

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ENVIRONMENTAL STUDIES
PROCEDURES MANUAL

SUBTASK 7.11
WILDLIFE ECOLOGY-
BIRDS AND NON-GAME MAMMALS

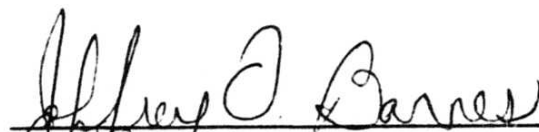
**Terrestrial
Environmental
Specialists, Inc.**

ALASKA POWER AUTHORITY
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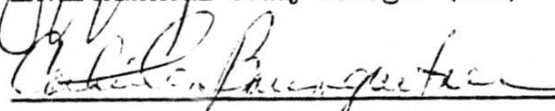
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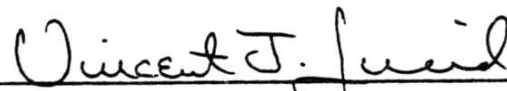
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to
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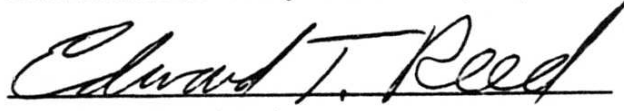
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July 1980

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PROCEDURES MANUAL

Bird and Non-game Mammal Studies

<u>TABLE OF CONTENTS</u>	Page
Introduction	1
Technical Procedures	
Selection of intensive plot sites	2
Animal enumeration procedures	
Bird censusing	2
Bird survey	3
Small mammal trapline sampling	3
Enumeration of other non-game mammals	4
Measurements of habitat variables	5
Data Procedures	6
Quality Control	10
Schedule	10
Personnel	10
Literature Cited	12
 <u>LIST OF FIGURES</u>	
Field Form for Bird Censusing	7
Recording Form for Habitat Measurements	8
Sample Format for Recording Plant Frequencies	9
Activity Schedule	11

I. INTRODUCTION

The bird and non-game mammal studies of the upper Susitna River Basin are being undertaken to aid in determining the potential effect that the proposed Susitna Project might have on the fauna of the region. More specifically, we will determine what species of birds and non-game mammals occur in the upper Susitna River Basin and determine, on a seasonal basis, the manner and extent of their use of the region, including the habitats in which they are found. These data can then be used to 1) evaluate habitat potential in the area, 2) provide a basis for predicting faunal changes based on habitat changes caused by environmental alterations, including changes in water level, and 3) evaluate possible mitigative measures, should they prove necessary.

The bird and non-game mammal studies are composed of three interrelated work packages: 1) Avifaunal survey, 2) Bird community-habitat study, and 3) Non-game mammal studies. Field work on the several programs will be shared by all personnel, field schedules will be coordinated wherever possible, and intensive study sites will be combined where feasible. The general objectives of the three work packages follows:

Avifaunal survey

1. Determine all species of birds using the region.
2. Determine, on a seasonal basis (winter, summer, spring and fall migration), each species' relative abundance and general habitat use.
3. Determine spring and fall migration dates (earliest, latest, peak) and, insofar as time permits, the seasonal chronologies of each species.
4. Determine the extent and type of use of the area by the Peregrine, Bald Eagle, and Osprey.
5. Determine, generally, the use of the region by waterbirds, including shorebirds and waterfowl.

Bird community-habitat study

1. Determine, for each of the major upland habitats of the region, the type and degree of use by birds, and compare these habitats relative to species composition, density, dominance, etc.
2. Obtain data relative to species habitat use that can be used in later analyses on habitat selection by specific species (Phase II, 1982).

Non-game mammal studies

1. Determine all species of small and medium-sized mammals occurring in the region.
2. Determine, for each of the major habitats of the region, species composition, relative abundance, and habitat use.

II. TECHNICAL PROCEDURES

SELECTION OF INTENSIVE PLOT SITES

Census plots will be established in each of the major terrestrial habitats in the vicinity of the proposed dam sites. In so far as feasible, small mammal traplines will be set up in conjunction with the bird census plots, although additional small mammal habitats will also be sampled.

