# SUSITNA HYDROELECTRIC PROJECT

## ENVIRONMENTAL REPORT

TASK 7: ENVIRONMENTAL

FURBEARERS - 1980

MAY 1981

Prepared for:

Prepared by:

Terrestrial Environmental Specialists, Inc.

ALASKA POWER AUTHORITY

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# ENVIRONMENTAL STUDIES ANNUAL REPORT 1980

## SUBTASK 7. 11 WILDLIFE ECOLOGY

## FURBEARERS

MAY 1981

by

ALASKA COOPERATIVE WILDLIFE RESEARCH UNIT
Fairbanks, Alaska 99701
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TERRESTRIAL ENVIRONMENTAL SPECIALISTS, Inc.
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Liberty Bank Building, Main at Court
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# SUSITNA HYDROELECTRIC PROJECT
# FURBEARER STUDIES

ANNUAL REPORT
(January - December 1980)

To:
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SUMMARY

Progress was made upon all aspects of furbearer and habitat inventories and impact assessments during the first year of investigation. Emphasis was placed upon population surveys and seasonal furbearer/habitat relationships. Furbearers that may inhabit the impact areas include red fox, coyote, lynx, mink, pine marten, river otter, short-tailed weasel, least weasel, muskrat and beaver.

General estimates of furbearer abundance and habitat use during periods of snow cover were based upon aerial transects and aerial checks of lakes and ponds. Surveys of aquatic furbearers were conducted from a riverboat during August from Devil Canyon to the Kashwitna River. Movements of individual foxes, marten and mink, and their preference for particular habitats were monitored by radio telemetry. Diets of carnivorous furbearers were investigated by identifying food remains in their droppings and food remains in the digestive tracts of furbearers taken by trappers in the area.

Populations of all furbearers identified for investigation exist within the impoundment areas and along the Susitna River from Devil Canyon to Cook Inlet, however, numbers of coyotes and lynx are low. Beavers and muskrats are present along much of the river and its main tributaries. Beaver numbers increase progressively from Devil Canyon downstream to the confluence of the Kashwitna River.

A total of five red foxes were outfitted with collars containing radio transmitters. Red foxes in the study area used dens later in the autumn than has previously been reported for foxes. Some red foxes appear to utilize shores of the Susitna River and deltas of tributaries during summer and autumn, then shift to alpine zones in winter as snow depth increases along the river. Other foxes appear to remain above timberline throughout the year.

Four pine marten and two mink were radio-collared during 1980. It appears that adult male marten have mutually exclusive home ranges during summer with creeks in some cases forming boundaries of the home ranges. The activity data gathered during autumn suggest that marten at that time are generally nocturnal with a minor activity peak around noon.

Loss of habitat and reductions in furbearer numbers may be expected in areas inundated, where roads are constructed, and at borrow pits. We expect that pine marten will be most severely impacted, followed in decreasing order by mink, fox, otter and weasel. High levels of human activity and noise pollution during furbearer breeding and denning seasons could severely alter reproductive success of all species. Projected changes in flow rates of the Susitna River downstream from the Devil Canyon impoundment could result in marked changes in the habitats available to aquatic furbearers. Beaver and muskrat could benefit from delayed freeze-up in autumn and possibly benefit from more stable rates of flow. The anticipated seasonal drawdown of the Watana impoundment is likely to have a marked negative impact upon beaver, muskrat, mink, and river otter that inhabit the Watana impoundment area.

Changes in impoundment design to lower and/or stabilize the pool levels will benefit furbearers by reducing loss of foraging and denning habitats. Loss of habitat from construction of dams, borrow pits, access roads and diversion tunnels can be minimized by utilizing borrow and fill sites as close as possible to actual construction. Regarding the access route to impoundment sites, we believe the best access route would be Corridor 2, south of the river to Devil Canyon, then across the river and follow Corridor 1 from Devil Canyon to the Watana site. If only the Watana dam is to be constructed, Corridor 3 from the Watana site to the Denali Highway would be preferred.

Creek drainages and adjacent areas are extremely important to furbearers. We recommend that access roads and construction activities be outside creek valleys when practical.

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# 1 - INTRODUCTION

This report summarizes the progress made during the first year of Phase I studies by the team investigating impacts upon furbearers. One additional year of Phase I investigations will be completed before Phase II studies are initiated. Objectives and specific tasks of Phase I studies are reviewed below.

Phase I studies of furbearers are designed to determine probable impacts of the proposed Susitna Hydroelectric Project upon the following species: Red fox, *Vulpes fulva*; coyote, *Canis latrans*; lynx, *Lynx canadensis*; mink, *Mustela vison*; pine marten, *Martes americana*; river otter, *Lutra canadensis*; short-tailed weasel, *Mustela erminea*; least weasel, *Mustela nivalis*; muskrat, *Ondatra zibethica* and beaver, *Castor canadensis*.

## 1.1 - Objectives for Phase I

(a). Determine general abundance of each species in the study area.

(b). Assess habitat preferences of each species.

(c). Analyze seasonal use of habitats and degree and type of utilization of habitats for each species.

(d). Project the probable impacts of the proposed development on each species.

- (i). Assess likely changes in habitats from the proposed action.
- (ii). Project changes in abundance of furbearers in response to habitat changes.
- (iii). Predict other, non-habitat related impacts upon furbearers.

## 1.2 - Tasks for the period January-December 1980

(a). Review of literature.

(b). Familiarize the study team with the study area.

(c). Design a viable sampling scheme for the impoundment zones, areas adjacent to the impoundments, and downstream areas.

(d). Conduct baseline surveys of furbearer populations and furbearer and habitat relations.

  (i). Generate information on activity patterns and home range size and shape of elusive furbearers.

  (ii). Provide information on furbearer distribution and movements, especially during snow-free periods of the year.

  (iii). Determine preferred seasonal habitats.

(e). Consult with residents, trappers, scientists, government officials and others who are knowledgeable of the Susitna area or similar areas or knowledgeable in a discipline pertinent to our research.

(f). Develop close working relations with other professional study teams conducting studies related to probable impacts of the hydroelectric project upon resources.

(g). Provide information as needed to aid in developing recommendations for mitigation and development proposals including alternative access routes, borrow sites and transmission line corridors.

(h). Participate in public meetings and provide information to the media as appropriate and as approved to inform the public about progress of the study.

## 2 - METHODOLOGY

The study area for this project was defined as the Corps of Engineers' proposed impoundment zones, land and water areas within 12 kilometers (7.5 miles) of the impoundment zones and the downstream flood plain to Delta Islands (Figure 1).

### 2.1 - Literature Review

Literature searches have been carried on through the first year of Phase I studies. Computer bibliographic searches as well as manual searches of literature, indices and private reprint libraries have been employed.

### 2.2 - Muskrat and Beaver Surveys

In spring 1980, just prior to break-up, a survey of lakes and ponds in the study area was conducted to determine the presence and relative numbers of muskrats and beavers present during winter. Aerial searches for muskrat push-ups and beaver sign were conducted on three dates in spring 1980. An initial survey was made on 10 March. Forty-five lakes and ponds were surveyed on this date, requiring 6.0 hours of flying time in a Bell 206 helicopter. The snow cover on many lakes was still too deep to permit positive identification of muskrat push-ups. A second attempt was made on 24 April, however, deep snow was still present on some lakes. A third attempt was made on 9 May. On this date the weather was clear and the melt of snow and ice had progressed to a point that permitted optimum sightings of push-ups. Ninety-seven lakes were surveyed in 6.9 hours. Lakes surveyed were below 850 meters (2800 feet) in elevation and they were within the proposed impoundment zones or 4.8 km (3 miles) thereof. Lakes within 4.8 km (3 miles) of the Susitna River were surveyed as far downstream as Gold Creek.

### 2.3 - Fox den surveys

Aerial searches for active red fox dens were made in areas that appeared to offer suitable denning sites: well-drained, south-facing slopes with

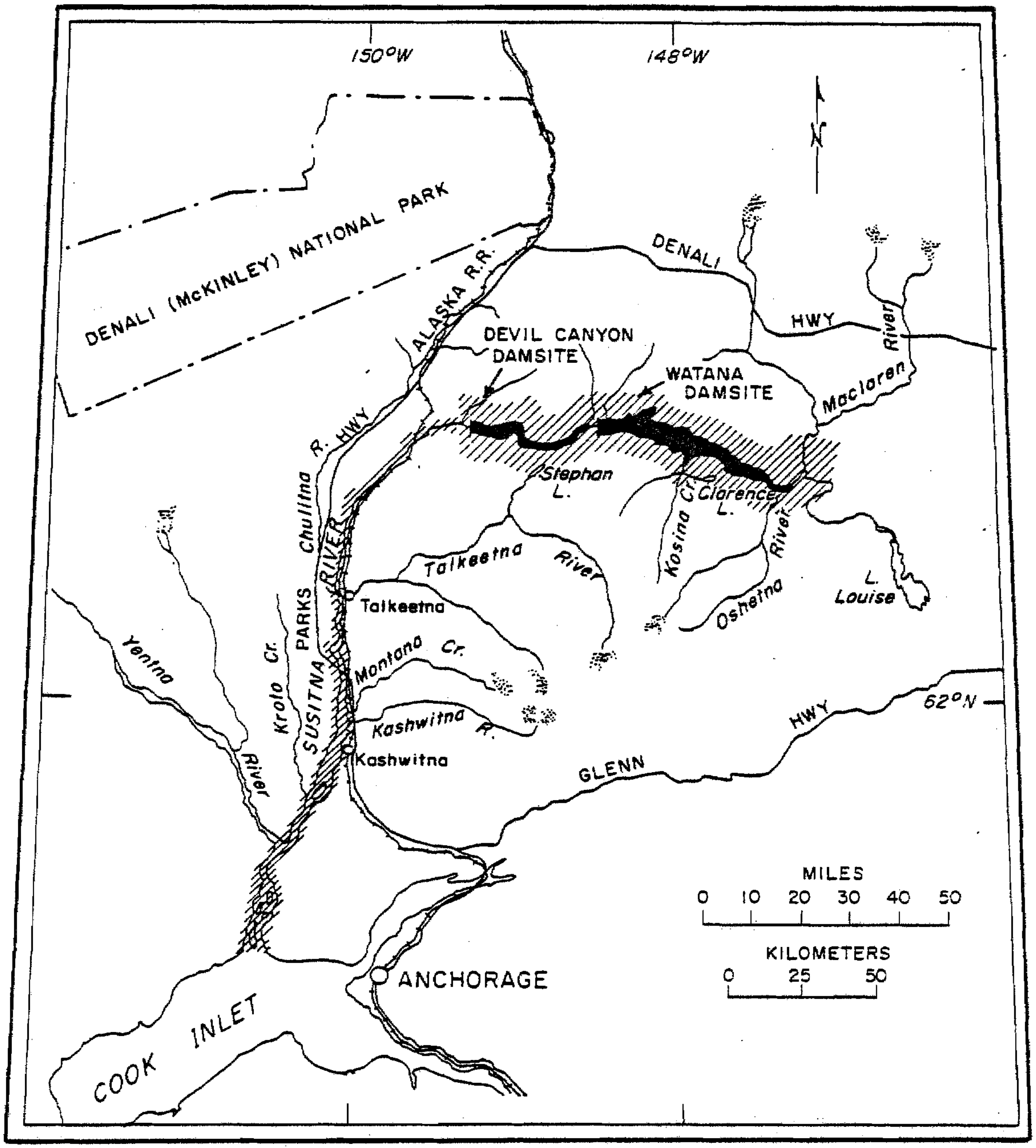


Figure 1.

