MOOSE VEHICLE INTERACTIONS AND AN ASSOCIATED PUBLIC AWARENESS PROGRAM ON THE KENAI PENINSULA, ALASKA

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ABSTRACT: Moose roadkill information was presented for the years 1977-1991. Mean numbers of moose killed were 111.7 ± 19 for 1977-82 and 216.3 ± 25 for 1984-89. Information for 1983 was not available. The 1989-90 kill of 366 moose was extremely high because of severe winter conditions and high moose concentrations along highways. Roadkills during the 1990-91 season were slightly higher (234) than the mean for 1984-89 but included additional reports from outlying communities. Figures without these communities (177) show a decrease of 18%. A public awareness program initiated in October 1990 increased people's understanding of potential hazards of encountering moose on Peninsula roads and hopefully reduced moose roadkills. Primary factors for moose-vehicle accidents were an increase in the Peninsula's human population and improved road maintenance allowing motorists to travel at higher speeds. Secondary factors include decreased visibility from encroaching vegetation and short winter days. Cooperating agencies included Alaska State Troopers, Fish and Wildlife Protection, Department of Fish and Game, and Department of Transportation and Public Facilities. Additionally, several local citizens representing various organizations and three elementary schools participated. A multi-media approach was used to educate the widest group of motorists consisting of public service announcements, bumper stickers, window signs, road signs, and coloring posters for elementary school children. The slogan "Give Moose A Brake" was adopted to remind motorists to slow down and drive with caution.

ALCES VOL. 27 (1991) pp.1-7

The Kenai Peninsula has a history of fluctuating moose populations which correspond to browse regrowth following wildfires (Lutz 1960, Schwartz and Franzmann 1989). The latest peak in moose numbers occurred in the early 1980's following forest succession from a burn in 1969.

Human populations also increased dramatically during the past 30 years since discovery of the Swanson River Oil Field. Populations increased from 9,053 in 1960 to 40,802 in 1990 (Kenai Peninsula Borough Economic Development District Inc. 1991). The Kenai's proximity to Anchorage, to developed oil and gas fields, and more recently development of recreational opportunities have contributed to rapid growth on the Peninsula and high traffic volume. Fifty-eight percent of the Kenai Peninsula's population (Kenai, Soldotna, Sterling, and Nikiski) reside near the perimeter of the 1969 burn in the northern Kenai lowlands (Fig. 1).

Fig. 1. Major communities and highways of the Kenai Peninsula, Alaska.

During severe winters moose congregate in regenerating forest stands and follow packed trails to and from feeding areas. Roads and driveways provide excellent pathways for moose which create hazards for motorists. During the winter of 1989-90 deep snows concentrated moose into lowland areas near several communities resulting in higher than average roadkills. Three hundred sixty-six moose were reported lost to vehicle accidents. Property damage to vehicles was high, averaging $4,000.00 at one auto body shop. Even more importantly, 2 human lives were lost during the summer of 1990 as a result of moose-vehicle accidents.

These events stimulated interest from managing agencies and concerned citizens. As a result of several meetings a public awareness campaign was initiated to increase the awareness of moose hazards to Peninsula motorists. A committee was formed from agency personnel and local citizens to address moose roadkills. Committee members were concerned for the safety of Peninsula residents and the health of the moose population. The campaign consisted of gentle reminders to the public about moose and the potential hazards of encountering a moose on the highway. The committee wanted to adopt as many programs as feasible for the upcoming winter and evaluate each for effectiveness.

STUDY AREA

The Kenai Peninsula is located south of Anchorage across Turnagain Arm (Fig. 1). Access to the Kenai Peninsula is primarily by ground transportation along 2-lane highways and by air services to Kenai, Soldotna, and Homer. Approximately 1,450 miles of state maintained roads and highways are on the Kenai Peninsula in addition to city and borough roads. The 1969 burn lies adjacent to the Sterling Highway and the surrounding communities of Sterling, Soldotna, Kenai, and Nikiski.

