MOOSE MANAGEMENT IN THE ANCHORAGE MANAGEMENT AREA: A DISCUSSION PAPER

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Anchorage, Alaska

October 1995

INTRODUCTION

This report provides information pertinent to a discussion of moose management in the Anchorage Management Area.

Moose are a well-established resident of the Anchorage area. Like white-tailed deer in the lower 48 states, moose easily adapt to life in urban areas. In Anchorage, moose find abundant winter food because land clearing stimulates regrowth of willows, birches, and aspens. They find shelter in the scattered greenbelts, parks, and uncleared private lands that remain forested. They find protection from predators, because wolves and bears seldom enter the urban area and heavily used parks.

Moose can be hazardous to public safety. Like deer, moose are frequently hit by motor vehicles, but a collision with a moose is liable to involve considerably more damage and injury. Moose cows can vigorously defend their calves. Rutting bulls occasionally attack people as well. Moose often act aggressively in winter, either because they are fed by humans; agitated by dogs, vehicles or people; or stressed by hunger and traveling through deep or crusted snow.

Moose can also be a nuisance. They eat garden produce, fruit trees, and ornamental shrubs. They temporarily block access to buildings and vehicles. They attack dogs and charge people. They block ski trails and disrupt races of all kinds on trails.

Animals in urban areas are subject to a "wildlife acceptance capacity" (Decker and Purdy 1988). In other words, there is a maximum number of moose that can exist compatibly with the local human population. The wildlife acceptance capacity depends on local land uses, the density of the moose population, and the attitudes and priorities of local human populations. The wildlife acceptance capacity is a measure of community attitude, not that of individuals in the community, some of whom may be extremely tolerant of damage and injury caused by wildlife. Numerous moose-vehicle collisions, complaints of property damage, and widespread concern for safety suggest that the wildlife acceptance capacity may have been exceeded in Anchorage.

The moose population of the Anchorage Management Area is not managed proactively. Management is essentially reactive. Fish and Game biologists and Fish and Wildlife Protection officers distribute road-killed moose to charities, shoot badly injured or unusually aggressive moose, chase moose from school grounds and school bus stops, attempt to move moose away from people using capsaicin sprays or rubber slugs, and give advice on avoiding injury and property damage.

We propose convening a public/agency task force to review all pertinent information, determine the wildlife acceptance capacity for moose, assess the feasibility of various management alternatives, and make recommendations to the Department of Fish and Game. ADF&G will write a management plan based on these recommendations. This approach helped resolve a similar problem with an urban deer population in Minnesota (McAninch and Parker 1991).

The management plan that will result from this planning process will identify a wildlife acceptance capacity for moose in the Anchorage Management Area, based on a public

survey. The plan will also outline preferred management alternatives. in the event the wildlife acceptance capacity has been exceeded.

The Department of Fish and Game recognizes that the moose population in the Anchorage Management Area has the biological potential to provide a sustainable harvest by hunters. If the harvest was large enough and distributed appropriately (or if it was conducted in conjunction with other means of control), it could ameliorate, to some degree, adverse moose-human interactions. However, it is not appropriate to adopt this solution unless Anchorage residents are in substantial agreement. Our intent is to implement the recommendations of the task force, after considering data on public attitudes, if the recommendations are achievable with available funding and staff.

Area Description

The Anchorage Management Area is part of Game Management Unit 14C. It includes all Cook Inlet drainages south of the Elmendorf and Fort Richardson Military Reservations and north of and including Rainbow Creek drainage, but excluding the Anchorage Coastal Wildlife Refuge (Figure 1). This is the most highly developed portion of the Municipality of Anchorage, including much of what is commonly called the "Anchorage Bowl."

Much of the land in the Anchorage Management Area is privately owned; however, over one-third of the area is within the southwest corner of Chugach State Park. The Bureau of Land Management manages Campbell Tract, surrounding the Campbell Airstrip. The Municipality owns and manages Kincaid Park and most other parks and greenbelts.

History of the Anchorage Moose Population

The early distribution and abundance of moose in the Cook Inlet region is unclear. Moose numbers probably increased, just as they do today, whenever a catastrophic fire or a series of fires returned vegetation to an earlier successional stage preferred for food (Lutz 1960). After several decades of increase, the population would inevitably decline as the vegetation matured, unless another fire occurred. Ironically, humans (beginning with the earliest inhabitants, the Dena'ina) were probably responsible for increasing the area's moose population by accidentally or intentionally setting fires.

In 1900, Dena'ina elders told Osgood (1901:61) that moose did not inhabit the Tyonek area, across Knik Arm from what was to soon be the town of Anchorage, when they were boys. Local residents told Lieutenant Learnard (1900), who explored upper Cook Inlet in 1898, that moose had been very numerous a few years before, but had rapidly diminished in the immediate vicinity of the coast because large numbers had been shot by Natives and miners. A geologist who accompanied another exploration party reported that moose were plentiful throughout the Kenai Peninsula and Matanuska Valley, except in the immediate proximity of mining camps (Mendenhall 1898). Moose were not found north of Turnagain Arm in 1914, according to another source, "although they were extremely plentiful a few miles away" (Gideon 1967). If a pocket of moose still survived relatively unscathed in the Anchorage Bowl, it was probably decimated by the thousands of people attracted to the area by the construction of the Alaska Railroad and founding of Anchorage in 1915-17. Two wildlife biologists repeated reports that

moose were abundant in the nearby Susitna Valley in the late 19th century, but scarce from 1910 to 1936 (Spencer and Chatelain 1953). According to Tyonek elders, moose remained scarce on the west side of Knik Arm into the 1940s (Fall et al. 1984).

Large fires were reported in 1898 (Mendenhall 1900) and in the 1920s and 1930s during construction and maintenance of the Alaska Railroad (Spencer and Chatelain 1953). With fires creating excellent moose habitat, all that was needed for the moose population to rebound was protection from overharvest; cow moose breed as yearlings and moose in good habitat have a high rate of twins and triplets. Enforcement of wildlife laws was poor or indifferent in Alaska until 1925 (Sherwood 1981:151). Passage of the Alaska Game Law in 1925 presumably allowed the moose population a chance to recover.