Susitna Basin. Study area for assessing probable impacts of the Susitna Hydroelectric project upon furbearers indicated by hatching. During 1980 study efforts extended downstream as far as the Kashwitna River.

fine soil. Valuable reports of active fox dens were obtained from other TES and Acres researchers. Locations of active and inactive fox dens were plotted on 1:63,360 scale maps.

## 2.4 - Live trapping and radio-collaring

Red foxes were captured with leg hold traps and outfitted with radio-collars. Foxes were radio-located from the ground and from aircraft using yagi antennas and radio receivers. Locations were plotted on 1:63,360 scale maps.

Marten were trapped on an opportunistic basis using Tomahawk 8"X8"X29" live traps and a variety of baits and lures. A total of 24 traps were taken to the study area, but generally 2 to 12 were set on any particular night depending upon manpower available and specific trapping objectives for the night. At times only 2-4 traps were set to recapture radio-collared marten to replace radios with weak batteries.

Marten and mink were radio-collared on an intensive study site at the mouth of Tsusena Creek. Mink and marten were radio-located from the ground and from aircraft using yagi antennas and radio receivers. Locations of mustelids were plotted on 1:24,000 scale maps. Activity patterns of mink and marten were monitored from 24 September to 20 October. Fluctuations in signal strength were used to differentiate between activity and inactivity. Four 24-hour activity watches were conducted.

## 2.5 - Following fox trails

Fox trails were followed when fresh snow was present. When followed on foot or snow shoes, each fox trail was sampled every 150 paces for snow depth, snow hardness, vegetation, elevation, physiography, activity of the animal, and proximity to lakes, ponds, streams, or rivers. Other noteworthy activities of the animal were recorded, for example, kill sites or scent posts (Table 1 is a sample trail data sheet).

Table 1. Sample Fox Trail Data Sheet.

Name of Observer: W. Hobgood  Date: 10/11/80  Altitude: 3200 MSL  Sample Interval: 150 paces
Weather: Partly cloudy  T°: 20°F  Location: Swimming Bear Lake  Date of last snow: 10/11/80
Collared Fox? Yes ___ No _X_  Band ___ Channel ___

| Sample Point | Snow Depth | Vegetation | Physiography | Within 50 Yds Prey Species? | Lake or Stream? | Activity | Comments |
|---|---|---|---|---|---|---|---|
| 1 | 2.5" | Lake shore/bog | Lake shore rock morph | No | Edge of Lake | Wandering by edge of lake | |
| 2 65p. | 2.5" | " " " | " " | No | " " " | --- | Scent post |
| 3 150 | 2.5 | " " " | " " | No | Lake within 100 yds | Walking | In areas of deep snow he avoided it by bounding from tussock to tussock |
| 4 w/in 12p. | 2.5" | " " " | " " | No | Lake within 100 yds | Investigating ground sq den | |
| 5 150 | 2.5" | " " " | " " | No | Within 50 yds | Walking | --- |
| 6 150 | 2.5" | Mat cush exposed boulders/rocks | " " | No | Within 50 yds | Coming down hill along edges | Backtracking snow drift |
| 7 w/in 38p. | 2.5" | " " " | " " | No | Within 50 yds | Coming down hill along edges | Urine post |
| 8 150 | 2.5" | Mat cush exposed field of boulders | " " | Yes | Within 75 yds | Coming down knob | Investigated squirrel hole at 144p. |
| 9 150 | Deep snow | " " " | " " | Yes | Within 100 yds | Hopping along in deep snow | --- |
| 10 150 | Deep snow | Tussocks, some rocks | " " | Yes | 125 yds away | Investigating gross clump | Tracks of ptarmigan tracks within 20 yds |
| 12 150 | Deep snow | Mat cush and shrubs | " " | Yes | 125 yds away | Running | Determined this fox observation Oct. 10 from helicopter |

Aproximately 16 km (10 miles) of fox trails were followed in November 1980 at 2 locations, Swimming Bear Lake vicinity and on the Tsusena-Deadman bench, directly behind Watana Camp.

## 2.6 - Food habits studies

Studies of the food habits of furbearers were based upon field sign at feeding sites, identification of food remains in scats, and identification of food remains in stomachs and guts of carcasses obtained from trappers. Scats of red foxes were collected at den sites and along fox trails. Scats of mustelids were collected from trails, successful live traps and resting burrows which were located by telemetry. Carcasses of foxes, marten, mink, and short-tailed weasels taken by trappers near the study area were necropsied for additional dietary data. A total of 43 marten, mink and short-tailed weasels were necropsied for stomach and intestinal contents. Teeth of these animals were saved for later age studies. Similarly, 10 red foxes were necropsied. Scats and gastrointestinal tract contents of furbearers have been dried and will be analyzed in summer 1981.

## 2.7 - Aerial transects

A system of snow transects was developed early in spring 1980 and altered during autumn to sample a wider area and provide a broad overview of furbearer distribution and habitat preference. The revised transects are 9.6 km (6 miles) long and perpendicular to the river (Figure 2). The transects extend 4.8 km (3 miles) south and 4.8 km (3 miles) north of the Susitna River. Fourteen transects occur at intervals of 9.6 km (6 miles) from Portage Creek to the Tyone River (Figure 2).

To run the transects, a helicopter carrying 2 observers and a person to record observations is flown along the transect at 24-32 kmph (15-20 mph) at treetop level or the lowest possible altitude, generally 10-20 m (30-60 feet). Tracks of furbearers are observed and counted as crossed along the flight path. The following are recorded each time the trail

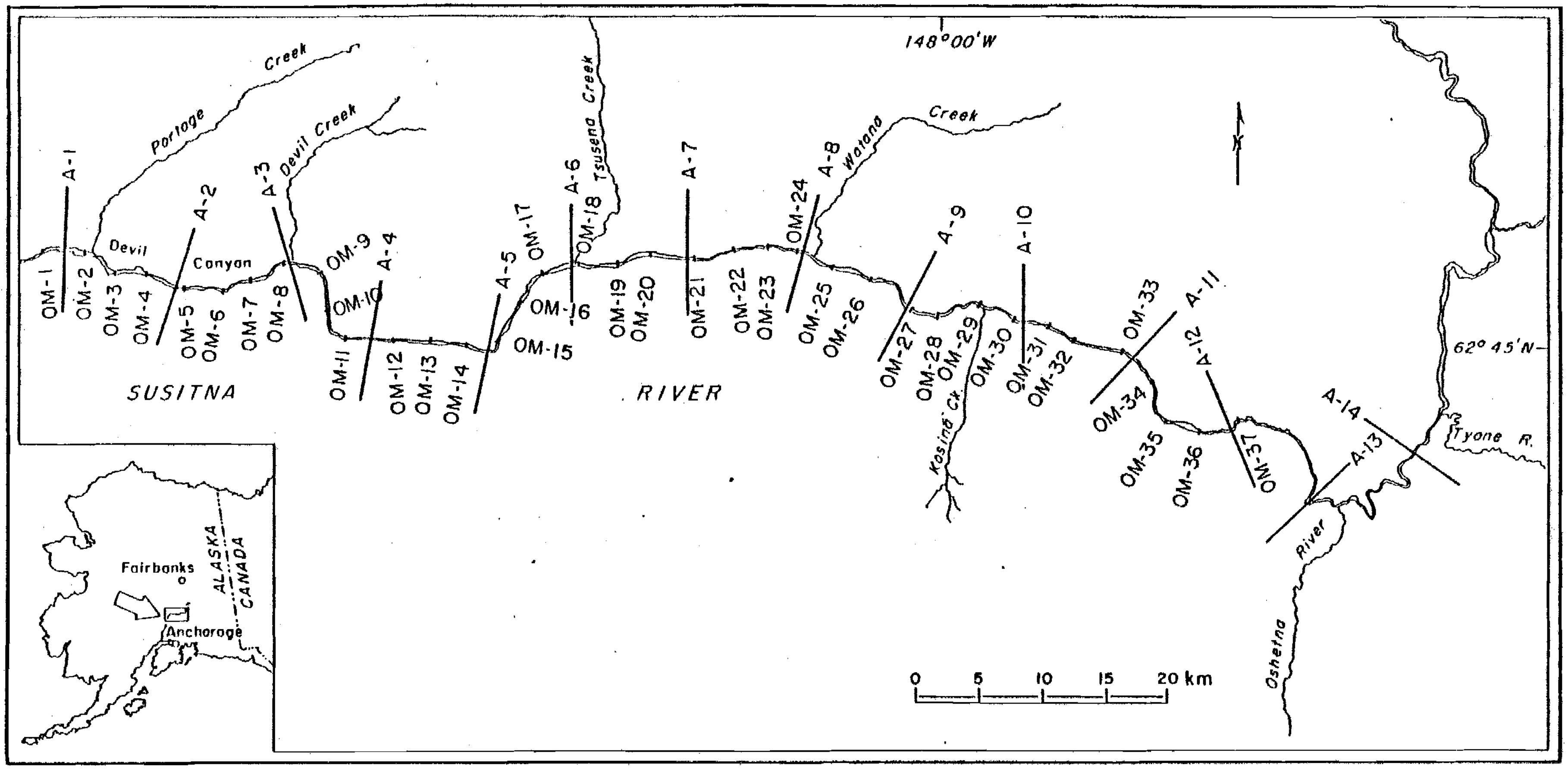


Figure 2. Aerial transects for furbearers (A) and checkpoints for signs of otter and mink (OM).

of a furbearer is crossed: the species of the furbearer, the vegetation type and the 100 foot elevation contour in which the trail was found. To determine accuracy of track identification, ground truth checks were conducted on 3 transects. Team members walked along transects shortly after the transects were run by helicopter. Data recorded were the same as those recorded from aircraft.

