1963 REPORT ON GAME STUDIES

DIVISION OF GAME JUNEAU, ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

JUNEAU, ALASKA

STATE OF ALASKA
William A. Egan, Governor

DEPARTMENT OF FISH AND GAME
Walter Kirkness, Commissioner

DIVISION OF GAME
James W. Brooks, Director
Don H. Strode, Federal Aid Coordinator

ALASKA WILDLIFE INVESTIGATIONS

Volume V
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-6-R-5

The subject matter contained within these reports is often fragmentary in nature and the findings may not be conclusive; consequently, permission to publish the contents is withheld pending permission of the Department of Fish and Game. Additional biological information obtained during the period covered by these reports will be published at a later date in comprehensive form.

(Printed August 1964)

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FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: B TITLE: Moose Studies

JOB NOS.: 1, 2, 3, 4, 5, and 6

PERIOD COVERED: July 1, 1963 through December 31, 1963.

ABSTRACT

The moose project was inactive during most of the reporting period. Information obtained will be incorporated into the moose status report due June 30, 1965.

RECOMMENDATIONS

No management recommendations at this time.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: B TITLE: Moose Studies

JOB NOS.: 1, 2, 3, 4, 5, and 6

PERIOD COVERED: July 1, 1963 through December 31, 1963

OBJECTIVES

To obtain and evaluate current information relative to productivity, survival, mortality, sex and age composition, movements, and harvest of Alaska's moose populations.

To develop more precise and reliable research techniques which when feasible will result in data suitable for statistical analysis.

FINDINGS

Many phases of the moose project were inactive during this reporting period because the project leader resigned and a new leader was not assigned to the project during the balance of the reporting period.

Some work was accomplished on these Jobs (Job No. 7 is reported on separately) but compilation and analysis of the data was not completed. These findings will be incorporated into the moose status report scheduled for completion by June 30, 1965.

SUBMITTED BY:

Robert A. Rausch
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: B TITLE: Moose Studies

JOB NO.: 7 TITLE: Experimental Exclosure

PERIOD COVERED: July 1 to December 31, 1963

ABSTRACT

An experimental fence to exclude moose was constructed around a cultivated field of oats and field peas. The fence effectively excluded moose. The fence was the minumum structure necessary to exclude moose. Fence breakage was high during the construction period and occurred occasionally after completion.

RECOMMENDATIONS

Fences constructed to exclude moose from cultivated fields or experimental plots should be sturdier than the experimental design and should incorporate the following principles:

1. The fence should be set to lean outward from the exclosure on at least a 45 degree angle.

2. The fence should consist of a minumum of 4 and preferably 5 wires extending from approximately 2 to 6 feet above the ground.

3. Posts should be 16 feet or less apart.

4. A 10 foot area should be cleared of trees and brush on the outside of the entire perimeter.

5. Streamers or flagging should be attached no less than 6 feet apart to all wires.

Fences should be constructed around agricultural areas before the moose have become accustomed to feeding on the cultivated crops (prior to emergence of seedlings).

The information contained in this report and recommended fence designs should be made available to persons having moose damage or attempting to raise crops in areas where damage is inevitable.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: B TITLE: Moose Studies

JOB NO.: 7 TITLE: Experimental Exclosure

PERIOD COVERED: July 1 to December 31, 1963

OBJECTIVES

To ascertain the minimum structure necessary to exlude moose from agriculture land and forage analysis plots.

TECHNIQUES

Materials to construct a fence to exclude moose were supplied to Julian Fowler, a dairy farmer located at Shaw Creek (approximately 80 miles south of Fairbanks).

Several moose were regularly utilizing the field, which Mr. Fowler had fertilized and planted with oats and field peas. Grazed areas and tracks were obvious.

Several fence designs were considered and a design requiring minimum materials and labor was selected. A three-strand barbed wire fence was constructed utilizing native wood posts placed 32 feet apart and set to lean outward on a 15 to 20 degree angle (Figure 1). Some living trees were used as posts.

The first strand of barbed wire was installed approximately 3 feet from the ground on porcelain insulators. A 110 volt, 60 cycle A. C. electronic high line fence charger was used to charge the first wire. The second and third wires were installed at approximately 4 1/2 feet and 6 feet from the ground. They were not electrically charged. Yellow plastic streamers were attached to all wires.

