented for incorporation in the planning process through the work of the Planning Team Members.

A. Issues

An issue is something which is debated. For example, the amount of land to be disposed of is an issue; some people favor more land and others would prefer less. Another issue is the effect of agriculture on fish and game; some feel that the effect is positive, others feel that it is negative or neutral. The purpose of this paper is simply to report the issues objectively without siding with any particular viewpoint. These issues are then to be addressed in the Tanana Basin Area plan which will create policies to deal with them. The issues reported here are those which the plan can affect through classifications or management guidelines.

The issues identified in this chapter were collected and summarized from three sources. The public meetings that were held in the Tanana Basin during the spring of 1982 was the first source of issues used for this chapter. Planning team members, after reading the comments from the public meetings developed a series of issues concerning the resource they represent. The Tanana Basin Plan sketch elements were a second source used to identify issues. The sketch elements were developed in 1981 to provide a starting point for the Tanana Basin Area plan. The issues identified in the sketch elements were based on conversations with agencies, resource experts and public interest groups. The third source was interviews with agency representatives.

B. Local Preferences

Local preferences about how these issues should be addressed were determined from two principal sources. One of the sources which will be used in the planning process for developing local preferences is a series of community originated land use plans. Several communities are currently working on proposed plans for state land in their area; others have already submitted proposals to DNR.

These local land use plans provide a clear indication of what a community prefers. This is particularly true when a proposal receives endorsement of village councils, city councils, native corporations, and other interest groups in the area.

The possibility of doing land use plans was mentioned at the public meetings and in a newsletter that was sent to all communities. Only a few of the communities, however, have decided to submit proposals. Most of these proposals will not be completed until February, but some have been on file with the State Department of Natural Resources and are included in this report.

The Tanana Basin Public Meetings are the other source of information on local preferences. Public meetings were held in all communities in the Basin in the spring of 1982 to discuss the Tanana Basin Area Plan. The notes from these meetings were then given to members of the planning team who then developed the summaries included here. The summaries represent the planning team members' understanding of how residents want state land in their area managed for a specific resource.

These sources of local preferences are not as accurate as a public survey, but in most cases, they represent the only information available. They should not be considered to be representative of the entire community; they are simply indications of the opinions of some of the residents.

A survey now being conducted by the Alaska Department of Community and Regional Affairs will provide a better indication of local preferences in the Tok area. The results of this survey will be available to the planning team by March of 1983.

II. ISSUES CONCERNING FISH AND WILDLIFE RESOURCES

The sketch elements and the public meetings were used to develop the following list of issues:

1. Potential loss of state owned fish and wildlife habitat land base. Maintenance, in the face of increased development, of a viable base of habitat lands for the procuction of existing or enhanced levels of wildlife resources.

   The Tanana Basin contains vast areas of important fish and wildlife habitat. Not only is this habitat critical to maintenance of the species but it also supports extremely important subsistence, recreational, and commercial uses by local and state residents and non-residents. These uses provide millions of dollars worth of food, furs, and commercial income. Recreational uses provide thousands of hours of pleasure and some of the main attractions supporting the booming tourism industry. (Sketch Element)

2. Fish and wildlife management on state lands.

   Under AS 16.20.230(5) the Department of Fish and Game is mandated to preserve and protect habitat areas especially crucial to the perpetuation of wildlife. The demand for and use of fish and wildlife resources is high in the Tanana Basin. Management practices will affect the numbers of fish and wildlife present for use and the habitat available to support these populations. Fire is often beneficial and can be a useful management tool but it can negatively impact adjacent resources and activities. (Sketch Element)

3. Loss of access to prime and important fish and wildlife habitat areas for the purpose of fishing, hunting, trapping, subsistence, and non-consumptive use of the resource. Maintenance and enhancement, in the face of increased development, of the uses of wildlife resources, including subsistence, recreational hunting resources, trapping and fishing non-consumptive uses, and livlihood.

   Land allocations and decisions are being made so that settlement and agricultural developments can occur in the Tanana Basin. Depending upon the nature of these decisions, access to major fish and wildlife use areas may be lost. Proper identification, recognition and protection of these access routes is important in order to maintain traditional fish and wildlife related uses aready established in the Tanana Basin. (Sketch Element)

4. Alteration or loss of critical and prime fish and wildlife habitat. Mitigation of the impacts to wildlife resources and the uses of those resources by non-compatible uses of developments.

   Many activities and decisions occurring in the Tanana Basin today, such as settlement, agricultural and industrial development, result in a loss or alteration of essential habitat. Land use decisions affect the availability and quality of wildlife habitat. Low density settlement, shelter belts, leave strips, and the retention of sloughs or ponds can minimize negative effects on landfills and some industrial developments increase negative effects on wildlife through habitat loss, reduced habitat quality, or obstructing normal movements of fish or wildlife.

5. Evaluation of wildlife resource values for the purpose of making natural resource decisions. (Public Meetings)

III. LOCAL PREFERENCES FOR FISH AND GAME MANAGEMENT

A. Community Originated Land Use Plans.

The following section lists the various community originated plans that have been completed, or are in progress for state lands in the Basin For detailed information on each plan listed here, contact the Division of Research and Development.

1. Minto Flats

Minto Village Council passed a resolution in 1980 requesting that state classify Minto Flats for Wildlife Habitat and Forestry. The village council sent the resolution with a "Summary Report" about Minto Flats to the Department of Natural Resources. The Summary Report discusses the fish and game resources, the village's utilization of these resources, and includes a map which identifies historic fishing spots and trails into the Minto Flats.

The Department of Natural Resources sent the Summary Report and classification request for interagency review, but in late 1980 the proposal was put on hold so that it can be addressed by the Tanana Area Basin Plan.

At the public meeting held in Minto on April 15, 1982 to discuss Tanana Basin Area Plan, residents wanted to know why their classification request had not been processed.

2. Tok River Basin

In 1979 the Department of Fish and Game, in response to public opinion in the Tok area, requested that land in the the Tok River Basin be classified as Wildlife Habitat. Division of Forest, Land and Water Management gave public notice of the proposed classification at which time the Tok Chamber of Commerce, Tetlin Village Council and Tok Fish and Game Advisory Board voiced their support of the classification. The Director of the Department of Land and Water and Forests concurred with the classification action and sent the request to the Commissioner, at which time it was decided that the classification should wait until the Tanana Basin Area Plan was under way.

The Department of Fish and Game wrote a report in support of the Tok River classification. The report addresses population, economic considerations, wildlife values, nonconsumptive recreation, timber harvesting, mining, management objectives and procedures, and it includes a legal description of the area proposed for wildlife habitat.

At the public meeting held in Tok on March 31, 1982 to discuss the Tanana Basin Area Plan residents asked about this classification request.

3. Lake Minchumina

In August 1979, the Lake Minchumina Homeowners Association sent the Department of Natural Resources a formal classification request based on a Land Use Plan for the Lake Minchumina Area. The community identified nearby lands for wildlife habitat, watershed, public recreation, forestry, greenbelts and dispersed open-to-entry disposal classification. The community wrote a narrative justifying their proposal.

The proposal went through in-house and interagency review and public notice. The DFLWM supported the classifications and felt that the proposal had generated "a general scheme for dealing with state lands tht both the public and the district can support". The District sent the proposal to the Commissioner at which time the request was put on hold pending the Tanana Basin Area Plan.

4.a. Yanert-Revine Creek Area Community Land Use Plan

In December 1979, the communities in the Yanert-Revine Creek area submitted a land use plan for lands adjacent to their community to the Department of Natural Resources. The plan was "the result of efforts of the entire community" and was developed over a period of three months during which time the community conducted three public meetings. The plan designated specific areas for disposals, recreation, and wildlife habitat, and included management guidelines for buffers, density of settlement and public easements. The plan did not include any formal classification requests, so it was not processed by the Division of Land and Water. However, the cover letter from the community stated that "We, as a community, strongly urge the Division of Forests, Land and Water Management to consider this proposal and adopt it as its guidelines for land disposals in this area."

5. Lower Tanana-Manley Hot Springs Area

The Forestry Section of DFLWM in response to a proposal from Northland Wood, requested that certain lands along the major river drainages between Nenana and Manley Hot Springs be classified for forestry. The proposal included a land use plan that discussed the following topics: location, criteria for the recommendation, access, vegetation, timber resources, soils, wildlife and fish habitat, recreation, current use, reasons for state selection of the lands, adjacent land uses, benefit to the public, expected impact of forest classification, proposed management guidelines, and justification for requested classification.

The request was sent for interagency review at which time it was decided that the classification was premature since other resource potentials of the land had not been assessed fully.

6. Community Strategy Plans

Tanana Chiefs Conference has worked extensively over the past several years with most Village Councils in the Doyon Region to develop Community Strategy Plans. Strategy Plans identify goals and objectives for each community. Most goals and objectives address social services. However, there is a section in each strategy plan that identifies land use concerns and priorities for their area.

7. Interior Village Association Planning Project

Interior Village Association, an organization based in Fairbanks, which specializes in helping village corporations do corporate planning, is currently working with Manley Hot Springs and Tanana to develop corporate plans for the village's lands. These plans should be done by September. At that time, the village corporations will begin doing feasibility studies on the projects they identified in their plan. IVA is also encouraging other Village Corporations to do similar plans.

8. Bean Ridge Corporation Classification Request

Bean Ridge Native Corporation of Manley Hot Springs on October 15, 1982, requested the state to classify lands surrounding Manley Hot Springs as wildlife habitat. Bean Ridge feels it is critical to protect habitat lands in the Manley area, since the land is used for subsistence by residents of Manley, Minto, Tanana, Nenana and Rampart and sport hunters from residents of other areas.

9. Upper Tanana Land Use Plan

The Upper Tanana Development Corporation is currently working on a community and land use plan for the Upper Tanana region. The plan will be based on a coordinated effort of all local governments and interest groups in the area.

The Upper Tanana Development Corporation hopes to have some information from their planning effort available in time to be used in the Tanana Basin Area planning process.

10. Lower Tanana Land Use Plan

Tanana Chiefs Conference is currently working with the village councils, city councils and village corporations of Minto, Manley, Tanana and Nenana on a set of classification requests for state land in the lower Tanana River basin. Classification requests are for forestry, minerals, and fish and wildlife habitat. Also included in

the plan is a description of areas that should be off limits to disposals, and lands where some settlement might be acceptable. This effort should be completed in time to be used in the Tanana Basin Area planning process.

11. Land Bank Nominations

The states land disposal program allows the public to nominate lands that they would like to see sold to the public. During September 1982, DNR received 7 different nominations for land in the Tanana Basin that should be sold. The decision on these requests were deferred to the Tanana Basin Area Plan for planning team review.

B. Tanana Basin Public Meetings

Matt Robus, the Tanana Basin Planning Team member from the Alaska State Department of Fish and Game is responsible for incorporating fish and game concerns into the planning process. After attending several of the public meetings and reading the meeting notes, he outlined the following local preferencesfor each community in the Basin:

Anderson

There is a feeling that wildlife forms the basis for several existing land uses, and that the value of these resources should be considered when making allocations to development projects. Apparently the people at the hearing felt that small tract agriculture is an appropriate level of development, and that it can be compatible with wildlife (as opposed to large scale agriculture). Settlement disposals were identified as a conflict with existing uses.

Specific conditions or qualifiers which this community has identified which affect the management of this resource include:

- Checkerboard pattern for agricultural development.
- Desire for a "core" of wildlife habitat lands.
- Recognition of fire as a habitat management tool.

Cantwell

Speakers felt that the eventual amount of development near Cantwell will be limited and that wildlife would continue to do well with the amount of habitat left over. An exception was critical habitat areas. The recognition of fire as a habitat management factor was widespread and uniformly positive. The protection of existing access was also a concern.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game include:

- Grazing authorizations in this area will create conflicts with wildlife resources, with most significant problems being related to disease transmission and predator depredation.

- The desire for using fire to manage habitat will be a constraint upon settlement disposals.

Delta

Those present generally perceived the possibility for compatibility between wildlife and agriculture. There is an implication that "agriculture is good for wildlife" but negative aspects, like crop depredation or habitat changes, weren't discussed, saturation of accessible habitat by recreational trappers means conflict during any further development.

Dot Lake

The use of wildlife is regarded as an extremely important existing use. Any activity that will negatively influence the resource or disrupt existing subsistence uses will meet with heavy local opposition. The overwhelming desire in this community is to keep the land base which supports existing uses intact, and to avoid introducing disruptive activities, or attracting additional people who would add pressure to wildlife resources.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game include:

- Disposals (settlement)
- Hunting and recreation by non-locals.
- Mining (if it involves large areas of habitat).

Compatible uses as perceived:

- Forestry.
- Trapline cabins.

Fairbanks

Access is an important factor that needs to be preserved, but establishment of improved access is not generally favored.

Subsistence and recreational use of wildlife resources is ongoing and a full-fledged land use. Managing land as wildlands doesn't foreclose options for future. Single-use development allocations were generally not favored in important habitat areas, since they preclude use of wildlife.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game include:

- Suggestion was to leave backcountry alone, while concentrating development around existing areas.

- Prime conflicts identified were:
  a) agriculture (access, loss of habitat, depredation).
  b) disposals (access and pressure upon resource).
  c) mining (minimal conflict unless critical habitat is involved).

Healy

It was felt that wildlife was important enough so that decisions that would bring in potentially conflicting activities should err on the side of conservatism.

Concern was expressed about the effects disposals would have upon the use of fire for habitat management, and also for the cost of protecting such disposals from fire.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game include:

- Identify trumpeter swan resting areas and prime caribou winter, calving, summer and migration areas.

Lake Minchumina

It is felt that the use of wildlife is presently at saturation, and that additional users brought in by land disposals will create severe conflicts.

A concern for the protection of access was also expressed. As in other remote communities, wildlife is one of the predominant existing land uses, with much value, and potential conflicting activities are viewed with alarm.

Manley

Wildlife resources are the basis for much ongoing use. there is already the perception that the resource is being pressured by increasing levels of use. Activities such as disposals, which would conflict with trapping and other uses of wildlife are not favored by locals. A "leave it the way it is" atmosphere is evident - indicating satisfaction with the existing lifestyles and methods of making a living.

Mentasta Lake

The use of wildlife resources is one of the most important, and most valued, existing uses. The predominant sentiment expressed was "leave it as it is" and conflicting activities (disposals, commercial timber operations) are not favored. Fire was recognized as a habitat management tool.

Minto

This is another community where the existing use of the land - largely subsistence hunting and trapping - are considered as being of utmost importance. The people value their lifestyle and see no need to change it. They feel that developmental activities of any sort will conflict with present uses of the land and its resources.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game include:

- Desire for control of fire probably stems from the experience of summer, '81. Exclusion of fire in future will affect distribution and density of wildlife populations.

- Desire to classify much of Minto Flats as a wildlife area.

Nenana

Concern was expressed over the effects disposals have upon access. This is especially true with regard to traplines. A recommendation was made to keep land as habitat in the case of a direct conflict with disposals. The group seemed willing to consider new development in the area, but also clearly stated that existing uses should be protected.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game:

- Apparently the meeting may not have served as a forum for Native concerns. Wildlife may turn out to be even more highly valued when this is taken into account.

Northway

Recognition of the importance of existing uses of wildlife. Desire to keep this situation - so development of remote areas is undesireable. If disposals occur, they should border the road. The attraction of outsiders is also undesireable, from the standpoint of local residents.

Specific conditions or qualifiers which this community has identified which affect the management of fish and game:

- Fire may be an acceptable managment tool, based on comments of local residents.

Tanacross

The use of wildlife is an important existing use and part of lifestyle. Perception is that disposals conflict with habitat, but that some land near roads could be disposed of without much conflict. A concern for protecting and improving access was evident.

Tanana

The predominant sentiment is that current wildlife use is very important, and that no change is desired. People are concerned about access to habitat areas. Subsistence hunting and trapping support many people and they want it to stay that way. Disposals are acceptable only if they occur a long ways away.

Tetlin

Again, subsistence use of wildlife is of prime importance to these people, and they express a desire to see it remain the same. They are amenable to a little bit of various activities, but the overwhelming desire is to keep land in its natural state.

Tok

There should be protection for critical habitats and prime habitats (riparian corridors, etc.), and existing uses. Disposal acreage has outstripped need and creates fire management problems. Finally, a concern for access through developments. One time exploitation of non-renewable resources should be balanced against long term value of habitat it destroys.

Specific conditions or qualifiers which this community has identified which affect the management of this resource include:

- Agriculture may conflict directly with habitat, since they both are tied (generally) with best soils.

Chapter 3

Demand

October 19, 1983

INTRODUCTION

This chapter briefly discusses the current level of use of fish and wildlife resources in the Basin. This is an indication of demand for these resources, but because use is constrained by regulation, it is not possible to estimate the actual demand. Therefore, it should be recognized that this chapter represents only the minimum level of demand.

HISTORICAL OVERVIEW

Historically, fish and game have been extremely valuable resources to the people living in the Tanana Basin. For hundreds of years before Western influence came to Alaska, residents relied on fish and wildlife resources for their survival. Fish and game were the cornerstone around which native lifestyle, religion, social organization and culture developed. The Native population in the Basin, despite the economic development and social change that has come to the area in the last 100 years, still feel that fish and game are critical to their physical and cultural survival.

Wildlife resources have also played an important role in non-Native people's lives in Alaska. Taken for food and fiber originally, these resources now fulfill additional roles in providing recreation, income, and a sense of heritage to users. Access to and the ability to use fish and wildlife is still a highly valued aspect of the Tanana Basin, and to many, an indicator of the quality of life here.

CURRENT USE AND DEMAND

Estimates of the number of people annually involved in using fish and wildlife resources are portrayed in Table 3-1. A total of 46,541 individuals are documented. It should be noted that unreported harvest may be a major factor in some parts of the Basin and these users are omitted from this analysis. This includes many subsistence activities for which no reporting systems or data exists. Also, no information is included regarding non-consumptive use. All of the above, in addition to the fact that harvest is regulated through seasons, bag limits, and permits, are reasons for considering these figures to be a minimum indication of demand. Because estimates of user-day information vary widely for a single variable, and since they are not pertinent to several sectors of the wildlife economy, they are not included here.

In addition to estimating the number of people involved in wildlife-related activities, it is instructive to compare the rates of participation with those of residents of other regions of the U.S. in order to gauge the importance of these activities locally and regionally. The following facts are drawn from a study by Stephan Kellert entitled "American attitudes, knowledge, and behaviors toward wildlife and natural habitats" (USF&WS 1980).

1. The portion of Alaskans who have hunted in the last two years (39.4%) is 86% higher than in the next highest region of the nation.

2. The portion of Alaskans who have fished within the past two years (75.9%) is 49% higher than in the next highest region.

3. Alaskans harvest predominately for meat (83.5% of hunters, 48.2% of fishermen) with sport values being secondary (10.5% and 16.5% respectively).

4. The portion of Alaskans who belong to at least one humane, environmental, wildlife preservation, sportsman, or conservation group is 35.3%. By contrast, the next highest region was only 15.0%

Additionally, the Outdoor Recreation Plan prepared by the Division of Parks, ADNR (1981) indicated that 71% of the residents of Interior Alaska reported that the opportunities for hunting and fishing were among the major reasons for living here. This interest is reflected in data on participation in these activities.

In 1981, 5,759 harvest reports or sealing records were submitted for hunting caribou, Dall sheep, moose, black bear and grizzly bear in Game Management Units 12 and 20. More than 80% of these, or 4,629, were from people who live within the Tanana Basin, and 3,300 from people who live in Fairbanks.

Moose hunting is the most popular activity and accounts for almost 70% of the total harvest reports from all origins. Sheep hunting, however, is apparently more popular with urban hunters than rural. Bear hunters are required to report only if successful; therefore, many unsuccessful hunters' efforts are not represented.

CONCLUSION

The current level of use of fish and wildlife resources in the Tanana Basin is largely defined and limited through the action of the Boards of Fisheries and Game. In this light, the number of users of fish and wildlife resources is of limited use in estimating demand for those resources. However, this analysis shows that there is a high level of activity associated with fish and wildlife harvest and, further, that the rate of participation in these activities is generally much higher in Alaska than in other regions of the United States.

TABLE 3-1

Users of Fish and Wildlife Resources in the Tanana Basin

Recreation *

	Ak. Residents	Non-residents	Total
Hunting			
Big Game	5700	**	5700
Small Game	7200	**	7200
Migratory Birds	3300	**	3300
Others	1200	**	1200
Fishing	19600	7100	26700

Commercial ***

Guides	96
Fishermen	36/884
Trappers	600

Subsistence ****

Fishermen	283/542

Total (exclusive of unreported harvest) 46541

* Source: National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USF&WS 1980).

** Sample size too small to allow estimate of non-residents.

*** Numbers represent individuals, not person-years. First fishing number represents individuals catching fish within the Basin, second number represents individuals catching Tanana Basin stocks downstream. All trappers are included here for simplicity. See Chapter 5 for details.

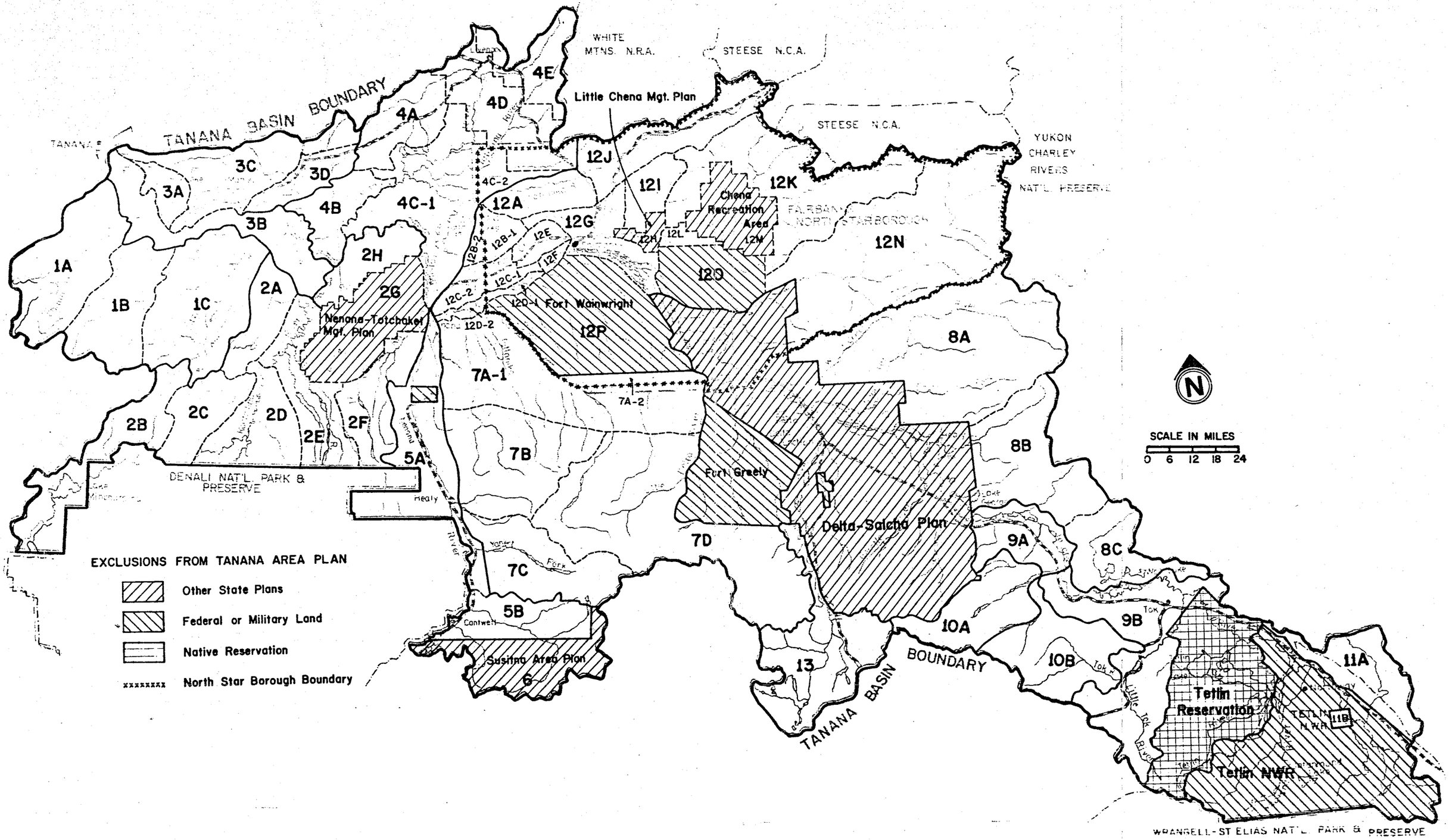
**** All uses other than fishing are excluded because of lack of data. First number represents individuals catching fish within the Basin, second number represents individuals catching Tanana Basin stocks downstream. See Chapter 5 for details.

Chapter 4

Supply of the Resource

Physical Capability of the Tanana Basin for Fish and Wildlife and Associated Uses

OCTOBER 19, 1983


WHITE MTNS. N.R.A.
STEESE N.C.A.
Little Chena Mgt. Plan
TANANA BASIN BOUNDARY
STEESE N.C.A.
YUKON CHARLEY RIVERS NAT'L. PRESERVE
4E
4D
4A
3C
3D
3A
4B
4C-1
4C-2
12A
12J
12I
12K
Chena Recreation Area
12H
12L
12M
12G
12B-2
12B-1
12E
12F
12C-1
12C-2
12D-2
12O
12O-1 Fort Wainwright
12P
12N
FAIRBANKS NORTH STAR BOROUGH
1A
1B
1C
2A
2H
2G
Nenana-Totchaket Mgt. Plan
2B
2C
2D
2E
2F
5A
7A-1
7A-2
7B
8A
8B
DENALI NAT'L. PARK & PRESERVE
Healy
Fort Greely
Delta-Salcha Plan
7D
9A
8C
7C
5B
Susitna Area Plan
6
10A
9B
10B
13
TANANA BASIN BOUNDARY
11A
Tetlin Reservation
TETLIN N.W.R.
11B
Tetlin NWR
WRANGELL-ST ELIAS NAT'L. PARK & PRESERVE
N
SCALE IN MILES
0 6 12 18 24
EXCLUSIONS FROM TANANA AREA PLAN
Other State Plans
Federal or Military Land
Native Reservation
North Star Borough Boundary

CHAPTER 4
TABLE OF CONTENTS

PART I

PHYSICAL CAPABILITY OF THE TANANA BASIN FOR FISH AND WILDLIFE AND ASSOCIATED USES

INTRODUCTION

This chapter contains a summary of the supply of fish and wildlife resource values (biological and human use) extant within the Tanana Basin, and depicts the distribution of lands that supports them. The identification and explanation of such values and their associated land base is a necessary step in preparation for making recommendations for the retention and management of state lands for the protection and optimization of wildlife resource values.

By the term physical capability, we mean the relative ability of land to support wildlife resources and/or the use by humans of those resources. Rather then attempt to describe why areas are "capable", we have chosen to list and map various values, allowing their distribution to define which lands are capable. At a later stage in the plan (Chapter 7), the values will be aggregated and rated, in order to generate maps of the relative value of areas that support wildlife resource values. That map (the suitability map) is based on the distribution of extraordinary values (critical habitat, for instance) and the density and diversity of other values, and is the basis for making our land allocation recommendations in Alternative 3. Therefore, the foundation to the entire process is the information contained in this chapter.

The chapter is organized into an explanation of procedures used to obtain and categorize wildlife resource information, and the products resulting from their application. These products were developed along two parallel tracks: the organization of information relating to habitat quality, and that relating to human use of wildlife resources. These two bodies of information remain fundamentally separate until both are used to develop land allocation recommendations (land suitability maps) later. Supply figures, expressed as the area of various categories of allocation recommendations, are included in Chapter 7.

Products resulting from this chapter include: A) map overlays covering the Tanana Basin base maps (1:250,000 scale) depicting habitat distribution and relative habitat importance by species, B) map overlays depicting the general distribution and relative intensity of human use of wildlife resources, C) narrative descriptions of wildlife resources and habitat, human use information, and supply information (populations and density estimates), D) matrices summarizing the material contained in the narratives and on the overlays.

PROCESS USED TO PRODUCE THE MAPS OF PHYSICAL CAPABILITY

Identification of Fish and Wildlife Values in the Tanana Basin

The process used to develop physical capability maps for fish and wildlife resources in the Tanana Basin had two steps. The first was to identify all the areas in the Basin that have fish and wildlife values and to describe those values. The second step was to attach a relative value to each of these areas, so that the more important and critical areas were highlighted. These steps led to the creation of maps showing habitat importance by species for the Tanana Basin. Concurrently, human use information was organized and a system for determining relative importance of areas was devised.

In order to identify specific areas with significant fish and wildlife habitat values, the following species, or species groups were considered:

- Bison, black bear, caribou, grizzly bear, moose, and Dall sheep.
- Furbearers (including one or a combination of: marten, lynx, wolf, mink, beaver, muskrat, fox, otter, wolverine, and coyote).
- Peregrine Falcon.
- Other Raptors (including one or a combination of: golden eagle, bald eagle, goshawk, Harlan's hawk, rough-legged hawk, red-tailed hawk, osprey, sharp-shinned hawk, grey owl, great horned owl, gyrfalcon, kestrel; and when data were limited, a combination called hawks, eagles, and falcons.
- Small Game (including spruce grouse, ruffed grouse, sharp-tailed grouse, snowshoe hare, rock ptarmigan, and willow ptarmigan.
- Waterfowl (always a combination of one or several groups of diving ducks, puddle ducks, geese, cranes, and trumpeter swans).
- Anadromous Fish (always a combination of one or more of the following species: king salmon, coho salmon, and chum salmon).
- Resident Fish (including one or a combination of grayling, whitefish (several species), burbot, pike, dolly varden, lake trout, and sheefish).

The importance of habitat to these species was assessed through interviews with biologists on Departmental staff, and by assimilating data from sources mentioned below. Tanana Basin subunits (or blocks of like subunits) were used as reference areas within which descriptions and evaluations were made. In order to standardize values between areas and between species, a set of criteria was developed which allows the characterization of habitat importance to various species by area. The categories of importance (critical, prime, important, or low) defined by the criteria are based on

comparisons of the relative importance of habitats to species within the Tanana Basin study area boundaries. They represent an evaluation of the importance of habitat in a given area to maintenance of a specific population's existence or to maintenance of population level of abundance on a long-term sustained basis. Factors taken into consideration were patterns of habitat uses, life functions, sensitivity to human activities, and empirical and inductive information on the ranges of population densities or abundance. The criteria not only represent classifications based upon habitat use, life functions, and sensitivity to human activities, but also include evaluations based on densities and diversity of use.

Determination of Habitat Importance

Specific Habitat Importance Categories and Associated Criteria

Prime habitat: Prime habitats are those capable of supporting maximum densities of one or more species groups on a long-term basis and are necessary to the perpetuation of those populations.

Prime habitat may encompass one or more of the following characteristics: (1) supports seasonally high concentrations of wildlife species; (2) provides elements necessary for special uses, including migration corridors, feeding, calving, breeding, and other use areas; and (3) may be utilized by endangered species. Prime habitat may also include critical habitat, which is defined as those habitats that because of their unique and valuable qualities are particularly crucial to the perpetuation of one or more species groups of wildlife. This definition follows Title 16. Critical habitat may fall within the prime habitat category and it may be difficult to disaggregate the values. Critical habitat may include areas essential for food, shelter, breeding, rearing, escape, and for some species, migration, or may be so classified because of its importance to an endangered species.

Prime habitat for a given species is comprised of the most productive combination of food and cover for a particular seasonal use in a particular region or area or by a particular population. For example, prime spring/summer moose habitat on the Tanana Flats consists of interspersed ponds, bogs, streams, secondary stands of willows and birches, and stands of spruce, birch, or aspen forest. The plant species present and their spatial arrangement make the area nearly ideal moose calving and summer habitat. Moose annually migrate to the Flats in numbers to take advantage of this habitat for 2 to 3 months. Another example of prime habitat is the alpine/subalpine country found in the Tanana Hills which is prime habitat for grizzly bears. However, rather than being a concentration of important plant food and cover species as on the Tanana Flats, the seasonally preferred plant food and cover species are thinly distributed, with occasional highly important areas such as berry patches, sedge and grass meadows, moose calving areas or caribou calving areas. Although the general area is prime

grizzly bear habitat, the basic productivity is substantially lower than an area like the Tanana Flats.

Important habitats - are those habitats in the Tanana Basin capable of supporting medium or high densities of one or more species groups for short or long periods of time and important to the perpetuation of those populations. Important habitat may include areas important for food, shelter, breeding, rearing, and for some species, migration. In general, the habitat quality is lower than prime habitat because the plants comprising the habitat are of lower quality as food or cover, are less abundant, or their spatial arrangement is less advantageous to the species in question. Differences in habitat quality usually result from a combination of these characteristics. For example, hills adjacent to the Tanana Flats contain few ponds, sedge meadows, young second-growth willow or birch stands, and dense cover. Willows of a less desirable species are more common. As a result, the hills do not comprise prime moose spring/summer habitat, although portions of them may be prime late fall or early winter habitat. In general, important habitat covers large expanses, and while not as productive of wildlife on a per unit basis, the cumulative values are significant in maintaining overall species population levels in an area.

Low Value Habitat - Low value habitat are those that are necessary to support the existing distribution, abundance, and productivity of Tanana Basin fish and wildlife populations. Low value habitats are often characterized by large expanses of land possessing habitats utilized by key species, but not in known moderate or high densities (based on present-day knowledge). However, low value habitat is important as the base habitat for large numbers of wildlife over expansive areas. Large acreages classified as low value may be elevated to prime or important as more on-the-ground information is obtained in the Tanana Basin, or as the result of habitat improvement.

Types of Information Used in Determination of Habitat Importance

Habitat classes described and mapped herein are based on both empirical and inductive information. Empirical information consists principally of known seasonal habitat use by the species considered. The relative importance of a particular habitat area is based on the known or inferred degree and consistency of use by a population over a period of time. For example, data on seasonal locations of many radio-collared moose for several years document traditional seasonal habitat use.

A second source of empirical information is habitat assessment studies on the ground. Considering the whole Tanana Basin and all species, numerous habitat assessment studies have been done. When these studies are separated according to the wildlife species of interest, further separated by location, and grouped according to the intensity of assessment, habitat assessment efforts are spotty in coverage and in degree of detail. Again using moose as an example, however,

on-the-ground habitat assessment has been done in numerous representative habitat types in various parts of the Tanana Basin.

A third source of empirical information is general knowledge of habitat characteristics based on casual observations of the area in question. These observations are made during aircraft overflights, surface vehicle travel on land and water, foot travel, and horse and dog team trips. The trips usually have some other main objective but afford chances to observe general habitat characteristics in passing.

Empirical knowledge of habitat characteristics, seasonal movements of species populations, and influences of physical factors on habitat characteristics enables biologists to generalize about habitat characteristics in areas where little or no detailed study has been done. For example, based on known winter habitat use by moose in general, it is logical to identify riparian willow stands as prime moose late winter habitat. Interior river valleys support various amounts of riparian willows, but essentially all contain prime moose winter habitat. Based on this knowledge, the approximate extent of prime late winter moose habitat can be outlined on maps.

Parallels between areas of known importance and habitat characteristics and areas of unknown importance can be similarly drawn for most seasonal habitats for most wildlife species. This process is essentially a refinement of that used by the hunter and naturalist in seeking a species in unfamiliar country. The biologist can look at a topographic map and inductively make a sound general assessment of probable general habitat quality in a particular area. However, lacking more detailed information on habitat or its use, the biologist will have to settle for the general assessment.

PRODUCTS

Habitat Importance Map Overlays

Habitat distribution maps prepared in the past by the Habitat Division, ADF&G (Region III), were used as a starting point for the preparation of a habitat importance map. As biologists were interviewed, they were asked to modify or supplement the existing maps, using new or updated data and making judgements based upon the aforementioned criteria. The result was a Basin-wide, multi-species map of habitat distribution and quality. These overlays are available for viewing at the Department of Fish and Game office in Fairbanks.

Human Use Map Overlays

At the time of writing, our human use maps consist solely of a reproduction of the Tanana Basin Land Use Atlas. This Atlas, published by the Department of Natural Resources as a part of the Tanana Basin Area Planning process in 1982, includes an inventory of backcountry areas, trails, waterways, and sites less than 160 acres (historic and archeological sites, highway

turnouts, and access points to trails, rivers, and backcountry) currently used for the following activities: crosscountry skiing, dog sledding, hiking, horseback riding, off-road vehicles, snowmachine riding, boating, mountain climbing, and wildlife viewing. The Atlas also maps areas of use for hunting, fishing, trapping, and the relative values of each area for these uses.

Although we have additional information on human use (which has been used in later stages of integration of wildlife values), it has not been possible to organize and produce additional overlay materials to date. It was felt that despite the generality of the Atlas and the danger inherent in relying on a single product for this information, this map is a useful way to look at: 1) the patterns and combinations of uses occurring in the Basin, and 2) the relationship of the areas valuable for this purpose to those valuable as habitat. Since the Atlas has been reviewed and supplemented at village meetings and public meetings held in Fairbanks, it is likely that in a broad sense, it depicts human use accurately.

Wildlife Resources Narratives

Narratives describing the capability of the land to support wildlife, and also the extent of human use of wildlife, were drafted for each Large Unit addressed in the Tanana Basin Area Plan. Within these, contiguous Small Units with similar wildlife capability and patterns of human use of wildlife were described in a single narrative. In one case, portions of two Large Units were combined. In each of the 20 combined narratives, wildlife species which consistently occurred within the area discussed were addressed. Occasional or uncommon species that were more abundant in a neighboring set of Small Units were mentioned in both narratives, but discussed in detail only in the narrative for the area in which the greater abundance occurs.

Several Basin-wide narratives were written, either because a species was extensive in its movements and use of range (e.g., caribou), or that information did not differ significantly from unit to unit (e.g., raptors, waterfowl, and small game). In cases where pertinent site-specific information was available for these species, it was included in subunit writeups.

Detailed wildlife species and species group accounts were included in the narratives in alphabetical order. The complete list is: black bear, caribou, fish, furbearers, grizzly bear, moose, sheep, and waterfowl. Additional narratives covering larger areas of land for specific wildlife species and species groups were included prior to the combined Small Unit narratives. These additional narratives described small game, raptors, and waterfowl throughout the Tanana Basin and each of the three major caribou herds that use the Tanana Basin.
Each combined Small Unit narrative begins with a summary. In the summary, all areas of critical or prime habitat and intensive human use of wildlife are mentioned. For species or species groups present but uncommon in the area, the reader is referred to the specific narrative describing those

animals. The locations of raptor nesting areas and areas of intensive small game use are also described.

In each combined Small Unit narrative, individual species or species group accounts follow the summary. With the exception of fish, each of those accounts was organized according to the following headings:

Habitat Importance. A brief description of habitat quality designations for the wildlife species or species group was given.

Critical Habitat. A listing of land areas or vegetation types present that constitute critical habitat was included if appropriate.

Seasonal Use and Vegetation Description. A listing of special use areas for the wildlife species or group of species, followed by a description of the combined Small Unit area, was described, emphasizing vegetation types used by the wildlife species or species group. This heading included a justification for any critical or prime habitat areas, if not justified above.

Potential Habitat Enhancement Areas and Techniques. Areas in which the habitat quality for the wildlife species or group of species could be improved by the use of management techniques were described. Limitations on the use of those techniques were also discussed.

Density and Population Estimates. Estimates of the size and density of populations of the wildlife species or group of species and of the trend of increase or decrease in population size were discussed. If no counts had been made, relative estimates by biologists or other persons who knew the area were included.

Harvest. Levels of reported harvest over the past several years, and potential future harvests, were considered. Estimates of unreported harvest were made if applicable and available.

Human Use and Access. Past, present, and projected future human use of the wildlife species or group of species, including both hunting and nonconsumptive uses, were considered. Intensity of use, areas of use, and means and corridors of access were described.

The narratives on fish were divided into three parts:

Habitat Importance. A list of critical and prime habitat areas, and special use areas were included.

Presence. A list was prepared of anadromous and resident fish species that occur in each major waterbody in the areas and that are used for sport and/or for food. Habitat types taken by each fish species were briefly discussed.

Human Use and Access. This section was the same as Human Use and Access section described above.

The wildlife resources narratives are available for reference at the offices of the Habitat Division, Alaska Department of Fish and Game, Fairbanks.

Habitat Importance and Human Use Matrices

Matrices have been developed for each Large and Small Unit in the Basin and are appended to this chapter. These identify the following:

Habitat importance for each species or group of species. These are the same categories that were shown on the overlays and were described in the criteria and narrative sections.

Mineral licks. These are critical areas for sheep and very important areas for moose and caribou. They were taken from the overlay depiction.

Potential enhancement areas (present or absent). These areas were described only in the narrative sections and were not mapped.

Associated human uses. Hunting, fishing, and trapping including the intensity rating (intensive or moderate) have been taken from the Human Use Overlay.

Important access points. These points were taken from the trails overlay which were based on information from the Department of Natural Resources' Tanana Basin Land Use Atlas.

SOURCES OF INFORMATION

The map overlays and accompanying narratives were developed by Frances VanBallenberghe, Matt Robus, Mike Masters, and Carl Hemming. Data and interpretations were supplied by biologists and technicians of the Alaska Department of Fish and Game listed in Appendix 2. The Habitat Division cartographic staff produced most of the maps. The following sources of information were used:

1. **Alaska's Wildlife and Habitat, Volume I,** published by the Alaska Department of Fish and Game in 1973, includes a plant and animal reference list, physiography of Alaska, wildlife species accounts, wildlife distribution, and seasonal use maps.

2. **Alaska's Wildlife and Habitat, Volume II,** published in 1978 by the Alaska Department of Fish and Game, includes wildlife species accounts for furbearers, small game and raptors, game management unit accounts, and wildlife distribution maps.

3. **Big Game Data Index Files (BGDIF),** Alaska Department of Fish and Game, Game Division. Standard files containing all observations and data routinely recorded on habitat, population

PART II

WILDLIFE RESOURCES NARRATIVES

For brevity and clarity, these narratives have not been included in the ADNR-published version of this element paper. The narratives are available for reference at the offices of the Habitat Division, Alaska Department of Fish and Game, Fairbanks, Alaska.

APPENDIX I

Notes on Interpretation of Habitat Importance and Human Use Matrices

For any species or species group, the highest habitat importance category found in the Small Unit is always marked. If lower quality habitat is also present, corresponding boxes are usually not filled in.

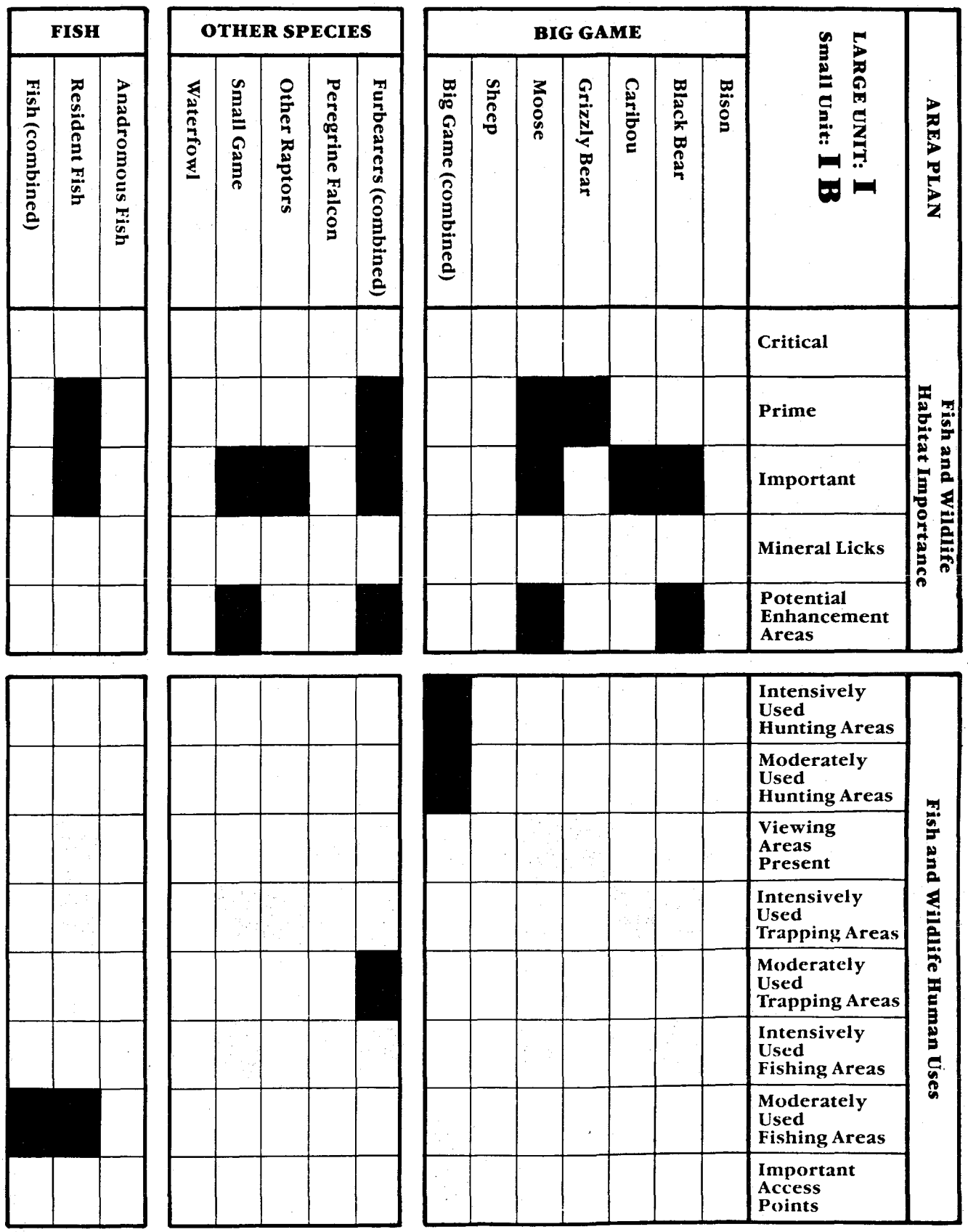
For big game species, the human use section of the matrix is filled out only for the bottom row (combined). If the use applies to any big game species listed, the combined box is filled out.

Important access points are defined strictly to include only trailheads, boat launches, landing strips, lakes suitable for light airplanes, and other points of limited areal extent. Roads, trails, rivers, and other extended features providing access are not included.

