INTENSIVE MANAGEMENT OF MOOSE AT HIGH DENSITY: IMPEDIMENTS, ACHIEVEMENTS, AND RECOMMENDATIONS

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ABSTRACT: In 1994, the Alaska Legislature passed legislation directing the Board of Game to identify big game prey populations where "intensive management" (IM) would be used to attain and sustain high levels of harvest. The IM law specifically provides for active management of predators and habitat, but fails to mention that antlerless hunts are key to achieving high levels of harvest. We discuss IM for moose in Game Management Unit (GMU) 20A through 2005, because GMU 20A has a unique history of predator management and currently supports the highest moose density for any equivalent-sized area in Alaska. Moose numbers in GMU 20A exceeded the IM population objectives beginning in 1999, but the IM harvest objectives were not met during 2002-2005. We identified the following impediments to achieving IM harvest objectives in GMU 20A: (1) negative public attitude toward antlerless moose hunts; (2) local citizen advisory committees have veto power over antlerless hunts; (3) bull:cow ratios are difficult to maintain when harvests are restricted largely to bulls; (4) access issues, including spatial and temporal distribution of the harvest; (5) social issues including local-non-local hunter conflicts, hunter-landowner conflicts, and illegal harvest; and (6) insufficient funding for research programs, management activities, and public education. Despite these impediments, liberal antlerless harvests were sufficient in 2004 and 2005 to halt moose population growth and attain high levels of harvest; annual harvests reached the highest levels recorded for GMU 20A. To facilitate the management of high-density moose for high levels of harvest, we recommend: (1) elimination of advisory committee veto power over antlerless hunts; (2) greater flexibility by the Alaska Department of Fish and Game (ADF&G) to implement and manage antlerless hunts; (3) close monitoring of hunting-related social issues; (4) ADF&G authorization to initiate prescribed burns; and (5) increased funding for management activities, research programs, and public education.

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In 1994, the Alaska Legislature mandated that the Board of Game (Board) establish population and harvest objectives for intensive management (IM) of identified big game prey populations with the purpose of achieving high levels of harvest (Alaska Statutes 2005). This legislation defined several terms including "intensive management," "harvestable surplus," "high level of harvest," "identified big game prey populations," and "sustained yield." The intent of the legislation was to direct the Board to choose areas where predator and habitat management would be used to attain and sustain high levels of harvest. In other areas, moose would be managed less intensively and for other purposes.

Hundertmark and Schwartz (1996) provided a critical review of the concept of IM for moose (*Alces alces*) in Alaska. They interpreted that the IM legislation directed management for maximum sustained yield and they recommended managing at densities above maximum sustained yield. They also discussed the problems and expense involved with implementing cow harvests and managing predators and habitat, but with no specific examples.

This paper differs in that we discuss IM

in the context of a specific case history of moose where we have ultimately been successful in managing for the highest levels of harvest compared to any equivalent-sized area in Alaska today. Thus, we discuss achievements in managing for high levels of harvest rather than simply impediments. This case history focuses on moose in Game Management Unit (GMU) 20A in Interior Alaska, primarily since 1998 (when IM was authorized in GMU 20A), but we also review regulatory and biological events leading up to IM. In most IM areas, moose populations are below established population objectives and the immediate challenge is to raise moose numbers to higher levels using predator control and habitat management. However, in GMU 20A the moose population surpassed the population objective in 1999, yet the harvest objectives were not reached (using reported harvest) during 2002-2005. GMU 20A is an important case history for 3 additional reasons including: (1) the highest moose density for any equivalent-sized area in Alaska; (2) a history of periodic state wolf (*Canis lupus*) control to elevate moose numbers; and (3) a history of high predator (wolves, black bears [*Ursus americanus*], and grizzly bears [*Ursus arctos*]) harvests, particularly of wolves by trapping.

STUDY AREA

Our study area encompassed GMU 20A immediately south of Fairbanks and across the Tanana River (Fig. 1). The study area encompasses 17,000 km^2, but only 13,044 km^2 contains topography and vegetation characteristically used by moose. Gasaway et al. (1983), Boertje et al. (1996), and Keech et al. (2000) described the physiography, habitat, climate, major predator and prey species, and moose population status from 1963 to 1997. The only significant human settlements are found along the perimeter of the game management unit, although one subdivision is near the center of the unit, and remote cabins and airstrips are scattered throughout much of the unit. Less than 5% of GMU 20A is accessible by road, but seasonal military and mining trails provide access to most of the area in winter after the rivers freeze; usually November in recent years.