Vegetation types vary with mixtures of overstory plants including paper birch (*Betula papyrifera*), black cottonwood (*Populus trichocarpa*), aspen (*Populus tremuloides*), white spruce (*Picea glauca*), black spruce (*Picea mariana*), Sitka spruce (*Picea sitchensis*), Lutz spruce (*Picea x lutzii*), and mountain hemlock (*Tsuga mertensiana*) (Reynolds 1990). Stands of timber vary in age from various large wildfires in 1871, 1890, 1910, 1926 (Lutz 1960), 1947, and 1969 (Schwartz and Franzmann 1989). Subsequent regrowth was responsible for increased moose densities. The 1947 fire which burned approximately 500 mi^2 and the 1969 fire which burned approximately 135 mi^2 were the most recent fires and occurred near roads and towns.

METHODS

Information from moose-vehicle collisions on Peninsula roads was collected by Alaska Fish and Wildlife Protection officers, Alaska State Troopers, and Alaska Department of Fish and Game staff. Following a collision, motorists were required to notify Alaska State Troopers' dispatch with the location and time of the accident, fate of the animal, and whether emergency services were needed. If the moose was killed, Fish and Wildlife Protection was notified and then persons on a charity list were contacted to salvage meat and provide any biological samples requested by the Department of Fish and Game. Information gathered included date of kill, sex, age (adult or calf), road mile, and fate of the moose. If the moose was not killed, a Fish and Wildlife Protection Officer was sent to the scene to dispatch the moose if necessary.

Adult moose were usually salvaged and divided between two needy families who had previously signed up with the State Troopers office. Prior to the winter of 1990-91, moose killed and reported to Fish and Wildlife Protection field offices were only summarized and reported annually. With the onset of the awareness program a new system of reporting required all field offices to provide summa-

ries every 2 weeks. Reports from 1990-91 are complete with reports from the entire Peninsula, whereas previous years' summaries may only contain partial data from field offices.

The slogan "Give Moose a Brake" was adopted as the theme for the awareness program. Bumper stickers, window signs and buttons were designed and distributed over the counter in offices of cooperating agencies. Road signs (4 X 8 feet) were constructed and placed along roads near major communities (Fig. 2).

Three local elementary schools, participated in a poster coloring contest. Winners received a prize and all posters were collected for exhibition in Peninsula communities. The focus of this portion of the program was to convey the message to families through school-aged children.

Public service announcements were aired by local radio stations free of charge. These announcements also focused on the awareness of children and encouraged them to help their parents watch for moose while driving.

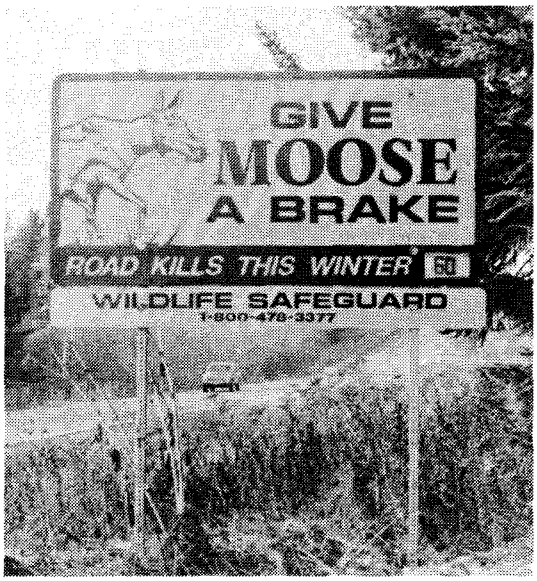

Fig. 2. One of 8 signs posted near communities on the Kenai Peninsula, Alaska. Roadkill tally was updated weekly.

RESULTS

Roadkill numbers have been recorded and summarized from 1977 to present and represent only reported fatalities. An unknown but believed significant number of moose were injured and not reported if vehicle damage was minor. Unreported moose vehicle accidents that result in moose that move away from the road and die may be as high as 18% (Poll 1989). Prior to the 1990-91 winter, roadkill reports from the Seward and Homer areas were not available and subsequently not added to the Peninsula total. In 1991, 57 moose were added to the total for the Peninsula from these 2 areas.

Two significant increases in roadkills were identified; the first following the Department of Transportation's (DOT) improved winter road maintenance and the second during the severe winter of 1989-90 when deep snows forced more moose than usual into wintering areas along roads.

