

KOYUKUK RIVER MOOSE MANAGEMENT PLAN

2000-2005

Unit 24 and the northern portion of Unit 21D



Photo by Larry B Jennings

*Alaska Department of Fish and Game
Division of Wildlife Conservation*

*In cooperation with the
Koyukuk River Moose Hunters' Working Group*



MARCH 2001

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MISSION STATEMENT

Protect, maintain, and enhance Koyukuk River drainage moose populations and habitats in concert with other components of the ecosystem and provide for fair and equitable human uses of the moose resource.

“All of us here are from across the state with different life styles but we are here for the same reason - so we can continue to hunt and eat moose meat. Even if we disagree on some things we have to compromise and save the moose for future generations.”

- Pollock Simon, Allakaket

“I don’t claim to represent any group other than just the typical Alaska family that wants to get out and pursue game. I grew up in Idaho and my family has always hunted and fished – we never bought meat at the supermarket. I have a small sense of how important game is for those living on the river. I hope through all of this I can learn from the group and keep your passion in mind. And I hope you can learn from my passion and me. I have hunted the Koyukuk for 10 years or so, and I have a real desire to know that my boys can go up there and hunt later in life.”

- Layne Channer, Wasilla

EXECUTIVE SUMMARY

The Koyukuk River Moose Management Plan (KRMMP) was developed through the cooperative efforts of the the Koyukuk River Moose Hunters' Working Group (KMWG or "Working Group"), Alaska Department of Fish and Game (ADF&G or "Department"), and other agencies. The KMWG is a citizen-based advisory body composed primarily of representatives from state Fish and Game advisory committees. The group also includes representatives from the federal Western Interior Regional Advisory Council and commercial operators. Agency personnel have been involved in the planning process as technical advisors. The recommendations of the Working Group were developed through a consensus decision-making process. The process was designed to develop recommendations in time for the March 2000 meeting of the Alaska Board of Game.

At the March 2000 meeting, the Board of Game adopted regulatory proposals that resulted from the planning effort with a few minor modifications. Later that spring the Federal Subsistence Board adopted several proposals to align federal regulations with those recently adopted by the state. The draft plan remained open for public comment through the fall 2000 hunting season. This provided an opportunity to evaluate how the new regulations were working before the draft plan was submitted to the Board of Game for final approval.

ADF&G's Division of Wildlife Conservation initiated the planning process in response to concerns about increasing numbers of hunters and harvest levels and potential affects on moose populations, primarily in the lower section of the Koyukuk River. In 1999, 731 hunters were checked at the Ella's Cabin checkstation and reported a harvest of 367 moose. This compares to 299 hunters harvesting 181 moose 11 years earlier in 1988. In addition to human harvest pressures, it appears that predators are having a significant influence. A survey conducted in spring 1999 indicated an approximate 17% increase in wolf populations over the 1994 estimate. Moose surveys conducted in fall 1999 indicated that moose populations have peaked and have possibly declined by 10% or more.

The KRMMP identifies separate management zones for the upper and lower Koyukuk drainage. These zones are based on differences in moose habitat, populations, and hunting pressure. Using numbers of hunters that participated in the hunt in 1998, the plan recommends establishing a baseline maximum number of hunters in the lower river. This recommendation is based on the consensus of Working Group members on the need to be cautious biologically, and to retain the quality of the hunting experience. The plan identifies the need to monitor harvest levels in the upper Koyukuk River and middle Yukon River area to be sure excess harvest does not develop from displacement of hunters from within the Koyukuk Controlled Use Area (CUA) or other reasons.

As a result of the planning effort, moose hunting regulations in the lower river within the Koyukuk CUA have been significantly changed. The general registration hunt on the lower Koyukuk River has been changed to a drawing hunt with separate resident and nonresident drawing pools. Separate resident and nonresident drawing hunts help to retain opportunity for nonresidents and commercial guides, but at a much lower level than has occurred in recent years. If resident demand continues to increase however, nonresident opportunity will have to be further reduced or eliminated. Because the plan is based on Alaska subsistence laws in

which all Alaska residents are potentially qualified as subsistence hunters, there is potential for subsistence use to increase significantly. If this happens, further restrictive measures would likely be necessary.

As the need to stabilize moose populations in the Koyukuk has become evident and recommendations have been made to reduce human harvest levels, the KMWG strengthened its recommendations regarding control of predation. Initially the group focused on increasing opportunities to harvest predators. The group then agreed to recommend predator control, including aerial wolf hunting, and to urge preparation of an Intensive Management Plan.

The KRMMP includes recommendations that involve other agencies such as the US Fish and Wildlife Service (FWS) or that may require legislative action. For example, the recommendation to revise the definition of wanton waste to allow for successful enforcement of cases where meat is removed from the field but is not kept in a condition suitable for human consumption likely requires legislation. Another recommendation requires hunters to hire guides and transporters that are properly registered with the state. The plan urges cooperation with FWS in matters such as enforcement of illegal guiding and transporting and habitat enhancement.

The KMWG met in December 2000 to review how the regulation changes worked during the fall 2000 hunting season and consider public comments on the draft plan. Members of the Working Group agreed that the fall 2000 season was greatly improved and that both local and nonlocal hunters enjoyed a much higher quality hunt than in the past several years. The group did not recommend any significant changes to the draft plan. The KMWG did agree to recommend that the group continue to meet annually, or more often if needed, to monitor implementation of the plan and possible changes in moose population levels or hunter numbers.

While the KMWG experienced disagreements along the way, members achieved consensus on most issues and exercised a great deal of cooperation and compromise. The Working Group is to be commended for their hard work and dedication to protect the moose resources of the Koyukuk drainage. The recommendations included in the KRMMP are designed to maintain opportunities and balance the interests of all users within sustained yield and the requirements of state and federal law.

INTRODUCTION

OVERVIEW

The Koyukuk River Moose Management Plan (KRMMP) addresses management of moose within the Koyukuk River basin, an area encompassing over 31,000 mi² of Interior Alaska. The planning area includes all of Unit 24 and the northern half of Unit 21D. A number of communities lie within the Koyukuk drainage including Wiseman, Bettles, Evansville, Allakaket, Alatna, Hughes, Huslia, and finally Koyukuk, which is located at the mouth of the Koyukuk River on the Yukon River (Fig 1). For these villages and also the Yukon River villages of Nulato, Galena, and Kaltag, moose along the Koyukuk are an important subsistence resource. Many Alaskan residents from outside the immediate area also hunt Koyukuk River moose, as do residents of other states and countries. Several commercial big game guiding and transporting companies operate in the Koyukuk area.

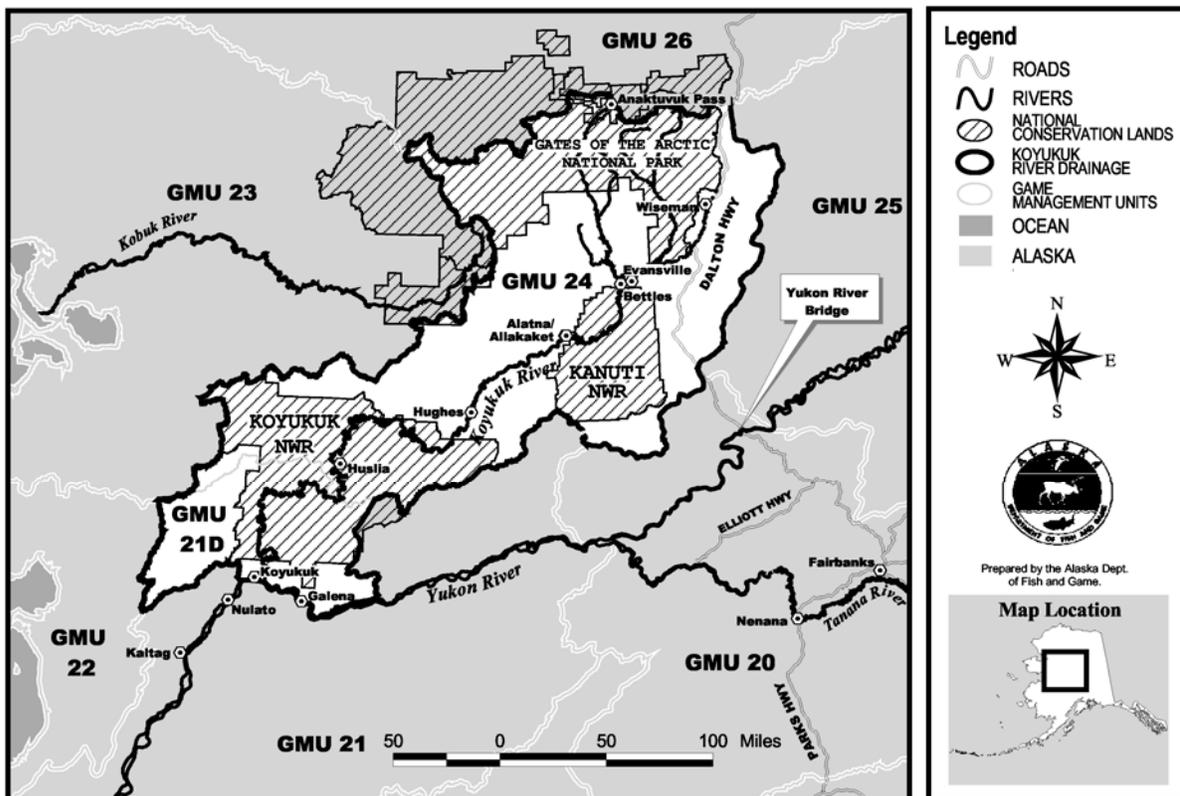


Figure 1 Koyukuk River basin region

Within the Koyukuk River drainage, land is predominately in federal ownership, although there are also state and private lands. The majority of private lands consist of Native allotments and lands owned by Doyon Regional Native Corporation, Gana-A' Yoo, Ltd., Evansville, Inc., and K'oyitl'ots'ina, Ltd. Village Native Corporations. There are three federal Conservation System Units within the Koyukuk drainage including the Koyukuk National Wildlife Refuge, Kanuti National Wildlife Refuge, and Gates of the Arctic National Park and Preserve (Fig 1). Remaining federal lands, including the Dalton Highway and trans-Alaska

Pipeline corridor, are managed by the Bureau of Land Management. The Koyukuk River is a navigable waterway, and land below the ordinary high water line is owned by the State of Alaska.

The state and federal governments have overlapping management responsibilities for subsistence hunting. While the State of Alaska is responsible for management of wildlife and hunting by both residents and nonresidents on all lands in Alaska, the federal government is responsible for protection of subsistence uses on federal public lands and their authorities can supercede state regulations if needed to protect subsistence uses. The Koyukuk River Advisory Committee (KRAC) and Middle Yukon River Advisory Committee (MYAC) serve as the state Fish and Game advisory committees for the region. The Western Interior Regional Advisory Council (WIRAC) is the federal advisory body for management of subsistence uses on federal lands in the area.

Moose were unusually abundant in the lower Koyukuk River for the last 10–15 years and this abundance attracted many hunters. The Alaska Department of Fish and Game (ADF&G or “Department”) in cooperation with the Koyukuk and Kanuti NWRs, has monitored moose populations and harvest levels during this period of increased hunting activity. The KRAC, MYAC, and some villages have expressed concerns about the continuing trends of increasing hunter numbers and harvest levels, and have submitted proposals to the Alaska Board of Game (Board) related to Koyukuk moose. Residents of Koyukuk River villages have sought an increased role in managing the local moose resource, and to this end established a group called the Koyukuk River Basin Moose Comanagement Team. Similarly, nonlocal Alaskan hunters with concerns about Koyukuk moose management have submitted proposals to the Board.