Observations were made of moose activity within and adjacent to the exclosure during and after the construction of the fence.

Figure 1. Experimental moose fence at Shaw Creek, Alaska.

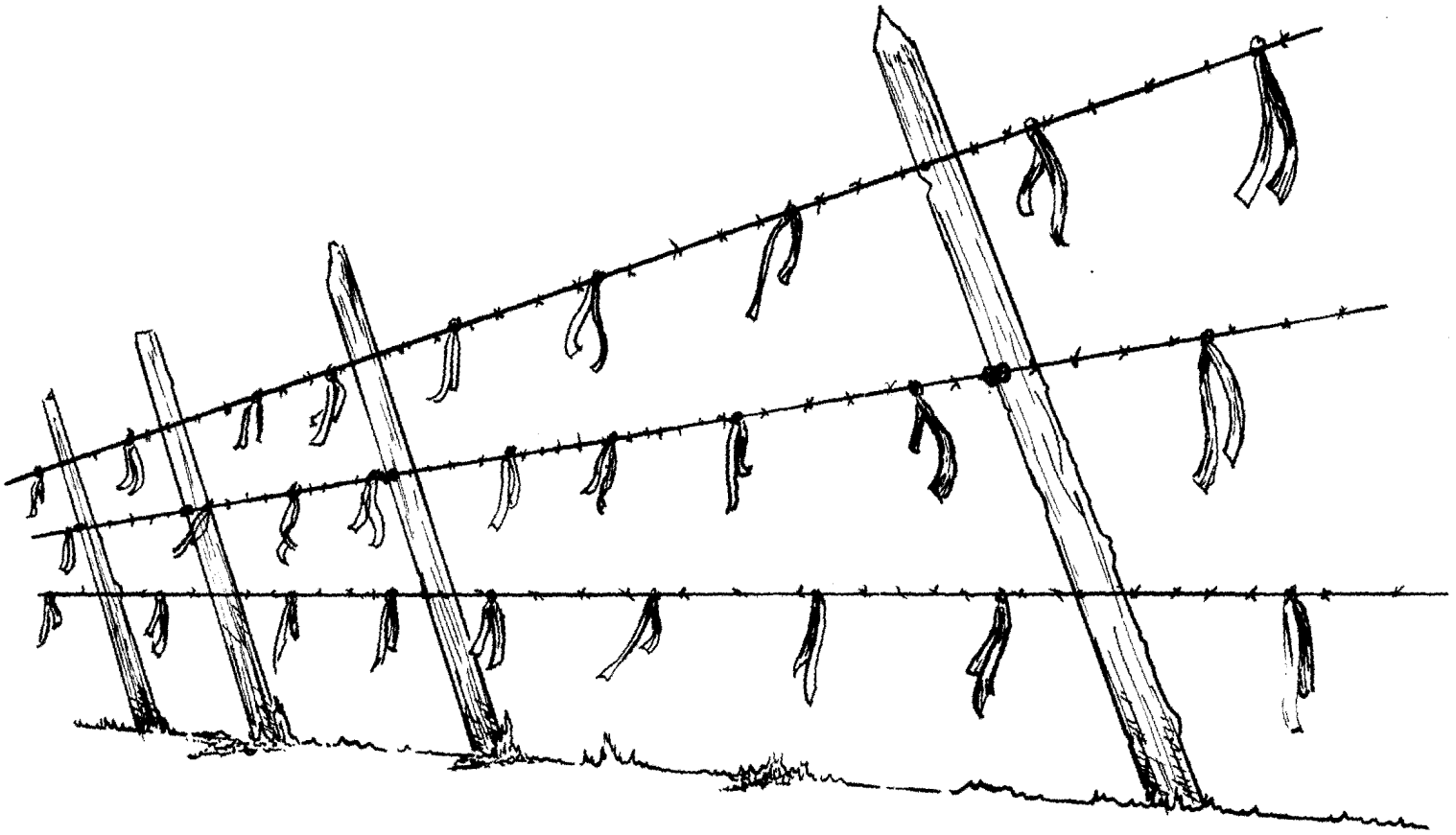
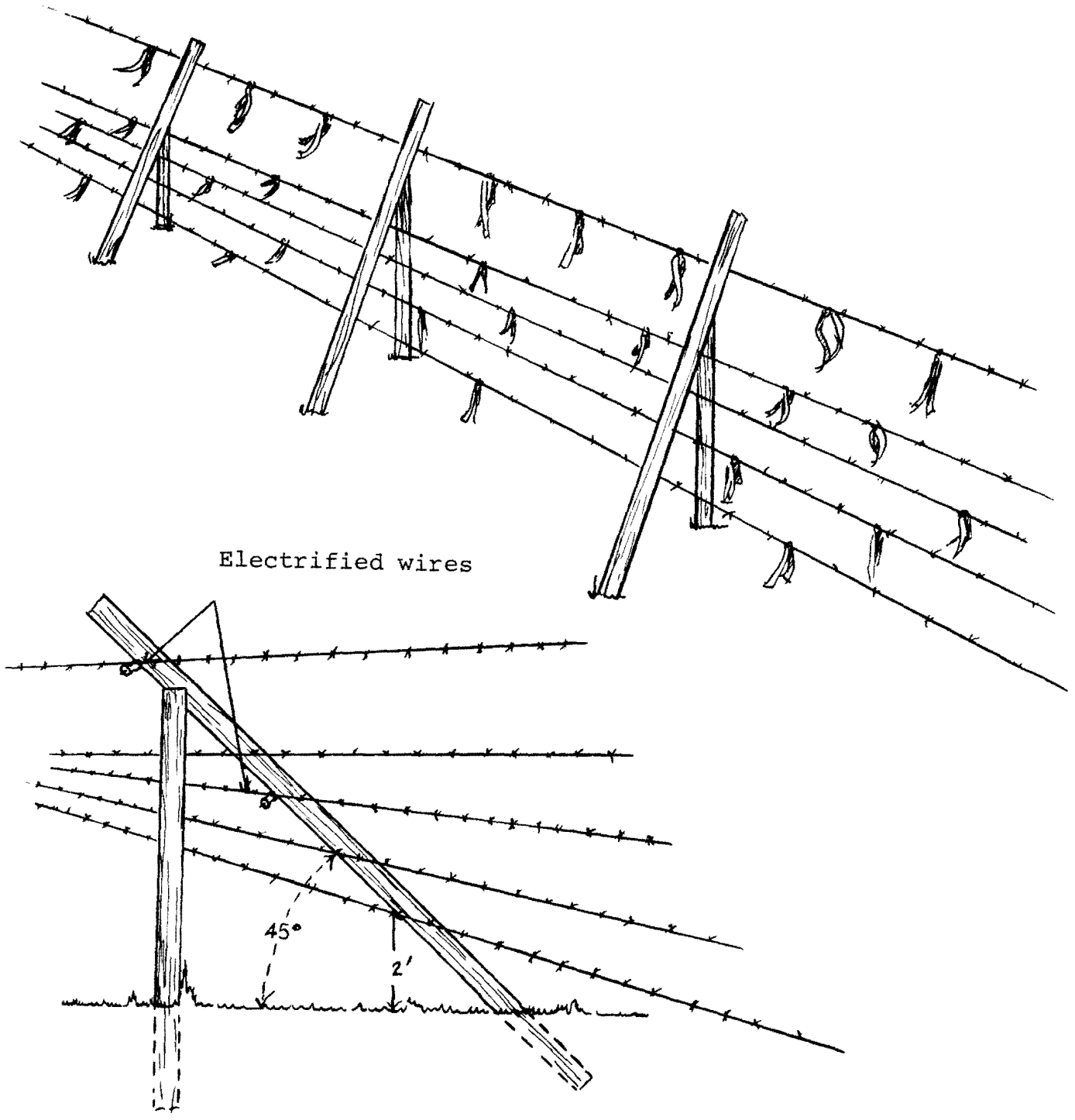


Figure 2. Suggested moose fence



FINDINGS

Moose activity within the exclosure decreased with the installation of the first wire. The yellow plastic flagging attached to the wire served to alert the moose to the presence of the wire. In locations where the fence went through wooded areas additional flagging and plastic bags had to be tied to the wire to prevent frequent breakage.