The DOT increased road maintenance in 1983. The goal of DOT's new "dry road" policy was to remove snow immediately after a snowstorm and increase road sanding frequency to provide safer roads. Since roads were in better condition motorists could increase their speed and moose road kills nearly doubled. Mean road kills prior to the "dry road" policy were 111.7 ± 19 for the period 1977-1982 (Fig. 3). Following the new policy, road kills were significantly greater ($t=8.16$, $P<0.001$) averaging 216.3 ± 25 for the period 1984-1989. All records of roadkills for the winter 1982-83 were accidentally destroyed.

The winter of 1989-90 was severe with deep snows and cold temperatures. Moose migrated from the high country earlier than usual and in greater numbers. High concentrations of moose were observed in the 1969 burn which is adjacent to several Peninsula communities. This area was also covered in deep snow and moose frequented plowed areas including highways. In 1989-90 roadkills were the highest ever recorded at

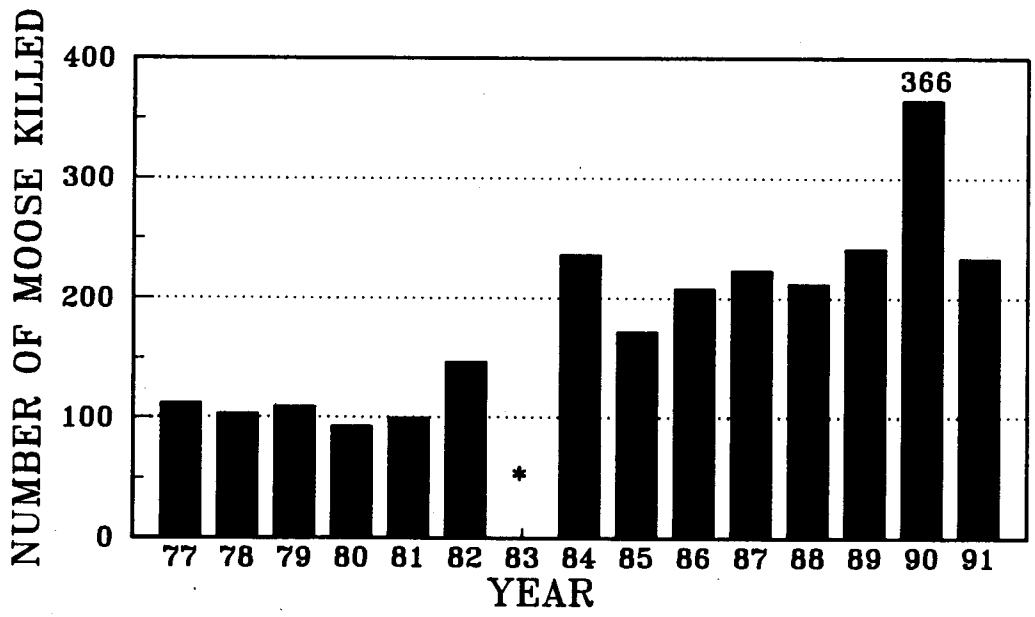

Fig. 3. Mortalities from moose/vehicle accidents from fiscal years 1977-1991 on the Kenai Peninsula, Alaska. Data were unavailable for 1983. Means for 1977-82 and 1984-89 were 111.7 and 216.3, respectively.

366 reported moose.

Monthly assessment of roadkills indicated this was a winter problem for the Kenai Peninsula. The percentage of roadkill moose remained low during spring, summer, and fall when average daily traffic volume was highest and began to rise in November (Fig. 4). Ironically, the tourist season on the Kenai Peninsula is a summer oriented industry and traffic volume peaks during summer months and is lowest during peak moose roadkills November-February) (Alaska Dept. of Trans. and Public Facilities 1991). Roadkills peaked in December and January when daylight hours were at a minimum. In February when day length began to increase, moose-vehicle accidents began to decrease. By March, when snowmelt began, roadkills decreased further and eventually returned to near summer levels.

Moose are active during dark hours and tend to move most during dawn and dusk (Renecker 1986). Because of the short day length, twilight hours during winter occur at approximately the same time people are commuting to and from work. Consequently, these

Fig. 4. Percentage of roadkills of moose by month and monthly average daily traffic (MADT) volume Alaska Department of Transportation counters on the Kenai Peninsula, Alaska 1989-90.

are times when motorists are most likely to encounter moose.

