Wildlife Mitigation and Human Safety for Sterling Highway Milepost 58-79 Project

Submitted by

Richard D. Ernst, Wildife Biologist
U.S. Fish and Wildlife Service
Kenai National Wildlife Refuge
P.O. Box 2139
Soldotna, AK 99669

Jeff Selinger, Area Biologist
Alaska Department of Fish and Game
43961 Kalifornsky Beach Road, Suite B
Soldotna, AK 99669-8367

Submitted to

Jim Childers, Project Manager
Alaska Department of Transportation and Public Facilities
P.O. Box 196900
Anchorage, AK 99519-6900

Federal Highways Administration
Western Federal Lands Highway Division
610 E 5th Street
Vancouver, WA 98661

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PROBLEM STATEMENT

Roads constitute the largest human artifact on earth (Forman and Sperling 2003) and have both direct and indirect impacts on fish and wildlife. The most obvious direct impact besides the loss of habitat is animal mortalities due to collisions with vehicles. These collisions also result in human deaths, injuries, and property damage. Indirectly, highways bisect habitat and can impair or prevent natural animal movements across the landscape. Without adequate, continuous habitat, the ability of wildlife to access food, water, mineral licks, shelter, breeding sites and other vital areas becomes hampered. Wildlife populations also become divided. Higher traffic volumes and speeds increase the highway impacts on wildlife.

Animal-vehicle collisions are a major problem with the existing Sterling Highway and will likely worsen with the planned improvements to the highway infrastructure (passing lanes, wider shoulders). Sterling Highway milepost 70-72 (by the Watson Lake pullout) ranked 7th of Alaska's rural highway segments with the highest moose-vehicle collision rates (State of Alaska 1994). Bangs (1989) states that road-kill is the largest mortality source for adult female moose in the Kenai National Wildlife Refuge. Road-kill mortality for adult female moose is likely additive since this sex and age group is believed least susceptible to natural mortality and limited harvest of cows occurs on the Kenai Peninsula (Loranger 1991).

There are many techniques, structures and methods developed and deployed across the world for mitigating road impacts on wildlife and landscapes. There is a need for monitoring and research to judge the effectiveness of mitigation measures on wildlife-vehicle collisions as well as wildlife movements across roads. Scientifically based research on various deterrent devices, techniques and structures is needed to give the state transportation agency the appropriate tools to combat the problem. As state departments of transportation across the nation invest in wildlife crossing structures and other measures, the benefit/cost analysis will guide future applications of mitigation techniques.

Landscape connectivity is the degree to which the landscape facilitates animal movement and other ecological flows. Roads, combined with powerline or pipeline rights-of-way may have a

greater impact on a species than the road itself. Isolation caused by roads may reduce gene flow, thus causing genetic effects (Forman and Sperling 2003).

Moose population estimates in Game Management Subunit 15A (north of the Kenai River) have declined from a high of 5,298±927 (80% CI) in 1971 to the lowest ever 2,068±238 (80% CI) in 2001. Both the Refuge and the Department of Fish and Game have a goal of 3,600[1] moose for 15A and we are well below that. Habitat quality continues to decline as early seral forests of aspen, birch and willow mature. We need to aggressively enhance large acreages of moose habitat as well as reduce animal deaths via vehicles to stop this decline. Both the U.S. Fish and Wildlife Service and the Department of Fish and Game need to make habitat enhancement a priority and fully fund the work.

Moose kills from vehicle collisions have occurred along the Sterling Highway and will likely increase as vehicle speed and traffic volume rise. Human safety is also an issue as well as the costs in vehicle damage, medical care, and lost work time. Figure 1 shows the number of human injuries/fatalities from moose-vehicle collisions along the Sterling Highway MP 58-79 from 1980-2001.

BACKGROUND SUMMARY

Franklin D. Roosevelt established the Kenai National Moose Range on December 16, 1941, only 9 days after the bombing of Pearl Harbor. After that tragic day, "a day that will live in infamy", President Roosevelt thought it important enough to reserve land in Alaska for the purpose of "...protecting the natural breeding and feeding range of the giant Kenai moose on the Kenai Peninsula, Alaska, which in this area presents a unique wildlife feature and an unusual opportunity for the study in its natural environment of the practical management of a big game species that has considerable local economic value . . ." (Executive Order 8979). The order provided further "... that the reservation for the national moose range shall not operate to prevent the construction and operation of a highway to connect the area open to settlement with the Seward-Sunrise road by the most practical route."