About three breaks occurred each night after installation of the first wire. Breakage decreased as additional flagging was placed at the locations where breakage frequently occurred and as the moose learned to jump over the wire. After the addition of the second and third wire, moose were effectively excluded from the exclosure. Wires were occasionally broken, but the moose usually did not enter.

The experimental fence was the minimum that would serve to exclude moose, and a practical fence should be stronger to reduce maintenance (Figure 2). Constructing an appropriate fence before agricultural crops become attractive to moose should reduce much of the breakage and maintenance.

The seasonal feeding habits of the moose may have made the experimental fence appear more effective. A normal change to other food sources may have attracted the moose from the exclosure; however, a prominent trail had been developed around the exclosure.

SUBMITTED BY:

Robert A. Rausch
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 2 TITLE: Bison Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

ABSTRACT

Movements and distribution of the Big Delta herd were not significantly different from those recorded since 1959. Additional evidence was obtained to verify the existence of a separate calving segment of the Big Delta herd on the Tanana River in the vicinity of Healy Lake.

The 1963 production of calves appeared greater than in 1962; however, a smaller segment of the herd was observed. The percentage of calves observed in the herd averaged 19 per cent in June and July, considerably higher than the 12 per cent observed in 1962.

Twenty male bison were harvested during the October 5-10 permit hunt of the Big Delta herd. Seventeen bison were examined for disease and parasites.

No work was performed on the Copper River herd.

RECOMMENDATIONS

An annual permit hunt should be continued and the number of animals harvested should be adjusted within the annual production.

Applicants for permits to hunt bison should be required to be 10 or more years of age.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 2 TITLE: Bison Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

OBJECTIVES

To determine annual population structure and production and implement management of the Big Delta and Copper River bison herds.

TECHNIQUES

Aerial surveys were made in June and July to determine the annual production and herd composition of the Big Delta herd.

A permit hunt was conducted in October, during which twenty bison were harvested from the Big Delta herd. Specimens, to be used to determine reproductive performance, were collected and most bison were examined to establish the incidence of parasitism and to determine their general health.

No work was performed on the Copper River herd.

FINDINGS

Calf Production

Thirty-five calves and 142 adults were observed on June 5 during a flight along the Delta River. Adverse weather conditions were encountered which possibly affected the results of the survey. Another survey was scheduled for July.

During the second flight on July 25, 126 adults and 26 calves were seen. The percentage of calves observed was 20 per cent on June 5 and 17 per cent on July 25. The surveys for 1961, 1962, and 1963 are compared in Table 1. The limited evidence indicates that 1963 production was higher than the low recorded in 1962.

Movements and Distribution

The movements of the Big Delta herd were similar to the movements observed since 1959.

Movements to the calving area on the Delta River and down the river to breeding grounds occurred at almost identically the same dates as in 1962.

There were no reports or observations of bison wintering in areas where they have not been previously observed.

On May 23, Howard Metsker, fisheries biologist, observed approximately 35 to 40 bison on a bar in the Tanana River below Healy Lake. He reported sighting newborn calves but was unable to determine the number. Several previous reports have been received of a separate calving segment in the Healy Lake area. It is unlikely that this group of bison was included in the June 5 survey and it probably constitutes a separate calving segment of the Big Delta herd.

Harvest

A permit hunt for 20 aged animals was approved for the Big Delta herd. Twenty persons were selected to hunt bison and five persons were selected as alternates from the 2,010 applications approved for the lottery. Sixty applications were disqualified: 43 were received late, 8 were duplicates, 6 had incomplete information and 3 were disqualified for miscellaneous reasons. Prior to the closing date many applications were returned to the applicant because the information required on the application was not completed. Applications were available at all offices of the Alaska Department of Fish and Game by July 15, and August 31 was the last day applications were accepted.