Proposals submitted by local residents or advisory committees often conflict with proposals or testimony before the Board from nonlocal residents. These differing views create a difficult situation for the Board in making regulatory decisions that are acceptable to a wide range of Koyukuk moose users.

PLANNING PROCESS

This plan was developed through the cooperative efforts of ADF&G and the Koyukuk River Moose Hunters’ Working Group (KMWG or “Working Group”). The process was designed to provide for coordination with federal land managers and the federal subsistence management program. State and federal agency personnel participated in the planning effort as technical advisors.

The KMWG is a temporary body created to advise the Department on Koyukuk River moose management. The KMWG is intended to supplement the existing advisory committee system by providing a forum to bring local and nonlocal hunters together to work on developing management recommendations. While Working Group members are primarily representatives of advisory committees, great care is taken to ensure that the role of the advisory committees remains in place.

The KMWG is composed of representatives of the Koyukuk River, Middle Yukon River, Fairbanks, Matanuska Valley, Anchorage and Kenai/Soldotna advisory committees.

Additional members represent the federal Western Interior Regional Advisory Council and commercial guides. Members of the KMWG are:

- Hugh Bifelt, Hughes, Koyukuk River Advisory Committee
- Layne Channer, Wasilla, Matanuska Valley Advisory Committee
- Gary Dawkins, Soldotna, Kenai/Soldotna Advisory Committee
- Rueben Hanke, Kenai, Anchorage Advisory Committee
- Gilbert Huntington, Galena, Commercial guides
- Orville Huntington, Huslia, Koyukuk River Advisory Committee
- Benedict Jones Koyukuk, Western Interior Regional Advisory Council
- Greg Machacek, Fairbanks, Fairbanks Advisory Committee
- Royce Purinton, Nulato, Middle Yukon River Advisory Committee
- Pollock Simon, Allakaket, Koyukuk River Advisory Committee
- Rudy Sommer, Huslia, Koyukuk River Advisory Committee
- Michael Stickman, Nulato, Middle Yukon River Advisory Committee

The US Fish and Wildlife Service (FWS) provided funding for two additional WIRAC members, Ron Sam and Jack Reakoff, to attend Working Group meetings. During the planning process Rudy Sommer resigned from the Working Group because he was no longer able to attend meetings. Jack Wholecheese participated in the December 2000 Working Group meeting.

Technical advisors included ADF&G's Division of Wildlife Conservation (Glenn Stout and David James), Division of Subsistence (Dave Andersen and Polly Wheeler), and the Board Support Section (Jim Marcotte); Division of Fish and Wildlife Protection (Brett Gibbens); Koyukuk National Wildlife Refuge (NWR) (Gene Williams and Joanna Roberts); Kanuti NWR (Tom Early, Lisa Saperstein, and Greg McClellan); Gates of the Arctic National Park (Dave Mills and others); Bureau of Land Management (Ruth Gronquist); Bureau of Indian Affairs (Ida Hildebrand); FWS Office of Subsistence Management (Vince Mathews and Pete DeMatteo); and Tanana Chiefs Conference, Inc. (Gabe Sam). Randy Rogers, the ADF&G Region III Wildlife Management Planner, coordinated the project and facilitated all meetings of the Working Group. Other than the ADF&G staff, the Koyukuk NWR staff has been the most actively involved in the planning effort.

A basic premise of the Working Group was a consensus decision-making process, rather than majority-rule voting. Since it was uncertain if consensus could be reached on all issues, provision was made to identify alternative points of view, if needed. During Working Group meetings all persons in attendance were invited to participate by identifying issues of concern, suggesting solutions and commenting on actions being proposed. The major steps in the planning process included:

- Conducting a thorough information review to develop a common understanding of the existing management situation.
- Identifying major issues of concern that needed to be addressed.

- Establishing goals and objectives to address the identified issues.
- Developing ideas for alternative actions to resolve issues.
- Evaluating alternative actions to determine what actions will be most effective, feasible and acceptable to the broadest possible range of user groups.
- Seeking consensus on recommendations for management goals, objectives and actions.

After the May, June, and August meetings of the Working Group, a meeting summary was distributed to a mailing list that includes advisory committees, village councils, city offices and all persons who signed-in at meetings or expressed an interest in the process. Following the October 1999 meeting, the preliminary recommendations of the KMWG were distributed for public review. During October and November, public information meetings were held in Koyukuk River and middle Yukon villages, and presentations were made at several advisory committee meetings and at a meeting of the WIRAC. In November a flyer entitled “Ella’s Cabin Moose Checkstation News” was sent to all Alaska residents who registered at the checkstation during the fall 1999 hunting season. The intent of the flyer was to ensure that all Koyukuk moose hunters are aware of the planning effort and the opportunity to comment on the plan. Comments on the Preliminary Recommendations were accepted through December 3, 1999. The KMWG met December 3–4, 1999 and reviewed public comments on the preliminary recommendations and data from the fall 1999 moose surveys. On February 10, 2000 the group reviewed the regulatory proposals submitted to the Board by the Department on behalf of the Working Group and the draft Koyukuk River Moose Management Plan 2000–2005 and made final recommendations to the Department. Members of the Working Group who were present agreed by consensus that the draft KRMMP, with the revisions they requested at the meeting, adequately represents their recommendations and should be forwarded to the Board of Game.

At the March 2000 meeting, the Board of Game adopted most of the regulatory proposals that resulted from the planning effort. Later that spring the Federal Subsistence Board adopted several proposals to align federal regulations with those recently adopted by the state. The draft plan remained open for public comment through the fall 2000 hunting season. This provided an opportunity to evaluate how the new regulations were working before the draft plan was submitted to the Board of Game for final approval.

There were six written comments received during the comment period, including letters and e-mail. Four of these urged that nonresident permits for the general hunt in the Koyukuk CUA be reduced or eliminated to favor Alaskan resident’s use of the resource. Several persons also commented on the need to reduce predation. In separate telephone conversations, two people commented that the Department should exercise its authority under 5 AAC 92.052(13) to not allow drawing permits to be awarded to children under the age of 10.

To further assess hunter attitudes on the new regulations, the Department sent a Koyukuk CUA moose hunters’ survey to nearly 600 persons who obtained either a general drawing permit or subsistence registration permit for the area. In the preliminary analysis of the survey results, 74% of the respondents felt that the regulation changes were needed. Satisfaction with the fall 2000 Koyukuk CUA moose hunt was rated as “highly acceptable” or “outstanding” by

57% of respondents and another 28% rated the hunt as “average.” Over 75% of the respondents felt that the number of other hunters they saw during the fall 2000 hunt was “about right.” There was a large volume of comments submitted with the survey, many of which suggested that predation is the number one cause of moose mortality in the area. Overall, the survey responses indicate that hunters felt the regulation changes were needed and were working well.

The KMWG met in December 2000 to review how the regulation changes worked during the fall 2000 hunting season, consider public comments on the draft plan, and review responses to the Koyukuk CUA moose hunters’ survey. Members of the Working Group agreed that the fall 2000 season was greatly improved and that both local and nonlocal hunters enjoyed a much higher quality hunt than in the past several years. The group did not recommend any significant changes to the draft plan. The KMWG did agree to recommend that the group continue to meet annually, or more often if needed, to monitor implementation of the plan and possible changes in moose population levels or hunter numbers.

The KMWG addressed numerous challenges throughout the planning process. Prior to the first meeting local and nonlocal hunters shared skepticism about the planning process and how much progress might be made while an extremely divisive statewide battle over subsistence management was taking place. Members of the Working Group had to set aside concerns over a lawsuit pending against the Department regarding Koyukuk River moose management and continue to do their best to develop and devise sound management recommendations. Members of the Working Group who are involved in the Western Interior Regional Advisory Council have defended the plan against several proposals to the Federal Subsistence Board that would have undercut the agreements reached in the planning effort. The volume of hunters and resultant congestion that occurred on the lower Koyukuk River in the fall 1999 hunting season exceeded everyone’s expectations. Finally, recent moose survey data indicate the likelihood of a population decline. Because of these factors, some of the recommendations that result from this plan go beyond what was anticipated at the beginning of the process by nearly all involved. The degree of consensus that has been achieved is a testimonial to the dedication and commitment among Working Group members to work together to protect the moose resource of the Koyukuk River Basin.

The expected life of this plan is 5 years. Some changes in the management program may be necessary within this time period. Future productivity of the moose population, predation levels, and weather patterns are all unknown. Likewise, it is impossible to predict the effect of all management actions recommended in this plan on total harvest levels. Therefore, the plan contains guidelines that are intended to provide flexibility adequate to meet conservation and allocation challenges.

ORGANIZATION OF THE PLAN

Following this introduction, Background Information provides the information necessary to better understand the current management situation and the recommendations of the plan. It includes data on habitat, predation, moose population trends, harvest levels, and commercial activity levels.

The dual state and federal systems of wildlife management in Alaska add complications to the planning process and point to the need for coordination and cooperation among managers and all wildlife users. There are limitations on the management options available under both the state and federal systems. A few of the major factors involving state and federal subsistence law and predator control are outlined in Management Considerations. An understanding of these factors is crucial to developing an understanding of the reasoning behind the plan and what the range of viable management options are, as well as the possible ramifications of no action or inadequate action.

Issues of concern identified by the Working Group are listed on page 14. While many of the recommended management actions are directed at the lower river area because of the higher level of hunting pressure, some of the issues are much the same throughout the Koyukuk Basin.

Management Recommendations describes the management intent, goals, objectives and actions that are the key components of this plan developed through the consensus decision-making process of the KMWG. This section also includes the intensive management population and harvest objectives for Units 21D and 24 established by the Board of Game, recommended harvest rates for the Koyukuk CUA, and biological decision-making factors to be considered in managing overall harvest rates within the Koyukuk River basin.

BACKGROUND INFORMATION

HABITAT

There are few detailed habitat studies of the Koyukuk River drainage. The study completed by Jandt (1992) used remote satellite imagery to analyze vegetation types over much of the lower Koyukuk. In combination with moose radiotelemetry studies, this work proved very valuable in demonstrating the importance of the riparian habitats near the Koyukuk River and other major drainages. Riparian habitat is where moose browse species such as willow, birch, and other deciduous vegetation are most abundant. The lower Koyukuk River below Hughes has broad areas of riparian habitat and is where the highest concentrations of moose are found. Kielland (1997) conducted a study evaluating the nutritional quality of several willow species in the Three-day Slough section of the Koyukuk River, and concluded willow in that area are nutritionally higher in quality compared to willow in other areas of Interior Alaska.

PREDATION

The role of predators in the Koyukuk River drainage was studied cooperatively by FWS and ADF&G in the 1980s on the Kanuti NWR and Koyukuk NWR. Moose are the predominant prey species in the lower Koyukuk drainage for wolves. Except during winter, if migrating caribou become available, moose are the major prey species for wolves in the upper Koyukuk as well. The density of wolves in the upper Koyukuk was estimated to be 10.4 wolves/1000 km² during a Kanuti study completed in 1991 (Wilk and Osborne 1991). A population estimate completed on the lower Koyukuk River revealed 8.7 (± 1.2) wolves/1000 km² (Becker et al. 1998). An aerial reconnaissance survey completed in 1999 indicated a wolf density 17% higher than the 1994 estimate (12.4 wolves/1000 km²). For the upper and lower Koyukuk River drainage, current wolf:moose ratio estimates are 1:40 to 1:28,

respectively. Osborne et al. (1991) estimated mortality of moose calves less than 9 months of age. Black bears killed 40% of all radiocollared calves, followed by wolves (9%), unknown predators (8%), grizzly bears (3%), and other unknown causes (5%) (total mortality rate = 65%).