The Sterling Highway was that connecting highway, built by the Alaska Road Commission in 1947. In 1955-56 a new section bypassing the former Sterling Highway (Skilak Lake Road) was built. Prior to statehood no right-of-way was ever documented for the Sterling Highway. After

[1] Kenai National Wildlife Refuge Comprehensive Conservation Plan. 1985. page 129.

statehood, easements for the Sterling Highway and Skilak Lake Road were granted to the State of Alaska Department of Transportation. Upgrades and resurfacing took place in the 1970's and 1980's.

In May 1949[2], a public land order issued by the Bureau of Land Management withdrew certain lands (three townships) within the present Moose Range boundary for settlement. The Fish and Wildlife Service posed no objection provided that before the lands reopened for homesteading the Bureau would give consideration for recommendations by the Fish and Wildlife Service to provide passageways for the migration of moose across the proposed settlement area. This corridor, removed from the refuge in 1964 (Figure 2), practically divides the moose range in half. The Fish and Wildlife Service planned for three or more "moose runways" running north and south, several miles in width, to be reserved across the central corridor. It was feared that moose would have no unobstructed way of getting back and forth across a developed corridor cut through the middle of the moose range.

In 1963 the Alaska congressional delegation proposed the removal of 75,000 acres in the Skilak Lake area from the Kenai National Moose Range. A report prepared by the Alaska Field Committee[3] to respond to the proposal was made in 1964. The report recognized the importance of the Skilak Lake area:

> *"Perhaps the most essential feature of this tract to moose is that of a migration corridor between the north and south sections of the Range...it is essential to retain the three-mile corridor to permit the unimpeded travel movement to and from their winter and summer ranges and through the winter area as required by forage and snow conditions. Elimination of this corridor would jeopardize the value of the Range for moose."*

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[2] Memorandum from J. Clark Salyer II, Chief, Branch of Wildlife Refuges, Washington, D.C. to Regional Director, Juneau, Alaska, on May 20,1949.

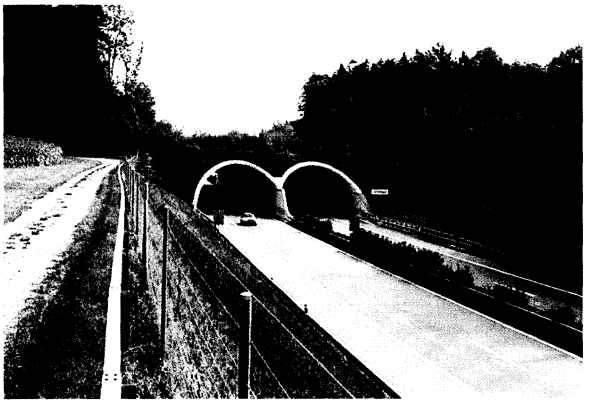
[3] Made up of representatives from Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, Solicitor's Office and Office of the Secretary

The Sterling Highway MP58-79 project cuts through the remaining three townships of undeveloped land that connects the north and south areas of the Kenai National Wildlife Refuge [the Kenai National Moose Range was renamed the Kenai National Wildlife Refuge by the Alaska National Interest Lands Conservation Act in 1980]. The right-of-way for the highway is 300 feet. Along side this highway are two 100-foot rights-of-way for power lines. This 500 foot wide corridor bisects the refuge into a northern and southern partition, and may reduce movement of moose back and forth, in essence fragmenting the habitat for moose and other wildlife species.

Also along this corridor is some of the best winter range for moose. The refuge's crushing and burning between the Sterling Highway and the Skilak Lake Road, the Hidden Creek fire in 1996, the Mystery Hills fire in 2001, and the refuge's prescribed burning along the Mystery Creek Road should create more winter browse for moose and attract more moose in the future to this road corridor (Figure 3). Also, Homer Electric Association hydro-axed the right-of-way north of the Sterling Highway creating more moose browse close to the highway. This could lead to an increase in moose-vehicle accidents on this stretch of highway.