Twenty applications were received from children less than 10 years of age, and a 9 year old was drawn to participate in the hunt. It is doubtful if children less than 10 years of age are capable of properly handling a high power rifle suitable for killing bison, and a minimum age for applicants should be

Table 1. Initial calf production in the Big Delta bison herd in 1961, 1962, and 1963.

Date	Total No. Bison Observed	No. of Adults	No. of Calves	% Calves in Total Observed	% Calves in Total Estimated Herd
5/27/61	268	216	52	19	15
6/26/62	258	227	31	12	8.4
6/ 5/63*	177	142	35	20	--

* The June 5 survey is considered to be more comparable with the 1961 and 1962 surveys than is the July 25, 1963 survey.

established for future hunts.

The 45-day period of accepting applications was satisfactory; however, the period should not be shortened. The 34-day period from August 31 to October 5 was sufficient to allow for filing the applications, organizing the lottery and contacting the persons selected. The lottery was conducted on September 11.

The organization of the hunt was similar to the 1961 bison hunt. Five persons would be eligible to hunt each day commencing with the October 5 opening day. Each hunter was accompanied by a Department of Fish and Game employee to assure that only aged bison were taken.

The hunt progressed very well. Most hunters reported on the day they were eligible and killed their bison the same day. The last bison was taken on October 10 and only one alternate was used.

All bison taken were males and no bison were crippled and not recovered. Testes were recovered from all animals and seventeen animals were examined for disease and parasites. Disease and parasite information is reported in Parasite and Disease Investigation, W-6-R-5, Work Plan D-6, Volume V.

SUBMITTED BY:

Loren W. Croxton
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 4 TITLE: Radiation Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

ABSTRACT

The systematic collection of bone, muscle and rumen content samples from two- or three-year old caribou from the Arctic, Nelchina and Alaska Peninsula herds began during December 1963. Five animals from each herd will be taken four times each year (April, July, September, and December). The different times and areas coincide with seasonal and regional differences in diet. Analytic data are not yet available from the first series of collections.

RECOMMENDATIONS

The study should be continued through two full yearly series of collections. If atmospheric testing is not resumed there will probably be little reason for continuing the project at the present level. In this event sampling could be restricted to the Nelchina herd which is the most heavily utilized and easiest to sample.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 4 TITLE: Radiation Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

OBJECTIVES

To determine the levels of strontium-90 and cesium-137 in caribou and in vegetation on caribou ranges in Alaska.

To periodically evaluate and summarize available data and compile up-to-date reports on the problem of concentrations of radioelements in the caribou-lichen-human food chain in Alaska.

TECHNIQUES

Samples of bone, muscle tissue, and rumen contents will be taken from five animals from each of three different areas (Arctic, Nelchina and Alaska Peninsula) during April, July, September and December. The collection periods and areas were chosen to correspond with seasonal dietary changes and regional differences in diet. Only two- or three-year-old animals will be included in the sample. The specimens will be forwarded to the Southwestern Radiological Health Laboratory, U. S. Public Health Service, Las Vegas, for radiological assay of strontium-90 and cesium-137 content.

FINDINGS

Collecting of specimens was initiated in December. Because caribou were very scarce in the vicinity of Anaktuvuk Pass at that time, only three animals were collected from the Arctic herd. Collections from the Nelchina and Alaska Peninsula herds were accomplished as scheduled. The specimens have been sent to the laboratory for radiological assay, but the results are not yet available.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 5 TITLE: Insecticide Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

ABSTRACT

During June 1963, the U. S. Forest Service sprayed a segment of Prince of Wales Island with 1/4 pound DDT (dichloro-diphenyl-trichloro-ethane) per acre to determine its effectiveness in controlling the black-headed budworm (Acleris variana). The Alaska Department of Fish and Game initiated studies on Cabin Creek drainage to observe influence of the spraying on bird and mammal populations. Collections of preferred deer food species, Vaccinium ovalifolium (blue huckleberry) and Cornus canadensis (ground dogwood), were made before and after spraying and analyzed for DDT residue. All samples taken 30 days after spraying showed some DDT, ranging from a low of 0.38 ppm (parts per million) to a high of 39.3 ppm. The average amount of DDT for 30 V. ovalifolium samples was 6.31 ppm and for 30 samples of C. canadensis, 4.97 ppm. DDT content was consistently higher from collections on south slopes than north slopes. Highest values were from samples taken between 300 and 600 feet elevation.