Human caused mortality was a significant form of moose mortality second only to predation. From 1977-1991 roadkills comprised 24.7% of all human caused mortalities compared to 71.0% for sport hunting. The calculation of illegal harvest from enforcement cases pursued by Fish and Wildlife Protection was about 5% of the sport harvest or 3.6% of all known human caused mortalities. Sex and age composition of 786 roadkill moose between 1986 and 1990 showed that the majority were calves comprising 54.6%. Cow (38.5%) and bull (6.9%) roadkills occurred relative to population figures from fall composition surveys. Calf ratios of roadkills were over 3 times greater than calf ratios in the northern Kenai Peninsula population.

A public awareness program was created in the fall of 1990 to increase the awareness of motorists concerning the hazards of moose living near roads. The publicity campaign consisted of reminders in the form of bumper stickers, road signs, window signs, coloring posters for elementary school children, radio public service announcements, and an information pamphlet about moose and their behavior. The program focused around a central theme: "Give Moose a Brake" to educate motorists concerning the hazards of moose along roads and the need for speed reduction. The primary goal was to reduce human injury and death and lower property damage from moose-vehicle collisions. The secondary goal was to reduce the number of moose killed by vehicles. There was no systematic approach to determine change in human injury or property damage. An 18% reduction in moose kills in 1990-91 from the 1984-89 mean suggests lower property damage and hence lower personal injury.

Cost of the awareness program was kept to a minimum by utilization of existing public service agencies. The Community Services Bureau is a division of the Alaska State Troopers and was responsible for creation of the slogan and design of window signs and bumper stickers. The five road signs cost $325.00 each. The design for the coloring posters was purchased from a local artist and printed by a printing company for a cost of approximately $250.00. Public service announcements were aired free of charge by local radio stations.

DISCUSSION

Currently the moose population on the Kenai Peninsula is stable in most areas to declining in areas where seral vegetation has matured (Loranger 1991). Moose migrate from upland areas when snow depth inhibits movement and feeding to areas with less snow and adequate forage. Much of this prime wintering area lies in and around the 1969 burn which borders several Kenai communities. Therefore, moose density along roadsides can be directly related to snow depth. During severe winters exceptionally large numbers of moose can be encountered as was the case in 1989.

Historically, moose roadkills were reported as a "chief cause" of moose mortality other than legal hunting (Spencer and Chatelain 1953). Two factors were identified as the primary sources of moose-vehicle interactions. First, the speed a vehicle is traveling determines reaction time and average stopping distance. Improved roads and better winter maintenance allows motorists to travel at higher speeds and may have contributed to a two-fold increase in roadkills on the Kenai Peninsula. A secondary source that contributes to moose-vehicle accidents is related to roadside visibility. Good visibility along roadsides is a key to safer roads by allowing motorists to see potential problems in advance and therefore allow additional reaction time to avoid them. Poll (1989) found that clearing right-of-ways would increase visibility day and night and "reduce the element of surprise for drivers and ungulates".

Roadkills for the winter 1990-91 were slightly higher than the mean for the period 1984-89 even though the winter could be described as average and moose distribution as normal. When the awareness program was initiated in the fall of 1990 substantial effort was exerted to obtain accurate data from the entire Peninsula. In past years roadkill reports from remote field offices of Fish and Wildlife Protection were not readily available and hence not included in annual summaries. The final total of 234 moose roadkills for 1990-91 includes 57 additional moose from Homer and Seward. By not including these 57 moose to make data comparable between years the total of 177 would then be 18% lower than the mean of 216 for the periods 1984-85 through 1988-89. We would caution attributing the reduction simply to the awareness program. Other external factors including winter severity and population decline due to habitat degradation could also affect these figures.

It is impossible to determine how many motorists were affected during the first year as a result of our awareness program. A 5-year evaluation is planned and will compare moose vehicle accidents to human fatalities, property damage, human population and traffic densities, and road maintenance and construction. Anecdotal information suggests that some people were more aware of driving conditions and the potential for encountering moose. If one human life was saved or an accident avoided because people were more alert, then it is our opinion that the program was a success and should be continued.