MOOSE POPULATION STATUS

Aerial trend count surveys are the most common moose monitoring surveys used on the Koyukuk River drainage and provide the most continuous data sets available. Trend counts are conducted in the highest density areas because counting the greatest number of moose possible provides for more reliable evaluations of sex and age ratios. Sex and age ratios are the most important aspect of trend count surveys. However, site-specific densities from Trend Count Areas (TCA) are useful in identifying changes in moose numbers over time or for relative comparisons to other TCAs. The Three-Day Slough TCA is the most notable TCA with data going back to 1981. Densities climbed throughout the 1980s and peaked around 1993 at more than 13 moose/mi². Survey data from the past few years indicate the density may be declining. However, survey conditions in 1999 were marginal and may have compromised the results. Conditions in 2000 precluded the fall survey in Three Day Slough altogether. The bull:cow ratio in the Three Day Slough TCA in 1999 was 18 bulls:100 cows. In general, most trend count survey results in the drainage suggest declining densities. However, it is not known if these trends represent the kind of moderate fluctuations that were documented in the past or if the trends are of a longer or more permanent magnitude. Moose densities fall off dramatically on the upper Koyukuk River drainage north of Hughes due mostly to habitat limitations.

Moose population estimates were conducted in 1987 and 1997 on the lower Koyukuk River drainage on a 1509-mi² area including the high-density moose areas as well as lower density nonriparian habitats. Population estimation surveys are important tools in wildlife management, but interpretation is based on the understanding that individual surveys for a given year are “pictures in time” that do not tell us which direction a population may be going without several years of continuous data. Moose densities for the 1509-mi² portion (Unit 21D) of the survey in 1997 were estimated to be 2.15 moose/mi². By comparison, a 1993 survey summarized by Martin and Zirkle (1996) on the upper Koyukuk River (Unit 24) showed densities of 0.45 moose/mi² on the Kanuti NWR, which is typical for most of Unit 24.

Estimates of the number of moose in Unit 21D, based primarily on the 1997 survey and previous estimates throughout the unit, suggested a population of 9000–10,000 moose. However, trend count surveys like those conducted in Three-Day Slough in 1998 and 1999, indicate declining numbers of calves and yearling bulls (Table 1). Low recruitment of calves into the population explains most of the decline in the population throughout Unit 21D. With a unitwide decline of approximately 10% since 1997, the current estimate is 8500 ± 1000 moose.

Table 1 Three Day Slough Trend Count Area aerial moose composition counts

Regulatory year	Survey area (mi ²)	Bulls:100 Cows	Yrlg Bulls: 100 Cows	Calves: 100 Cows	Twins:100 cows w/calves	Moose counted	Moose/mi ²
1991–1992 ^a	83.3	34	10	31	6	909	10.9
1992–1993	83.3	35	10	31	7	1088	13.1
1993–1994	83.3	38	8	25	4	1106	13.3
1994–1995	83.3	36	9	28	5	1026	12.3
1995–1996	83.3	23	7	36	6	1054	12.7
1996–1997 ^a	83.3	24	8	23	4	928	11.1
1997–1998 ^a	83.3	20	9	24	3	721	8.7
1998–1999	83.3	30	9	13	0	990	11.9
1999–2000 ^a	83.3	18	3	14	6	546	6.6
2000–2001 ^b							

^a Low snow years/late surveys; potential survey errors associated with distribution, sightability, bull moose shedding antlers, etc.

^b No survey completed in regulatory year 2000–2001.

The 1998 estimate of 11,000–15,000 moose in Unit 24 was based primarily on surveys conducted in 1989 and 1993 on the Kanuti NWR, in 1997 on the Koyukuk NWR, and a 1987 survey conducted within the Gates of the Arctic National Park. The 1999 survey for that portion of Unit 24 upstream of Hughes was 4956 ± 1050 . The previous estimate was a maximum of 7500 moose, so the decline in that portion of Unit 24 is estimated to be on the order of 25%. Combined with the estimate for Unit 24 downstream from Hughes, revised to be a maximum of 4000 moose, the population estimate for all of Unit 24 is 9000 moose ± 1500 .

MOOSE HARVEST

Harvest increased steadily within the Koyukuk CUA of the lower Koyukuk drainage during the past 10 years. In the Koyukuk CUA in 1999, 731 hunters were checked and they harvested 367 moose. This compares to the 299 hunters that harvested 181 moose in 1988 (Fig 2). But, because of the changes to hunt regulations for regulatory year 2000 (regulatory year 2000 = 1 Jul 2000 through 30 Jun 2001), the number of hunters (515) and the number of moose harvested (278) were substantially reduced.

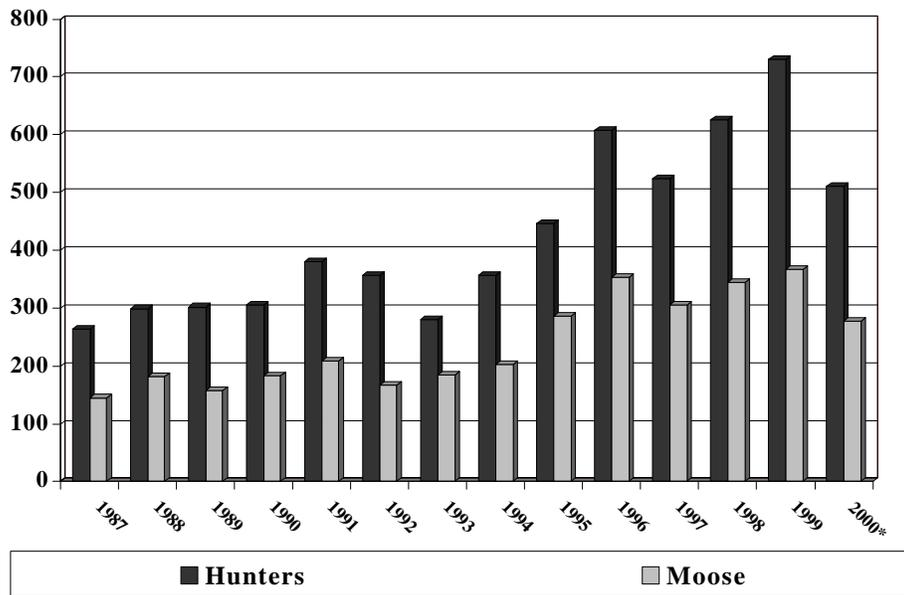


Figure 2 Permits issued and moose harvested, Ella's Cabin checkstation, 1987–2000 (* = preliminary data, data represents harvest for expanded permit area after March 2000 regulation changes)

The demographics of the hunt from 1988 to 1998 were characterized by an increasing number of nonlocal residents (265% since 1988; 121 vs. 321 hunters) and nonresidents (630% since 1988; 20 vs. 126 hunters). Success remained constant during that time, as did the age and antler width of the bulls harvested on the lower Koyukuk. Annual harvest by humans was approaching the general guidelines of sustainability with the 1998 harvest on a 5400-mi² area of the lower Koyukuk River drainage in the range of 6.5–7% of the estimated population. The 1998 harvest for the entire drainage (Units 24 and northern 21D) was approximately 3.5–4% of the estimated population. It is apparent that harvest in Units 21D and 24 was increasing steadily, particularly in the past decade. Harvest and estimated unreported harvest are shown in Figures 3 and 4 for Units 21D and 24.

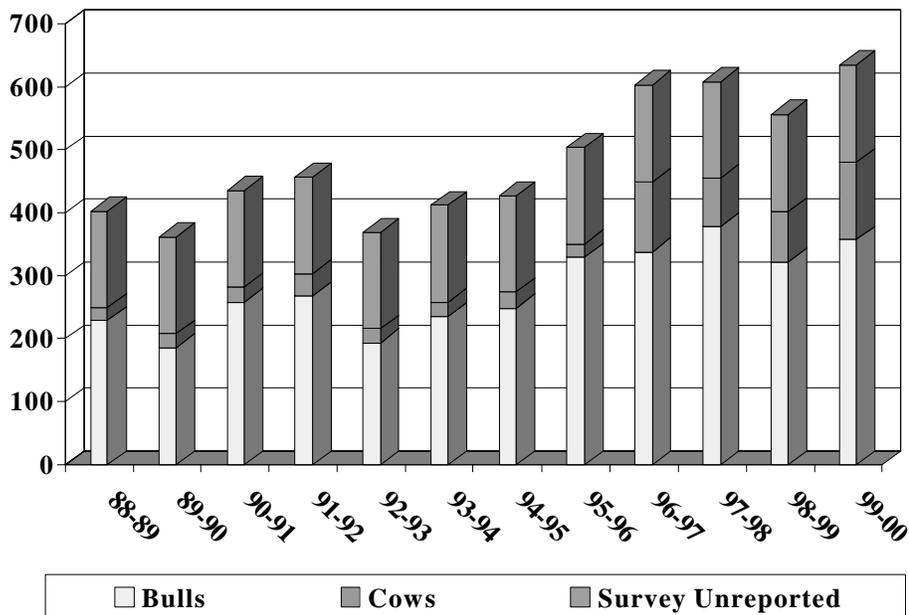


Figure 3 Unit 21D moose harvest, 1988–1999

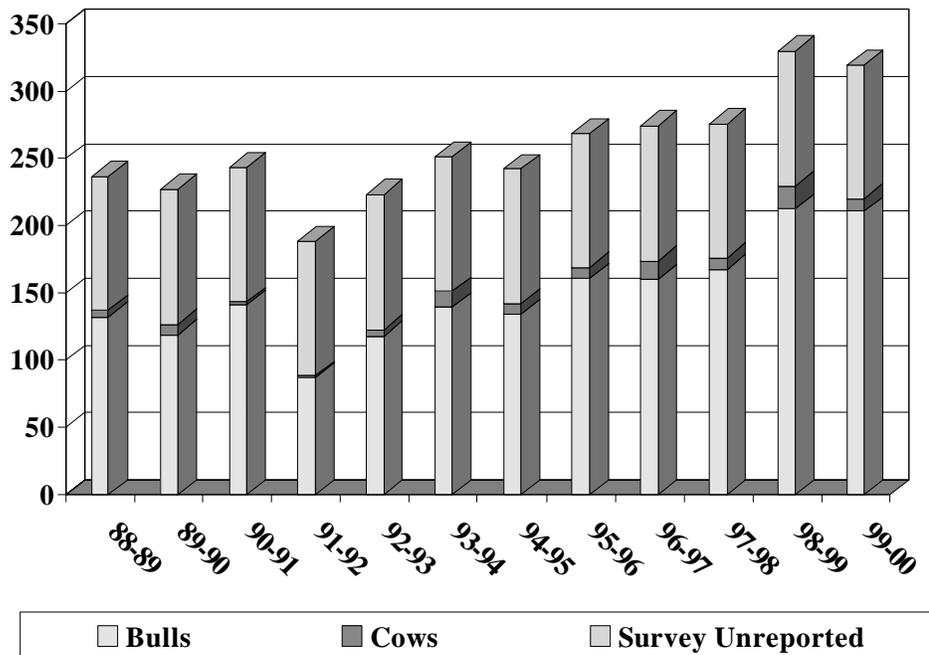


Figure 4 Unit 24 moose harvest, 1988–1999

COMMERCIAL ACTIVITIES

In Units 21D and 24 combined, 8–13% of the hunters who submitted harvest reports used commercial services of some kind (Fig 5). As the total number of hunters increased, the proportion using commercial services remained relatively constant. Fifty-five of the 1332

hunters who submitted harvest reports in regulatory year 1999–2000, used registered guides. Apart from the legally reported guiding operations, there was increasing public concern and opposition toward illegal guiding or transporting activities. This is an important issue to land management and law enforcement agencies.