AREA PLAN	LARGE UNIT: I Small Unit: IA	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime				■	■										
	Important		■			■			■		■	■			■	
	Mineral Licks															
	Potential Enhancement Areas		■			■			■	■		■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas															
	Moderately Used Hunting Areas	■														
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas													■	■	
	Important Access Points															

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

LARGE UNIT: I Small Unit: IC	BIG GAME							OTHER SPECIES					FISH		
AREA PLAN	Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance															
Critical															
Prime				■	■			■							
Important		■	■		■			■		■	■			■	
Mineral Licks															
Potential Enhancement Areas		■			■			■			■				
Fish and Wildlife Human Uses															
Intensively Used Hunting Areas							■								
Moderately Used Hunting Areas							■								
Viewing Areas Present															
Intensively Used Trapping Areas															
Moderately Used Trapping Areas								■							
Intensively Used Fishing Areas															
Moderately Used Fishing Areas													■	■	
Important Access Points													■		

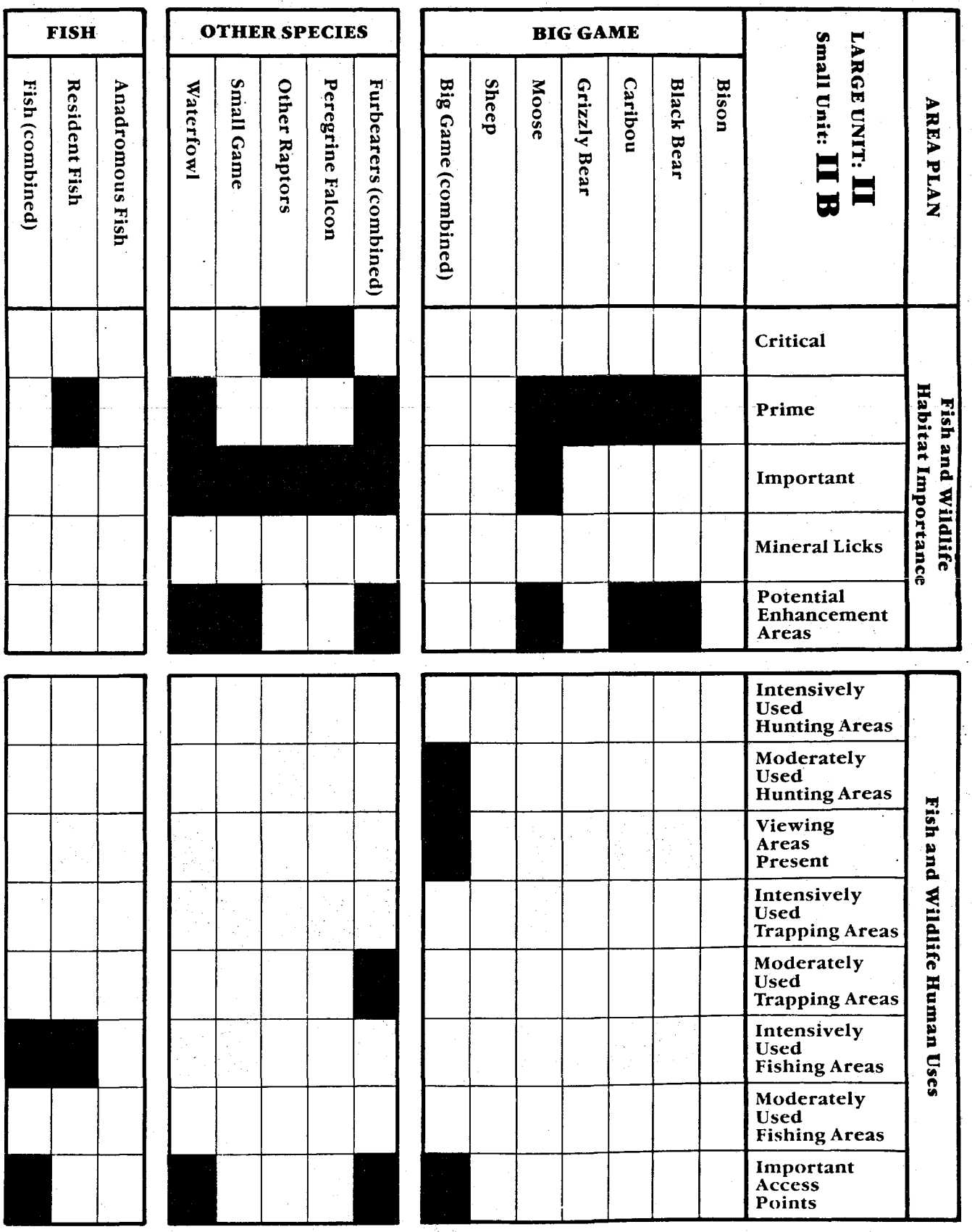
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: II Small Unit: II A	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime								■							
	Important		■			■			■		■	■	■		■	
	Mineral Licks															
	Potential Enhancement Areas		■			■			■				■			
Fish and Wildlife Human Uses	Intensively Used Hunting Areas							■								
	Moderately Used Hunting Areas							■								
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas													■	■	
	Important Access Points													■		

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



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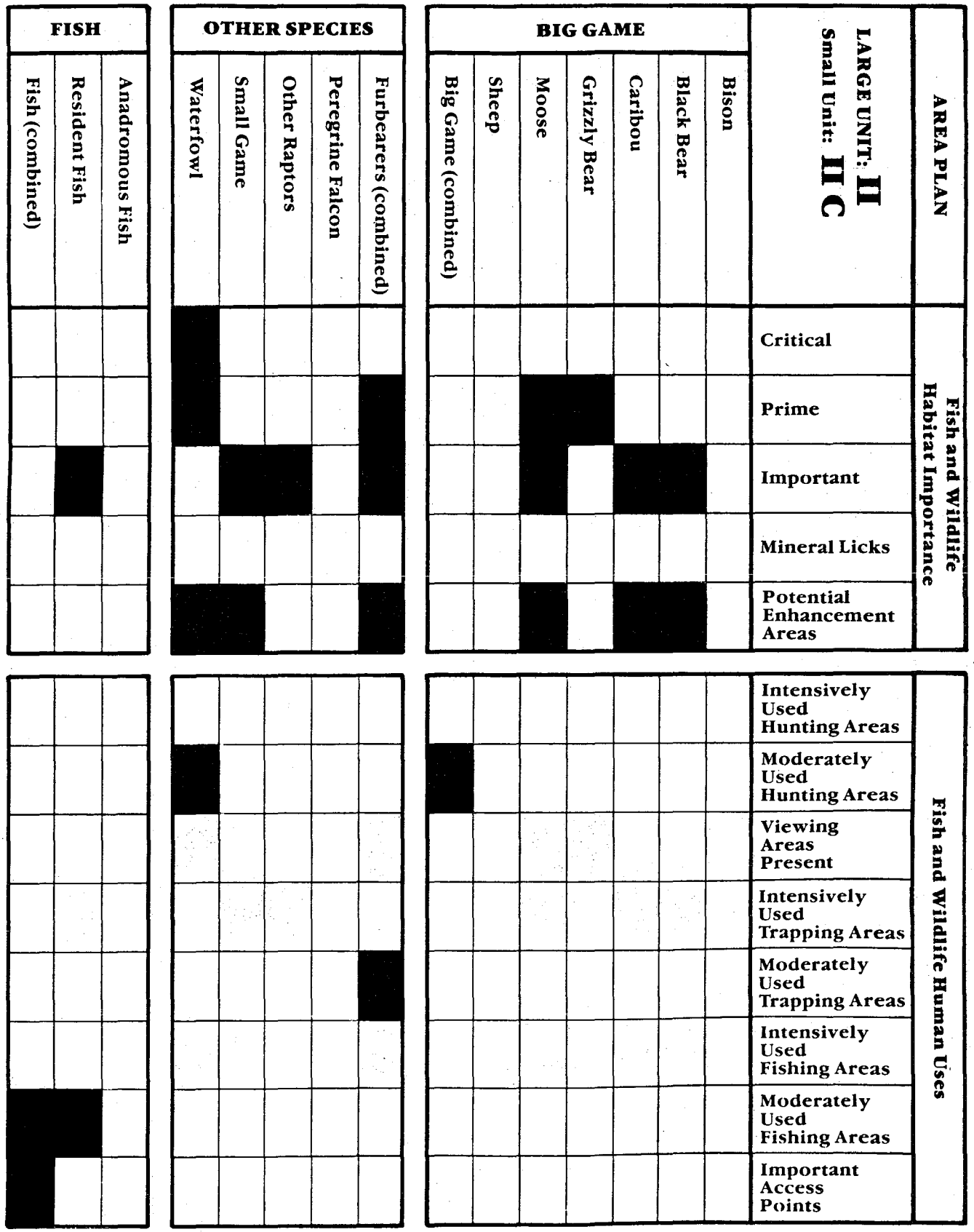
Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



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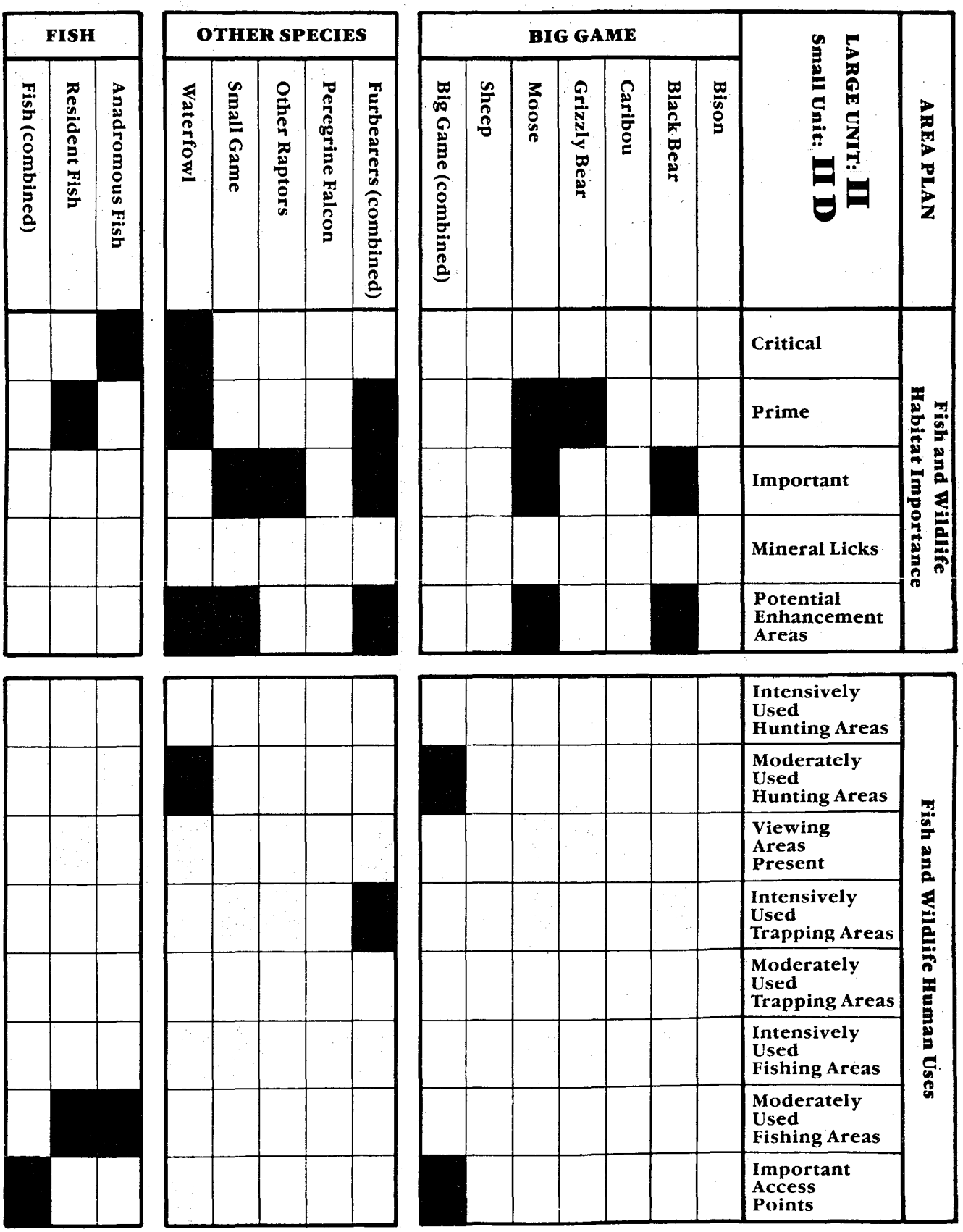
Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



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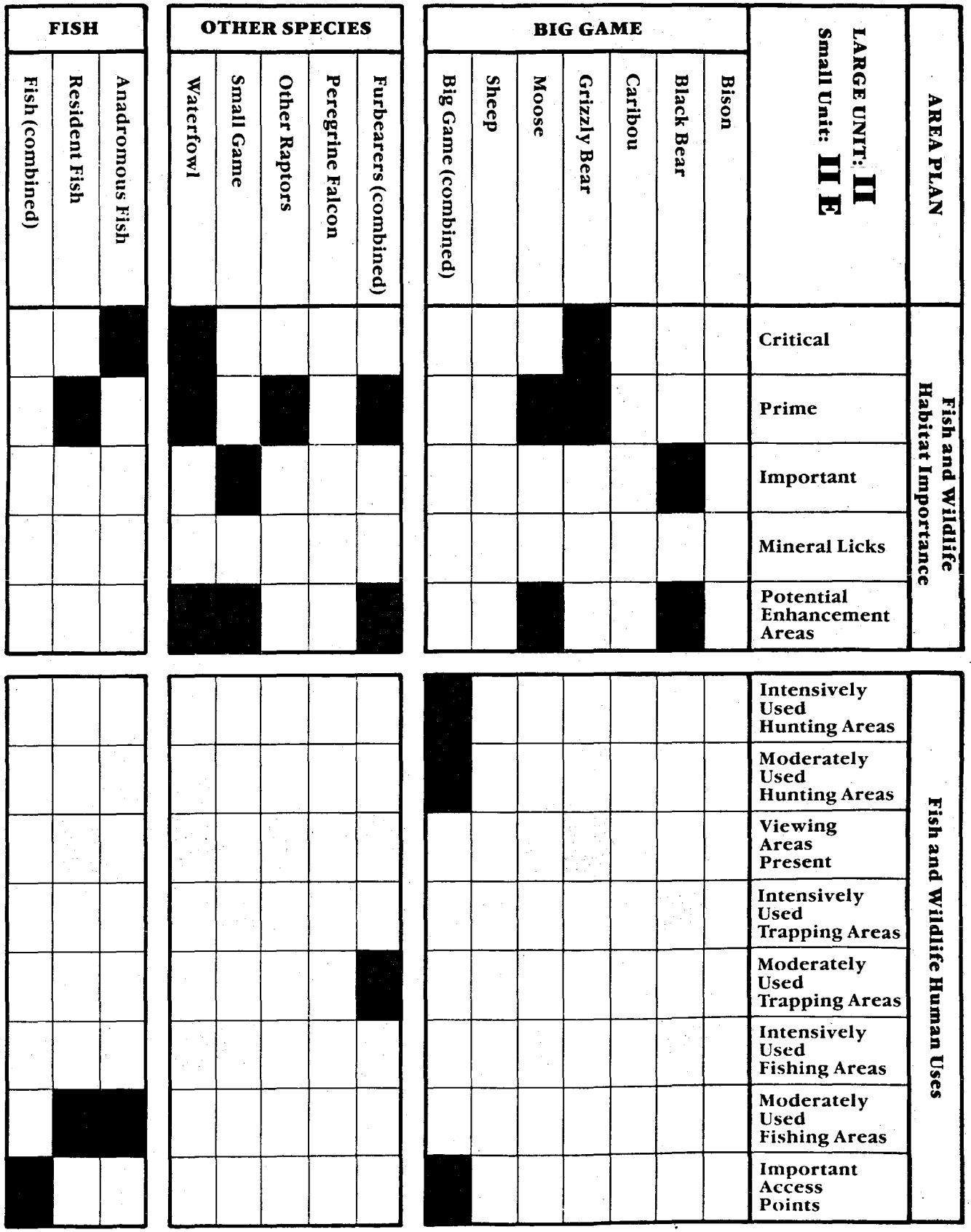

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: II Small Unit: II F	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime			■	■				■							
	Important		■	■		■			■		■	■	■		■	
	Mineral Licks															
	Potential Enhancement Areas		■	■	■	■			■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas															
	Moderately Used Hunting Areas							■								
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas															
	Important Access Points							■	■							■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: II Small Unit: II H	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime		■			■			■						■	
	Important										■	■	■			
	Mineral Licks															
	Potential Enhancement Areas		■			■			■				■			
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■						■				■				
	Moderately Used Hunting Areas															
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas														■	
	Important Access Points															

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Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: III Small Unit: III A	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime					■			■				■	■	■	
	Important		■									■				
	Mineral Licks															
	Potential Enhancement Areas		■			■			■				■			
Fish and Wildlife Human Uses	Intensively Used Hunting Areas							■								
	Moderately Used Hunting Areas							■								
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas													■	■	■
	Important Access Points							■	■				■	■		■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

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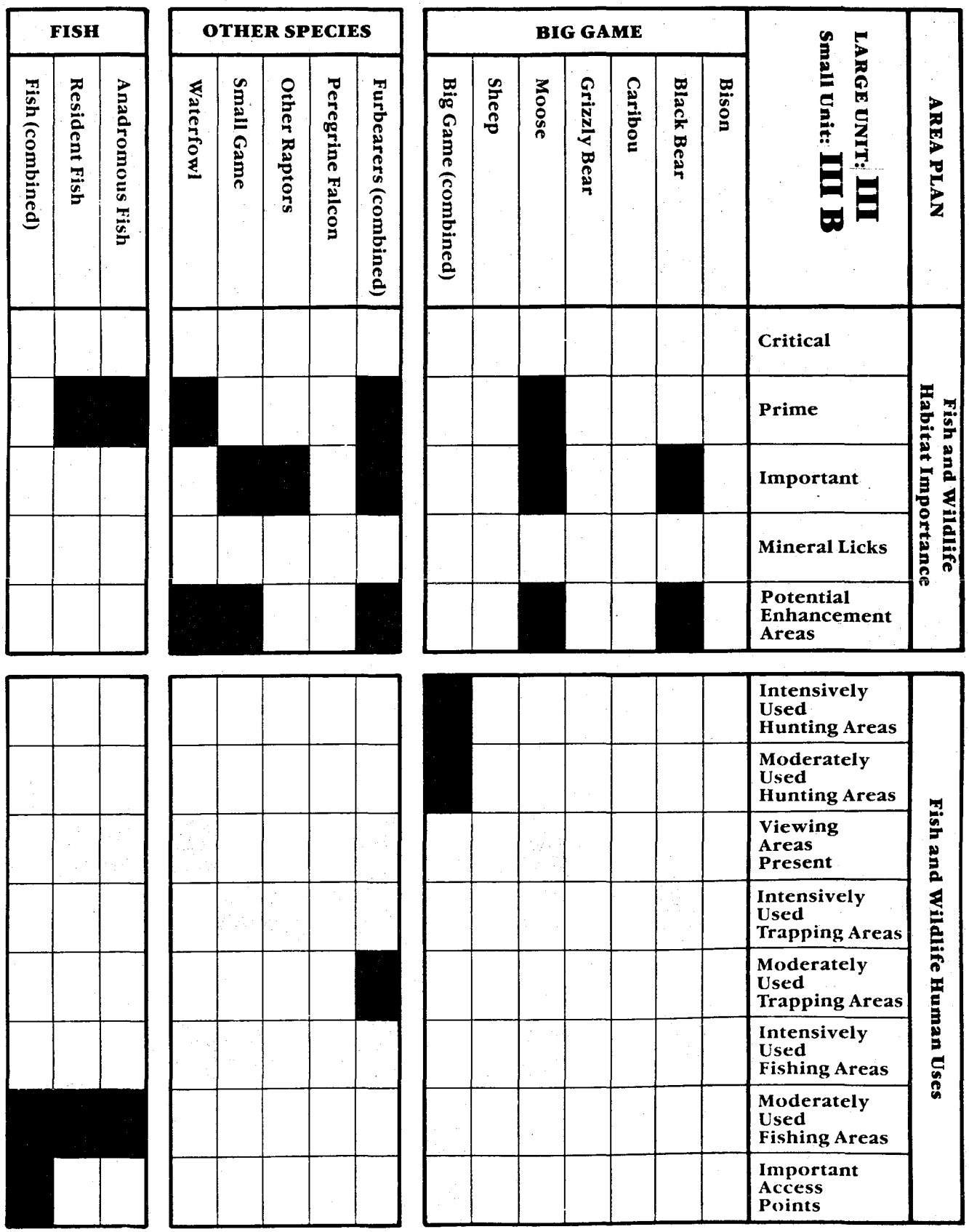

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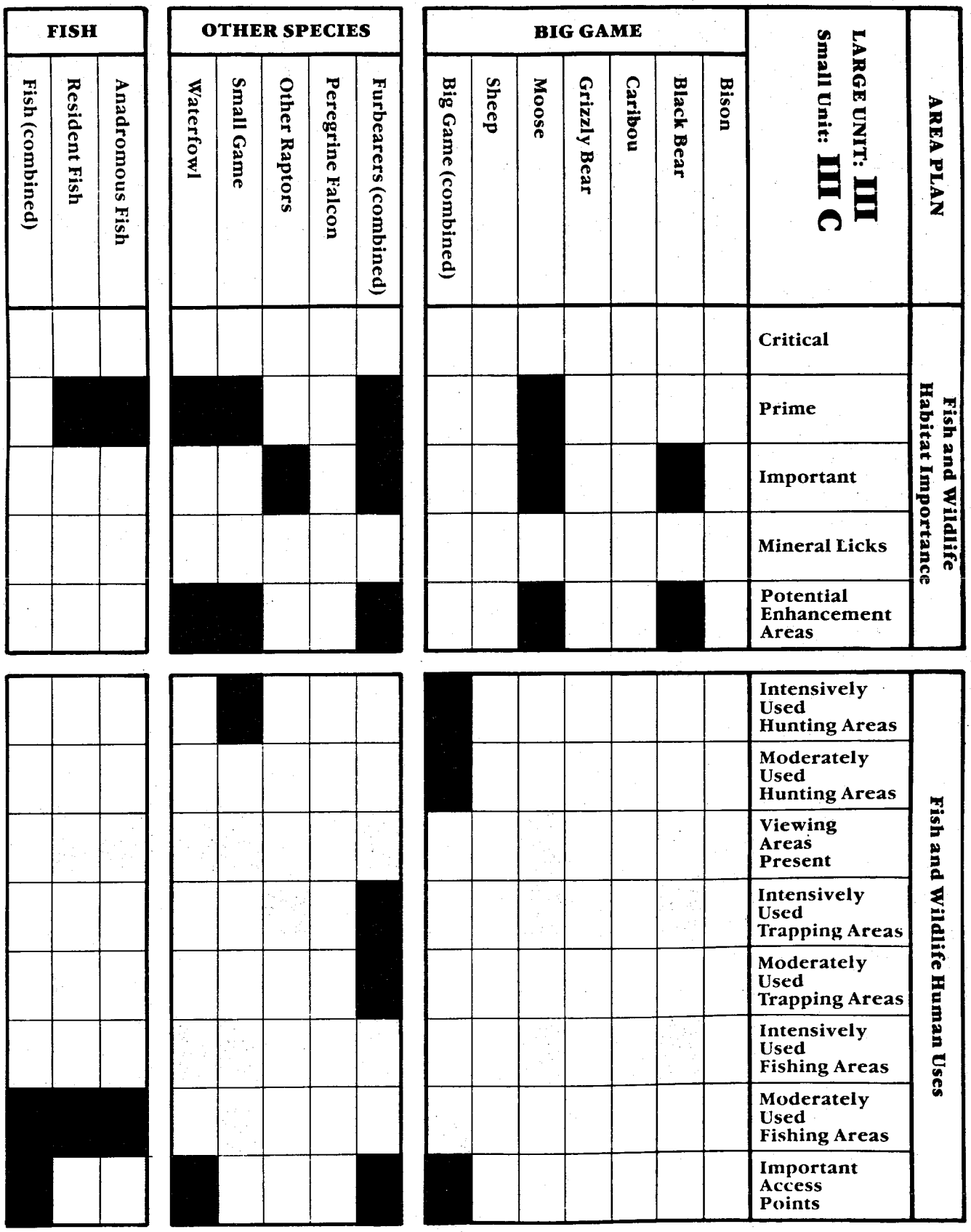

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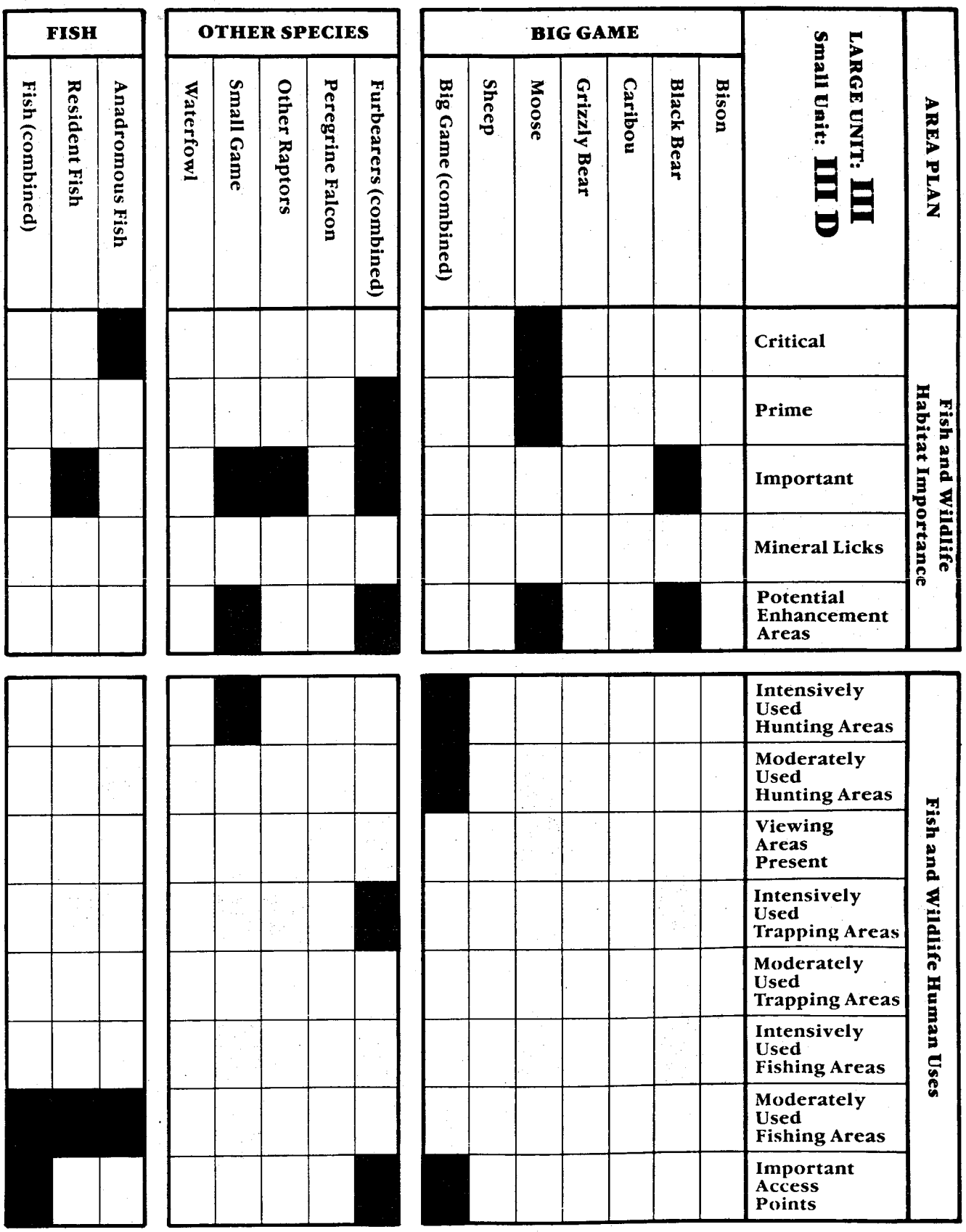

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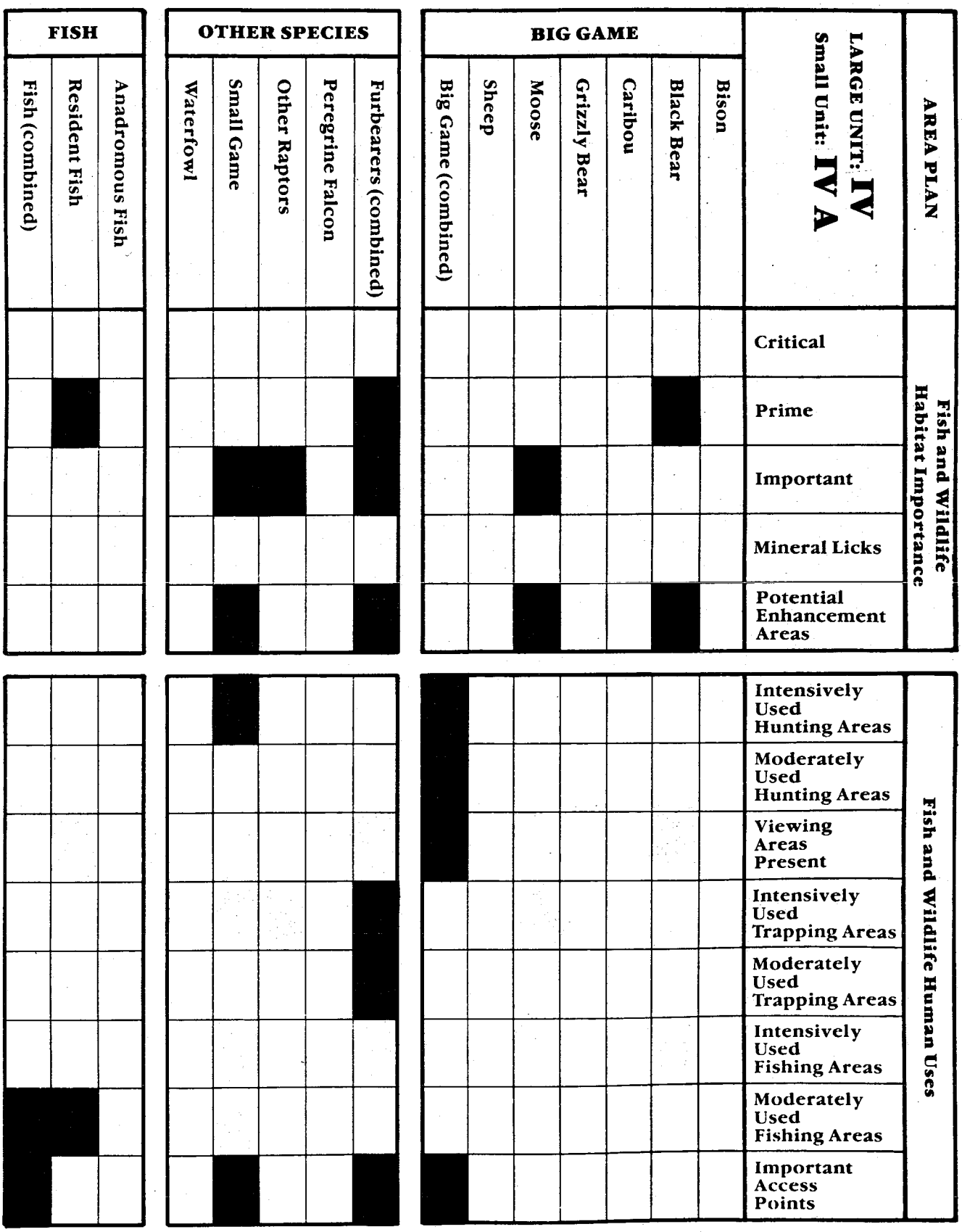
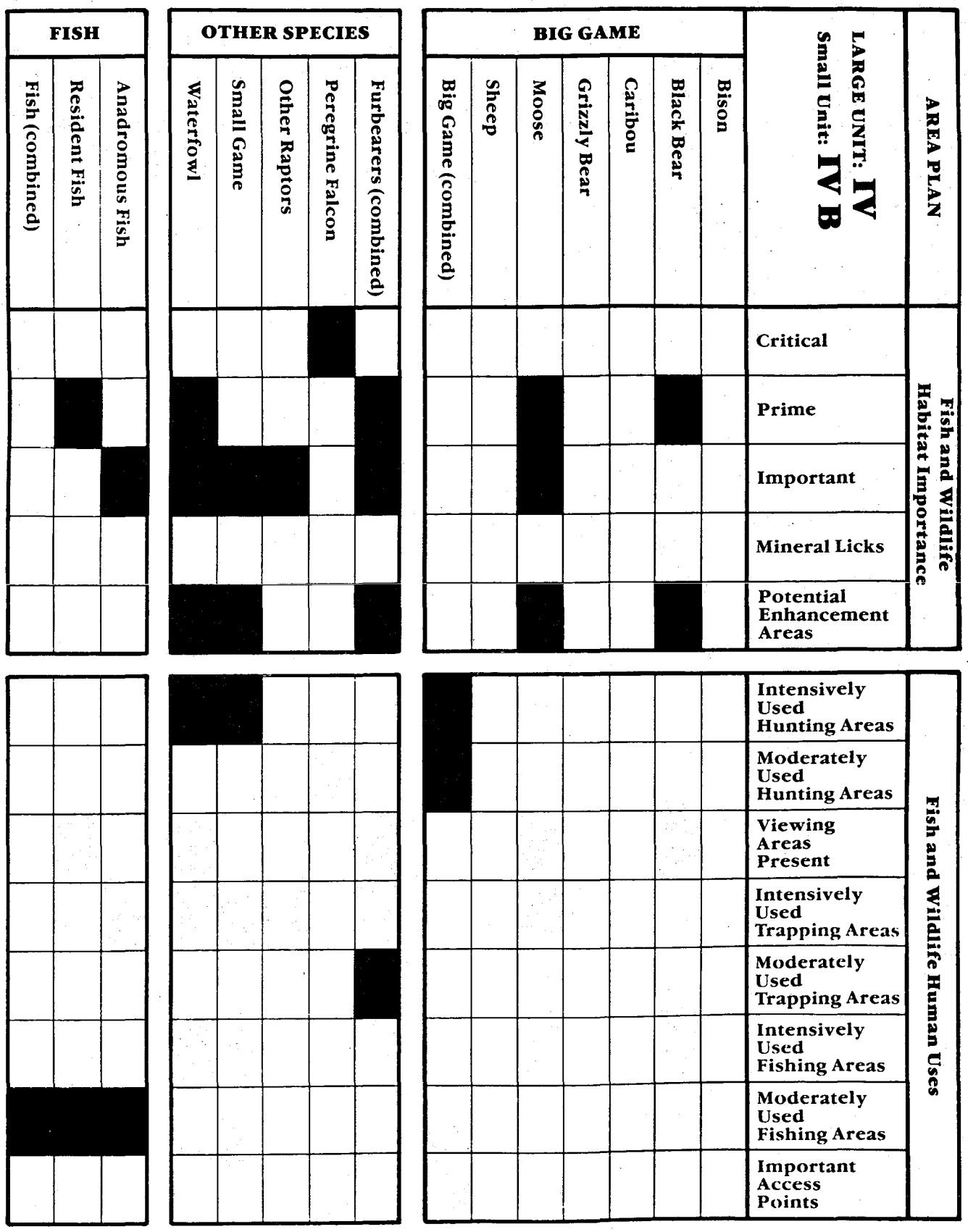


* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

LARGE UNIT: IV Small Unit: IV C-1	BIG GAME							OTHER SPECIES					FISH		
AREA PLAN	Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance: Critical					■							■			
Fish and Wildlife Habitat Importance: Prime		■			■			■		■				■	
Fish and Wildlife Habitat Importance: Important					■					■	■	■	■		
Fish and Wildlife Habitat Importance: Mineral Licks															
Fish and Wildlife Habitat Importance: Potential Enhancement Areas		■			■			■				■			
Fish and Wildlife Human Uses: Intensively Used Hunting Areas	■	■			■		■				■	■			
Fish and Wildlife Human Uses: Moderately Used Hunting Areas															
Fish and Wildlife Human Uses: Viewing Areas Present	■														
Fish and Wildlife Human Uses: Intensively Used Trapping Areas								■							
Fish and Wildlife Human Uses: Moderately Used Trapping Areas								■							
Fish and Wildlife Human Uses: Intensively Used Fishing Areas													■	■	
Fish and Wildlife Human Uses: Moderately Used Fishing Areas															
Fish and Wildlife Human Uses: Important Access Points	■							■		■	■				■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: IV Small Unit: IV C-2	BIG GAME							OTHER SPECIES						FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime		■			■			■						■	
	Important					■			■			■				
	Mineral Licks															
	Potential Enhancement Areas		■			■			■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■										■				
	Moderately Used Hunting Areas															
	Viewing Areas Present															
	Intensively Used Trapping Areas								■							
	Moderately Used Trapping Areas															
	Intensively Used Fishing Areas														■	■
	Moderately Used Fishing Areas														■	
	Important Access Points															

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: IV Small Unit: IV D	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical									■						
	Prime		■			■			■		■				■	
	Important					■			■			■				
	Mineral Licks															
	Potential Enhancement Areas		■			■			■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■										■				
	Moderately Used Hunting Areas															
	Viewing Areas Present	■														
	Intensively Used Trapping Areas								■							
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas													■	■	
	Moderately Used Fishing Areas															
	Important Access Points	■							■			■				■

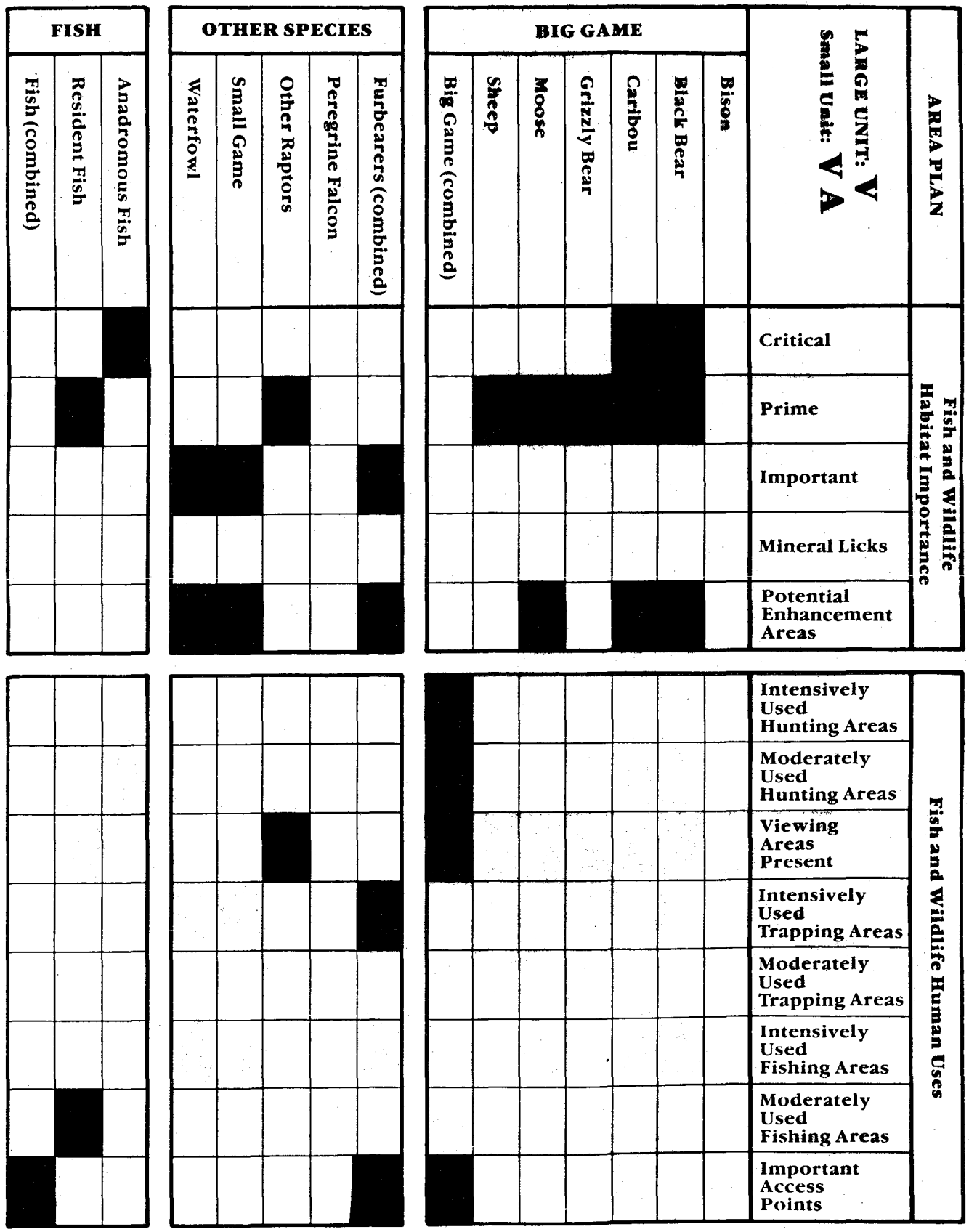
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: IV Small Unit: IV E	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime			■											■	
	Important		■			■			■		■	■				
	Mineral Licks															
	Potential Enhancement Areas		■			■			■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■										■				
	Moderately Used Hunting Areas															
	Viewing Areas Present	■														
	Intensively Used Trapping Areas								■							
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas													■	■	
	Important Access Points	■						■	■			■				■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: V Small Unit: V C	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime			■	■	■	■		■			■			■	
	Important										■					
	Mineral Licks															
	Potential Enhancement Areas					■			■							
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■						■								
	Moderately Used Hunting Areas	■						■				■				
	Viewing Areas Present	■						■								
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas													■	■	
	Moderately Used Fishing Areas															
	Important Access Points	■						■				■				■

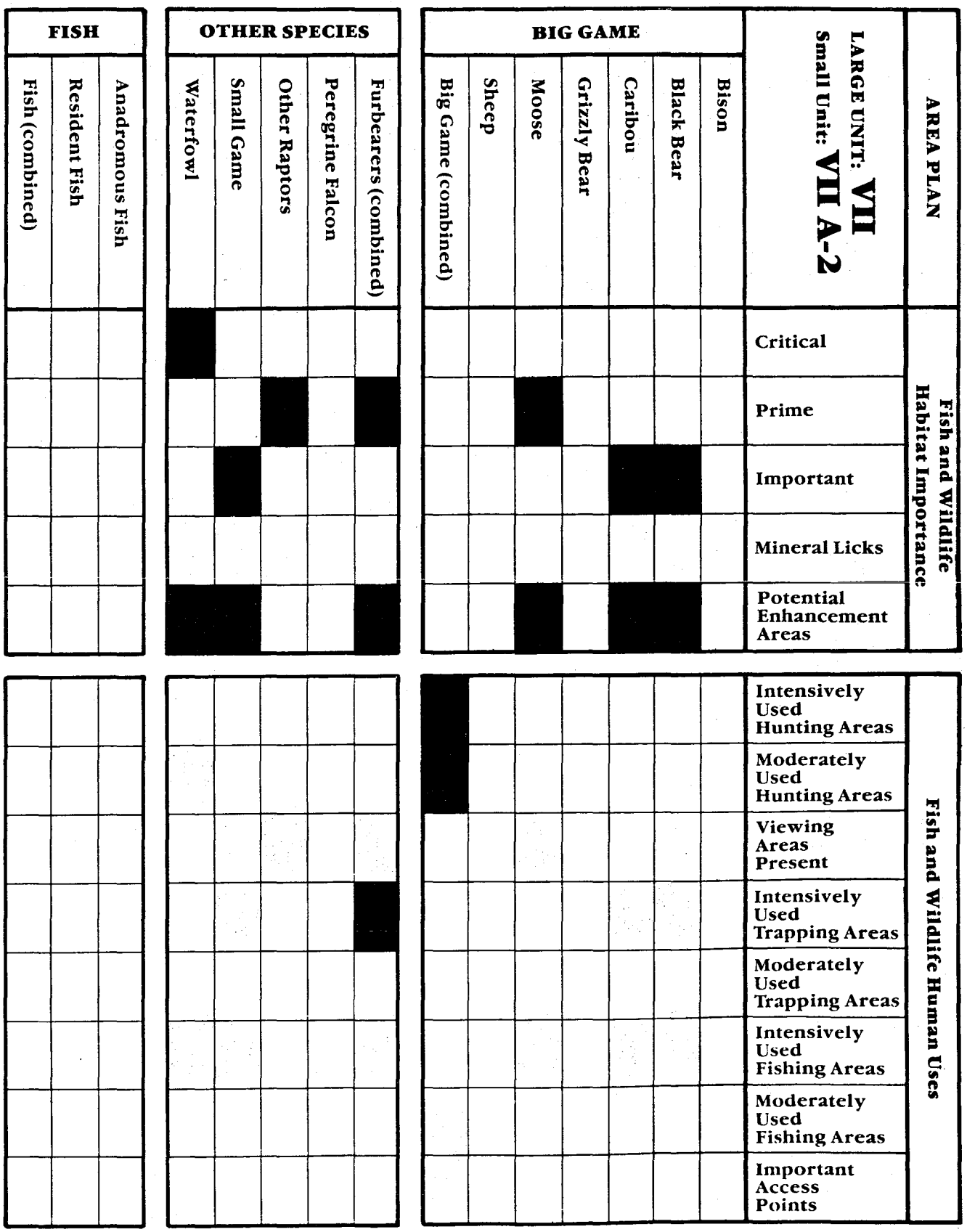
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: VII Small Unit: VII A-1	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical												■			
	Prime		■			■			■		■					
	Important			■								■			■	
	Mineral Licks															
	Potential Enhancement Areas		■	■		■			■			■	■			
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■						■								
	Moderately Used Hunting Areas	■						■								
	Viewing Areas Present															
	Intensively Used Trapping Areas								■							
	Moderately Used Trapping Areas															
	Intensively Used Fishing Areas													■	■	
	Moderately Used Fishing Areas															
	Important Access Points	■						■								

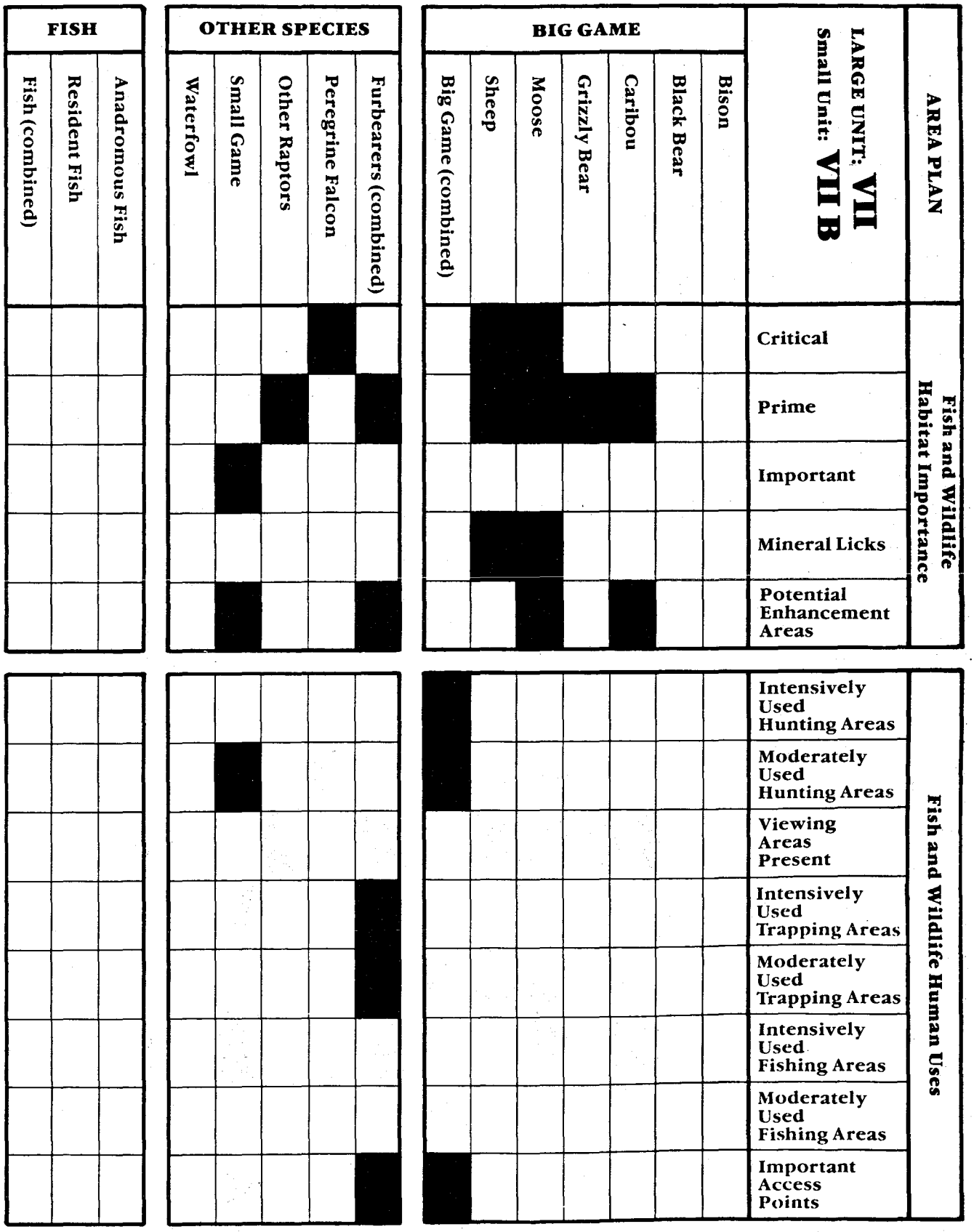
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



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Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: VII Small Unit: VII C	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical			■		■	■									
	Prime			■	■	■	■		■		■					
	Important											■				
	Mineral Licks						■									
	Potential Enhancement Areas								■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas							■								
	Moderately Used Hunting Areas							■				■				
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas								■							
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas															
	Important Access Points							■	■							

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: VII Small Unit: VII D	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical			■			■			■						
	Prime			■	■	■	■		■		■					
	Important					■						■				
	Mineral Licks					■	■									
	Potential Enhancement Areas			■		■			■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas							■								
	Moderately Used Hunting Areas							■								
	Viewing Areas Present															
	Intensively Used Trapping Areas								■	■						
	Moderately Used Trapping Areas								■	■						
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas															
	Important Access Points							■								