The State of Alaska has the highest occurrence of moose-vehicle collisions in North America. Moose-vehicle collisions on the Sterling Highway MP58-79 totaled 214 between 1980 and 2001 (Figure 4). Figure 4 shows an increasing trend in moose-vehicle collisions where the highway cuts through the refuge. Figure 5 shows where the moose-vehicle collisions are occurring by "CDS milepoint" not "physical milepost". [The CDS stands for "Coordinated Data System" which is used by the Alaska Department of Transportation and Public Facilities for describing lengths along the National Highway System. These numbers increase moving west to east as opposed to physical mileposts which increase moving east to west.] Most collisions are occurring between the Watson Lake – Egumen Lake pullouts, CDS milepoints 102.5 – 103.5.

The Alaska Department of Fish and Game estimates that approximately 15% of moose-vehicle accidents go unreported. Bangs, et al. (1989) however, reported that tagged moose were killed by vehicles at twice the rate of those reported to the Alaska Department of Fish and Wildlife Protection. Child et al. (1991) stated that the reported number of moose-vehicle collisions from the Ministry of Transportation and Highways in British Columbia may underestimate by two to six times the actual number of moose kills.



The 27th North American Moose Conference, hosted by Alaska's Department of Fish and Game, had the theme "incidental moose mortality, causes, consequences and management". In an attempt to address the problem, participants identified mitigation on future highway projects as a primary goal. The Department of Transportation and Public Facilities identified the Sterling Highway MP 70-72, in the top 5 percentile of Alaska's rural highway segments with the highest moose-vehicle collision rates. The Department recommended detailed study for moose-vehicle accident mitigation and postings of moose warning signs (State of Alaska 1991).

During winters of heavy snowfall, the number of collisions reported in Alaska and British Columbia may triple the number of moose fatalities that would occur in a normal winter. These numbers are conservative, however, because not all collisions result in an immediate fatality; some moose are never found at the scene of the accident, and not all collisions are reported (Child and Stuart 1987).

OBJECTIVES

The goal of this proposal is to improve human safety by reducing wildlife-vehicle collisions along the Sterling Highway MP 58-79 within the Kenai National Wildlife Refuge and to protect the "...giant Kenai moose on the Kenai Peninsula, Alaska, which in this area presents a unique wildlife feature..."(Executive Order 8979). The objectives are:

1. To identify any pre-construction moose migration routes across the existing Sterling Highway MP 58-79.
2. Improve the quality of data collected from wildlife-vehicle collisions and its storage.

3. Look at mitigation measures that could reduce moose-vehicle collisions and increase human safety.
4. Evaluate the success of mitigation measures that are employed. Data collected during this study will be presented at the International Conference on Ecology and Transportation and submitted for publication.

Objective 1. Identify moose migration routes and high density crossing areas along the existing Sterling Highway MP 58-79.

Capture and collar 20 adult female moose on the refuge in the area of the Sterling Highway MP 58-79. Captures may be done at various times of the year to ensure resident as well as migratory moose are tagged. Global positioning system (GPS) or satellite collars will be used. Locations will be collected every 30 minutes to allow for detailed movement information including daily and seasonal movement patterns.

[The following can be included to aid in identifying wildlife species that cross the highway and to assist in additional means of mitigation.

- Identify tracks of all wildlife species crossing the roadway at specific intervals during the winter (snow present)
- Install infrared video cameras along the highway to record nighttime movements of all wildlife across the roadway.]

Objective 2. Improve the wildlife-vehicle collision database.

Work with Alaska Departments of Transportation and Public Facilities, Fish and Game, and Public Safety, to improve the data collection for wildlife-vehicle collisions as well as the data storage. Currently there is no detailed information on other species of wildlife killed in collisions besides moose. Also, the location of collisions could be more accurately recorded using global positioning system devices. Collecting more detailed and accurate information on wildlife-vehicle collisions will greatly assist in judging the effectiveness of mitigation structures and techniques.

Objective 3. Review mitigation measures and develop guidelines for the selection, configuration, location, monitoring, evaluation, and maintenance of wildlife crossings that could be designed and developed as part of the construction project to reduce wildlife-vehicle collisions.

Review the literature for the latest wildlife crossing structures, techniques and other options for mitigating wildlife impacts along the Sterling Highway. Work with Department of Transportation and Public Facilities to design and place mitigation measures along the highway. Also work with Homer Electric Association to provide electricity for any mitigation measures that require power such as lights, electric fences, infrared cameras, etc. Work with Department of Transportation and Public Facilities and the utility company to manage vegetation within their rights-of-way to help minimize collisions. Also, review refuge habitat enhancement efforts to decide how best to draw moose away from the highway.