World War II brought a large number of people into the Anchorage area and stimulated the local economy. Development of the military base and post-war homesteading, clearing, and more fires eliminated large tracts of mature forest. Moose began to increase in the late 1940s as preferred foods--such as young willows, birch, and other browse species--replaced the mature birch-spruce forest. Moose numbers increased considerably during the early 1950s; by the late 1950s and early 1960s moose were abundant. A series of mild winters in the 1970s and early 1980s improved moose productivity and winter survival, which further increased the population. The moose population has remained high during the past three decades.

Moose distribution and abundance. An estimated 200-300 moose live in the Anchorage Bowl (excluding the military reservations, Campbell Tract, and upper Hillside area) year-round. Moose are not counted in most of the Anchorage Management Area due to difficulty in sighting them from the air among the confusion of structures, roads, and human activity; however, an aerial survey of Kincaid Park and the area west of Anchorage International Airport found 31 moose (resulting in an estimate of 50 in the area) in late December 1993. The portion of the Anchorage Management Area in and adjacent to the state park (i.e., the Hillside area) has not been surveyed in recent years. During the last survey, in 1990, 165 moose were estimated on the Hillside. The total estimate for the Anchorage Management area is 400-450 moose, but the population is undoubtedly higher in winter, perhaps twice as high, due to the influx of migratory moose.

Most of the moose found in the Anchorage Bowl in winter are migrants from Fort Richardson, Elmendorf Air Force Base, and the mountains east of town where they are found to an elevation of 3,500 feet in summer and fall. When snow accumulation begins to restrict movement and cover foods in November and December, moose move down the mountainsides and out of the valleys of Ship, Campbell, and Rabbit creeks. These valleys funnel moose into the lower elevations where snowpack is less and movement is facilitated by numerous roads and trails. In winter moose are concentrated in parks, greenbelts (particularly those located along streams), and residential areas that contain considerable browse. In spring, the surviving moose return to the military reservations or follow the melting snow back into the mountains.

The moose population in the Anchorage Management Area is controlled primarily by starvation, vehicle collisions, and, to a lesser degree, heavily restricted hunts on the two

military reservations. Annual moose mortality resulting from collisions with vehicles and trains has increased throughout the Anchorage area (GMU 14C: Table 1). The 261 moose killed in collisions during the winter of 1994-95 was a record high. A secondary source of mortality is the dispatching of badly injured or highly aggressive moose. Most of the badly injured moose are survivors of vehicle collisions, and are included in that tabulation. Approximately 10 aggressive moose were dispatched in the winter of 1994-95, significantly more than usual. Little predation occurs in the management area, although predators in adjacent management areas include two wolf packs, a few brown bears, numerous black bears, and human hunters.

Moose-Human Conflicts

As Anchorage's moose and human populations grew, conflicts developed. Moose could not be hunted in the Anchorage area in the early 1950s. A Superior Court judge from Seattle, visiting Chugiak in 1953, described a local moose problem (Cochrane 1983:93) similar to that which exists throughout the Anchorage area today.

> Chugiak was suffering from just too many moose. They followed the kids to the school buses; they scared the dogs; they stuck their heads through windows regardless of glass; they trampled gardens and ruined vegetables; they chased women indoors and chased strong men up trees; they combated cars on roads and highways to the mutual disadvantage of both cars and moose. They even challenged the Alaska Railroad.

In the early years, moose raided vegetable gardens in summer and were occasionally hit by motor vehicles. Few roads, particularly paved roads, and few vehicles limited the number of collisions. The highway from Anchorage to Palmer was built in 1936, a one-lane dirt road; paving began in 1950 (Cochrane 1983:28). Beginning in 1954, moose were hunted in what is now the Anchorage Management Area and, presumably, most moose learned to avoid humans, at least during the hunting season. A lot of poaching occurred, as people in "remote" parts of the Anchorage Bowl couldn't resist the opportunity to fill the freezer or get rid of a pest. This would have also made moose more wary of humans, or at least would have eliminated the less wary animals.

As Anchorage grew, conflicts intensified. Nowadays there are many more school children to chase, many more dogs in yards or on chains that can be injured or killed, and many more roads and vehicles. In addition, human behavior and expectations have changed. Vehicular speeds have increased as more roads were paved. Main commuter roads on the Hillside were not paved until the 1960s and 1970s. The four major east-west arterials on the Hillside account for approximately half of the moose collisions in the Municipality (Figure 2). Del Frate and Spraker (1991) attributed a significant increase in moose-vehicle collisions on the Kenai Peninsula to the Department of Transportation's "dry road" policy. When snow was removed immediately after a snowstorm and roads sanded for better traction, motorists increased speeds and road-kills nearly doubled.

Collisions are three times more likely in the dark than during the day (Thomas 1995). Most collisions occur in December and January, months with the least amount of

daylight. The number of collisions rises in winter partly because more moose are in lowland areas traversed by roads and they are attracted to roads because of easier walking and, often, the presence of edible shrubs. Collisions are least frequent in April and May. Most collisions occur between 5 p.m. and midnight. A smaller peak occurs between 6 a.m. and 9 a.m. These hours correspond to periods when moose tend to be most active, visibility is often limited, and a lot of vehicles are on the roads, particularly commuters. Cows and calves are more often hit than bulls, partly because they are more numerous, but also because motorists that see and avoid hitting a cow will sometimes hit the calf following close behind. Thomas (1995) concluded that the typical moose-vehicle collision in Alaska involves a local person who is familiar with the road and probably drives it daily.

A recent study estimated moose-vehicle collisions in rural Alaska cost an average of $15,150 for vehicle repairs; emergency, medical, and legal services; and lost wages (Thomas 1995). Thus, the average annual cost to residents of Anchorage is at least $1,545,000, based on the average annual number of moose-vehicle collisions. Unreported vehicle accidents that result in moose leaving the scene and dying unnoticed may be as high as 18% (Poll 1989).

No records have been compiled on the number of human injuries and fatalities caused by collisions with moose in Anchorage. Overall, about 20% of Alaska's moose-vehicle accidents result in human injuries and only 0.5% result in a fatal human injury (Thomas 1995). Anchorage probably has fewer fatalities than the statewide average because speeds tend to be slower than on rural highways. To the best of our knowledge, only three humans have died in collisions with moose in the Anchorage area since 1975 (M. McDonald, pers. commun.). The number of moose-related, traffic fatalities may be a little higher than this, because some people are probably killed while avoiding a moose.