Selection of actual habitats to be sampled and specific plot locations cannot be made until field work begins in early July 1980. Avian census plots will be set up in as uniform habitat as is available and will be selected according to Kessel (1979). Preliminary indications suggest that it may be possible to establish bird census plots of sufficient size in the following habitats: Alpine dwarf shrub mat, dwarf shrub meadow, low shrub thicket, medium shrub thicket, deciduous forest (cottonwoods at Gold Creek), coniferous forest, mixed deciduous-coniferous forest, scattered woodland and dwarf forest, and perhaps tall shrub thicket. In addition, small mammal traplines will be established in wet meadow habitat and across some edge (ecotonal) areas.

ANIMAL ENUMERATION PROCEDURES

Bird Censusing

If possible, each bird census site will be a square 10 ha (25 acres) plot, a size above the minimum recommended by the International Bird Census Committee (1970) and one that can be adequately censused in 4 hours--the approximate period of maximum bird activity each morning.

Each 10-ha census plot will be divided by a 7x7 grid, resulting in forty-nine 0.2-ha subplots. Census techniques will be based on the territory mapping census method (International Bird Census Committee 1970). During the breeding season (approx. 15 May to 5 July), seven to nine censuses will be conducted on each plot; censuses will be conducted in pairs of two consecutive days at each plot--partly to minimize the effects of changing territorial boundaries, and partly to alleviate transportation problems between plots. Censuses will be

conducted between 0300 and 0800 Alaska Standard Time (0200-0700 Daylight Savings Time), which is generally within the time of greatest singing activity.

During a census, the observer will stop at the center of each subplot to record avian activity. All birds seen or heard will be recorded and located on a field map of the plot. For each bird seen, activity, height of bird, and substrate used (including plant species) will be recorded.

Bird Survey

A comprehensive survey will be conducted within an approximate 10-mile band on either side of the river, from Gold Creek to the upriver location above which the impoundment will not influence the avian use of the region. Field work will be more or less continuous during spring and fall migration and the summer period (approximately 10 April to mid-October). Winter observations will be obtained during the winter census period and from reports of other project personnel spending periods of the winter in the area.

The main procedure will be to walk transects across as much and as wide a variety of habitats as possible throughout the study area and to record all observations of all species seen or heard. Wherever feasible, data will be recorded by habitat. Relative abundance will be based on the number of birds per unit of time. In addition to abundance and habitat information, data indicative of seasonal chronologies will be recorded (migration, nesting, fledging, molting, etc.), as will specific information on any nests found (habitat, number of eggs/young, age/condition of young, etc.) or any out-of-the-ordinary activity.

One or two aerial surveys will be made to search for the evidence of large, nesting raptors--Osprey, Bald and Golden eagles, Peregrine, and Gyrfalcon. Raven nests will also be recorded.

Aerial surveys of waterbirds, especially waterfowl, will be conducted over wetland areas periodically throughout the migration and summer seasons.

Observations of unusual interest will be solicited from other project personnel: dates of first and last seasonal sightings, unusual species, large numbers, nests or other evidence of breeding, etc.

Small Mammal Trapline Sampling (Soricidae, Cricetidae, Zapodidae)

A modification of the North American Census of Small Mammals (Calhoun 1948) will be used to sample shrews, voles, and mice. When possible, two parallel trapline transects, 289 m long and at least 90 m apart, will be established in all bird census plots and in other habitats as opportunity permits. Each transect will consist of 20

trap stations, spaced every 15.2 m. Two "Museum Special" snap-traps and one cone pitfall trap will be set within a 1 m radius of each trap station centerpoint for three consecutive nights. Snap-traps will be baited with a mixture of peanut butter, rolled oats, ground walnuts, and bacon grease. Pitfalls, which are heavy galvanized sheetmetal cones measuring 155 mm in diameter and 260 mm in vertical depth, will be pressed into the soil so that the cone opening is flush or slightly lower than ground level; they will not be baited.