Objective 4. Evaluate the success of mitigation measures employed.
Maintain GPS collars on moose after construction to monitor movements of moose and evaluate the effectiveness of any constructed wildlife crossing structures and mitigation techniques. Work with Alaska's Departments of Public Safety, Fish and Game, and Transportation and Public Facilities, and Kenai National Wildlife Refuge officers to aggressively record all wildlife-vehicle collisions and accurately record locations where they occur.

RESEARCH PLAN

Project Management. The research for this project will be done through an Interagency Work Group made up of representatives from the U.S. Fish and Wildlife Service; Alaska Departments of Fish and Game, Transportation and Public Facilities, and Public Safety; Alaska Moose Federation; and Federal Highways Administration. Direct project management will be the responsibility of the Kenai National Wildlife Refuge. The Project management will collaborate with research partners such as the Moose Research Center to accomplish specific tasks.

Wildlife-Vehicle Collision Database. Recording wildlife-vehicle collisions into an extensive database will be paramount to the outcome of this proposal. Tracking collisions before construction should be done in the same manner as after construction. An effort needs to be made to improve getting information on collisions and recording

specific information on location; wildlife species, age, sex, condition, number of animals and associations (i.e. cow and calf).

Wildlife Tracks Database. To document other species of wildlife crossing the Sterling Highway, the use of track counts in snow along both sides of the highway could be used. Snow machines could be used to run the length of the highway to identify and document species near and crossing the highway. Tracks counted would be marked to avoid repeat counts. These track surveys would be done weekly or monthly during the winter months. Used in conjunction with video or infrared cameras should supplement track identification.

Literature Review. There are numerous references on wildlife crossing structures and techniques, which would be reviewed to assist in determining which, if any, methods could be helpful in reducing wildlife-vehicle collisions along the Sterling Highway. A variety of crossing structures have been used in Europe and Canada. Many state departments of transportation are currently in the process of constructing structures.

Animal Captures and Deployment of Collars. The use of GPS/satellite collars on moose will require four capture operations: pre-construction deployment and then retrieval to collect movement data, followed by a post-construction deployment and retrieval to collect movement data to judge effectiveness of wildlife crossing structures, techniques and methods. Incidental helicopter time may be needed if any collared animals die shortly after the collars are deployed or to retrieve collars in very remote locations. GPS collars must be retrieved in order to obtain the stored movement data. Satellite collar information can be downloaded real time. Animal captures must follow animal care protocols.

Aerial Animal tracking. Use of fixed-wing aircraft to monitor the radio collars and check on the welfare of each animal will be done on a bi-weekly basis. As soon as a collar is found to be on mortality mode and death of the animal verified, it will be retrieved, data downloaded and redeployed.

Progress Reports. Progress reports will be made within 6 months of the beginning of each federal fiscal year to the working group.

Final Report. A final report will be provided to all the agencies in the working group upon completion of the project. This will be at least three years post-construction. A presentation of findings will be submitted for consideration at the next available International Conference on Ecology and Transportation and published in the conference proceedings.

TIME SCHEDULE

The start of this proposal will depend on the planned start of construction for the Sterling Highway MP 58-79 project. Specification, purchase, building and deploying the GPS collars will need to be done 2 years prior to actual construction. It is critical for collecting detailed moose movement data so migration routes can be documented before actual construction of new highway can begin. Use of moose movement data will be critical to determine the best options for mitigating impacts of the roadway. This information will help to determine the best use of Federal Highway funds for wildlife crossing structures and/or other techniques or methods of mitigation.

A minimum of two years of moose movement data collected after construction will be necessary to judge the effectiveness of wildlife crossing structures and making scientifically valid analysis of mitigation. After obtaining post-construction moose movement data from the GPS collars as well as other wildlife crossing data from track counts, and detailed wildlife-vehicle collision reports, a final report will be written within one year.

IMPORTANT NOTICE

Understand that the research project described herein is tentative. The final content of the project depends on the level of funding made available.