Subdivisions have expanded throughout the Anchorage Bowl, to the edge of the military reservations and Chugach State Park. Many of the peripheral residential areas, such as those on the Hillside, have large lots with abundant browse and cover. Moose are attracted to these areas. Ornamental shrubs and flowers are now more common than vegetable gardens. A moose can do a great deal of damage to a landscaped yard or small garden in a short amount of time. Some ornamental shrubs, such as the popular mountain ash, are preferred foods of moose. Each year, local moose damage tens (perhaps hundreds) of thousands of dollars worth of ornamental shrubs, flowers, fruit trees, and vegetables.

Because moose are not hunted in town, many have become habituated to humans. These moose are more likely to use residential areas, where they encounter numerous people and dogs and they are less likely to flee in a confrontation. This familiarity and loss of fear has increased both the frequency and potential danger of encounters.

Outdoor recreation has grown in popularity. A recent public survey found 79% of Anchorage households had at least one member that walked for pleasure, 76% biked on paved trails, 43% cross-country skied, 40% hiked, 39% biked on unpaved trails, 31% ran, and 18% rollerbladed (MOA 1995). All of these activities bring humans into contact with moose. Walkers and hikers frequent trails near the four westernmost access points to Chugach State Park. Other popular walking trails are in Kincaid and Bicentennial

parks and along the Tony Knowles Coastal Trail. From 1973 to 1995 the number of bicycle trails have increased from 3 to 180 miles, mostly in the Anchorage Bowl (MOA 1995). Many are located in parks and greenbelts. The Anchorage Bowl has approximately 84 miles of maintained cross-country ski trails. Visits to two of the most popular ski areas--Kincaid and Russian Jack Springs parks--nearly quadrupled in five years (1986-1991) from 11,588 to 42,066 (MOA 1995). Many more ski trails are unmaintained. Joggers are not only numerous, they are increasingly running on unpaved trails in areas where they are more likely to encounter moose, such as in Chugach State Park. Three decades ago, relatively few residents engaged in these recreational activities.

Speed is a major factor in moose/human encounters. Several recreational activities growing in popularity in the Anchorage area--mountain biking, rollerblading, ski-joring, and dog mushing--all increase the speed at which a moose is encountered, allowing less time for either the moose or the human to bail out. The latter two activities involve dogs, which adds to the unpredictability and reduces human control of the situation. Some trail users expect moose to yield the right-of-way to humans and are unwilling to go around or wait for the moose to move out of the way.

Moose seem to be more aggressive in recent years, probably for four reasons. Because there is no hunting in most of the Anchorage Bowl, generations of local moose have learned that humans are not particularly dangerous and have become less wary and more willing to fight rather than flee. Second, moose are often hungry and exhausted in the winter, because food is in short supply and snow, particularly deep or crusted snow, makes foraging more difficult. They tend to spend more time on packed trails and roads (also used by people) and are much more easily agitated. Third, the large numbers of people and dogs that moose encounter increase their stress, making them more aggressive. Finally, more urban residents are feeding moose. When a moose is hand-fed by humans it expects food from other humans. When food isn't forthcoming, the moose often becomes agitated and may attack. The publicity of the moose's plight during the severe winter of 1989-90, and several subsequent severe winters, has led many people to feed moose. They have continued feeding moose in subsequent winters, as some people feed wild birds. Amateur photographers try to stage scenes of people hand-feeding moose like those published in magazines. The Anchorage offices of Fish and Game and Fish and Wildlife Protection received hundreds of calls on aggressive moose in neighborhoods during the winter of 1994-95, and approximately 10 unusually aggressive moose had to be shot in the Anchorage Bowl. These were almost invariably moose that had been fed by humans.

Frequent charges are symptoms of our urban condition; moose in rural areas are seldom as aggressive. In fact, moose that threaten humans in rural areas (e.g., dog-mushers or during the rut) are typically shot--a solution rarely exercised by urban dwellers due to a prohibition on the discharge of firearms and the proximity of other dwellings.

Although moose numbers have been stable throughout the municipality in recent years, the perception that moose are growing more abundant in the Anchorage Bowl is probably accurate. Since 1989 the Anchorage area has experienced three winters (1989-90, 1991-92, and 1994-95) with snow depths significantly higher than normal.

During these winters, more moose were forced into the Anchorage Bowl. Thus, in the recent memory of many Anchorage residents, moose appear to be more abundant than in the 1980s.

Public Attitudes Toward Moose

The public exhibits a wide range of attitudes toward moose. Most Anchorage residents enjoy seeing moose in town and sharing them with visitors.

Perhaps the biggest concern is among parents of school children that encounter moose on the way to and from school, or on school playgrounds. Cross-country skiers, skijorers, and dog mushers usually appreciate moose in general, but don't like to encounter them on trails. Most residents tolerate moose browsing on their ornamental shrubs, but some homeowners (particularly those that have spent a lot of time and money on landscaping or gardening) want fewer moose in town. Gardeners show the same range of attitudes. Dog owners worry about moose attacking their pets. Some people would rather have fewer moose to reduce the chance for collisions.

Generally, people in Anchorage tolerate some damage and nuisance from moose, but there appears to be a limit. Requests for a hunting season or other form of moose population control increase whenever someone is trampled or killed, during severe winters when more moose are in town (or at least are more visible), and when higher-than-average numbers of moose-vehicle collisions are reported by the media.

Extreme attitudes range from killing or moving all moose out of town to increasing the number of moose in town (because they are difficult to see in summer). Attitudes of most residents fall somewhere in between. Most would probably agree that highly aggressive moose should be shot or moved out of town and that some limited population control should be conducted. We do not know the relative proportions of Anchorage residents holding these opinions. Nor do we know what factors determine attitudes towards moose in town or if or how attitudes change. We could greatly improve our understanding of Anchorage residents' levels of awareness, attitudes, and willingness-to-pay to maintain the moose population at existing levels by conducting a sociological and economic survey in the Anchorage area.

The most commonly suggested solution to moose-human conflicts is to reduce the population through public hunting.