In addition to the awareness program, the Alaska Department of Fish and Game is providing input to the Department of Transportation on new road construction or proposed upgrades to existing highways. Poll (1989) contends that improvement of roadside visibility, especially in high kill areas, could significantly reduce the incidence of collisions. A highway design with reduced roadside vegetation can provide motorists with good visibility. Possible mitigation measures may be necessary away from highways when highways are constructed in high density areas. Habitat enhancement away from road systems could be an effective form of mitigation. Fencing may be necessary when other attempts have failed to reduce roadkills in specific areas. Well designed fence systems (with escape routes and travel corridors) appear to be one of the only methods that nearly eliminate roadkills in an area (Poll 1989). McDonald (1991) found a 95% reduction in fenced versus unfenced areas on the Glenn Highway near Anchorage, Alaska.

MANAGEMENT CONSIDERATIONS AND RECOMMENDATIONS

As long as wildlife exist near human civilization and communities continue to grow, we will have wildlife-vehicle interactions. In some areas roadkills may be so numerous that they become additive mortality. This may be the case on the Kenai Peninsula. Loranger (1991) stated that moose mortality from vehicle collisions may be adversely impacting moose populations near residential areas on the Peninsula. The moose population on the northern Kenai Peninsula is currently declining due to maturing seral vegetation. High roadkill numbers may accelerate the decline without any habitat enhancement.

We would like to continue the public education program to maintain a high level of awareness of the hazards of moose along Peninsula roads. In addition to participating agencies, public involvement is crucial to maintaining a "grassroots" program. A grassroots program is essential when funding is scarce. Road signs with a weekly roadkill tally help keep motorists aware of the situation.

Along with a public awareness campaign, coordination with the Department of Transportation on new highway projects is encouraged. Construction of roads and highways outside of areas with high wintering

densities (ie. riparian zones) should be a critical part of the planning process. If roads must be constructed in or near high density areas, roads and right-of-ways must be designed with visibility as an important goal. For example, right-of-ways should be cleared a minimum of 50 feet from the roadside and vegetation maintained to a level that will be covered by snow. An alternate method to keep moose away from roadsides is to clear and seed the shoulder with a dense low growing grass that will inhibit browse growth. These methods are being employed in limited areas on the Kenai Peninsula. Additional testing is needed over large areas to determine feasibility. In areas where road construction destroys critical habitat or more importantly increases the number of wildlife killed, mitigation should be considered.

ACKNOWLEDGEMENTS

We thank the concerned citizens who helped organize and operate this program; Alaska Fish and Wildlife Protection, and Alaska State Troopers for data collection, Wildlife Safeguard for financial support, Alaska State Troopers-Community Services Bureau for design of materials and slogan creation, local artists for public service announcements, Department of Transportation and Public Facilities for erection of signs and roadside mowing, C. Schwartz and other employees of Alaska Department of Fish and Game for advice and review of materials.

REFERENCES

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES. 1991. Central region traffic volume report 1987-1990. 127 pp.

KENAI PENINSULA BOROUGH ECONOMIC DEVELOPMENT DISTRICT INC. 1991. 1990 situation and prospects, Kenai Peninsula Borough. 62pp.

LORANGER, A. 1991. Kenai National Wildlife Refuge moose management plan, technical supplement. Kenai Natl. Wildl. Refuge, AK. In press.

LUTZ, H. J. 1960. Early occurrence of moose on the Kenai Peninsula and in other sections of Alaska. U.S.D.A. For. Serv. Alaska For. Res. Center. Misc. Publ. No. 1. 25 pp.

McDONALD, M. 1991. Moose movement and mortality associated with the Glenn Highway expansion, Anchorage Alaska. Alces 27: 208-219.

POLL, D. M. 1989. Wildlife mortality on the Kootenay Parkway, Kootenay National Park final report. Kootenay National Park, Radium Hot Springs, B. C. 105pp.

RENECKER, L. A. 1986. Bioenergetics and behavior of moose (*Alces alces*) in the aspen boreal forest. Phd Thesis. Univ. of Alberta, Edmonton. 260 pp.

REYNOLDS, K. M. 1990. Preliminary classification of forest vegetation of the Kenai Peninsula, Alaska. Res. Pap. PNW-RP-424. U.S.D.A. For. Serv. Pacific N. W. Res. Sta. 67pp.

SCHWARTZ, C. C., and A. W. FRANZMANN. 1989. Bears, wolves, moose, and forest succession, some management considerations on the Kenai Peninsula, Alaska. Alces 25:1-10.

SPENCER, D. L. and E. F. CHATELAIN. 1953. Progress in the management of the moose of south central Alaska. Trans. 18th N. Am. Wildl. Conf. 539-552.