## 2.8 - Downstream furbearer surveys

Furbearer sign and habitat use preferences were inventoried along the Susitna River during August 1980 from 3 km (1.9 miles) above the confluence with the Indian River to 4 km (2.5 miles) below the confluence with the Kashwitna River (Figure 1). This survey included portions of the three major river habitat types below Devil Canyon, including:

(a). Section I. - Devil Canyon to confluence with Talkeetna and Chulitna Rivers. Characterized by rapid flow, usually single channel, narrow flood plain with occasional stands of mature forests.

(b). Section II. - Confluence with Talkeetna and Chulitna Rivers to confluence with Montana Creek. Characterized by meandering channels, broad flood plain with forested shores and islands.

(c). Section III. - Confluence with Montana Creek to Cook Inlet. Characterized by broad meandering and braided channels, numerous sloughs and oxbow lakes, broad flood plain with heavily forested shores, islands and tributary deltas.

Observations of furbearers and their signs along the Susitna River were made from a 24-foot riverboat. Numerous stops were made to verify signs observed. Two observers called out animals and sign sighted on opposite sides of the boat. A third team member recorded observations and noted locations on maps. Data were then tabulated according to river mile.

## 2.9 - Otter and mink surveys

An unusually high incidence of otter sign was noted along the Susitna River for a short period in November. To document this occurrence of sign, check points were established at intervals of 4 km (2.5 miles) along the Susitna River from Portage Creek to the Oshetna River (Figure 2).

# 3 - RESULTS AND DISCUSSION OF BASELINE STUDY

## 3.1 - Literature Review

Over 350 references relating to furbearers and hydroelectric development have been collected and reviewed. Only a small portion of this literature treats impact assessment in northern regions. A symposium in Ottawa, Ontario on 7 and 8 January 1974, reviewed major hydroelectric projects in Canada and the impact assessments made for these projects. Proceedings of this symposium were published in the Journal of Fishery Research Board of Canada, Volume 32, number 1. Baxter and Glaude (1980) also reviewed environmental effects of dams and impoundments in Canada. Probably the most extensive study of impacts of a proposed hydroelectric project in Alaska was directed at the Rampart Canyon Dam on the Yukon River (Spurr 1966, Leopold 1966). Recently the Arctic Environmental Information and Data Center (1980) reported their assessment of probable environmental effects of constructing and operating the Terror Lake hydroelectric facility on Kodiak Island. A team working with Konkel (1980) modified a widely used terrestrial habitat evaluation system for Alaska and developed a handbook to be used in assessing the importance of habitats for some Alaskan wildlife species.

Published accounts treating the life requisites of furbearers in Alaska and probable effects of environmental alterations upon furbearers are reviewed in the discussion sections of this report treating particular furbearers.

## 3.2 - Muskrat and Beaver Surveys

Findings of the spring surveys for muskrats in impoundment zones are summarized in Table 2. The beaver and muskrat surveys in May, plus observations by team members on shuttle flights and sightings reported by helicopter pilots and other project personnel, indicated that populations of these species occur along much of the Susitna River and its main tributaries. Sign of these animals was most visible in early spring

Table 2. Results of Surveys for Muskrat Pushups, Spring, 1980.

| Lake number | Elevation MSL | No. pushups | Locations of Lakes: Quarter section | Section | Range | Township |
|---|---|---|---|---|---|---|
| 001 | 875 | 2 | SW | 31 | 1W | 32N |
| | | | SE | 31 | 1W | 32N |
| 002 | 1550 | 4 | SE | 30 | 1W | 32N |
| | | | SW | 29 | 1W | 32N |
| 003 | 1725 | 14 | NE | 30 | 1W | 32N |
| | | | NW | 29 | 1W | 32N |
| 004 | 2100 | 0 | NE | 20 | 1W | 32N |
| | | | NW | 21 | 1W | 32N |
| | | | SE | 20 | 1W | 32N |
| 005 | 1640 | 26 | SE | 15 | 1W | 32N |
| | | | SW | 14 | 1W | 32N |
| | | | SE | 14 | 1W | 32N |
| | | | NW | 23 | 1W | 32N |
| 006 | 1625 | 0 | NW | 23 | 1W | 32N |
| | | | NE | 23 | 1W | 32N |
| 007 | 1575 | 0 | NW | 24 | 1W | 32N |
| | | | SW | 24 | 1W | 32N |
| | | | SE | 23 | 1W | 32N |
| | | | NE | 23 | 1W | 32N |
| 008 | 1520 | 0 | SW | 6 | 1E | 31N |
| 009 | 1520 | 0 | SE | 6 | 1E | 31N |
| 010 | 1450 | 0 | SW | 32 | 1E | 32N |
| 011 | 1550 | 0 | SE | 32 | 1E | 32N |
| 012 | 1375 | 0 | SE | 32 | 1E | 32N |
| 013 | 1780 | 0 | SW | 4 | 1E | 32N |
| | | | SE | 4 | 1E | 32N |
| 014 | 2375 | 0 | NW | 28 | 1E | 32N |
| 015 | 2375 | 0 | NE | 21 | 1E | 32N |
| | | | NW | 22 | 1E | 32N |
| | | | SW | 22 | 1E | 32N |
| | | | NW | 27 | 1E | 32N |
| | | | SE | 21 | 1E | 32N |
| 016 | 2335 | 0 | SW | 16 | 1E | 32N |
| | | | SE | 16 | 1E | 32N |
| | | | SW | 15 | 1E | 32N |
| | | | NW | 22 | 1E | 32N |
| | | | NE | 21 | 1E | 32N |
| 017 | 2475 | 0 | NE | 22 | 1E | 32N |
| | | | NW | 23 | 1E | 32N |
| 018 | 1875 | 0 | NW | 35 | 1E | 32N |
| 019 | 1650 | 0 | SW | 35 | 1E | 32N |
| | | | NW | 2 | 1E | 31N |
| 020 | 1775 | 0 | SE | 35 | 1E | 32N |
| | | | NE | 2 | 1E | 31N |

| Lake number | Elevation MSL | No. pushups | Locations of Lakes | | | |
|---|---|---|---|---|---|---|
| | | | Quarter section | Section | Range | Township |
| 021 | 2375 | 0 | NW | 36 | 1E | 32N |
| 022 | 2375 | 0 | NW | 36 | 1E | 32N |
| 023 | 2250 | 0 | SW | 24 | 1E | 32N |
| | | | SE | 24 | 1E | 32N |
| | | | SW | 19 | 2E | 32N |
| | | | NW | 30 | 2E | 32N |
| | | | NE | 25 | 1E | 32N |
| | | | NW | 25 | 1E | 32N |
| 024 | 2375 | 0 | NE | 19 | 2E | 32N |
| | | | NW | 20 | 2E | 32N |
| 025 | 2370 | 0 | NW | 20 | 2E | 32N |
| | | | NE | 20 | 2E | 32N |
| | | | SE | 20 | 2E | 32N |
| | | | SW | 20 | 2E | 32N |
| 026 | 2325 | 0 | SW | 21 | 2E | 32N |
| 027 | 1750 | 0 | NW | 27 | 2E | 32N |
| | | | NE | 27 | 2E | 32N |
| | | | SE | 27 | 2E | 32N |
| | | | SW | 27 | 2E | 32N |
| 028 | 2475 | 0 | NE | 7 | 4E | 31N |
| 029 | 2350 | 0 | SW | 8 | 4E | 31N |
| 030 | 1975 | 0 | NW | 17 | 4E | 31N |
| 031 | 1975 | 0 | NE | 17 | 4E | 31N |
| 032 | 2275 | 1 | NW | 5 | 5E | 31N |
| | | | SW | 5 | 5E | 31N |
| 033 | 2275 | 0 | SW | 5 | 5E | 31N |
| 034 | 2350 | 0 | SW | 4 | 5E | 31N |
| | | | SE | 5 | 5E | 31N |
| 035 | 2230 | 0 | SW | 9 | SE | 31N |
| | | | SE | 9 | 5E | 31N |
| | | | NE | 16 | 5E | 31N |
| | | | NW | 16 | 5E | 31N |
| | | | NE | 17 | 5E | 31N |
| | | | NW | 17 | 5E | 31N |
| | | | NE | 18 | 5E | 31N |
| | | | SE | 7 | 5E | 31N |
| | | | SW | 8 | 5E | 31N |
| | | | SE | 8 | 5E | 31N |
| 036 | 2225 | 8 | SW | 10 | 5E | 31N |
| | | | SE | 9 | 5E | 31N |
| 037 | 2275 | 0 | SE | 3 | 5E | 31N |
| | | | SW | 3 | 5E | 31N |
| | | | SE | 10 | 5E | 31N |
| | | | SW | 10 | 5E | 31N |
| | | | NE | 9 | 5E | 31N |
| 038 | 2110 | 0 | SE | 11 | 5E | 31N |
| | | | SW | 11 | 5E | 31N |

| Lake number | Elevation MSL | No. pushups | Locations of Lakes: Quarter section | Section | Range | Township |
|---|---|---|---|---|---|---|
| | | | NW | 14 | 5E | 31N |
| | | | NE | 15 | 5E | 31N |
| | | | SW | 15 | 5E | 31N |
| | | | NW | 15 | 5E | 31N |
| | | | SW | 10 | 5E | 31N |
| 039 | 2325 | 0 | NW | 3 | 5E | 31N |
| 040 | 2240 | 0 | SW | 21 | 5E | 32N |
| 041 | 2225 | 1 | NW | 21 | 5E | 32N |
| 042 | 2240 | 0 | NE | 21 | 5E | 32N |
| 043 | 2260 | 1 | NE | 21 | 5E | 32N |
| | | | NW | 22 | 5E | 32N |
| | | | SE | 21 | 5E | 32N |
| | | | NE | 21 | 5E | 32N |
| 044 | 2275 | 0 | SW | 15 | 5E | 32N |
| | | | NW | 22 | 5E | 32N |
| 045 | 2240 | 0 | SE | 16 | | |
| | | | NE | 21 | 5E | 32N |
| 046 | 2275 | 0 | SE | 15 | 5E | 32N |
| | | | SW | 45 | 5E | 32N |
| 047 | 2240 | 7 | NW | 15 | 5E | 32N |
| | | | NE | 16 | 5E | 32N |
| 048 | 2425 | 6 | NW | 10 | 5E | 32N |
| 049 | 2350 | 0 | NW | 14 | 5E | 32N |
| | | | SW | 14 | 5E | 32N |
| 050 | 2350 | 0 | NW | 14 | 5E | 32N |
| 051 | 2350 | 0 | NW | 14 | 5E | 32N |
| 052 | 2350 | 0 | NW | 14 | 5E | 32N |
| | | | NE | 14 | 5E | 32N |
| 053 | 2350 | 0 | NE | 14 | 5E | 32N |
| 054 | 2350 | 0 | SE | 14 | 5E | 32N |
| 055 | 2350 | 0 | NE | 14 | 5E | 32N |
| | | | SE | 14 | 5E | 32N |
| 056 | 2350 | 0 | NE | 14 | 5E | 32N |
| | | | NW | 13 | 5E | 32N |
| 057 | 2275 | 0 | SW | 35 | 5E | 32N |
| 058 | 2324 | 0 | NE | 53 | 5E | 32N |
| 059 | 2275 | 32 | NE | 13 | 5E | 31N |
| | | | NW | 18 | 5E | 31N |
| | | | SW | 18 | 5E | 31N |
| | | | SE | 13 | 5E | 31N |
| | | | SW | 13 | 5E | 31N |
| | | | SE | 14 | 5E | 31N |
| | | | NE | 14 | 5E | 31N |
| | | | NE | 13 | 5E | 31N |
| 060 | 2270 | 0 | SW | 5 | 6E | 31N |
| | | | SE | 5 | 6E | 31N |
| | | | NE | 8 | 6E | 31N |
| | | | SW | 8 | 6E | 31N |