Recent History of Moose Hunts

In 1954, residents of Chugiak convinced the game board that moose were becoming too numerous. The game board opened the area for moose hunting, and the Chugiak Benefit Association sold derby tickets for $2, with a grand prize of a rifle or a deep freeze for the hunter who submitted the largest set of antlers (Cochrane 1983:93).

The moose hunting season in the Anchorage area was September 1-20, the same as the Matanuska-Susitna Valley (the remainder of Unit 14) but shorter than areas farther north. As numbers of moose continued to increase in the late 1950s, the hunting season in Anchorage was lengthened to mid-August through September and it

reopened during November. Cow moose could be hunted by registration permit during the November season. After more than 15 years, the November hunt was eliminated in 1974. Two years later, antlerless hunting was also eliminated, except during the Fort Richardson hunt. During the same year (1976) all moose hunting ceased on the Anchorage Hillside (defined as the area south of Tudor Road and east of the Seward Highway).

Moose hunting remained closed in the Anchorage Management Area until 1981, when the Alaska Board of Game provided for an either-sex registration hunt depending on moose numbers. Similar hunts by special drawing permit were also opened in adjacent management areas within the city limits at about this time.

Too few moose were harvested in the Anchorage Management Area (Table 2) to control the population, except in the vicinity of the Anchorage International Airport.

1983 Hillside hunt. After a high count of 172 moose on the Hillside in fall 1983, a two-day, archery-only, registration hunt for bulls and cows was authorized. Forty-one moose were harvested, including 25 cows and 16 bulls. Another two or three moose were wounded and not recovered.

This was an extremely controversial hunt. Archers were required to pass a proficiency test to qualify. Far more archers (187) participated than expected. A registration hunt cannot limit the number of participants, only the number of animals taken. This unanticipated glut of hunters, forced to compete with others in a two-day hunt, was the primary problem. Hunting was permitted in portions of Chugach State Park. Hunters could also hunt or gain access on private property, but only if permission was obtained from the landowner. Because permission was often not obtained and property boundaries were usually unmarked, frequent trespass occurred. One unethical hunter killed a moose in a closed area. A videotape of a wounded moose and a hunter gutting a moose in a private driveway was aired on the local television news. A vocal minority and sensational media coverage etched in many minds a negative impression of this hunt. Many bowhunters have been reluctant to ask for another hunt in Anchorage because of the controversy generated.

Previous airport hunts. Moose were considered a significant threat to aircraft at the Anchorage International Airport from the 1960s through the early 1980s. Moose were frequently encountered on and adjacent to runways. A landing DC-7 crashed into a cow and calf in 1958 or 1959; the moose were killed, but no humans were injured (Medred 1984). A cow moose charged and hit a taxiing jet in the mid-1960s. Because of the potential for other collisions and multiple fatalities, several archery-only hunts were held on or adjacent to airport property to reduce the local moose population. As many as 22 were killed in one season during the late 1960s. After the airport was fenced, the hunts were no longer necessary. The last hunt was held in 1985. The moose population near the airport declined an estimated 50% after it was denied access to the browse within the airport's fence.

Before the airport bowhunts, some moose were shot near the airport by Department of Fish and Game staff. Documentation of these kills is sketchy; however, six moose were shot between July 1962 and May 1963.

The airport was not entirely closed to moose, because the major access roads do not have gates. Moose gain access to the browse along the runways primarily through the Kulis Air National Guard gate and the taxiway and access road near the airport post office. The airport security detachment has a state permit to harass moose out of the fence or shoot them if necessary. Airport security personnel shot 7 moose in 1984, 10 in 1985, 3 in 1986, 1 in 1989, 2 in 1990, 4 in 1993, and 6 in 1994 (Rossi et al. 1995). The current policy is to shoot moose inside the fence only as a last resort (Doug Lohr, Operations Supervisor, pers. commun., October 1995). No moose have been shot since July 1994.

No moose hunts have been conducted in the Anchorage Management Area since 1985, although the department is presently authorized to issue up to 30 drawing permits annually for an archery-only hunt for antlerless moose and young bulls with spike-fork antlers.

PROBLEM STATEMENT

Moose in Anchorage injure and occasionally kill humans and pets, disrupt human activities, damage property, and are frequently killed or injured themselves. Reducing moose densities through public hunting has been recommended as a way to reduce human-moose conflicts and increase opportunities to hunt moose.

ISSUES

Moose are a fact of life in Anchorage, and it is unlikely that the public will support eliminating most of them from the Anchorage Management Area. At any population level, moose will have costs and benefits. Presumably, the higher the population level, the higher the costs and benefits.

The following issues should be considered and elaborated on, if necessary, by a public/agency task force.

Benefits of the existing high moose population

o Moose are a popular species for viewing by residents and visitors and have "existence value" as a symbol of wild Alaska in Anchorage.

o Moose, both as prey and carrion, support a variety of predator and scavenger species in the Anchorage Management Area, including wolves, coyotes, wolverines, black and brown bears, eagles, ravens, magpies, and jays. These species are also desired for viewing and their "existence value."

Costs of the existing high moose population

o Each year in Anchorage one to two hundred moose-vehicle collisions damage property, injure or kill humans and moose, and have additional costs in insurance and lost wages.

o Trains that have hit moose on the tracks have been derailed. This has not happened in Anchorage, but has occurred at least once between Wasilla and Talkeetna.

o Moose on runways are a potential danger to aircraft crews and passengers. Several moose have been struck by aircraft in Anchorage. In other states, airplanes have crashed and human lives lost in collisions or attempting to avoid deer on runways.

o Moose threaten the safety of children on school grounds, walking to and from school, and at school bus stops. Children have been injured by moose in Anchorage, but none killed.

o Moose attack dogs cornered in fenced yards, on chains, or being exercised. Many dogs have been attacked, some injured, and a few killed by moose.

o Moose threaten and attack people during recreational activities, particularly cross-country skiing and dog mushing. Some people avoid certain trails or reduce outdoor activities in winter or summer because of the threat.

o Moose have attacked and injured Anchorage residents on or near their homes. Some people are afraid to leave home for days because moose in the neighborhood are acting aggressively or perceived to be dangerous. Two recent deaths in Anchorage have fueled widespread fear and concern for human safety. The family of one of the fatalities is suing the University of Alaska--Anchorage for failing to drive a cow and calf away from the entrance to a campus building.

o Moose eat ornamental trees and shrubs, fruit trees, flowers, and vegetables, costing residents tens (perhaps hundreds) of thousands of dollars annually in damages and for preventative measures.

o The moose population in the Anchorage Management Area is currently controlled by vehicle collisions and starvation.

o The demand for a sustainable annual harvest is not being met.

o Agencies such as Fish and Game, Fish and Wildlife Protection, State Troopers, Anchorage Police Department, Department of Transportation and Public Facilities, and the Anchorage School District spend thousands of hours each year responding to problems caused by moose; this time could be allocated to other pressing issues.