Trapping periods for all study plots will be as follows: late August-early September 1980; May 1981; late August-early September 1981. For each captured animal the following information will be recorded: date; trap location (plot, station number); trap type (snap-trap or pitfall); species (if needed Hall & Kelson, 1959, will be used for identification); sex; weight (using 50 g and 100 g Pesola scales); and reproductive condition (males--testes abdominal or scrotal; females--pregnant, number and size of embryos, lactating, whether vaginal opening perforate or imperforate).

A representative sample of study skins and skeletal material will be preserved and deposited in the University of Alaska Museum.

Enumeration of Other Non-game Mammals

Red Squirrel (*Tamiasciurus hudsonicus*)

In each bird census plot, the location of all active squirrel middens will be mapped in August 1980 and 1981. From these data red squirrel density will be determined for each major habitat by assuming one squirrel per midden (after Wolff and Zasada 1975).

Snowshoe Hare (*Lepus americanus*)

Snowshoe hare fecal pellets will be counted and removed from a permanently marked 1 m x 1 m area at each vegetation sample point on bird and mammal census plots. To increase sample size in restricted habitats (such as riparian shrub thicket, if present), additional pellet sample stations will be established. Within a 2 m diameter circle of each sample point, the number of browsed twigs will be counted to obtain a measure of browse intensity.

Sampling will be done in spring and fall (at the time of small mammal trapping) to generate a relative use estimate of each area for winter and summer.

Arctic Ground Squirrel (*Spermophilus parryii*)

Sightings of ground squirrel colonies will be solicited from all field workers in the study area. Minimum information requested of observers will include colony location and areal extent (for mapping purposes), habitat type, and a rough approximation of squirrel numbers

or general magnitude of numbers (1-10, 10-20, 30-40, etc.) as indicated by animals seen, heard, and/or the density of burrows in the area.

As time and manpower permits, ground squirrel colonies will be visited to determine animal numbers and general habitat characteristics. Upon inspection and an approximate delineation of the colony boundaries, a permanently marked belt transect, oriented 45° to the direction of the slope, will be established within the colony area (starting point randomly determined) and will be censused for all active squirrel burrows. If colonies are of sufficient size, the transect will be 15 m wide by 1000 m long. Sample size (i.e., the belt transect) will be checked for adequacy by methods discussed by Cochran (1963) and adjusted as necessary.

For each colony area the following data will be recorded: major habitat type (including soil and non-vegetative characteristics), slope, and aspect.

Porcupine (*Erethizon dorsatum*)

Sightings of porcupines will be solicited from all field workers in the study area. Information requested will include date, location, habitat, activity, and, if appropriate, the species and size of plant used.

These data, in combination with a measure of relative habitat use (e.g., number of barked trees and other sign) on the bird and small mammal study plots, will be used to estimate relative habitat use.

Other Non-game Mammal Species

Sightings of hoary marmots (*Marmota caligata*), collared pikas (*Ochotona collaris*), bat species, and other potentially occurring non-game mammal species will be solicited from field workers in the study area.

MEASUREMENT OF HABITAT VARIABLES

The variables chosen to describe the habitats of the intensive study plots (birds and small mammals) are those that we judge are most likely to affect, either directly or indirectly, the animal community structure, species composition, and habitat occupancy levels of these habitats. Some of these variables have already been tested in central Alaska by Spindler (1976), Spindler and Kessel (1980), MacDonald (1980), West (1979), and Wolff (1977).

The bird census subplots and/or small mammal trap stations will be used as sample units in vegetation analyses. Systematically located points will be sampled, using the point-centered quarter method of Cottam and Curtis (1956), but including more detailed sampling of ground cover, understory, and shrub vegetation. Sampling

will be vertically stratified into six layers (after Kessel 1979): ground cover (0-0.25 m), dwarf shrub (0.25-0.4 m), low shrub (0.5-1.1 m), medium shrub (1.2-2.4 m), tall shrub (2.5-4.9 m), and tree (>5.0 m).