Mice were more abundant after than before the spray application. No difference was noted in bird populations.

Tissue samples were obtained from Sitka black-tailed deer, mink, short-billed gulls and eagles to determine DDT residue but analysis has not been completed at this time.

RECOMMENDATIONS

At least five additional deer tissue samples should be obtained from the spray area in March 1964, and analyzed for

DDT content. These animals will have been feeding on contaminated vegetation for the maximum length of time deer will normally be exposed. After March, new growth will become available and most deer move to higher ranges.

The remaining bird and mammal tissue samples should be analyzed.

A recommendation should be submitted to the U. S. Forest Service regarding future use of 1/4 pound per acre DDT applications on forests in Southeast Alaska.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 5 TITLE: Insecticide Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

OBJECTIVES

To determine the influence of 1/4 pound DDT (dichloro-diphenyl-trichloro-ethane) per acre as used in aerial sprays to control black-headed budworm (Acleris variana) on birds and mammals in Southeast Alaska.

TECHNIQUES

In June 1963, the U. S. Forest Service, Region 10, conducted a pilot project to determine the effectiveness of a 1/4 pound DDT per acre spray application for controlling black-headed budworm populations. Spraying was done on June 21 from a PBY aircraft flying approximately 500 feet above the ground. The U. S. Fish and Wildlife Service and the Alaska Department of Fish and Game were invited to initiate studies to determine the effects of this spraying on fish and wildlife populations.

The spray site was in the vicinity of Skowl Arm on the east side of Prince of Wales Island, Southeast Alaska, about 35 miles northwest of Ketchikan. Three drainages were sprayed; however, all bird and mammal investigations were confined to Cabin Creek drainage.

Neither funds nor time allowed for extensive investigations of all species which might be influenced. Therefore, efforts were concentrated on the Sitka black-tailed deer, the most abundant big game species in Southeast Alaska, which is usually present in forests where subsequent spray programs may be undertaken.

Vegetation, bird and mammal collections were made immediately prior to spraying (June 12-19) and on two occasions after spraying (July 17-23 and December 5-7). Figure 1 shows the location of the study area and the collecting sites.