| Lake number | Elevation MSL | No. pushups | Locations of Lakes | | | |
|---|---|---|---|---|---|---|
| | | | Quarter section | Section | Range | Township |
| | | | SE | 7 | 6E | 31N |
| | | | SW | 7 | 6E | 31N |
| | | | NE | 7 | 6E | 31N |
| | | | NW | 8 | 6E | 31N |
| 061 | 2225 | 3 | SW | 4 | 6E | 31N |
| | | | SE | 5 | 6E | 31N |
| 062 | 2225 | 0 | NW | 2 | 6E | 31N |
| 063 | 2325 | 0 | SE | 19 | 6E | 32N |
| 064 | 2375 | 0 | NW | 19 | 6E | 32N |
| | | | NE | 24 | 5E | 32N |
| 065 | 2450 | 3 | SW | 18 | 6E | 32N |
| 066 | 2350 | 0 | NE | 18 | 6E | 32N |
| | | | NW | 18 | 6E | 32N |
| 067 | 2350 | 24 | SW | 7 | 6E | 32N |
| | | | SE | 7 | 6E | 32N |
| | | | SW | 8 | 6E | 32N |
| | | | SE | 8 | 6E | 32N |
| | | | NE | 17 | 6E | 32N |
| | | | NW | 17 | 6E | 32N |
| | | | NE | 18 | 6E | 32N |
| 068 | 2270 | 15 | SE | 17 | 6E | 32N |
| | | | SW | 16 | 6E | 32N |
| | | | NW | 21 | 6E | 32N |
| | | | NE | 20 | 6E | 32N |
| 069 | 2275 | 14 | SE | 11 | 6E | 32N |
| 070 | 2325 | 8 | NW | 12 | 6E | 32N |
| 071 | 1750 | 5 | SE | 24 | 6E | 32N |
| 072 | 1650 | 2 | NW | 31 | 7E | 32N |
| 073 | 2000 | 0 | SW | 29 | 7E | 32N |
| 074 | 2050 | 2 | NW | 29 | 7E | 32N |
| | | | NE | 29 | 7E | 32N |
| | | | SE | 29 | 7E | 32N |
| 075 | 2050 | 0 | SE | 29 | 7E | 32N |
| | | | NE | 32 | 7E | 32N |
| 076 | 2050 | 2 | SW | 28 | 7E | 32N |
| 077 | 2050 | 0 | SE | 29 | 7E | 32N |
| 078 | 2050 | 0 | SE | 29 | 7E | 32N |
| 079 | 3150 | 0 | SE | 23 | 7E | 31N |
| 080 | 2750 | 0 | SE | 6 | 8E | 31N |
| 081 | 2700 | 0 | SE | 6 | 8E | 31N |
| | | | SW | 5 | 8E | 31N |
| 082 | 1850 | 2 | SW | 8 | 8E | 31N |
| 083 | 2525 | 0 | SW | 33 | 8E | 32N |
| | | | NE | 33 | 8E | 32N |
| 084 | 2525 | 0 | NW | 3 | 8E | 31N |
| 085 | 2650 | 0 | SW | 2 | 8E | 31N |
| | | | SE | 2 | 8E | 31N |

| Lake number | Elevation MSL | No. pushups | Locations of Lakes | | | |
|---|---|---|---|---|---|---|
| | | | Quarter section | Section | Range | Township |
| 086 | 2650 | 0 | SE | 2 | 8E | 31N |
| 087 | 2650 | 0 | SE | 2 | 8E | 31N |
| 088 | 2431 | 1 | SE | 7 | 9E | 31N |
| 089 | 2840 | 25 | SE | 25 | 11E | 30N |
| | | | SW | 30 | 11E | 30N |
| | | | NW | 31 | 11E | 30N |
| | | | NE | 36 | 11E | 30N |
| 090 | 2855 | 2 | SE | 30 | 11E | 30N |
| | | | NW | 31 | 11E | 30N |
| 091 | 2850 | 0 | NW | 31 | 11E | 30N |
| 092 | 2550 | 1 | SW | 5 | 11E | 29N |
| | | | NW | 8 | 11E | 29N |
| 093 | 2550 | 0 | NW | 8 | 11E | 29N |
| | | | NE | 8 | 11E | 29N |
| | | | SE | 8 | 11E | 29N |
| | | | SW | 8 | 11E | 29N |
| 094 | 2560 | 0 | SE | 5 | 11E | 29N |
| | | | NE | 8 | 11E | 29N |
| 095 | 2550 | 0 | SW | 4 | 11E | 29N |
| 096 | 2550 | 0 | NW | 9 | 11E | 29N |
| 097 | 2550 | 0 | NW | 9 | 11E | 29N |
| 098 | 2550 | 0 | NW | 9 | 11E | 29N |
| | | | SW | 9 | 11E | 29N |
| 099 | 2550 | 0 | SE | 8 | 11E | 29N |
| | | | SW | 9 | 11E | 29N |
| 100 | 2800 | 1 | NE | 26 | 10E | 30N |
| 101 | 2800 | 0 | NE | 26 | 10E | 30N |
| | | | NW | 25 | 10E | 30N |
| 102 | 2800 | 0 | SW | 24 | 10E | 30N |
| 103 | 2800 | 0 | SW | 23 | 3E | 30N |
| | | | NW | 26 | 3E | 30N |

when snowmelt was in advanced stages but lake and river ice still remained. Up river from Gold Creek the bulk of sign of these aquatic species was found in lakes on plateaus above the river valley between 2000 feet and 2400 feet MSL. Two sightings of beavers were reported by surveyors working along the Susitna River between Fog and Devil Creeks, however, these beavers may have been dispersing 2-year-olds since to our knowledge no active lodges or bank dens have been sighted on the river, or on the lower reaches of the feeder streams.

### 3.3 - Fox Den Surveys

Ten den sites were located between Devil Creek and Watana Creek in 1980 (Figure 3). Two of these sites, number 8, Swimming Bear Lake, and number 9, High Lake, were used for rearing young in 1980. One site, number 10, Watana Creek, which was discovered in November 1980, showed signs of use during the preceding summer. No sign of activity was observed at the remaining 7 sites during the year.

Den sites discovered in the Susitna area are characterized by south-facing slopes, sandy soil, offering a good view of the surrounding area, and by being near water, in most cases adjacent to a lake. Further, dens found were either above or near treeline between 730 meters (2200 feet MSL) and 1066 meters (3200 feet MSL). Murie (1944) reported that

> "Red fox dens in McKinley Park were in the open and in the woods, on sunny knolls far up the slopes, and on the flats. Most of them were dug in sandy loam...".

His findings are similar to ours except that ground and air searches have thus far failed to produce fox dens in the woods. Allison (1971) working in Mt. McKinley National Park recorded dens in habitats similar to the dens we observed. Allison made no mention of woody plants near dens over 4 feet in height, except alder. Steve Buskirk (pers. comm.), a Park Ranger for several years in McKinley National Park, stated that some fox dens did occur in the woods in the Park.

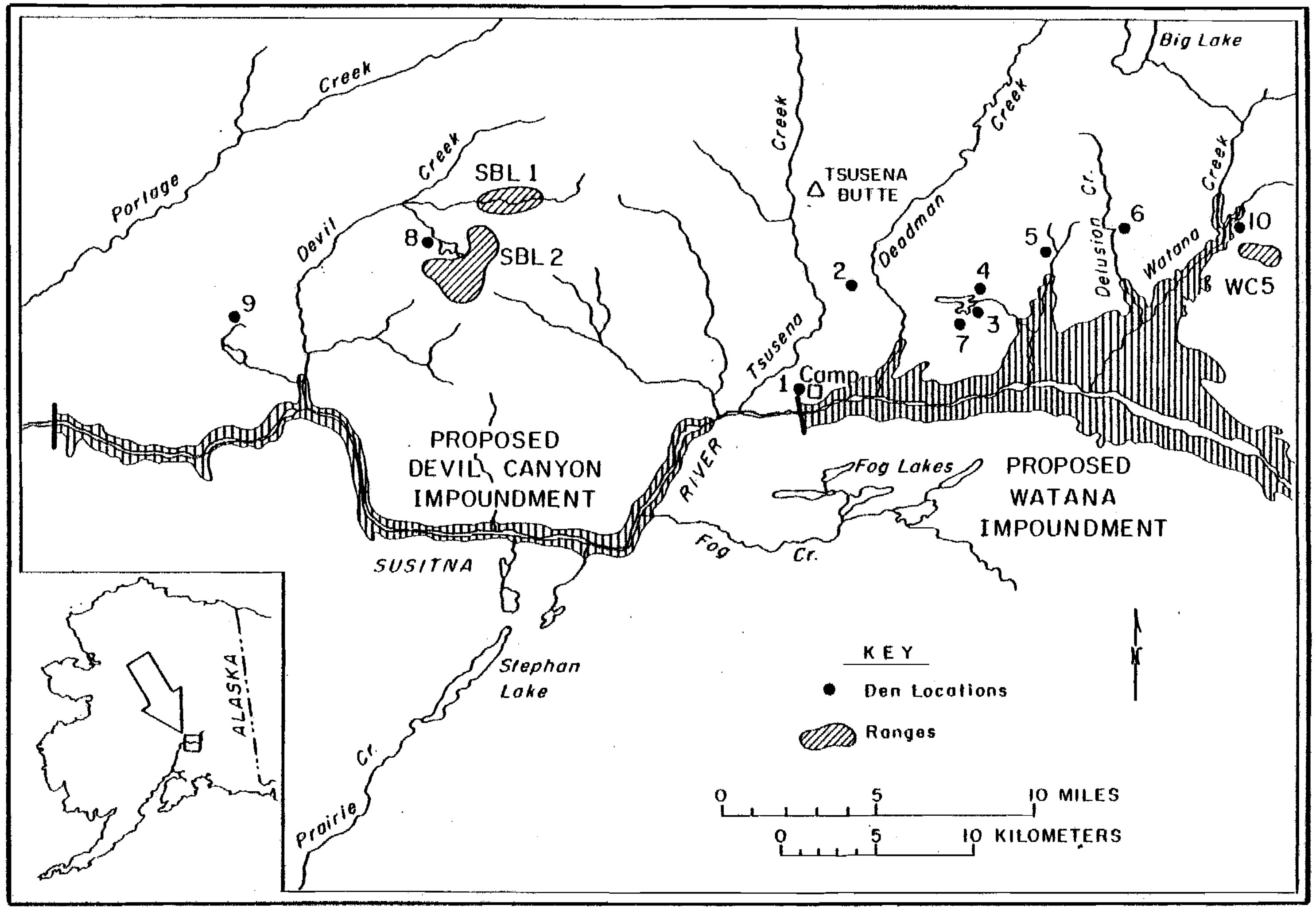


Figure 3. Locations of fox dens discovered during 1980 and minimum home ranges of 3 radio-collared foxes.