BUDGET

Pre-Construction Phase I (Fiscal Year 2004-2006)

20 GPS/satellite collars	$75,000
Capture operation (helicopter, drugs, darts, fuel, aircraft)	$20,000
Travel costs	$5,000
Aerial tracking flights (aircraft, fuel, antenna, receiver)	$4,000
Ground track counts (snowmachine, fuel, digital cameras, field guide, GPS units, infrared/video cameras)	$50,000
Recapture costs to retrieve collars and download data. (may be one to two years after initial deployment)	$22,000
10% overhead	$17,600
Subtotal	$193,600

Post-Construction Phase III (Fiscal Years 2007-2009)

Refurbish GPS/satellite collars	$30,000
Capture operation (helicopter, drugs, darts, fuel, aircraft)	$25,000
Travel costs	$6,500
Aerial tracking flights (aircraft, fuel, antenna, receiver)	$5,000
Recapture costs to retrieve GPS collars and download data. (may be one to two years after initial deployment)	$28,000
Digital video equipment to survey stretches of roadway/underpasses	$55,000
Recapture costs to retrieve GPS collars and download data. (may be one to two years after initial deployment)	$30,000
10% overhead	17,900
Subtotal	$197,400
GRAND TOTAL	**$391,000**

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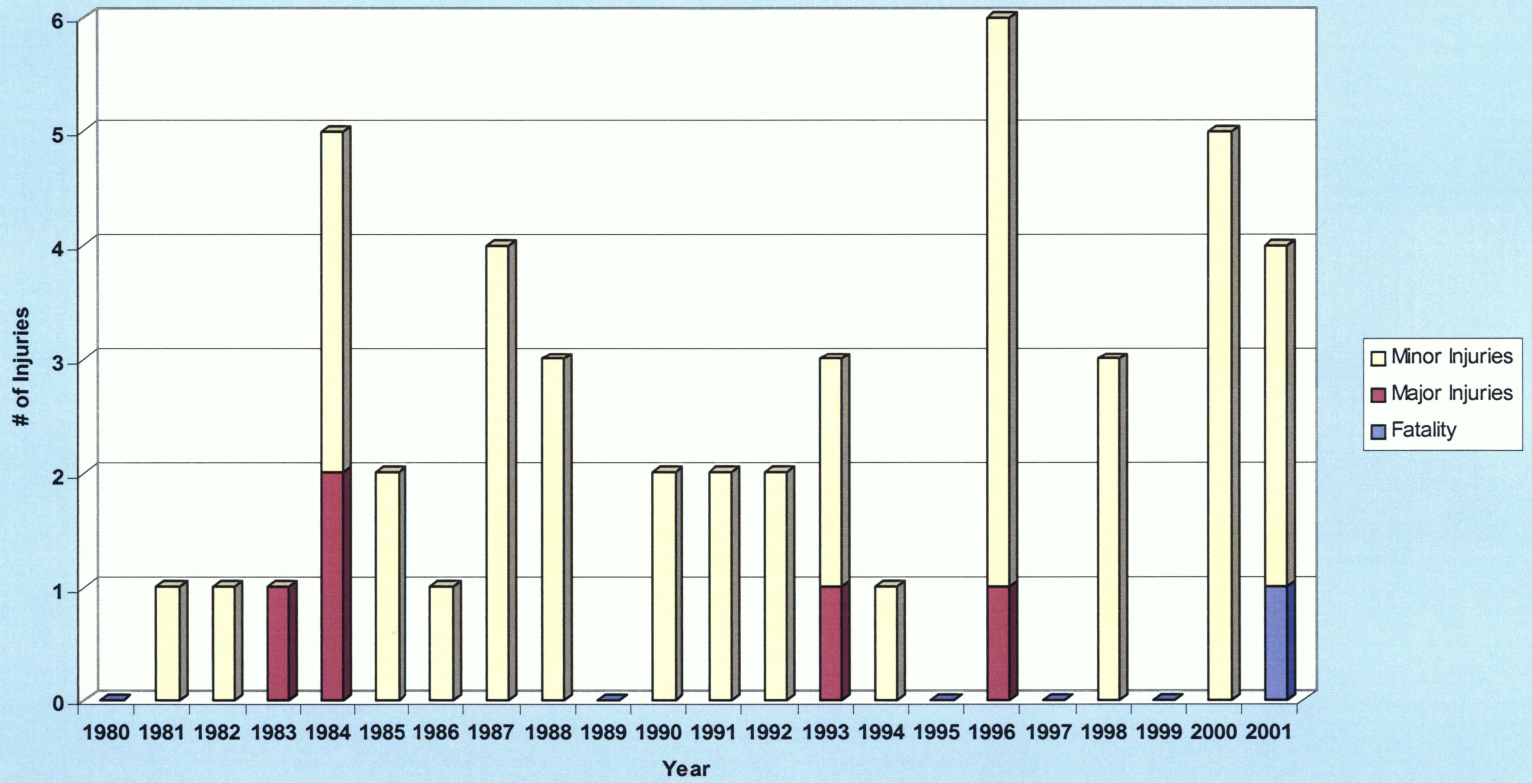
Figure 1. Human Injuries/Fatalities from Moose-Vehicle Collisions
Sterling Highway Milepost 58-79