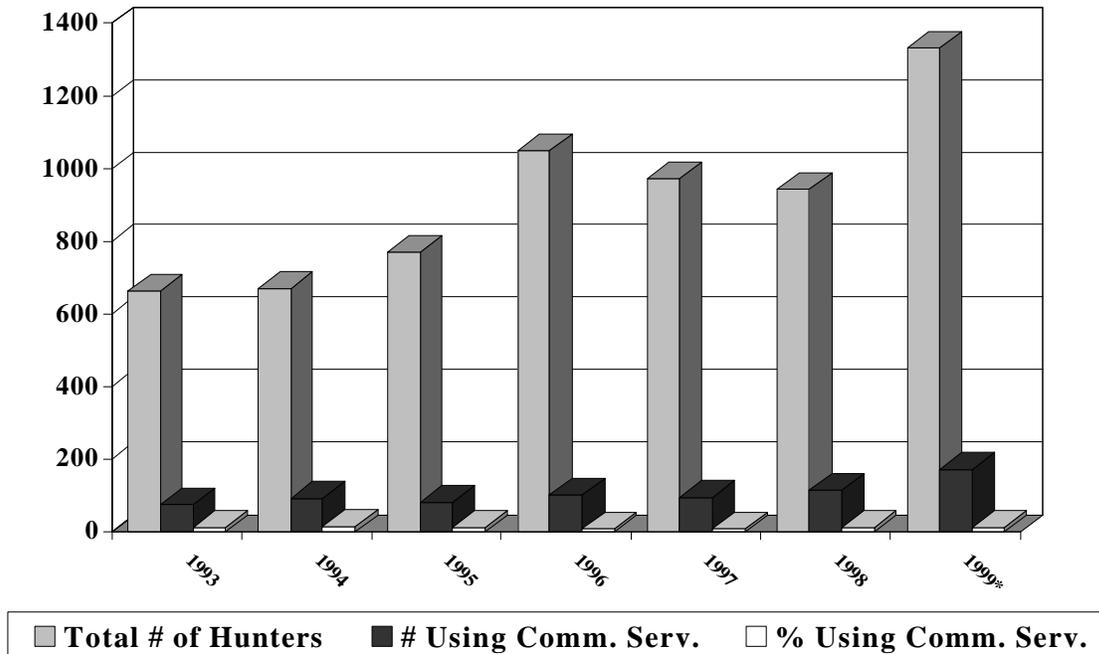


Figure 5 Number of moose hunters and hunters using commercial services in Units 21D and 24, 1993–1999 (* = preliminary data)

MANAGEMENT CONSIDERATIONS

State law includes a priority for subsistence use of fish and game and an intensive management law that provides criteria for restoring abundance or productivity of moose populations to achieve human consumptive use goals adopted by the Board of Game. Federal law has significant influence on both subsistence management and other aspects of management such as predator control. The following narrative provides insight into these issues as they affect Koyukuk moose management. It is in no way intended to be a comprehensive review.

SUBSISTENCE MANAGEMENT

Interactions of State and Federal Law

State allocation of hunting opportunities must be done according to the subsistence use and allocation criteria laid out in AS 16.05.258. It is important to note that under state law, all Alaska residents are potentially eligible as subsistence hunters. This conflicts with the federal requirement in the Alaska National Interest Lands Conservation Act for a subsistence priority for rural residents only.

In 1990, because the state was not in compliance with the federal rural subsistence priority, the federal government assumed management of subsistence hunting on federal lands in Alaska. For the most part, federal subsistence hunting regulations in the Koyukuk River drainage have been consistent with state hunting regulations. The notable exception to this is the closure of federal public lands in the Kanuti CUA to the taking of moose except by federally qualified subsistence users, that is, rural residents of Unit 24, Anaktuvuk Pass, Koyukuk and Galena. Federal control of subsistence would be exerted on additional federal lands in the area if state management does not adequately provide for rural subsistence uses.

Nonetheless, state law does contain a subsistence priority and an overview of how it is implemented is provided below. The unsuccessful litigation that had been proceeding against the Department regarding Koyukuk River drainage moose subsistence management highlights the importance of the Department and Board carefully complying with state subsistence law.

Board of Game Allocation Procedures

In making allocation decisions, the Board must first consider if there are customary and traditional subsistence uses of the game population. If there is a positive customary and traditional finding, the Board must determine if a portion of the game population can be harvested consistent with sustained yield (“harvestable surplus”). If a harvestable surplus for the particular population exists, then the Board must determine the amount reasonably necessary for subsistence uses. The Board then adopts regulations to provide a reasonable opportunity for subsistence uses. Hunting regulations for other uses may be adopted by the Board after regulations are adopted to provide a reasonable opportunity for subsistence.

The Board has made a positive customary and traditional determination for moose in Units 21 and 24. Because of the positive customary and traditional determination, the Board has adopted regulations providing for reasonable opportunity for subsistence use when making allocation decisions regarding Koyukuk moose. If the status of the moose resource demands reduction in hunting opportunity, the Board must make a reasonable opportunity finding and uses other than subsistence must be restricted first.

The Board makes allocation decisions within a four-level framework based on the harvestable surplus of the wildlife resources consistent with sustained yield and the level of hunting demand. The four levels are:

- 1 Determination of sufficient harvestable surplus for all consumptive uses.
- 2 Sufficient harvestable surplus for subsistence and some, but not all, other uses.
- 3 Sufficient harvestable surplus to provide reasonable opportunity for subsistence uses only (Tier I).
- 4 Insufficient harvestable surplus to provide a reasonable opportunity for all subsistence use. Allocations must be made among subsistence users (Tier II).

During the last several years of moose abundance, particularly in the lower Koyukuk, there has been sufficient harvestable moose to provide for a variety of consumptive uses. As hunter demand continues to increase and/or if the moose population declines, additional steps in the allocation process must be considered. The Board has some degree of discretion in

determining when and how these additional steps are taken; it is not a simple formula decision. For example, where there are sufficient harvestable animals for all subsistence uses, the Board has discretion to determine the allocation of general hunting opportunities between residents and nonresidents, so long as provision is made for residents to take moose for personal or family consumption.

When the level of harvestable animals is sufficient to provide a reasonable opportunity for subsistence uses, but not other uses, opportunities for nonresidents are completely eliminated. This situation is referred to as “Tier I.” Tier I management might limit the business of guides and transporters who may depend largely on out-of-state customers. When there are not sufficient harvestable animals to provide a reasonable opportunity for all subsistence use, then a Tier II management program is required. Under Tier II it is necessary to distinguish among subsistence users. Again, under existing state law all Alaskans are potentially eligible for subsistence. The criteria used to determine who receives Tier II hunting permits are:

- Customary and direct dependence on the game population by the subsistence user for human consumption as a mainstay of livelihood.
- The ability of the subsistence user to obtain food if subsistence use is restricted or eliminated.

The additional criteria for allocation of Tier II permits in AS 16.05.258(b)(4)(B)(ii), “the proximity of the domicile of the subsistence user to the stock or population...” was found by the courts to violate the Alaska Constitution and, therefore, can no longer be applied.

The KMWG struggled with the difficulties of trying to maintain hunting opportunities for a variety of users when hunter participation has steadily increased and the moose population has reached its peak and may be in decline. If the number of hunters continues to increase or if the moose population experiences a decline and cannot support all demands, Tier I and Tier II allocation measures will eventually be required.

PREDATOR CONTROL

State Intensive Management Requirements

Alaska Statute 16.05.255(e)–(g), the Intensive Management statute, requires the Board of Game to adopt regulations providing for intensive management to achieve high levels of human consumptive use. Section (h) of the law defines intensive management as “management of an identified big game population consistent with sustained yield through active management measures to enhance, extend, and develop the population to maintain high levels or provide for higher levels of human harvest, including control of predation and prescribed or planned use of fire and other habitat improvement techniques.”

The Board determined that moose in Units 21D and 24 are important for providing high levels of human consumptive use, and in fall 2000, established intensive management population and harvest objectives (p 32). Intensive management population and harvest objectives provide the Board a means to readily determine if a population has been depleted or has reduced productivity.

If the Board must consider intensive management for a population, the Board will direct the Department to prepare an Intensive Management Implementation Plan in the form of a proposal for consideration at the next Board meeting. Section (f) of the intensive management law indicates that intensive management requirements do not apply if the Board determines that intensive management would be “inappropriate due to landownership patterns.”

Federal and State Constraints

Under the Alaska National Interest Lands Conservation Act that established the Koyukuk NWR, and Kanuti NWR predator control is not specifically prohibited. Written policy of FWS does not prohibit predator control either. However, it is also the policy of FWS to require full analysis and public review under the National Environmental Policy Act before implementing a predator control program on a federal refuge. Not only would this involve a substantial commitment of resources, the outcome would be uncertain.

The policy of Governor Tony Knowles is that he will not reinstate predator control programs unless:

- It is based on solid science;
- A full cost-benefit analysis must show that it makes economic sense for Alaskans; and
- It must have broad public support.

Recent experience demonstrates that by far the most difficult policy requirement is number 3, the need for broad public support. Both the present Governor and his predecessor shut down wolf control programs largely because broad public support was lacking.

Given these constraints, predator control in general and wolf control specifically, was not considered a viable management option during this planning process, although it is widely recognized that biologically and economically, wolf control can be an effective wildlife management tool in some situations.

ISSUES OF CONCERN IDENTIFIED BY THE WORKING GROUP

The primary issues of concern identified and agreed upon by the KMWG include the following:

- The combined mortality factors of human harvest (approximately 7%) and predation (at least 65%) may lead to a decline in Koyukuk River moose populations, particularly if combined with severe winter weather.
- Predation is significant, increasing, and needs to be addressed.
- There has been a great increase in the number of hunters along the Koyukuk River, particularly on the lower river, and the number of hunters may adversely affect the moose population.
- Fish and Game regulations are not being adequately enforced and wanton waste of game meat is occurring on the Koyukuk River.
- Commercial guiding and transporting operations are increasing on the Koyukuk River.

- Guiding and transporting laws are not being adequately enforced within the Koyukuk River drainage and, as a result, illegal guiding and/or transporting is increasing.
- Increasing numbers of moose hunters on the Koyukuk River are affecting traditional subsistence hunting and land-use patterns and the quality of the hunt experience for all hunters.
- Gaps exist in biological information and harvest data concerning Koyukuk River moose.
- There are human-caused environmental impacts along the river and some of these may be affecting the resource.

MANAGEMENT RECOMMENDATIONS

The four main components of the management recommendations of the Koyukuk River Moose Management Plan (KRMMP) include:

- 1 Identification of management zones and the intent for managing moose populations and hunting in each zone;
- 2 Management goals, objectives and actions;
- 3 Intensive Management population and harvest objectives and recommended harvest rates in the Koyukuk CUA, and;
- 4 Biological decision-making factors.

The statement of management intent for each management zone describes the overall intent for managing the moose populations and harvest levels in that area. The statements of management intent, goals, objectives and actions developed by the KMWG are the core of this plan. They address the issues identified by the Working Group, and are intended to be in effect throughout the life of this plan. The management actions outlined in Background Information describe the “tools” to be used in accomplishing the overall goals and objectives of the plan and the management intent for each zone.