Allison (1971) noted that

> "...red foxes use homesites only during the small part of each year when the young are being raised".

This is not the case in our study area where fox tracks were often seen during the winter at or near den sites. In most cases, at least 1 entrance was kept clear of snow and showed evidence of being entered by a fox throughout the winter.

Fox pups remained at den sites into September on our study site. Allison (1971) reported that fox families vacated dens by mid-August in Mt. McKinley National Park. Storm (1972) reported fox families utilized den sites until late July in the midwest. Storm (1972) found that foxes in Iowa and Illinois remained together as a family unit into October. Sheldon (1950) observed that some fox families stayed together until September and that the latest date of an occupied den was recorded on July 10, 1947. Sheldon's study area was in central New York. Our findings in the Susitna area suggest that a period of roughly 1 month may pass between abandonment of the den site and dispersal of young. A period of about 3 months passed between abandonment of the den site and dispersal in Storms study area in Iowa and Illinois.

Present information indicates that foxes in the study area utilize den sites much later than in other areas of Alaska. The latest date reported for foxes at dens in Alaska is August 11 (Magoun, pers. comm.).

## 3.4 - Live Trapping and Radio-collaring

### 3.4.1 - Red Fox

Five foxes were fitted with radio collars (Table 3): 3 pups from the Swimming Bear Lake site, 1 pup from the High Lake site, and 1 adult-sized fox from the Watana site (Figure 3).

Table 3. Background for captured foxes. Capture locations are shown on Figure 3.

| | Fox #1 | Fox #2 | Fox #3 | Fox #4 | Fox #5 | Fox #6 |
|---|---|---|---|---|---|---|
| Date | 8/10/80 | 8/10/80 | 8/10/80 | 9/2/80 | 9/4/80 | 11/10/80 |
| Time | 5:40 a.m. | 5:40 a.m. | 5:40 a.m. | 9:30 p.m. | 7:00 a.m. | 9:30 a.m. |
| Location | Swimming Bear Lake | Swimming Bear Lake | Swimming Bear Lake | High Lake | High Lake | Watana |
| Weight | 3.1 kg | 3.3 kg | 3.5 kg | 6.4 kg | 4.3 kg | 5 kg |
| Total length | 88.0 cm | 89.0 cm | 42.0 cm | (escaped) | 105 cm | 101 cm |
| Tail length | 32.0 cm | 34.0 cm | 35.0 cm | | 39.0 cm | 39.4 cm |
| Muzzle length | 7.5 cm | 6.6 cm | 7.0 cm | | 7.0 cm | 7.3 cm |
| Nose pad width | 1.9 cm | 1.8 cm | 2.0 cm | | 2.3 cm | 2.2 cm |
| Shoulder | 33.5 cm | 33.2 cm | 36.0 cm | | 40.0 cm | 40.0 cm |
| Right ear | 6.8 cm | 8.2 cm | 8.1 cm | | 9.0 cm | 8.3 cm |
| Hind foot | 15.2 cm | 15.5 cm | 17.0 cm | | 18.0 cm | 16.5 cm |
| Color phase | red | red | cross | red | cross | red |
| Collar no. | 526 | 528 | 530 | | 527 | 529 |
| Collar freq. | 164.567 | 164.615 | 164.667 | | 164.590 | 164.641 |
| Ear tag no. | 104 | 105 | 106 | 109 | 110 | 111 |
| Age class | juvenile | juvenile | juvenile | Believed adult | juvenile | juvenile? |
| Sex | F | M | M | | M | F |

Two pups dispersed from the Swimming Bear Lake site during the period September 20, 21, 22, 1980. One pup (fox No. SBL2) established a territory in the vicinity of its den (Figure 3). Another (fox No. SBL1) established a territory in an adjacent drainage 2.4 km (1.5 miles) north of its den site (Figure 3). A cross color phase pup (fox No. SBL3) dispersed out of the area (Figure 3). He was last seen at 1:40 p.m., 22 September 1980, about 2.4 km (1.5 miles) southeast of the den site.

In 1980, the Swimming Bear Lake area was occupied by a red female adult and 3 pups, 2 of which were the red color phase and 1 a cross-color phase. When the den was initially discovered in late July, an adult cross fox was observed on 2 occasions at the den site. This fox was believed to be the adult male.

An active den site 2.4 km (1.5 miles) north of High Lake was discovered in early September 1980 (Figure 3). Upon our arrival, 2 September 1980, at least 3 separate foxes were seen at the den: 1 red, 1 light red, and 1 cross. At 9:30 p.m., 2 September 1980, a red female was captured (fox No. HL4). She weighed 6.4 kg (14 lbs.) and escaped while being measured. This appeared to be an adult female. Pups and adults were difficult to distinguish due to the large size of the pups. It also seems likely that there were at least 2 foxes at this site which had almost identical coloration. Based on observations at that time, it appeared that 1 red female and 3 pups (1 red, 1 light red, and 1 cross) were occupying the den.

On 4 September 1980 a cross pup weighing 4.3 kg (9.5 lbs.) was captured about 1.6 km (1 mile) east of the den. This animal had lost its milk canines and the carnassials were erupting (Table 3). No new tracks or activity at the den were observed on 3 September or 4 September 1980 and when no fox signs were observed after subsequent visits to the site, it was assumed that the den had been vacated. Sheldon (1950) suggested that dens are abandoned about the time the pups lose their lacteal dentition.

The cross pup (fox No. HL4) fitted with a radio-collar at High Lake den was located only on 2 occasions after release, despite intense efforts to relocate it (Figure 3). On 21 September 1980 this fox's signal was picked up and followed. He was located approximately 1.6 km (1 mile) south of Swimming Bear Lake near a small lake. Two pups from the Swimming Bear Lake den were also located in that same area on 21 September. On 18 October 1980 the radio signal from this fox was again received and followed. He was located on a ridge, 4200' MSL, between Devil Creek and Portage Creek and about 11.2 km (7 miles) north of the High Lake den (Figure 3).

In early November 1980 an abundance of fox sign was noted along Watana Creek. On 6 November 1980 five steel traps were set in favorable locations along the creek. Warm weather and the formation of anchor ice in the creek increased the water level. This flooded all traps within 3 days. Fox tracks around a lake on the plateau above Watana Creek were spotted and investigated. A red fox was observed sitting on a den mound. Two traps were set on the frozen lake and on 10 November a red fox (fox No. WC5) weighing 5 kg (11 pounds) was captured and fitted with a radio collar. This fox was accompanied by another red fox of about the same size, possibly a litter mate. Since the date of capture, this fox has remained in the area of the Watana den (Figure 3).

Radio-telemetry, snow transects, and observation flights suggest that some foxes may remain at higher elevations throughout the year. Searches of the area by project investigators in late winter and early spring 1980 produced no evidence of foxes along the Susitna River or the lower elevations along tributaries. Tracks and other signs of foxes were noted along the banks of the Susitna River in late fall and early winter 1980. Winter snow transect surveys in 1980 produced evidence of utilization of the shores of the Susitna River in late fall and early winter. This seasonal movement pattern will be studied closely in the upcoming year.

Ptarmigan and arctic ground squirrels may be principal prey species (Table 4) of foxes. Ptarmigan and/or their tracks were observed each time investigators approached areas where foxes had foraged near or above timberline during winter. During summer, ground squirrels were sighted whenever investigators were near fox den sites. Ground squirrel remains were found at den sites in the summer. Murie (1944) states that ground squirrels in McKinley Park were abundant and much used by foxes. He has little to say relating to use of ptarmigan because populations of these birds were low in the park at the time of his studies. Scat analyses and additional carcass necropsies will provide more concrete information.

The snow transect scheme was designed to provide data which will allow us to correlate the tracks of a specific species with vegetation cover, snow depth, and elevation during late fall and early spring. The transects provide an index to areas intensely utilized by foxes. Data were also collected from following fox trails on the ground to gain a finer scale of resolution, especially in the snow depth and vegetation categories. Snow hardness is measured along fox trails to assess the effects of snow hardness as well as snow depth on fox movements.

The void in our fox data base for the snow-free months will be filled by monitoring transmitter-equipped foxes, scat collection, observation at den sites, and stream sandbar surveys. All of these surveys were initiated in 1980 and will be continued in 1981.

Additional data regarding utilization and/or exclusion of/from stream bank habitat, juvenile dispersal, and food habits will be forthcoming in 1981.

### 3.4.2 - Marten and Mink

A total of 4 marten and 2 mink were radio-collared during 1980. Home range sizes and shapes were obtained for 3 adult male marten.