Kenai Moose Range Boundary Changes

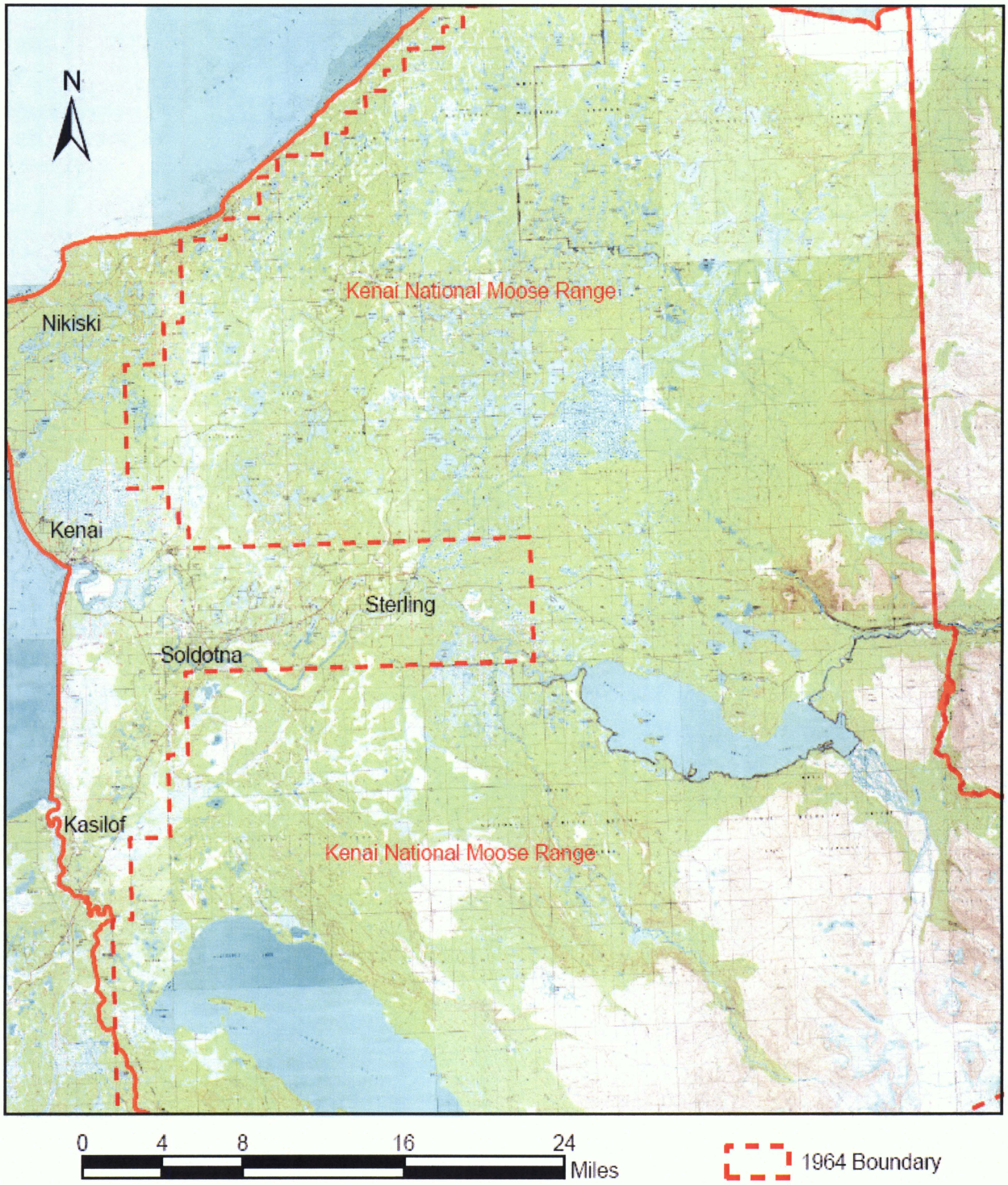


Figure 2. Boundary change in 1964 that removed from the original Kenai National Moose Range (1941) areas open for settlement. This in time became the communities of Nikiski, Kenai, Soldotna, Kasilof, and Sterling.