Using the point-centered quarter method, the following vegetative characteristics will be obtained for trees and for the medium and tall shrubs: distance to nearest tree and to nearest shrub/shrub patch (=density measure); size of shrub patch, if any; height and diameter of stem/trunk; canopy thickness of trees and of shrubs (lowest live branch to top of tree/shrub); canopy coverage of shrubs, trees, and total canopy coverage. Additionally, the following data will be obtained from each center point: foliage height density profile, using a coverboard with squares for four readings per station at heights of 0.4 m, 0.8 m, 1.8 m, and 3.7 m; and distance to nearest water and characteristics of water (fluvial or lacustrine, depth, length, and width).

Ground cover will be sampled from a 0.5 x 0.5 m square centered on each point center. Percent cover for each of the following groups will be estimated: sedge, grass, forb, mat shrubs, litter, moss, lichen, fungi (including a count of "toadstools"), standing water, and bare ground; species occurrence of the sedges, grasses, forbs, and woody plants will be recorded.

Percent dwarf shrub cover (0.25-0.4 m high) and percent low shrub cover (0.5-1.1 m) will be estimated from a 3.0 m x 3.0 m square, as will microtopographic relief (ranked in four classes, based on average elevational range).

Other data to be obtained include depth of organic substrate (four measurements per sample station), depth to frozen ground, amount of "edge," and the age of the stand (stem slice or tree auger), slope (Abney level), and aspect (compass) of the census plot.

III. DATA PROCEDURES

Quantifiable data gathered in the field (examples of recording sheets attached) will be reduced and analyzed using univariate and multivariate statistical procedures with the aid of a computer. Square root and logarithmic transformations of the data will be used where appropriate. Statistical procedures we expect to use include parametric and non-parametric univariate one-way analysis of variance, multiple stepwise regression, discriminant function analysis, principle component analysis, and contingency analysis. Computer programs performing these analysis will be from "Biomedical Computer Programs" (Dixon and Brown 1979) and/or "Statistical Package for the Social Sciences" (Nie et al. 1975).

Observer _____

_____ Plot Census # _____ Date _____

Time Start _____ Time Finish _____

Temp _____ Weather _____ Sp _____

T	T	T	T	T	T	T
T	T	T	T	T	T	T
T	T	T	T	T	T	T
T	T	T	T	T	T	T
T	T	T	T	T	T	T
T	T	T	T	T	T	T
T	T	T	T	T	T	T

FIELD FORM FOR BIRD CENSUSING

SUSITNA BIRD AND NON-GAME MAMMAL
HABITAT MEASUREMENTS

PLOT _____ STATION _____ DATE _____ OBSERVER _____

COVER: Ground (≤ 0.25 m) (%)

Mat Shrub	Grass	Sedge	Forb	Litter	Moss	Lichen	Fungi	Standing Water	Bare Soil

COVER: Dwarf Shrub (0.25-0.4 m) (%) = _____ COVER: Low Shrub (0.5-1.1 m) (%) = _____

MAT DEPTH (cm):

Q1
Q2
Q3
Q4

MICRO-RELIEF (class #) = _____

class: 0=flat
1= ≤ 0.25 m
2= $> 0.25 < 0.50$ m
3= ≥ 0.50 m

EDGE:

Distance to nearest
edge _____ m

Length of edge _____ m

DISTANCE TO STANDING WATER (m): _____

CANOPY COVERAGE (%):

Lacust. or Fluvial	Depth	L	W	Area

Tree

Shrub

FOLIAGE HEIGHT DENSITY (# squares visible):

	Q1	Q2	Q3	Q4	TOTAL
	Woody (General) Forb	Woody (General) Forb	Woody (General) Forb	Woody (General) Forb	
0					
0.4 m					
0.8 m					
1.3 m					
3.7 m					

TOTAL

SHRUBS AND TREES:

	Plant Species	Distance	Canopy		Stem Diameter	Shrub/Clump Canopy Diam.		Canopy Thickness
			Top	Bottom		L	W	
SHRUBS	Q1							
	Q2							
	Q3							
	Q4							
TREES	Q1							
	Q2							
	Q3							
	Q4							

SAMPLE FORMAT-HABITAT STUDIES

(Note: A plant species list specific to this project will be compiled for the actual data forms to be used).