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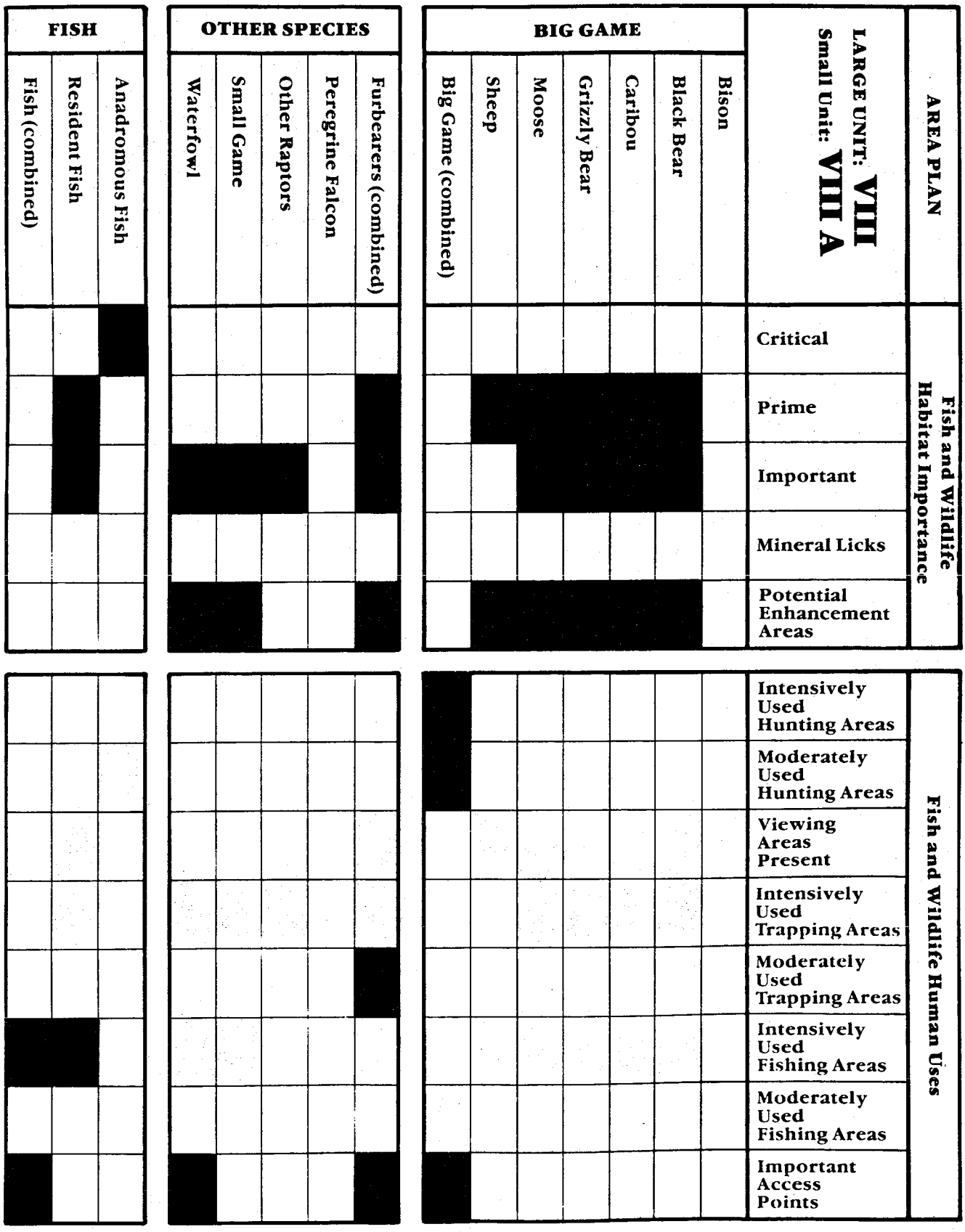
Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



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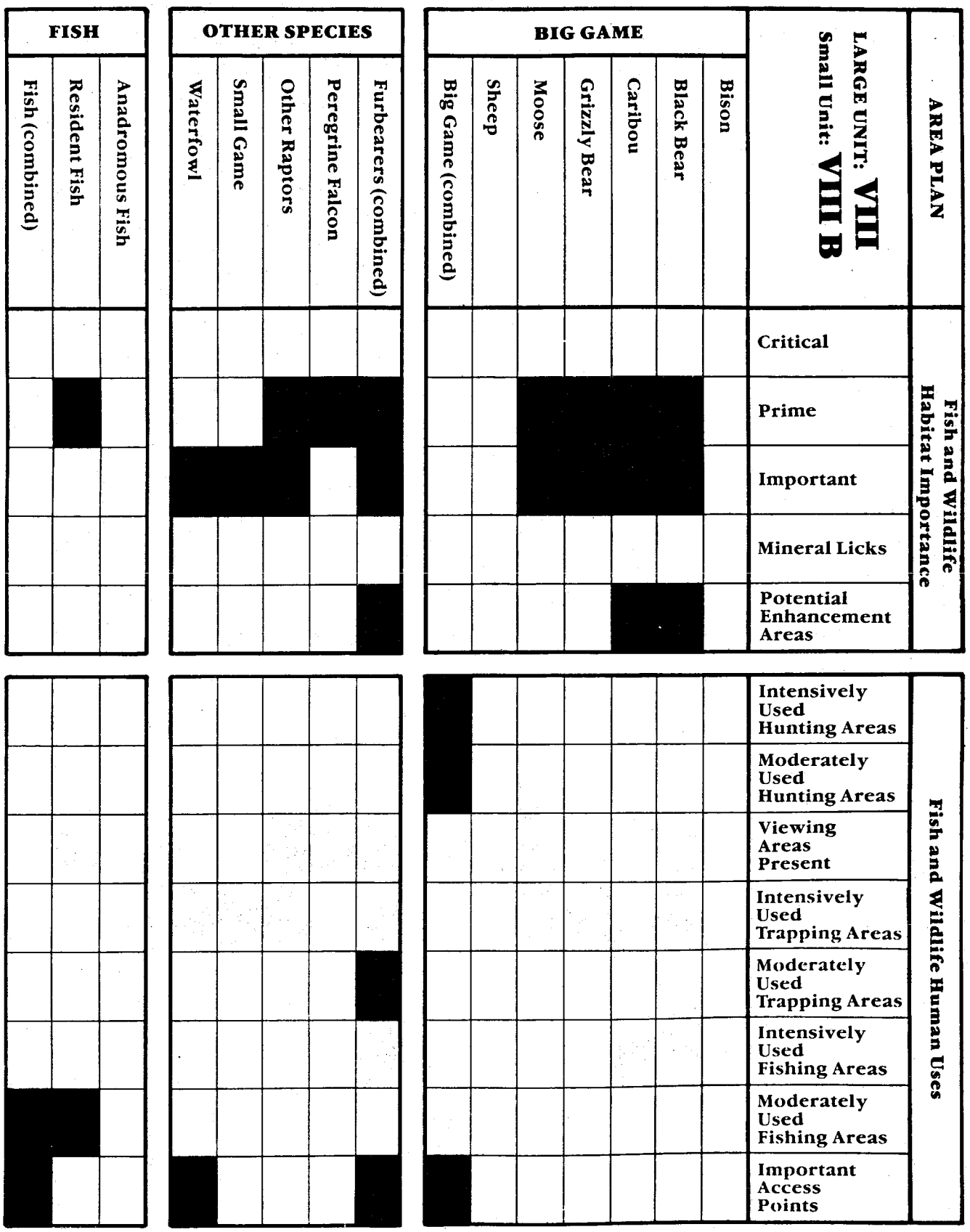
Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



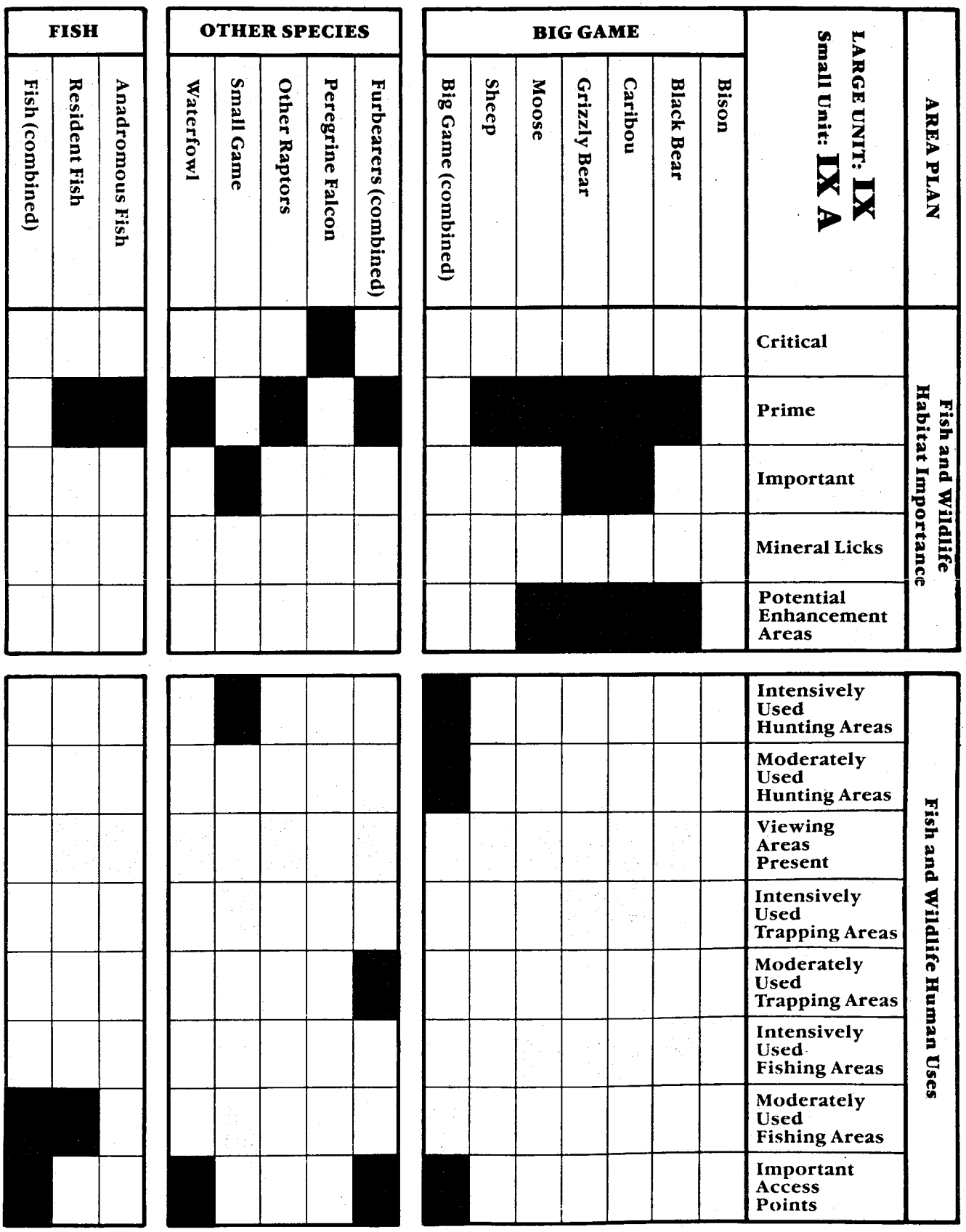
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

LARGE UNIT: Small Unit: VIII C	BIG GAME							OTHER SPECIES					FISH		
AREA PLAN	Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance: Critical															
Fish and Wildlife Habitat Importance: Prime		■		■	■			■				■		■	
Fish and Wildlife Habitat Importance: Important			■	■	■			■		■	■				
Fish and Wildlife Habitat Importance: Mineral Licks															
Fish and Wildlife Habitat Importance: Potential Enhancement Areas		■			■			■							
Fish and Wildlife Human Uses: Intensively Used Hunting Areas	■						■					■			
Fish and Wildlife Human Uses: Moderately Used Hunting Areas							■								
Fish and Wildlife Human Uses: Viewing Areas Present															
Fish and Wildlife Human Uses: Intensively Used Trapping Areas															
Fish and Wildlife Human Uses: Moderately Used Trapping Areas									■						
Fish and Wildlife Human Uses: Intensively Used Fishing Areas													■		
Fish and Wildlife Human Uses: Moderately Used Fishing Areas															
Fish and Wildlife Human Uses: Important Access Points	■						■	■				■			■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



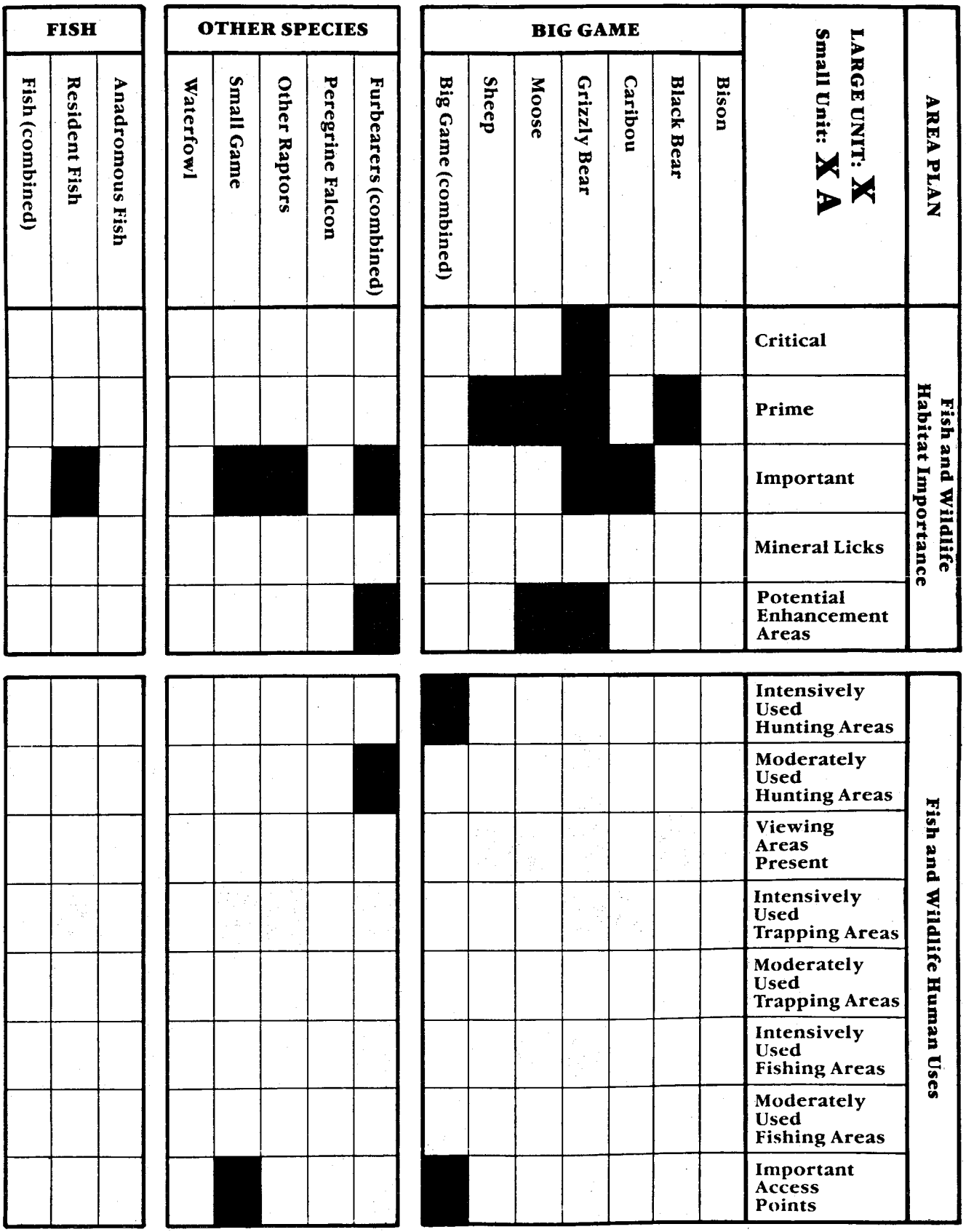
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: IX Small Unit: IX B	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical									■						
	Prime		■	■	■	■	■		■	■	■			■	■	
	Important				■				■			■	■			
	Mineral Licks						■									
	Potential Enhancement Areas							■	■			■				
Fish and Wildlife Human Uses	Intensively Used Hunting Areas	■						■								
	Moderately Used Hunting Areas	■						■								
	Viewing Areas Present	■						■								
	Intensively Used Trapping Areas									■						
	Moderately Used Trapping Areas															
	Intensively Used Fishing Areas															
	Moderately Used Fishing Areas													■	■	■
	Important Access Points	■						■	■	■		■		■		■

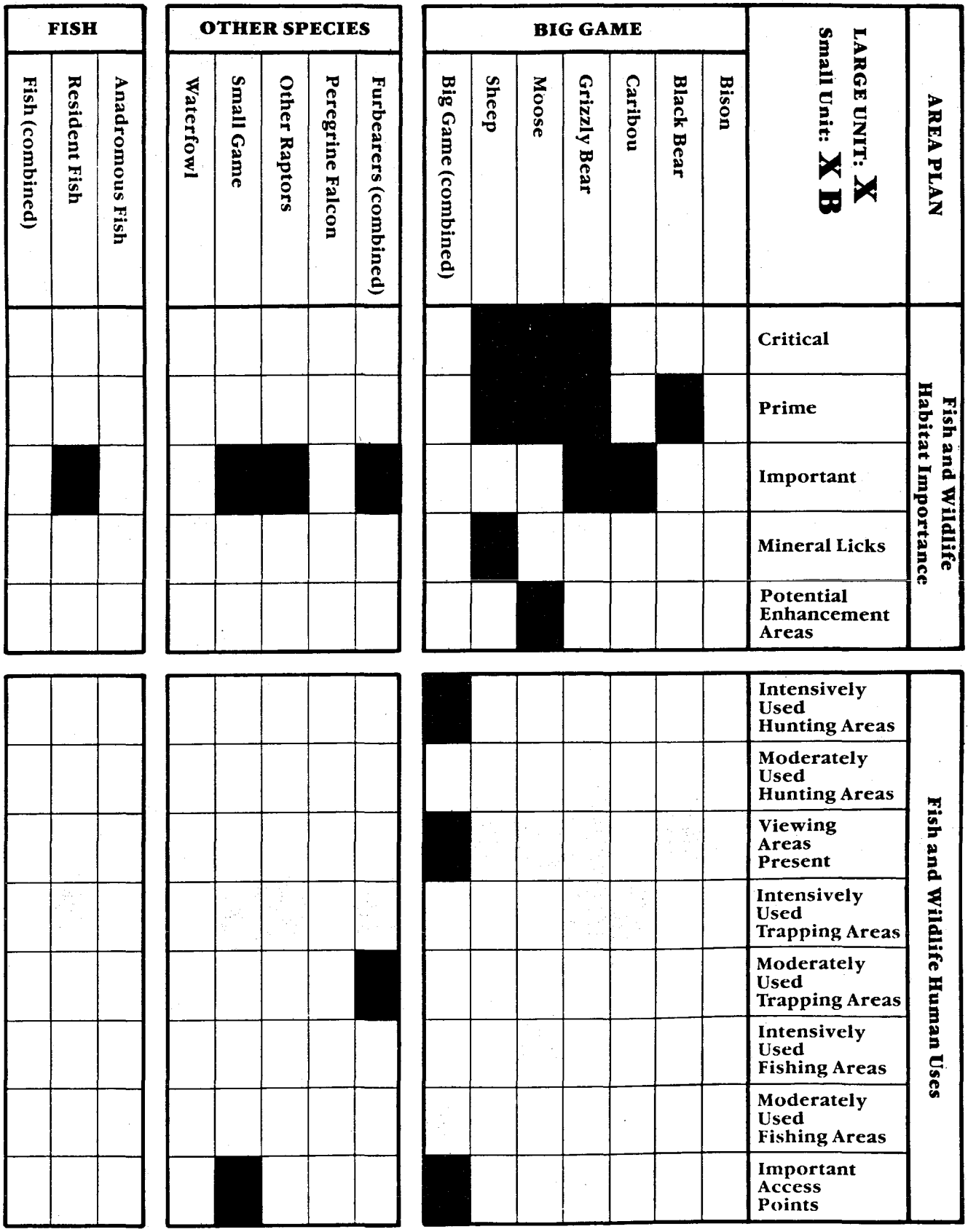
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: XI Small Unit: XI A & B	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical															
	Prime		■	■	■				■				■			
	Important			■	■	■					■	■			■	
	Mineral Licks															
	Potential Enhancement Areas		■			■			■							
Fish and Wildlife Human Uses	Intensively Used Hunting Areas												■			
	Moderately Used Hunting Areas							■								
	Viewing Areas Present															
	Intensively Used Trapping Areas															
	Moderately Used Trapping Areas									■						
	Intensively Used Fishing Areas													■	■	
	Moderately Used Fishing Areas															
	Important Access Points															

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

AREA PLAN	LARGE UNIT: XII Small Unit: XII A	BIG GAME							OTHER SPECIES					FISH		
		Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance	Critical													■		
	Prime		■			■			■			■			■	
	Important										■		■			
	Mineral Licks															
	Potential Enhancement Areas															
Fish and Wildlife Human Uses	Intensively Used Hunting Areas							■								
	Moderately Used Hunting Areas															
	Viewing Areas Present															
	Intensively Used Trapping Areas								■							
	Moderately Used Trapping Areas															
	Intensively Used Fishing Areas													■	■	
	Moderately Used Fishing Areas													■		
	Important Access Points							■					■			■

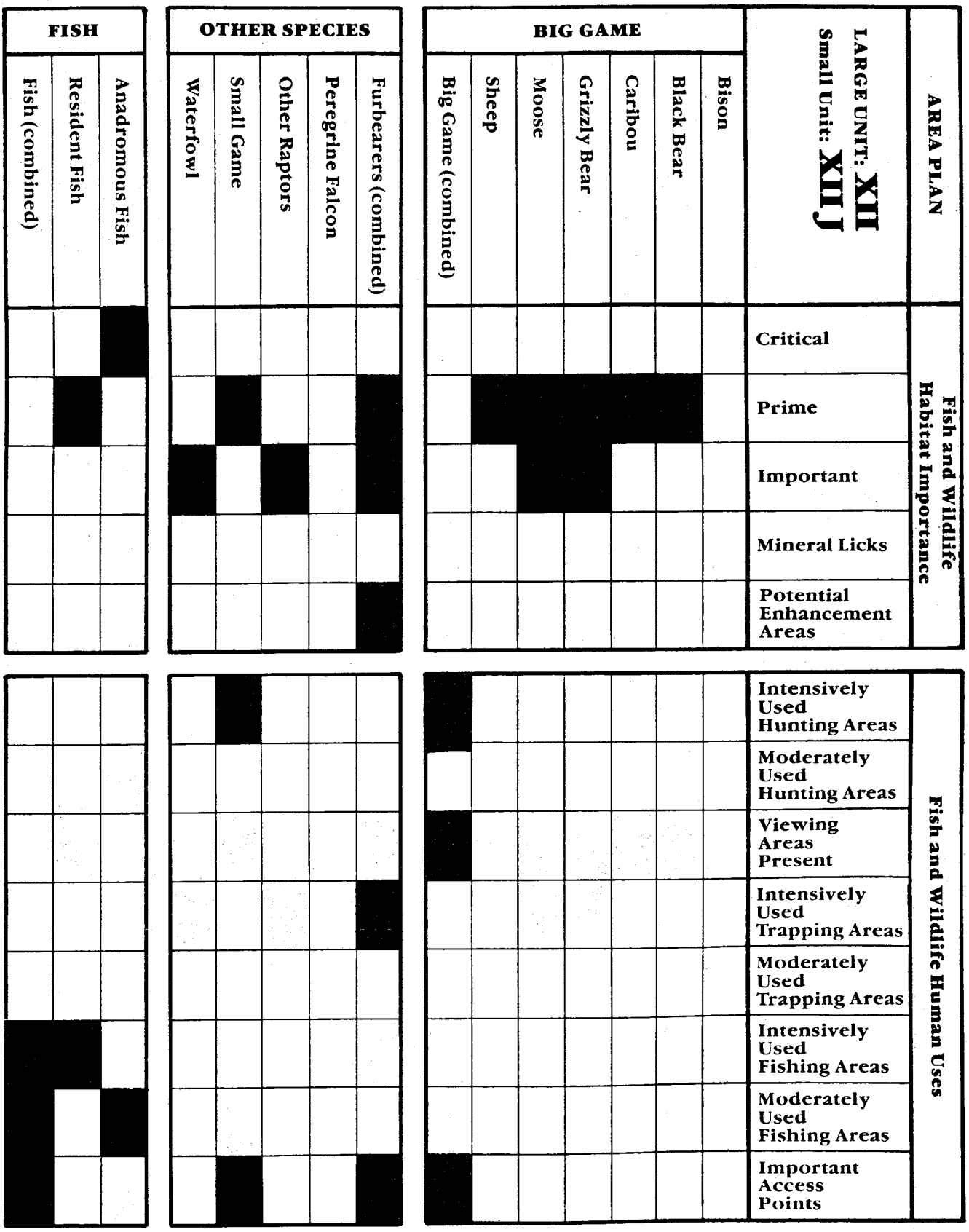
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

LARGE UNIT: XII Small Unit: A,B,C,D,E,F,G,I,L (Fairbanks Area)	BIG GAME							OTHER SPECIES					FISH		
AREA PLAN	Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance: Critical									■						
Fish and Wildlife Habitat Importance: Prime		■			■			■			■	■	■	■	
Fish and Wildlife Habitat Importance: Important										■					
Fish and Wildlife Habitat Importance: Mineral Licks															
Fish and Wildlife Habitat Importance: Potential Enhancement Areas															
Fish and Wildlife Human Uses: Intensively Used Hunting Areas	■						■				■				
Fish and Wildlife Human Uses: Moderately Used Hunting Areas															
Fish and Wildlife Human Uses: Viewing Areas Present											■				
Fish and Wildlife Human Uses: Intensively Used Trapping Areas								■							
Fish and Wildlife Human Uses: Moderately Used Trapping Areas															
Fish and Wildlife Human Uses: Intensively Used Fishing Areas													■	■	■
Fish and Wildlife Human Uses: Moderately Used Fishing Areas															
Fish and Wildlife Human Uses: Important Access Points	■						■				■				■

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



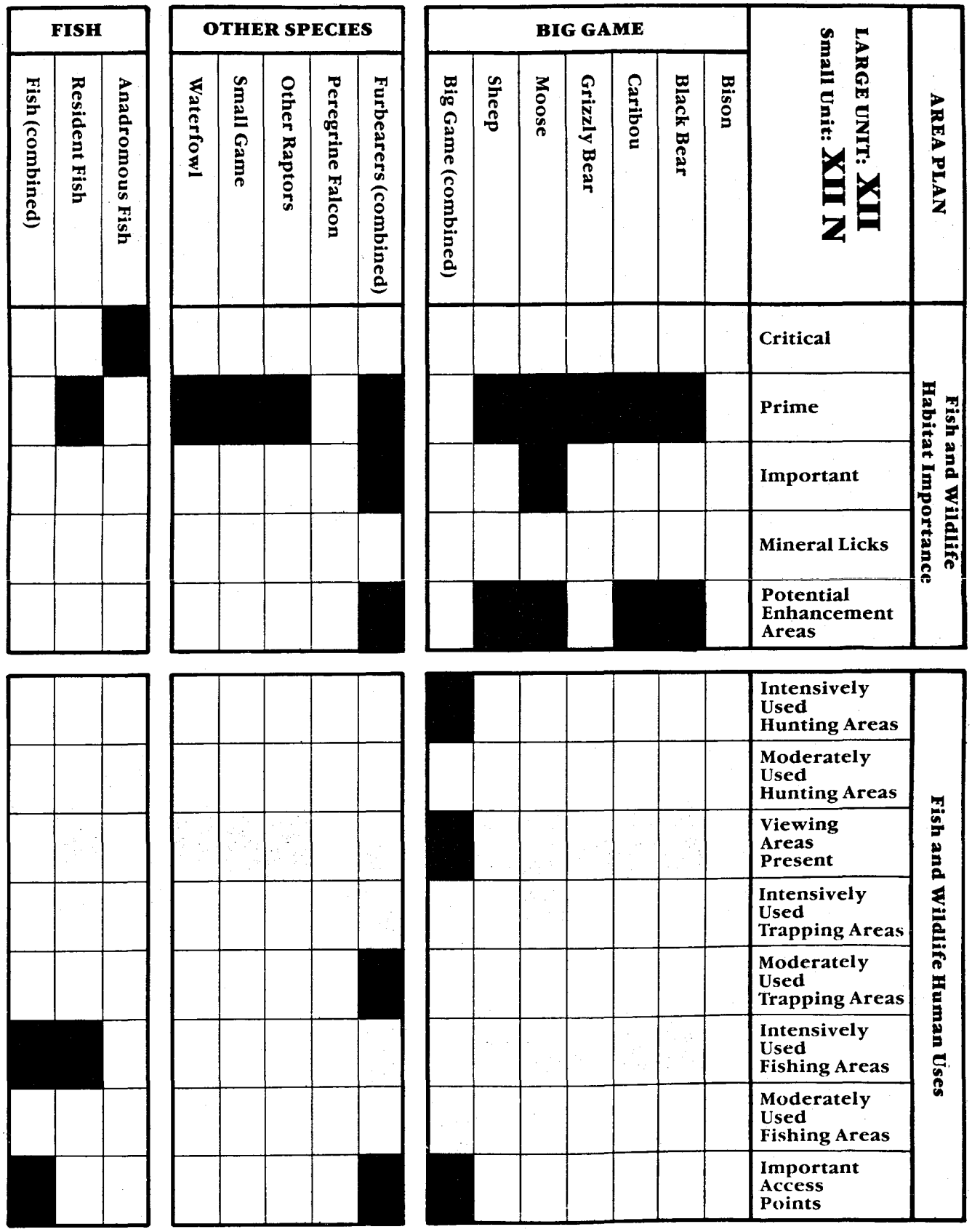
* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

LARGE UNIT: XII Small Unit: XII K	BIG GAME							OTHER SPECIES					FISH		
AREA PLAN	Bison	Black Bear	Caribou	Grizzly Bear	Moose	Sheep	Big Game (combined)	Furbearers (combined)	Peregrine Falcon	Other Raptors	Small Game	Waterfowl	Anadromous Fish	Resident Fish	Fish (combined)
Fish and Wildlife Habitat Importance															
Critical													■		
Prime		■	■	■	■			■			■			■	
Important				■	■					■		■			
Mineral Licks															
Potential Enhancement Areas		■	■		■			■							
Fish and Wildlife Human Uses															
Intensively Used Hunting Areas							■				■				
Moderately Used Hunting Areas							■								
Viewing Areas Present							■								
Intensively Used Trapping Areas								■							
Moderately Used Trapping Areas															
Intensively Used Fishing Areas														■	
Moderately Used Fishing Areas															
Important Access Points							■						■		

* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.



* This matrix does not distinguish between the type of big game, small game, or waterfowl hunted in an area or the different types of trapping or fishing.

Note: Certain combinations of wildlife species and human uses can never occur in any Small Unit, e.g., Peregrine Falcon x Hunting Areas.

APPENDIX II

BIOLOGISTS CONSULTED IN THE FORMULATION OF CAPABILITY MAPS

Alaska Department of Fish and Game

Game Division	Commercial Fish Division	Sport Fish Division
Dick Bishop	Fred Andersen	Mike Kramer
Bud Burris	Louis Barton	Dick Peckham
Steve DuBois		Bill Ridder
Bill Gasaway		Mike Doxey
Bob Stephenson		
Jim Davis		
Pat Valkenburg		
Wayne Heimer		
Larry Jennings		
Tom McCall		
Dave Woodward		
Jerry McGowan		
Herb Melchior		
Harry Reynolds		
Dave Johnson		
Dave Kellyhouse		

F.R.E.D.

Jim Raymond

U.S. Fish and Wildlife Service

Skip Ambrose
Dirk Derksen
Jim King

Chapter 5

Economic Value of the Resource

Economic Value of Fish and Wildlife and Associated Uses in the Tanana Basin

November 10, 1983

CHAPTER FIVE
TABLE OF CONTENTS

CHAPTER FIVE
TABLE OF CONTENTS
(continued)

CHAPTER FIVE
TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF TABLES
(continued)

Table **Page**

APPENDIX A

LIST OF TABLES
(continued)

Table **Page**

APPENDIX B

LIST OF TABLES
(continued)

Table **Page**

APPENDIX C

LIST OF TABLES
(continued)

Table **Page**

APPENDIX D

LIST OF FIGURES

PART I—OVERVIEW

INTRODUCTION

Alaska is currently confronted with a range of critical resource use decisions that will ultimately shape the State's destiny for decades to come. These decisions include micro-level allocation decisions (e.g., how much of a given game herd should be devoted to subsistence as opposed to recreational hunting), regional land use planning decisions (e.g., how much land should be dedicated to settlement, agriculture, timber harvest, mineral development, etc. at the expense of wildlife habitat), and longer range structural issues (e.g., how much of Alaska's perpetual economic, social, and cultural benefits from the maintenance of fish and wildlife habitat should be traded for other non-renewable, but immediate, development benefits).

On a level more specific to the Tanana River Basin, one of the greatest advantages of residing in the Basin is the opportunity to engage in outdoor commercial, recreational, subsistence, and other lifestyle pursuits that the Basin's environmental setting affords. For this set of residents, public-policy decisions which affect the allocation of the Basin's land and water resources are of great interest and concern. For other residents who may be indifferent to the environmental amenities present in the Basin, these same policy issues remain critically important not only because of the resultant need to balance conflicting alternative uses of the Basin's resources, but also because of the significant economic benefits which are derived from the Basin's fish and wildlife resources. These economic benefits affect all Basin residents, users and non-users alike, through the stimulation of each sector of the Basin's economy. As such, even residents without direct vested interests in the Basin's fish and wildlife resources may still directly benefit through the provision of jobs funded by fish and wildlife use expenditures. Thus the need to valuate the Basin's publically owned fish and wildlife resources deserves careful consideration as the State proceeds with the allocation of its limited revenues and the Basin's land and water resources.

In light of these resource use conflicts, the Alaska State Legislature and resource management agencies are realizing the imminent need to develop assessment techniques for evaluating conflicting resource use allocations. Unfortunately, in many cases, the information and methodologies necessary to make credible and informed decisions have simply not existed. This shortcoming has been particularly true with the valuation of the State's fish, wildlife and habitat resources. An acute need currently exists for a comprehensive valuation of the State's fish, wildlife and habitat resources which can be disaggregated to regional, sub-regional, species-specific, and user group (commercial, recreational, subsistence, aesthetic, non-consumptive, etc.) levels. Optimally, information thus collected could be combined with biological, social and cultural data to:

1. Optimize the allocation of fish and wildlife resources among competing user groups.
2. Determine the feasibility of investment in fish and wildlife enhancement/rehabilitation.
3. Establish policy or management priorities.

In recognition of these needs, the Alaska Department of Fish and Game, along with other resource managers participating in the Tanana Basin Area Plan, have initiated preliminary valuations of the economic benefits accruing to the State from the respective resource values in the Basin. Since it is apparent that a valuation study such as this will be both methodologically and empirically precedent setting, it should be noted that the current fish and wildlife evaluation is considered preliminary and subject to change as valuation techniques are critiqued and refined.

The intent of this chapter is threefold: 1) To provide an overview of some of the conceptual issues, conflicts and procedures involved in the valuation of both market and non-market fish and wildlife values, 2) To provide a brief, comparative analysis of the major valuation methodologies, and 3) To present the summary results of ADF&G's preliminary valuation of the documentable baseline economic benefits of the Tanana River Basin's fish and wildlife resources. This chapter does not contain complete answers to the conceptual issues raised by fish and wildlife valuation. Rather, its purpose is to begin the process of bridging the gap between fish and wildlife valuation theory and its application. It provides a synthesis of the state-of-the-art in valuing fish and wildlife and offers information which can be used by economists, biologists, natural resource managers, and politicians to establish a common groundwork for constructive dialogue in resource allocation decisions. Because of the rather broad audience to which this chapter is directed, an effort has been made to present the economic concepts in as basic and elementary a manner as possible. However, the use of some jargon and specific terms was unavoidable due to the rather complex and technical nature of the subject matter. At the same time, some readers may feel that the chapter is not rigorous enough in its treatment of technical discussions. For those who wish to probe in depth the conceptual issues and methodologies discussed, references have been supplied throughout the chapter. In addition, a rather extensive, selected bibliography of fish, wildlife and public recreation economic valuation papers is presented in Part IV of this chapter.

BACKGROUND OF FISH AND WILDLIFE VALUATION

In recent years, economists and scientists have made impressive developments in fish and wildlife valuation methodologies. Unfortunately, major conflicts have existed both within and between the biological and economic communities as to which methodologies are most appropriate. In part, these differences of opinion exist because valuation methodologies have developed independently in several major disciplines, including economics, sociology, psychology, philosophy, outdoor recreation, ecology, and fish and wildlife biology. Consequently, each discipline has developed their own concepts of value to be measured, terminology and valuation denominator. Therefore, if anything is currently needed in the methodology of resource valuation, it is some form of consensus among practitioners on how and when to use these various methods. Many of these tools can make significant contributions to efforts by public agencies to evaluate management options. Yet, this is not likely to happen if the methods cannot be adapted to the constraints set by theoretical, technical, and institutional factors. Not all of the methods discussed in this chapter will equally satisfy all of these constraints. However, understanding the methods and discussing their strengths and weaknesses will increase their usefulness for resource valuation. As such, the following discussion is presented for the reader's

understanding and briefly outlines the major valuation conceptual issues, valuation criteria and methodologies.

CONCEPTUAL ISSUES

Alaska's Constitution mandates that the state's natural resources, including its land and waters, be managed "for the maximum benefit of its people" (Article VIII, Section 2). Problematically, while this mandate appears to both require and ensure that the state optimize the benefit derived from its natural resource allocation and use decisions, it raises a difficult question: What constitutes maximum benefit? What is the relationship between private and public benefits? Can benefit be measured in financial terms which can be captured and analyzed in traditional private market transactions or does benefit also include non-market transactions and social benefit considerations which are not readily measurable? Finally, how should non-economic considerations such as cultural, behavioral, social and life-style options be integrated with benefits expressed in financial terms?

In light of these concerns, resource managers have been increasingly turning to economic valuation as a tool for determining maximum benefit. This approach has been suggested in preference to all other alternatives for several reasons. First, all mechanisms for arriving at an allocation of natural resources already recognize, either explicitly or implicitly, that tradeoffs must be made between natural resources and other goods. Secondly, economic theory offers a logical and testable framework for comparing alternatives. Thirdly, economic theory is consistent with the principals of consumer welfare maximization and therefore with how goods are valued in this society. Finally, economic valuation concepts provide a firm and consistent basis for comparing alternative management decisions or public policy positions. This approach is not intended to deny the importance of other non-economic considerations, but rather holds that comparability of benefit measurement will assist in determining "maximum benefit to the public." When warranted, non-economic consideration will (and should) inevitably modify the final allocative decisions. Under ideal and perhaps wishful conditions an economic analysis should,

> "consider market and nonmarket resource impacts; recognize the opportunities foregone as a result of using resources one way versus another; wrestle with the problem of distribution of benefits and costs among residents; assess concern with the equity of choices; and analyze the efficiency of using resources as inputs in a wide array of market, social and environmental circumstances" (Meyer Resources Inc., Economic Evaluation of River Projects.).

Unfortunately, the accepted economic valuation techniques and procedures generally used in natural resource planning do not quite equal the goals just mentioned. Despite these limitations, economic analysis introduces an objective element in the controversial world of resource allocation, subject to its own set of assumptions and biases. One must keep these assumptions in mind at all times when using economic analysis to prevent its misuse and misunderstanding.

One important assumption is that open-access natural resources are no different than other market commodities in that they have a rate of exchange by which society values their services. In other words, a trade-off exists between

open-access resources and other commodities and one can use these trade-offs to estimate dollar values. This assumption leads economists to search for implicit prices placed by the individuals who may use the services. To the extent that shadow (implicit) pricing does not mirror actual values, the utility of allocation decisions based on financial comparisons will decrease.

A second assumption, related to the first, is the "sovereignty of present consumers." This assumption maintains that the value of the resource can be completely defined in terms of the wants and desires of present users even though effects may be felt in the future. The lack of participation of future generations in determining values of irreversible damages introduces a bias of unknown direction into the analysis. Natural resources may be valued differently by different generations.

Finally, although there is a long history of economic consideration of the effects of income distribution, natural resource planning has generally neglected to consider these effects. Damage valuations are based on a given income distribution pattern, usually assumed to be the existing one. The net effect of this assumption is that the valuation explicitly excludes losses that represent simple transfers of income. For example, when a local tourist industry loses business due to a reduction of viewable fish and wildlife, the lost business volume is not necessarily considered an economic damage even though it is a loss to the locality at a given time. In a broader context, this business may be transferred to other economic activities. Whether the transfer of income from the first industry to the second one is a desirable occurrence is a question that economic analysis does not address.

VALUATION CRITERIA

In order to establish meaningful relationships between valuation methodologies and their application in resource valuation, it is necessary to first develop some evaluation criteria. The criteria chosen for this review are validity, applicability and acceptability. These criteria are used to provide a basis for understanding the advantages and disadvantages of the methods which are described later and the circumstances in which they will perform best.

Theoretical validity gives a method the credibility of performing in an accurate, unarbitrary and consistent manner. Credibility is indispensable if the method purports to be able to lead to reasonable and meaningful valuation. Mechanically, a theoretically valid method is a framework constructed upon logical sequence of inductive steps that can be traced to a well-established body of knowledge consisting of facts and reasonable assumptions. Assumptions are necessary complements to facts, for two reasons. First, an analytical framework inevitably simplifies the real world to capture the elements most relevant and essential to the working of the framework. Second, the collection of all facts that are necessary to support an analytical framework without resort to assumptions can be extremely costly and cumbersome. Nonetheless, while the need for assumptions in developing economic models is well documented, the need to assess the sensitivity of these assumptions to "real world" conditions is essential for effective planning. For example, economists assume in demand analysis that, given constant income and other prices, a person will buy less of a good when its price increases. While in general this assumption typically holds true, it is necessary to empirically establish the magnitude and slope of this function if a meaningful demand analysis is to be performed. It

is thus important for one to examine the interpretation of facts and assumptions underlying a method when evaluating the validity of the method. Ultimately, a theoretically valid method is built on recognizable facts and defendable assumptions.

Applicability can be broadly interpreted as the cost of implementation. The applicability of a method becomes an important consideration when the method is to be subjected to wide uses in solving real world problems. As much as one desires accuracy, any increase in accuracy is usually accompanied by rising implementation costs in terms of data requirements and analytical effort. For example, the advantage of the replacement cost method lies in its low cost. For resources that can be replaced in the marketplace, the necessary information can be obtained easily, such as considering cost of equivalent beef from a store as the replacement cost for moose killed. However, the use of more sophisticated methods such as travel cost may increase the accuracy of the estimate but involves higher expenditures for surveys and statistical analysis. The consideration of cost is especially crucial when a method is to be applied to a large regional area where the benefit of incremental effort to improve accuracy may be very small. In other words, the cost of applying a method cannot be judged independently from the benefits of the application.

The third criteria is the method's acceptability, not only to the research community, but also to government agencies. A method is acceptable to the research community if there is a consensus that the method is proven valid through peer reviews and an extended period of challenges. Acceptability to government agencies depends mostly on the credibility the research community attaches to the method and also on the method's ready understanding and applicability. It should thus be recognized that there can be substantial differences between the standards needed by public agencies for planning purposes and those acceptable to the scientific community. Planners and managers need sufficient knowledge of a situation to make rational decisions. The level of accuracy needed for public decision making may be greater, or less, than the arbitrary standards of acceptance often used in the academic community. The sensitivity of the decision to specific elements should be a prime consideration in determining the level of accuracy needed in public planning.

METHODOLOGY SELECTION

Deciding what type of fish and wildlife economic valuation is most appropriate or whether it is even worth its cost in assisting in the development of a management goal requires an appreciation of the conceptual issues and range of evaluation methodologies. In addition, it is absolutely imperative that planning efforts clearly identify the objectives of public sector involvements. For instance, while the government sector is usually concerned with matters such as the allocation of social welfare concerns, securing changes in the distribution of income and economic stability, most resource plans often fail to specify measures of success related to these objectives. On the other hand, the maximization of net returns is frequently used as a criterion of success although there are generally no policies or laws which stipulate it as such. In fact, if maximizing net returns were the sole objective of government involvement, one could present a strong agrument that the allocation process should occur strictly through market mechanisms. The point is that valuation success should be measured in terms of the stated objectives.

The following key questions should be assessed and answered prior to deciding which, if any, economic valuation methods to employ:

1. **What is the management goal or problem and how will the economic data be used?** The best method to use will obviously depend upon the objective. For instance, if the management choice is between maintaining a specific, definable area as wildlife habitat or converting it to agriculture, it would be useful to develop estimates of the economic benefit tradeoffs considered. In this case, net benefit calculated for the specific area considered is generally considered the appropriate measure of economic value. On the other hand, it state or regional public policy makers are attempting to define basic state or regional development goals or policies, then an appreciation of the gross level of economic stimulation induced by fish and wildlife values would be a more appropriate measure.

2. **What group of fish and wildlife are to be evaluated?** Fish and wildlife under consideration must be defined taxonomically, spatially and temporally before being evaluated. In addition, it should also be made clear whether all or part of the resource is being evaluated.

3. **Which fish and wildlife values are to be evaluated?** In addition to consumptive commercial, recreational or subsistence use values, fish and wildlife resource may also have non-consumptive existence, option, request, research, meat or nutritional values for private consumption, and other indirect economic, cultural or social values, and finally capital asset values as breeding stock for the production of future harvestable surpluses.

4. **Which evaluation methods are applicable for the desired goal, resources under consideration, and available data base?** The conceptual and methodological difficulties in using economic techniques must be recognized. The importance of fish and wildlife use activities for which there are few user expenditures (i.e., many non-consumptive viewing activities, etc.) is often hard to document. Travel cost transfer methods may be difficult to employ if the users are dispersed throughout a region (rather than occurring at specific sites). Travel cost transfer methods are also poorly suited for separating specific fish/wildlife benefits from other recreational components of the experience.

In summary, it should be recognized that the economic evaluation of fish and wildlife is no panacea. Gross values, as measured by expenditures of time or money, can be estimated and are often quite useful for regional or state-level policy decision making when the impacts of different alternatives are difficult to foresee. In these cases, expenditure data may actually bolster a point of view more effectively because expenditure data is generally more familiar to decision makers. In addition, if induced income and employment levels are the paramount concern, then gross expenditures may be the most relevant consideration in judging project feasibility. However, gross expenditures are generally of little use in evaluating concrete alternatives. In such cases, the consumer benefit or value above the costs of using the resource is needed. Net value estimates solve this problem in theory but require information that, in practice, is often difficult or impossible to obtain as accurately as managers would

like. In such cases, assumptions based on subjective opinions are usually required as part of an economic evaluation. Consequently, a risk exists that these estimates may be interpreted incorrectly as a result of the hypothetical nature of their methodologies.

VALUATION METHODOLOGIES

The major valuation techniques for measuring and comparing fish and wildlife values are listed in Table 1. Over the years, numerous variations and refinements of these methods have been proposed. The key assessment problem addressed by most of the methodologies is that of valuating non-market resource values. The following discussion briefly outlines the major valuation techniques, their benefits and their limitations. It should be noted that the valuation methodologies presented are, by choice, primarily restricted to those which have here-to-for, received fairly widespread political acceptance. While this approach is pragmatically expedient for the Tanana Basin Planning effort, the reader should be advised that other valuation concepts, such as welfare economics, have been advanced by economists and warrant future consideration.

Conventional Market Valuations: Market valuations of fish and wildlife resource values are generally defined in purely monetary terms and is typically referred to as financial analysis. This form of analysis is extremely straightforward and consists of determining the total gross income, operating expenditures and net income (profit) for commercial users of fish and wildlife resources (such as commercial fishermen, guides, fish processors, trappers, etc.). Conventional market valuations of commercial fish and wildlife users are particularly useful for broad, regional analysis of the direct fiscal and employment impacts associated with state government proposals to either expand or contract the harvestable supply of fish and wildlife. It should be noted that government manipulation of harvest rates is not strictly restricted to harvest limits or quotas but may also be related to decisions to convert wildlife habitat to alternative non-compatible uses. Two major limitations should be noted with this approach. First, market analysis does not permit the valuation of un-priced components of the business activity. For instance, commercial fishermen may also derive recreational and aesthetic benefits from fishing. In addition, market valuation only captures the monetary values accruing from "cropping" biological populations. No value is assigned for standing stocks, option values, or existence values. Secondly, conventional market analysis may not consider the opportunity costs of labor. In many instances, there may be a net social benefit associated with commercial labor costs. This is the case when opportunity labor costs are less than actual hour wages due to the fact that many of the workers would otherwise be unemployed. This limitation may be negated by considering opportunity costs of labor as diseconomies of scale.

There is one additional constraint which should be noted when directly comparing commercial market values (i.e., agricultural development) with recreational "Consumer Surplus" benefits. These two assessments of value are only comparable if the following two rules are followed (Little, 1957 and Mishan, 1976):

1. Market prices should be used to evaluate benefits and costs when the scale of a project is sufficiently small so that prices of the relevant goods are not unreasonably influenced. This could be true for small increases which are sold in a reasonably competitive market; it is also likely to be true for most inputs purchased in order to

implement an option. It should be recognized, however, that despite the merits of this simplified approach, market prices are generally responsive to shifts in demand-supply relationships. Small biases may therefore be incorporated into an economic model when using this approach.

2. If, however, the scale of a project is sufficiently large so as to alter prices of some goods, then it is necessary, for these goods, to account for consumers' surplus changes. Following these rules will ensure that benefit and cost measures for all options and outputs are comparable.

Individual Gross Expenditures: The total gross expenditures by recreational sportsmen for transportation, food, lodging and equipment has frequently been used as an estimate of recreational benefits. By its nature, an expenditure estimate may provide an accurate estimate of monetary costs, but cannot estimate the amount by which total benefits exceed costs, or net benefits. Because economists usually evaluate options be comparing net benefits, they have generally disdained gross expenditure valuations. However, despite the noted limitation of expenditure surveys in estimating net value, there are numerous cases where such data is extremely useful to resource managers. When the impacts of different alternatives are difficult to foresee, then the accepted practice in many decision-making processes is to rely on recognized indicators of general importance. Agriculture may be referred to as a billion-dollar industry. Revenues from car sales may be said to have risen by so many million. Although these figures are not precise indicators of importance, programs to assist agriculture or other sectors of the economy are regularly justified in such terms. Fish and wildlife programs are also typically reviewed at similar levels. In these cases, expenditure and amount-of-use data may bolster a point of view more effectively than an estimate of net value simply because expenditure data are more familiar to decision makers.

Thus in cases where state or regional public policy makers are attempting to define basic state or regional development goals or policies, an assessment of the gross level of economic stimulation induced by total expenditures for fish and wildlife may be the most appropriate, feasible and cost-effective valuation technique.