Other issues related to holding a moose hunt in the Anchorage Management Area:

o The Anchorage moose population could support an annual harvest and be maintained at existing or lower levels.

o Potentially suitable locations such as Chugach State Park, Kincaid Park, and Bicentennial Park are all heavily used by other recreationists, some of whom would object to a hunt. How would conflicts be avoided or minimized?

o Adverse public reaction could increase antihunting sentiment among nonhunters.

o How would public and hunter safety be ensured?

o Could enough moose be harvested in a safe and publicly acceptable manner to significantly reduce adverse moose-human interactions?

o How would trespass be prevented?

o Could individual moose (e.g., highly aggressive, badly injured) be harvested selectively?

SOME MANAGEMENT ALTERNATIVES

Other cities have similar problems with urban populations of white-tailed deer. Wildlife managers have assessed various management alternatives. Following is a synopsis of the current options. The public/agency task force should discuss these alternatives and any others raised during the planning process.

Trap or immobilize excess moose and transfer to other locations

Trapping, immobilizing, and transporting activities are labor-intensive and expensive. Costs for capturing urban deer in other states have ranged from $113 to $800 per deer. The cost to move three aggressive, orphaned moose calves out of Anchorage during the winter of 1994-95 ranged from $300-650, depending mostly on personnel time to drive them a considerable distance out of town. Using aircraft would cost more. Moving adult moose would cost more than moving calves because more time, staff, and equipment would be required.

It makes little sense to move moose unless the release site is at least 30 miles away (so they are unlikely to return to the capture site) and is capable of supporting them. In winter there are few, if any, places where a sufficient surplus of moose browse exists, because the food is needed by the local moose. Aggressive moose should not be relocated to a site where they may encounter other people.

Moose are susceptible to traumatic injury during immobilization and handling. Trauma losses average approximately 4% for deer. Delayed mortality as high as 26% has been reported for deer. One of the three moose calves moved out of Anchorage in winter 1994-95 died, probably from a combination of an ineffective drug antidote, handling, and capture myopathy (a stress-related disease).

Survival rates of relocated animals are frequently low. Because they are unfamiliar with their new surroundings, animals may die from starvation or increased predation. Losses of 55-85% have been reported for deer 4-15 months after relocation. One of the three

moose calves moved out of Anchorage in winter 1994-95 survived the capture and handling, but died less than 10 days later, probably from starvation. The third moose calf was not seen again and probably died of starvation or predation.

Use fencing and repellents to manage conflicts with moose populations

Fencing and repellents are a site-specific solution at best. There would be no practical way to exclude moose from the city or even from the major roads. At best, fences work in limited areas such as the Anchorage International Airport, Glenn Highway (near Anchorage), and around yards or individual plants. In New York state, it was determined that fencing a 25-acre parcel with an eight-foot-high woven wire fence costs approximately $60 per acre per year; a moderately priced, high-tensile electric fence costs approximately $18 per acre per year.

In the early 1980s, the Glenn Highway between Muldoon and Hiland Road had the highest number and rate of moose-vehicle accidents in Alaska--typically 45 per year (Thomas 1995). During the three years after fencing and lighting a 3.3-mile stretch between Muldoon Road and the main gate of Fort Richardson, moose-vehicle collisions declined 95% (McDonald 1991). The cost of fencing was estimated before construction at about $10 per linear foot, or about $350,000 (Mike McDonald, pers. commun.).

Repellents have been developed for deer, although their performance is highly variable. There are no known effective moose repellents. Several commercial deer repellents and "folk remedies," such as Irish Spring soap or putrified eggs, appear to work under some circumstances, but when moose are abundant and hungry they largely ignore unpleasant odors and tastes if the underlying food is nutritious. Repellents lose their effectiveness rapidly and constant reapplication is expensive.

Fencing and repellents are expensive, labor-intensive, and often unaesthetic. These considerations typically limit their use.

Use fertility control to regulate moose population

Fertility control agents (synthetic progestins and estrogens) have been and continue to be evaluated for use in deer population control. Concerns pertaining to oral contraception include the cost and logistics of bait distribution, dosage control, and ingestion of bait by non-target wildlife.

While it is feasible to control fertility in captivity, free-ranging animals are more difficult subjects. Some fertility drugs have reduced deer productivity but failed to control herd growth. Deer have developed an aversion to treated bait. Daily treatments necessary for some drugs are impractical: how do you locate and identify treated moose that need their daily dose or a periodic implant; how do you find every fertile moose? Even if a drug is found that requires only one treatment, there are still potentially insurmountable problems in treating an adequate proportion of the population (Garrott 1995). For example, assume that 90% of the moose can be found, 90% of these moose can be treated successfully, and the contraceptive has a 95% efficiency. This highly optimistic scenario would successfully neuter only 77% of the breeding population (i.e., 0.90 x 0.90 x 0.95 = .77). Every year fertile moose would wander into the area, further

reducing the proportion of infertile moose in the population. Presumably, every treated moose would require a visible marker or tag. The effects of long-term exposure of moose to steroids and the effects of steroid-treated carcasses on consumers in the food chain, including humans are unknown.

Change human behavior or expectations

The Department of Fish and Game and other state and federal wildlife agencies have attempted to inform and educate the public with little success. Programs such as "Give Moose A Brake" have had limited effect on human behavior. Judging by the average speed of vehicles on the Glenn and Seward highways, motorists appear to ignore the roadside tallies of moose killed in collisions.

Few Anchorage residents voluntarily erect sturdy, eight-foot-high fences around their gardens or ornamental shrubs. Few residents base their landscaping decisions on which plants are unpalatable to moose. Despite the law prohibiting feeding, in effect since July 1993, and subsequent publicity, many Anchorage residents still feed moose.