PLOT		SUBPLOTS		DATE	
TREES	SUBPLOT #			SUBPLOT #	
<i>Betula papyrifera</i>		<i>Brassica rapa</i>		<i>Potentilla palustris</i>	
<i>Larix laricina</i>		<i>Calla palustris</i>		<i>Pyrola asarifolia</i>	
<i>Picea glauca</i>		<i>Caltha natans</i>		<i>Pyrola grandiflora</i>	
<i>Picea mariana</i>		<i>Caltha palustris</i>		<i>Pyrola minor</i>	
<i>Populus balsamifera</i>		<i>Cardamine sp.</i>		<i>Pyrola secunda</i>	
<i>Populus tremuloides</i>		<i>Castilleja caudata</i>		<i>Ranunculus lapponicus</i>	
<i>Prunus pedus</i>		<i>Chrysosplenium tetrandrum</i>		<i>Ranunculus trichophyllus</i>	
TALL SHRUBS		<i>Chrysosplenium wrightii</i>		<i>Rubus arcticus</i>	
<i>Alnus incana</i>		<i>Cicuta mackenzieana</i>		<i>Rubus chamaemorus</i>	
<i>Betula glandulosa</i>		<i>Corallorrhiza trifida</i>		<i>Rumex arcticus</i>	
<i>Betula gland. x papy.</i>		<i>Cornus canadensis</i>		<i>Rumex crispus</i>	
<i>Salix alaxensis</i>		<i>Cornus canad. x suecica</i>		<i>Saussurea angustifolia</i>	
<i>Salix arbusculoides</i>		<i>Cypripedium guttatum</i>		<i>Senecio lugens</i>	
<i>Salix bebbiana</i>		<i>Draba sp.</i>		<i>Solidago canadensis</i>	
<i>Salix brachycarpa</i>		<i>Prosera rotundifolia</i>		<i>Spiranthes romanzoffiana</i>	
<i>Salix candida</i>		<i>Epilobium angustifolium</i>		<i>Stellaria crassifolia</i>	
<i>Salix glauca</i>		<i>Epilobium palustre</i>		<i>Stellaria laeta</i>	
<i>Salix monticola</i>		<i>Equisetum arvense</i>		<i>Stellaria longifolia</i>	
<i>Salix novae-angliae</i>		<i>Equisetum fluviatile</i>		<i>Stellaria longipes</i>	
<i>Salix planifolia</i>		<i>Equisetum palustre</i>		<i>Taraxacum sp.</i>	
LOW SHRUBS		<i>Equisetum pratense</i>		<i>Thalictrum sparsiflorum</i>	
<i>Andromeda polifolia</i>		<i>Equisetum scirpoides</i>		<i>Tofieldia pusilla</i>	
<i>Arctostaphylos rubra</i>		<i>Equisetum silvaticum</i>		<i>Tridentalis europaea</i>	
<i>Arctostaphylos uva-ursi</i>		<i>Equisetum variegatum</i>		<i>Typha latifolia</i>	
<i>Betula nana</i>		<i>Erigeron sp.</i>		<i>Valeriana capitata</i>	
<i>Chamaedaphne calyculata</i>		<i>Fragaria virginiana</i>		<i>Vicia sp.</i>	
<i>Empetrum nigrum</i>		<i>Galeopsis bifida</i>		<i>Viola biflora</i>	
<i>Ledum palustre</i>		<i>Galium boreale</i>		<i>Viola epipsila</i>	
<i>Linnaea borealis</i>		<i>Galium trifidum</i>		GRASSES, SEDGES, and RUSHES	
<i>Myrica gale</i>		<i>Geocaulon lividum</i>		<i>Calamagrostis canadensis</i>	
<i>Oxycoecus microcarpus</i>		<i>Hammarbya paludosa</i>		<i>Carex sp.</i>	
<i>Potentilla fruticosa</i>		<i>Hippuris vulgaris</i>			
<i>Ribes hudsonianum</i>		<i>Iris setosa</i>			
<i>Ribes triste</i>		<i>Lemna minor</i>			
<i>Rosa acicularis</i>		<i>Lycopodium annotinum</i>			
<i>Rubus idaeus</i>		<i>Menyanthes trifoliata</i>			
<i>Salix fuscescens</i>		<i>Mertensia paniculata</i>			
<i>Salix myrtillofolia</i>		<i>Moehringia lateriflora</i>			
<i>Shepherdia canadensis</i>		<i>Moneses uniflora</i>		MOSSES	
<i>Spiraea beaueverdiana</i>		<i>Myriophyllum spicatum</i>			
<i>Vaccinium uliginosum</i>		<i>Nuphar polysepalum</i>			
<i>Vaccinium vitis-idaea</i>		<i>Oxytropis campestris</i>			
<i>Viburnum edule</i>		<i>Parnassia palustris</i>			
HERBS		<i>Pedicularis labradorica</i>			
<i>Achillea sibirica</i>		<i>Petasites frigidus</i>		LICHENS	
<i>Aconitum delphinifolium</i>		<i>Petasites sagittatus</i>			
<i>Amerorchis rotundifolia</i>		<i>Pinguicula villosa</i>			
<i>Anemone richardsonii</i>		<i>Platanthera obtusata</i>			
<i>Astragalus sp.</i>		<i>Polemonium acutiflorum</i>			
		<i>Polygonum alaskanum</i>			
		<i>Polygonum pennsylvanicum</i>			
		<i>Potentilla norvegica</i>			