The KMWG placed greater emphasis on the lower Koyukuk River due to the greater hunting pressure in that area. Several of the proposed management actions that involve changing moose hunting regulations apply only within the Koyukuk CUA. No immediate changes are proposed for the moose hunting regulations in Unit 24 outside of the Koyukuk CUA, however, careful monitoring of the moose populations and harvest levels is recommended and, if necessary, regulation changes may be proposed in the future. In addition, restrictions on general hunting within the Koyukuk CUA have the potential to shift hunting pressure towards areas on the middle Yukon River. Hunting pressure in the middle Yukon River should be carefully monitored, even though this is not the area covered in this plan.

The harvest levels based on varying moose population estimates recommended by the KMWG can be used to determine how many general hunting permits should be issued in the Koyukuk CUA. The Statements for Management Intent and Biological Decision-making Criteria can be used to evaluate whether revisions to the management program might need to be considered within the duration of this plan. Authorities of the Department and some recommendations in the plan allow for discretion that should provide sufficient flexibility to

address minor changes in management. More significant changes involving revisions to regulations would require advisory committee review and be subject to the Board decision-making process.

If the above factors suggest that significant reductions in harvest might be necessary to protect the moose resource, the Board of Game would be required to apply the allocation criteria of AS 16.05.258 (see Subsistence Management, p 11). In the following management program, the KMWG has recommended a restriction in the level of nonresident hunting opportunity (20% of permits) and a reduction in the level of resident general hunting opportunity (80% of permits) by establishing drawing hunts in the Koyukuk CUA. The plan does not recommend reducing residents' subsistence hunting opportunities, and thereby retains opportunity for residents to take moose for personal or family consumption. As noted in Management Considerations, the Board has discretion in determining when to apply subsistence allocation measures and the criteria are not applied as a simple formula.

MANAGEMENT ZONES

For the purposes of this plan, the Koyukuk River drainage has been divided into two management zones (Fig 6). These two zones are characterized by distinct differences in moose population densities, hunter numbers, and methods of access. The boundary between the two zones is based on preexisting Uniform Coding Units so that moose population and harvest data can be tracked within each management zone.

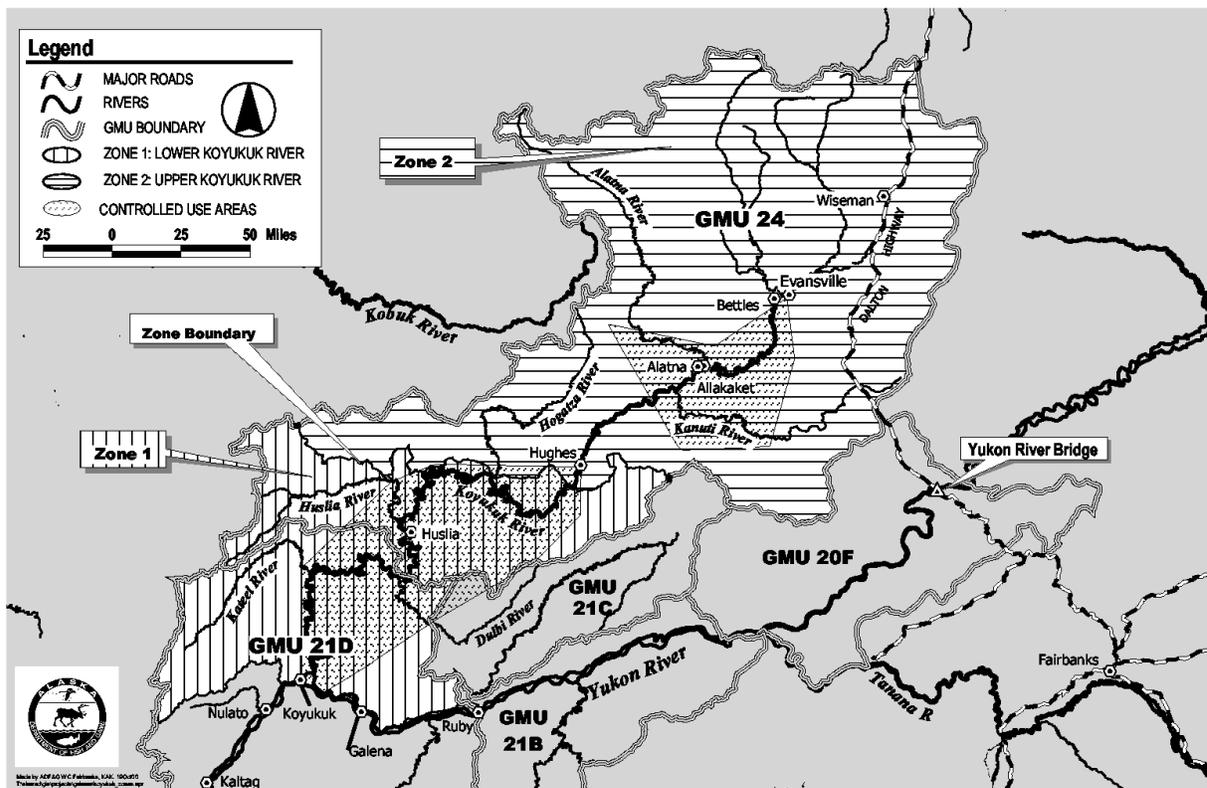


Figure 6 Units 21D and 24 management zones developed by the Koyukuk River Moose Hunters' Working Group

Management Zone 1: The lower Koyukuk River drainage within Unit 21D and the lower portion of Unit 24, generally south of Hughes.

This zone is comprised of the meandering floodplain of the lower Koyukuk River and lush riparian habitats and surrounding hillsides. In recent years this zone has exhibited high-density moose populations and high levels of human consumptive use. Much of the zone lies within the Koyukuk CUA and is closed to the use of aircraft for hunting moose. A large portion of the hunters using this area gain access by boats launched from the Dalton Highway Bridge on the Yukon River and from Galena.

Statement of Management Intent for Zone 1:

Seek to maintain high moose population densities and provide for continuation of a high level of human harvest, while not allowing significant growth in hunter numbers and harvest levels.

Rationale: The management intent for Zone 1 is based on a desire to be biologically conservative with the moose resource and to recognize that the quality of the hunt is an important issue to the hunting public. Excessive crowding can diminish the hunting experience and can also lead to a lower success rate, both of which are important to local hunters and those who travel great distances to hunt in the lower Koyukuk. While there is a desire to maintain a high-density moose population, there may be limits in the ability of the habitat to support the densities of moose enjoyed over the last several years. The numbers to be used as the baseline for the maximum number of hunters and moose harvest comes from the level that occurred in the 1998 fall season.

Management Zone 2: The upper portion of the Koyukuk River drainage within Unit 24, generally north of Hughes

Within Zone 2 the Koyukuk River channel has fewer meanders and more upland vegetation. The far northern portion of Zone 2 is within the Brooks Range and transitions into alpine terrain. Zone 2 has less dense moose populations than the lower Koyukuk River and, in addition, experiences less hunting pressure, although hunting activities are concentrated along the Koyukuk River and other more easily accessed areas. Moose hunters access this zone through a variety of means including aircraft (where allowed) and boats and rafts launched from Dalton Highway access points and communities along the river.

A portion of this zone is designated as the Kanuti CUA and is closed to the use of aircraft for hunting moose. Federal public lands in the Kanuti CUA are closed to the taking of moose, except by rural Alaska residents of Unit 24, Anaktuvuk Pass, Koyukuk and Galena. The northeastern portion of this zone includes the Dalton Highway Corridor Management Area (DHCMA) that extends 5 miles on each side of the Dalton Highway. In the DHCMA only bow hunting is allowed and no motorized vehicles, except aircraft, boats, and licensed highway vehicles may be used to transport game or hunters.

Statement of Management Intent for Zone 2:

Maintain or increase moose populations while providing for continuation of the present moderate number of hunters and level of harvest. Carefully monitor harvest levels along the Koyukuk River corridor, the Dalton Highway Corridor Management Area, and other easily accessed areas to ensure localized depletion of moose populations does not occur.

Rationale: The upper Koyukuk drainage in Zone 2 has lower moose densities than Zone 1 and an increase in the population is desired. Limited tools are available to effect increases in the moose population. Moose populations cannot support intense localized harvest as has occurred within Zone 1. Restrictions on hunter numbers in the lower river may result in increased hunting demand up river, necessitating careful monitoring of hunting pressure. If major decreases in the moose population or increases in harvest occur during the life of this plan, adjustments to the harvest management program may be needed.

GOALS, OBJECTIVES AND MANAGEMENT ACTIONS

This section outlines goals, objectives and actions agreed upon by the KMWG. Priority levels of 1 through 3 (with 1 being the highest priority) are assigned to each action to show the relative importance of the action because Department resources may be limited. The sections on “Discussion and Evaluation” provide further detail on each objective and how success in achieving the objective can be measured. Beneath each action statement there is short “status” narrative explaining what has been done or will be done to implement the measure.

GOAL 1: Manage Koyukuk River drainage moose on a sustained yield basis to provide both hunting and other enjoyment of wildlife in a manner that complements the wild and remote character of the area and that minimizes disruption of local resident’s lifestyles.

Objective 1.1: Establish and/or maintain programs to acquire data on hunter use levels in the Koyukuk River drainage and to ensure proper handling of meat.

Discussion and Evaluation: Information on hunter use levels can be obtained through permit hunt data, with supplemental data from harvest tickets. Inspections to ensure proper handling of meat can occur at checkstations, through periodic random checks in the field, or through Fish and Wildlife Protection enforcement activities. This objective can be evaluated based on the quality of data collected at checkstations or through permit and harvest ticket data analyses, and by qualitatively assessment of the success in enforcing proper handling of meat.

Action 1.1.1: *Expand the area of subsistence registration hunt RM832 and the drawing hunt recommended to replace general hunt RM830 (see action 1.3.3) to apply within the entire Koyukuk CUA. Make subsistence registration permits available in Hughes as well as Huslia and Ella’s Cabin. (Priority 1)*

Rationale: Expanding the area of the general drawing hunt and subsistence registration hunts to the entire Koyukuk CUA will enable better tracking of numbers of moose hunters and harvest levels and help ensure the harvest remains within management objectives.

Status: The Board of Game and Federal Subsistence Board implemented this action during their spring 2000 meetings.

Action 1.1.2: *Continue the mandatory moose hunter checkstation on the lower Koyukuk River. (Priority 1)*

Rationale: Maintaining the checkstation is important to continue building on the moose harvest data accumulated over the years this station has operated, to ensure that the terms of permit conditions are complied with, and that moose meat is not wasted.

Status: The Ella's Cabin checkstation on the lower Koyukuk River was operated during the fall 2000 hunting season and the Division of Wildlife Conservation intends to continue this activity.

Action 1.1.3: *Establish a mandatory checkstation in Huslia to check all moose hunters. (Priority 1)*

Rationale and Discussion: This checkstation is proposed to acquire better data on hunter numbers and harvest levels, to ensure that permit conditions are met in the expanded area of the RM832 subsistence hunt and general drawing hunts, and to enable checking of all moose hunters and meat that arrive in Huslia. The DWC has expressed concern that the amount of additional harvest data that would be obtained by establishing a moose hunter checkstation in Huslia would not justify the cost.

Status: The Board of Game deferred action on a proposal to establish a moose hunter checkstation in Huslia until the spring 2002 meeting when the need for a checkstation can be reevaluated.