Some techniques may help drivers avoid collisions with moose. They include slower posted speeds at night, brighter headlights or street lights, underpasses for wildlife at known crossings, roadside clearing, and not using mineral salts on roads. Fencing and improving visibility at night with lights or clearing are the only two proven methods (McDonald 1991, Lavsund and Sandegren 1991). However, all of these methods are expensive and involve trade-offs.

Conduct a regulated moose hunt

With few predators willing to follow moose into town, the moose population has few natural checks. Every year, more moose calves are born. Like other members of the deer family, moose numbers will increase until they deplete their food supply--at which time they will starve to death in large numbers. Ironically, the mortality from collisions has helped stave off a widespread die-off during recent severe winters.

Biologically, the moose population could support a harvest in the Anchorage Management Area. However, the hunt would not be feasible without considerable public support.

Moose hunts were conducted in the Anchorage Management Area from 1969 to 1985. All of these hunts were limited to archers only. Bow and arrows have the advantage of short range, an important consideration in or near an urban area, and are extremely lethal when accurately placed. During the 1970s it became evident that many Alaskan bowhunters lacked proficiency. In three annual hunts, 1,440 bowhunters reported shooting 98 arrows to harvest 11 moose (Table 2). Many of these hunters were using bows for the first time (Griese 1993). An unknown number of moose were wounded but not retrieved during these hunts. When 30% of the moose struck by arrows in a subsequent bowhunt on Fort Richardson were wounded, this was perceived at the time as a substantial improvement over wounding rates at the Anchorage airport (Griese 1993).

The high wounding rates during airport moose hunts led to adoption of a proficiency test requirement for Anchorage area hunts in 1982. Archers were required to place three of five arrows into a lethal area of a life-size moose target. The test was passed by 76% of the 190 archers that took the test; of those passing, 37% passed with their first three arrows, 30% needed four arrows, and 33% needed all five arrows (Griese 1993). During a subsequent hunt on Fort Richardson, their test proficiency was correlated with accuracy in the hunt. Notably, the most proficient archers shot six moose and reported wounding none, a 100% kill rate, while those archers who needed four arrows to pass the test had a 55% kill rate and those needing five arrows had a 30% kill rate. The poor performance by the least proficient archers prompted several modifications in the proficiency test. Currently, archers must place five of eight arrows, shot at four separate targets, into lethal areas to pass the proficiency test. Beginning in 1987, successful completion of an International Bowhunter Education Program course was required in addition to the proficiency test.

Some deer hunts in other states, in areas with similar public safety concerns, allow the use of muzzleloading rifles or shotguns with slugs. Both have limited ranges compared to modern hunting rifles, and both are more accurate than an arrow. At least two studies on deer hunters have shown wounding rates for arrows are twice as high as shotgun slugs; on the other hand, shotgun hunters were more likely to miss (Langenau 1986). Hunter proficiency for both of these methods can be improved by hunter education and requiring hunters to pass a test for accuracy. Muzzleloading rifles have been used in one of the Fort Richardson moose hunts since 1989.

Hunting is the least expensive method in terms of public funding (Ellingwood and Caturano 1988). There is a high demand for hunting moose in the Anchorage area. In 1994, 7,799 permit applications were submitted (at $5 apiece) for 205 moose permits in other local management areas. Hunters would value the meat.

Potential problems are 1) unpopularity of a hunt among antihunters, some nonhunters, and even some hunters; 2) public safety; 3) trespassing; and 4) conflicts with other people using the same area.

If a hunt were held, it would be managed very differently from the last Hillside and airport hunts. Large numbers of hunters would not be in the field. Participation would be limited by lottery, just as in most other moose hunts in the Anchorage area. The hunting pressure could be spread out by issuing the permits for different periods, as is done for sheep hunts in Chugach State Park. Hunts could be limited to a season when the fewest hikers or skiers are out, such as October or early November. Hunts could also be restricted to mid-week days, to further avoid conflicts with others. This would not be a trophy hunt; it could be limited to cows and yearling bulls. Access could be limited and hunt boundaries established to avoid trespass. Safety and proper conduct could be promoted by required applicants to attend a week-long, hunter education course stressing hunter ethics and safety. Proficiency in shooting and tracking could be required. The hunt could be restricted to use of bow and arrow, or shotguns or muzzleloading rifles, all with limited ranges. Hunters could be required to remove all signs of a kill--to avoid offending others or attracting bears in spring.

Control moose with sharpshooters

This method would be labor-intensive and expensive. An urban deer removal program in Wisconsin averaged $74 per animal shot over bait. Most of this cost was for 13.6 hours of labor for each deer removed, at $3.65 per hour. Obviously, labor alone would drive up the cost in Anchorage. The meat could be donated to charities, although the existing charity list is glutted by road-killed moose in some winters. Another option is to hold a drawing for the meat, instead of the hunting opportunity. The next drawing winner on the list would be contacted when a moose was dispatched. Applicants would pay the usual permit application fee and might be required to purchase a hunting license.

One advantage of this method would be the ability to cull individual animals. Sharpshooters could selectively harvest aggressive or badly injured moose, or moose that appear to be candidates for a vehicular collision.

Employing government sharpshooters would be controversial among hunters if hunting was also a feasible alternative. Hunters would perform the same function for free, although managing and enforcing the hunt would cost something.

If sharpshooters were employed by the state, they would be trained and insured for liability in the event property was damaged or someone was shot. Another option is for an enforcement officer or biologist to accompany individual hunters and designate the animal to be shot. This is being tried in Homer; however, it is extremely labor-intensive (and therefore expensive) and liability is a question. Some of the cost would offset current costs of chasing animals.

Provide supplemental food

Supplementing the natural food supply of moose in the Anchorage Management Area would be counterproductive because it would increase survival, resulting in additional population growth. This would increase the potential to overbrowse, thereby damaging the natural food supply.

No change

"Let nature take its course" is an option. The public/agency task force should determine if it is a viable one.

PLANNING OBJECTIVES

1) Obtain support of land management agencies (e.g., Alaska Division of Parks and Outdoor Recreation, Anchorage Parks and Recreation, Bureau of Land Management, Anchorage International Airport) for the planning process and determine their willingness to allow hunting or sharpshooters if these are recommended alternatives.