Table 4. Summary of necropsies of 9 red fox carcasses obtained from Don Newman and Mary Kay McDonald. All of the foxes were trapped within 20 miles of Adventures Unlimited Lodge, mile 100 Denali Highway.

| SPEC. NO. | SEX | FEMORAL MARROW FAT | BODY FAT | OMENTAL FAT | GASTROINTESTINAL CONTENTS | COMMENTS |
|---|---|---|---|---|---|---|
| 475 | F | pink - red | not observable | | black bird feathers, unknown fur | |
| 476 | M | pink, no yellow | minimal | | | probably a quick kill |
| 477 | M | pink, no yellow | thin | | empty | probably not a quick kill |
| 478 | M | yellowish pink | moderate | moderate | salmon bones and flesh, mouse parts, ungulate fur | probably a quick kill |
| 479 | F | pink, not yellow | minimal | | caribou fur, flesh and bones | tapeworms present in gut |
| 480 | ? | pink, not yellow | none | | caribou fur, hare fur, bird (ptarmigan?) feathers, bi-colored mouse tail | skull not collected |
| 481 | F | pinkish yellow | none | | ptarmigan remains | reproductive track collected, probably not a quick kill |
| 482 | F | red, gelatinous | | | several feather shafts | probably not a quick kill, 6 placental scars counted (4+2) |
| 483 | F | pink, some yellow | none | | | |

No meaningful home range data were obtained for mink. Background information for the 6 collared mustelids is presented in Table 5. Home range and movement data for 4 marten are given in Figure 4. Daily activity pattern data for 3 adult male marten are presented in Figure 5.

Home range data acquired to date pertain solely to male marten. It appears that adult male marten have mutually exclusive home ranges during summer, with creeks in some cases forming home range boundaries. Radio locations depicted are primarily those of daytime resting sites. The minimum areas of 3 of these marten home ranges (518, 519 and 520) were 4.74 $km^2$ (1.83 $mi^2$), 5.44 $km^2$ (2.10 $mi^2$) and 4.87 $km^2$ (1.88 $mi^2$) respectively. These home range minimum size estimates are made with the following assumptions:

1. Creeks and the Susitna River form home range boundaries during summer.

2. Marten home ranges do not extend above treeline during summer. Movements of marten beyond the home ranges depicted by these resting locations may be significant and could indicate considerably larger home range sizes.

Many estimates of North American marten home ranges reported in the literature (Hawley and Newby 1957, Linsink 1954) are based upon capture-mark-recapture methods. Archibald (1980) has shown that home range sizes determined by telemetry are greater than home range sizes for the same animals determined from trapping grid methods. Archibald found that telemetry-based home ranges for 5 marten over 1 year in age (2 males, 3 females) averaged 4.1 $km^2$. Mech and Rogers (1977) found 4 marten (3 males, 1 female) in Minnesota to have an average home range size of 12.8 $km^2$.

The activity data gathered to date (Figure 5) suggest that during autumn marten are nocturnal, with limited activity occurring

Table 5. Background information for radio-collared mustelids, Tsusena Creek study area.

| Collar Number | Species | Sex | Age Class | Weight (g) | Capture Date | Remarks |
|---|---|---|---|---|---|---|
| 519 | marten | male | adult | 1440 | 22 Aug 80 | Testes scrotal |
| | | | | | 23 Aug 80 | Released from trap |
| | | | | | 25 Sep 80 | Released from trap |
| 520 | marten | male | adult | 1370 | 27 Aug 80 | Testes scrotal |
| 518 | marten | male | adult | 1380 | 9 Sep 80 | Testes receding |
| | | | | 1120 | 25 Nov 80 | Transmitter dead, last heard 12 Nov.; transmitter replaced. |
| 515 | mink | male | 1 yr. + | 780 | 2 Oct 80 | Canine teeth broken. Collar slipped between 19 Oct. and 30 Oct. |
| 516 | marten | male | ? | 1260 | 2 Nov 80 | This animal caught by a trapper on 28 Nov. |
| 510 | mink | male | juvenile | 580 | 28 Nov 80 | Weasel collar attached. Transmitter failed in 1-2 days. |

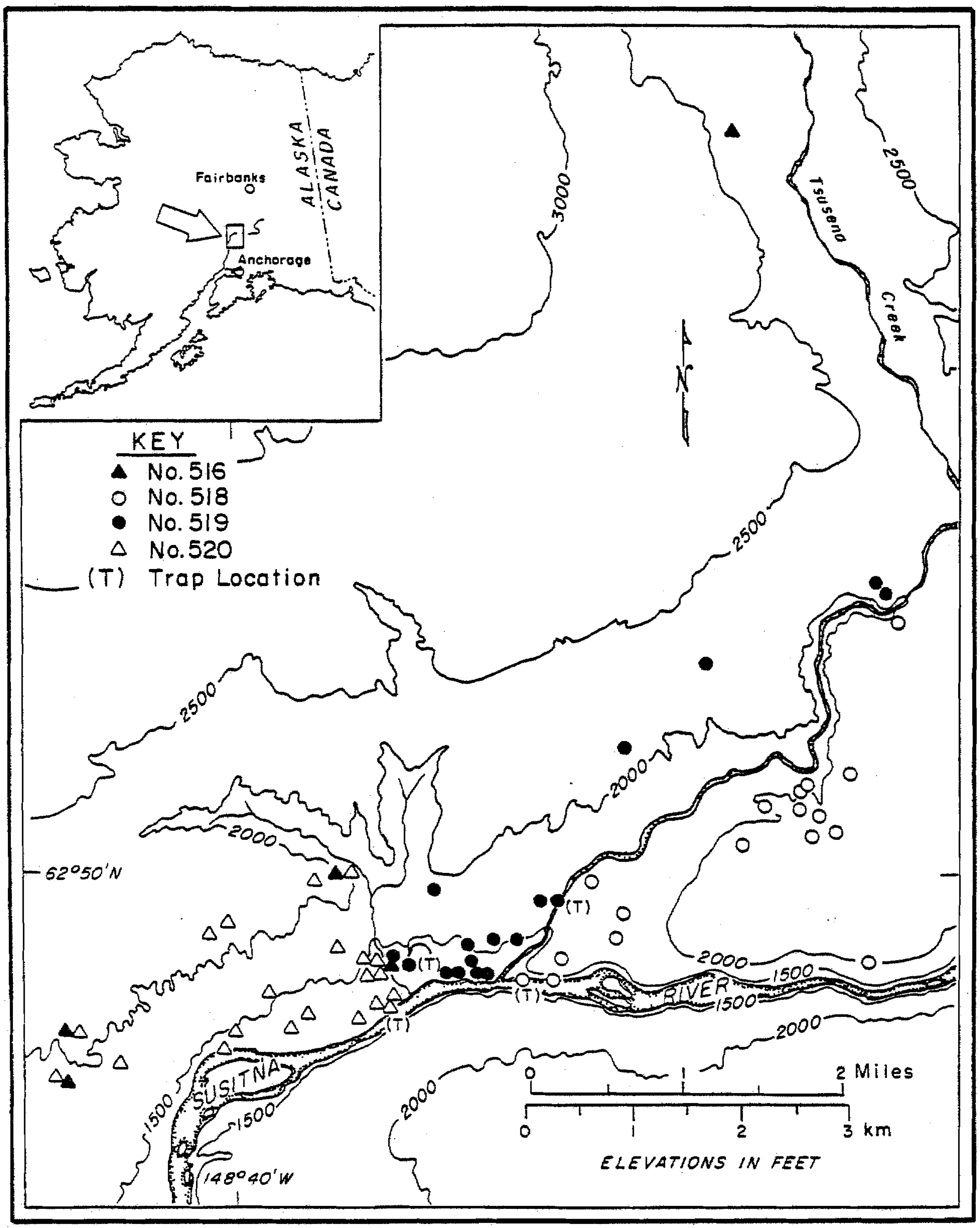


Figure 4. Tracking locations for 4 radio-collared marten.

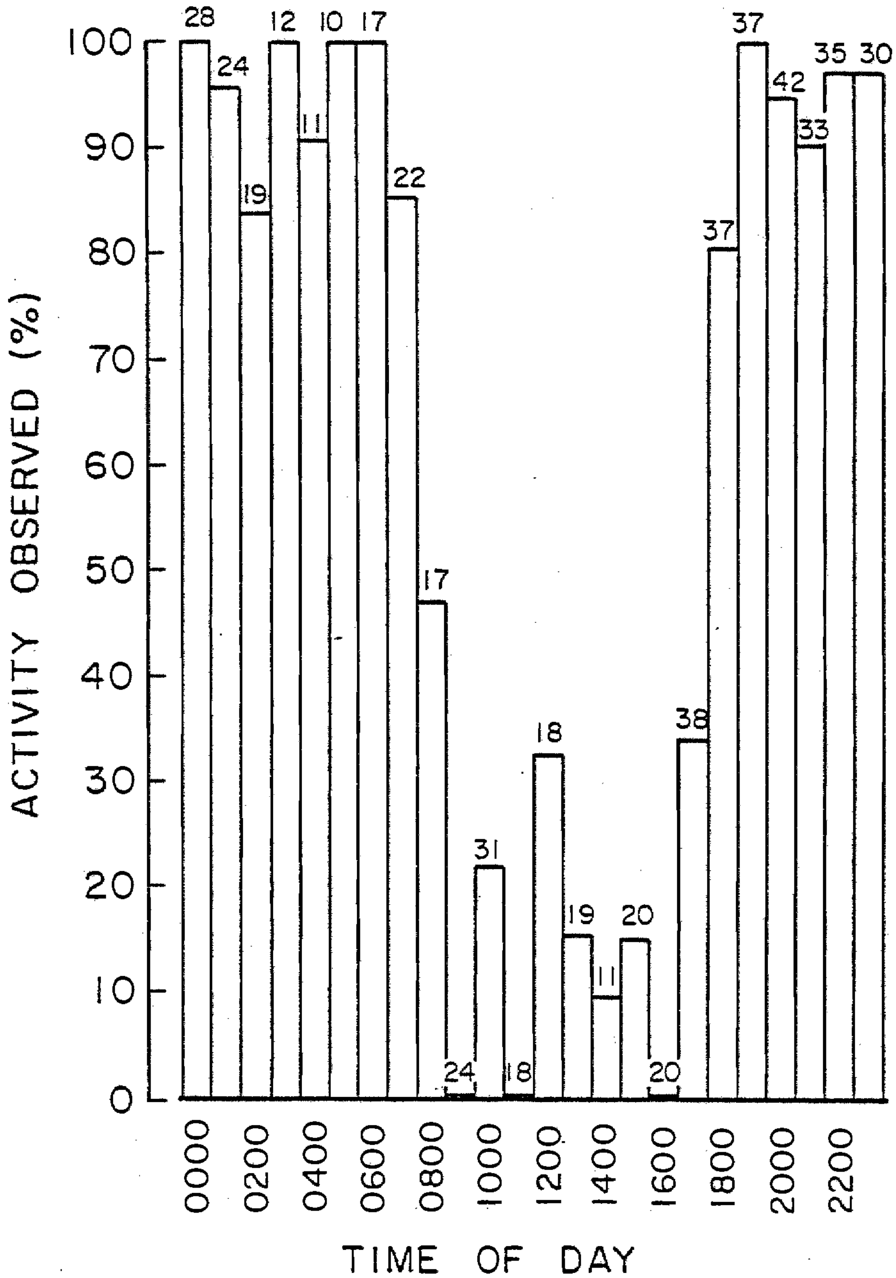


Figure 5. Daily activity patterns of 3 adult male marten, 24 September - 20 October 1980. Columns reflect the percent of total radio readings that indicated activity. Numbers at the top of columns indicate total numbers of readings.

around 1200 hours. In most cases observed marten become active near sunset and continued to be active throughout the night with few or no periods of inactivity. Activity usually ceased near sunrise.