Objective 1.2: Maintain opportunities for subsistence harvest of moose by Alaska residents sufficient to meet subsistence needs.

Discussion and Evaluation: It is important to note that providing subsistence opportunities does not necessarily correlate to harvest success. Local resident's subsistence use levels are fairly consistent, however, it is difficult to project the number of nonlocal Alaska residents who may choose to participate in the Koyukuk subsistence hunts. The annual subsistence harvest of moose can be compared to the Board's determination of the amount of moose necessary to meet subsistence needs to determine if a reasonable level of subsistence harvest is occurring. Annual harvest of moose within local communities should be monitored and compared to previous household subsistence use data to evaluate the trends in local subsistence harvest levels.

Action 1.2.1: *Reexamine and update the amounts of moose reasonably necessary to meet subsistence needs in Units 21 and 24. (Priority 1)*

Rationale: The numbers established by the Board in 1992 for the amount of moose reasonably necessary to meet subsistence needs in Units 21 and 24 need to be reexamined in light of improved harvest data for the region.

Status: In March 2000 the Board of Game reevaluated the amount of moose necessary to meet subsistence needs and revised the numbers to 450–550 moose in Unit 21 and 150–250 moose in Unit 24.

Action 1.2.2: *Modify the season for subsistence registration hunt RM832 to begin and end 5 days earlier (Aug 27–Sep 20). (Priority 1)*

Rationale and Discussion: Beginning the subsistence season 5 days earlier will provide subsistence users an opportunity to harvest moose earlier, possibly with less crowding than occurs during the general hunt season. This may also help to reduce the number of hunters in the Koyukuk CUA during the general hunt season.

The Department expressed concern that opening the RM832 subsistence hunt 5 days earlier may result in a substantial increase in participation in this hunt. This concern is heightened because Alaska resident hunters who are not successful in the general hunt drawing for the area may choose to hunt under the subsistence permit hunt so that overall harvest levels may not be reduced. Further, the KMWG has not recommended prohibiting the harvest of antlerless moose in the RM832 hunt and a large cow moose harvest could occur.

Status: The Board of Game moved the subsistence registration hunt season 5 days forward during their spring 2000 meeting. The Department has drafted emergency orders to close the season if it appears that harvest exceeding the sustained yield may occur. In fall 2000 it was not necessary to issue the emergency closure.

Action 1.2.3: *Submit a proposal to the Federal Subsistence Board to shift the fall federal subsistence season within the Koyukuk CUA 5 days earlier to match the proposed change in the state season. (Priority 1)*

Rationale: This action is intended to align the state and federal subsistence seasons to help reduce confusion among users and avoid the need to determine if hunting is occurring on federal lands or on state or private lands.

Status: The Federal Subsistence Board moved the subsistence registration hunt season 5 days forward during their spring 2000 meeting.

Action 1.2.4: *Maintain the distinction between subsistence registration hunt RM832 and the general drawing hunt proposed to replace registration hunt RM830. (Priority 1)*

Rationale and Discussion: There must be a clear way to distinguish between the subsistence hunt and general hunts. The Board of Game has previously determined that trophy use of antlers is not part of the customary and traditional subsistence hunting patterns on the Koyukuk River whereas consumption of the meat of the head is a traditional subsistence practice. Requiring the hunter to destroy the trophy value of

antlers would ensure consistency in application of the permit hunt requirements for hunters who do not pass through the Ella's Cabin checkstation and either reside in or depart through Huslia or Hughes.

Status: The Board of Game endorsed a policy requiring the hunter to destroy the trophy value of any bull moose taken in the subsistence registration hunt by sawing through the palm of at least one antler at the kill site. The head must be salvaged and remain with all the meat to the final point of processing.

Action 1.2.5: *Maintain the existing winter hunting seasons in Units 21D and 24. (Priority 1)*

Rationale: This is to clearly identify the intent to retain the provision in the existing hunting regulations that provides additional subsistence opportunity during the winter.

Status: The winter moose hunting season in Unit 21D is now opened by emergency order when weather conditions are favorable. Winter antlerless seasons will continue to be evaluated on an annual basis in cooperation with the local advisory committees.

Objective 1.3: Once reasonable opportunity for subsistence harvest of moose has been provided, allow resident and nonresident general hunting of moose while ensuring the total harvest is sustainable and within harvest and other management objectives.

Discussion and Evaluation: The ability to provide opportunities for general hunting of moose will be dependent on the availability of a harvestable surplus of moose exceeding the amount necessary to meet subsistence needs and is also dependent on the number of Alaska residents who choose to participate in the subsistence hunt. Success in meeting Objective 1.3 can be evaluated based on whether opportunities for resident and nonresident general hunting are provided and the number of hunters who are able to participate, relative to the management intent for each management zone.

Action 1.3.1: *Apply the discretionary permit authority of the Department to manage the harvest of cow moose within the Koyukuk CUA as needed to meet population, harvest, and other management objectives. (Priority 1)*

Recommendations to implement this action include:

- a) When restrictions in cow harvests are needed, they should first be applied to the general hunt, then to the fall subsistence hunt, and last to the winter hunt.
- b) Following the 2000 hunting season, and after each successive season, the Department should evaluate the biological status of the moose population and work with advisory committees to ensure that ongoing antlerless moose hunts remain within sustained yield.

Rationale and Discussion: The harvest of moose in the Koyukuk CUA is at or near maximum sustained yield. Surveys conducted in 1998 and 1999 showed low calf survival and recruitment rates. Currently, elimination of the cow harvest in the general hunt is needed to offset the lowered productivity of the moose population and increased predation by wolves. Under severe conditions, temporary restriction of cow

harvests in the subsistence seasons may also be necessary to prevent a major decline of the moose population. If future moose survey data show an expanding population or increased productivity, opportunities to harvest cow moose can be reinstated.

The Department expressed concern about recent survey data suggesting a decline in productivity of the moose population and supported a temporary closure of the cow harvest in the RM832 subsistence hunt until the impact of reduced productivity could be more fully assessed. This concern is heightened because of the potential for increase in participation in the RM832 among Alaska residents who are not successful in drawing a general permit and the earlier opening of the subsistence season.

Status: The Board of Game and Federal Subsistence Board retained a 5-day period for the taking of antlerless moose in the Koyukuk CUA and the remainder of Unit 24 for the fall 2000 season. Antlerless moose seasons will continue to be evaluated on an annual basis.

Action 1.3.2: *The Department's existing emergency closure authority can be used, if necessary, to ensure that harvest levels remain within the statements of management intent, goals and objectives of the KRMMP. (Priority 1)*

Rationale: This action is intended to highlight both the Working Group's recommendation and the Department's obligation to ensure that harvest remains within sustained yield principles.

Status: An emergency order was issued to close the 2000 winter season in northern Unit 24 due to concerns about excessive harvest. An emergency order was drafted to close the fall 2000 season in the Koyukuk CUA if overharvest appeared likely to occur but the order was never issued. Use of emergency closures will continue as needed.

Action 1.3.3: *Institute resident and nonresident permit drawing general hunts in place of the RM830 general hunt. (Priority 1)*

Specific provisions recommended for the permit drawing hunts, include:

- a) The number of permits made available will be determined by the Department based on moose population data and will be designed to ensure that the total harvest is consistent with the goals and objectives of the KRMMP. The hunter success rate and other information will be used to project the number of permits that can be issued.
- b) Persons who are successful in drawing a general hunt permit will not be eligible to participate in the RM832 subsistence hunt. This is consistent with the provisions of 5 AAC 92.052(1).
- c) Separate drawing pools should be established for the resident and nonresident general hunts. Eighty percent of the permits available each year should be distributed to the resident drawing pool and 20% to the nonresident drawing pool.
- d) The hunt will be for one bull by drawing. The antlers may remain intact and be retained by the hunter.

- e) The drawing should be held approximately 12 months in advance to allow hunters sufficient time to plan trips.
- f) There should be two separate hunt periods, one from Sep 5–14 and one from Sep 16–25 to spread out hunting pressure for the purpose of minimizing congestion and maintaining the quality of the hunt. Hunters should be required to pass through a checkstation or submit their permit card to the Department within 48 hours of the end of their 2-week hunt period.

Rationale: Since 1990 the number of hunters registering for the Koyukuk CUA has increased from 306 hunters to 731 hunters in 1999 (239%). The harvest of moose has increased from 183 to 369 during the same time (202%). While the moose population was at its peak from 1992–1995 and growing, harvest rates approaching 8–9% could be supported. With the recent indications of a less productive population and possible decrease in number of moose, high harvest rates cannot be supported. Although a variety of regulations have been implemented to prevent excessive harvest in the lower Koyukuk River area over the years, and although the moose population has supported high levels of harvest, current demand by all users exceeds the supply of moose. Logistical preparations and cost of travel by nonlocal hunters to reach the lower Koyukuk require that provisions be made to allow for advance planning and to ensure certainty of participation by hunting partners.

Status: The Board of Game and Department implemented the drawing hunt as recommended by the KMWG with the exception that the 50" or four brow tine antler restriction was retained for nonresidents. The Department was unable to implement the recommendation to accommodate a party of four hunters. In December 2000 the KMWG agreed that the party of four hunters provision was not essential and it has been removed. Beginning with the drawing for the fall 2001 hunt, the Koyukuk moose permit drawing is being done in January, consistent with the intent of provision (e) above.

Objective 1.4: Manage Koyukuk River drainage moose hunting to minimize adverse impacts to private property and local residents.

Discussion and Evaluation: Impacts to private property and local residents is not completely within the control of ADF&G. Actions taken by the Department such as working with private landowners and providing the hunting public with information on private property can help reduce the problem. This objective will require a qualitative evaluation of efforts by the Department to work with landowners and hunters to minimize the problem.

Action 1.4.1: *Work with landowners to provide information on the location of private property at checkstations and permit distribution points. Encourage landowners to post both the beginning and ending of private property along the river corridor. (Priority 2)*

Rationale: Information on the location of private property will assist hunters in preventing unintentional trespass.

Status: Doyon, Inc. provided landownership maps that were posted in the Ella's Cabin checkstation for the fall 2000 hunt. Doyon also sent letters to all drawing permit winners to notify them to be cautious about trespassing on private property in the area.

Action 1.4.2: *Work with land managers and landowners to identify the boundaries of the Koyukuk CUA along the Koyukuk River. (Priority 2)*

Rationale: Marking the boundaries of the Koyukuk CUA as they are crossed while traveling on the river will assist hunters in complying with regulations within the controlled use area.

Status: This will be an ongoing cooperative effort with the Division of Wildlife Conservation and Koyukuk NWR.

Objective 1.5: Maintain opportunities for wildlife viewing, photography, and other nonconsumptive uses of wildlife within the Koyukuk River drainage.

Discussion and Evaluation: This objective is included in recognition of the importance of wildlife viewing and photography to both the hunting and nonhunting public. Maintaining a healthy ecosystem, including the populations of both moose and predator species, will result in providing wildlife viewing opportunities without additional management provisions. At the same time, nonconsumptive users may also be adversely affected by the crowding that has occurred during fall on the lower river. Management actions included in this plan that will reduce crowding among hunters will also benefit nonconsumptive users. A qualitative evaluation of this objective will be required.

GOAL 2: *Protect and enhance moose habitat within the Koyukuk River drainage in order to support existing or, in the case of areas with depressed moose populations, increased population levels.*

Objective 2.1: Manage to enhance key riparian habitats critical to moose populations.

Discussion and Evaluation: Conduct a qualitative analysis of efforts to cooperate with other landowners to maintain or improve riparian habitat.