Governmental Gross Expenditures: Prewitt (1949) said "a reasonable estimate of the benefits arising from...(a project or proposal)...may be normally considered as an amount equal to the specific costs of developing, operating, and maintaining the recommended facilities." Since by definition, any project undertaken could be justified by this method, it has not generally been popular with either economists or biologists. This type of valuation is most useful for calculating the impact of state expenditures on the gross state product and employment levels. In addition, it is also used as a component of assessing the cost-effectiveness of state programs.

Input-Output Multiplier Analysis: Input-output modeling is a method of describing the flow of goods and services within an economy and allows the interdependencies of industries within the economy to be examined relative to potential impacts on the overall economy due to various policies. Although this form of analysis is generally used to predict the potential impact which may stem, for instance, from the expansion of a particular industry, it is also used to model

the existing structural composition of an economy. Gross expenditure and income estimates are the primary inputs in the model. Gross income and employment (multiplier) estimates and basic labor to gross output ratios are the primary outputs. As a limitation, however, it should be noted that input-output analysis is a static approach that is most useful in describing historical changes except in periods of long-run economic and technical stability. The primary limitations of this approach for planning are its short time horizon, the lack of consideration for market limitations, and an implicit assumption of unlimited capital availability.

Consumer Surplus Benefits: In the absence of market transactions on which to base the value of the recreational use of fish and wildlife resources, an analysis concept generally referred to as consumer benefit has been developed. Consumer benefits are related to are the increase in the flow of services from an open-access natural resource directly to the public as consumers. These benefits relate to the consumption of resources which takes place outside of the marketplace. This distinction is warranted by the fact that methods dealing with commercial market benefits generally are oriented to an increase of the resource's value based on its marketplace activities, e.g., rent, sales value, profit and business volume, whereas the methods used in measuring public consumer benefit attempt to create a surrogate market where implicit (shadow) prices can be derived.

Presently, there are two general categories of valuation methodologies for estimating implicit values which are being investigated and perfected by economists working in this area. The first category is known as the Travel Cost Method (TCM) and is associated with the names of Hotelling (1949) and Clawson and Knetsch (1966). The second category is known as the Contingent Valuation Method (CVM) and derives from the work of Davis (1963).

Use of the TCM or "indirect" method begins by observing the rate of participation of certain population groups in outdoor recreational activities at a given site and relating these participation rates to the costs of transportation, opportunity costs of time and other variable expenses. The demand curve so estimated is then used as the empirical basis for computing the net willingness to pay or "consumers' surplus" associated with the site. Refinements of the TCM have included a more complete specification of the demand function to include other causal factors such as income and the examination of the role that travel and participation time plays in the recreationist's decisions and, hence, their net benefits.

The CVM is a "direct" technique for resource valuation in that its' approach is to ask recreationists specific questions regarding their willingness to pay and/or willingness to accept compensation if opportunities for participation in outdoor recreation activities are altered.

As noted, two major forms of valuation are used with the CVM technique: willingness to accept (WTA) and willingness to pay (WTP). Because these forms of valuation introduce the concept of property rights into the analysis, it is necessary to understand what each form of valuation is actually measuring and when it is appropriate to use it. Willingness to accept, or sell, implies the possession of a property right and is thus must appropriately applied in situations where resources are presently used to generate fish and wildlife-based experiences - but are under consideration for a possible transfer to an

alternative and incompatible use. Willingness to pay, on the other hand, implies a desire to obtain property rights or to influence the exercise of these rights by others and is most appropriately applied to situations in which a transfer of resources from some other purposes to the production of fish and wildlife-based experiences is under consideration. Thus, in situations where a competing use, mining for instance, has initial property rights, the value to users of common property fish and wildlife resources is determined by the income-constrained maximum willingness to pay - to buy out the miner. Where common property fish and wildlife users have the initial property rights, value is determined by the unconstrained minimum amount that will be accepted in exchange for that right. Since these two measures of value are in general not the same, a determination of initial property rights is extremely important - such assignment of rights may determine the outcome of a decision to allocate a resource to its optimal or highest value use.

In addition to the TCM and CVM valuation methodologies, several other variants have been proposed but have not received serious consideration due to obvious potential for biases. A quick description of these methods follows:

> Community Decision - Meyer (1974, 1975) first told respondents what the municipal expenditures per household by the City of Vancouver were for various areas such as Education and Social Assistance. He asked how he would rearrange these allocations. Then he asked them to state the comparable annual values, per household, for a series of activities relating to recreation, including wildlife and fisheries.
>
> Judicial Award - This variant of the Community Decision was suggested by Meyer (1975) who asked "If you were a judge in a court, and someone had been arbitrarily excluded from the activities listed for one year, what dollar damages would you award him or her?"
>
> Professional Opinion - Ashton et al. (1974) asked wildlife biologists what they thought an individual of each wildlife species was worth. This method has been little used because of its obvious bias and subjectiveness.

Existence Value: So far, each of the fish and wildlife values discussed have been rooted in either commercial exploitation or actual recreational activities. However, it is also possible for an individual to derive satisfaction (and thus place a value) simply from knowing that wild birds, fish and animals exist. For example, an individual at home making no sensory contact with or deriving commercial benefit from moose may derive real satisfaction (social benefit) from just contemplating the existence of these animals. In perhaps more down to earth financial terms, individuals who contribute both their time and money to efforts for the preservation of a species such as blue whale (which they are unlikely to encounter either on a sensory level or in the marketplace) demonstrate a behavior which implies the presence of an existence value.

Nonetheless, while there is little doubt that existence values should be included as social benefits, it has been difficult to segregate this value from other fish and wildlife valuation components. Consequently, when existence values are in conjunction with market or recreational activities, they are considered as integral to that activity. In all other cases, however, where existence values cannot be internalized with other valuations, it is generally described as an external benefit and expressed in non-financial units. Obviously, a great deal

of work will be necessary to establish a valid, applicable and acceptable valuation methodology for existence values.

Option Values: Option demand and option value exists when an individual places value on having the option for himself, or others (offspring), to participate in an activity in the future. As such, option values are not current use values, but an additional source of benefits which deserve explicit recognition. Option value can exist separately from consumer surplus, or benefits, under three general categories: 1) When there is an uncertainty as to future demand for (and/or supply of) a wildlife species (This encompasses an implicit assumption that there is a certain risk threshold beyond which individuals are reluctant to cross); 2) When re-establishing or expanding a curtailed supply of fish and wildlife would be very costly in the short run or technically impossible (i.e., extinction of a species); and 3) When there is no practical way for the resource owner to be paid for providing the option because exclusion is not possible. The inability to exclude those who do not pay for the option of future consumption establishes the relevance of option value for public policy (Adapted from Langsford and Cocheba, 1978). In the case of common property fish and wildlife resources, the ownership rights are obviously vested in the public. In this situation, the provisions of the willingness to accept (sell) apply. Therefore, in these cases, the third category should be amended to read "When there is no practical way for the public to be individually compensated for their collective decision to sell their future consumption options."

As one final note, because future participation in a particular fish or wildlife associated activity may require it, an effective option demand requires that the population of a given species be maintained at a level well above that which may threaten extinction. Thus, even when populations are large enough to permit legal hunting and fishing and the value of incremental changes in human population are considered, a strong argument still remains for the expression of an option value.

Benefit-Cost Analysis: Benefit-cost analysis assesses changes in the value of goods and services that are expected to result from undertaking a management option in comparison to those changes which are expected from an alternative option. Benefits represent the additional value of goods and services produced, while costs are the value of goods and services that could have been produced had the needed resources remained in their most likely alternative use. The difference between benefits and costs is termed net benefits and is intended to be a measure of the gain in social welfare.

Consistent definitions of benefit can best be understood if the motivation behind benefit-cost analysis is examined. The benefit-cost test is a "potential Pareto" criterion. Under a true "Pareto" criterion, an alternative is considered worthwhile if it makes no one worse off and at lease someone better off. In order to pass such a test, it would be necessary for those who benefit from an option to actually make compensatory payments to those who lose. Under a benefit-cost test, however, an option is considered worthwhile if such compensation could be made, even though it may not actually be made. Clearly, if the sum of gains and losses is positive, actual monetary transfers could increase welfare above the initial level and the option would therefore pass the benefit-cost test.

With benefit-cost analysis, the concern is with the total or aggregate change in benefits for all affected users--and not the gain or loss of any particular individual. Benefits and costs are ordinarily measured by the sum of each individual recipient's valuations. Thus, leaving aside the distribution of this gain, a dollar of benefit enters with the same weight, regardless of who derives the benefit. In order to include distributional effects in benefit-cost analysis (i.e., to evaluate the distribution of benefits and costs among the population), some consensus of the weights to be attached to the gains and losses of each individual would be required. In the absence of such a concensus, the distributional impacts should be considered separately as part of the comprehensive analysis (Adapted from Dwyer, 1980).

While the use of benefit-cost analysis to judge actions that relate to fish and wildlife may be a political reality, its limitations should be considered. The most obvious is the lack of a public mandate to maximize net returns from fish and wildlife resources. The technique is also often inadequate for public planning because it does not consider distributional shifts which are often a major public concern with political ramifications. Externalities, certainly a matter of public concern, are often ignored. There is also an underlying assumption of total certainty regarding future events, something that even economists cannot guarantee. To realistically plan for the future, the probability of being wrong must be considered. Difficulties with the quantification of many values, uncertainty with respect to the future, and arbitrary discount rates make the technique a questionable ranking mechanism. While benefit-cost analysis can be a useful tool, its limitations must be taken into consideration as it can be extremely misleading.

Additional background sources introducing the reader to benefit-cost analysis may be found in Part IV of this chapter.

Cost-Effective Analysis: Cost-effectiveness is primarily a method for finding the least cost alternative for meeting a single objective. For example, if the objective is to improve public health there may be several alternative ways to meet this: more hospitals, better health instruction in schools, etc. Each approach could be costed out and the least cost alternative would be chosen. The primary merit of this approach is that it can thus help to determine the least costly means of satisfying socio-politically set objectives, thus eliminating the need to quantify benefits in monetary terms.

This approach, however, is not highly regarded by planners, basically because it does not assist in choosing between dissimilar objectives. If there is not enough money to meet all objectives, then choices between objectives will have to be made and this method will not be of assistance. Despite this limitation, certain applications of cost-effectiveness analysis offer distinct advantages for state policy makers. For instance, although the State currently desires to expand its economic base, it is facing the prospect of declining state revenues. Therefore, one component of all policy decisions must be an awareness of how state expenditures for either management or infrastructure development will compare with their estimated stimulation of the state's economy. In this regard, cost-effectiveness analysis should be indispensably correlated with benefit-cost analysis.

TABLE 1. Outline of the Major Methods for Assessing Fish and Wildlife Values.

I. Conventional Market
II. Expenditures
- A. Direct Effects
  - 1. Individual ("Gross Benefits")
  - 2. Government
- B. Indirect (Secondary) Effects
  - 1. Input-Output (Multiplier Effects)

III. Consumer's Surplus
- A. Travel Cost (Simulated Demand)
- B. Contingent Valuation
  - 1. Participating
    - a. Willingness to Pay
    - b. Willingness to Sell
    - c. Community Decision-making
    - d. Judicial Award
    - e. Professional Opinion
  - 2. Non-participating
    - a. Existence Value
    - b. Option Value

IV. Combinations and Manipulations
- A. Benefit-Cost
- B. Cost Effectiveness

Source: Adapted from Steinhoff, 1982.

PART II—TANANA BASIN RESULTS

INTRODUCTION

Part II of this chapter presents a preliminary valuation of the economic benefits accruing to the State economy from the consumptive use of fish and wildlife produced within the Tanana River Basin. Similar resource evaluations are being conducted for other resource values: settlement, mineral development, recreation, forestry and agriculture. There are three basic reasons for examining the economic value of the Tanana Basin's fish and wildlife resources as part of this planning effort. First, basic economic information complements the physical data presented in Chapters Three, Four and Six of this report and yields a more enlightened perspective on the level of activities which are currently occurring within the Basin. Secondly, the provision of economic data offers a logical, consistent and testable framework for comparing proposed alternative management schemes. Finally, the development of economic valuations for the Tanana Basin's fish and wildlife resources will help to educate the public, resource managers, and state policy makers that the Basin's fish and wildlife resources contribute significantly to the Basin's entire economic structure.

It should be recognized at the outset, however, that the State's responsibility in land use planning is not limited solely to economic maximization. Rather, the State is charged with a responsibility for balancing social, environmental and economic considerations. In this capacity, economic valuations are conceptually intended to assist state managers in determining land and resource allocations which will maximize public benefits.

As a final note, since this evaluation study is precedent setting, all readers should consider this evaluation preliminary and subject to change as valuation techniques are critiqued and refined.

METHODOLOGY

As discussed in Part I of this chapter, there are numerous types and forms of economic valuations for fish and wildlife resources. Not each of these, however, is equally appropriate or cost-effective for the Tanana Basin Study. Under most circumstances, planners have generally opted for applying the technique of benefit-cost analysis to provide estimates of the magnitude and distribution of the projected gains and/or losses which may be associated with the proposed changes in resource allocation. The standard evaluative procedure for allocative efficiency in such public expenditure/policy analyses involves a "with - versus - without" project or program test. This form of analysis simply means that an attempt is made to assess the public's net benefit (the difference between user's cost and gross benefits) from the use of a resource both with and without the change(s) under consideration. In this regard, benefit-cost analysis may be viewed principally as an accounting technique and, as such, is generally not held in high repute by economists. Many other forms of systems analysis are generally considered superior but have not typically been accepted politically; perhaps due to their complexity.

For the current Tanana Basin Study, benefit-cost analysis generates a significant empirical problem. A benefit-cost valuation requires that the proposed alternative allocations be specifically defined and that public benefits and losses are clearly measurable. Such a situation is not the case for the current Tanana Basin study. Basin-wide fish and wildlife benefits are presently accruing from natural habitat which is varied in quality and distributed across federal, state, municipal, native corporation and other private land-holdings. With our current lack of knowledge relating to the underlying physical-biological interrelationships of fish and wildlife populations, it is neither credible, applicable, nor acceptable to attempt to project the economic value of fish and wildlife originating from state land covered under the current planning effort. Even if such were not the case, theoretical problems originating with the valuation of "subsistence" utilization of fish and game, methodological restraints originating from a non-conformance of the Basin's "recreational users" and travel networks with standard simulated demand (consumer benefit) valuations, coupled with basic data gaps would all preclude the use of a standard benefit-cost evaluation for the current study.

Therefore, the Tanana Basin fish and wildlife valuation was based on a regionwide assessment of the gross economic impacts stemming from state management expenditures and the commercial, recreational, and subsistence utilization of the Basin's fish and wildlife resources. As was noted in Part I, gross economic impact analyses can be estimated with reasonable accuracy and are quite useful in regional or state-level policy decisions when the impacts of alternative allocations are difficult to foresee. The basic intent of this valuation is to clearly document the magnitude and importance of the Basin's current fish and wildlife production values. It is not intended to provide the information needed to estimate net benefit. It obviously follows that this evaluation cannot be used to say that the net economic benefits will decrease by so much if a particular management choice is made. This evaluation, however, does reflect the level of state gross economic activity which currently exists under existing lifestyle, social, cultural, and environmental constraints.

In addition, a separate valuation of the net benefits for commercial users of the Basin's fish and wildlife resources was generated. This analysis was performed to assess the profitability of commercial fish and wildlife resource development. Finally, a separate valuation was generated for the State's net benefit stemming from the present defacto management of most of the Tanana Basin for fish and wildlife production. This analysis was performed to permit the calculation of the cost-effectiveness (State Net Expenditures to Gross Economic Stimulation) of the State's management of the Tanana Basin for fish and wildlife production.

LIMITATIONS—GENERAL NOTE

Because economic models are simply abstracts of reality and are thus recursive in nature, they are unfortunately hinged upon assumptions which are derived from the observation of other economic systems. For the Tanana River Basin, these empirical limitations, coupled with the small size of Alaska's boom-bust economy and a lack of historic data, made it difficult to employ traditional economic techniques with the same degree of sophistication or statistical accuracy as for larger, more mature and less rapidly changing areas. Consequently, although diligence was exercised in the choice of assumptions, this preliminary analysis may be subject to both interpretative and statistical errors. It is therefore

recommended that this valuation be utilized only in conjunction with an understanding of the limitations which are noted.

This valuation should not be construed as a summary of all benefits accruing from fish and wildlife production in the Tanana Basin. Rather, it is a preliminary attempt to quantify some of the documentable economic values and may not even quantify all of the value for which valuations are presented. In addition, economic values were not generated for subsistence hunting, subsistence trapping, personal income effects, existence value, option value or the capital asset value of breeding stock for the production of future harvestable surpluses.

COMMERCIAL (PRODUCER) ECONOMIC VALUES

Introduction: Commercial or producer beneficiaries of the Tanana Basin's fish and wildlife resources are defined as those who expect a monetary return for their consumptive use of these resources. Within the Tanana Basin, four groups have been defined as commercial beneficiaries: trappers, commercial fishermen, fish processors and fishing and hunting guides. In addition, non-consumptive commercial operators (i.e., tourism, non-hunting game viewing and photography, etc.) also commercially benefit from the Basin's fish and wildlife resources. These non-consumptive users, however, were not included as part of this analysis, but were evaluated as part of the general recreation element analysis.

Trapping: The estimated gross revenue from trapping in the Tanana Basin during the 1980-1981 season was $1,130,286. The estimated total operating expenditures were $706,048. Therefore, the estimated net revenue or producer benefit for the 1980-1981 season was $424,238.(Table 2).

Based on an analysis of both biological supply and market transactions in Alaska, it is apparent that major opportunities may exist for substantially increasing the derived benefits from trapping in the Tanana Basin. Based on the assumptions presented in Appendix A, the estimated potential gross economic value of trapping in the Tanana Basin is 7.6 million dollars. If we assume a similar ratio of net revenue to gross revenue (37.5%), then the projected net benefit from expanded fur trapping and fur garment manufacturing industries in the Tanana Basin is 2.85 million dollars. As a note of caution, since it is extremely risky to project potential economic benefits for an expanded or new industry without, at a minimum, a preliminary market assessment and a good understanding of the anticipated inter-relationship of the proposed industry with other trade sectors in Alaska, these projections should be viewed as speculative and thus significant only as a estimator of the order of magnitude of the potential benefits.

The methodologies and assumptions used to derive these estimates are presented in Appendix A.

Commercial Fisheries: The estimated gross revenue from the commercial sale of salmon harvested within the Tanana Basin in 1981 was $175,351. However, in addition to the commercial harvest of salmon strictly within the Tanana Basin, a larger number of salmon, which are produced by salmon which spawn in the Basin, are intercepted and commercially harvested in the Lower and Middle Yukon River salmon fisheries. Since data is not currently available which differentiates

Tanana Basin salmon stocks which are caught in the Lower and Middle Yukon River commercial fisheries, a computer model (originally developed by ADF&G's FRED Division to predict the percent contribution of Clear Hatchery releases to the Yukon River fisheries) was modified to permit an estimation of the percent contribution of Tanana Basin salmon stocks to the Lower and Middle Yukon River salmon fisheries. Based on this analysis, the 1981 gross revenue derived from the commercial harvest of Tanana Basin origin salmon in the Lower and Middle Yukon River fisheries was $2,445,156. The combined gross revenue for both fisheries was $2,620,507. The total estimated operating expenditures of these fisheries for salmon attributable to the Tanana Basin were $691,181 in 1981. Therefore, the estimated net revenue or producer benefit for the 1981 fishing season was $1,929,326 (Table 2).

The methodologies and assumptions used to derive these estimates are presented in Appendix B.

Fish Processing: The commercial or producer benefits generated from the secondary processing of commercially caught salmon which are derived from Tanana Basin spawning stocks was calculated by multiplying the first wholesale value of $26,267,500 (Geiger, Andersen and Brady, 1981) of the entire 1981 Yukon River salmon pack (based on the type of processing when the fish were shipped out of the Yukon District) times the estimated percent contribution (32.1%) of Tanana Basin salmon stocks to the Yukon River salmon fisheries (see Appendix B for estimation methodology). Based on this calculation, the estimated gross revenue generated by the fish processing industry in 1981 was $8,431,867.

In order to calculate the net revenue or producer benefit from the fish processing industry, it was first necessary to determine total operating expenditures. However, while relatively accurate records are collected and available for the gross revenue received by fish processors, total expenditure data is not collected. Furthermore, because of wide variations in processing plant size, operation, efficiency, etc., it is difficult to estimate an average level of expenditures.

Therefore, after consultation with the Department of Labor, and a comparison of wages to gross revenue (Geiger, et al, 1981), total processing plant operating expenditures were estimated at 80% of gross revenues. Based on this assumption, the net revenue or producer benefit generated by the commercial salmon fish processing industry in 1981 was $1,686,373 (Table 2).

Because of the methodology by which these estimates were generated, they should be considered an order of magnitude estimate only. Nonetheless, despite these methodological limitations, it is most probable that the total gross revenue generated in-state is actually higher than the current calculations indicate. This probable understatement of in-state total gross revenue is due to the fact that the first wholesale value used does not include the value of fish processing which occurs outside of the Yukon District but within Alaska. For instance, in the Yukon District, a significant portion of the total salmon harvest is shipped directly out of the District for processing in other central Alaskan localities. Consequently, a portion of the actual total wholesale value earned in-state is not reflected in this analysis.

Fish and Wildlife Guiding: The commercial or producer benefit generated by commercial fish and wildlife guiding operations within the Tanana Basin was

estimated based on a market analysis prepared by the Professional Guiding Association of Alaska, which represents all guides in Interior Alaska. The chairman of this organization, Lynn Castle, completed a preliminary assessment on the economics of guiding in 1982. Although this assessment is currently unpublished, the following economic analysis is based upon that work as reported by personal interview with Mr. Castle.

Mr. Castle estimated that the gross revenue generated by commercial fish and wildlife guiding operations in the Tanana Basin was approximately 1.2 million dollars in 1981. This is based on his assumption that 20 guiding operations grossed slightly over $50,000 that year and 10 operations grossed between $20,000 and $25,000.

The total operating expenditures for each guiding operation were estimated by Mr. Castle to be approximately 80% of their total gross revenue. This estimate was based on the following assumed breakdown of operating expenditures:

Food	10%
Labor	30-40%
Transport	10-15%
Insurance	10-15%
Debt Service	5-10%
Capital Improvements - less than	10%

Based on these assumptions, the total net revenue or producer benefit from commercial fish and wildlife guiding operations in the Tanana Basin was calculated as 20% of gross revenue or approximately $240,000 in 1981 (Table 2).

SUBSISTENCE (PRODUCER) ECONOMIC VALUES

A total economic valuation of subsistence use of fish and wildlife in the Tanana Basin has not been attempted or seen as desirable by the Department of Fish and Game's Division of Subsistence or by any other agency or group concerned with presenting information on subsistence in Alaska. Part of the reason for this relates to data availability and methodology development. A reasonably complete data base for subsistence uses exists for only a few communities in the state. In addition to the data problem, there are no widely accepted methods of putting a dollar value on subsistence resource uses. In some studies researchers have estimated value by calculating a replacement cost for subsistence foods (i.e., what "store bought" food would cost). Replacement costs, however, are a minimal estimate of a portion of subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

Although recognizing this concern, a 1974 report commissioned by the Federal-State Land Use Planning Commission for Alaska (FSLUPC) confirmed the significance of the fish and wildlife subsistence harvests in the Tanana Basin. In 1973, the residents of five rural Tanana Basin villages reported harvesting over 202,000 pounds of wildlife, 2,700 pounds of waterfowl and upland game birds and nearly 197,300 pounds of resident fish for food. In addition, nearly 1,200 furbearers were harvested for non-food and non-commercial purposes; i.e., personal use, clothing, etc. (Patterson, 1974). Because of the limited scope of the FSLUPC study and the large potential for methodological under-reporting, the

actual subsistence harvest in the Tanana Basin was probably much larger than reported.

More recently, a 1981 report on the culture and economy of six Yukon River Delta communities (prepared under contract for the Division of Subsistence and the Socioeconomic Studies Program of the Alaska Outer Continental Shelf Office), estimated that during the period, June 1980 to May 1981, the average family household produced 4,597 pounds dressed weight of subsistence foods or approximately 783 pounds per household member (Wolfe, 1981). Based on replacement cost, the value of this food was calculated at $21,238 per household. This value is significantly higher than the estimated mean annual earned household income which was estimated at $17,512 per household in October 1981 (Wolfe, 1981). While these per household values are not directly transferable to the Tanana Basin, they are indicative of the beneficial economic impact which subsistence use of fish and wildlife can have to rural economies.

Current subsistence harvest data is not available for wildlife, waterfowl, upland game birds, or most resident fish stocks. However, in 1981, Tanana Basin subsistence fishermen reported harvesting nearly 407,900 pounds of salmon, sheefish and whitefish. An additional 566,100 pounds of salmon which were produced by Tanana Basin salmon stocks were estimated to have been harvested in the Lower Yukon River subsistence salmon fisheries (see Appendix B for explanation of this derivation). Based on conservative replacement cost values for the portions of the total harvest used for human and dog food, the estimated minimum 1981 market value for these fisheries was $2,180,667 (Table 2).

The methodology, assumptions and limitations of these estimates are presented in Appendix C.

Notwithstanding the significance of these values, there are many concerns about the appropriateness of attempting to put a dollar value on subsistence. Most researchers in this area believe that there is a fundamental economic difference between subsistence and market economy activities. In keeping with this view of subsistence valuation, the Division of Subsistence of the Alaska Department of Fish and Game recognizes the following four non-market values for subsistence harvests of fish and wildlife: behavioral values, social values, cultural values and theoretical values.

At the behavioral level, research conducted by the Subsistence Division has shown that subsistence hunting and fishing is most often a group activity and that subsistence products are widely shared throughout communities and regions. The individual hunter or fisherperson is not the producing and consuming unit in subsistence systems and may not be motivated by concerns for material gain.

At the social level, subsistence activities are often a major focus of the community and an important force for the intergration of the community. The attention of harvest seasons, harvest activities and harvest responsibilities often underlie family and community organizations. Quite often rural communities are located at sites with good access to fish and game resources. Many communities continue to exist primarily because of this access.

At the cultural level, the ideals, beliefs and world views of members of subsistence societies are closely joined to the resources they harvest and the

environment in which they live. This cultural importance is often reflected in religious beliefs, myths, and folklore, place naming and geographic knowledge.

At the theoretical level, a strong argument has been made that a dual economy operates with respect to the subsistence mode of production and that the subsistence economy operates according to a different set of rules and principles than the market economy. According to this argument, concepts and methods derived in the context of market economies, eg. benefit/cost, marginal return, profit or producer benefit etc., cannot be applied with success to areas of subsistence economy.

Regardless of how the Basin's subsistence hunting and fishing activities are evaluated, it is apparent that they are significant and integral part of the lifestyle of most rural residents. Especially important is the value of subsistence hunting and fishing activities to low-income families. Particularly in the rural portions of the Basin where jobs are scarce, subsistence hunting and fishing heavily supplements, and in many instances surpasses in value, the earned income of local residents.

RECREATIONAL (CONSUMER) ECONOMIC VALUES

Introduction: The gross economic values associated with the recreational harvest of the Tanana Basin's fish and wildlife resources were calculated based on the gross expenditures reported by Tanana Basin recreationalists in the U.S. Fish and Wildlife Service's 1980 National Survey of Fishing, Hunting, and Wildlife - Associated Recreation - Alaska State Report.

Following are the summary results of this survey for five categories of recreational use: sport fishing, big game hunting, small game hunting, waterfowl hunting, and other (miscellaneous) game hunting. In addition, a sixth category, Special Equipment, is presented which reflects the attributable purchase of special equipment (i.e., boats, tents, recreational vehicles, cabins, etc.) predominantly used in association with the recreational consumption of the Basin's fish and wildlife resources. Since these expenditure summaries are based on 1980 dollars, they have been adjusted for inflation to reflect 1981 real dollars to permit direct comparability with the commercial, subsistence and state expenditure summaries (see Table 7 for the inflation rates used).

The methodology, assumptions, limitations and tabular summaries for these estimates are presented in Appendix D.

Sport Fisheries: The total 1981 estimated gross expenditure in-state for sport fishing in the Tanana Basin was $9,630,612.

Big Game Hunting: The total 1981 estimated gross expenditures in-state for recreational big game hunting in the Tanana Basin was $2,432,626.

Small Game Hunting: The total 1981 estimated gross expenditures in-state for recreational small game hunting in the Tanana Basin was $1,073,198.

Waterfowl Hunting: The total 1981 estimated gross in-state expenditure for recreational small game hunting in the Tanana Basin was $679,040.

Other Game Hunting: The total 1981 estimated gross in-state expenditures for recreational hunting of animals not generally classified as game animals within the Tanana Basin was $50,702.

Special Equipment Bought or Available for Recreational Fishing and Hunting: The total 1981 estimated gross in-state expenditures for special equipment used in conjunction with recreational hunting and fishing in the Tanana Basin was $3,003,244.

STATE INCOME AND EXPENDITURES

Total State expenditures to manage fish and wildlife resources and their habitat within the Tanana Basin were calculated for 1981 based on estimates by the ADF&G Regional Supervisors of the percent allocation for each Division of their total Regional budgets for activities conducted in the Tanana Basin. In addition, an equivalent percentage was then applied towards common Regional overhead expenditures and attributed to the Tanana Basin. Based on this methodology, total State expenditures were $871,478 in 1981 (Table 2).

The gross income received by the State for activities directly attributable to the Tanana Basin's fish and wildlife resources was $858,450 in 1981 (Table 4). This total was derived by totaling income received from the collection of license fees (for hunters and fishermen who actually participated in activities within the Basin), commercial fishing processor taxes, fishing vessel and commercial fishermen license fees, annual Commercial Fisheries Entry Commission permit fees, and wildlife-related tax transfer payments under the provisions of the federal Pittman-Robertson Program.

Based on these assumptions, the total net revenue or benefit to the State was a minus $13,028 in 1981. It should be noted, however, that this analysis does not include benefits which may have accrued to the state from the following sources as a result of commercial, subsistence and recreational use of the Tanana Basin's fish and wildlife resources. A complete breakdown of these sources of revenue is not currently available.

1. The State derives income from the collection of a state corporate income and biennial franchise tax from the Fish Processing, Guiding and, to a limited degree, Commercial Fishing industries. At present, corporate tax rates range from 16% to 46% of taxable income. In addition, all commercial users (including non-corporate) of the Basin's fish and wildlife resources pay a $25 Business License fee.

2. In addition to direct tax revenue from primary producers, a percentage of the corporate state income tax and business license fees for secondary support industries is attributable to the economic linkage of those sectors with commercial, subsistence, and recreational consumers of the Basin's fish and wildlife resources and should be included in total State benefits.

3. State gasoline tax revenues are generated by the purchase of fuel for vehicular, airplane, snowmachine, and boat use by commercial, subsistence and recreational consumers of the Basin's fish and wildlife resources. At present, this tax ranges between 2 to 8 cents per gallon. To a lesser extent, this source of revenue is also applicable to secondary support

industries (to the extent that their business is supported by activities generated by the Basin's fish and wildlife resources).

4. Aircraft engaged in commercial operations (such as in the Guiding and Fish Processing Industries) are required to pay an annual registration fee on each aircraft utilized in intrastate commerce. This fee is based on the certified gross takeoff weight and presently ranges between $25 to $600 per plane.

GROSS ECONOMIC AND EMPLOYMENT EFFECTS FROM THE TANANA BASIN'S FISH AND WILDLIFE RESOURCES

Introduction: In addition to direct fish and wildlife benefits, there is another measure of economic impact to the Basin's economy which is quite useful - namely an analysis of the total gross income and employment effects of fish and wildlife benefits on other components of the state's economy. These effects occur because expenditures for fish and wildlife (commercial, subsistence, recreational and state management) circulate through the entire economy. For instance, a commercial fisherman's gasoline expenditures may be redistributed as gross income to a service station owner. The service station owner, in turn, must use part of that income to hire employees to run the service station, to purchase gasoline from a bulk distributor (who in turn must also hire employees and make expenditures), and to make other expenditures for necessary goods and services. In similar fashion, individual expenditures by employees and other suppliers will also ripple throughout the economy. The magnitude, percent of purchases made locally, and distribution of these economic effects is extremely important to the formulation of public policy and helps to guide and predict the economic development of a region.

As described in Part I of this chapter, Input-Output Modeling is one method of describing the flow of goods and services within an economy and allows the interdependencies of various industries within the economy to be examined relative to the overall economy. This form of analysis was used in this evaluation to determine the significance and impact of the Basin's fish and wildlife on the State's economy.

Methodology and Limitations: There are several assumptions inherent in input-output models that may qualify and temper the implications which may be drawn from the results. Technical relations in these models are assumed to be static among industries. As such, each industry is assumed to have a linear production function with unlimited factor availability and to be operating at full capacity at all times with constant returns to scale. Such assumptions may be unrealistic for industries constrained by biological productivity and warrant future investigation.

In addition to these constraints, the specific input-output model utilized in this analysis may also be subject to error. This model (Logsdon, et al, 1977) was developed in 1972 using the Washington State economy as the template for developing an Alaskan input-output model. Obviously, using a model developed for one state to generate a model for another state imposes the non-verified assumption that a similarity exists in their economic structures. Given the relatively small size and immaturity of Alaska's economy, it would be extremely naive to totally accept that assumption. Notwithstanding these limitations, this model is believed to illustrate the basic relations in Alaska's economy.

The gross income and employment multipliers derived from this analysis are presented in Table 5.

However, since these relationships were expressed in 1972 dollars. it would be a basic error of modeling to utilize the 1972 labor-to-gross output ratios without first correcting for the effects of inflation; i.e., current outputs must be expressed in real, not nominal, dollar values relative to 1972. In addition, economic changes induced by the construction of the Trans-Alaska Pipeline, technological changes, and a growing tendency within some industrial sectors to substitute capital assets for labor, also suggest that more current labor-to-gross output ratios should be used.

Unfortunately, current labor-to-gross output ratios for all industrial sectors in Alaska are not available. Therefore, after consultation with the State Department of Labor, we updated the labor-to-output ratios generated by the 1972 model to reflect: 1) the ratios currently in use by the State Administration for estimating employment shifts induced by State expenditures (Krienheder and Teal, 1982), and 2) an update of the 1972 ratios for all other industrial sectors based on an inflation correction factor derived from the Anchorage Consumer Price Index. A comparison of the 1972 and estimated 1980 labor-to-gross output ratios and the estimated annual inflation rates are presented in Table 6 and 7, respectively.

Economic Multiplier Effect: The total in-state gross economic income effect from the recirculation of Tanana Basin fish and wildlife expenditures was 63.9 million dollars in 1981. Of this total, 32.8 million dollars, or 51.3 percent, was attributable to commercial users of the Basin's fish and wildlife; 28.5 million (44.6%) was attributable to recreational uses; and 2.6 million (4.1%) to state expenditures for fish and wildlife management. Because of the methodology utilized to valuate subsistence fisheries did not include a measure of the exchange of money, it was not appropriate to evaluate its' gross income effect. Similarly, no estimates were generated for either subsistence trapping or hunting.

The individual in-state gross economic income effects for each category of use are presented in Table 2.

Personal Income Effect: Supplemental to the gross economic income effects stemming from the recirculation of Tanana Basin fish and wildlife expenditures, there is an additional income effect (coined personal income effect) which is derived from a real increase in personal, disposable income when wild fish and game products are substituted for store-bought products.

There are some that would argue that in many respects, this effect should not be treated as an economic benefit, in-so-much as they perceive that expenditures are merely being shifted from one market sector to another. To a limited degree, certain aspects of this argument are valid. For instance, in an evaluation of the State's swine industry, it would not be appropriate to consider the dollar equivalent of a consumer substitution of pork for beef (assuming state beef production) as an economic benefit to the State. In this instance, benefits have simply shifted from one sector of the economy to another. However, if pork prices were reduced, the net savings would reflect a real-increase in disposal income and purportedly would then be available for other purchases

in the same or other sectors of the economy. Since fish and game resources reflect a complete substitution of the meat they replace (which is currently primarily purchased wholesale out-of-state), replacement-product market prices were used as an estimate of the personal income effect.

There is one important limitation to the use of personal income effects which should be recognized. Since the level of expenditures for recreational hunting and fishing may reflect consumer anticipation of both the recreational experience and the meat product, personal income effects should not be confused with estimates of the net values of fish and wildlife resources. Nevertheless, in gross economic impact analyses such as the current TBAP fish and wildlife valuation, personal income effects do represent a higher level of economic activity attributable to the Basin's fish and wildlife.

In 1981, the total documentable personal income effect was $7,470,463 and is summarized by category in Table 2. The individual calculations for sport fishing and recreational hunting are presented in Tables 3 and 4, respectively. The replacement cost estimates are presented in Table C10. Because of methodological difficulties and data gaps, no personal income effects are included in this summary for commercial trapping and fishing, subsistence trapping and hunting, or recreational small game and other game hunting. Thus, the total personal income effects summarized in Table 2 should be considered a minimal estimate for the TBAP Basin.

Total Economic Effect: The total documented, in-state, economic effect attributable to the recirculation of Tanana Basin fish and wildlife expenditures and the personal income effect induced by the substitution of fish and wildlife for market food purchases was $71,390,826 in 1981 (Table 2).

Employment Effect: The total in-state direct employment supported by the Tanana Basin's fish and wildlife resources was estimated to be 872 full-time positions in 1981. An additional 827 full-time, in-state positions, were indirectly supported by the Basin's fish and wildlife resources. The total in-state direct and indirect employment attributable to the Basin's fish and wildlife resource was therefore 1,699 full-time positions in 1981. Of this total, the following percentages were attributable to the various categories of use:

Commercial	**Percent**
Trapping	3.0%
Commercial Fisheries	7.3%
Fish Processing	49.2%
Guiding	1.5%
Sub-Total	61.0%
Subsistence	
Trapping	Not Available
Hunting	Not Available
Fishing	9.2%(Minimal Est.)

Recreational	
Sport Fishing	14.2%
Big Game Hunting	3.5%
Small Game Hunting	1.6%
Waterfowl Hunting	1.0%
Other Game Hunting	0.1%
Special Equipment Purchases	4.5%
Sub-Total	24.8%
State Management	6.1%

(NOTE: Percentages may not total 100% due to rounding)

The individual direct and indirect in-state employment effects for each category of use are presented in Table 2.

EXTERNAL BENEFITS OF THE TANANA BASIN'S FISH AND WILDLIFE RESOURCES

The valuation methodologies utilized in this analysis for generating the gross economic benefit of the Tanana Basin's fish and wildlife resources do not valuate all of the benefits attributable to fish and wildlife. In addition to the existence values, option values, and brood stock values outlined in Part I of this chapter, utilization of the Basin's fish and wildlife resources is deeply rooted in the culture, traditions and lifestyles of the Basin's residents. Hunting and fishing have been an integral part of the Basin's culture and lifestyle for not only most Native Alaskans, but also most non-native residents as well. Both rural and urban residents consider these activities to be a fundamental aspect of their lifestyles. These activities have thus occurred both within and between communities and have become an important social tie for all Basin residents.

Another aspect of hunting and fishing which is not explicitly addressed by this analysis is the social and economic value of these activities to low-income families. Particularly in the more rural portions of the Basin where cash employment is scarce, the utilization of fish and wildlife substantially supplements the income of these residents and may help to reduce their dependency upon governmental social welfare programs.

Perhaps the most difficult value to measure at all is the value of a traditional lifestyle which, for many, provides a sense of identity, continuity and self-sufficiency in a rapidly changing world.

PART III—SUMMARY

It should be quite apparent to the reader by now that the Tanana Basin's fish and wildlife resources contribute significantly to the Basin's entire economic structure. In 1981, the total in-state, gross economic effect attributable to the Tanana Basin's fish and wildlife resources was approximately 71.4 million dollars. Expressed in 1983 dollars, this represents a current gross income effect of over 79.9 million dollars. In addition, a total of 1,699 full-time jobs are both directly and indirectly attributable to fish and wildlife use expenditures.

A summary of the documentable, 1981 baseline, gross economic and employment benefits from the Tanana Basin's fish and wildlife, as corrected to reflect current 1983 dollars, is presented in Table 2.

This valuation, however, should not be construed as a summary of all benefits accruing from fish and wildlife production in the Tanana Basin. Rather, it is a preliminary attempt to quantify some of the documentable economic values and may not even quantify all of the value for which valuations are presented. In addition, economic values were not generated for subsistence hunting and trapping, some personal income effects, and such external or unquantified benefits as existence value, option value, capital asset value of breeding stock for the production of future harvestable surpluses, and other social, cultural or lifestyle considerations.

In order to place some of these non-economic or quantifiable considerations into perspective, it is perhaps appropriate to consider the following general attitudes and behaviors of Alaskans towards fish and wildlife resources. The following statistics were prepared by the U.S. Fish and Wildlife Service in 1980 (Kellert, 1980) and document the high value Alaskans placed on the State's fish and wildlife resources relative to other regions of the United States. As a group, Alaskans demonstrated the following attitudes and behaviors toward fish and wildlife (Figures 1, 2 and 3):

1) In 1980, 39.4% of all Alaskans reported hunting within the past two years. This is a participation rate which is 86% higher than the next highest region in the United States (Rocky Mountains - 21.2%).

2) In 1980, 75.9% of all Alaskans reported fishing within the past two years. This is a participation rate which is 49% higher than the next highest region in the United States (South - 50.9%).

3) In 1980, 6.9% of all Alaskans reported trapping within the past two years. This is a participation rate which is 229% higher than the next highest region in the United States (South - 2.1%).

4) In 1980, 83.5% of all Alaskan hunters reported that securing meat was the primary reason for hunting; 10.5% reported sport as the primary reason; and 6.0% reported that they were nature hunters.

5) In 1980, a total of 35.3% of all Alaskans reported belonging to humane, environmental, wildlife preservation, sportsmen or general conservation organizations. This is a participation rate which is 89% higher than the net highest region in the United States (North-Central - 18.7%).

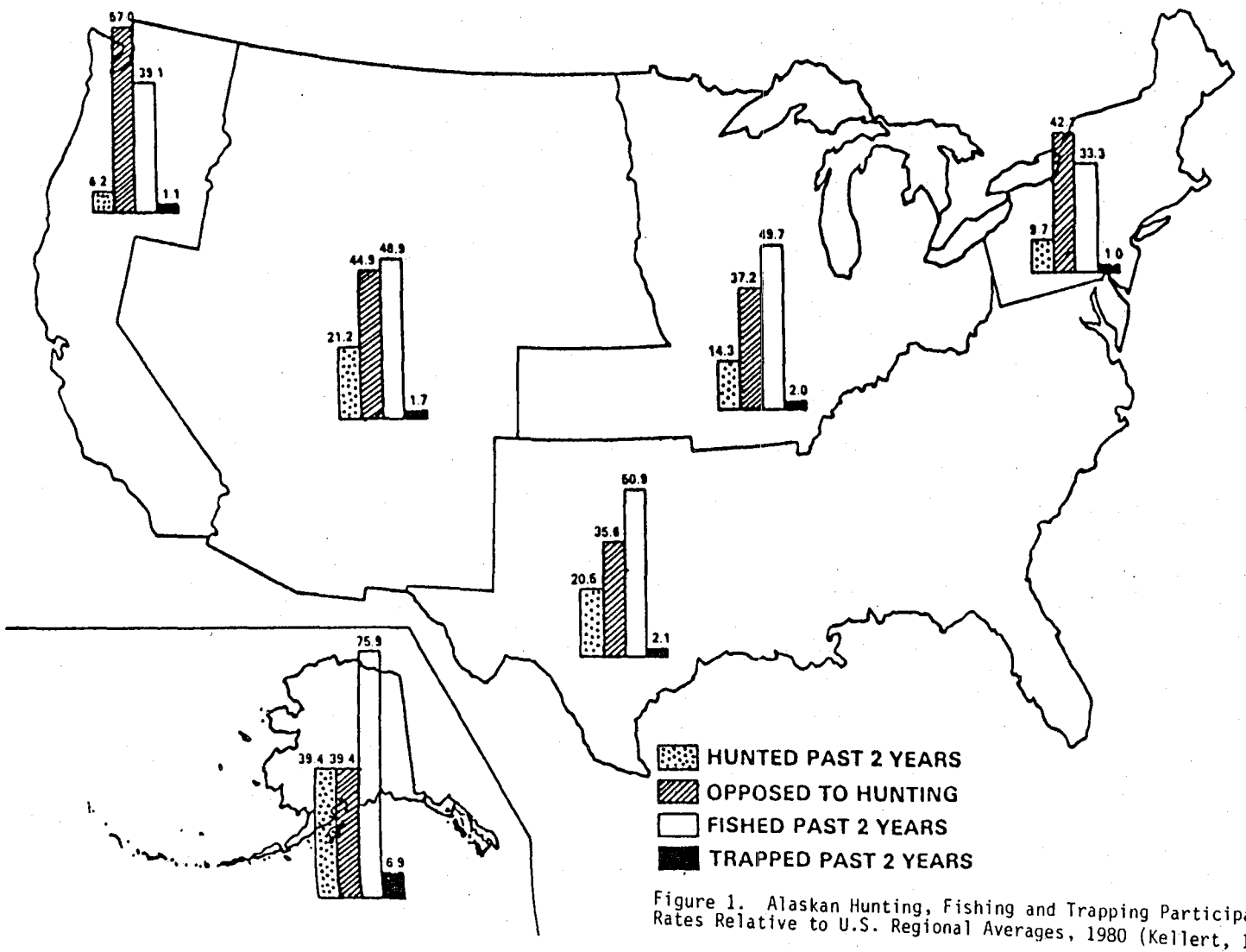


Figure 1. Alaskan Hunting, Fishing and Trapping Participation Rates Relative to U.S. Regional Averages, 1980 (Kellert, 1980)

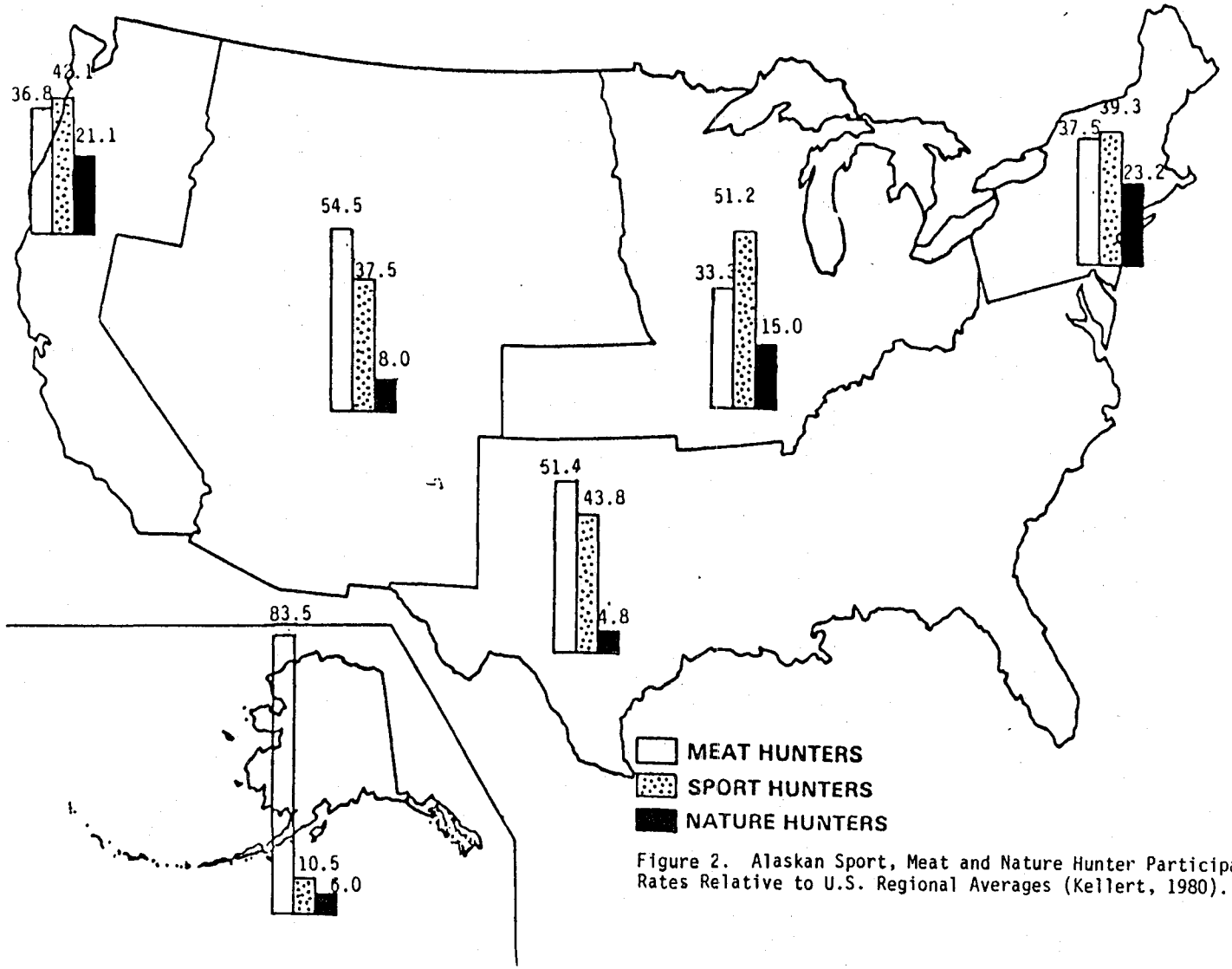


Figure 2. Alaskan Sport, Meat and Nature Hunter Participation Rates Relative to U.S. Regional Averages (Kellert, 1980).