Enhanced Moose Habitat along the Sterling Highway

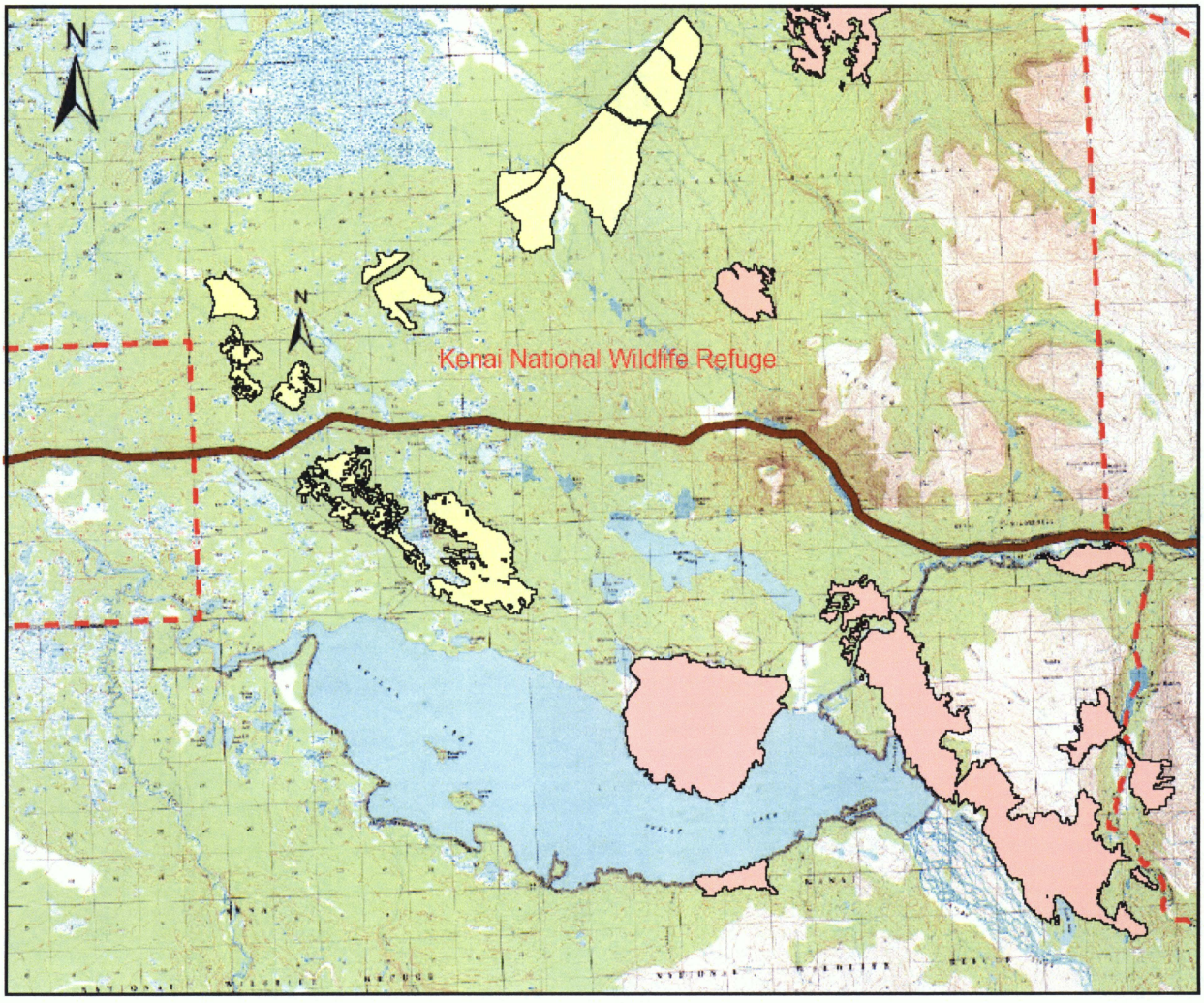


Figure 3. Areas of enhanced moose habitat resulting from both prescribed burning and wildfires. Having these enhanced habitats on both sides of the Sterling Highway may increase moose movements across the highway.