Action 2.1.1: *Work with the FWS and other land managers and private landowners to ensure moose habitat and habitat enhancement are promoted through land use planning and environmental assessments. (Priority 2)*

Rationale: Through routine agency land use planning and environmental review processes, there may be opportunities to promote habitat enhancement. Submitting comments during these processes can raise the awareness of habitat improvement opportunities.

Status: This will be an ongoing activity as opportunities arise in agency planning efforts.

Action 2.1.2: Cooperate with the FWS and other landowners to conduct quantitative moose habitat surveys and to evaluate, plan and implement prescribed burns to maintain and/or improve moose habitat. (Priority 1)

Rationale: Quantitative habitat surveys are needed to document current habitat conditions and determine enhancement needs and priorities. Prescribed burns can help to maintain successional vegetation important for moose browse.

Status: The Galena Area Biologist has included habitat improvement objectives in the Units 21 and 24 moose management report and initiated discussions with FWS about potential prescribed burn locations.

GOAL 3: *Manage predation on moose so that moose abundance can be maintained or increased, harvest levels by humans can be maintained and populations of predators remain viable.*

Objective 3.1: Provide for increased levels of harvest of key moose predator species (wolves, black bear and brown bear) consistent with existing management objectives for those species.

Discussion and Evaluation: Harvest levels of wolves, black bear, and grizzly bears can be numerically compared to previous years' harvest and species management objectives for evaluation. Increasing harvest levels is dependent on hunters taking more predators and that can be enhanced by modification of harvest limits, tag fees, and seasons.

Action 3.1.1: Modify brown/grizzly bear harvest regulations in Unit 24 and Unit 21D to allow a take of one bear each year for all resident and nonresident hunters. (Priority 1)

Rationale: With the exception of residents hunting under the Northwest Alaska Brown Bear Management Area regulations, current regulations allow a hunter to take one bear every 4 years. Allowing a limit of one brown bear per year may promote a greater bear harvest by hunters who seek to retain the head and claws and do not want to salvage the meat for human consumption. This may contribute to reducing moose predation by brown bears.

Status: The Board of Game adopted the recommended regulation changes. The take of one brown bear in Unit 21D and Unit 24 will count against the limitation of one bear every 4 years that applies in other areas of the state.

Action 3.1.2: Extend the spring season for both general and subsistence hunting of grizzly bears in Units 21D and 24 by 2 weeks to June 15. (Priority 3)

Rationale: Presently the spring grizzly bear season is limited by access difficulties due to the late breakup of rivers. This will help increase grizzly bear harvest in the spring hunt, especially by guided nonresidents, and may help reduce moose predation.

Status: The Board of Game extended the brown bear season in Units 21D and 24 to June 15 and there is a proposal before the Federal Subsistence Board to align the federal and state seasons.

Action 3.1.3: *The Koyukuk River Moose Hunters' Working Group recommends the Alaska Legislature reduce or eliminate the nonresident tag fees for grizzly bears in Units 21D and 24. (Priority 3)*

Rationale: Reduced nonresident grizzly bear tag fees may help increase grizzly bear harvest.

Status: This action will require citizens to work with legislative representatives and there has been no progress to date.

Action 3.1.4: *Modify black bear hunting regulations to allow black bear baiting in the fall in Units 21D and 24 within the Koyukuk River drainage. (Priority 2)*

Rationale: Allowing black bear baiting during the fall hunting season may help increase take of black bears during the time when many hunters are present.

Status: The Board of Game adopted regulations to allow black bear baiting in the fall in Units 21D and 24 within the Koyukuk CUA. A proposal to align the federal regulations will be considered by the Federal Subsistence Board in spring 2001.

Action 3.1.5: *Educate local residents on the relationship between black bear predation and moose calf survival in order to encourage a greater harvest of black bears. (Priority 3)*

Rationale: Many hunters may not be aware of how important black bear predation on moose calves can be in some situations. Providing educational information on black bear predation of moose calves may lead to increased harvest of black bears and reduced predation on moose.

Status: This is an ongoing effort. Harvest of black bears was increased during the fall 2000 moose season, in part due to efforts to inform hunters about black bear predation at the Ella's Cabin checkstation.

Action 3.1.6: *Encourage hunters and local residents to increase the harvest of wolves. Cooperate with FWS and other organizations to provide wolf trapping education in local villages. (Priority 1)*

Rationale: Increasing the harvest of wolves may help to reduce predation on moose.

Status: The Galena Area Biologist has helped to coordinate several wolf trapping clinics in local villages and this will be an ongoing project according to interest and available funding.

Action 3.1.7: *The KMWG recommends that predator control, including aerial wolf control, be implemented to accomplish the objectives of the KRMMP and to be consistent with state*

Intensive Management statutes (AS 16.05.255 [e-g]). The KMWG further recommends that the Board of Game direct the Department to prepare an Intensive Management Plan for the Koyukuk Basin. (Priority 1)

Rationale: The low calf survival and yearling recruitment suggested by recent data is more likely due to bear and wolf predation than hunting pressure by humans. Provisions included in previous sections of this plan will reduce moose harvest levels by humans; however, further action, including additional reductions in harvest of moose by humans, may be needed to maintain moose populations. This action is given a low priority because wolf control is not likely to be implemented within a national wildlife refuge.

Status: The Board of Game did not act on this recommendation during their spring 2000 meeting. At their December 2000 meeting the KMWG reaffirmed support for this recommendation.

GOAL 4: *Ensure that commercial guiding and transporting of moose hunters is conducted legally and that commercial operations do not displace noncommercial hunters.*

Objective 4.1: Work to prevent increases in transporting operations and number of hunters transported.

Discussion and Evaluation: ADF&G has no direct control over the volume of commercial transporting operations or numbers of hunters transported into the field. The level of transporting operations can mainly be affected by controlling the numbers of hunters, particularly nonresidents, who utilize transporter services. The number of hunters using transporters and the percent increase, can be determined from the registration permits in the RM832 subsistence hunt and, in the future, from drawing permit information in the general hunt.

Action 4.1.1: *Recommend to FWS that limits be established for the number of transporters allowed to operate in the Koyukuk NWR and the total number of hunters each transporter can place in the field. (Priority 3)*

Rationale: Limiting the number of transporters operating in the Koyukuk NWR may help reduce hunter numbers and harvest levels.

Status: Koyukuk NWR staff is aware of this recommendation. If federal regulations are proposed that would provide FWS the authority to regulate transporters in national wildlife refuges within Alaska, the recommendation in this plan can be made part of the public record.

Objective 4.2: Work with FWP and FWS to minimize illegal guiding and illegal transporting of moose hunters in the Koyukuk River drainage.

Discussion and Evaluation: Conduct a qualitative analysis of Department efforts to follow through with the actions outlined below.

Action 4.2.1: *Work with the Department of Law, Board of Game, Fish and Wildlife Protection and others to develop regulations and/or legislation that would make it illegal for a person to hire a guide or transporter who is not properly registered with the state. (Priority 2)*

Rationale: A provision in state law prohibiting use of a guide or transporter who is not properly registered with the state would discourage use of unregistered guides and transporters and enable more successful prosecution of out-of-state residents' guiding and transporting violations under the federal Lacey Act.

Status: Legislation was proposed in 2000 that would have required hunters to obtain proof of a guide's license. The proposed legislation did not involve transporters and was not passed. This is a legislative matter that will require supporters to work with legislative representatives to seek adoption.

Action 4.2.2: *Provide information on guides and transporters who are properly registered with the state through hunter inquiries, at checkstations, and other appropriate means of information distribution. (Priority 3)*

Rationale: Providing this information will alert persons who may be unknowingly using a guide or transporter who is not properly registered with the state.

Status: Lists of properly registered guides and transporters were on display at the Ella's Cabin checkstation during fall 2000. Providing information on registered guides and transporters will be an ongoing effort in cooperation with the Division of Occupational Licensing.

GOAL 5: *Work to improve enforcement of Fish and Game regulations in the Koyukuk River drainage and reduce the number of violations that occur.*

Objective 5.1: Cooperate with FWP and FWS to minimize wanton waste of game within the Koyukuk River drainage.

Discussion and Evaluation: The number of confirmed wanton waste reports can be reviewed each year in cooperation with FWP to determine if less waste is occurring. Efforts to investigate and prosecute wanton waste cases can also be evaluated, relative to previous years' efforts. Efforts of the Department to achieve adoption of a revised definition of wanton waste can be qualitatively evaluated.

Action 5.1.1: *Work with FWP and the Alaska Legislature on developing a revised definition of "wanton waste" to allow for successful enforcement of cases where meat is removed from the field but is not kept in a condition suitable for human consumption. (Priority 1)*

Rationale: FWP has indicated that many cases of possible wanton waste of meat cannot be prosecuted if meat is removed from the field, even when it is becoming spoiled. FWP intends to propose a revised definition of “wanton waste” to address this problem and the KMWG would like to support this effort.

Status: Legislation to revise the definition of wanton waste was proposed in 2000 but did not pass.

Action 5.1.2: *Encourage and support the efforts of FWP to inspect key moose meat transporting locations such as the Galena boat landing, Galena air cargo hangars, and the Bettles airfield for possible wanton waste violations. (Priority 3)*

Rationale: There have been reports of meat spoiling in transporting locations once hunters have passed through the Ella's Cabin checkstation. This action can help to verify and possibly reduce this problem. Prosecution may still depend on a revision of the definition of wanton waste.

Status: FWP conducted an increased enforcement effort on the lower Koyukuk River in fall 2000 with extra troopers and boats in the area. Several wanton waste cases were investigated. Overall, reports of wanton waste were significantly reduced. FWP cannot, however, commit to this level of enforcement on a regular basis.

Action 5.1.3: *Promote the Fish and Wildlife Safeguard program and encourage both residents and visitors to the area to report possible violations promptly. (Priority 2)*

Rationale: Better reporting of potential violations can help reduce wanton waste and other violations of game management laws.

Status: This will be an ongoing activity as opportunities arise.

Action 5.1.4: *The KMWG recommends that the Alaska State Legislature provide adequate funding to the Division of Fish and Wildlife Protection so that the division can maintain a year-round field presence. (Priority 3)*

Rationale: Following the 1999 fall hunting season, Fish and Wildlife Protection officers operating in the Koyukuk area had little to no authorization for routine patrol flight time due to budgetary constraints. FWP must have the capability of a year-round field presence in order to maintain the deterrent factor of violators knowing they may get caught and to have enforcement capability prior to the new fiscal year.

Status: This action requires citizens to work through their legislative representatives to support the budget for FWP.

GOAL 6: Seek to prevent or minimize detrimental environmental impacts in the Koyukuk River drainage that are associated with moose hunting or that may affect moose conservation.

Objective 6.1: Work with FWS to minimize or eliminate garbage and fuel spills that can result from moose hunting in the Koyukuk River drainage.

Discussion and Evaluation: Problems with hunter-related garbage and fuel handling are not within the direct authority of ADF&G. However, Department efforts to inform the hunting public of these concerns and proper procedures to use can help alleviate problems. This objective will require a qualitative evaluation of efforts directed towards pollution prevention.

Action 6.1.1: Cooperate with FWS to develop and distribute information on pack-it-in, pack-it-out garbage requirements and proper fuel handling techniques, including removing all fuel containers from the field. (Priority 3)

Rationale: Providing information on pollution prevention during hunter registration will help reduce trash and fuel handling problems.

Status: This will be an ongoing activity as opportunities arise.