REGULATORY AND BIOLOGICAL HISTORY

Since its passage in 1994, the IM law has been the primary force behind increasing moose harvests in much of Alaska. For GMU 20A, the Board set the population and annual harvest objectives at 10,000-12,000 and 300-500 moose, respectively, in 1998 based on recommendations from the Alaska Department of Fish and Game (ADF&G). The Board increased the harvest objectives to 500-720 moose in 2001 and to 1,400-1,600 moose in 2004 based on recommendations from the Fairbanks Advisory Committee.

The following history should help place these objectives in perspective. The moose population in GMU 20A increased to an estimated 23,000 moose in the early 1960s following large-scale wildfires in the early 1940s, federal predator control in the 1950s, and low bull-only harvests (Rausch et al. 1974, Gasaway et al. 1983). A dramatic population decline to an estimated 2,800 moose occurred by early winter 1975. Causes for the decline included at least 5 harsh winters between 1961-1962 and 1974-1975, accompanying high predation, and excessive cow harvests during 1971-1974 (Gasaway et al. 1983). Managers had underestimated the effects of predation and the severity of the decline and mistakenly advocated cow hunts to improve birth rates. These ill-timed and misguided cow hunts led to legislation that authorized local citizen advisory committees to hold veto power over antlerless hunts.

Following the decline, a period of population growth ensued from 1976 through 2003. Causes for the increase included state wolf control (1976-1982, 1993-1994), public

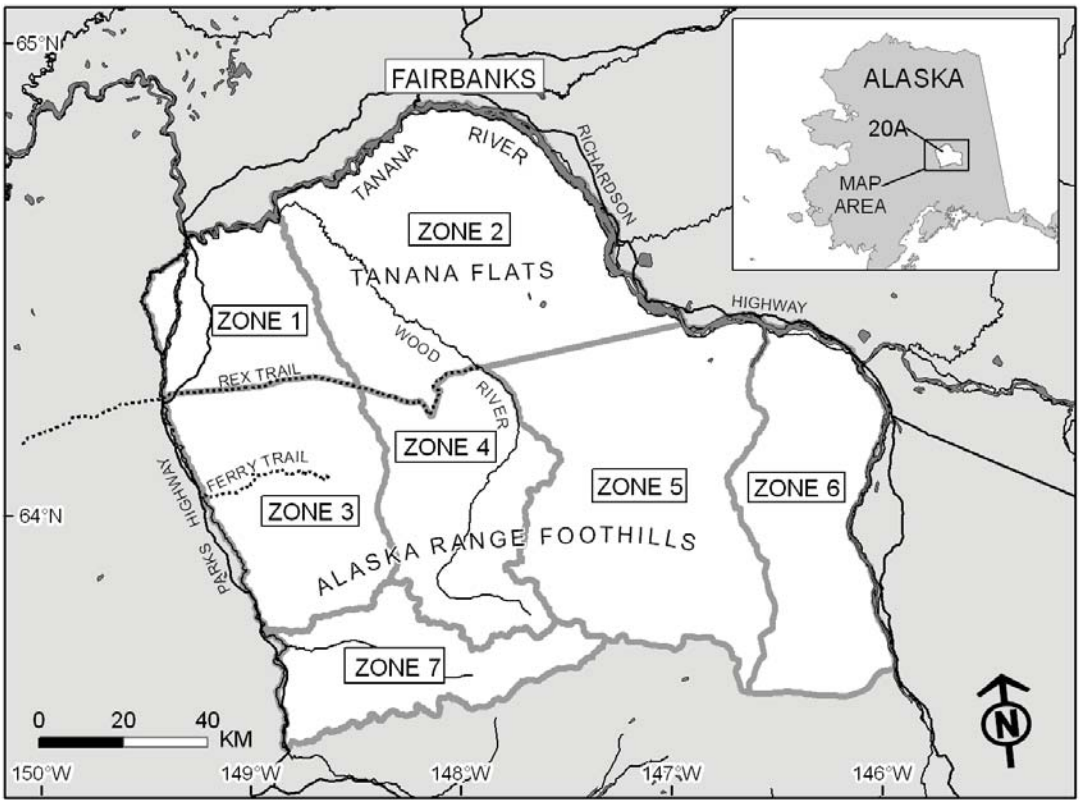

Fig. 1. Location of Game Management Unit 20A and 7 antlerless hunt zones in Interior Alaska, 2005.

harvest of predators, mostly conservative bull-only harvests, and nearly 3 decades of mostly mild winters (Boertje et al. 1996, National Weather Service 1974-2004). By November 2004, GMU 20A had the highest moose density in Alaska for any equivalent-sized area. We estimated 16,800 moose (14,980-18,650; 90% CI) in 13,044 km^2 of moose habitat. Methods for estimating moose numbers included the use of spatial statistics (Ver Hoef 2001) and a sightability correction factor of 1.20 (Gasaway et al. 1986). Estimates during 1996-2004 were fitted with a trendline through parametric empirical Bayes estimates (Ver Hoef 1996:1048).