2) Determine the attitudes, experiences, costs, willingness-to-pay, and preferred management alternatives of Anchorage residents relative to moose in the Anchorage Management Area using a public questionnaire.

3) Evaluate the feasibility and public acceptance of alternatives for reducing moose numbers in the Anchorage Management Area.

4) Determine the availability of suitable hunt areas and evaluate the feasibility and public acceptance of an annual moose hunt in the Anchorage Management Area.

5) Evaluate the efficacy of hunting for reducing and maintaining lower moose numbers.

6) Evaluate the effects of reducing moose densities on number, location, and type of moose-human conflicts.

7) Evaluate the benefits to hunters of holding an annual moose hunt in the Anchorage Management Area.

8) Evaluate the opportunity cost of reducing moose numbers and identify potential sites in the Anchorage Management Area for optimum moose-viewing opportunities.

9) Develop a five-year management plan for the Anchorage Management Area, incorporating these findings.

TASKS

The management plan and any necessary Board of Game action should be developed in seven phases. The decision to proceed with each phase will depend on satisfactory progress in the previous phase, adequate funding, and available staff.

Task 1: meet with land management agencies (Objective 1)

Task 2: public survey by ADF&G (Objective 2)

Task 3: public/agency task force (Objectives 3-8)

Task 4: management plan written by ADF&G (Objective 9)

Task 5: if hunt is an approved alternative, submit to Board of Game for approval

Task 6: seek funding sources to enhance moose viewing opportunities

Task 7: if hunt is authorized, monitor moose population and hunting effort

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Table 1. Moose killed in collisions with vehicles and trains in Game Management Unit 14C.

Year[1]	Vehicle	Train	Total[2]	Comments
1959-60	20	--[3]	20	
1960-61	28[4]	4	32	Anchorage pop. 82,833
1961-62	53	4	57	
1962-63	118	--	118	
1963-64	66	3	69	
1964-65	54[4]	6	60	
1965-66	24[4]	8	32	Anchorage pop. 102,337
1966-67	26[4]	3	29	
1967-68	47[4]	4	53	
1968-69	23[4]	0	23	
1969-70	86	0	86	
1970-71	65	3	69	Anchorage pop. 126,385
1971-72	106	2	108	
1972-73	60	4	64	
1973-74	--	2	2	Legal speed limit reduced to 55 mph
1974-75	74	4	78	
1975-76	44	1	45	Pop. 177,817; Glenn Highway widened to 4 lanes
1976-77	59	2	61	
1977-78	67	2	69	
1978-79	93	7	100	
1979-80	74	5	79	
1980-81	61	0	61	Anchorage pop. 174,431
1981-82	91	6	97	
1982-83	159	5	164	
1983-84	130	8	138	
1984-85	87	5	92	
1985-86	92	6	98	Anchorage pop. 248,263
1986-87	111	8	119	
1987-88	91	28	119	6.8 mi of Glenn Hwy widened to 6 lanes and 1.6 mi fenced
1988-89	98	13	111	Additional 1.7 mi of Glenn Hwy fenced
1989-90	120	17	137	
1990-91	90	11	101	Anchorage pop. 230,185
1991-92	129	24	153	
1992-93	90	10	100	Anchorage pop. 240,258
1993-94	100	9	109	
1994-95	239	22	261	

[1] From June 1 to May 31 for vehicles and from May 1 to April 30 for trains.
[2] Minimum number killed, because not all collisions are accounted for and some moose die later of injuries.
[3] "--" means unknown.
[4] Fort Richardson (Glenn Highway) only.

Table 2. Moose permit hunts in the Anchorage Management Area: 1969-1995.[1]

Regulatory year[2]	Number harvested			Number of hunters	Number of hours effort	Number of arrows shot
	Bulls	Cows	Total			
1969-70			22	649	ca. 3,000	--
1970-71		14	14	--[3]	--	--
1971-72		5	5	--	--	--
1972-73		3	3	265	1,001	16
1973-74	2	4	6	661	2,379	68
1974-75		2	2	515	2,185	14
1975-76			--	--	--	--
1976-82			0	0	0	0
1983-84	25	16	41	187	--	--
1984-85	2	6	8	12	--	--
1985-95			0	0	0	0

[1] All hunts limited to archery-only; all hunts on airport property, except Hillside hunt in 1983; no hunts since 1985.
[2] From July 1 to June 30.
[3] "--" means unknown.