Action 6.1.2: ADF&G should cooperate with FWS to remove existing fuel containers and debris from the river corridor. (Priority 3)

Rationale: Trash and other debris, primarily discarded fuel containers, have accumulated along the Koyukuk River over the years. Most hunters are much more aware of the need to remove waste than in the past, but action is needed to clean up trash.

Status: This will be an ongoing activity as opportunities arise.

GOAL 7: Fill in any existing gaps in biological and harvest data concerning Koyukuk River drainage moose.

Objective 7.1: Establish and/or maintain programs to acquire additional biological and harvest information needed for management of the moose in the Koyukuk River drainage.

Discussion and Evaluation: Progress in identifying biological and harvest data gaps and establishing research programs to address them can be qualitatively measured. Actions 1.1.1 thru 1.1.3 involving expansion of the lower Koyukuk permit hunt areas and establishing and/or maintaining moose checkstations will also contribute to fulfilling this objective.

Action 7.1.1: *Develop a priority list for projects to acquire additional biological and harvest data to assist in meeting management objectives and implement the projects according to priorities and within budgetary limitations. (Priority 2)*

Rationale: Biological and harvest data within the Koyukuk drainage, and in particular, the lower Koyukuk, is good relative to many areas of Alaska. Still, gaps in data occur and the Department would like to identify and resolve biological and harvest information needs.

Status: The Galena Area Biologist has coordinated moose and predator survey and research efforts closely with the FWS. A stratified moose population survey was conducted in the upper Koyukuk drainage in fall 1999. Moose harvest has been closely monitored in upper Unit 24 and an emergency order was issued to close the winter season because of concerns about possible overharvest in the Wild River drainage. There have been few suggestions for additional research projects up to this point, but there will be ongoing opportunities for new ideas through advisory committee and regional council meetings.

Projects suggested by the KMWG:

- Conduct a moose population estimation survey in each management zone at least once every 5 years.
- Carefully monitor moose harvest in the Dalton Highway corridor and in the John, Alatna, and Wild River drainages.

GOAL 8: *Secure funding through agencies or other sources for implementation of the Koyukuk River Moose Management Plan.*

Objective 8.1: Ensure that adequate funding is available so that recommendations made by the KMWG in the Koyukuk River Moose Management Plan can be implemented.

Discussion and Evaluation: Conduct a qualitative analysis of the funding available to implement the Koyukuk River Moose Management Plan.

Action 8.1.1: *Work within the existing Department budgeting process to identify funding needs and obtain funds to implement the KRMMP. (Priority 1)*

Rationale: ADF&G's budget process is the main place where funding needs can be identified and directed towards Koyukuk River moose management.

Status: The Department has continued to support Koyukuk moose management projects through funding for the Galena Area Office and the Wildlife Planning program.

Action 8.1.2: *Cooperate with other agencies, including but not limited to FWS, Native corporations, and village councils, to seek additional funding for Koyukuk River moose management. (Priority 2)*

Rationale: There are opportunities for cooperative efforts on moose and predator biological surveys and other matters and additional or shared funding should be sought when possible.

Status: This will be an ongoing effort as opportunities arise.

POPULATION AND HARVEST OBJECTIVES AND HARVEST RATES FOR THE KOYUKUK CUA

Intensive Management Population and Harvest Objectives

At their fall 2000 meeting, the Board of Game adopted Intensive Management Population and Harvest Objectives for the Koyukuk River area as follows:

Area	Moose	
	Population objective	Harvest objective
Unit 21D	7000–10,000	450–1000
Unit 24	8000–12,000	250–600

Under Action 3.1.7 the KMWG recommended that the Board of Game direct the Department to prepare an Intensive Management Plan for the Koyukuk River Basin. Policy for implementation of the Intensive Management laws is still evolving and the implications of falling outside the ranges of the population and harvest objectives are not well defined. There is a possibility that reaching the higher end of the Intensive Management Harvest Objectives would result in conflicts with the Statements for Management Intent for Zones 1 and 2 through a significant increase in hunter numbers. Until an Intensive Management Plan or other policy is developed that would dictate otherwise, the Statements of Management Intent in this plan should be the primary guide for management decisions.

Harvest Rates for the Koyukuk CUA

The following harvest rates are to be used in determining harvest levels within the Koyukuk CUA. It should be recognized that these rates can be higher than the overall harvest rates for Zone 1 that are suggested in Biological Decision-making Factors. However, these different harvest rates are not inconsistent because very low harvest occurs in Zone 1 outside the Koyukuk CUA, so the combined harvest in Zone 1 will still meet the harvest guidelines for that area.

For the high-density portion of Zone 1 within the Koyukuk CUA, the Working Group has recommended the following guidelines to determine harvest rates within the KCUA based on the Department's moose population estimates:

Number of moose				
Below Huslia	Above Huslia	Total	=	% Harvest rate
5500	1500	7000	=	8
4500	1250	5750	=	7.5
3500	975	4475	=	7

The harvest rate will be determined by matching the current population estimate to the closest population level listed in the table above. The moose population levels and harvest rates can then be used to determine the number of general permits that can be issued for the drawing hunt in the following manner. The moose population estimate multiplied by the appropriate harvest rate provides the estimate of the harvestable surplus of moose. The estimated subsistence harvest of moose is subtracted from this number to determine the number of moose that can be harvested in the general hunt. The number of general drawing permits that can be issued will be determined using hunter success rates and participation rates of previous years.

BIOLOGICAL DECISION-MAKING FACTORS

This section describes some of the techniques and information the Galena Area Biologist will use to exercise best professional judgment in managing the Koyukuk River Basin moose resource.

Population Monitoring and Estimation

Recruitment. Posthunting season TCA surveys and population estimation surveys will be conducted to evaluate a variety of population parameters. Because ratios can be susceptible to error due to the random variation of low numbers, trend count surveys will be conducted in areas of traditionally high moose density for the specific intent of maximizing the number of moose counted. Calves:100 cows ratios will be evaluated annually as a measure of productivity of the moose population in all TCAs. Calving rates will be closely linked to yearling:cow ratios that more specifically demonstrate recruitment rates into the population. However, yearling:cow ratios cannot be used as the sole indicators of recruitment rates because of the error associated with aerial classifications of yearlings (e.g., inconsistent ability to classify yearling cows [therefore not classified], classification errors of yearling bulls).

Ratios in the range of 20–30 calves:100 cows will be considered appropriate if population stabilization is the current management objective. If the management objective is designed to reduce growth rate of the population or reduce population densities, then rates of 20 calves:100 cows or lower may be acceptable. Rates in excess of 30–40 calves:100 cows will be considered adequate to support population growth.

Reproductivity. Normal breeding activity can occur at rates of 15–20 bulls:100 cows with yearling bulls comprising nearly one-third of the total. A ratio of greater than 20 bulls:100

cows suggests enough bulls for breeding purposes (not to be confused with too many) in the number of bulls.

Zone 1 — For the high-density areas of the lower Koyukuk, managing for ratios of 30 bulls:100 cows and greater for this high density population, would be consistent with a strategy designed to provide a greater number of large “trophy-sized” bulls for a “trophy-type” hunt, but would not likely result in measurable improvements in reproductive rates of the population.

Zone 2 — For the low-density areas of the upper Koyukuk, a ratio of 15–20 bulls:100 cows may be low. Managing for ratios of up to 30–40 bulls:100 cows for this low density population may be necessary to allow for adequate breeding where cows are sparsely distributed.

Harvest Monitoring

Harvest levels will be monitored by standard methods which include, but are not limited to: general harvest ticket reporting, permit registration reporting, door-to-door Subsistence Division surveys, wounding-loss estimates, and historical records of unreported harvest. Reported levels of harvest for moose populations in Alaska range from 3–12%.

Zone 1. Harvest rates for the highest density portion of the lower Koyukuk have recently approached 10%. Harvest rates in the northern portion of Unit 21D (north of the Yukon River) have been on the order of 7% annually. Because predation is a significant mortality factor and considered to be increasing in Management Zone 1, a conservative harvest rate on the order of 7% ($\pm 1\%$) of the posthunt population estimate is appropriate for a stabilized population. (Note: This also prescribes a more conservative harvest rate than published values that are recommended for “prehunt” population estimates).

Prescribed harvest rates will vary depending on population status. Using 1998 as the benchmark, the population for Management Zone 1 was estimated to be approximately 10,000 moose, and growth appeared to have leveled off after more than a decade of increase. Harvest management guidelines to maintain the current moose population status, were based on the following important factors:

- The population was a high-density population for Interior Alaska moose.
- The population was in a level portion of the “growth curve.”
- The population was subject to predation.
- Predator numbers were increasing.

Declines in the population to less than 8000–9000 may require incremental decreases in harvest rates until the decline has been stabilized and the trend for growth is established. This is where the population is estimated to be in 1999. Conversely, for increases in the population to a level greater than 11,000–12,000, liberalized harvest of cows can be initiated and liberalized rates of harvest can be considered.

Zone 2. Harvest rates in Management Zone 2 have been on the order of 2.5–3.0%. Because predation is a significant mortality factor and considered to be increasing, a conservative harvest rate of not more than 5% ($\pm 1\%$) of the posthunt population estimate is appropriate for a stabilized population in this management zone. (Note: This also prescribes a more conservative harvest rate than published values that are recommended for “prehunt” population estimates). A more conservative harvest rate is appropriate so that isolated concentrations of moose are not over harvested.

Prescribed harvest rates will vary depending on population status. Using 1998 as the benchmark, the population for Management Zone 2 was estimated to be approximately 7500 moose. Because limited data is available for Zone 2, population trends are uncertain but are generally believed to have followed a pattern similar to Zone 1. Harvest management guidelines to maintain the current status, were based on the following important factors:

- The population was a low-density population typical of Interior Alaska moose.
- The population was in a level portion of the “growth curve.”
- The population was subject to predation.
- Predator numbers were increasing.

Declines in the population to less than 6000–7000 may require incremental decreases in harvest rates until the decline has been stabilized and the trend for growth is established. Conversely, if the population increases to a level greater than 8000–9000, liberalized harvest of cows can be initiated and liberalized rates of harvest can be considered.

Predation

Data on predation levels are limited. Grizzly bear harvest is low and public reports suggest numbers may be increasing, but no data are available to confirm this trend. Information on black bears is also limited, but black bear predation of moose calves has been shown to be very significant. Wolf numbers are increasing in the Koyukuk River drainage, and are also responsible for a significant level of moose mortality. Predator management in the Koyukuk River drainage will be limited to wolf population monitoring and harvest reporting through hide sealing requirements. Political constraints do not appear to allow for predator control (i.e., 60% removal for > 5 years), but regulation (i.e., 30%+ for perpetuity) may be feasible if increased harvest by hunters and trappers can be promoted. Declining recruitment parameters suggest predation may be having an increasingly downward influence on the population, and that information will be incorporated into the decision-making process of moose management.

Habitat Management

Habitat management should be focused on two primary considerations: loss of habitat due to advancing successional status (e.g., fire suppression, advancing conifer forests, grass lakes drying up, etc.) and browsing damage to willow and other woody vegetation by high concentrations of moose within the riparian corridors. Harvest parameters should be liberalized when populations increase and the browse component of the habitat declines in quality or quantity. Habitat enhancement projects should be initiated however, to ensure a consistent level of browse availability (quantity) through time. Twinning rates or calf weights are important measurements to evaluate moose habitat when the information is available.

Weather

Periodic weather events are an unpredictable variable that will eventually require change to even the most perfectly designed decision-making processes. Severe heavy snowfalls have been known to deplete high-density moose populations. It should not be considered a failure of the KRMMP when drastic fluctuations occur in the population as a result of these unforeseen events.

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