We suggest that the combined harvests of wolves, grizzly bears, and black bears likely contributed to higher survival rates (Keech et al. 2000) and high densities of moose in GMU 20A. Average annual reported harvest of wolves during 1976-2001 (not including wolves killed by ADF&G control programs) was 42, and percent of the autumn population killed ranged from 12% (1980 and 1985) to 50% (2000; Boertje et al. 1996; Young 2000, 2003). Average annual reported harvest of grizzly bears during 1976-2001 was 15 bears. The increase in average annual harvests from 10 grizzly bears, 1976-1979, to 17 bears, 1980-1991, reportedly led to a population decline by 1992 (Reynolds 1999). Average annual reported harvest of black bears 1976-2001 was 41, but harvest was highly variable among years (range 14-64).

Moose seasons and bag limits in GMU 20A have varied markedly in recent history. Harvests of both antlered and antlerless moose were common through the 1960s and early 1970s when moose numbers were high, but total harvests were conservative (1 - 4% of

prehunt numbers) except during 1971-1974 (6 - 19% of prehunt numbers; Gasaway et al. 1983:25).

Following the low point in the population in 1975, only bulls could be hunted until 1996 and, initially, seasons were shortened to 10 days. As moose numbers increased from the late 1970s through the mid-1990s, seasons were progressively lengthened to as many as 25 days. High harvest rates (21 - 26%) of the prehunt bull population from 1995 to 1999 resulted in bull:cow ratios declining below the management objective of 30:100 in 1999. Experience has shown that with a bull:cow ratio of < 30:100, hunters become dissatisfied with the low opportunity to encounter a bull and particularly a mature bull. In 2000, the bull-only hunting season was shortened from 25 to 20 days to reduce harvests. In 2002, antler restrictions (i.e., harvest limited to bulls having spike or forked antlers, antlers having a width equal to or greater than 50 inches, or, at a minimum, antlers with ≥ 3 brow tines on at least one brow palm; Schwartz et al. 1992) were instituted to further reduce the harvest of bulls to a sustainable level.

During 1996-2001 (except 1999) antlerless hunts resumed but at very low levels (61-76 cow moose, 1% of the prehunt cow population). Finally, in 2004 and 2005, approval from local citizen advisory committees allowed antlerless hunts to be liberalized from a drawing hunt (300 permits) with a 25-day season to a registration hunt (unlimited permits) with a 101 day season. To more effectively distribute the antlerless harvest across the unit, GMU 20A was divided into 7 different hunt zones (Fig. 1).

IMPEDIMENTS TO ELEVATING MOOSE HARVESTS

Antlerless Hunts: Negative Public Attitudes and Advisory Committee Veto Power

By the late 1980s, ADF&G was proposing conservative antlerless hunts be resumed in GMU 20A to help slow moose population growth and to increase harvest, but public opposition remained strong, based on experiences from the early 1970s. The affected advisory committees were not supportive. By law, antlerless hunts require majority support annually from affected advisory committees and 4 advisory committees have jurisdiction over GMU 20A.

Finally, after meeting with the 4 local advisory committees several times a year for nearly a decade and discussing the opportunities for increasing harvest, antlerless hunts were resumed on a limited drawing basis (300 permits) in 1996. The change occurred after initial disapproval by the 4 advisory committees in 1996. We then wrote an editorial in the local newspaper strongly advocating antlerless harvests and we thoroughly informed the Board of this reoccurring dilemma. The advisory committees subsequently reversed their decisions in time for the 1996 hunt. Still, the hunts were not popular with the hunting public and remained highly controversial. For example, the average annual antlerless harvest was only 68 (1996-1998 and 2000-2001). Also, the antlerless hunt was not held in 1999 because the advisory committees desired that the hunt be held only when ADF&G could show unequivocally that the moose population was increasing.