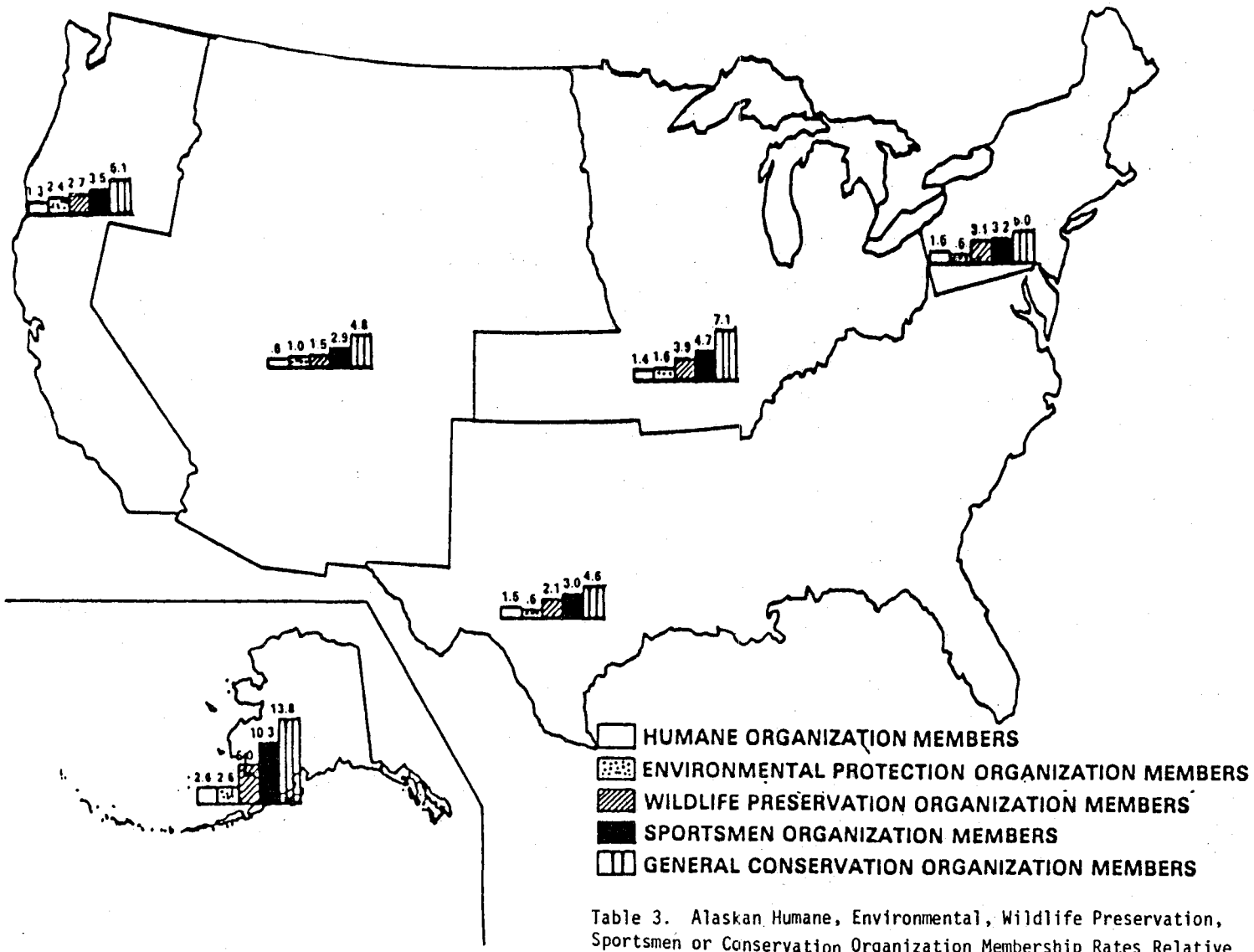


Table 3. Alaskan Humane, Environmental, Wildlife Preservation, Sportsmen or Conservation Organization Membership Rates Relative to U.S. Regional Averages, 1980 (Kellert, 1980).

TABLE 2. Summary of the Documentable, 1981 Baseline, Gross Economic Benefits from Fish and Wildlife in the Tanana River Basin, as corrected to reflect 1983 Real Dollar Values.

	Producer (Thousand $)			Consumer (Thousand $)	State (Thousand $)			Employment Impact			Gross Economic Income (Thousand $)			
Category	Gross Income	Expend.	Net	Gross Expend.	Gross Income	Expend.	Net	Direct Employ.	Employ. Effect	Total Employ.	Direct Econ. Effect	Personal Econ. Effect	Total Econ. Effect	1983 Adjusted Gross Econ. Income (Thousand $)
Commercial														
Trapping	1,130	706	424					51	1	52	1,967	N/A	1,967	2,202
Comm. Fish	2,621	691	1,929					121	4	125	4,560	N/A	4,560	5,105
Fish Proc.	8,432	6,745	1,686					119	718	837	24,199	---	24,199	27,096
Guiding	1,200	960	240					24	1	25	2,088	---	2,088	2,338
Subsistence														
Trapping	---	---	N/A					N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hunting	---	---	N/A					N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fisheries	---	---	2,181					152	5	157	---	3,685	3,685	4,126
Recreational														
Sport Fish				9,631				220	22	242	16,276	871	17,147	19,199
Big Game				2,433				55	5	60	4,111	2,866	6,977	7,812
Small Game				1,073				25	2	27	1,814	N/A	1,814	2,031
Waterfowl				679				16	2	18	1,148	48	1,195	1,338
Other Game				51				1	1	1	86	N/A	86	96
Special Equip.				3,003				69	7	76	5,076	---	5,076	5,683
State Management					858	871	13	19	60	79	2,597	---	2,597	2,908
TOTAL								872	827	1,699	63,920	7,470	71,391	79,935

NOTE: Summations may not equal totals due to rounding. See text for actual numbers and methods of calculations.

TABLE 3. Sport Fishing Personal Income Effects for the TBAP Area in 1981.

Species	Harvest #'s 1)	Average Lbs/Fish 2)	Total Weight	Unit Value 3)	Total Value	Income Multiplier 4)	Total Income
King Salmon	763	15.0	11,445	4.04	46,238	1.69	78,142
Coho Salmon	45	5.5	248	4.04	1,002	1.69	1,693
Land Locked Coho	57,294	0.2	11,459	4.04	46,294	1.69	78,237
Chum Salmon	595	7.0	4,165	4.04	16,827	1.69	28,438
Rainbow Trout	24,571	0.2	4,914	4.04	19,853	1.69	33,552
DU/AC	572	0.2	114	4.04	461	1.69	779
Lake Trout	1,721	3.0	5,163	4.04	20,859	1.69	35,252
Grayling	75,288	0.3	22,586	4.04	91,247	1.69	154,207
Northern Pike	9,941	4.5	44,734	4.04	180,725	1.69	305,425
Whitefish	4,873	2.0	9,746	4.04	39,374	1.69	66,542
Burbot	4,122	3.0	12,366	4.04	49,959	1.69	84,431
Sheefish	93	7.0	651	4.04	2,630	1.69	4,445
TOTAL	179,878		127,591 lbs.		515,469		871,143

1) Mills, 1981.
2) Mike Kramer, 1983, personal communication, Alaska Dept. of Fish and Game, Sport Fish Division, Fairbanks.
3) Replacement cost value, Fairbanks area. See supportive table.
4) Logsdon, et al, 1977.

TABLE 4. Recreational Hunting Personal Income Effects for the TBAP Area in 1981.

SPECIES	HARVEST #'s 1)	LBS./ ANIMAL 2)	TOTAL WEIGHT	UNIT VALUE 3)	TOTAL VALUE	INCOME MULTIPLIER 4)	TOTAL INCOME EFFECT
Moose	540	715	386,100	2.74	1,057,914	1.69	1,787,875
Caribou	82	150	12,300	2.74	33,702	1.69	56,956
Sheep	131	100	131,000	2.74	358,940	1.69	606,609
Bison	61	1,200	73,200	2.74	200,568	1.69	338,960
Black Bear	109 5)	150	16,350	2.74	44,799	1.69	75,710
Geese	826	4	3,304	1.63	5,386	1.69	9,102
Ducks	14,078	1	14,078	1.63	22,947	1.69	38,781
TOTAL 6)	15,827		636,332		1,724,256		2,913,993

1) Big Game Harvest statistics are based on 1981 data for Game Management Units 12 and 20. Actual Unit 20 Black Bear harvest was 217 but included 17 Life and Property kills. Waterfowl harvest statistics are from Campbell and Timm. 1983.
2) Dressed weights were derived from the following sources:
   a) Moose - Wolfe, Robert J. 1981.
   b) Caribou, Sheep, Black Bear - Patterson. 1974.
   c) Bison - Reardon. 1981.
   d) Geese, Ducks - Wolfe, Robert J. 1981.
3) Replacement cost value, Fairbanks area. See supportive table.
4) Logsdon, et al, 1977.
5) Assumption is that only 50% of the 52 black bears harvested are utilized for human consumption.
6) Does not include upland 218 game birds or small game.

TABLE 5. Multiplier Analysis of the Alaska Economy by impact ranking, 1972

Gross Income Multiplier		Employment Multiplier	
State	2.98	Fish Processing	6.03
Mining	2.93	Construct	3.53
Fish Processing	2.87	State	3.17
Oil & Gas	2.70	Manuf	2.82
Construct	2.34	Pulp	1.92
Pulp	2.30	Lumber	1.47
Lumber	1.87	Transport	1.25
Com/Utl	1.87	Mining	1.25
Transport	1.84	Oil & Gas	1.19
Agric	1.80	Com/Utl	1.19
Fish	1.74	Trade	1.10
Manuf	1.72	FIRE	1.07
FIRE	1.70	Service	1.04
Trade	1.69	Fish	1.03
Service	1.63	Forest	1.02
Forest	1.61	Agric	1.01

Source: Logsdon, Charles, L., et al, 1977.

TABLE 6. Labor/Output Ratios for Alaska's Industrial Sectors in 1972 and 1980 (per million $ output)

Sector	1972 L/O Ratio[1]	1980 L/O Ratio
Agriculture	99.01	50.42[3]
Fish	90.73	46.20[3]
Forest	200.18	101.94[3]
Mining	11.86	6.04[3]
Oil & Gas	5.52	2.81[3]
Lumber	21.01	10.70[3]
Pulp	12.36	7.80[2]
Fish Processing	17.93	14.20[2]
Manufacture	23.49	11.96[3]
Construction	16.95	8.63[3]
Transportation	21.25	10.82[3]
Communications/Utilities	23.74	12.09[3]
FIRE	17.82	9.07[3]
Trade	44.90	22.86[3]
Service	47.73	24.31[3]
Tourism	N/A	20.10[2]
State Government	35.56	21.80[2]

1 Logsdon, Charles L., et al, 1977.

2 House Research Agency Memoranda 80-106. Effect of State Expenditures on Unemployment and In-migration. 1980.

3 Updated ratios unavailable. L/O Ratio estimated based on a real dollar adjustment of the nominal 1972 output to reflect inflationary changes. The inflation rate was estimated based on the Anchorage Consumer Price Index (see supportive table). Because these estimates are not based on an updated input/output model and additionally may not reflect significant shifts from labor to capital assets in some industrial sectors, caution should be noted in their use. Nonetheless, it is believed that the revised estimates are more reflective of current labor/output ratios than the 1972 estimates.

TABLE 7. Estimated Annual Inflation Rates, U.S. Average and Anchorage for 1971-82.[1]

	U.S. Average	Anchorage
1971	4.3%	3.0%
1972	3.3	2.7
1973	6.2	4.2
1974	11.0	10.8
1975	9.1	13.7
1976	5.8	7.7
1977	6.5	6.6
1978	7.7	7.1
1979	11.3	10.4
1980	13.5	10.2
1981	10.4	8.1
1982	6.1	5.5
1983	< 4.0	4.0

[1] Estimated inflation measured by the Consumer Price Index. See text for discussion.

PART IV—LITERATURE CITED

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APPENDIX A
TRAPPING

I. GROSS REVENUES

Gross revenues derived from commercial trapping in the Tanana Basin can be estimated by multiplying the number of furs harvested in the region by the average market price per pelt.

Number of Animals Harvested

The average fur harvest was calculated for the 1980-1981 season based on fur export data as reported to the Department of Fish and Game (Table A-1). However, it was necessary to adjust the estimated harvest because export reports have consistently underestimated actual harvests. Although the degree to which all fur harvests are underestimated is not known, based on a comparison of the number of pelts sealed to the reported number of pelts exported (for beaver, lynx and otter), Herb Melchior (ADF&G's Statewide Furbearer Biologist) has concluded that reported exports, on the average, underestimate the number sealed by 34 percent. In addition, although sealing data provide the best estimator of harvest that we have for certain furbearer species, they do not account for 100 percent of the harvest (i.e., many furs harvested are not reported to Fish and Game). Therefore, all harvest figures used in this analysis have been increased by a conservative 40% to account for both the fact that export data underestimates harvests and that many furs harvested are not reported.

Price/Pelt

Two separate prices were calculated to account for fur pelts which were not sold "raw", but rather were initially processed by the trapper to make hats, mukluks or coats. Fur that is processed at home brings a higher price than furs sold directly to buyers. In addition, it was necessary to determine the total number of furs which were processed at home. These estimates were determined by comparing the ratio of furs sold directly to dealers in-state plus fur exports to Lower 48 dealers with the number of furs personally exported for tanning. Table A-1 summarizes these assumptions and depicts the total current gross revenues derived from trapping in the TBAP area.

II. OPERATING COSTS

The total amount of money spent by a trapper to participate in this activity, when subtracted from gross revenues as established in the previous section, results in a net profit, or individual producer benefit, for the trapper.

A trapper's operating costs include the amortized costs of owning various combinations of airplane, snowmachine, dog team, and highway vehicles, miscellaneous equipment (traps, dog harnesses, gas cans, etc.) and the annual cost of fuel to run equipment. Each of these costs are calculated in separate sections of this analysis.

For the purpose of this evaluation, these costs were calculated to estimate total operating costs for the "typical" trapper. However, there is a large

measure of variability among trappers as to the type and degree of participation in trapping. For instance, some trappers derive a significant portion of their income from trapping while others primarily trap for recreational benefits. In addition, most individuals do not exert equal trapping pressure on all furbearer species. For instance, based on trapper responses to the 1982-83 ADF&G Trapper Survey, only 6% of all TBAP Area trappers trapped for beaver. Consequently, the estimates of the average units of gear per trapper were calculated as an average for all trappers. Again using beaver as an example, the results of the 1982-83 ADF&G Trapper Survey allowed us to calculate that the average number of beaver traps set per trapper for those who actually trapped for beaver was 10.8. However, weighted for the number of trappers who did not trap for beaver, the average number of beaver traps set per trapper for the "typical" TBAP trapper was 0.62.

The final step in calculating total operating costs for trapping in the TBAP area was to breakdown expenditures separately for each mode of transportation used by trappers. These subtotals were then summed on a weighted basis relative to the percent of trappers using each respective mode. The distribution of trapping effort by transportation mode was estimated from the 1982-83 ADF&G Trappers Survey and were calculated as follows:

Mode	Percent of Total Trappers Using This Mode
Airplane/Walking	1.5
Airplane/Dog Team	3.0
Airplane/Snowmachine	4.5
Vehicle/Walking	6.1
Vehicle/Dog Team	1.5
Vehicle/Snowmachine	53.0
Snowmachine Only	27.3
Dog Team Only	1.5
Walking Only	1.5

Capital Costs

Various combinations of an airplane, snowmachine, dog team, highway vehicle, and walking are generally used to reach a trapline and to run the line. Each different mode, and combination of modes have different costs associated with them. The amortized cost of owning a piece of equipment is only one of the capital expenses of trapping. There is also the cost of other miscellaneous items such as dog harnesses and gas cans. The total cost of these items must also be prorated over their expected life-cycle to calculate the cost of the equipment per year.

Since a particular piece of equipment is generally also used for activities unrelated to trapping, only 40% of the yearly cost of a plane, and 60% of the cost of a snowmachine and dog team was attributed to trapping. Since less than 1% of the use of a motor vehicle can be attributed to trapping, no annual capital costs were calculated. However, vehicle operating costs were calculated and are discussed in the next section.

The assumptions which were made to calculate the capital costs of owning equipment used in trapping are broken down in Table A-3.

Travel Costs

A trapper's operating costs include both the roundtrip costs of getting to and from the start of the trapline and the costs of actually running the trapline. Although the automobile/snowmachine and snowmachine only modes are the most common forms of transportation in the TBAP area, all possible combinations of airplane, automobile, snowmachine, dog team, and foot travel are utilized by trappers.

In order to calculate the travel costs it was first necessary to estimate the average roundtrip distance to the start of the trapline and the average length of the trapline. These estimates were calculated based on the pooled Fairbanks Area/Rural TBAP area responses to the 1982-83 Trapper Survey (Table A-8, A-9, and A-10).

Secondly, it was necessary to estimate the average number of times a trapper checks his traps during the 16 week trapping season. Based on assumptions provided by Herb Melchior (ADF&G Statewide Furbearer Biologist) and a review of the 1982-83 ADF&G Trapper Survey, this analysis assumes that the average non-aircraft trapper checks his line 1.5 times a week or 24 times a season. Trappers who utilized aircraft to travel to their traplines were assumed to average one trip per week or 16 times a season.

The final assumptions which were included in this analysis of travel costs were the actual operating expenditures per mile (or hour) for aircraft, vehicles and snowmachines. It was assumed that most aircraft trappers use a Super Cub class airplane which consumes approximately 6 gallons of gas per hour. Most vehicle trappers utilize four-wheel drive vehicles which were assumed to have an operating cost of $0.40/mile. Snowmachine trappers typically utilize small, lightweight snowmachines which have a rated mileage of 30 to 40 miles per gallon. However, under actual field conditions (deep snow, sled loaded with equipment, spare fuel, etc.) it is assumed that the typical snowmachine only averages 15 miles per gallon.

The assumptions which were made to estimate travel costs per trapper are summarized in Table A-4.

Other Operating Costs of Trapping

In addition to the capital and operating costs of transportation equipment used in trapping, trappers must also purchase a variety of traps, stretcher boards, rifle, knife, ax, and other miscellaneous equipment.

The assumptions used to calculate the average cost per year for this equipment are presented in Table A-5. As initially indicated, these assumptions represent the average amount of equipment used by the "typical" trapper and have been adjusted to validly reflect the inclusion of trappers who did not participate in all forms of trapping.

Summary of Operating Expenses

The total cost per trapper per year was determined by adding together (a) transportation equipment costs, (b) travel costs, and (c) other operating costs. These costs are summarized in Table A-6.

III. NET BENEFITS TO TRAPPING

The gross revenue from trapping in the Tanana Basin during the 1980-1981 season was $1,130,286. Net revenue, or producer surplus was $424,238.

IV. POTENTIAL BENEFITS

Major opportunities exist for substantially increasing the economic benefits of trapping in the TBAP area. Based on the comparison of the current total Statewide fur export with the historic 1910-1983 trend, it is evident that the 1980-81 statewide export was substantially below the State's average sustained fur export (Figure A-1). Unfortunately, similar historic records for the Tanana Basin are no longer available. It is reasonable, however, to assume that fur exports derived from the Tanana Basin have followed a similar pattern to that of the State as a whole. Although several factors are undoubtedly responsible for the marked post-World War II decline in fur export production, the rapid expansion of a cash economy and employment opportunities based on large government capital project expenditures during this period appears to be one of the most significant.

Notwithstanding this apparent decline in the level of fur trapping, ADF&G biologists have concluded that there is no apparent physical evidence to indicate that the habitat's carrying capacity or the abundance of furbearers in the Tanana Basin is significantly different from historic levels. Therefore, it is reasonable to believe that the potential furbearer harvest in the TBAP area could once again approximate the average historic level.

In addition, the economic benefit of trapping in the TBAP area could be increased with the inclusion of in-State secondary fur processing and fur garment manufacture. Currently, most fur pelts are exported "raw" out-of-State.

Although it is extremely risky to attempt to project potential economic benefits for a new industry without, at a minimum , a preliminary market assessment and a good understanding of the anticipated inter-relationship of the proposed industry with other trade sectors in Alaska, it is possible to make a gross estimate of the potential economic benefits. These estimates, therefore, should be viewed as speculative and thus significant only as an indicator of the order of magnitude of the potential benefits.

Several assumptions were made prior to calculating the potential economic benefit of trapping in the TBAP Area. These assumptions were:

FIGURE A-1. Alaska Fur Export Statistics, in thousands of Pelts, 1910 to 1981.

1) An expansion of the domestic and international fur market sufficient to support the expansion of the annual TBAP fur harvest up to the average historic level (approx. 200% increase over current levels).
2) Continued matching of fur supply with demand so as to maintain current fur prices.
3) The inclusion of in-State fur processing and fur garment manufacturing industries are conservatively estimated to add 100% of "value-added" to the "raw" fur trapping values.
4) The use of a gross income multiplier of 1.74 for the expanded fur trapping industry and 1.72 for the potential secondary fur industries. These multipliers were calculated by Logsdon, et al, 1977, for the fishing and manufacturing industries, respectively, and were chosen, in the absence of more refined estimates, as most representative of the trapping industries.

Based on these assumptions, the estimated potential gross economic value of trapping in the TBAP Area is 7.6 million dollars.

Potential Fur Harvest Gross Revenue	2.2 Million
Gross Secondary Economic Effect	1.6 Million
Sub-total	3.8 Million
Secondary Fur Processing & Manufacture - Gross Revenue	2.2 Million
Gross Secondary Economic Effect	1.6 Million
Sub-total	3.8 Million
TOTAL	7.6 Million

TABLE A-1. Summary of Current Gross Revenues from Trapping in the TBAP Area.

Species	1980-81 Fur Harvest (#'s) 1)	% of Raw Furs Exported	Price of Exported Furs 2)	Gross Revenues From Exported Furs	% of Raw Furs Locally Processed	Price for Furs Locally Processed	Gross Revenues From Furs Locally Processed	Gross Revenues for Exported and Locally Processed Furs
Beaver	1,796	100%	$ 43.00	77,228	0	0	0	77,228
Fox	2,021	95%	90.00	172,796	5%	180.00	18,189	190,985
Marten	10,998	95%	38.00	397,028	5%	100.00	54,900	451,928
Mink	1,813	99%	49.00	87,949	1%	100.00	1,800	89,749
Muskrat	11,883	95%	4.00	45,155	5%	8.00	4,753	49,908
Lynx	707	99%	235.00	164,484	1%	500.00	3,500	167,984
Otter	51	97%	44.00	2,177	3%	88.00	135	2,312
Wolf	200	0	0	0	100%	300.00	0	60,000
Wolverine	134	0	0	0	100%	300.00	0	40,200
TOTAL								$1,130,286

1) Alaska Department of Fish and Game. The 1980-81 harvest was estimated by adjusting the reported fur export upwards by 40% to account for unreported harvests. See text for explanation.

2) Appendix Table A-2.

TABLE A-2. Average Price per Pelt for Exported and Locally Processed Furs, TBAP Area.

Species	% of Furs Sold at Given Price 1)	Price per Pelt 2)
Beaver		
Exported	100%	$ 43.00
Fox		
Exported	95%	90.00
Locally Processed	5%	180.00
Marten		
Exported	95%	38.00
Locally Processed	5%	100.00
Mink		
Exported	99%	49.00
Locally Processed	1%	100.00
Muskrat		
Exported	95%	4.00
Locally Processed	5%	8.00
Lynx		
Exported	99%	235.00
Locally Processed	1%	500.00
Otter		
Exported	97%	44.00
Locally Processed	3%	88.00
Wolf		
Locally Processed	100%	300.00
Wolverine		
Locally Processed	100%	300.00

1) Alaska Department of Fish and Game. See text for estimation methodology.

2) "The Alaska Trapper and Dog Mushing News," February, 1982, Page 19. Locally processed price was estimated based on ADF&G conversations with local trappers and fur garment manufactures.

TABLE A-3. Total Costs Associated with Owning, Operating and Maintaining Equipment for Trapping in the TBAP Area.

Mode	Major Equipment Cost	Life Cycle	Prorated Cost/Year	Other Misc. Gear	Life Cycle	Prorated Cost/Year	Annual Maint. Cost	Total Yearly Cost	% Attrib. to Trapping	Total Cost/Year Attrib. to Trapping
Airplane	$25,000	20	$1,250	0	0	0	$2,100[2]	$3,350	40%	$1,340.00
Snowmachine	2,500[3]	5[3]	500	$150	10	$ 15	35	550	60%	330.00
Dog Team	750[4]	5	150	500	5	100	0	250	60%	150.00
Automobile[1]										

Source: Alaska Department of Fish and Game and conversations with local trappers.

[1]The cost of automobile ownership is not calculated the same way as snowmachine, airplane and dogs since the percentage of times per year that the vehicle is used for trapping versus other uses is so small. The automobile costs are calculated on the next table at 40¢/mile.

[2]Other costs for airplanes include (a) $750/year for an overhaul and other general maintenance (b) $350/year for engine rebuilding ($7,000 for rebuilding once during the 20 year life of the plane) (c) $1,000/year insurance.

[3]The cost and life of a trappers snowmachine is different than the calculations used to determine snowmachine cost to a hunter or recreational user. The cost to a trapper is slightly more ($2,500 rather than $2,000) and the machine lasts only 5 years rather than 10.

[4]Average team has 10 dogs, each of which cost approximately $75.00.

TABLE A-4. Annual Travel Costs Per Trapper Associated with Getting to and Running a Trapline, by Mode of Transportation in the TBAP Area.

	TRAVEL COSTS FROM RESIDENCE TO TRAPLINE						TRAVEL COST TO RUN TRAPLINE				TOTAL COST
Mode	Miles/Hours Traveled to Start of Trapline (Roundtrip)[1]	Cost/Mile or Hour	Total Cost to get to Starting Pt. of Line	# Times/ Season Expend. is Incurred	Total Cost/ Year to get to Trapline	Average Trapline Length (Miles) (Roundtrip)	Cost/Mile	Total Transportation Cost to Run Trapline	# Times/ Season Expend. is Incurred	Total Cost/ Year for Trans. to Run Line	Total Transport Cost/Year Run Line
Airplane & Foot	1.5 hrs.	10.20/hr.[2]	15.30	16[4]	244.80	0	---	---	---	---	$ 244.80
Airplane & Dog Team	1.0 hrs.	10.20/hr.[2]	10.20	16[4]	163.20	65	---	---	---	864.00[6]	1,027.20
Airplane & Snow-machine	1.5 hrs.	10.20/hr [2]	15.30	16[4]	244.80	30	0.10/mile	3.00[3]	16[4]	48.00	292.80
Passenger Vehicle & Foot	23 miles	.40/mile	9.20	24	220.80	5	---	---	---	---	220.80
Passenger Vehicle & Dog Team	60 miles	.40/mile	24.00	24	576.00	60	---	---	---	864.00[6]	1,440.00
Passenger Vehicle & Snow-machine	63 miles	.40/mile	25.20	24	604.00	63	0.10/mile	6.30[3]	24	151.20	756.00
Dog Team only	---	---	---	---	---	35	---	---	---	864.00[6]	864.00
Snowmachine only	---	---	---	---	---	41	0.10/mile	4.10[3]	24	98.40	98.40
Foot only	---	---	---	---	---	4	---	---	---	---	0

Source: Alaska Department of Fish and Game and local trappers.

(continued)

Footnotes:

[1] ADF&G 1982-83 Trapper Survey. Unpublished. Fairbanks.

[2] 1 hour flying times uses up 6 gallons of gas. 6 gallons at $1.70/gallon equals $10.20/hour.

[3] Assumes 15 mile/gal. gas @ $1.50 gal. = $0.10/mile.

[4] Trappers that use airplanes fly their line once a week or 16 times each season, and then spend 2 days running the line.

[5] Average of 1.5 trips a week over a 16 week season equals 24 trips a season.

[6] Trappers using dog teams do not expend a certain amount of money for fuel on each trip they take. They do however, have to feed their dogs. Each dog costs approximately $12 per month. 10 dogs @ $12/month = $120/month x 12 months/year = $1440/year. However, only 60% of the yearly cost of dogs is attributable to trapping since the dogs are used for other activities as well. 60% of $1440 = $864/year.

TABLE A-5. Annual Miscellaneous Equipment Costs for Trapping in the TBAP Area.

Equipment	Cost of Equipment	Average # of Items Owned	Life of Equipment	Total Cost/ Year for Equipment	% of Yearly Cost Attributable to Trapping	Total Cost/ Year of Equipment
Mink/ Marten Traps	$ 35.09/doz.[1]	50.33[2]	5 yrs.	$ 29.43	100%	$ 29.43
Fox Traps	41.45/doz.[1]	20.29[2]	5 yrs.	14.02	100%	14.02
Otter Traps	83.84/doz.[1]	0.29[2]	5 yrs.	0.41	100%	0.41
Lynx Traps	57.25/doz.[1]	27.23[2]	5 yrs.	25.98	100%	25.98
Beaver Traps	103.95.doz.[1]	0.78[2]	5 yrs.	1.35	100%	1.35
Wolverine Traps	103.95/doz.[1]	5.03[2]	5 yrs.	8.71	100%	8.71
Wolf Traps	59.95/ea.[1]	5.03[2]	5 yrs.	60.31	100%	60.31
Misc. Traps	65.00/doz.	14.41	5 yrs.	15.61	100%	15.61
Stretcher Boards for Beaver	7.50 ea.[3]	½ doz.	5 yrs.	9.00	100%	9.00
Stretcher Boards for Fox	19.25/doz.[1]	1 doz.	10 yrs.	1.95	100%	1.95
Stretcher Boards for Muskrat	12.95/doz.[1]	1 doz.	10 yrs.	5.18	100%	5.18
Stretcher Boards for Mink & Marten	10.00/doz.[1]	2 doz.	10 yrs.	2.00	100%	2.00

TABLE A-5 continued.

Equipment	Cost of Equipment	Average # of Items Owned	Life of Equipment	Total Cost/ Year of Equipment	% of Yearly Cost Attributable to Trapping	Total Cost/ Year for Equipment
Stretcher Boards for Lynx	50.00/doz.[1]	½ doz.	10 yrs.	2.50	100%	2.50
Stretcher Boards for Wolf	20.00/bd.[3]	2 bds.	10 yrs.	4.00	100%	4.00
22 Rifle or Pistol	125.00/ea.[3]	1/ea.	10 yrs.	12.50	75%	9.38
Knives, Ax & Saws	60.00[3]	---	10 yrs.	6.00	25%	1.50
Other Misc. Gear	75.00	---	10 yrs.	7.50	100%	7.50
Bailing Wire	15.00/roll	1 roll	0	15.00	100%	15.00
Lures & Scents	---	---	---	30.00[3]	100%	30.00
TOTAL						$243.83

1 Average prices from The Trapper, Vol. 8, No. 11, July 1983.

2 Based on the average number of traps set per trapper, increased by 25% to reflect spare and replacement traps, as reported in the 1982-83 ADF&G Trapper Survey.

3 Estimated by the Alaska Department of Fish and Game based on conversations with local trappers.

TABLE A-6. Total Annual Capital and Operating Expenditures for Trapping in the TBAP Area.

Mode	Cost of Owning Operating & Maintaining Equipment to Get to Trapline (Table A-3)	Cost of Owning Operating & Maintaining Equipment to Run Trapline (Table A-3)	Travel Cost/ Trapper to Run Trapline (Table A-4)	Other Equip. Costs/Trapper/ Year (Table A-5)	Total Cost/ Trapper/Year	% Trappers This Mode	Total Trappers Using This Mode[1]	Total Trapping Costs
Airplane & Foot	1,340.00	0	244.80	243.83	1,828.63	1.5%	9	16,458
Airplane & Dog Team	1,340.00	150.00	1,027.20	243.83	2,761.03	3.0%	18	49,699
Airplane & Snowmachine	1,340.00	330.00	292.80	243.83	2,206.63	4.5%	27	59,579
Passenger Vehicle & Foot	0	0	220.00	243.83	463.83	6.1%	37	17,162
Passenger Vehicle & Dog Team	0	150.00	1,440.00	243.83	1,833.83	1.5%	9	16,504
Passenger Vehicle & Snowmachine	0	330.00	756.00	243.83	1,329.83	53%	318	422,886
Dog Team Only	0	150.00	864.00	243.83	1,257.83	1.5%	9	11,320
Snowmachine Only	0	330.00	98.40	243.83	672.23	27.3%	164	110,246
Foot Only	0	0	0	243.83	243.83	1.5%	9	2,194
TOTAL								706,048

[1] The Alaska Department of Fish and Game has estimated that there are approximately 600 trappers in the Game Management Units 12 and 20.

TABLE A-7. Current Net Producer Benefits from Trapping in the TBAP Area.

	Gross Revenues All Trappers	Operating Costs to All Trappers	Net Revenues or Producer Benefits to All Trappers
1980-81	1,130,286	706,048	424,238

Source: Tables discussed in previous sections of this appendix.

TABLE A-B. 1982-83 ADF&G Trapper Survey, Summary of the Fairbanks Sub-unit Responses, TB&P Area.

Mode	# Trappers Respond.	% of Total Respondents	Round-trip Dist. to Start of Line[2]	R.T. Trap Line Length	Average Number of Sets per Trapper							Average # Years Trapped
					Lynx	Marten	Fox	Otter	Wolf/Wolver.	Beaver	Other	
Airplane & Foot	1	3.0	110	0	0	0	0	0	0	6	0	2
Airplane & Dog Team	0	0	---	---	---	---	---	---	---	---	---	---
Airplane & Snow-Machine	1	3.0	100	30	15	40	2	0	0	15	0	16
Passenger Vehicle & Foot	3	9.1	27	6	9	11	22	0	0	0	17	13
Passenger Vehicle & Dog Team	1	3.0	60	60	16	0	6	0	0	0	10	8
Passenger Vehicle & Snowmachine	18	54.5	74	29	14	40	14	0	3	1	4	7
Foot Only	1	3.0	0	4	1	3	18	0	0	0	3	14
Dog Team Only	1	3.0	0	35	10	0	30	0	0	0	10	10
Snowmachine Only	7	21.2	0	43	24	48	13	1	5	0	4	11
TOTAL[1]	33	100.0	50.9	29	15	34	14	0.2	3	1	5	9

1 Averages weighted by the percent composition for each mode of transportation.
2 Estimate based on respondents address and reported trapping area.

TABLE A-9. 1982-83 ADF&G Trapper Survey, Summary of the Rural Sub-unit Responses, TBAP Area.

Mode	# Trappers Respond.	% of Total Respondents	Round-trip Dist. to Start of Line[2]	R.T. Trap Line Length	Average Number of Sets per Trapper							Average # Years Trapped
					Lynx	Marten	Fox	Otter	Wolf/Wolver.	Beaver	Other	
Airplane & Foot	0	0	---	---	---	---	---	---	---	---	---	---
Airplane & Dog Team	2	6.0	75	65	16	128	0	3	0	0	0	7
Airplane & Snow-Machine	2	6.0	100	30	12	25	6	0	20	0	2	9
Passenger Vehicle & Foot	1	3.0	10	3	4	12	0	0	0	0	0	1
Passenger Vehicle & Dog Team	0	0	---	---	---	---	---	---	---	---	---	---
Passenger Vehicle & Snowmachine	17	52.0	51	99	35	41	26	0	22	0	28	15
Foot Only	0	0	---	---	---	---	---	---	---	---	---	---
Dog Team Only	0	0	---	---	---	---	---	---	---	---	---	---
Snowmachine Only	11	33.0	0	40	27	44	12	0	7	0	8	18
TOTAL[1]	33	100.0	37	70	29	45	18	0.2	15	0	17	15

1 Averages weighted by the percent composition for each mode of transportation.
2 Estimate based on respondents address and reported trapping area.

TABLE A-10. 1982-83 ADF&G Trapper Survey, Summary of the Combined Fairbanks and Rural Sub-unit Responses, TB&P Area.

Mode	# Trappers Respond.	% of Total Respondents	Round-trip Dist. to Start of Line[2]	R.T. Trap Line Length	Average Number of Sets per Trapper							Average # Years Trapped
					Lynx	Marten	Fox	Otter	Wolf/Wolver.	Beaver	Other	
Airplane & Foot	1	1.5	110	0	0	0	0	0	0	0	6	2
Airplane & Dog Team	2	3.0	75	65	16	128	0	3	0	0	0	7
Airplane & Snow-Machine	3	4.5	100	30	13	30	5	0	13	0	6	11
Passenger Vehicle & Foot	4	6.1	23	5	8	12	17	0	0	0	13	10
Passenger Vehicle & Dog Team	1	1.5	60	60	16	0	6	0	0	0	10	8
Passenger Vehicle & Snowmachine	35	53.0	63	63	24	41	20	0	12	1	16	11
Foot Only	1	1.5	0	4	1	3	18	0	0	0	3	14
Dog Team Only	1	1.5	0	35	10	0	30	0	0	0	10	10
Snowmachine Only	18	27.3	0	41	26	46	13	0.5	4	0	6	15
TOTAL[1]	66	100.0	44	50	22	40	16	0.23	8	0.62	12	12

1 Averages weighted by the percent composition for each mode of transportation.
2 Estimate based on respondents address and reported trapping area.

APPENDIX B
COMMERCIAL FISHERIES

I. GROSS REVENUES

The gross revenue from the commercial sale of salmon which originate in the Tanana Basin can be determined by multiplying the total number of salmon caught by the average weight and price per pound for each species.

The total 1981 Tanana Basin commercial salmon catch, average weights, price/pound and total gross revenue is presented, by species, in Table B2.

In addition to the commercial harvest of salmon within the Basin, a large number of salmon, which are produced by salmon which spawn in the Basin, are intercepted and harvested commercially in the Lower and Middle Yukon River salmon fisheries. Since data is not currently available which would have permitted us to differentiate Tanana Basin salmon stocks which are caught in the Lower Yukon River commercial fisheries, a computer model (originally developed by ADF&G's FRED Division to predict the percent contribution of Clear Hatchery releases to the Yukon River fisheries) was modified to enable us to estimate the percent contribution of Tanana Basin salmon stocks to the Lower and Middle Yukon River salmon fisheries. The total commercial salmon harvest attributable to Tanana Basin stocks is then calculated by multiplying the percent contribution times the total salmon harvests, by species, for each individual fishery.

II. OPERATING COSTS

Total operating cost to the fisherman affects the profits made from a season of fishing. The total amount of money spent by the fishermen to participate in this activity, when subtracted from gross revenues as established in the previous section results in the net profits to the fishermen, or the producer benefits.

A fisherman's operating costs include the amortized costs of owning a boat and motor, the cost of gas to run the boat, and the price of fishing gear (nets, fishwheel), and other miscellaneous gear (licenses).

In the Lower and Middle Yukon River commercial salmon fisheries the following capital costs were assumed: 1) $2,000 for a boat with a five year life, 2) $3,000 for a motor with a three year life, and 3) $200 for a miscellaneous equipment (gas cans, etc...) with a ten year life. In addition $35/year was included for maintainence. These estimates were derived based on conversations with local fishermen. Since boats are also used for transportantion, firewood gathering, berry picking, hunting, subsistence fishing, etc., only 50% of the annual capital expenditures are attributed to commercial fishing activities.

Within the Tanana Basin, identical annual capital expenditures were assumed except that $1,000 was added for a boat trailer with a projected ten year life. Although boats are also used for transportation, recreation, hunting and subsistence fishing, surface road transportation is generally available within the Basin. Therefore, 75% of the annual capital expenditures were attributed to commercial fishing activities.

Another cost that must be factored into this analysis is the cost of nets or a fishwheel. It is assumed that a fishwheel is a $1,250 initial investment, which lasts approximately 4 years. This comes to $312 per year. In addition to this cost an additional $150 per year must be paid in order to maintain the wheel for a total annual cost of $462. It is assumed that a net is a $1,000 initial investment which last approximately seven years. This averages $143 per year. Each year an additional $500 is spent on patching these nets for a total annual cost of $643.

Fishermen must also pay license fees every year. A vessel license fee costs $20 per year. In addition, there is an annual limited entry permit license renewal fee of $30 per year.

The initial cost of obtaining a limited entry commercial fishing license was not included in this analysis. Although entry permit licenses are a capital cost, they are personal property which has consistently grown in real value. Therefore, in actual practice an unrealized capital gain could be assigned to the ownership of the license. Currently, entry permits are valued between $15,000 to $20,000, while fishermen that bought their permits years ago paid next to nothing. Because of the consistent capital growth in the value of limited entry permit licenses and the absence of deductable depreciation, an amortized annual cost for entry permits was not included in this analysis.

The various assumptions relating to total operating costs are summarized in Table B4.

III. NET PRODUCER BENEFITS

The net producer benefit from commercial salmon fishing during the 1981 season was approximately 1.93 million dollars and is presented in Table B1.

TABLE B-1. Gross Revenues, Operating Expenditures and Net Benefits from Commercial Fishing in 1981.

	TBAP Area			Outside TBAP Area 2)			Total Benefits	
Species	**Gross Revenues**	**Oper. Expend.**	**Net Benefits**	**Gross Revenues**	**Oper. Expend.**	**Net Benefits**	**Gross Revenues**	**Net Benefits**
King Salmon	29,957			392,177			422,134	
Summer Chum Salmon	48,940			1,029,315			1,078,255	
Fall Chum Salmon	75,131			824,190			899,321	
Coho Salmon	4,568			30,298			34,866	
King Salmon Roe	1,737			0			1,737	
Summer Chum Salmon Roe	5,961			165,309			171,270	
Fall Chum Salmon Roe	9,057			3,867			12,924	
TOTAL	175,351	78,961	96,390	2,445,156	612,220	1,832,936	2,620,507	1,929,326

1) Source: Alaska Department of Fish and Game. See supporting tables.

2) Data for fishermen outside of the TBAP Area who are intercepting and harvesting TBAP Basin salmon stocks.

TABLE B2. Gross Revenues From Commercial Salmon Fishing Within the TBAP Area. 1)

Species	Total Catch	Pound/Fish (1981-Aver.)	Total Pounds	Price/Lb. (1981)	Gross Value to the Fisherman
King Salmon	1,264	23.7	29,957	1.00	29,957
Summer Chum Salmon	34,465	7.1	244,702	0.20	48,940
Fall Chum Salmon	29,008	7.4	214,659	0.35	75,131
Coho Salmon	2,284	5.7	13,019	0.35	4,568
King Salmon Roe			579	3.00	1,737
Summer Chum Salmon Roe			1,987	3.00	5,961
Fall Chum Salmon Roe			3,019	3.00	9,057
TOTAL					175,351

1) SOURCE: Alaska Department of Fish and Game, Division of Commercial Fisheries, 1981 Yukon Annual Management Report.

TABLE B3. Gross Revenues From Commercial Salmon Fishing Outside the TBAP Area Derived From Fish Produced in the TBAP Area. 1)

Species	Total Catch Outside Basin	% Contr. of TBAP Stocks 2)	Est. Total Catch Outside Basin From TBAP Stocks	Pounds/Fish (1981-Aver.)	Total Pounds	Price/Lb. 1981	Gross Value to the Fisherman
King	149,891	8.792	13,178	24.8	326,814	1.20	392,177
Summer Chum	1,157,262	29.648	343,105	7.5	2,573,288	.40	1,029,315
Fall Chum	361,209	51.858	187,316	8.0	1,498,528	.55	824,190
Coho	21,418	34,670	7,426	6.8	50,497	.60	30,298
Summer Chum Salmon Roe	185,858#'s	29.648			55,103	3.00	165,309
Fall Chum Salmon Roe	2,485#'s	51.858			1,289	3.00	3,867
TOTAL							2,445,156

1) Source: Alaska Department of Fish and Game, Division of Commercial Fisheries, 1981 Yukon Annual Management Report.

2) See Tables B6-9 for derivation.

TABLE B4. Total Operating Expenditures, by Statistical Area, Per Year, by Gear Type for TBAP Area Commercial Salmon Fisheries. 1) 2)

Item	Area 334-10,20,30	Area 334-40 4)		Area 334-60	
	Nets 3)	Nets	Fishwheels	Nets	Fishwheels
Cost of Owning Boat 5)	728	728	728	1,166	1,166
Cost of Gas For Boat 6)	750	750	750	450	450
Cost of Fishwheels or Nets 7)	643	643	462	643	462
License Fees 8)	50	50	50	50	50
Individual Operating Costs	2,171	2,171	1,990	2,309	2,128
Number of Fishermen in Stat. Area 9)	254	6	24	13	23
Total Operating Costs	551,434	13,026	47,760	30,017	48,944

1) Source: Alaska Department of Fish and Game and conversations with local fishermen.
2) Includes expenditures incurred by Yukon River fishermen outside of the TBAP Area who are harvesting fish derived from TBAP Area Stocks.
3) Set and gill nets are the only legal gear.
4) Gear type composition is an estimate based on percent composition of Limited Entry Commission Licenses.
5) Assume the following costs for Areas 334-10 to 40: Boat @ $2,000/5 year life, Motor @ $3,000/3 year life, Misc. @ $200/10 year life, Maintainence @ $35/year. Since boats are also used for transportation, firewood gathering, berry picking, hunting, subsistence fishing, etc., only 50% of expense can be attributed to commercial fishing activities. For Area 334-60 (TBAP Basin) assume the same costs but add Trailer @ $1,000/10 year life. Since boats are also used for subsistence, recreation, hunting, and basic transportation only 75% of expense is attributed to commercial fishing activities.
6) Assume $1.50/gallon in the TBAP Basin, $2.50/gallon outside of Basin.
7) Fishwheels: Assume a $1,250 initial cost (4 year life) plus $150/year maintainence.
Nets: Assume a $1,000 initial cost (7 year life) plus $500/year maintainence.
8) Vessel License, $20; Commercial Fisheries Entry Commission License Renewal, $30.
9) Equivalent number of fishermen. See supportive tables for explanation.

TABLE B5. Equivalent Number of Commercial Fishermen Outside of the TBAP Area Who Harvest Salmon Derived From the TBAP Area. 1)

Origin 2)	Percent 3)	Number of Fishermen	
		Raw Number	Equivalent Number
Stat Area 334-10, 20, 30	32.1	790	254
Stat Area 334-40			
Nets	32.1	18	6
Fishwheels	32.1	76	24
TOTAL		884	284

1) Source: Alaska Department of Fish and Game (1981 Data).
2) STAT AREA 334-10, 20, 30 extends from the mouth of the Yukon River to Old Paradise Village just downstream of the Anvik River. STAT AREA 334-40 extends from Old Paradise Village to Illnois Creek near Tanana.
3) Because fishermen in these stat areas are harvesting both TBAP Area salmon and those destined for other drainages, an "equivalent" number must be determined to calculate the number of fishermen who are "wholly" harvesting TBAP Basin salmon.

The equivalent number is calculated by determining the mean percent contribution for all salmon species combined of TBAP Area salmon, in each stat area.

Using the individual species percent contribution data (see supportive tables) an overall contribution percentage for TBAP Basin Stocks is derived as follows:

Salmon	% of Total Catch	% Contribution
King	12.6	8.792
Summer Chum	62.5	29.648
Fall Chum	22.5	51.858
Coho	2.3	34.670
TOTAL AVERAGE CONTRIBUTION		32.103%

TABLE B6. Percent Contribution of TBAP Area King Salmon Stocks to the Commercial and Subsistence Fisheries in the Lower Yukon River Outside of the TBAP Area. 1)

Fisheries	Run (1,000's)	Catch (1,000's)	Escap. (1,000's)	% Surv.	% Contr.
ARCH	204.3	77.2	0.5	4.386	8.565
ANDR	126.6	9.4	7.0	2.729	8.599
ATCH	110.2	4.4	1.0	2.526	9.146
ANVI	104.8	15.0	4.0	2.425	9.233
RODO	85.8	0.7	2.0	2.078	9.663
KALT	83.1	0.2	0.4	2.061	9.896
NULA	82.5	0.8	4.0	2.056	9.944
KOYU	77.7	1.1	1.4	2.036	10.456
MELO	75.2	1.2	0.9	2.007	10.650
TOZI	73.1	2.3	2.0	1.975	10.782
TANA	68.8	0.3	60.9	1.913	11.095
TOTAL	204.3	112.6	84.1	-----	8.792 2)

1) Source: Alaska Department of Fish and Game. Escapement/Return/Fisheries Survival Model derived from F.R.E.D. Division Mark/Recapture Program for Clear Hatchery. See text for methodology.

2) TBAP Area contribution to catch is 8.792% plus or minus 2.516% at a 90% confidence level.

TABLE B7. Percent Contribution of TBAP Area Summer Chum Salmon Stocks to the Commercial and Subsistence Fisheries in the Lower Yukon River Outside of the TBAP Area. 1)

Fishery	Run (1,000)	Catch (1,000)	Escap. (1,000)	% Surv.	% Contr.
ARCH	1,594.9	134.2	2.0	2.196	13.685
ANDR	1,458.7	28.4	217.6	2.011	13.703
ATCH	1,212.7	11.2	20.0	1.972	16.162
KAKO	1,181.5	18.6	4.1	1.954	16.436
INNO	1,158.8	0.4	6.3	1.923	16.494
BONA	1,152.1	2.6	15.0	1.923	16.584
ANVI	1,134.5	62.0	527.5	1.918	16.803
RODO	545.0	30.1	22.7	1.813	33.067
KALT	492.2	42.4	1.0	1.713	34.592
NULA	448.8	78.6	66.6	1.566	34.669
KOYU	303.6	86.4	60.9	1.291	42.275
MELO	156.3	47.1	19.7	0.924	58.746
TOZI	89.5	7.5	1.6	0.646	71.677
UP YUK.	80.4	7.9	19.5	0.591	73.103
TOTAL	1,594.9	557.4	984.5	-----	29.648

1) Source: Alaska Department of Fish and Game. Escapement/Return/Fisheries Survival Model derived from F.R.E.D. Division Mark/Recapture Program for Clear Hatchery. See text for methodology.