Figure 4. Number of Moose-Vehicle Collisions (trend in red)
Sterling Highway Milepost 58-79

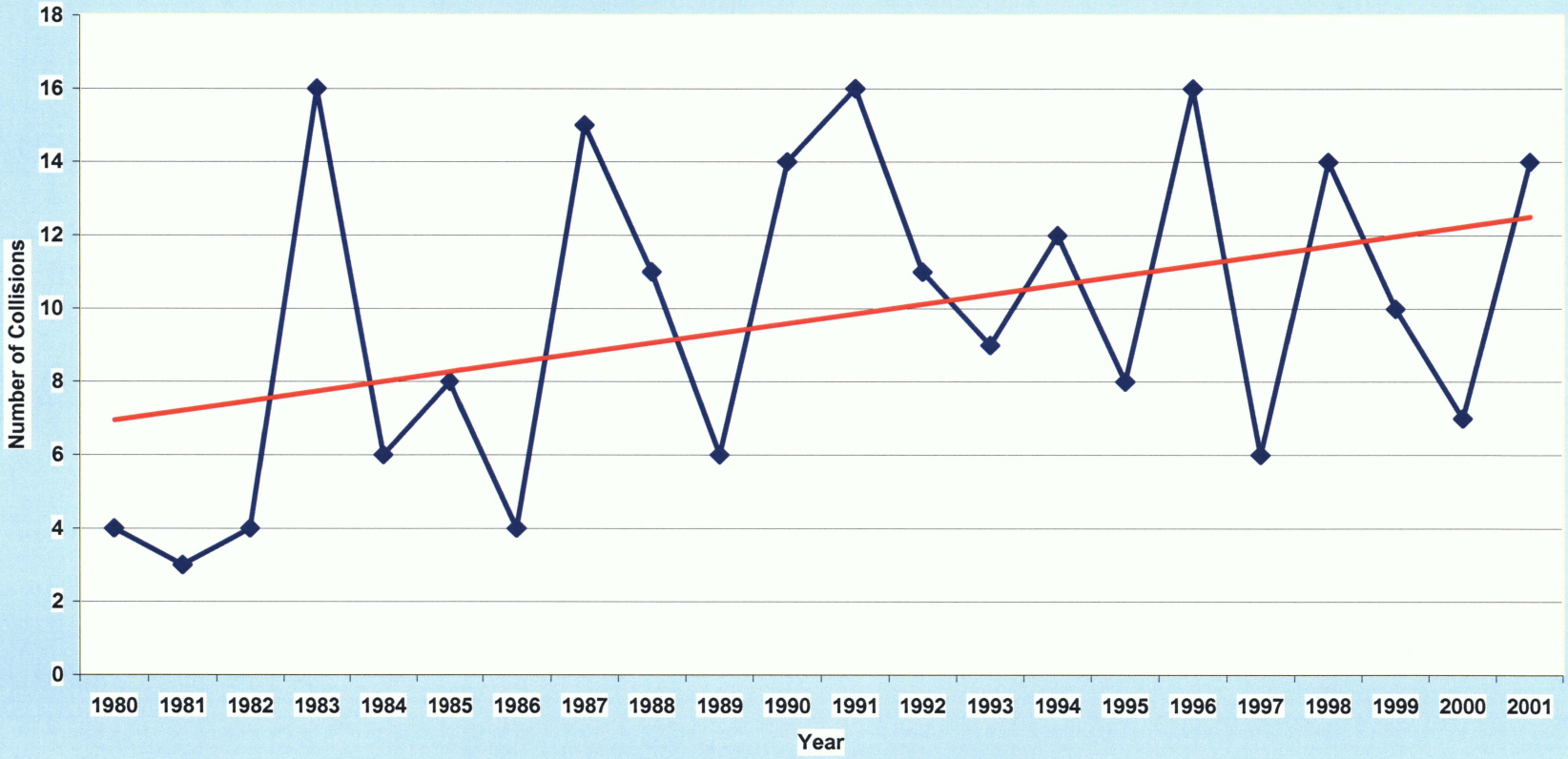


Figure 5. Moose-Vehicle Collisions (1980-2001) by Sterling Highway Coordinated Data System (CDS) MilePoint

NOTE: CDS milepoints are used by DOT&PF to log distance as opposed to physical "milepost" markers.
CDS milepoint 102.5-103.5 is by Watson Lake.