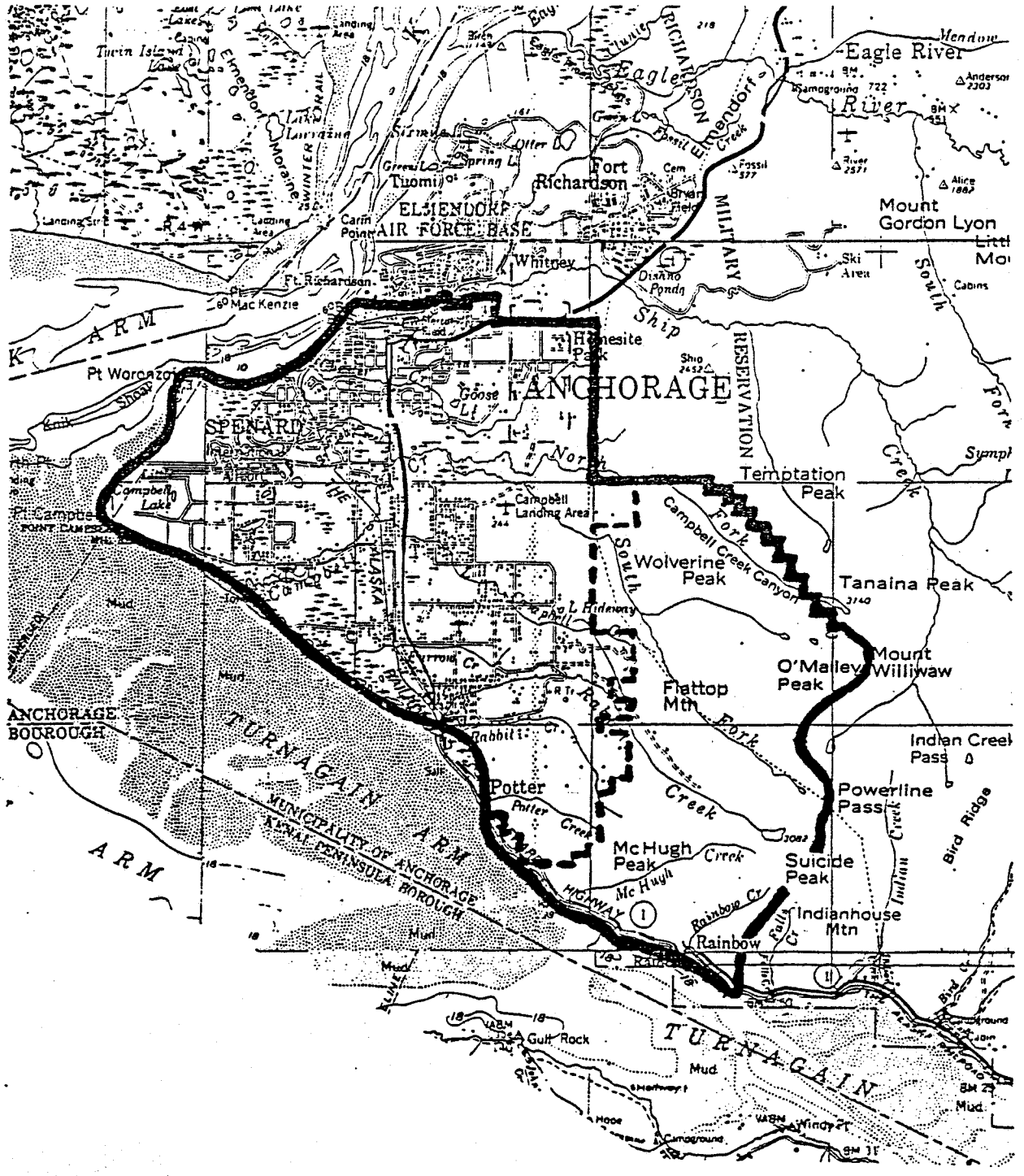

Figure 1. Anchorage Management Area, including a portion of Chugach State Park (east of dashed line).

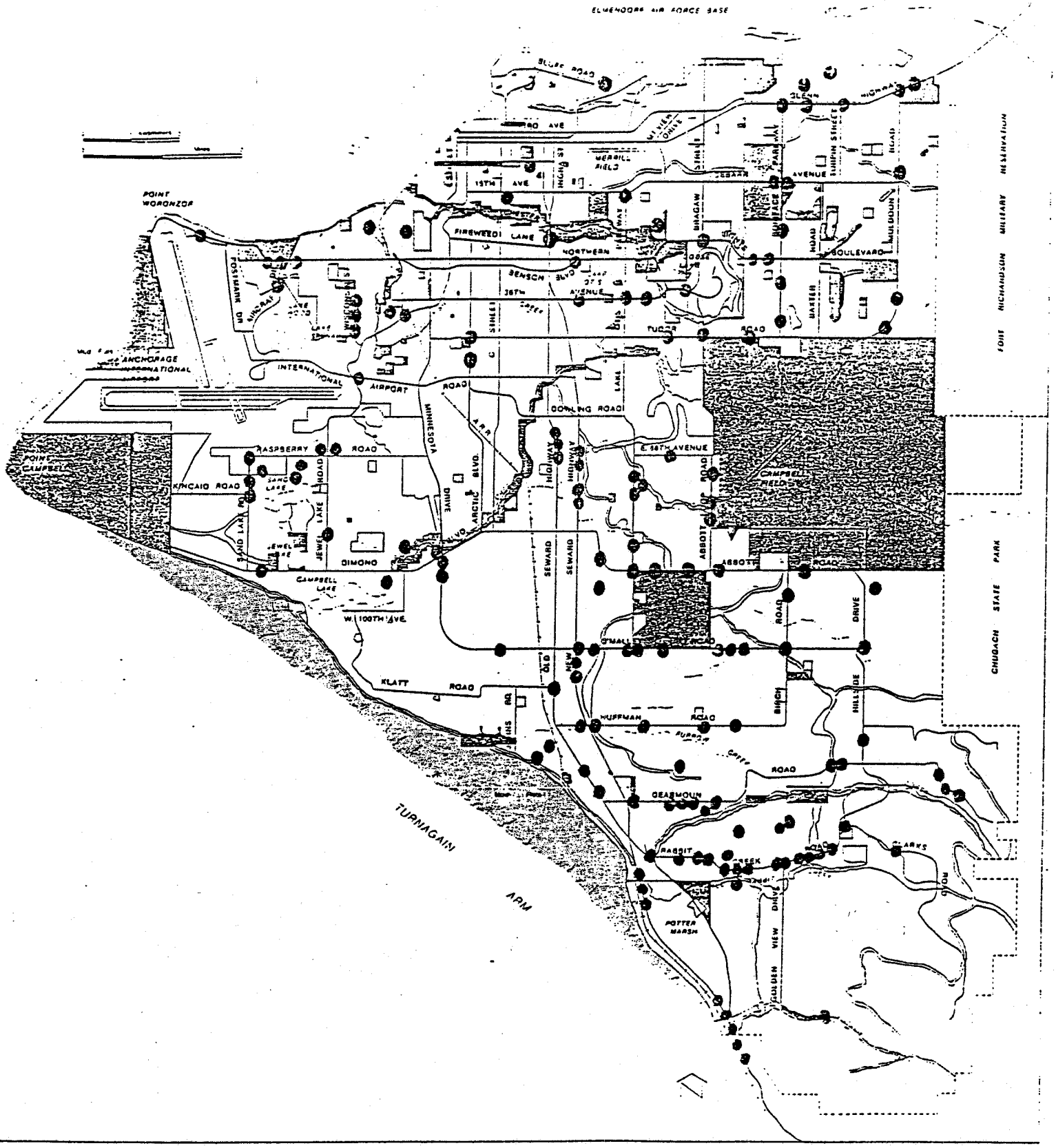

Figure 2. Known locations of 151 moose fatalities resulting from collisions with vehicles in Anchorage: June 1994 - May 1995. Shaded areas are municipal parks, open areas, and greenbelts.