2) TBAP Area contribution to catch is 29.648% plus or minus 2.516% at a 90% confidence level.

TABLE B8. Percent Contribution of TBAP Area Fall Chum Salmon Stocks to the Commercial and Subsistence Fisheries in the Lower Yukon River Outside of the TBAP Area. 1)

Fishery	Run (1,000)	Catch (1,000)	Escap. (1,000)	% Surv.	% Contr.
LOW YUK	437.8	185.0	0	0.913	51.858
MID YUK	252.8	16.0	114.0	0.527	51.858
TOTAL	437.8	201.0	114.0	-----	51.858

1) Source: Alaska Department of Fish and Game. Escapement/Return/Fisheries Survival Model derived from F.R.E.D. Division Mark/Recapture Program for Clear Hatchery. See text for methodology.

2) TBAP Area contribution to catch is 51.858% plus or minus 6.192% at a 90% confidence level.

TABLE B9. Percent Contribution of TBAP Area Coho Salmon Stocks to the Commercial and Subsistence Fisheries in the Lower Yukon River Outside of the TBAP Area. (1)

Fishery	Run (1,000)	Catch (1,000)	Escap. (1,000)	% Surv.	% Contr.
ANDR	80.5	11.1	3.0	7.243	33.382
INNO	66.4	3.0	1.5	6.245	34.891
BONA	61.9	0.1	0.5	5.962	35.736
ANVI	61.3	0.6	1.5	5.953	36.027
TANA	59.2	5.6	33.8	5.895	36.940
TOTAL	80.5	20.4	40.3	-----	34.670

1) Source: Alaska Department of Fish and Game. Escapement/Return/Fisheries Survival Model derived from F.R.E.D. Division Mark/Recapture Program for Clear Hatchery. See text for methodology.

2) TBAP Area contribution to catch is 34.670% plus or minus 1.941% at a 90% confidence level.

APPENDIX C
SUBSISTENCE FISHERIES

The 1981 estimated minimum net revenue from the subsistence harvest of fish which originate in the Tanana Basin was calculated using a replacement cost analysis (i.e., estimating the "store bought equivalency cost of subsistence harvested fish) and is presented in Table C1.

The equivalent replacement costs were derived by averaging a cross-sectional survey of fish prices at a Fairbanks Safeway Store on June 13, 1983 (Table C10). A cost differential was applied to the Fairbanks base price to reflect the higher prices which are charges in rural areas. The price differential in rural areas adjacent to the road network was projected as a 10% increase over the Fairbanks base price. In rural areas not connected to the road network, this differential was set at 20% above the Fairbanks base price.

Subsistence fish harvests within the Tanana Basin in 1981 were calculated by the Alaska Department of Fish and Game (Geiger, et al, 1981) and are presented in Tables C2 through C8.

In addition to the subsistence harvest of salmon within the Basin, a large number of salmon which are produced by salmon which spawn in the Basin, are intercepted and harvested for subsistence in the Middle and Lower Yukon River subsistence salmon fisheries. Since data is not currently available which permits us to differentiate Tanana Basin salmon stocks which are caught in the Lower and Middle Yukon River subsistence salmon fisheries, a computer model (originally developed by ADF&G's FRED Division to predict the percent contribution of Clear Hatchery releases to the Yukon River fisheries) was modified to enable us to estimate the percent contribution of Tanana Basin salmon stocks to the Lower and Middle Yukon River salmon fisheries. The total subsistence salmon harvest attributable to Tanana Basin stocks was then calculated by multiplying the percent contribution times the total salmon harvests, by species, for each individual fishery. This model was developed for both the commercial and subsistence salmon fisheries and is described in Appendix B. Appendix Tables B6 through B9 present the model-estimated percent contributions for each species of salmon harvested.

TABLE C1. Total Estimated Replacement Cost Values in Dollars of the Subsistence Fisheries, TBAP Area Production. 1)

Region	King Salmon	Summer Chum Salmon	Fall Chum Salmon	Coho Salmon	Sheefish	Whitefish	Chum Salmon Carcass	Total
Fairbanks	38,299	84,169	104,409	44,101	364	482		271,824
Other Basin Communities	177,311	61,842	190,462	185,912	4,484	20,070	5,030	645,111
Other Alaska Communities	144,317	614,313	390,589	114,513	Unknown	Unknown		1,263,732
TOTAL	359,927	760,324	685,460	344,526	4,848	20,552	5,030	2,180,667

1) Source: Alaska Department of Fish and Game. See supportive tables for derivation.

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C2. Estimated Replacement Cost Value of the King Salmon Subsistence Fisheries for TBAP Area Stocks. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	400	23.7	9,480	4.04 2)	38,299
Other Basin Communities	1,685	23.7	39,935	4.44 3)	177,311
Other Alaska Communities	1,200 5)	24.8	29,756	4.85 4)	144,317
TOTAL	3,285		79,171		359,927

1) Source: Alaska Department of Fish and Game
2) 100% utilized for human consumption. Par value estimated at $4.04/lb. See supportive table.
3) 100% utilized for human consumption. Par value estimated at Fairbanks value plus 10% (freight).
4) 100% utilized for human consumption. Par value estimated at Fairbanks value plus 20% (freight).
5) 13,647 (total harvest) times 8.792% (percent contribution) = 1,200

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C3. Estimated Replacement Cost Value of the Summer Chum Salmon Subsistence Fisheries for TBAP Area Stocks. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	3,239	7.1	22,997	3.66 3)	84,169
Other Basin Communities	7,708	7.1	54,727	1.13 4)	61,842
Other Alaska Communities	41,790 2)	7.5	313,425	1.96 5)	614,313
TOTAL	52,737		391,149		760,324

1) Source: Alaska Department of Fish and Game
2) 140,955 (total harvest) times 29.648% (percent contribution) = 41,790
3) Estimate 90% used for human consumption, 10% for dog food. Equivalent par value calculated as follows: 90% ($4.04/lb.) + 10% ($0.20/lb.) = $3.66/lb.
4) Estimate 80% used for dog food, 20% for human consumption. Equivalent par value calculated as follows: 80% ($0.20/lb plus $0.10 freight = $0.30/lb.) + 20% ($4.44/lb.) = $1.13/lb.
5) Upstream of Anvik estimate 80% used for dog food, 20% for human consumption. Downstream of Anvik estimate 90% used for human consumption, 10% for dog food. Equivalent par value calculated as follows: 21.6% (Percent catch below Anvik) x [90% ($4.85/lb.) + 10% ($0.20/lb. plus $0.20/lb. freight = $0.40/lb.)] plus 78.4% (Percent catch above Anvik) x [80% ($0.20/lb. freight = $0.40/lb.) + 20% ($4.85/lb.)] = $1.96/lb.

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C4. Estimated Replacement Cost Value of the Fall Chum Salmon Subsistence Fisheries for TBAP Area Stocks. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	3,855	7.4	28,527	3.66 3)	104,409
Other Basin Communities	22,777	7.4	168,550	1.13 4)	190,462
Other Alaska Communities	24,910 2)	8.0	199,280	1.96 5)	390,589
TOTAL	51,542		396,3b/		685,460

1) Source: Alaska Department of Fish and Game
2) 48,036 (total harvest) times 51.858% (percent contribution) = 24,910
3) Estimate 90% used for human consumption, 10% for dog food. Equivalent par value calculated as follows: 90% ($4.04/lb.) + 10% ($0.20/lb.) = $3.66/lb.
4) Estimate 80% used for dog food, 20% for human consumption. Equivalent par value calculated as follows: 80% ($0.20/lb. plus $0.10 freight = $0.30/lb.) + 20% ($4.44/lb) = $1.13/lb.
5) Upstream of Anvik estimate 80% used for dog food, 20% for human consumption. Downstream of Anvik estimate 90% used for human consumption, 10% for dog food. Equivalent par value calculated as follows: 21.6% (percent catch below Anvik) times [90% ($4.85/lb) + ($0.20/lb. plus $0.20/lb. freight = $0.40/lb.)] plus 78.4% (Percent catch above Anvik) times [80% ($0.20/lb. plus $0.20/lb. freight = $0.40/lb.) + 20% ($4.85/lb.)] = $1.96/lb.

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C5. Estimated Replacement Cost Value of the Coho Salmon Subsistence Fisheries for TBAP Area Stocks. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	1,915	5.7	10,916	4.04 2)	44,101
Other Basin Communities	7,346	5.7	41,872	4.44 3)	185,912
Other Alaska Communities	3,472 5)	6.8	23,611	4.85 4)	114,513
TOTAL	12,733		76,399		344,526

1) Source: Alaska Department of Fish and Game.
2) 100% utilized for human consumption. Par value estimated at $4.04/lb.
3) 100% utilized for human consumption. Par value estimated at Fairbanks value plus 10% (freight).
4) 100% utilized for human consumption. Par value estimated at Fairbanks value plus 20% (freight).
5) 10,015 (total harvest) times 34.67% (percent contribution) = 3.472.

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C6. Estimated Replacement Cost Value of the Sheefish Subsistence Fisheries. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	9	10	90	4.04 2)	364
Other Tanana River Basin Communities	101	10	1,010	4.44 3)	4,484
Other Alaska Communities					Unknown
TOTAL	110		1,100		4,848

1) Source: Alaska Department of Fish and Game
2) 100% utilized for human use. Par value estimated at $4.04/lb.
3) 100% utilized for human use. Par value estimated at Fairbanks value plus 10% (freight).

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C7. Estimated Replacement Cost Value of the Whitefish Subsistence Fisheries. 1)

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks	53	2.25 2)	119.25	4.04 3)	482
Other Basin Communities	2,009	2.25 2)	4,520.25	4.44 4)	20,070
Other Alaska Communities			c		Unknown
TOTAL	2,062		4,638		20,552

1) Source: Alaska Department of Fish and Game
2) Species composition unreported. Estimated average weight for mixed catch; Bering Cisco 1 lb., Broad Humpback, Least Cisco 2.5 to 5 lbs. Overall average based on estimated catch levels - 2.25 lbs. (Anderson, 1983).
3) 100% utilized for human consumption. Par value estimated at $4.04/lb.
4) 100% utilized for human consumption. Par value estimated at Fairbanks value plus 10% (freight).

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quanify.

TABLE C8. Estimated Replacement Cost Value of the Fall Chum Salmon Subsistence Carcass Fishery at Big Delta.

Region	1981 Harvest	1981 Average Weight/Fish	1981 Harvest (In Pounds)	Estimated Value Per Pound	Total Replacement Cost
Fairbanks					
Other Tanana River Basin Communities	5,030	5.0	25,150	.20 2)	5,030
Other Alaska Communities					
TOTAL	5,030		25,150		5,030

1) Source: Alaska Department of Fish and Game
2) 100% utilized for dog food. Par value estimated at $0.20/lb.

NOTE: Replacement cost values are a minimal estimate of a portion of the subsistence use values and do not represent all market values or behavioral, social and cultural values which are difficult to quantify.

TABLE C9. Number of Subsistence Fishing Families Harvesting Salmon Produced in the TBAP Area. 1)

Origin	Fishing Families	
	Raw Number	Equivalent Number
Fairbanks	228	228
Other Basin	55	55
Other Alaska 2)	542	174
TOTAL	825	457

1) Source: Alaska Department of Fish and Game (1981 Data).
2) Includes fishermen in the lower Yukon River downstream of the TBAP Area who are intercepting and harvesting salmon produced in the TBAP Area.
3) Because only a percentage of the fish caught by these fishermen can be attributed to the TBAP Area, an equivalent value has been generated which estimates the number of families wholly participating in subsistence salmon fisheries harvesting salmon produced in the TBAP Area.

The equivalent is derived by calculating the mean percent contribution, for all salmon species, of TBAP Area salmon caught in the Yukon River below the mouth of the Tanana River.

Using the individual species percent contribution data (see supportive tables) an overall contribution percentage for TBAP Basin Stocks is derived as follows:

Salmon	% of Total Catch	% Contribution
King	12.6	8.792
Summer Chum	62.5	29.648
Fall Chum	22.5	51.858
Coho	2.3	34.670
TOTAL AVERAGE CONTRIBUTION		32.103%

TABLE C10. Meat, Fish and Poultry Prices, Safeway Stores, Inc., Fairbanks, June 13, 1983.

Meat	Price Per Pound
Ground Beef	$1.59
Vienna Sausage	1.76
Pork Loin Roast	1.79
Ham	1.89
Pork Spare Ribs	1.89
Beef Heart	1.99
Beef Chuck Roast	1.99
Ground Sausage	1.99
Pork Chops	2.09
Beef Chuck Steak	2.19
Beef Top Sirlon	2.19
Hot Dogs	2.39
Spam	2.47
Stew Beef	2.59
Sliced Bacon	2.68
Beef Tongue	2.79
Sliced Bologna	3.58
Beef Top Round	3.59
Sliced Salami	3.96
Beef Rib Steak	4.49
Beef T-Bone Steak	4.49
Beef New York Steak	5.99
AVERAGE PRICE/POUND	$2.74

Fish	Price Per Pound
Snapper	$2.29
Tuna Fish	2.84
Cod Filets	3.29
Halibut	3.49
Dover Sole	3.69
Perch	3.89
Ling Cod	4.10
Salmon Roast	6.19
Salmon Steak	6.59
AVERAGE PRICE/POUND	$4.04

Poultry	Price Per Pound
Chicken - Whole	$1.19
Cornish Game Hens	1.55
Duck	1.55
Turkey	1.59
Chicken Legs & Thighs	2.29
AVERAGE PRICE/POUND	$1.63

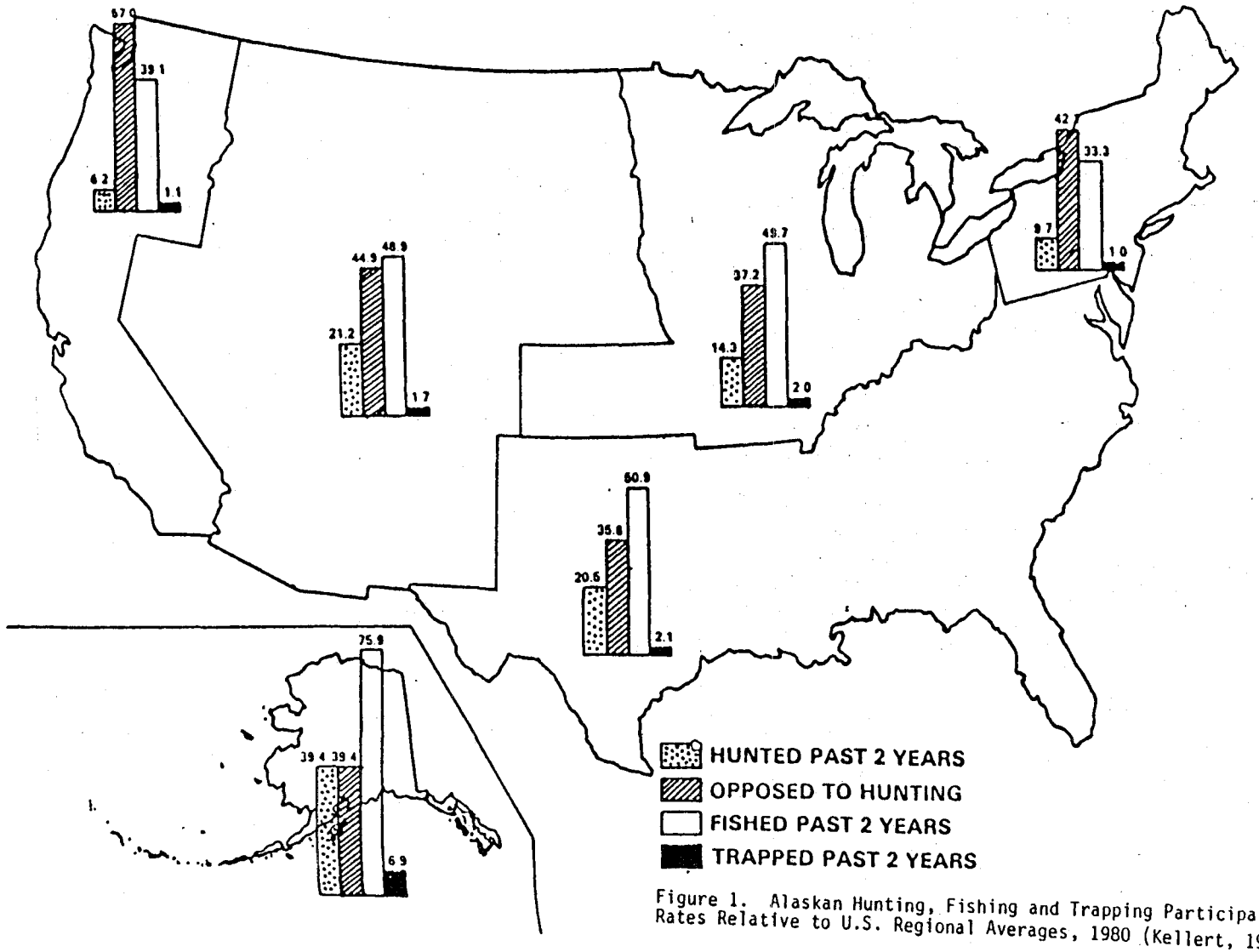

Figure 1. Alaskan Hunting, Fishing and Trapping Participation Rates Relative to U.S. Regional Averages, 1980 (Kellert, 1980)

APPENDIX D

1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation

Alaska State Report

INTRODUCTION

The U.S. Fish and Wildlife Service's 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - Alaska State Report was a component of the Service's most recent nationwide effort to gather information about American participation in fishing, hunting and other forms of wildlife-associated recreation. This national survey has been conducted every 5 years since 1955 and represents one of the oldest and most comprehensive continuing recreational surveys. The 1980 survey was the second survey to produce individual state reports. The 1980 survey was furthermore the first in this series to gather information related to the non-consumptive use of fish and wildlife. The survey was conducted in two stages; an initial screening of households to identify participants and a followup enumeration of selected households with participants to collect detailed data about the households' wildlife-related recreation. Sample sizes were designed to provide statistically reliable results at the State level for hunting and fishing and at the Census geographic division level for nonconsumptive activities. In the State of Alaska, 2,220 households were screened for participants in wildilfe-associated activities. A total of 780 sportsmen were later interviewed in person.

LIMITATIONS

The statistics produced by the 1980 survey are estimates derived from a sample. Hence, they are apt to differ somewhat from the actual values being estimated. This occurs because there are two types of errors possible in an estimate based on a sample survey - sampling errors and nonsampling errors.

Non-sampling Errors: Non-sampling errors generally occur in sample surveys and can often be attributed to an inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, inability or unwillingness on the part of respondents to provide correct information, inability to recall information, errors made in collection such as in recording or coding the data, errors made in processing the data and errors made in estimating values for missing data. Although the U.S. Fish and Wildlife Service believes that most of the important operational and out-of-range response errors were detected and corrected during the course of its review, it should be noted that the cummulative non-response rate for this survey was 24.5 percent. This level of non-response may have created large biases in the estimates. In addition, because the population sample for this survey was drawn from the 1970 U.S. Census files as updated through November 1978, there was an overall undercoverage as compared to the 1980 decennial census of 35.0 percent. Undercoverage at this level has the potential for introducing large biases into the estimates. Thus, caution should be exercised in interpreting the results and comparing the estimates for Alaska with other states.

Sampling Errors: The particular sample used for the U.S. Fish and Wildlife Service's survey was one of a large number of all possible probability samples of the same size that could have been selected using the same sample design. Thus, estimates derived from the different samples are expected to differ from each other. Although the exact sampling error is unknown, guides to the potential size of the sampling error may be provided by the standard error of the estimate. Approximations of the standard errors for the various estimates used in this valuation are presented in Tables D9 through D12. These estimated standard errors also partially measure the effect of variable non-sampling errors but do not measure any systematic biases in the data.

FISHERMEN AND HUNTER EXPENDITURES

Gross in-state expenditures by fishermen and hunters within the Tanana Basin were derived from the U.S. Fish and Wildlife Service's survey by multiplying the total number of participants for each category of use (e.g., fishing, big game hunting, etc.) times the average expenditures per participant statewide engaged in that activity. Since a particular piece of equipment (i.e., a rifle) may be used in more than one category of use, only a prorated portion of the total expenditures for common items was allocated to a single use category. The summary calculations used to calculate total gross expenditures are presented in Table D1. Total estimated State per-capita expenditures by item for each category of use are presented in Tables D2 through D6.

In addition to the potential sources of error previously mentioned, there are two additional but believed minor inconsistencies which deserve mention. First the data reporting unit utilized by the U.S. Fish and Wildlife Service does not exactly correspond to the boundaries of the Tanana Basin Area Plan (Figure D1). However, based on our knowledge of the locations of sportsmen activity, we do not believe that this inconsistency is significant. Secondly, because total average expenditures per participant were only collected on a state-wide basis, no expenditure estimates specific to the Tanana Basin are available. At present, we have assumed that Tanana Basin sportsmen expenditures parallel state-wide averages. However, it should be noted that this assumption has not been verified.

The estimation of the total in-state gross expenditures on special equipment bought or available for recreational fishing and hunting in the Tanana Basin required special treatment for several reasons. First, the U.S. Fish and Wildlife Service's survey did not estimate these expenditures on a sub-regional basis, it was necessary to allocated a specified percentage of the statewide totals to the Tanana Basin. Two methods of calculation were considered: 1) The Tanana Basin's percent share of the State's population and 2) The Tanana Basin's percent share of the total estimated number of sportsmen statewide. Since both methods of calculation derived an estimated value of approximately 15%, that figure was used.

Secondly, the entire purchase price of a piece of equipment cannot always be entirely allocated to fishing and hunting activities. For instance, a boat may be used for recreational pursuits other than hunting and fishing. Consequently, a subjective allocation of the allowable percent utilization for hunting and fishing was made. Since these allocations are subjective and are not statistically verified, caution should be noted with their use.

Finally, consumers do not purchase all of their equipment in Alaska. Some items are purchased out-of-state. Therefore, since this analysis was restricted to in-state expenditures, a correction factor which reflected the estimated percent of in-state purchases was applied toward each expenditure item category.

The Tanana Basin summary calculations and state totals for total special equipment expenditures are presented in Tables D7 and D8, respectively.

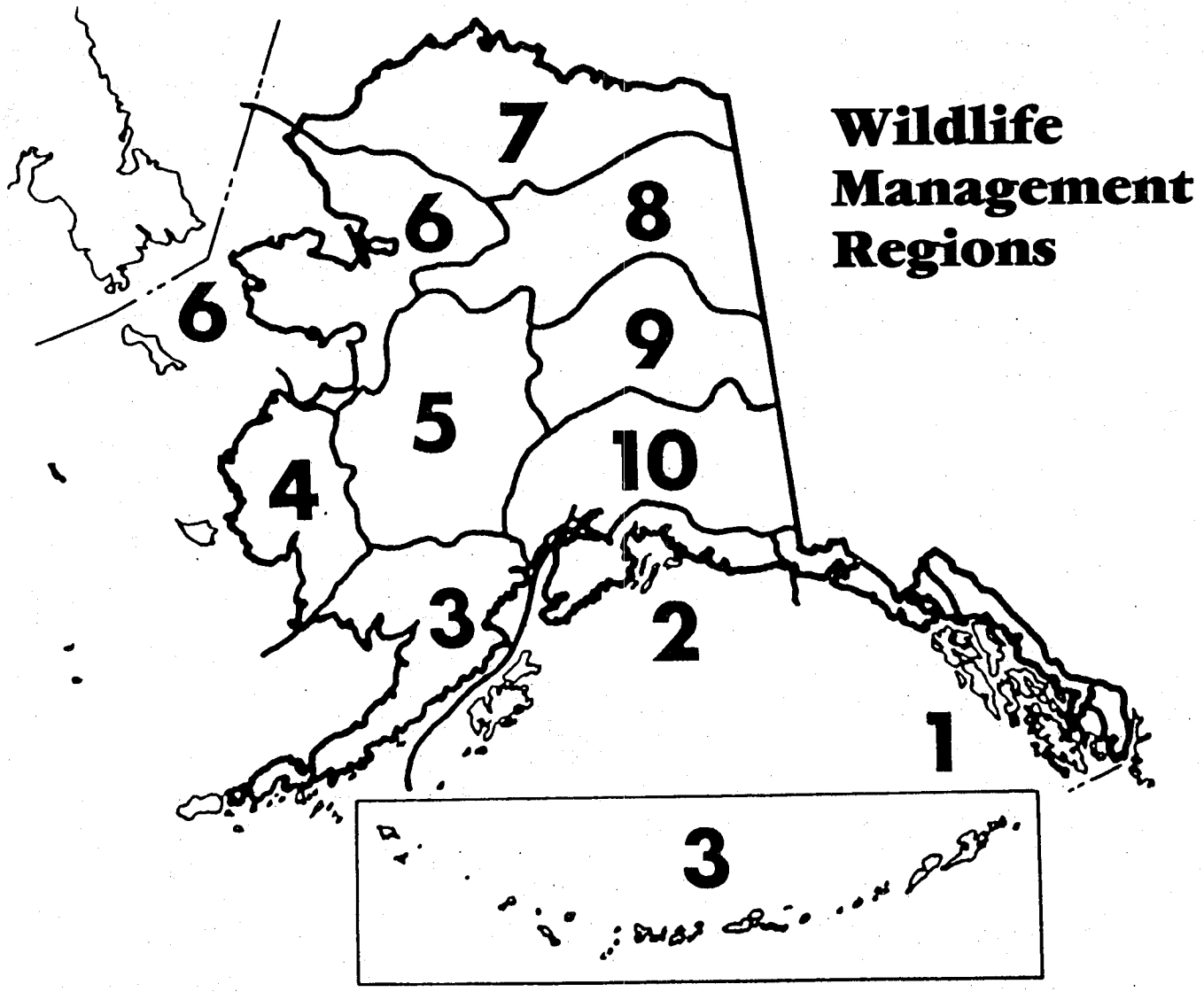

Figure D1. Data Reporting Units, U.S.F.W.S. *1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation.*

TABLE D1. Summary of In-State Gross Expenditures for Recreational Fishing and Hunting in the Tanana Basin.

Type of Sport	In-State Gross Expenditures		
	Participants (hundreds)[2]	Average Participant $	1980 Total
State Residents			
Freshwater Fishermen	196	330.46	$6,477,016
Big Game Hunters	57	391.00	2,228,700
Small Game Hunters	72	136.56	983,232
Migratory Bird Hunters	33	188.52	622,116
Other Hunters	12	38.71	46,452
Nonresidents[1]			
Freshwater Fishermen	71	330.46	2,346,266
TOTAL			$12,703,782

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report

1 Although Non-resident hunters did utilize the Tanana Basin, sample sizes were inadequate to permit inclusion in this table.

2 Population 16 years old and older.

TABLE D2. Expenditures for Freshwater Fishing: 1980

(Population 16 years old and older) **Alaska State Summary**

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)
STATE, TOTAL	1178	97.6	398674	330.46
FRESHWATER, EXCLUDING GREAT LAKES				
FOOD AND LODGING:				
FOOD	927	77.0	117067	97.26
LODGING	119	9.9	5002	4.16
TRANSPORTATION:				
PUBLIC	73	6.1	12951	10.76
PRIVATE	958	79.6	120159	99.82
PRIVILEGE FEES AND OTHER:				
GUIDE FEES	7	0.6	176	0.15
PACK TRIP FEES	*25	2.0	*14143	*11.75
PUBLIC LAND USE FEES	*38	3.2	*425	*0.35
PRIVATE LAND USE FEES	*30	2.5	*515	*0.43
BOAT LAUNCHING FEES	57	4.7	1631	1.35
EQUIPMENT RENTAL FEES	80	6.6	2725	2.26
ALL FRESHWATER				
FISHING EQUIPMENT USED PRIMARILY IN FRESHWATER:				
FRESHWATER RODS	430	35.7	18805	15.59
FRESHWATER REELS	367	30.4	13627	11.30
LURES, LINES, HOOKS, ETC.	691	57.3	26051	21.59
DEPTH FINDERS AND FISH FINDERS	1	0.1	37	0.03
TACKLE BOXES	127	10.5	2094	1.74
MINNOW SEINES AND TRAPS	3	0.3	23	0.02
MINNOW BUCKETS AND OTHER BAIT HOLDERS	*23	1.9	*94	*0.08
SCALES	*20	1.6	*271	*0.22
KNIVES	186	15.4	4124	3.42
PREPARED BAIT	334	27.7	4296	3.56
ROD HOLDERS	6	0.5	55	0.05
SPEAR FISHING EQUIPMENT	7	0.6	158	0.13
CREEL, STRINGERS, AND FISH BAGS	*35	2.9	*268	*0.22
LANDING NET	87	7.2	1708	1.42
SEINES AND OTHER NETS	*28	2.3	*2265	*1.88
ICE FISHING EQUIPMENT	*26	2.2	*1258	*1.04
OTHER	*19	1.6	*623	*0.52
LICENSES, TAGS, AND PERMITS:				
LICENSES	839	69.6	11745	9.74
STAMPS, TAGS, AND PERMITS	209	17.3	1527	1.27

(See footnotes at end of table.)

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated

TABLE D2. Expenditures for Freshwater Fishing: 1980 *(Continued)*

(Population 16 years old and older) **Alaska State Summary**

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)
AUXILIARY EQUIPMENT USED PRIMARILY FOR FRESHWATER FISHING:				
CAMPING EQUIPMENT	112	9.3	11583	9.60
BINOCULARS, FIELD GLASSES, ETC.	13	1.1	772	0.64
SNOW SHOES AND SKIS	12	1.0	874	0.72
SPECIAL FISHING CLOTHES	85	7.0	3681	3.05
RUBBER BOOTS AND WADERS	199	16.5	7510	6.22
MAINTENANCE AND REPAIR OF EQUIPMENT	*37	3.1	*3259	*2.70
PROCESSING AND TAXIDERMY COSTS.	5	0.4	688	0.57
OTHER	9	0.8	6451	5.35

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - Alaska State Report.

TABLE D2. Expenditures for Big Game Hunting: 1980

(Population 16 years old and older)

Alaska State Summary

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)
STATE, TOTAL	482	96.4	195303	391.00
FOOD AND LODGING:				
FOOD	428	85.8	39050	78.18
LODGING	*19	3.8	*2455	*4.92
TRANSPORTATION:				
PUBLIC	66	13.2	14318	28.66
PRIVATE	421	84.4	40442	80.97
PRIVILEGE FEES AND OTHER:				
GUIDE FEES	1	0.2	231	0.46
PACK TRIP FEES	5	0.9	1612	3.23
PUBLIC LAND USE FEES	3	0.6	69	0.14
PRIVATE LAND USE FEES	0	0.0	0	0.00
EQUIPMENT RENTAL FEES	9	1.7	702	1.41
HUNTING EQUIPMENT USED PRIMARILY FOR BIG GAME HUNTING:				
GUNS AND RIFLES	86	17.3	33607	67.28
BOWS AND ARROWS	10	2.1	1343	2.69
TELESCOPIC SIGHTS	48	9.7	7075	14.16
DECOYS AND GAME CALLS	7	1.4	56	0.11
GAME CARRIERS	*20	4.0	*1168	*2.34
AMMUNITION	215	43.1	10552	21.13
HAND LOADING EQUIPMENT	*39	7.7	*4172	*8.35
EQUIPMENT CASES AND CARRIERS	*37	7.3	*1301	*2.61
HUNTING DOGS AND ASSOCIATED COSTS	2	0.3	3338	6.68
OTHER	8	1.7	338	0.68
LICENSES, TAGS, AND PERMITS:				
LICENSES	190	38.1	3936	7.88
STAMPS, TAGS, AND PERMITS	*19	3.7	*367	*0.73
AUXILIARY EQUIPMENT USED PRIMARILY FOR BIG GAME HUNTING:				
CAMPING EQUIPMENT	51	10.3	11423	22.87
BINOCULARS, FIELD GLASSES, ETC.	*23	4.7	*2514	*5.03
SNOW SHOES AND SKIS	4	0.9	275	0.55
SPECIAL HUNTING CLOTHES	50	10.1	3488	6.98
RUBBER BOOTS AND WADERS	*17	3.4	*659	*1.32
MAINTENANCE AND REPAIR OF EQUIPMENT	9	1.8	354	0.71
HUNTING BOOTS AND PACKS	60	11.9	3727	7.46
PROCESSING AND TAXIDERMY COSTS	*25	5.1	*6208	*12.43
OTHER	10	1.9	523	1.05

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report.

TABLE D4. Expenditures for Small Game Hunting: 1980

(Population 16 years old and older) — **Alaska State Summary**

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsmen (dollars)
STATE, TOTAL	251	73.8	46425	136.56
FOOD AND LODGING:				
FOOD	157	46.1	10323	30.37
LODGING	5	1.4	395	1.16
TRANSPORTATION:				
PUBLIC	7	2.2	2301	6.77
PRIVATE	197	58.0	13961	41.07
PRIVILEGE FEES AND OTHER:				
GUIDE FEES	0	0.0	0	0.00
PACK TRIP FEES	0	0.0	0	0.00
PUBLIC LAND USE FEES	1	0.2	1	0.00
PRIVATE LAND USE FEES	0	0.0	0	0.00
EQUIPMENT RENTAL FEES	0	0.0	0	0.00
HUNTING EQUIPMENT USED PRIMARILY FOR SMALL GAME HUNTING:				
GUNS AND RIFLES	*35	10.4	*6155	*18.11
BOWS AND ARROWS	1	0.4	298	0.88
TELESCOPIC SIGHTS	6	1.9	282	0.83
DECOYS AND GAME CALLS	7	2.2	81	0.24
GAME CARRIERS	4	1.1	98	0.29
AMMUNITION	93	27.3	4522	13.30
HAND LOADING EQUIPMENT	9	2.5	744	2.19
EQUIPMENT CASES AND CARRIERS	7	2.1	254	0.75
HUNTING DOGS AND ASSOCIATED COSTS	8	2.4	2538	7.46
OTHER	1	0.2	18	0.05
LICENSES, TAGS, AND PERMITS:				
LICENSES	56	16.4	1044	3.07
STAMPS, TAGS, AND PERMITS	0	0.0	0	0.00
AUXILIARY EQUIPMENT USED PRIMARILY FOR SMALL GAME HUNTING:				
CAMPING EQUIPMENT	6	1.6	1150	3.38
BINOCULARS, FIELD GLASSES, ETC.	2	0.7	177	0.52
SNOW SHOES AND SKIS	5	1.5	146	0.43
SPECIAL HUNTING CLOTHES	9	2.5	450	1.32
RUBBER BOOTS AND WADERS	0	0.0	0	0.00
MAINTENANCE AND REPAIR OF EQUIPMENT	0	0.0	0	0.00
HUNTING BOOTS AND PACKS	10	2.9	682	2.01
PROCESSING AND TAXIDERMY COSTS	7	2.0	804	2.36
OTHER	0	0.0	0	0.00

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report.

TABLE D5. Expenditures for Migratory Bird Hunting: 1980

(Population 16 years old and older) — **Alaska State Summary**

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)
STATE, TOTAL	178	79.6	42191	188.52
FOOD AND LODGING:				
FOOD	119	53.3	9209	41.15
LODGING	7	3.2	3557	15.89
TRANSPORTATION:				
PUBLIC	*20	8.8	*7839	*35.03
PRIVATE	148	66.0	8637	38.59
PRIVILEGE FEES AND OTHER:				
GUIDE FEES	3	1.4	1116	4.99
PACK TRIP FEES	3	1.4	478	2.14
PUBLIC LAND USE FEES	1	0.3	1	0.00
PRIVATE LAND USE FEES	4	1.9	207	0.93
EQUIPMENT RENTAL FEES	5	2.3	122	0.54
HUNTING EQUIPMENT USED PRIMARILY FOR MIGRATORY BIRD HUNTING:				
GUNS AND RIFLES	9	4.1	2633	11.77
BOWS AND ARROWS	0	0.0	0	0.00
TELESCOPIC SIGHTS	0	0.0	0	0.00
DECOYS AND GAME CALLS	*17	7.7	*687	*3.07
GAME CARRIERS	4	1.6	84	0.38
AMMUNITION	55	24.7	2571	11.49
HAND LOADING EQUIPMENT	3	1.5	167	0.74
EQUIPMENT CASES AND CARRIERS	10	4.3	473	2.11
HUNTING DOGS AND ASSOCIATED COSTS	4	2.0	991	4.43
OTHER	0	0.0	0	0.00
LICENSES, TAGS, AND PERMITS:				
LICENSES	*23	10.3	*351	*1.57
FEDERAL DUCK STAMPS	120	53.4	896	4.01
OTHER STAMPS, TAGS, AND PERMITS	*27	11.9	*183	*0.82
AUXILIARY EQUIPMENT USED PRIMARILY FOR MIGRATORY BIRD HUNTING:				
CAMPING EQUIPMENT	6	2.6	839	3.75
BINOCULARS, FIELD GLASSES, ETC.	0	0.0	0	0.00
SNOW SHOES AND SKIS	0	0.0	0	0.00
SPECIAL HUNTING CLOTHES	6	2.7	622	2.78
RUBBER BOOTS AND WADERS	8	3.7	359	1.61
MAINTENANCE AND REPAIR OF EQUIPMENT	0	0.0	0	0.00
HUNTING BOOTS AND PACKS	2	1.1	111	0.49
PROCESSING AND TAXIDERMY COSTS	1	0.4	55	0.25
OTHER	0	0.0	0	0.00

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report.

TABLE D6. Expenditures for Hunting Other Animals: 1980

(Population 16 years old and older)

Alaska State Summary

Expenditure item	Spenders		Expenditures	
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)
STATE, TOTAL	*21	47.3	*1708	*38.71
FOOD AND LODGING:				
FOOD	14	32.1	294	6.67
LODGING	0	0.0	0	0.00
TRANSPORTATION:				
PUBLIC	2	5.6	160	3.62
PRIVATE	*20	45.4	*1243	*28.17
PRIVILEGE FEES AND OTHER:				
GUIDE FEES	0	0.0	0	0.00
PACK TRIP FEES	0	0.0	0	0.00
PUBLIC LAND USE FEES	0	0.0	0	0.00
PRIVATE LAND USE FEES	0	0.0	0	0.00
EQUIPMENT RENTAL FEES	0	0.0	0	0.00
HUNTING EQUIPMENT USED PRIMARILY FOR OTHER HUNTING:				
GUNS AND RIFLES	0	0.0	0	0.00
BOWS AND ARROWS	0	0.0	0	0.00
TELESCOPIC SIGHTS	0	0.0	0	0.00
DECOYS AND GAME CALLS	1	2.0	11	0.24
GAME CARRIERS	0	0.0	0	0.00
AMMUNITION	0	0.0	0	0.00
HAND LOADING EQUIPMENT	0	0.0	0	0.00
EQUIPMENT CASES AND CARRIERS	0	0.0	0	0.00
HUNTING DOGS AND ASSOCIATED COSTS	0	0.0	0	0.00
OTHER	0	0.0	0	0.00
LICENSES, TAGS, AND PERMITS:				
LICENSES	0	0.0	0	0.00
STAMPS, TAGS, AND PERMITS	0	0.0	0	0.00

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Summary.

TABLE D7. Total 1980 Gross Expenditures for Special Equipment Bought or Available for Fishing and Hunting in the Tanana Basin.

Expenditure Item	Alaska Total Expenditures (1980) (Hundreds of Dollars)[1]	% Allocated to the Tanana Basin[2]	% Allocated to Recreational Fishing/Hunting[2]	% Purchased In-State[2]	Total 1980 Tanana Basin Expend. (Hundreds of Dollars)
Inboard Boat	190,252	15%	40%	80%	9,132
Outboard Boat	100,717	15%	40%	80%	4,834
Other Boat	34,347	15%	40%	80%	1,649
Outboard Motor	67,921	15%	40%	80%	3,260
Boat Accessories	28,632	15%	40%	80%	1,374
Boat Trailers & Hitches	7,606	15%	40%	80%	365
Gasoline for Boat	92,973	15%	40%	100%	5,578
Travel or Tent Trailer	11,300	15%	15%	20%	51
Pickup Camper or Van	40,027	15%	15%	20%	180
Motorhome	0	15%	15%	20%	0
Trail Bikes, Dune Buggies, 4x4 Vehicles	27,913	15%	10%	60%	251
Cabins	12,440	15%	15%	100%	280
Other	56,541	15%	10%	60%	509
TOTAL	670,670				27,463

1 U.S.F.W.S., 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report

2 Subjective allocation. See text for discussion.

TABLE D8. Special Equipment Bought or Available for Fishing and Hunting: 1980

(Population 16 years old and older) — **Alaska State Summary**

Expenditure item	Purchased in 1980 primarily for fishing or hunting				Available or already owned in 1980	
	Spenders		Expenditures			
	Number (hundreds)	Percent of all sportsmen	Amount (hundreds of dollars)	Average per sportsman (dollars)	Number (hundreds)	Percent of all sportsmen
TOTAL EXPENDITURES	670	45.3	670670	1000.59	1021	69.0
INBOARD BOAT	10	0.7	190252	18717.68	184	12.5
OUTBOARD BOAT	62	4.2	100717	1633.64	570	38.6
OTHER BOAT	41	2.8	34347	837.02	238	16.1
OUTBOARD MOTOR	96	6.5	67921	709.34	527	35.6
BOAT ACCESSORIES	116	7.9	28632	246.34	446	30.2
TRAVEL OR TENT TRAILER	15	1.0	11300	757.83	129	8.7
PICK UP CAMPER OR VAN	*28	1.9	*40027	*1425.98	322	21.8
MOTORHOME	0	0.0	0	(B)	84	5.7
BOAT TRAILERS AND HITCHES	47	3.2	7606	160.61	221	15.0
CABINS	15	1.0	12469	837.70	144	9.7
TRAIL BIKES, DUNE BUGGIES, AND 4X4 VEHICLES	15	1.0	27913	1827.35	160	10.8
GASOLINE FOR BOAT	582	39.4	92973	159.66	205	13.9
OTHER	56	1.9	56541	1018.31	92	3.1

Note: Shading--based on a sample size less than 10. Asterisk--based on a sample size greater than or equal to 10 but less than 25.

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report.

TABLE D9. Standard Errors for Estimated Numbers of Sportsmen or Fishermen 16 Years Old and Over

(68 CHANCES OUT OF 100. NUMBERS IN THOUSANDS)

SIZE OF ESTIMATE	STANDARD ERROR
5	2
10	2
15	3
25	4
50	5
75	6
100	6
250	2
500	0
1000	0
2500	0
5000	0

Source: See Below.

TABLE D10. Standard Errors for Estimated Numbers of Hunters 16 Years Old and Over

(68 CHANCES OUT OF 100. NUMBERS IN THOUSANDS)

SIZE OF ESTIMATE	STANDARD ERROR
5	1
10	2
15	2
25	2
50	3
75	4
100	4
250	2
500	0
1000	0
2000	0

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Alaska State Report.

TABLE D11. Standard Errors for Estimated Expenditures by Sportsmen or Fishermen 16 Years Old and Over

(68 CHANCES OUT OF 100, NUMBERS IN THOUSANDS)

	ESTIMATED EXPENDITURES										
BASE OF THE ESTIMATE	250	500	1000	2500	5000	10000	25000	50000	100000	500000	1000000
25	98	169	307	719	1402	2769	6870	13703	27371	136711	273386
50	86	140	242	541	1034	2021	4978	9906	19763	98615	197179
100	79	123	202	424	789	1513	3684	7301	14535	72404	144740
250	75	111	173	336	594	1102	2617	5140	10183	50526	100954
500	73	107	162	301	513	925	2147	4177	8236	40698	81276
1000	72	105	157	281	467	822	1868	3601	7064	34758	69374
2000	72	104	154	271	443	766	1711	3275	6398	31368	62580
4000	72	104	152	266	430	736	1627	3099	6038	29528	58889

Source: See Below.

TABLE D12. Standard Errors for Estimated Expenditures by Hunters 16 Years Old and Over

(68 CHANCES OUT OF 100. NUMBERS IN THOUSANDS)

	ESTIMATED EXPENDITURES										
BASE OF THE ESTIMATE	100	250	500	1000	2500	5000	10000	25000	50000	100000	300000
25	27	58	108	210	513	1019	2031	5066	10124	20240	60705
50	23	45	81	153	366	722	1433	3565	7120	14229	42665
100	20	37	63	114	263	512	1008	2497	4979	9943	29798
250	19	32	49	82	174	326	628	1533	3042	6058	18125
500	18	29	44	68	132	234	433	1028	2018	3998	11917
750	18	29	42	63	115	193	344	791	1532	3013	8937
1000	18	28	41	60	105	169	290	640	1218	2372	6984
1500	18	28	40	57	94	141	222	440	787	1474	4207

Source: U.S.F.W.S. 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - Alaska State Report.

APPENDIX E
A SELECTED BIBLIOGRAPHY OF FISH AND WILDLIFE/PUBLIC RECREATION ECONOMIC VALUATION PAPERS

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Chapter 6

Demand and Supply

October 19, 1983

There are difficulties in comparing "demand" with "supply" for wildlife resources in the Tanana Basin Area Plan, since the terms are not expressed in common units. "Supply", for the purposes of land use planning, is represented by acreages of habitat falling into a hierarchy of retention priority categories based on its value to wildlife. "Demand" is commonly measured in numbers of animals or hunting/fishing/recreation days. Obviously, the amount and quality of habitat available determines the potential production of the animals that are in demand. However, the process of actually quantifying the habitat-population relationships for all areas and all species in the Basin is not possible at this time. Specific information needed to define carrying capacity, productivity and viable population ranges for any one species basin-wide is presently beyond the practical data-gathering capabilities of the Alaska Department of Fish and Game and other management agencies, and exceeds data requirements for current management practices.

However, current knowledge provides an adequate basis to make reasonable estimates regarding the relationships between demand and supply. For example, the extensive use of wildlife resources discussed in Chapter 3 illustrates demand, especially among Alaskans. Harvest regulations frequently become more restrictive in response to short- or long-term declines in fish and wildlife availability for population maintenance plus human uses. In some cases, increased human harvest and resultant decrease in wildlife populations has been the major stimulus for greater restrictions; in other cases, declines in wildlife populations due to natural causes such as severe winters have required greater harvest restictions. In either case, the need for greater restrictions indicates that human demand, as experienced by wildlife managers, has exceeded surpluses available for human use.

When fish or wildlife populations rise (as several have recently), the potential for accomodating increased human use may result in less restrictive regulations. Also, availability of fish or wildlife may be enhanced by improved access. The increased availability as reflected in increased levels of human use may contribute to an illusion that more fish or wildlife exist than before. However, the overall supply of habitat will still determine the maximum numbers of fish and wildlife. Estimates of potential carrying capacities for some species, based on present supply of habitat in the Tanana Basin, can provide an indication of how well supply meets demand. However, based on historic trends of human use indicators such as fishing, hunting and trapping license sales, demand will probably continue to increase. Supply of habitat, meanwhile, will decline to the extent that land use designations result in the reduction of habitat quantity or quality. While habitat management can, to some extent, compensate for loss in habitat quantity by increasing habitat quality, the full degree of compensation possible is unknown. It is limited by ecological, proprietary, logistical and political conditions.

Taking into account all of the above information, it is apparent that for some wildife species in some locations in the Tanana Basin, current demand exceeds supply. As demand increases in the future, while the supply of high quality habitat land decreases or remains constant, demand will increasingly outstrip supply.

Chapter 7

Land Suitability Based on Wildlife Resource and Human Use Values

October 19, 1983

CHAPTER 7. LAND SUITABILITY

In order to arrive at suitability recommendations (prioritization of habitat for public retention and management), several tasks had to be accomplished:

1. The formulation of appropriate categories of retention priority, along with attendent recommended land management philosophies.
2. The development of a way to aggregate wildlife resource values and to incorporate them into the categories of retention priority.
3. The development of a strategy for using both biological and human use data in rating land values.

First, we looked at suggested criteria provided by ADNR staff and Susitna Plan draft products. We decided that such a multi-tier process was suitable, and we arrived at the following categories for use in this element:

Suitability Category	Definition	Management Recommendations
A-1	Critical Habitat	Single Use (possible seasonal entry of some uses)
A-2	Special Value Areas	Single Use with compatible activities allowed
B-1	Wildlife Habitat	Multiple Use - Conservative management
B-2	Wildlife Habitat	Multiple Use - Liberal Mgmt.
C	Multiple Use	Protect wildlife values through management guidelines

The appended criteria sheets (Tables 7-1a-f) were filled out to meet ADNR format and to show how single species habitat values were aggregated and sorted into these management categories, based upon biological values.