## 3.5 - Following Fox Trails

Data from fox snow tracking surveys were recorded on standard data sheets (Table 1). These data will be analyzed during 1981.

## 3.5 - Food Habits Studies

Scats and gastrointestinal tracts of mustelids were dried and stored. None were analyzed during 1980. Fox scats and remains of food items from den sites were collected and stored. Analyses will be conducted during 1981. Gastrointestinal contents from 9 red fox carcasses were identified (Table 4).

## 3.7 - Transects

Analyses of aerial transect data were not completed in 1980.

## 3.8 - Downstream Furbearer Surveys

Use of the Susitna River by aquatic furbearers, especially beavers, increases progressively downstream from Devil Canyon as the river leaves the foothills of the Alaska Range and flows south to the confluence of the Kashwitna River. Increasing abundance of aquatic furbearers is best illustrated by sign of beavers (Table 6). In Section I, above the confluence with the Talkeetna and Chulitna Rivers, beaver sign is limited to occasional foraging sites and lodges along protected banks of the river, sloughs and tributaries. In Section II foraging sign is common along sloughs, deltas of tributaries and along stable banks of the Susitna River. Additional lodges and possibly bank dens not observed by the survey team probably exist away from the main channel of the river. Sign of beavers is in sight almost continuously along Section III. The

Table 6. Occurrence of Beaver signs along 3 sections of the lower Susitna River: Section I = Devil Canyon to confluence with Talkeetna and Chulitna Rivers, Section II = confluence with Talkeetna and Chulitna Rivers to confluence with Montana Creek, Section III = confluence with Montana Creek to Cook Inlet. Numbers in parentheses are adjustments to realistically reflect signs present in the Mature and Old River surveys. Signs were multiplied by a correction factor of 2 in the Mature River Section and a factor of 3 in the Old River Section. The increasing width and braiding of the river permitted the team to see approximately half the signs in Section II and only a fourth to a third in Section III.

| River Section | Miles Surveyed | Beaver Sign: Number Cuttings | Beaver Sign: Cuttings per Mile | Beaver Sign: Number Houses | Beaver Sign: Houses per Mile |
|---|---|---|---|---|---|
| Section I | 39 | 12 | .31 | 2 | .05 |
| Section II | 19 | 7 | .37 (.74) | 2 | .11 (.22) |
| Section III | 16 | 16 | 1.00 (3.00) | 4 | .25 (.75) |
| Entire Survey | 74 | 35 | .47 | 8 | .11 |

numerous islands and sloughs provide ideal habitats for foraging, caching food and building lodges, and only a portion of the sign was visible from the riverboat. An attempt to correct for increasing width and braiding of the river and limited visibility was made in Table 6.

Results of this survey agree with findings of Boyce (1974) and Hakala (1952) who reported beavers in Alaska favor lakes or slow flowing streams bordered by subclimax stages of shrub and mixed coniferous and deciduous forests. This description fits Section III of the Susitna River. Large rivers with narrow valleys and high velocity flows such as Section I of the Susitna River, are generally sparsely populated by beavers (Retzer 1955).

Other mammals observed in the downstream surveys included a moose calf in the Section I and 2 black bears in the Section II. Tracks of bears were common in all sections of the river and 2 sets of wolf tracks were observed in Section III.

## 3.9 - Otter and Mink Surveys

Results of the otter and mink surveys made during November 1980 are presented in Table 7. An unusually high incidence of otter sign was noted along the Susitna River during November. These surveys will be repeated during November 1981 to determine if otters again concentrate along the river at this time of year.

## 3.10 - Other Furbearers

Limited data were obtained for coyotes, lynx, short-tailed weasels and least weasels. Coyotes occur in the study area, however, they are uncommon and restricted to local family groups. Mr. Harold Larson, an agent for the Alaska Railroad at Gold Creek reported trapping a male coyote near Gold Creek during the 1979-1980 trapping season. Mr. Larson noted tracks he believed to have been made by coyotes along the Susitna

Table 7. Results of otter and mink surveys, Susitna River, 10 November - 12 November 1980. Number of tracks of each species observed at north and south sides of 37 river check points (Figure 2).

| Checkpoint Numbers | North | | South | |
|---|---|---|---|---|
| | Otters | Mink | Otters | Mink |
| 01 | 3 | 0 | 0 | 0 |
| 02 | 0 | 2 | 0 | 0 |
| 03 | 0 | 0 | 0 | 0 |
| 04 | 0 | 0 | 3 | 1 |
| 05 | 0 | 0 | 2 | 0 |
| 06 | 0 | 0 | 0 | 0 |
| 07 | 0 | 1 | 0 | 1 |
| 08 | 0 | 0 | 0 | 2 |
| 09 | 0 | 0 | 1 | 0 |
| 10 | 0 | 0 | 0 | 2 |
| 11 | 4 | 1 | 0 | 1 |
| 12 | 3 | 1 | 0 | 0 |
| 13 | 0 | 0 | 0 | 1 |
| 14 | 2 | 0 | 3 | 1 |
| 15 | 0 | 0 | 4 | 0 |
| 16 | 3 | 1 | 0 | 2 |
| 17 | 0 | 3 | 0 | 4 |
| 18 | 0 | 0 | 0 | 2 |
| 19 | 0 | 0 | 1 | 2 |
| 20 | 2 | 0 | 1 | 0 |
| 21 | 1 | 1 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 |
| 23 | 2 | 1 | 0 | 2 |
| 24 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 |
| 26 | 0 | 0 | 0 | 0 |
| 27 | 0 | 0 | 4 | 0 |
| 28 | 0 | 0 | 4 | 0 |
| 29 | 0 | 0 | 0 | 2 |
| 30 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 |
| 32 | 0 | 0 | 0 | 3 |
| 33 | 0 | 2 | 0 | 3 |
| 34 | 0 | 1 | 0 | 2 |
| 35 | 0 | 1 | 2 | 3 |
| 36 | 0 | 0 | 2 | 2 |
| 37 | 0 | 1 | 0 | 2 |

River near Gold Creek throughout the winter of 1979-1980. Mr. Ed Powell of Stephan Lake Lodge indicated that on 12 September 1980 he heard a coyote howling a short distance southwest of the lodge. On 6 October 1980 helicopter pilot Richard Harkness informed Buskirk that on three occasions during the preceding 4 weeks he observed a coyote in the vicinity of 62°47'30"N., 149°10'00"W. On 13 October 1980 Buskirk flew to this location with Harkness, but did not observe the animal which Harkness described. No other reports or observations of coyotes in the study area were obtained.

No direct evidence of lynx in the study area has been obtained. No lynx have been reported taken in the impoundment zones by trappers during the past two trapping seasons, and no observations of lynx by other project personnel have come to our attention. On 19 November 1980 Hobgood and Buskirk observed from the air a set of tracks which may have been made by a lynx. These were observed on the Susitna River beach on the north side of the river on aerial transect A-13. The observers were unable to land near the tracks to confirm the identification. In a December 1979 telephone conversation Harley McMahan, a Glenallen trapper, told Buskirk that he and his father had taken lynx in the canyon country of the Susitna River in the past. McMahan stated that lynx were fairly numerous in the winter of 1976-77, and were found primarily in forests along the river.

Short-tailed weasels. Short-tailed weasels are common and locally abundant in the study area. Their tracks have been observed in a variety of habitat types from the elevation of the Susitna River up to approximately 2600 feet above sea level. Short-tailed weasels or their tracks have been observed from near the mouth of Portage Creek to the Tyone River. Trappers on upper Tsusena Creek, in the Fog Lakes area and at Stephan Lake take them deliberately or incidentally while trapping other species.

Least weasel. Least weasels occur in the study area, however, their distribution, relative numbers and habitat preferences are poorly understood at this time. Several sets of tracks were observed on lower Watana Creek in March 1980 which we felt were definitely made by least weasels.

# 4 - IMPACT ASSESSMENT

## 4.1 - Construction Impacts

We consider construction impacts to be those attributable to:

(a) Excavation of borrow sites.

(b) Clearcutting and burning of woody vegetation in impoundment zones.

(c) Dam construction.

(d) Physical disturbance associated with road construction.

(e) Physical disturbance associated with transmission system construction.

(f) Other human activities such as transportation of personnel and equipment associated with the construction phase.

It is difficult to predict construction impacts of the project in light of the uncertainty of: 1) the number, location, and size of dams to be constructed, 2) the routes of access corridors, 3) a possible railroad, 4) diversion tunnel lengths and configurations, 5) borrow pits to be used and the extent of that use, and 6) the timing and duration of the actual construction. Each combination of these variables presents us with a unique set of conditions to assess and impact will vary in degree for each combination. In addition, published accounts of impact prediction and the demonstrated accuracy of such predictions are limited for furbearers in northern areas. Generally, where habitat is lost or degraded, furbearer numbers will decline. In our preliminary assessments of project impacts we have relied upon our present understanding of the distribution, habitat requirements and life strategies of furbearers in the study area.

(a) Excavation of borrow sites

Borrow site excavation will affect furbearers primarily due to loss of denning and foraging habitats, although some habitat restoration may be possible over several decades. Species most likely to be affected by borrow pit excavation (based upon proposed borrow sites) appear to be marten and fox. The proposed borrow site on upper Tsusena Creek could have negative local effects on foxes, mink, marten, otters and short-tailed weasels due to the relatively large area of land involved.

(b) Clearcutting of woody vegetation in impoundment zone

In general, habitat will be lost and furbearers eliminated in the impoundment zones, and at dam sites. The species most severely impacted by clearing forests will probably be those which rely heavily upon forest, riparian and riverine habitats - marten, lynx, mink and otter.

(c) Dam construction

The physical structures of the dams will usurp several square miles of land and this habitat will be lost.

(d) Physical disturbance of road construction

The physical disturbance and habitat loss from road (or railroad bed) construction would be relatively minor due to the small amount of land involved. The most serious impacts from road construction will arise from improved human access and collisions of wildlife with vehicles. These impacts are discussed under section 4.2.

(e) Physical disturbance of transmission system construction.