IV. QUALITY CONTROL

The primary assurance of quality will be in the selection of qualified research technicians and in providing them with appropriate supervision and guidance in relation to project goals and the necessary data and methods needed to obtain these goals.

Field data sheets and journals, as well as copies of reduced primary data will be retained in fireproof files at the University of Alaska Museum.

All specimens collected, including plant voucher specimens, will be deposited with the University of Alaska Museum.

V. SCHEDULE

(See attached figure)

VI. PERSONNEL

EDWARD T. REED, Group Leader

Environmental Scientist, Terrestrial Environmental Specialists, Inc.
Six years of experience evaluating project impacts on wildlife populations.

BRINA KESSEL, Principal Investigator

Professor of Zoology and Curator of Terrestrial Vertebrate Collections, University of Alaska Museum. Twenty-nine years studying birds, mammals, and habitats in Alaska.

STEPHEN O. MACDONALD, Non-game Mammals

Museum Technician I (mammals), Terrestrial Vertebrate Collections, University of Alaska Museum. Twelve years of field experience, including commercial fur trapping in Alaska, and three years of Alaska research on small mammals and habitat use.

DANIEL D. GIBSON, Bird Survey

Museum Technician II (birds), Terrestrial Vertebrate Collection, University of Alaska Museum. Fifteen years of experience and research on birds throughout Alaska, with emphasis on biogeography and systematics.

RESEARCH ASSISTANTS, Intensive plots and bird survey

Two or three assistants will be hired to help set up intensive plots and to assist in gathering data on all programs. These assistants must have the equivalent of a bachelor's degree and be familiar with basic ecological principles. At least two must be thoroughly familiar with the birds of the region, including having ability to identify birds by song; at least one must be able to identify central Alaskan plants. At least two will probably be graduate student level assistants.

V. SCHEDULE
Bird and Non-game Mammal Studies

ACTIVITY	1980												1981												1982*					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Bird Survey/Habitat Data Collection						X	X	X	X				X		X	X	X	X	X	X	X	X			?		X	X	X	
Bird Censusing																X	X	X										X	X	
Mammal Trapping								X	X							X				X	X							X		
Data Analysis									X	X	X	X								X	X	X	X	X						
Report Prep.										X	X	X	X					X	X			X	X	X	X					
Reports Due to TES							X							X						X						X				

* All 1982 field work is Phase II, and not part of the present Scope of Work.

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