Throughout the prioritization process, habitat value was treated separately from the values of land for public use. The desire was to be able to keep a separation between these values so that they would reinforce one another without becoming obscured in a final "lumping" of values. Strategically, it is most important to retain in public ownership a system of lands that will produce and sustain wildlife in numbers sufficient to allow management aimed at satisfying demand. Public use areas that are not also high quality habitats tend to be of secondary importance from this perspective (although in certain situations, they can be crucial). Conversely, a level of public use occurring in good habitat makes that area of even higher value. All this is based upon the rationale that: a) public use will, if necessary, shift to where the wildlife resource is, b) wildlife

production, in general, will not shift to other areas if valuable habitat is lost. Therefore, our first effort at prioritization dealt only with habitat values.

Subsequent to developing a preliminary prioritization map on the basis of biological value, a second map was prepared. In this instance, we concentrated on the human use patterns within the Tanana Basin. Overlays depicting human use (Tanana Land Use Atlas) were placed on our prioritization maps and conclusions drawn from the resultant pattern. It was evident that almost all important use areas were covered by our initial map. However: 1) Some areas of low biological value sustain high levels of use, usually because of access. 2) Some areas within our biological value categories have enough use that they are significantly more important than adjacent lands in the same category. Accordingly, we developed a weighted system of evaluating the relative importance of human uses (Table 7-2a) and a further prioritization matrix (Table 7-2b). Using this system of organizing subjective judgements, amendments were made to the original prioritization map through the use of an additional overlay. Basically, two kinds of changes are shown on this set of maps. First, areas outside the initially mapped wildlife habitat categories (A1,A2,B1,B2) were boosted into one of those categories as a result of the amount of use taking place there. On the whole, the extent of these areas is small, and it was evident that the vast majority of human use occurs on lands covered in our initial prioritization based on habitat quality. The second type of shift in prioritization at this stage involved an escalation in priority of already-identified areas that sustain significant levels of use in addition to being valuable habitat.

Appended to this chapter is a listing of values present in priority categories by TBAP subunit.

Our final recommendation under this Chapter is depicted by the combination of habitat value and human use overlays. The acreages corresponding to each priority category are listed in Table 7-3. Due to the stepwise nature of the analysis and the separation of the two major types of values, it is possible to see the reasons (or combination of reasons) that individual areas were prioritized at a given level. The Department of Fish and Game feels that the demonstrated feasibility and benefits of the production and consumption of wildlife resources, as well as the fact that habitat is generally a multiple use classification, make a convincing arguement that the recommendation presented represents a cost-effective way to allocate State-owned lands in the Basin while allowing a maximum of compatible activities to occur at the same time.

TABLE 7-1a: Wildlife Habitat Value Criteria

A-1 Critical Habitats (sheep licks, waterfowl nesting areas, caribou calving areas, etc.).

A-2 Special Value Areas - contain "prime" habitat for four or more key wildlife species.

B-1 Wildlife Habitat (Conservative Mgmt.) - contain "prime" habitat for two or more key species.

B-2 Wildlife Habitat (Liberal Mgmt.) - contains "prime" habitat for one key species,

or

One "prime" and one or more "important" values, when not in sensitive areas (e.g., upland subalpine),

or

Two "dispersed" "prime" values,

or

Three or more "important" values.

C Areas containing two or fewer "important" values.

TABLE 7-1b:
Criteria Used to Define Each Category of Recommendation

RESOURCE: Wildlife Habitat

CATEGORY: TYPE A-1 - SINGLE USE MANAGEMENT (CRITICAL HABITAT)

GENERAL DEFINITION OF CATEGORY: The resource values in this area would be irreparably harmed or opportunities would be lost if other resource activities were allowed in the area.

SPECIFIC CRITERIA FOR CATEGORY:

1. What circumstances or resource values need to be present for land to be placed in this category?

   These areas are composed of critical habitat areas, as defined in Chapter 4.

2. What criteria separate long-term projects from short-term projects for this resource?

   N.A.

3. How will demand be taken into account in determining which land qualifies for this category?

   This category is based upon biological criticality to wildlife populations. As such, no direct link to demand is made.

4. How will local preferences be taken into account in determining which land qualifies for this category?

   The dedication of these areas is necessary in order to maintain the existance of populations used and enjoyed by residents of the Tanana Basin.

5. What capability and suitability will be taken into account in determining which land qualifies for this category?

Capability Criteria	Suitability Criteria
Defined in Chapter 4	See #1 above

6. What resource output criteria will be used for this category? (i e., potential bushels/acre or board feet/acre)

   N.A.

7. How is economic feasibility information used in this category?

   It has not been used in the identification of these areas, but the case could be made that with the loss of these areas,

virtually all of the consumer, producer, and indirect economic benefits that result from affected populations would also be lost. These losses would occur not only on a local basis, but would in some cases, extend nation- or continent-wide.

8. How are transportation costs taken into account?

   N.A.

9. How are the availability or lack of necessary infrastructure going to be used in categorizing land?

   Infrastructure is not needed for the production of wildlife.

10. How will the demand vs. supply situation for your resource be taken into account?

    These extremely important production areas are vital to keep supply at a reasonable level. For species not used in the consumptive sense, these areas are required in order to prevent extirpation.

11. How will social effects be taken into account in this recommendation?

    Critical Habitats are necessary to maintain populations that have important social effects.

12. How will environmental effects be taken into account in this recommendation?

    The dedication of these areas will be a first significant step in constructing a viable system of wildlife-producing lands in the Tanana Basin. In fact, the preservation of critical habitats is a measure of environmental quality.

13. Other criteria.

TABLE 7-1c:

Criteria Used to Define Each Category of Recommendation

RESOURCE: Wildlife Habitat

CATEGORY: TYPE A-2 - SINGLE USE MANAGEMENT (SPECIAL VALUE AREA)

GENERAL DEFINITION OF CATEGORY: The resource values in this area would be irreparably harmed or opportunities would be lost if other resource activities were allowed in the area, although in some cases seasonal activities may be possible.

SPECIFIC CRITERIA FOR CATEGORY:

1. What circumstances or resource values need to be present for land to be placed in this category?

   These are extremely valuable areas on the basis of biological diversity, productivity and/or human use of wildlife resources. Because of the value of these areas in their present or potential states, they deserve dedication to single use management.

   Prime Habitat (Chapter #4) for four or more key species, except in Dall sheep habitat, where fewer species may occur. Special use areas are often heavily used by people as well as being extremely productive.

2. What criteria separate long-term projects from short-term projects for this resource?

   Over the long term, enhancement practices could boast the value of these areas even further.

3. How will demand be taken into account in determining which land qualifies for this category?

   It is because these areas do much to satisfy demand - either directly (on-site) or indirectly (through animal dispersal to other areas) that these areas are identified.

4. How will local preferences be taken into account in determining which land qualifies for this category?

   Local preference will strongly favor retention and dedication of these lands - because this is where these resources are produced and procured.

5. What capability and suitability will be taken into account in determining which land qualifies for this category?

Capability Criteria	**Suitability Criteria**
Defined in Chapter #4	See #1 above

6. What resource output criteria will be used for this category? (i.e., potential bushels/acre or board feet/acre)

   Subunit information is included in Chapter 4.

7. How is economic feasibility information used in this category?

   Feasibility data is not calculated to the acre. However, our economic information for the Tanana Basin indicated, that the use of wildlife causes significant net benefits. Since A-2 areas are among the most productive, diverse, and heavily used areas in the Basin, it follows that their dedication as a single-use wildlife area is most feasible.

8. How are transportation costs taken into account?

   For production, transportation is not relevant. Where use occurs, access is already available.

9. How are the availability or lack of necessary infrastructure going to be used in categorizing land?

   Infrastructure is not needed beyond existing levels to make this proposal feasible.

10. How will the demand vs. supply situation for your resource be taken into account?

    These extremely important production areas are vital to maintenance and/or improvement of the supply situation. Demand outstrips supply for many species.

11. How will social effects be taken into account in this recommendation?

    These areas are crucial to social values due to their productivity and diversity.

12. How will environmental effects be taken into account in this recommendation?

    The allocation of these areas to wildlife habitat would have benefits disproportionate to their size, and would protect significant environmental values.

13. Other criteria.

TABLE 7-1d:

Criteria Used to Define Each Category of Recommendation

RESOURCE: Wildlife Habitat

CATEGORY: TYPE B-1 - MULTIPLE USE; RETAIN IN PUBLIC OWNERSHIP (WILDLIFE HABITAT - "CONSERVATIVE MANAGEMENT")

GENERAL DEFINITION OF CATEGORY: These areas should be managed for this resource as the primary use, but other activities are allowed as specified in the proposed strict management guidelines.

SPECIFIC CRITERIA FOR CATEGORY:

1. What circumstances or resource values need to be present for land to be placed in this category?

   1 - Two or more species' (or species group's) prime habitat of an "intensive" nature. Rarely, when justified by circumstances locally, one species' habitat will qualify.
   2 - Two or more species' prime habitat of a dispersed nature, when in upland or subalpine areas that are sensitive to competing uses.
   3 - Areas that do not meet above conditions but support high levels of human use have been upgraded to this class. See map for their location.

2. What criteria separate long-term projects from short-term projects for this resource?

   N.A.

3. How will demand be taken into account in determining which land qualifies for this category?

   The key species groups used in the mapping and prioritization processes are in high (and increasing) demand.

4. How will local preferences be taken into account in determining which land qualifies for this category?

   This category reflects the desires of many of the speakers at TBAP public meetings, and should be supported in public review, and by sportsmen's, community, native, and professional guide and trapping organizations. Community-sponsored wildlife classification requests also support this.

5. What capability and suitability will be taken into account in determining which land qualifies for this category?

Capability Criteria	Suitability Criteria
Defined in Chapter #4	See #1 above

6. What resource output criteria will be used for this category? (i.e., potential bushels/acre or board feet/acre)

   These areas are essential for the existing levels of wildlife production and use, and must be maintained to provide any chance of significant increased benefits in the future.

7. How is economic feasibility information used in this category?

   Fish and Wildlife Economic Analyses are not calcualted to the acre. However, this type of area is the largest contributor to the large positive net benefit found for fish and wildlife resources. This is because: a) these areas produce amounts of fish and wildlife disproportionate to their area and b) they include the places where most people go to use wildlife resources. The feasibility of producing wildlife resources for the benefit of the public is known to be high on this type of land.

8. How are transportation costs taken into account?

   By taking human use areas into account when defining B-1 areas, the accessability is automatically guaranteed - people are already using these areas.

9. How are the availability or lack of necessary infrastructure going to be used in categorizing land?

   Little infrastructure is necessary for these resources to be used, and is not needed at all for the production of wildlife. The inclusion of use data in mapping category B-1 ensures that it includes areas for which the infrastructure exists to an extent sufficient to support use.

10. How will the demand vs. supply situation for your resource be taken into account?

    Due to time and manpower constraints, virtually all species mapped are ones in demand. In general, demand is (and will continue) increasing for both consumptive and non-consumptive uses - these lands can partially meet this on a sustained basis, and furthermore, produce these resources in areas that are accessible to the public.

11. How will social effects be taken into account in this recommendation?

    The maintenance of these areas in their present (or some future enhanced) state will have a stability effect upon social conditions, especially in rural areas. Any loss of integrity of this system will foster negative social effects.

12. How will environmental effects be taken into account in this recommendation?

The maintenance of the integrity of B-1 lands and their management for uses compatible with wildlife will have a significnt beneficial effect upon the Tanana Basin's environment in the future by protecting water quality, soil integrity, and other extent natural resources.

13. Other criteria.

TABLE 7-1e:

Criteria Used to Define Each Category of Recommendation

RESOURCE: Wildlife Habitat

CATEGORY: TYPE B-2 - MULTIPLE USE; RETAIN IN PUBLIC OWNERSHIP (WILDLIFE HABITAT - "LIBERAL MANAGEMENT")

GENERAL DEFINITION OF CATEGORY: These areas should be managed for this resource as the primary use, but other activities are allowed as specified in the proposed management guidelines.

SPECIFIC CRITERIA FOR CATEGORY:

1. What circumstances or resource values need to be present for land to be placed in this category?

   1 - One prime habitat value or
   2 - One prime and one important habitat value or
   3 - Two "dispersed" prime values in lowland areas or
   4 - Three or more important habitat values

2. What criteria separate long-term projects from short-term projects for this resource?

   N.A.

3. How will demand be taken into account in determining which land qualifies for this category?

   The species used to rate these areas are in high demand.

4. How will local preferences be taken into account in determining which land qualifies for this category?

   These areas reflect production of species important locally, but generally have poorer access and less use than higher priority categories.

5. What capability and suitability will be taken into account in determining which land qualifies for this category?

Capability Criteria	Suitability Criteria
Defined in Chapter #4	See #1 above

6. What resource output criteria will be used for this category? (i.e., potential bushels/acre or board feet/acre)

   Maintenence of existing levels of production should be the goal for these areas, although some local increases in resource area may be induced by improving access.

7. How is economic feasibility information used in this category?

   See previous discussions

8. How are transportation costs taken into account?

   Existing levels of use require no additional transportation facilities or improvements. Costs incurred for transportation relating to other activities may increase harvest of wildlife.

9. How are the availability or lack of necessary infrastructure going to be used in categorizing land?

   N.A.

10. How will the demand vs. supply situation for your resource be taken into account?

    The key species used to select this category are in high demand - although relative lack of access makes these areas less crucial than foregoing categories.

11. How will social effects be taken into account in this recommendation?

    See discussion in B-1

12. How will environmental effects be taken into account in this recommendation?

    See discussion in B-1

13. Other criteria.

TABLE 7-1f:

Criteria Used to Define Each Category of Recommendation

RESOURCE: Wildlife Habitat

CATEGORY: TYPE C - MULTILPLE USE; PUBLIC OWNERSHIP NOT ESSENTIAL

GENERAL DEFINITION OF CATEGORY: These areas could be managed for a variety of resource uses, but wildlife values should be protected by the proposed management guidelines.

SPECIFIC CRITERIA FOR CATEGORY:

1. What circumstances or resource values need to be present for land to be placed in this category?

   These are areas containing two or fewer "important" habitat ratings.

2. What criteria separate long-term projects from short-term projects for this resource?

   N.A.

3. How will demand be taken into account in determining which land qualifies for this category?

   These lands do not support the productivity and diversity of valuable wildlife that previous categories do.

4. How will local preferences be taken into account in determining which land qualifies for this category?

   These lands, in general, do not support local uses to the extent that previous categories do.

5. What capability and suitability will be taken into account in determining which land qualifies for this category?

Capability Criteria	Suitability Criteria
Defined in Chapter 4	See #1 above

6. What resource output criteria will be used for this category? (i.e., potential bushels/acre or board feet/acre)

   N.A.

7. How is economic feasibility information used in this category?

   N.A.

8. How are transportation costs taken into account?

   N.A.

9. How are the availability or lack of necessary infrastructure going to be used in categorizing land?

   N.A.

10. How will the demand vs. supply situation for your resource be taken into account?

    N.A.

11. How will social effects be taken into account in this recommendation?

    Since these lands are not heavily used or especially valuable, social effects ought to be minimal.

12. How will environmental effects be taken into account in this recommendation?

    Low environmental values will limit the severity of impacts.

13. Other criteria.

TABLE 7-2a: Relative Weighing System for the Aggregation of Human Uses of Fish and Wildlife

Type of Use	Intensity of Use (8) Intensive	(5) Moderate	(3) Low	None
(10) Big Game	80	50	30	0
(4) Small Game	32	20	12	0
(6) Waterfowl	48	30	18	0
(8) Trapping	64	40	24	0
(10) Fishing	80	50	30	0
Relative Scores	304	190	114	0

TABLE 7-2b: Matrix for Updating Land Retention Priority on the Basis of Relative Human Use Scores

Human Use Levels	Land Suitability Category A-1	A-2	B-1	B-2	C
190	"	"	A-2	B-1	B-1
115-190	"	"	B-1	B-1	B-2
0-114	"	"	B-1	B-2	C

TABLE 7-3: Acres of Land in the Five Wildlife Suitability Categories Throughout the TBAP Planning Area

Wildlife Suitability Category	Thousands of Acres
A-1	504
A-2	1718
B-1	3567
B-2	2476
C*	4209

* (obtained by difference using total planned acreage of 12,474,093)

APPENDIX I
SUMMARY OF FISH AND WILDLIFE VALUES BY PLANNING UNIT

The following tables represent a listing of fish and wildlife and human use values that were considered in making the land suitability designations for the Tanana Basin Plan. Recommendations for types of compatible uses are based on these designations (A1, A2, etc.). Some flexibility is necessary in this system due to the unique nature of habitat values for each species. In many cases more than one suitability designation occurs within a planning unit. In these cases, the table gives a general description of the geographic area involved. For specific information on geographic areas, the wildlife suitability map should be consulted. Backup information on species habitat values can be found in the physical capability narratives in Chapter Four. This table should be used as quick reference to the values considered in making land suitability designations and the associated recommendations.

UNIT	DESIGNATION	AREA	VALUES
I A Use - Mod. B/G	B-2	Chitanatala Mts.	1. Prime grizzly
I A	B-2	Southwest corner of the unit - upland area	1. Prime grizzly
I A Use - Mod., Trap, B/G	B-2	Lower Chitana River riparian corridor	1. Prime moose
I B Use - Mod., B/G	B-2	Bitzshtini Mts.	1. Prime grizzly
I B Use - Mod., B/G	B-2	Southeast corner of unit - Kuskokwim Mts. upland area	1. Prime grizzly
I B Use - Mod., B/G	B-2	Southwest corner of unit Chitanatala Mts.	1. Prime grizzly
I B B-2 Use - Mod.,Trap, B/G	B-2	Eastern border in center of unit in Cosna R. area	1. Prime caribou, former wintering area
I B Use - Mod. B/G, Trap	B-1	Cosna River corridor	1. Prime moose 2. Prime furbearer
I C Use - Mod. B/G, Trap	B-1	Zitziana R. corridor	1. Prime moose 2. Prime furbearer
I C Use - Mod. B/G, Trap	B-2	Upper Zitziana R. area	1. Prime furbearer
I C Use - Mod. Fish, Trap, B/G Important access points	B-2	Mooseheart Lake and Bear Lake	1. Human use
II A Use - Mod., Trap, B/G, Fish (Geskakmina Lake)	B-2	Eastern edge of unit	1. Prime furbearer
II A Use - Mod., Fish, Trap, B/G Important access point	B-2	West Twin Lake	1. Human use values
II B Use - Mod., Fish, Trap, B/G	B-1	Wien Lake	1. Prime furbearer 2. Human use values
II B Use - Int., Fish, Trap, Waterfowl, B/G	A-1	Area south and east of Lake Minchumina	1. Critical waterfowl 2. Prime moose 3. Prime furbearer

UNIT	DESIGNATION	AREA	VALUES
II B	A-1	Two sites on Lake Minchumina	1. Critical raptor - peregrine nest sites
II B Use - Mod., Trap, B/G	B-1	South end of unit	1. Prime caribou 2. Prime furbearer
II B	B-2	Western boundary southern part of unit	1. Prime furbearer
II B Use - Mod., Trap, B/G	B-2	North central portion of unit on west boundary	1. Prime grizzly 2. Prime furbearer
II B Use - Mod.,Trap, B/G	B-1	Southeast corner of unit	1. Prime moose 2. Prime furbearer 3. Prime grizzly
II C Use - Mod., Fish, B/G	B-2	Mucha Lake	1. Human use values
II C Use - Mod., Waterfowl, B/G,	A-1	Wetlands south of John Hansen Lake	1. Critical waterfowl 2. Prime furbearer
II D Use - Int., Trap; Mod., B/G	B-1	Kantishna R. corridor	1. Prime moose 2. Prime furbearer
II D Use - Mod., B/G, Waterfowl; Int., Trap.	A-1	Bearpaw R. wetlands	1. Critical waterfowl
II E Use - Mod., B/G, Fish; Int., Trap.	B-1	Kantishna and Toklat River corridors	1. Prime moose 2. Prime furbearer 3. Prime grizzly
II E Use - Int., B/G Mod., Trap.	A-1	Toklat R. Springs confluence of Toklat and Sushana Rivers	1. Critical fish (salmon spawning area) 2. Critical waterfowl (overwintering mallards) 3. Critical grizzly 4. Critical furbearer
II F Use - Mod., Trap.	B-2	Comma Lake area	1. Important moose
II F Use - Mod., Trap, B/G	B-1, B-2	Southern portion of unit	1. Prime caribou 2. Prime furbearer

UNIT	DESIGNATION	AREA	VALUES
II H Use - Mod., Trap.	A-2	Wetlands south of Tanana River	1. Prime moose 2. Prime furbearer 3. Prime black bear
III A Use - Mod., Trap., B/G; Int., Fish	A-2	Fish Lake area	1. Prime moose 2. Prime furbearer 3. Prime waterfowl 4. Prime resident fish
III B Use - Mod., Trap. Int., B/G	A-1	Wetland area west of Dugan Hills along Tanana River east of Jennie M. Is.	1. Critical waterfowl 2. Prime moose 3. Prime furbearer
III B Use - Mod., Fish; Int., B/G, Trap.	B-1	Tanana, Zitziana and Cosna River corridors	1. Prime moose 2. Prime furbearer
III B Use - Mod., Fish Int., B/G, Trap.	B-2	Chitanana R. corridor and wetlands associated with Zitziana River	1. Prime moose
III C	B-1	Southern portion of unit	1. Prime moose 2. Prime furbearer
III C Use - Int., B/G, S/G, Trap.	B-1	Area near Eureka and north of Tofty	1. Boosted from B-2 to B-1 due to intensive human use
III C Use - Mod., B/G; Int., Trap.	B-2	Northern portion of the unit	1. Prime moose
III D Use - Mod., B/G, Trap.	B-1	Western portion of unit	1. Prime moose 2. Prime furbearer
IV A Use - Int., B/G, S/G, Trap.	B-2	Area near Manley Road and trail system	1. Important moose 2. Important furbearer, * Boosted from C B-2 due to intense human use
IV B Use - Int., B/G, Waterfowl Mod., Trap	A-2	Area west of the Tolovana River	1. Critical Moose 2. Prime furbearer 3. Prime waterfowl
IV B	A-1	Tanana bluff east of Deadman Lake	1. Critical raptor - peregrine nest site

UNIT	DESIGNATION	AREA	VALUES
IV B Use - Mod., Trap; Int., B/G	B-2	Dugan Hills	* Boosted from C to B-2 due to intensive human use
IV C-1 Use - Mod., Fish; Int., B/G, Waterfowl, S/G, Trap.	A-1	Minto Flats core area	1. Critical moose 2. Prime black bear 3. Prime furbearer 4. Prime resident fish 5. Prime raptor 6. Prime waterfowl
IV C-1 Use - Int., Trap.	A-2	Areas bordering core area of Minto Flats	1. Prime moose 2. Prime furbearer 3. Prime black bear
IV C-2 Use - Int., Trap., B/G, S/G	A-2	Tolovana R. corridor	1. Prime moose 2. Prime furbearer 3. Prime black bear
IV D	A-1	Grapefruit Rocks Mile 39 Elliott Highway	1. Critical raptor-peregrine falcon nest site
IV D Use - Int., Trap., B/G, S/G	A-2	Upper Tolovana River Corridor	1. Prime moose 2. Prime furbearer 3. Prime black bear
IV D Use - Int., B/G, S/G, Trap.	B-2	Strip along Elliott Highway	1. Important moose 2. Important furbearer * Boosted from C to B-2 due to intensive human use
IV E Use - Mod., Trap.	B-2	Northern portion of the unit	1. Prime caribou 2. Important moose
IV E Use - Int., B/G, Trap.	B-1	McCord Creek area	1. Prime caribou 2. Important furbearer, * Boosted from B-2 to B-1 due to intensive human use
IV E Use - Int., B/G, S/G, Trap.	B-2	Strip along Elliott Highway	1. Important moose 2. Important furbearer, * Boosted from C to B-2 due to intensive human use

UNIT	DESIGNATION	AREA	VALUES
V A Use - Int., Trap.	A-1	Western portion of unit - Stampede Trail area	1. Critical caribou - McKinley Herd calving ground 2. Prime moose 3. Prime furbearer
V A	A-2	Southern portion of unit	1. Prime moose 2. Prime furbearer 3. Prime caribou 4. Prime grizzly
V A Use - Int., B/G, Trap.	A-2	Eastern area central section of unit	1. Prime grizzly 2. Prime furbearer 3. Prime caribou
V A Use - Int., Trap.; Mod., B/G	B-1	Northern Area	1. Prime moose 2. Prime black bear 3. Prime furbearer
V A Use - Mod., B/G, Trap.	B-1	Central Area	1. Prime caribou 2. Prime moose 3. Prime grizzly 4. Prime furbearer
V A Use - Mod., B/G, Trap.	B-2	Clear Area	1. Important caribou 2. Prime moose
V A Use - Mod., B/G, Trap.	B-2	Southern tip of unit	1. Prime caribou
V C Use - Mod., B/G, Trap.	B-1	Northern Edge of unit	1. Prime caribou 2. Prime grizzly 3. Prime sheep
V C	A-2	Southern and central portions of unit	1. Prime caribou 2. Prime sheep 3. Prime moose
VII A-1	A-1	On several drainages in the Tanana Flats	1. Critical water-fowl- swan nest sites
VII A-1 Use - Int., B/G river corridors Mod., B/G other areas; Mod., Trap.	A-2	Remainder of unit	1. Prime moose 2. Prime waterfowl 3. Prime black bear 4. Prime furbearer
VII A-2 Use - Mod., B/G Int., Trap.	B-1	Majority of unit	1. Prime moose 2. Prime furbearer

UNIT	DESIGNATION	AREA	VALUES
VII A-2 Use - Int., B/G, Fish, Trap.	A-2	Small area south of Blair Lakes	1. Prime moose 2. Prime furbearer 3. Prime waterfowl
VII B	A-1	Roosevelt Creek at headwater area of Gold King Creek	1. Critical moose mineral lick 2. Critical raptor peregrine nest site
VII B Use - Int., Trap., B/G	A-2	Majority of Unit	1. Prime moose 2. Prime caribou 3. Prime furbearer 4. Prime grizzly bear
VII B Use - Int., B/G, Trap.	B-1	South and west portion portion of unit	1. Prime moose 2. Prime caribou 3. Prime grizzly
VII C Use - Int., B/G, Trap.	A-1	Eastern portion of the unit	1. Critical caribou - Yanert Herd calving area 2. Prime sheep 3. Prime moose 4. Prime caribou 5. Prime furbearer
VII C Use - Int., B/G	A-2	Majority of unit	1. Prime sheep 2. Prime moose 3. Prime caribou 4. Prime furbearer
VII C Use - Int., B/G	B-1	Northern portion of the unit	1. Prime sheep 2. Prime moose 3. Prime caribou
VII D	A-1	Nest site areas	1. Critical raptor - peregrine falcon nest sites
VII D	A-1	Headwaters of the Wood/Yanert drainages	1. Critical caribou - Yanert Herd calving area
VII D Use - Int., B/G; Mod., Trap.	A-2	Majority of unit	1. Prime sheep 2. Prime moose 3. Prime caribou 4. Prime grizzly

UNIT	DESIGNATION	AREA	VALUES
XII A-1	A-1	Selected nest sites	1. Critical waterfowl - swan nest sites
XII A-1	A-2	Remainder of Unit	1. Prime waterfowl 2. Prime moose 3. Prime furbearer 4. Prime black bear
Use - Mod./Int., B/G; Int., Trap.			
XII A	B-1	Chatanika R. Corridor	1. Prime moose 2. Prime black bear 3. Prime resident fish 4. Critical fish - salmon spawning 5. Important furbearer
Use - Int., B/G, S/G, Trap.			
XII A	A-2	Inner Chatanika R. corridor from Murphy Creek to Olnes	* Same as above but boosted from B-1 to A-2 due to intensive human use
Use - Int., B/G, S/G, Trap, Fish			
XII B-1	B-2	Northest portion of unit	1. Prime furbearer
Use - Int., S/G			
XII B-1	B-2	Southern portion of the unit	* Boosted from C to B-2 due to intensive human use
Use - Int./Mod., B/G, S/G, Int., Trap.			
XII B-2	B-1	Northern tip associated with Chatanika River corridor	See XII A
XII C-1	B-1	Goldstream Creek Corridor	1. Prime moose 2. Prime black bear
Use - Int., B/G, S/G, Trap.			
XII C-1	B-2	West end of Goldstream Creek corridor	1. Prime black bear 2. Important moose
Use - Int., S/G, Trap.			
XII C-2	C	Entire Unit	
XII D-1	A-1	Nesting cliffs	1. Critical raptor - peregrine falcon nest site
XII D-1	B-1	Tanana River corridor	1. Prime moose 2. Prime furbearer
Use - Int., B/G			

UNIT	DESIGNATION	AREA	VALUES
XII D-2	A-1	Nesting cliffs	1. Critical raptor - peregrine falcon nest sites
XII D-2	B-1	Tanana River corridor	1. Prime moose 2. Prime furbearer 3. Prime fish
Use - Int., B/G, Trap., Fish			
XII E	B-1	Goldstream Cr. corridor	1. Prime moose
Use - Int., S/G			
XII E	B-2	Ester Dome area	1. Prime furbearer
Use - Int., S/G, Trap.			
XII F	A-1	Nesting Cliffs	1. Critical raptor - peregrine falcon nest sites
XII F	C	Remainder of unit	
XII G	B-1	Goldstream Cr. corridor	1. Prime moose
Use - Int., S/G; Mod., Trap.			
XII G	B-2	Steese Highway - Pedro Dome	1. Prime furbearer
XII G	B-1	Steese Highway area	* Boosted from B-2 to B-1 due to intense human use
Use - Int., B/G; Mod., Trap.			
XII I	B-2	Eastern portion of the unit	1. Prime moose
XII I	B-2	Western portion of the unit	1. Prime black bear
Use - Int., S/G' Mod., Trap.			
XII J	B-2	Steese Highway corridor	1. Prime black bear 2. Important moose * Boosted from B-2 to B-1 due to intense human use
XII J	B-1	Steese Highway corridor	
Use - Int., B/G, S/G, Fish, Trap.			

UNIT	DESIGNATION	AREA	VALUES
VII D eastern side Use - Int. B/G	A-1	Small area on northern border of Unit between Delta Cr. and E. Fork Delta R.	1. Critical habitat Delta Caribou Herd calving ground 2. Prime sheep 3. Prime furbearer
VII D	A-1	East F. Robertson River	1. Critical habitat sheep mineral lick
VII D Use - Int. B/G	B-1	Remainder of Unit	1. Prime sheep 2. Prime grizzly 3. Important moose
VIII A Use - Int. B/G; Mod. Trap.	A-2	Shaw Cr. Flats	1. Prime moose 2. Prime black bear 3. Prime furbearer 4. Prime caribou 5. Prime waterfowl 6. Prime resident fish Shaw Cr.
VIII A Use - Mod. Trap. Int. B/G	B-1	Area just outside of Shaw Cr. Flats	1. Prime black bear 2. Prime furbearer
VIII A Use - Mod., Trap., Int. Fish below Central Cr. Int. B/G below Central Cr.	B-1	Goodpaster drainage including upland terrain at headwaters and south fork drainage	1. Prime sheep in headwater area 2. Prime caribou 3. Prime moose upstream to Central Creek 4. Prime grizzly upstream to Glacier Cr. 5. Prime black bear below Central Cr. and South Fork drainage 6. Prime furbearer same area as black bear 7. Prime fish throughout system upstream to Boulder Creek
VIII A	B-2	Remainder of Unit	1. Prime Caribou

UNIT	DESIGNATION	AREA	VALUES
			2. Prime grizzly elevated terrain in eastern portion of Unit only
VIII A	C	Southwest portion of Unit	
VIII B Use - Mod., Trap., B/G	B-1	North and East portion of the Unit	1. Prime caribou 2. Prime sheep extreme northern portion of Unit only 3. Prime grizzly
VIII B Use - Mod., Trap. Int. B/G T Lake area Mod. B/G Billy Cr.	B-1	Billy Creek Drainage and Sand Lake area	1. Prime moose 2. Prime furbearer Billy Creek drainage only 3. Prime waterfowl Billy Cr. drainage 4. Prime resident fish 5. Prime black bear
VIII B Use - Int. Fish, B/G; Mod. Trap.	B-1	George Lake area	1. Prime furbearer 2. Prime resident fish 3. Prime black bear
VIII B	C	Remainder of Unit	
VIII C Use - Int. Fish (Mansfield,Fish & Wolf Lakes); B/G Lakes area and Tanana River; waterfowl lakes and assoc. wetlands	B-1	Mansfield, Fish and Wolf Lakes, Mansfield Cr. and headwater area	1. Prime moose 2. Prime caribou - headwater area only 3. Prime furbearer in Mansfield Creek drainage to Wolf Cr. 4. **Prime grizzly - headwater area only** 5. **Prime waterfowl - Mansfield Cr. Wetlands south of Mansfield, Fish Wolf Lakes**

UNIT	DESIGNATION	AREA	VALUES
VIII C	B-1	Area north of Mansfield Fish and Wolf Lakes	*Boosted from C to B-1 due to intensive human use
VIII C	C	Remainder of Unit	
IX A Use - Int. B/G Mod. Trap.	B-1	Majority of Unit	1. Prime moose 2. Prime furbearer 3. Prime black bear 4. Prime Fish - Tanana River
IX B	B-1	Entire Unit with the exception of an area around Tok which extends roughly from Tanacross to Tok bounded by the Eagle Trail and the Tanana R.	1. Prime moose except northeast section 2. Prime caribou - northeast section only - elevated terrain 3. Prime furbearer - Tok R. drainage, N. face of Alaska Range and Tanana R. corridor 4. Prime black bear, north of Ak. Highway 5. Prime grizzly - northeast section of Unit 6. Prime Fish, Tanana River 7. Prime sheep east of Little Tok River
	A-2	Tok R. corridor	* Boosted from B-1 to A-2 due to intensive human use use
Use - Int., Trap.; Int. B/G,S/G		and N. Face Ak. Range	
IX B Use - Int. Trap., S/G;	B-2	Lower Little Tok R. Drainage	1. Prime resident fish 2. Prime black bear northwest corner of Unit
X A	B-1	Entire Unit	1. Prime moose - Robertson River Drainage and lower elavation areas

UNIT	DESIGNATION	AREA	VALUES
Use - Mod. Trap.; Int. B/G			2. Prime sheep in higher areas - southern part of Unit. 3. Prime furbearer, Tok and Robertson River drainages 4. Prime grizzly bear 5. Important caribou
X B	B-1	Entire Unit	1. Prime moose - Tok and Robertson R. drainages
Use - Mod. B/G (entire area); Mod. Trap.			2. Prime sheep - higher elevation areas throughout unit 3. Prime furbearer - Tok and Robertson R. drainages 4. Prime grizzly in northern portion of the Unit
X B	A-2	Tok River and Clearwater Cr. drainages	* Intense human use boosted designation from B-1 to A-2
X B	A-1	1) Clearwater Cr. headwaters 2) Tok Glacier areas 3) Between Dry Tok Cr. and Tok Creek 4 & 5) Sheep Cr. and Cathedral Cr. areas	1. Critical habitat sheep mineral lick areas
XI A Use - Mod. Trap.	B-2	N.E. portion of Unit	1. Prime caribou - 40 Mile caribou Herd 2. Prime grizzly bear
XII N Use - Int. Fish, below N. Fork; Mod. B/G	B-1	Salcha River Corridor	1. Prime blak bear 2. Prime furbearer 3. Critical fish - king salmon spawning area 4. Important moose

UNIT	DESIGNATION	AREA	VALUES
XII N	B-1	Headwaters of Salcha near West Point	1. Prime sheep 2. Prime grizzly bear
XII N	B-2	Remainder of Unit	1. Prime grizzly bear east of N. Fk. Salcha R.
Use - N.E. Corner of the Unit Mod. B/G			2. Prime caribou 3. Important moose
XII K	B-1	East Fork Chena R. drainage	1. Prime moose 2. Prime caribou 3. Prime furbearer 4. Prime black bear - downstream from Van Curler's Bar 5. Prime resident fish habitat - criticial salmon spawning habitat
Use - Mod. Trap.; Mod. Fish, Van Curler's Bar area			
XII K	B-1	Chena Hot Springs area - Headwaters Little Chena R./ Anaconda Cr. Drainage	1. Prime moose 2. Prime caribou 3. Prime black bear - Chena Hot Springs area 4. Prime furbearer - Chena Hot Springs area
XII K	B-1	Little Chena Drainage North Fork Chena River	* Boosted from B-2 to B-1 due to intensive human use
Use - Int. Trap., S/G; Mod. B/G			
XII K	B-2	Remainder of Unit	1. Prime caribou - eastern portion 2. Prime moose - western portion
Use - Int. Trap.			
XII J	B-1	Steese Highway Corridor and head-water area of Chatanika River	1. Prime moose - south portion of Unit; important moose - Steese Hwy. Corridor

UNIT	DESIGNATION	AREA	VALUES
			2. Prime caribou - headwater area near 12-Mile Summit 3. Prime black bear 4. Prime furbearer - Montana Cr. area; Important furbearer Chatanika R. drainage 5. Prime sheep - northeast corner o Unit 6. Prime grizzly - N.E. corner of Unit 7. Critical salmon spawning habitat in Chatanika R. Prime resident fis habitat
Use - Int. Fish (Chatanika R.); Int. B/G, S/G Steese Hwy. Corridor			
	B-1	Strip north of the Steese Highway	* Boosted from B-2 to B-1 due to intensive human use
	B-2	Remainder of Unit	1. Prime Caribou 2. Prime black bear 3. Prime furbearer - north of Steese Hwy.
Use - Int. B/G North of Steese Hwy.			
XII L	B-1	Entire Unit	1. Prime moose 2. Prime black bear 3. Prime furbearer 4. Critical salmon spawning habitat - Chena R., Prime resident fish habitat 5. Raptor habitat - bald eagle
Use - Int. Trap., Fish, B/G, S/G			

Chapter 8

Fish and Wildlife and Recreation Resources

October 19, 1983

CHAPTER 8.

ALTERNATIVE 3—FISH & WILDLIFE & RECREATION RESOURCES

This alternative (#3) was formulated by comparing fish and wildlife and recreation values with proposals contained in other elements and making land allocations based on perceptions of conflict or compatability with our identified priorities. The intent of this effort was to allow proposals to proceed to the extent that they could be molded into the overall goals we were charged with - namely, to perpetuate and enhance the production and use of wildlife and recreation resources in the Tanana Basin.

The alternative was formed on an advocacy basis at the direction of ADNR. Decisions on what kind and to what extent other activities would be allowed under this alternative were made jointly by the team members representing the Department of Fish and Game and the Division of Parks. However, we made a good faith effort to include development activities in response to demand for them, leading to a reasonable and cost-effective mix of land uses.

Although some high value wildlife areas were reduced in size in order to allow other proposals to proceed, in general, our high priority areas took precedence over competing or conflicting uses. We did not invest a lot of effort in attempting to allocate lands to other activities according to priorities identified in other elements, and this is one of the manifestations of the advocacy method of formulating alternatives.

Interestingly, there were virtually no internal conflicts within Alternative #3. Both the wildlife and recreation resource values depend heavily upon access and preservation of wildlands, so we were able to agree on most allocations. The major differences of opinions centered on the type of guidelines necessary to mitigate and control development, rather on whether or not it should occur at all. The sole direct conflict between the recreation and wildlife elements concerned the development of downhill ski areas. These problems have been solved through modification of some projects and the deletion from this alternative of others. The possibility for including several of these in other, more development oriented alternatives was discussed.

Decisions made by the ADF&G representative on land allocations for this alternative are documented in the summary that follows this narrative. Preliminary guidelines have been submitted to the ADNR Tanana Basin Plan staff, and we expect to formulate in-depth guidelines by activity type for eventual inclusion in the plan.

FISH AND WILDLIFE RECREATION ALTERNATIVE

Detailed Responses to Land Allocations Proposed by Other Elements Organized by Planning Unit

This section provides documentation for the decisions made by the ADF&G representative on land allocations proposed in other elements. Reasons are given for allowing or excluding each specific land allocations, organized by large and small planning units. A separate listing covers land disposals within the Fairbanks North Star Borough. In some cases, a land allocation is allowed subject to specific guidelines or limitations; e.g., disposal for agriculture allowed, but only for small tract farming. Any limitations on specific land areas (except for settlement lands) are included in this section. Additional preliminary guidelines for each category of land use and for specific settlement areas have been submitted to ADNR, and detailed guidelines are being prepared. With very few exceptions, all other resource uses are allowed in areas of "C" habitat, the lowest habitat value category. In the second part of this section, all land uses within the Fairbanks North Star Borough are allowed in areas of "C" and "B-2" habitat quality without specific limitations. When conflicts occured between settlement, agriculture, and forestry, priority was given in the preceeding order for these reasons: settlement land is most limited, and large amount of land has already been identified for forestry in the Tanana State Forest. Unless noted otherwise, settlements are remote parcel (or homestead) offerings.

LARGE UNIT I

I A Settlement

Northwest corner of I-A.

Allowed in total as remote settlement, due to "C" habitat category.

Lower Chitanana River

Excluded from "B-2" habitat area along Chitanana River, allowed as a low density remote in "C" habitat area in order to reserve the higher quality wildlife habitat and the area more heavily used by humans along the river for wildlife. See agriculture portion of this area below.

I A Agriculture

Lower Chitanana River

Excluded from "B-2" habitat area along Chitanana River.

Allowed as small tract agriculture within "C" habitat area, for reasons outlined for settlement. Compatible with low density settlement.

Upper Chitanana Drainage

Allowed in total in "C" habitat due to habitat quality.

I A/B Minerals

Chitanana Mountains

Mineral exploration and development allowed in "B-2" habitat area, subject to guidelines to reduce conflicts between humans and summer feeding habitat for grizzly bears.

I B/C Settlement

Lower Cosna River

Excluded from "B-1" habitat area along river, in accordance with local preferences, past history of disposals, commissioner's decisions, high wildlife habitat quality and high human use of wildlife.

Allowed in adjacent "C" habitat. See personal use forestry portion of this area below.

I B Agriculture

Lower Cosna River

Excluded from "B-1" habitat along river, due to loss of high habitat quality riparian vegetation, possible degradation of water quality by siltation, fertilizer runoff.

Northern Cosna Drainage

Allowed in total in "C" habitat, due to habitat quality.

Southern Cosna Drainage

Allowed in total in "B-2" habitat, with guidelines to reduce human-grizzly bear conflicts.

I B/I C Forestry

Lower Cosna River

Excluded from "B-1" habitat along river, due to high wildlife habitat quality and human use and availability of forestry land in adjacent "C" habitat.

Allowed in "C" habitat, in a patchwork with settlement to allow for personal use.

I C Settlement/Agriculture

West Side of Lower Zitziana River

Allowed in "B-1" and in "C" habitat. Portion in "B-1" riparian habitat limited to a low density, and small total acreage in agriculture, and small plots with wide spacing to avoid significantly decreasing wildlife values.

I C Agriculture

Central and Southern Zitziana Basin

Excluded from "B-1" and "B-2" habitat due to high habitat quality, and possible water quality degradation, with the exception of one tract in "B-2" adjacent to a "C" agriculture area. "B-2" project for small plot agriculture only.

Allowed in total in "C" habitat due to habitat quality.

I C Forestry

Eastern Zitziana Drainage

Allowed in total in "C" habitat.

LARGE UNIT II

II A Settlement/Agriculture/Forestry

Northern Dry Creek Drainage

Excluded from "B-2" habitat wetlands to the north end and to the east, due to higher habitat quality than "C" habitat in which most of area lies; and due to avaliability of alternate access via Kindarina, Geskakmina and Iksgiza Lakes.

Any mixture of agriculture, forestry, and settlement allowed in suitable sites.

II A Settlement

East Twin Lake area

Allowed in a band of easily accessable "C" habitat land between West Twin Lake and East Twin Lake, and eastward from the latter into "B-2" habitat.

- Low density remote
- Setbacks from high human use areas on lakes
- Waterfront land and trail access to surrounding lands remain as public land (not easements)
- No further disposals around West Twin Lake

Not allowed in less accessable remainder of "C" habitat in preference to forestry and containing settled area.

II A Agriculture

South of Twin Lakes area

Excluded from "B-1" Kantishna River corridor due to loss of riparian high quality habitat, runoff potential, large amount of "B-1" and "C" land available.

Allowed in total in "B-2" and "C" habitat as small tract agriculture wherever soils are suitable.

II A Forestry

Twin Lakes area

Excluded from "B-1" Kantishna River corridor due to loss of high quality riparian habitat and availability of land in "B-2" and "C".

Allowed in areas not designated for agriculture and settlement in "B-2" and "C" habitat.

Commercial timber harvest not allowed in buffer zone around West Twin Lake.

II B Settlement

Wien Lake

Excluded from "B-1" area of high human use immediately surrounding lake (300-foot buffer zone of public land).

Allowed as low density remote in "B-2" and "C" habitat outside of buffer zone.

Trail access to surrounding public land to remain in public ownership (not as easements).

Lake Minchumina

Excluded from "A-1" and "B-1" habitat in the vicinity of Lake Minchumina due to: conflicts with critical peregrine falcon and waterfowl habitat; present settlements already at maximum desired density.

Allowed somewhere within "B-1" habitat southwest of Lake Minchumina, preferably on west side with access by the winter trail.

Guidelines required to avoid conflict with trapping and other human uses in the area.

II D Settlement

Bearpaw River

Excluded from "A-1" waterfowl habitat in wetland area along river.

II D Agriculture

Kantishna River

Excluded completely from Kantishna River "B-1" corridor due to destruction of high quality habitat, runoff and siltation.

Toklat River Uplands

Excluded completely from "B-1" habitat due to: destruction of high quality habitat; access problems to this small plot across the Toklat River upriver of the critical salmon spawning habitat at Toklat Springs; possible disturbances of underground water flow to the Springs; severe conflicts between grizzly bears and farmers.

II D Minerals

Southeast Uplands

Allowed, subject to general guidelines for appropriate habitat category.

II E/II F Settlement/Agriculture

Upper Toklat River

Excluded from "B-1" and "B-2" habitat west of Teklanika River due to: severe grizzly bear-human conflict potential near Toklat Springs critical salmon spawning area; very high wildlife quality; difficulty of access

across Teklanika River; runoff and underground water diversion problems (for agriculture).

Allowed in "B-2" habitat east of Teklanika River, as remote settlement with small-scale agriculture on suitable soils.

II E Agriculture

Toklat and Kantishna Rivers

Excluded completely from "B-1" riparian habitat along rivers due to destruction of high quality habitat, problems of runoff, siltation, and chemical contamination of river.

Excluded from "C" habitat southwest of Toklat Springs, due to reasons mentioned for II-D Toklat River Uplands.

II F Agriculture

Teklanika River Corridor

Excluded in total from "B-2" riparian habitat along river corridor due to destruction of high value wildlife habitat, conflicts with local use, runoff problems, large acreages of agricultural land.

II F Forestry

Lower Teklanika River

Allowed in total in "B-2" habitat along river.

II H Agriculture

Wetlands south of Tanana River

Not allowed due to unsuitability for agriculture due to poor drainage, and high value "A-2" wetland and waterfowl habitat.

III A/C Agriculture/Forestry

Fish Lake Drainage

Excluded from entire drainage "A-2" habitat due to: very high human use for subsistence and recreation; very high waterfowl and fish habitat values; siltation and runoff problems.

III A/C Forestry

Cosna Bluffs

Not allowed at all in "B-1" habitat due to: high habitat quality; conflicts with native land claims; high human use along Tanana River for subsistence and recreation, fish camps.

III C Settlement

South of Tofty

Allowed in "B-1" habitat due to proximity to existing settlement and limited area involved. Any density allowed.

Manley Road near Overland Bluff and Baker Lake

North portion in "B-1" habitat near road allowed as low density remote due to good access. Corridors of public land allowing access from road to public land beyond settlement required.

South portion in "B-1" habitat not allowed due to: relatively higher habitat quality and lower accessibility for settlement.

Manley Hot Springs

Northern portion in "B-1" habitat allowed for low density remote, due to good access.

Southern portion in "B-1" habitat not allowed due to relatively higher habitat quality and much higher human use along Tanana River.

Eureka

Allowed in total in "B-1", "B-2", and "C" habitat as large tract, low density settlement, due to good access, mining activity occurring in area, and previous disturbances from mining activities.

III C Agriculture

Serpentine River

Excluded from "B-1" habitat in southern areas due to high habitat quality combined with high human use, and in the west due to runoff into Fish Lake mentioned above.

Allowed in "B-2" habitat in northern band due to relatively lower habitat quality and human use. Small parcel agriculture only.

Remainder of III C

Excluded from most of area due to "B-1" habitat quality and high human use.

Allowed east of Tofty near Baker Creek along road to Manley due to good access and limited area. Corridors of public land required for access from road into back country.

III D Agriculture

Excluded from "B-1" habitat areas due to high habitat quality and high human use, and availability of land in "C" habitat.

Allowed in total in "C" habitat areas.

III D Forestry

Not allowed due to high "B-1" habitat quality and high human use.

III A-D Minerals

Exploration allowed throughout mineralized area, irrespective of habitat quality.

Development allowed throughout with guidelines varying from liberal to strict depending on local habitat quality and extent of prior mining disturbance. Water quality standards must be strictly maintained on rivers (e.g., Hutlinana River) and throughout the entire Fish Lake wetlands drainages.

LARGE UNIT IV

IV A Agriculture

Manley Road near junction with Minto Road

Allowed in total in "B-2" and "C" habitat areas due to ease of access, large area of suitable soils.

Any form or size of agricultural project acceptable except grazing, due to conflicts with ungulate and carnivorous wildlife.

Forestry or agriculture allowed in conflict area south of the road.