We assume that transmission system construction will involve placement of transmission towers between the dam sites and the Parks Highway. We also assume that helicopter construction techniques will be employed and that roads will not be built. If roads are built during construction of transmission systems, our comments under 4.1(d) and 4.2(d) apply. Impacts to furbearers from helicopter-assisted construction would consist chiefly of behavioral disturbance and would be relatively minor. Furbearer habitat along the selected transmission route to the intertie as well as the selected routes from Willow to Anchorage and Healy to Fairbanks as necessary, will be assessed during 1981.

(f) Other human activities associated with the construction phase.

Other human activities resulting from the construction phase include hunting and trapping by construction personnel, disposal of construction camp garbage and feeding of furbearers, primarily foxes and marten, by construction personnel. These impacts may be relatively light or severe, depending upon education programs and regulatory measures taken. This type of impact is subject to mitigation and it is discussed in section 5.

## 4.2 - Operation Impacts

(a) Downstream alterations in flow regime and water quality.

Projected changes in the flow rates of the Susitna River downstream from the Devil Canyon impoundment could result in marked changes in the quantity and quality of aquatic furbearer habitat. This was the case in the downstream portion of the Peace River following construction of the W.A.C. Bennett Dam where an extensive marsh on the Peace-Athabaska Delta became dry and furbearers numbers were reduced (Baxter and Glaude 1980). Reduced circannual water level fluctuations could conceivably create a water flow regime more favorable to muskrats and beavers. On the other hand, elimination of peak flows at breakup or at other times may have the effect of drying up wetlands and reducing the amount of subclimax, riparian vegetation along the river's edge.

Aquatic and semiaquatic furbearers (beaver, muskrat, otter and mink) are not known to select habitats on the basis of water turbidity. It seems unlikely that these species would be affected favorably by a reduction in water turbidity. Altered fish populations may have major (positive or negative) downstream effects upon otters and mink. Predictions of such effects must await projections of changes in downstream fish populations.

(b) Watana Dam and Reservoir.

The flooding of the Watana Reservoir will eliminate terrestrial furbearer habitat and create some habitat for aquatic furbearers. The quantity and quality of habitats created and lost will depend upon the maximum pool elevation, stability of pool level, ice characteristics, draw-down zone vegetation, reservoir fish and invertebrate populations. Assuming that annual fluctuations in water level will be 30-50 m (90-150 ft.) vertically, and that water level will rise during summer, peak in autumn, and decline during winter, there will be a large, unvegetated draw-down zone. This draw-down zone and the aquatic habitat created will be of limited value to otters, mink, muskrats, and beavers.

The flooding of the Watana Reservoir will cause loss of terrestrial furbearer habitat. The species most severely impacted from this habitat loss will be marten due to their high dependence upon forested habitats along the Susitna River and lower elevations along tributaries. Foxes are known to utilize riparian zones along the Susitna River and its tributaries during summer and autumn, but their degree of dependency upon these habitats has not yet been determined.

(c) Devil Canyon Dam and Reservoir.

The flooding of the Devil Canyon Reservoir will eliminate terrestrial furbearer habitat and create some aquatic furbearer habitat. The degree of this habitat change will depend upon the pool elevation and stability of the pool.

The aquatic habitat created by this reservoir may be of considerable value to otters, mink, and possibly to beavers and muskrats. Assuming that water level fluctuations are less than 2 m (6 ft.) vertically, that these fluctuations have a daily cyclic nature, that vegetation is permitted to grow within 19 m (30 ft.) of the reservoir's shore and that suitable populations of prey fish are found in the reservoir we predict that otters and mink will be favorably affected by the habitat created. Beavers and muskrats utilize the area within the Devil Canyon impoundment zone very little at this time and may be favorably affected by the aquatic habitat created. However, Murray (1961) indicated that the rise and fall from the normal water level should be no more than .6 meters (2 feet) for beavers to utilize an area. We are unable to predict how beavers and muskrats will be impacted until additional data are available about water level fluctuations, shoreline soils and shoreline vegetation.

(d) Access roads or railroads.

After the construction phase is completed, public use of access roads may have marked impacts upon furbearers. The public use impacts of roads would consist primarily of increased harvest and human harassment of furbearers in the study area. Roads would provide convenient access to areas which are now and have historically been remote. The severity of this impact would depend upon regulatory measures imposed. Since this impact is subject to mitigation through management measures, it is discussed in section 5. Vehicle-wildlife collisions would be another source of impacts to furbearers. The severity of this impact is difficult to predict because of the paucity of relevant published information. We believe that losses of furbearers resulting from vehicle collisions will be relatively low.

Once constructed, railroads would have minimal impacts upon furbearers. Railroads do not provide the ease of access which roads provide and we predict that a railroad could be operated without significantly impacting furbearers along its route. There may be little need for regulatory mitigative measures.

(e) Borrow sites.

The primary negative effect of borrow site development is removal, which affects utilization of borrow sites by furbearers and their prey. Left unvegetated, borrow sites would have little value to furbearers. Vegetation restoration measures would determine the suitability of restored habitats for various furbearers. The creation of grasslands and shrub vegetation may be attractive to small mammals and birds and thus provide foraging habitat for foxes, especially if vegetative heterogeneity is maintained. We believe it extremely unlikely that destroyed marten habitat could be regenerated in less than 75 years.

(f) Transmission facilities.

We assume that the operation of transmission facilities consists chiefly of occasional maintenance activities at transmission towers between the dam sites and the Parks Highway. We also assume that access for such maintenance work would be by means of helicopter. If road access is provided, our comments under 4.2(d) apply. Impacts upon furbearers from these occassional maintenance activities would probably be negligible. Operational impacts of transmission facilities from Willow to Anchorage and Healy to Fairbanks have not yet been assessed.

## 5 - MITIGATION

(a) Dam construction and excavation of borrow sites.

Habitat loss and disturbance due to construction activities can be mitigated by minimizing the size of construction zones and selecting and utilizing borrow sites as close as possible to the dams. Road construction may be minimized in the same manner.

If dams are engineered to provide access for spawning salmon into the system upstream from Devil Canyon, negative impacts to aquatic and terrestrial furbearers would be curtailed.

Pending further assessment of this aspect of potential impacts, we are optimistic that the introduction of spawning salmon into the upper river would positively impact all furbearer species present, including beaver and muskrat due to increased nutrients supplied to the system.

(b) Other human activities associated with the construction phase.

Trapping carried on by project personnel could result in severe local depletion of furbearers. Impacts upon furbearers from trapping and hunting by construction personnel may be mitigated by regulatory measures.

Habituation of furbearers, particularly red foxes and marten, to human food sources and garbage may be mitigated. Garbage generated during the construction phase can be disposed of in such a way that it is never available to foxes and marten. This may be accomplished through fencing, land filling, incineration, transporting garbage out of the area, or a combination of these methods. Feeding of foxes by construction personnel may be minimized through education and regulations with strict enforcement.

(c) Physical disturbance of transmission system construction.

Physical disturbance of transmission systems construction may be mitigated by the use of helicopter construction techniques rather than techniques which require surface access.

(d) Downstream alterations in flow regime and water quality.

Major tributaries of the Susitna River (Chulitna, Talkeetna and Yentna) may dampen the effects of the Devil Canyon and Watana impoundments significantly below the town of Talkeetna. Between Devil Canyon and Talkeetna a critical factor for beavers and muskrats may be maintenance of stable water flow during spring and winter so that lodges, food caches, and bank dens can be maintained.

(e) Watana Reservoir pool elevation fluctuations.

Adverse impacts upon otters, mink, beavers and muskrats due to water level fluctuations could be mitigated by minimizing those fluctuations.

(f) Access road operation.

Adverse impacts predicted from the operation of access roads could be mitigated through regulatory measures to restrict public access to the roads and/or manage hunting and trapping activities in the vicinity of the road.

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## 7 - AUTHORITIES CONTACTED

Ralph Archibald, Biologist, Yukon Wildlife Branch, Whitehorse, Yukon Territory - Presently conducting marten studies in the Yukon. Provided information about marten habitat preferences.

Joan Foote, Biologist, Institute of Northern Forestry, Fairbanks. - Contacted regarding habitat sampling procedures.

David Johnson, Biologist, Alaska Department of Fish & Game, Delta Junction, Alaska.
- Provided information about furbearer harvests in interior Alaska.

Gregory Konkel, Habitat Evaluation Coordinator, U.S. Fish and Wildlife Service.
- Discussed possibility of using HEP in assessment studies.

Ron Long, Trapper, Fairbanks, Alaska.
A local fox trapper with extensive knowledge of furbearers. Discussed historical furbearer population changes.

Harold Larson, Trapper and agent for the Alaska Railroad at Gold Creek. - Provided information about coyotes and other furbearers near Gold Creek.

Robert Larson, Biologist, Alaska Department of Fish and Game, Delta Junction, Alaska.
- Provided information about furbearer harvest in interior Alaska.

Herbert Melchior, Furbearer Biologist, Alaska Department of Fish & Game.
- Discussed furbearer harvests and management plans.

John Morrison, Supervisor of Biological Services Program, U.S. Fish and Wildlife Service.
- Discussed possibility of using USFWS data bases to aid in assessing impacts of development upon wildlife in Alaska.

Don Newman and Mary Kay McDonald, Trappers, Denali Highway, Alaska. - Provided furbearer carcasses and local trapping information.

Leroy Shank, Trapper, Fairbanks, Alaska. - Local marten trapper, provided historical information about furbearers.

Roger Smith, Trapper, Tsusena Creek, Alaska. - Local trapper, discussed trapping in the area and arranged for collection of carcasses.

Dr. Vic VanBallenberghe, Wildlife Biologist, Institute of Northern Forestry, Fairbanks, Alaska. - Former furbearer biologist with the Alaska Department of Fish and Game. Provided information on furbearers in the Susitna Basin and sampling and field techniques.

Glen Wingkte, Trapper, Kenai, Alaska. - Traps between Gold Creek and the Devil's Canyon dam site, provided information about furbearers trapped.

Bill Zielinski and Wayne Spencer, Biologists, Sagehen Creek Field Station, Truckee, California. - Conferred with these biologists about marten research they are conducting in California.

Mr. Lester E. Eberhardt, Terrestrial Ecology Section, Battelle Pacific Northwest Laboratories, Battelle Boulevard, Richland, WA 99352 - Provided techniques for radio collaring mink and weasels.

Mr. Al Sargeant, Northern Prairie Wildlife Research Center, P.O. Box 1747, Jamestown, ND 58401 - Conferred radio collaring mink and weasels.

Carol Resnick, Tsusena Creek, Alaska. - Provided information on furbearer occurrence in the study area, furbearer carcasses.