Harvest of cows was low because most permittees used the permits only if they did not shoot a bull. Therefore, in 2002 the Board changed the moose hunting regulations such that hunters with GMU 20A antlerless permits were prohibited from shooting a bull moose in that unit. As a result, the antlerless harvest increased to 94. Also in 2002, a calf hunt was initiated, but interest was limited (Young and Boertje 2004). Although 300 permits were available, the calf hunt was undersubscribed and only 275 permits were issued in 2002 and only 217 in 2003. Harvest was also low, with only 32 and 24 calves harvested in 2002 and 2003, respectively. In addition, in 2002 a limited registration hunt with a quota of 20

antlerless moose was initiated in the western portion of the Tanana Flats to increase harvest to meet subsistence needs. These changes in the antlerless permit hunt conditions, along with the new calf and registration hunts in the western Tanana Flats resulted in a harvest of 165 antlerless moose in 2003. The antlerless harvest, however, was still well below that estimated to curtail population growth.

Finally, with greater public acceptance and increasing advisory committee support, the antlerless hunt was liberalized significantly in 2004 and 2005. The hunt changed from a limited drawing with 300 permits being issued to open registration with over 5,400 permits issued. As a result, reported harvest increased to 600 antlerless moose in 2004 and 690 in 2005. However, even with overwhelming biological evidence (Boertje et al. 2007) and support for antlerless hunts from 3 advisory committees in 2004, one affected advisory committee rejected the GMU 20A hunt. If one other affected advisory committee had failed to support the hunt, the hunt would have been cancelled.

Maintaining Bull:Cow Ratios

Most hunters prefer to harvest a bull, but meeting the IM harvest objectives with bull-only hunting is often problematic. For example, when ADF&G reduced the harvest of bulls by about 300 in 2002 and 2003 to recover declining bull:cow ratios, the IM harvest objectives of 500-720 moose could not be met with bull-only hunting. Also, it is not possible to attain current IM harvest objectives (1,400-1,600 moose) with bull-only hunting.

Access Issues

Differential access across the unit affected the spatial and temporal distribution of the harvest (Fig. 1). Given the high all-terrain vehicle trail densities in Zones 1 and 3, areas with high moose densities were accessed easily and desired harvests were quickly reached and, at times, exceeded. In contrast, given that access was essentially limited to aircraft in Zone 5, the harvest objective of 120 moose was unmet with only 22 antlerless moose harvested. Zone 2 presents unique challenges in that some high-density areas received heavy harvests close to Fairbanks; whereas, in more remote portions of the zone, harvest was low because of poor boat access.

Related to differential access was the temporal distribution of the harvest. In most portions of the unit, access limitations, hunter densities, and harvest quotas worked in concert to allow ADF&G to close individual hunt zones in a timely fashion to prevent overharvest. In contrast, in Zones 1 and 3 where access was excellent and hunter densities were extremely high, harvests occurred so quickly that ADF&G was not able to close the hunt in time to prevent surpassing the established quota. The harvest objective for Zones 1 and 3 combined was 100 antlerless moose, yet nearly 200 moose were taken. This excessive harvest was the result of an early season opening that coincided with a long holiday weekend, a harvest reporting period that was too long (3 days), and a policy of 2-days public notification before a hunt can be closed. Finding ways to slow the harvest in areas with excellent access and high hunter densities is a challenge.

Social Issues

Local-non-local hunter conflicts — In general, local hunters dislike non-local hunters hunting moose in their "backyard". Of the 3,008 hunters that reported hunting moose in GMU 20A in 2004, 42% were non-local hunters (i.e., resided outside of Interior Alaska). As a result, local residents were crowded by non-local hunters, which destabilized long-term hunting patterns (i.e., traditional hunting camps). The result was a high level of dissatisfaction by local hunters, who can influence local advisory committees.

Hunter-landowner conflicts — Hunter densities were extremely high in the more

accessible portions of the unit, particularly Zones 1 and 3. Although season lengths differed between years, the number of hunters that reported hunting moose in GMU 20A increased from 1,189 in 2003 to 3,008 in 2004, an increase of 153%. This resulted in considerable congestion at roadside pullouts, camping areas, trailheads, trails, and other accessible areas.