IV A Forestry

South of Manley Road near junction with Minto Road

Allowed in total in "B-2", "C" habitat due to good access, large suitable area, for any type of forestry.

Agriculture, forestry or any mixture allowed.

IV A Minerals

Exploration and development allowed throughout mineralized areas in accordance with general guidelines for respective habitat quality areas.

IV B Agriculture

Dugan Hills and western Minto Flats

Excluded in total due to "A-1" and "A-2" habitat quality and proximity to Minto Flats. For Dugan Hills, also due to remote disposals already made in this area.

IV C1 Settlement

C.O.D. Lake

Not accepted in "A-1" habitat due to severe conflicts with human use for subsistence and recreation.

IV C1 Agriculture

Tolovana Hot Springs Dome and wetlands

Not allowed due to "A-1" and "A-2" habitat quality, problems of runoff and sedimentation reaching "A-1" habitat in Minto Flats.

Along Chatanika and other rivers in central Minto Flats

Not accepted in "A-1" habitat due to severe conflicts with human use for subsistence and recreation, and destruction of critical waterfowl habitat.

Lower Goldstream Creek and Dunbar area

Only projects which have already been reviewed by ADF&G are allowed.

No additional projects on lower Goldstream Creek and no projects on Little Goldstream Creek are allowed due to conflicts with high human use and very high wildlife values in "A-1" habitat.

IV C1 Minerals

Northern Minto Flats and Tolovana River wetlands

Exploration allowed only during the winter when waterfowl are absent and when the wetlands are frozen, under strict guidelines to decrease impact on "A-1" habitat and to avoid conflicts with trappers.

Development of minerals allowed only under a lease hold system with strict guidelines.

IV C2 Agriculture

Allowed in total in "C" quality habitat.

IV D Settlement

South of Amy Dome

Allowed in total in "B-2" habitat quality due to good road access, according to the recommendations included in the Statewide Plan.

IV D/E Agriculture

Throughout Small Units

Allowed for small-scale agriculture in areas relatively near the Elliott Highway in "B-2" habitat.

Not allowed in areas far from the highway due to infeasibility of access and rugged topography.

IV D Forestry

Upper Tolovana River, Snowshoe Pass

Allowed in full for personal use or small-scale commercial forestry.

IV D/E Minerals

Mineralized belts

Exploration and development allowed throughout, with provisions to maintain state water quality standards.

Follow general guidelines for mining in "B-2" habitat areas.

LARGE UNIT V

V A Settlement

Stampede Trail

Not allowed at all due to conflict with critical calving area for McKinley Caribou Herd and existing settlment in eastern part of requested land.

East of Denali National Park entrance

Allowed in total in "A-2" habitat for any form of settlement due to promixity to Parks Highway, acceptance by local residents, and previous acceptance by ADF&G.

Yanert River

Not allowed east of the Healy-Willow Electrical Intertie, due to conflict with "A-2" habitat quality, critical calving area for Yanert Caribou Herd, human use, and incompatability with community land use plan.

Allowed as small subdivisions west of the Intertie, due to good road access. All recommendations in community land use plan should be followed.

V A Agriculture

Clear area and Julius Creek

Not allowed in these "B-1" and "B-2" habtiat areas. These areas are covered by a large number of presently approved future settlements and small agriculture projects. Further development than what is already planned is not compatible with maintenance of high quality wildlife habitat.

V A Forestry

Seventeenmile Slough

Not allowed in "B-1" habitat area. This whole area is covered by presently approved settlements and small agriculture projects, with which forestry would not be compatible.

Southwest of Clear

Allowed in "B-2" and "C" habitat quality areas, if the forestry projects are made compatible with existing settlement in the area.

Southwest of Ferry

Allowed for local use forestry in "B-1" and "B-2" habitat areas, due to good access and need for a local supply.

Jumbo Dome area

Not allowed in "B-1" habitat quality area due to "B-1" habitat quality, high human use, marginal suitability for forestry due to lack of trees, and availability of local forestry land in more accessable areas along the Parks Highway.

V A Minerals

Stampede Trail

Western portion of area within critical calving grounds for McKinley Caribou Herd open to mineral entry under strict lease hold guidelines with seasonal restrictions and restrictions on the extent and nature of surface disturbances.

Eastern portion in "B-1" habitat area open to mineral exploration and development. General guidelines for "B-1" habitat to apply during development and operation stages, for wildlife protection.

LARGE UNIT VII

VII A1/A2 Settlement

Japan Hills Area

Requires check with ADF&G. Some remote settlement may be allowed.

VII A1/A2 Agriculture

Tatlanika and Totatlanika Rivers

Not allowed in "A-2" habitat quality area due to conflicts with human use, disturbance or or destruction of trumpeter swan nesting areas, loss of riparian areas important for moose browse, conflict with trappers, potential conflicts between wildlife, and crops and domestic animals, and for potential for disease transmission to wildlife.

Japan Hills and Wood River Areas

Requires check with ADF&G. Some small scale agriculture may be allowed.

VII A1 /A2 Forestry

West of Tanana River, Harding and Birch Lake Area

Allowed in "B-1" habitat area for private use and small-scale commercial forestry, due to relatively good access.

VII A1/A2 Minerals

Japan Hills Area

Allowed in mineralized portion of "B-1" habitat area for exploration and development, with strict guidelines for development.

VII B/C/D Settlement

Liberty Bell Mine Area

Allowed in "B-1" habitat area for low density remote settlement, due to relatively lower habitat quality, good access, and presence of settlement and mining activity at present.

Not allowed in "A-2" habitat area due to high habitat quality.

Yanert River

Not allowed for reasons given for Small Unit V-A.

VII B/C/D Agriculture

Totatlanika and Wood Rivers

Not allowed in "A-2" habitat due to high habitat quality, importance of riparian corridors for moose, grizzly bears and other wildlife, high human use, potential conflicts between wildlife and crops or domestic animals, and low feasibility of agriculture at high elevations.

VII B/C/D Forestry

Jumbo Dome Area

Not allowed for reasons given under Small Unit V-A.

VII B/C/D Minerals

Throughout Mineralized or coal-bearing areas in the western and central Alaska Range

Allowed or not allowed depending on habitat quality according to these guidelines:

A-1 Critical habitat:

- mineral licks: closed to mineral exploration and development.

- caribou calving grounds (northeast portion of Yanert River drainage and Molybdenum Ridge): mineral exploration and development allowed only under lease hold arrangements with seasonal restrictions and restrictions on the extent and nature of surface disturbance.

A-2 Special Value Areas: open to exploration, and to development under strict lease-hold arrangements. As other critical habitat areas such as lambing cliffs are identified, portions of "A-2" habitat may be upgraded to "A-1" value and closed to mineral entry.

B-1 Multiple use wildlife habitat: open to exploration and to development, with strict guidelines for development.

B-2 Multiple use wildlife habitat: open to exploration and to development, with mitigation stipulations as necessary for the latter.

LARGE UNIT VIII

VIII A Settlement

Lower Goodpaster River

Allowed in total in "B-1" and "B-2" habitat as a low density remote settlement, due to good access and limited area.

A minimum spacing must be maintained between parcels or groups of parcels in the "B-1" riparian corridor.

Setbacks must be followed along the river itself to allow recreational use of the river.

VIII A Agriculture

Throughout Small Unit

Allowed for small tract agriculture in "B-2" habitat in upper Central Creek and the west fork of the Goodpaster River, nearly contiguous parcels with reasonable potential access.

Grazing not allowed due to carnivore, ungulate, and disease problems. Guidelines required to minimize

conflicts between humans and grizzly bears, and wild ungulates and crops.

Not allowed in other "B-2" habitat and in "B-1" river corridors due to higher habitat quality, and access required through high quality habitat.

Agriculture is considered to be marginal in these mid-elevation, highly dissected hills with steep slopes, and should be developed only in limited areas.

VIII A Forestry

Shaw Creek Drainage

Not allowed in "B-2" and "B-1" habitat due to habitat quality, high human use of wildlife, long access routes, and presence of large forest reserve areas with easier access just west of this area.

South Fork of Goodpaster River

All of these parcels allowed for personal use or commercial forestry in "B-1" and "B-2" habitat. Access can be developed through the forest reserve or adjacent "B-2" and "C" habitat lands. Human use of wildlife is relatively low in these areas.

VIII A Minerals

Throughout mineralized area

Neither exploration nor development allowed in "B-1" river corridors due to critical salmon spawning habitat and other high wildlife values.

Exploration and development allowed in "B-1" habitat outside of river corridors, and in "B-2" habitat, with guidelines as for the western and central Alaska Range, Small Units VII B, C, and D.

VIII B Settlement

Lake George

Allowed in full in "B-1" habitat as a low density remote settlement due to good access via lake and forestry reserve, and high quality settlement land. Public use areas, access to back country, and buffer strips must be maintained as public land along the lake and the Tanana River.

Lower Billy Creek

Not allowed in "B-1" habitat due to very high wildlife habitat quality, high subsistence and recreational use.

VIII B Agriculture

"C" habitat areas throughout

Allowed in total for small tract agriculture. Grazing not allowed due to potential conflicts with grizzly bears and caribou. Access to areas northeast of T Lake must avoid conflict with "B-1" habitat around the lake and along Billy Creek, with high waterfowl and moose values and high human use.

With one exception, not allowed in higher elevation "B-1" habitat due to higher wildlife values, conflicts with grizzly bears and caribou, and lower feasibility for agriculture. One patch allowed to extend into "B-1" habitat adjacent to a "C" patch north of the forest reserve, due to good access and contiguous area. Guidelines required to minimize human-grizzly bear conflicts. Grazing not allowed.

VIII B Forestry

Healy River

Allowed in full in "B-1" habitat, due to proximity to forest reserve.

Northeast of T Lake

Allowed major portion in "C" habitat. Access guidelines as for agriculture in the same area.

Not allowed in minor portion in "B-1" habitat due to much higher habitat quality and more difficult access.

VIII B Minerals

Throughout Small Unit VIII B

Exploration and development allowed, according to general guidelines for the appropriate habitat suitability designation. In "B-1" upland habitat additional guidelines must be followed to minimize grizzly/human conflicts.

VIII C Agriculture

North of Mansfield Creek

Allowed in "C" habitat areas, under guidelines as for Small Unit VIII B.

Not allowed in "B-2" habitat for reasons explained in Small Unit VIII B.

Remainder of Small Unit VIII B

Not allowed in any areas due to conflicts with intensive subsistence and recreational use of wildlife, access through heavily used "B-1" habitat, runoff into heavily fished lakes, poor access and low feasibility in higher elevation areas.

VIII C Forestry

Mansfield Creek Drainage

Allowed in "C" habitat, not allowed in "B-1" uplands, reasons as for Small Unit VIII B.

VIII C Minerals

Throughout mineralized areas

Exploration and development allowed as in Small Unit VIII B.

LARGE UNIT IX

IX A Settlement

Throughout Small Unit IX A

Not acceptable in "B-1" habitat, with one exception, due to high subsistence use of fish and wildlife, recreational use of wildlife, and high habitat quality.

Berry Creek

Small scale project allowed in "B-1" habitat in western part of this Small Unit, due to lower subsistence use and good access from the Alaska Highway.

IX A Agriculture

Throughout Small Unit IX A

Not acceptable, with one exception, in "B-1" habitat due to high habitat quality combined with high subsistence and recreational use.

Bear Creek

One project allowed in "B-1" habitat for small tract agriculture, due to reasonable access and feasible location. Guidelines required to minimize human-wildlife conflicts. Grazing not allowed, due to wildlife conflicts.

IX A Minerals

Exploration and development allowed in "B-1" habitat according to general guidelines. Critical habitat areas such as peregrine falcon nesting cliffs closed to mineral entry.

SMALL UNIT IX B

Settlement, agriculture, and forestry all allowed in "C" habitat area around Tok. The exact locations and mixture of these uses in this area should be determined by others with expertise in the appropriate resource. Statewide resources plan must be consulted and followed.

IX B Settlement

Tok Area

Allowed in any form in "C" habitat area, not to extend south of Old Eagle Trail.

Porcupine Creek, northeast of Tetlin

Allowed as limited remote settlement in "B-1" habitat with a public land corridor between this settlement and the FY85 Dennison remote.

Elsewhere in Small Unit IX B

Not allowed in "A-2", "B-1", or "B-2" habitat areas due to high subsistence and recreational use of wildlife and high habitat quality.

IX B Agriculture

Tok Area

Allowed as small scale agriculture (family farms) on suitable soils in "C" habitat area near Tok, between Eagle Trail and Alaska Highway.

Elsewhere in Small Unit IX B

Not allowed in "A-2", "B-1", or "B-2" habitat areas due to high subsistence and recreational wildlife use, and

high habitat quality, and availability of suitable soils with good access in Tok area.

IX B Forestry

Tok Area

Allowed in any form in "C" habitat area, between Alaska Highway and Eagle trail.

Elsewhere in Small Unit IX B

Not allowed in "A-2", "B-1", or "B-2" habitat areas due to high subsistence and recreational use of wildlife, high habitat quality, large amounts of forest reserve land, and availability of forested land in "C" habitat around Tok.

IX B Minerals

Throughout mineralized belt

In "B-1" wetlands and flats along the Tanana River and around Lake Mansfield, Fish and Wolf Lakes, exploration and development allowed only under a strict lease hold system to avoid conflicts with heavy subsistence and recreational use of wildlife.

In other areas of Small Unit IX B, exploration and development allowed according to standard guidelines for the applicable habitat designation.

LARGE UNIT X

X A, X B Settlement

West Fork Robertson River

Not allowed in "B-1" habitat due to high potential for human-grizzly conflicts, and incompatability with controlled use big game management objectives for the adjacent Macomb Plateau area.

X A, X B Agriculture

Throughout Large Unit X

Not allowed in any location, in "A-1" and "B-1" habitat. Feasibility of agriculture in alpine tundra and high elevation valleys seriously questioned. Severe conflicts with high quality wildlife habitat; between grizzly bears, humans, and domestic animals; between domestic and

wild ungulates; between wild ungulates and crops. Disease transmission to Dall sheep, caribou makes grazing not allowable.

X A, X B Minerals

Throughout mineralized area

Critical habitat sheep mineral licks: closed to mineral entry.

Prime sheep habitat in "B-1" habitat category (outlined on map): exploration for and development of minerals under lease-hold arrangements only, with restrictions on the nature and extent of surface disturbance and seasonal use. Critical lambing cliffs and winter range may be identified in the future and may be closed to mineral entry or covered by more stringent guidelines.

Other "B-1" habitat: open to mineral exploration and development with strict guidelines for development including restrictions on seasonal use.

LARGE UNIT XI

XI A Settlement

Throughout Small Unit XI A

Allowed at some point(s) in a strip along and east of the Alaska Highway in "B-2" and "C" habitat for any type of settlement. Swampy areas along Gardiner Creek excluded due to unsuitability for settlement and due to high human use of waterfowl. Public land corridors must be maintained to allow access to backcountry.

Not allowed in areas distant from Alaska Highway in "C" habitat due to poor access and desireability of limiting settlement to certain areas.

XI A Agriculture

Throughout Small Unit XI A

Not allowed in "B-2" habitat in upper Gardiner Creek due to higher habitat quality, moderate human use, and lower feasibility for agriculture at these higher elevations.

Allowed in one location in "C" habitat for small farms, due to access through settlement and large single suitable land area.

Not allowed in other "C" habitat due to low feasibility for agriculture in steep, rugged hills and problems of runoff into Tetlin NWR wetlands.

XI A Minerals

Throughout mineralized area

Allowed in "C" habitat subject to general guidelines.

LARGE UNIT XII, exclusive of FNSB central area

XII J Settlement

Along Steese Highway

Allowed only in some part(s) of "B-2" habitat north of the highway, due to relatively lower wildlife value and human use. Low density remote settlement. Actual area disposed of to be limited to a small proportion of the mapped disposal area.

Not allowed in "B-1" habitat, Chatanika River corridor and headwaters due to high human use and high wildlife values.

XII J Minerals

Throughout mineralized area

Entire area open to mineral exploration and development, according to general guidelines for "B-1" and "B-2" habitat with emphasis on required maintenance of state water quality standards for fish spawning and rearing and for contact recreation.

XII K Settlement

Mt. Ryan area, West Fork of Chena River

Allowed in "B-2" habitat only, due to relatively lower wildlife habitat suitability and human use, reasonable access; presence of Far Mountain disposal already in this area; and preference for keeping settlement within limited areas away from high habitat value and high human use river corridors. Remote low density settlement only, total disposal acreage limited to a small part of total area mapped. Public land corridors required along trails.

Elsewhere in Small Unit XII K

Not allowed in "B-1" and "B-2" habitat due to conflicts with high human use, high wildlife habitat suitability, and access only along high value river corridors.

XII K Agriculture

Not allowed in "B-1" and "B-2" habitat areas due to high human use and high habitat values in river corridor, problems of siltation and chemical contamination of grayling spawning and fishing in river due to runoff from floodplains or upland tracts, only potential access along river through high value habitat, and grazing conflicts with sheep and caribou. Agriculture is not considered feasible in these steep, rugged hills and narrow dark valleys.

XII K Minerals

Middle Fork of Chena River

Mineral exploration and development allowed in "B-1" and "B-2" habitat areas, under general guidelines and with a strong emphasis on maintenance of water quality standards for fish spawning and rearing and for contact recreation.

XII N Agriculture

Salcha River corridor

Not allowed in "B-1" river corridor and adjacent "B-2" uplands due to: conflict with high human use; high overall wildlife values; major spawning habitat for king salmon; only reasonable access would be along high value river corridor; runoff of silt and chemicals would degrade fish habitat, fishing values.

XII N Forestry

North of Salcha River and South Fork of Salcha River

Not allowed in "B-2" and "B-1" habitat areas, because development of access would increase mining activities on upper Salcha River; presence of large areas for forestry with better access in lower Salcha and Goodpaster drainages; conflicts with high human use, high overall wildlife values, potential runoff problems into king salmon spawning habitat.

XII N Minerals

Entire Salcha River Basin

Closed to mineral exploration and development in "B-1" habitat along river corridors, due to critical king salmon spawning habitat.

Open to mineral exploration and development in "B-2" habitat uplands and "B-1" habitat uplands, with strict regulations to maintain water quality for salmon spawning

and to limit development of access routes through higher habitat suitability areas along the river.

LARGE UNIT XIII

XIII Settlement

Mount Pillsbury area

Not allowed in "B-1" habitat due to high habitat quality and difficulty of access across the Delta River.

XIII Agriculture

Eureka Creek area

Not allowed in "B-1" habitat due to high habitat quality and human use, potential conflicts between domestic animals and carnivorous wildlife, and potential disease transmission from domestic animals to wildlife.

The feasibility of agriculture in this area where elevations range between 3000 feet and 4000 feet is questioned.

XIII Minerals

Throughout Large Unit XIII

Exploration and development allowed in "B-1" habitat according to guidelines given for Small Units VII B, C, and D.

FAIRBANKS NORTH STAR BOROUGH

Settlement

120—Aggie Creek, and east of Aggie Creek
121

Allowed in "C" habitat, including small extensions into "B-2" habitat along the Elliott Highway, for remote settlement.

122—Washington Creek reoffer

Allowed in "B-2" habitat for remote settlement.

123—Hayes Creek reoffer

Not allowed in "B-1" Chatanika River habitat due to high habitat quality and human use, and use of the river for access.

Allowed in "C" habitat along the Chatanika River as a low density remote.

125—Walk-to-it

Not allowed in "A-2" and "B-1" habitat along the Chatanika River due to high habitat quality and very high human use, and access via "A-2" habitat along the river.

Allowed in "C" habitat north of the river corridor for low density remote settlement.

126—(west of McCloud)

Not allowed in "B-2" habitat due to the land being a part of the Forest Reserve.

127—(portion—Murphy)

Allowed in "B-2" habitat for residential subdivision.

128—Left Fork reoffer

Allowed in "C" habitat for remote settlement.

129—Emma Creek

Allowed in "C" habitat for residential subdivision.

132, (north and west of Ester Dome)
133

Not allowed at all in "B-1" habitat along Goldstream Creek and "B-2" habitat on Ester Dome due to high habitat value, human use, and high numbers of mining claims in these areas.

134—(east of Ester Dome)

Not allowed in "B-1", "B-2", and "C" habitat due to habitat values, human use, and high numbers of mining claims.

136—Any Creek reoffer

Same as no. 125, Walk-to-it.

137—(south of Vault)

Allowed in "B-2" habitat (raised from "C" by human use) due to good road access.

138—(near Fox)
139

Allowed in full in "B-1", "B-2", and "C" habitat due to present settlement and past mining activity, for residential subdivision.

140—Smallwood

Allowed in "C" habitat for residential subdivision.

141—(north of Tungsten)

Allowed in "C" habitat for residential subdivision.

142—(near Pedro Creek)
143

Allowed in full in "B-2" and "C" habitat due to proximity to Steese Highway and mining roads, for residential subdivision. Many mining claims in this area must be avoided.

144—(west of Little Willow)

Not allowed at all in "A-2" and "B-1" habitat along the Chatanika River due to high habitat quality and very high human use adjacent to the river.

145—Bears Den

Allowed in "B-2" habitat (raised from "C" by human use) due to good road access, and lying north of the Chatanika river riparian zone.

146—(east of Elliott Highway, mile 16)

Allowed in "B-2" habitat for residential subdivision.

147—Little Willow

Same as 144.

148—Skiview

Allowed in "C" habitat for resort or recreational development.

149—(east of Chatanika townsite)

Allowed in "B-1", "B-2", and "C" habitat as low density remotes, due to reasonable access from the Steese Highway and not lying along the very high habitat value and human use riparian zone of the Chatanika River.

150—(south of Kokomo remote)

Same as 149.

151—Crooked Creek

Western extension not allowed in "B-1" habitat due to high habitat value and human use, and access across the very high habitat value and human use riparian vegetation zone along the Chatanika River.

152—(north of Kokomo remote)

Not allowed in "B-1" habitat between the Chatanika River and Steese Highway due to proximity to campground, encroachment or high quality riparian habitat and very high use area.

153—(north of Steese Highway, mile 39-45)

Same as 149.

154—Riverview '84, White Mountain '84

155

Same as 149.

Agriculture

Not allowed in "B-1" river corridors due to high habitat quality and moderately high human use.

Allowed in "B-2"and "C" habitat areas.

Chapter 9

Fish and Wildlife Goals and Recommendations

October 19, 1983

FISH AND WILDLIFE GOALS AND RECOMMENDATIONS FOR THE TANANA BASIN AREA PLAN

I. INTRODUCTION

This paper presents recommendations on how the State should manage and address certain issues dealing with the fish and wildlife resources in the Tanana Basin. The recommendations are based on a close evaluation of the Fish and Wildlife Element paper, and the goals and objectives outlined in the Statewide Natural Reosurces Plan.

The first part of this chapter outlines statewide goals and objectives and discusses how land use classifications in the Tanana Basin can help to achieve those goals. Specific information on fish and wildlife in the Tanana Basin and on human use of those resources, gathered in the Fish and Wildlife Element paper, is used as the basis for relating statewide goals to the Tanana Basin. The discussion centers on whether the goals are reasonable, and to what extent they should guide land allocations and management decisions during the development of the Tanana Basin Area Plan.

Based on an evaluation of the statewide goals, the second part of this chapter was developed. This section discusses how the fish and wildlife resources in the Tanana Basin will be managed to move the State toward meeting the goals outlined in the first section. This chapter makes specific recommendations regarding how land with fish and wildlife values will be allocated to different uses and also how that land will be managed.

II. RELATIONSHIPS OF STATEWIDE FISH AND WILDLIFE HABITAT GOALS TO THE TANANA BASIN

A. Maintain a Land and Water Habitat Base

Statewide Goal: The State will maintain in public ownership suitable land and water areas in order to provide for the habitat needs of fish and wildlife resources.

In the Tanana Basin, sufficient undeveloped state land is available to fulfill this goal. In order to produce fish and wildlife, lands and waters reserved for a habitat base must be of high quality and form an interconnected network. The lands should be chosen to support the diversity of wildlife species used by basin residents in both consumptive and nonconsumptive ways. More than critical and special value areas are required; lands and waters providing high quality habitat during all seasons and for all life cycle functions of wildlife and fish are necessary. Due to the relatively low productivity per unit area of even the highest quality habitat in the Basin (compared to the most productive areas of Alaska), large areas of land are required to support wildlife populations of a sufficient magnitude to survive natural fluctuations in numbers and to allow for human harvest. Large land areas free from development are also necessary to carry out habitat enhancement through the use of prescribed burning. Fire suppression has decreased the amount of

high quality habitat available for some wildlife species important for human use, such as moose.

As is true throughout Alaska, demand for consumptive use of several fish and wildlife species in the Tanana Basin greatly exceeds supply. In some parts of the basin, permit drawings have been established for big game species, including Dall sheep, bison, and moose. In other areas, seasons and bag limits for big game species such as moose and caribou have become more restrictive over the years. This trend is expected to continue as the number of people living in the Basin increases and access is improved. If the land and water base available as habitat is decreased, fish and wildlife populations can be expected to decrease as well, further increasing the gap between supply and demand. The decrease in numbers of fish and wildlife would not necessarily occur in direct proportion to loss of habitat lands or waters, but might be either greater or less.

Local availability of fish and wildlife resources is important to both rural and urban residents of the Tanana Basin. Therefore, even if supply exceeded demand in another area of the state, a habitat land base would continue to be necessary in the Basin. One of the most common themes voiced in public meetings regarding the Tanana Basin Area Plan was an interest in perpetuating wildlife resources. Rural residents, in particular, rely on local availability of fish and wildlife. On the basis of survey results presented in DNR's Outdoor Recreation Plan, availability of local hunting and fishing opportunities is one of the major reasons why 71% of Basin residents choose to live in the Tanana Basin.

B. Ensure Access to Public Lands and Waters

Statewide Goal: The State will ensure access to public lands and waters for the purpose of providing and/or enhancing the responsible public use and enjoyment of fish and wildlife resources.

Ensuring access to public lands and waters is of equal importance to the maintenance of a habitat land base. Clearly, a network of high quality habitat lands and waters is of little benefit to wildlife users if legal and practical access to those lands has not been reserved and, if appropriate, developed. Access conflicts are developing in the Tanana Basin, when corridors or public use easements and customary or traditional access have not been reserved along routes to state land which lie across Federal lands transferred to private ownership. The State and the Fairbanks North Star Borough have not transferred a high percentage of their lands in the Tanana Basin to private ownership, but if this is done, reservation of access to remaining public lands will become increasingly more important for two reasons. First, transfer of public lands to private ownership or to uses that preclude public access and use of wildlife can block access to remaining public lands and waters. Second, a decreasing public land base will concentrate use on the remaining lands and intensify access conflicts unless feasible access is reserved. As mentioned earlier, local lands are extremely important, making reservation of access to all public lands throughout the Tanana Basin essential.

C. Mitigate Losses of Fish, Wildlife and Their Habitats

Statewide Goal: Where development is to occur, the State will seek to maintain as much fish and wildlife habitat as is possible in conjunction with any development project that is undertaken.

As will be explained in detail by the following goal, economic diversity is both desirable and anticipated within the Tanana Basin. Availability of land for mining, forestry, agriculture or settlement has been a concern expressed in public meetings in certain Tanana Basin communities. When deciding what types of development to encourage and where to do so, it is important to realize that there is a limited amount of high quality land in the Tanana Basin, and that the same lands and waters that have high habitat value are often those with high forestry, agriculture, or settlement value. Almost any development of state land to realize a potential non-wildlife use decreases its current value as a producer of fish and wildlife by reducing the extent, quality, or useability of the habitat by wildlife. However, decrease in habitat value can be minimized through mitigation, by the proper siting of developments and/or by tailoring the methodology of construction/design. The intent of mitigation is to minimize the impacts of developments to fish and wildlife, by planning so that development projects occur in a manner that will allow the productive capacity of the land to be maintained. For example, proper forestry practices can enhance habitat values for certain wildlife species.

The high value of fish and wildlife to Tanana Basin residents and the fact that demand for certain wildlife species exceeds supply, render it essential that development projects must be sited and designed to minimize impact on fish and wildlife resources in the Tanana Basin.

D. Economic Diversity

Proposed Statewide Goal: The State will protect fish and wildlife resources which contribute to the regional and state economy directly and indirectly through commercial, subsistence, sport, and nonconsumptive uses.

A diversified economy can provide the benefits of long term economic stability to residents of the Tanana Basin, desirable for urban and rural dwellers alike. Fish and wildlife resources have provided a base for long term, nonsubsidized economic activity with substantial direct and indirect benefits to the state and to Tanana Basin residents in the past and continue to do so. Enhancement of fish and wildlife yields is also possible, and should be considered as a part of economic development plans.

Direct economic benefits from consumptive use of fish and wildlife resources in the Tanana Basin, include, for example, jobs in guiding, trapping and commercial fishing. The latter is a major source of income statewide as well. Indirect benefits include, for example, jobs created from spending by residents and nonresidents who pay for hunting and fishing experiences in the Basin. Data collected as part of the Tanana Basin Area Plan illustrates that the use of fish and wildlife resources is presently contributing more than $79.9 million (1983 dollars) annually to the economy of the Basin, and employs the fulltime equivalent of 872 people directly

and 827 people indirectly. Consumptive use of fish and wildlife resources presently support more jobs that any other element of the Plan, with very low social and environmental costs.

Non-consumptive use of fish and wildilfe resources in the Tanana Basin, such as birdwatching, tourism, or nature photography, also generates direct and indirect economic benefits. These benefits were not included in the above analysis, but were considered in the recreation element.

It is not possible to precisely determine the correlation between economic benefit and the maintenance of high quality fish and wildlife habitat. However, it is reasonable to expect that if a substantial loss of high quality habitat to development of other resources occurred, a substantial decrease in economic activity related to wildlife would also occur. It has been demonstrated that both consumptive and non-consumptive users of wildlife are unlikely to expend the same, or more, effort and money to obtain such experiences under more crowded, less aesthetic and less productive conditions.

Fish and wildlife resources support additional uses and values which are not included in the above economic evaluation, particularly in the rural economy. In the mixed economy, harvesting of fish and wildlife resources for food and trade supplement employment in the cash economy. These are forms of employment and income which are very important to the livelihood of rural residents of the Tanana Basin, although they cannot be expressed in standard economic terms at our current level of knowledge of subsistence use.

Fish and wildlife resources are currently contributing substantially to the economy of the Tanana Basin. This contribution is self-regenerating. Allocating lands to other uses means replacing this existing value with a potential one. In order to protect the economic diversity and long term economic health of the Tanana Basin, it is important to assess whether the value potentially gained by an alternative land use truly offsets the renewable fish and wildlife value lost, both directly and indirectly.

E. Conclusion

In relation to the four statewide fish and wildlife habitat goals, discussed above in reference to the Tanana Basin, the fish and wildlife element and the Fish and Wildlife and Recreation Alternative derived from the element were designed to achieve the following results:

- Maintain fish and wildlife populations at or above current levels by retaining in public ownership a network of high quality habitat lands and waters capable of providing the best opportunities for habitat enhancement (This is related to the first and third statewide goals).

- Maintain or increase the current opportunities for sustained use of fish and wildlife resources (This is related directly to the second goal).

- Provide for economic diversity and balanced development, and meet reasonably expected demand for lands for other uses by allocating lands to those uses where the land suitability for the other resource use is high and where conflicts with fish, wildlife, and recreation are minimized (This is related to the fourth statewide goal, and also to the third).

The following two principles, in addition to the statewide goals, guided development of the wildlife habitat and human use suitability categories and maps, and the Fish and Wildlife and Recreation Alternative.

- It is most important to retain in public ownership a system of lands that will produce and sustain wildlife in numbers sufficient to allow management aimed at satisfying demand, rather than to retain public use areas that are not high quality habitats. This is based on the premise that public use can be shifted (e.g., through development of access), if necessary, to where wildlife resources are, while wildlife production cannot, in general, be shifted to other areas if valuable habitat is lost. The wildlife suitability map (Chapter 7 of the Fish and Wildlife Element) is based on habitat value and human use, but designed so the two values can be disaggregated. If possible, important public use areas will be retained regardless of habitat quality, but when tradeoffs are necessary high quality habitat will be favored over human use areas.

- Local preferences for land uses should be considered in developing land use alternatives and the draft plan. Particularly in rural areas of the Tanana Basin, residents strongly favor classification of surrounding lands as Wildlife Habitat. If other resource use activities are allowed to occur in these areas, such should be conducted in a manner to protect fish and wildlife values. If this cannot be done, the reasons should be stated explicity and justified in terms of the appropriate regionally interpreted statewide goals and the overall goals of the Tanana Basin Area Plan.

III. RECOMMENDATIONS

A. Legislatively Designated Fish and Wildlife Areas

The Alaska Legislature has recognized the need for designating and preserving a portion of Alaska's outstanding natural habitat and its associated fish and wildlife values. This legislative recognition is manifested in statutes which authorize establishment of State Refuges, Sanctuaries, Critical Habitat Areas, Range Areas, and Endangered Species Habitat (AS 16.20.020-320). These statutes provide that each special area will be managed by the Alaska Department of Natural Resources, subject to the close cooperation and concurrence of the Alaska Department of Fish and Game, to preserve those unique aspects for which each area was specially designated. Generally, the cited statutes also prescribe a conservation purpose for each type of area, delineate boundaries for each special area, require submittal and approval of development plans, or provide for preparation of area management plans and regulations.

The Tanana Basin Area Plan has provided an opportunity to identify special areas that meet the criteria for legislative designation. Due to the uncertainties of the political process, some of the areas that meet the biological criteria may not receive official designation. Therefore, it is imperative that the planning process identify these special areas and provide the necessary management to protect fish and wildlife values.

This section defines the criteria proposed for each of the five special area types which pertain only to state-owned portions of the Basin.

Where clear statutory guidance was found to be absent, the areas are described by past department policies and management practices. These definitions, therefore, represent Department of Fish and Game interpretation to some extent.

I. State Game Refuge

Statutory Purpose: "...to protect and preserve the natural habitat and game populations in certain designated areas of the state." AS 16.20.020.

Description: State game refuges are characterized by the objective of maintaining or increasing the traditional distribution and normal abundance of fish and wildlife. In this light, refuges are areas where for some reason, e.g. man's activities, species are or could be lost or displaced, and the habitat value and wildlife use of the area could be appreciably altered. The intent of a refuge is to maintain or reestablish a cross-section of the species and habitats of a given locale for continued use and enjoyment by the general public.

Management Practices: Management of a refuge, while recognizing the need to maintain a diversity of species and habitats, focuses on a featured species or groups of species. Management intensity will vary with the refuge and may include habitat development, rehabilitation, or enhancement. Compatible land uses will continue in refuges under permit stipulations that ensure maintenance of the fish and wildlife resources and continued use by the public. Compatible human use of refuges and their fish and wildlife populations is encouraged.

Areas Identified as State Game Refuges: Minto Flats (Waterfowl Refuge); Tok River (Game Refuge).

2. Fish and Game Critical Habitat Area

Statutory Purpose: "...to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose." AS 16.20.220

Description: A critical habitat area provides one or more necessary elements to the life cycle of a species, groups of species, or population, and each element is crucial to the perpetuation of that

species or population. Alteration of this habitat element would appreciably decrease the likelihood that the species or population could perpetuate itself.

Management Practices: Critical habitats should experience only minimal disturbance. Management focuses on maintaining the unique or uncommon character, quality, or productivity of the area's ecosystem. Nondisruptive recreational use and enjoyment of the habitat and species is allowed insofar as those activities are made possible by regulations of the Boards of Fisheries and Game. Other human activities are allowed by permit if the activity is compatible with the protection of the designated habitat and non-disruptive to local species. Development in critical habitat areas will be restricted to a greater extent than on refuges.

Areas identified as Critical Habitat: Toklat Springs, critical salmon spawning area; Alaska Range, critical sheep mineral licks; Alaska Range, critical caribou calving areas.

3. State Game Sanctuary

Statutory Purpose: "...preserving the natural habitat and fish and game" of the sanctuary. AS 16.20.120 and 16.20.170

Description: State game sanctuaries are created for the primary purpose of preserving the traditional distribution and normal abundance of species and their habitat. A sanctuary consists of undisturbed habitat utilized by an uncommonly large or unique assemblage of a population. It is a well defined area where particular attention is focused upon the species and its habitat for specific reasons. Sanctuaries are areas in which the featured species can find protection and inviolability afforded by an assylum.

Management Practices: Encroachments upon, or alteration of, a sanctuary may conflict with the species' natural habitat, alter its distribution, or may even preclude the likelihood of its survival. Accordingly, management strategies focus on the featured species and may preclude any habitat manipulations, alterations or human uses, if they affect the species' or sanctuary's ecosystem.

Areas identified as State Game Sanctuary: none.

4. State Range Area

Statutory Purpose: "...to protect free-ranging bison on the land...by management of habitat to provide an adequate winter range for the bison. It is also the purpose...to alter seasonal movements of bison herds on the land in order to diminish the damage caused by the herds to agriculturally developed land." Sec. 1, ch. 39, SLA 1979

Description: A State Range Area is an area encompassing the seasonal distribution of particular wildlife species, and in which active manipulation of wildlife habitat is intended.

Management Practices: Unique management practices are used which result in a desired distribution of the subject species within the designated range. Management practices may include supplying forage, altering existing plant cover, etc., in order to redistribute and protect the subject species and ultimately diminish the species' interference with private and public properties. All lawful land and resource use activities are allowed.

Areas identified as State Range Area: none.

5. Endangered Species Habitat

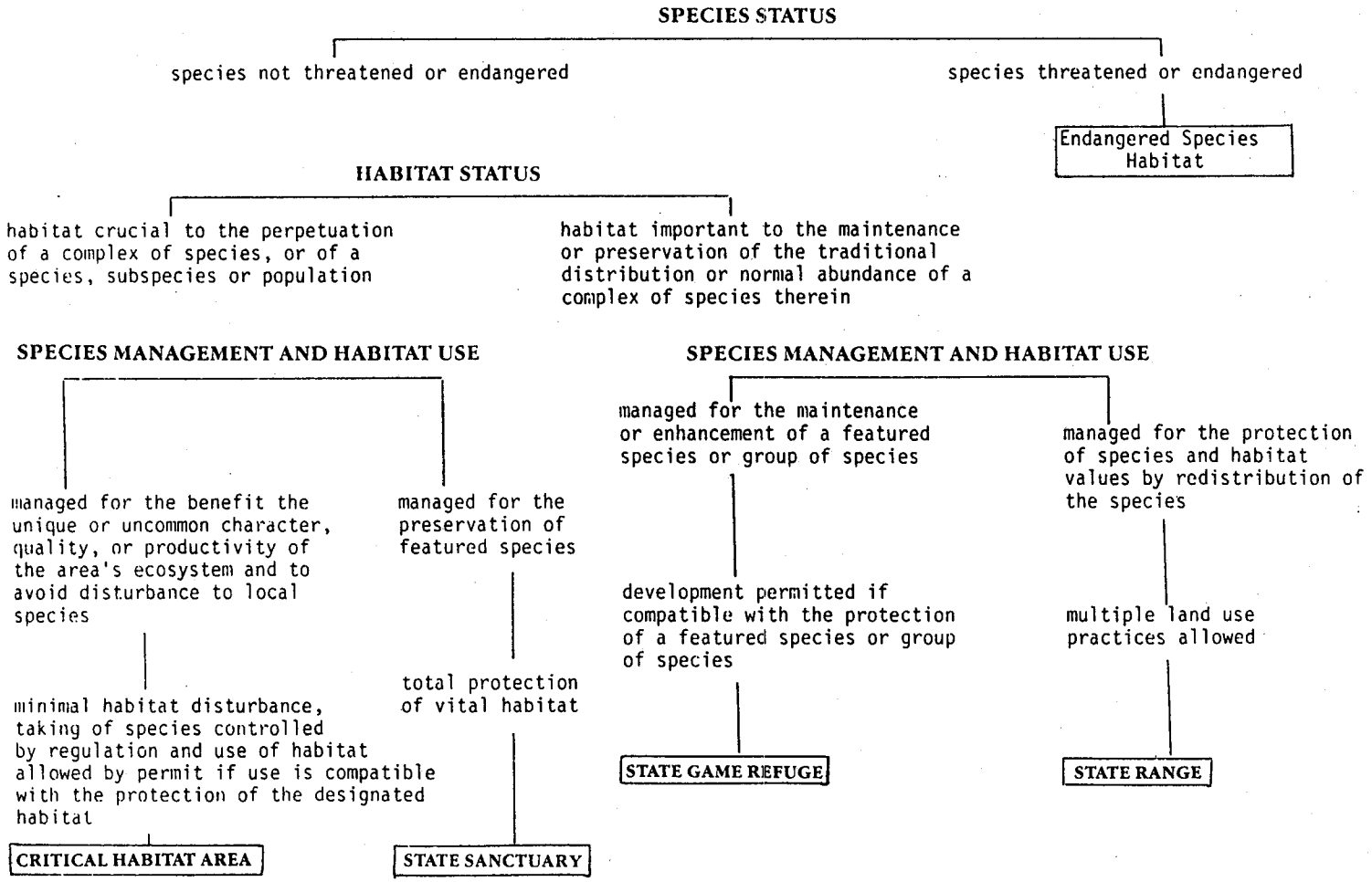
Statutory Purpose: "...to establish a program for...(the) continued conservation, protection, restoration, and propagation..." of fish and wildlife that "are now and may in the future be threatened with extinction." AS 16.20.180

Description: Endangered Species habitat is used by a threatened or endangered species. The habitat has characteristics analogous to critical habitat areas except that the species of concern is identified as threatened with extinction or listed by the state as endangered.

Management Practices: The alteration of this habitat would appreciably decrease the likelihood of the species' continued existence. Consequently, use of, or disturbance to, the habitat will be kept to an absolute minimum number of compatible uses. Use of or disturbance to the endangered species may only occur by permit and only for certain public purposes pursuant to AS 16.20.195.

Areas identified as Endangered Species Habitat: peregrine falcon nest sites as identifed in the fish and wildlife element of the Tanana Basin Area Plan.

CLASSIFICATION OF SPECIAL ALASKA DEPARTMENT OF FISH AND GAME AREAS



B. Single Use—Biologically Critical Fish and Wildlife Areas (A-1)

Criteria: These areas were identified as the highest priority retention lands in the planning area based on wildlife values. Lands in the "A-1" category have unique and valuable qualities that are particularly crucial to the perpetuation of one or more species groups of wildlife. Areas that meet the criteria include, but are not limited to, sheep licks, waterfowl nesting areas, caribou calving areas, peregrine nest sites, and salmon spawning areas. Some of the areas identified as Primary Use Fish and Wildlife have been recommended for legislative designation. All of the areas identified as "A-1" habitat meet the biological criteria and should be considered for proposal for some type of legislative designation within the proposed twenty-year planning period.

Areas Identified as Single Use—Biologically Critical Fish and Wildlife Areas: Identified in the Fish and Wildlife Element and in Alternative 3.

Management Guidelines: Generally, management of these areas will be to maintain the fish and wildlife values. Most other resource activities should be considered incompatible because conflicts may result in harm to the resource or loss of opportunity for use. Maintenance of the utility of these areas for the production and use of wildlife resources should be the primary management concern.

Justification:

1. These extremely important production areas are vital to maintain supply at a reasonable level. For species not used in the consumptive sense, these areas are required in order to prevent extirpation.

2. Critical habitats (defined in the biological sense) are necessary to maintain populations that have important social effects.

3. Loss of production and use of these areas would result in severe impacts on consumer, production and indirect economic benefits that result from wildlife.

4. The dedication of these areas will be a first significant step in constructing a viable system of wildlife-producing lands in the Tanana Basin. In fact, the preservation of critical habitats is a measure of overall environmental quality.

C. Single Use—Special Value Fish and Wildlife Areas (A-2)

Criteria: Special Value areas contain "prime" habitat (as defined in Chapter 4 of the Element) for four or more key wildlife species, except in Dall sheep habitat, where fewer species may occur. These areas are extremely valuable on the basis of biological diversity, productivity, and/or human use of wildlife resources. Special value areas are often heavily used by people as well as being extremely important to wildlife populations.

Areas Identified as Single Use—Special Value Fish and Wildlife Areas: The location and description of special value areas can be found in the Fish and Wildlife Element of the Plan and in Alternative 3.

Management Guidelines: Protection of wildlife values and associated human use should be the primary management goal for Special Value areas. Most resource uses can be viewed as incompatible with this proposed goal. In some cases, seasonal activity may be compatible.

Justification:

1. These are extremely valuable areas on the basis of biological diversity, productivity and/or human use of wildlife resources. Because of the value of these areas in their present or potential states, they deserve dedication to single use management.

2. Over the long term, enhancement practices could increase the value of these areas.

3. It is because these areas do much to satisfy demand - either directly (on-site) or indirectly (through animal dispersal to other areas) that these areas are identified.

4. Local preference will strongly favor retention and dedication of these lands - because this is where these resources are produced and procured. Feasibility is not calculated to the acre. However, our economic information for the Tanana Basin indicated, that the use of wildlife causes sigificant net benefits. Since "A-2" areas are among the most productive, diverse, and heavily used areas in the Basin, it follows that their dedication as single-use wildlife areas is most feasible.

5. These extremely important production areas are vital to maintenance and/or improvement of the supply situation. Remember, demand outstrips supply for many species.

6. These areas are crucial to social values due to their productivity and diversity.

7. The allocation of these areas to wildlife habitat would have benefits disproportionate to their size, and would protect significant environmental values.

D. Multiple Use Wildlife Habitat—Conservative Management (B-1)

Criteria for B-1 areas:

a) Two or more species' (or species groups) prime habitat of an "intensive" nature. Rarely, when justified by circumstances locally, will one species' habitat qualify
b) Two or more species' prime habitat of a dispersed nature, when in upland or subalpine areas that are sensitive to competing uses

c) Areas that do not meet above conditions but support high levels of human use have been upgraded to this class. See suitability map for their location.

Areas recommended as B-1 areas: Areas recommended for this classification are found in the Fish and Wildlife Alternative and in Alternative #3.

Management Guidelines for B-1 Areas: These areas should be retained in public ownership with wildlife production as the primary use. Other activities are allowed as specified in the proposed management guidelines. Because of the difference in species values occurring in each area with a "B-1" Suitability Category, management guidelines will vary. The intent of all guidelines will be to allow production of fish and wildlife resources.

Justification:

1. The key species groups used in the mapping and prioritization processes are in high (and increasing) demand.

2. This category reflects the desires of many speakers at the TBAP public meetings. Several local communities have submitted wildilfe classification requests that closely approximate the fish and wildlife alternative. Support for wildlife habitat is also found within sportsmen's, native, professional guide and trapping groups

3. These areas are essential for the existing levels of wildlife production and use, and must be maintained to provide the opportunity for significant increased benefits in the future.

4. Fish and wildlife economic analyses are not calculated to the acre. However, this type of area is the largest contributor to the large positive net benefit found for fish and wildlife resources. This is because: a) these areas produce amounts of fish and wildlife disproportionate to their land area, and b) they include the places where most people go to use wildlife resources. The feasibility of producing wildlife resources for the benefit of the public is known to high on this type of land.

5. By taking human use areas into account when defining "B-1" areas, the accessibility is automatically guaranteed -- people are already using these areas.

6. The maintenance of these areas in their present (or some future enhanced) state will have a stabilizing effect upon soical conditions, expecially in rural areas. Any loss of integrity of this system will foster negative social effects.

7. The maintenance of the integrity of "B-1" lands and their management for uses compatible with wildlife will have a significant beneficial effect upon the Tanana Basin's environment in the future by protecting water quality, soil integrity, and other natural resources.

E. Multiple Use Wildlife Habitat—Liberal Management B-2

Criteria for "B-2" Areas:

1) One prime habitat value; or
2) One prime and one important habitat value; or
3) Two "dispersed" prime values in lowland areas; or
4) Three or more important habitat values

Areas recommended for "B-2" category: found in the Fish and Wildlife Element of the Plan.

Management of "B-2" areas: should be for multiple use with liberal management to protect fish and wildlife values. Generally it is recommended that these areas be retained in public ownership and managed to provide a mix of land uses while maintaining existing levels of production of wildlife. Specific guidelines for resource activities on "B-2" lands are found in the guideline sheets.

Justification:

1. The species habitat values that were considered on this recommendation are in high demand. These areas reflect production of species important locally, but generally having poorer access and less use than higher priority areas.

2. New access facilities may create more use of these areas, increasing their relative importance in the future. Habitat manipulation may also result in higher relative importance to various species groups. The primary goal should be to maintain or improve the ability of these lands to produce wildlife. As demand increases in the future, the production and use of these areas will increase. Enlightened management will preserve these potentials while allowing other compatible resource activities to occur.

F. Multiple Use Areas—"C" Habitat

Criteria for "C" habitat areas: areas containing two or fewer "important" values.

Areas recommended: are shown in the Fish and Wildlife Element of the Plan.

Management guidelines: these areas could be managed for a variety of uses, including various settlement options. Wildlife values would be protected by the proposed management guidelines.

Justification:

1. These lands do not support the productivity and diversity of valuable wildlife that previous categories do.

2. These lands, in general, do not support local uses to the extent that previous categories do. Habitat manipulation or changes in access

status may increase the value of these areas for wildlife or use of wildlife resources. Opportunities to increase production of wildlife in these areas should be given consideration along with other potential land uses. Areas with lower habitat values should be managed to provide the maximum economic benefit possible using the most favorable mix of land use. Fish and wildlife values should be protected to the maximum extent possible.