Hunter-landowner conflicts ranged from trespass and garbage to human waste complaints. These complaints occurred on most private lands in GMU 20A, but particularly in and near the Ferry subdivision, located in western Zone 3. Parking and camping spots were overrun. Landowners in Alaska typically do not post their lands, so hunters were usually unaware they were parking or camping on private property. Landowners in the more remote Gold King subdivision, located in the central portion of the unit, had additional complaints about moose gut-piles. Gut-piles were potential attractants to black and grizzly bears and therefore posed a safety concern to subdivision residents. Hunter-landowner conflicts must be adequately addressed in order to maintain support for intensive harvests of moose.

Higher incidence of illegal kills — Although we do not have reliable numbers to compare illegal take among years, we hypothesize that illegal take was higher in 2004 with the registration permit hunt than it had been with limited drawing permit hunts. In addition, local hunters were convinced that illegal take had increased. According to the Alaska Bureau of Wildlife Enforcement, an inordinate amount of illegal activity was reported for one area in the southwestern portion of Zone 3 along Healy Creek. The known illegal take of several antlerless moose in that area nearly resulted in loss of advisory committee support for the hunt in 2005. Support was maintained when season and boundary changes were proposed for the 2005 season.

Lack of public support for habitat enhancement by prescribed fire — Prescribed fires are an integral component of IM to maintain and enhance moose habitat. The public is generally opposed to prescribed fires for a variety of reasons, which include the potential for smoke in Fairbanks, risk of the fire escaping and burning uncontrolled, and possible damage to private property. In addition, the general public and even most moose hunters do not understand the value and need for wildfires to rejuvenate moose habitat. Furthermore, the Department of Natural Resources is the agency authorized to conduct prescribed burns in Alaska. Since 1994, ADF&G has been actively promoting and offering to fund a large-scale prescribed burn (10,000-30,000 ha) on the Tanana Flats, but without success.

Funding Issues

Managing intensively requires information on factors that influence births and deaths in moose populations (Hundertmark and Schwartz 1996). Data on body mass, birth rates, survival rates, browse utilization, and population estimation were critical to convincing a skeptical hunting public that antlerless hunts were both timely and prudent in GMU 20A (Boertje et al. 2007). During 1996-2004, ADF&G spent roughly $800,000 on moose research and an additional $100,000 on annual population surveys. Without that information, it is highly unlikely ADF&G would have been successful in obtaining liberal antlerless harvests. For example, considerable hunting and harvest opportunities are likely being lost in adjacent IM areas because of inadequate funding.

ACHIEVEMENTS

In GMU 20A, ADF&G has made significant progress in elevating moose harvests to help meet IM mandates. Harvest strategies in GMU 20A in 2004 and 2005 provided the greatest moose hunting opportunities and

harvest in recorded history in GMU 20A (> 3,000 moose hunters). Reported harvest totaled approximately 1,000 moose (about 390 bulls, 540 cows, and 60 calves) in 2004 and 1,100 (about 430 bulls, 620 cows, and 70 calves) in 2005. Although these harvests did not meet the recent IM harvest objectives of 1,400-1,600 moose, modeling indicated that the harvest of cows was likely high enough to halt population growth (a management objective). In 2006, ADF&G is also proposing an additional drawing hunt (300 permits) for any-bull moose because increased recruitment of bulls has occurred since antler restrictions were initiated in 2002. Harvests from this new hunt, in combination with the hunts of 2004 and 2005, should allow us to approach the IM harvest objective in 2006.

RECOMMENDATIONS

We recommend that legislation granting advisory committees veto power over antlerless hunts be rescinded. This legislation was enacted in the mid-1970s, long before the IM law was passed. This 1970s legislation conflicts with and is an impediment to IM.

We also recommend that ADF&G have greater flexibility to implement and manage moose in IM areas (e.g., variable seasons, multiple bag limits, calf hunts, and greater authority to regulate access) because strategies to intensively manage harvest often run counter to prevailing public opinion (Hundertmark and Schwartz 1996). Regulations need to be highly flexible both to attain high levels of harvest and to guard against potential overharvest.

In addition, we recommend that managers closely monitor the myriad of hunting-related social issues associated with IM of moose populations. Social issues can be easily overlooked but are an integral part of securing and maintaining public support for hunts, especially those with high hunter densities and intensive harvests.

Furthermore, we recommend that ADF&G be given greater authority and funding to achieve prescribed fires. Prescribed fires are an integral component of IM to maintain and increase moose numbers.

Finally, we recommend adequate funding to determine population parameters and trends and to educate the public with this information. We concur with Hundertmark and Schwartz (1996) that implementing IM programs without reliable information will lead to mismanagement, including undesired population declines.

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