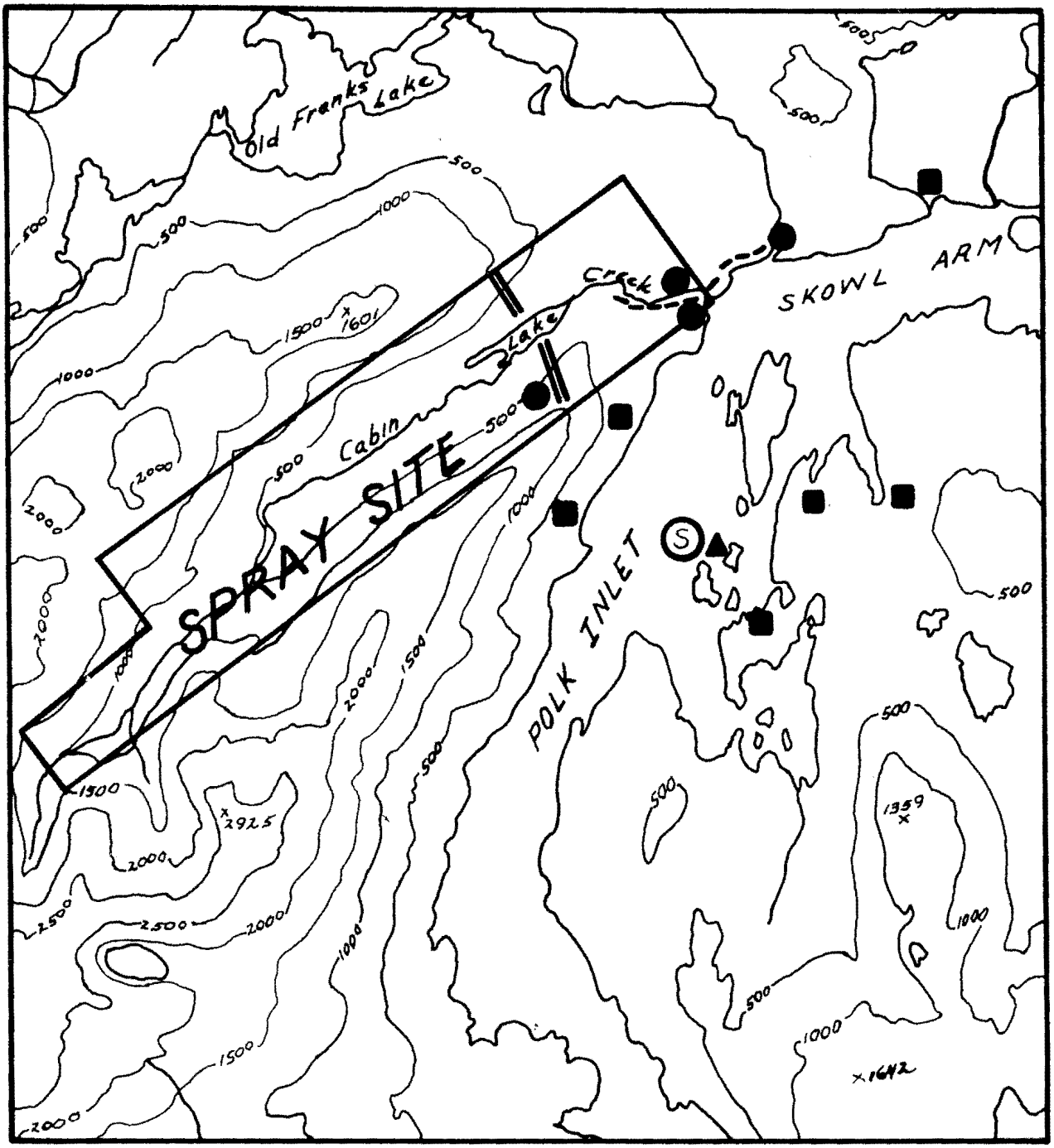
Samples were taken of preferred deer food species Vaccinium ovalifolium and Cornus canadensis on both sides of the drainage above Cabin Lake. During the collections made in June and July, two samples of each plant species were taken at each 100 foot contour interval, beginning at the lake level (200 feet above sea level) and continuing to 900 feet; however, only one sample of each species was taken at 900 feet. In December only one sample of each species was taken at each elevation level, and in three cases, snow cover made it impossible to obtain a C. canadensis sample. In the three collections, 76 V. ovalifolium and 73 C. canadensis samples were obtained for analysis.

Vegetation samples weighed about one pound each. Only that portion of the plant which deer normally utilize was taken. Samples were air-dried and sent to the Wisconsin Alumni Research Foundation, Madison, Wisconsin, where they were analyzed for residual DDT content.

Snap traps were placed along the beach and in the forests to determine small mammal abundance and deer, mink, sea gulls, and bald eagles were collected for tissue analysis. One pound samples were taken of both muscle (rump) and adipose (brisket and kidney) tissues from each deer collected. The entire carcasses of mink, sea gulls and eagles were retained. All tissue samples were frozen on the same day they were obtained.

FINDINGS

The Wisconsin Alumni Research Foundation assay reports of the vegetation samples are included in Appendix A. Figures 2 and 3 give a comparison of DDT residues for both plant species at each elevation level for the three collections. The 60 pre-spray samples (30 each of C. canadensis and V. ovalifolium) all contained less than 0.05 ppm DDT. Analysis showed nearly all to contain traces of DDT or DDE, but most showed such a small peak that it was almost immeasurable. The July sample (taken 30 days after spraying) ranged from a low of 0.38 ppm DDT to a high of 39.3 ppm. V. ovalifolium samples averaged slightly higher concentrations of DDT on both sides of the drainage than C. canadensis. The average DDT content of plants from the south



Key to collections:

Vegetation
Small Mammal Traps
Deer
Mink
Eagle
Seagulls

Figure 1. Location of Cabin Creek spray site, Prince of Wales Island, showing the positions where vegetation, bird and mammal collections were made.

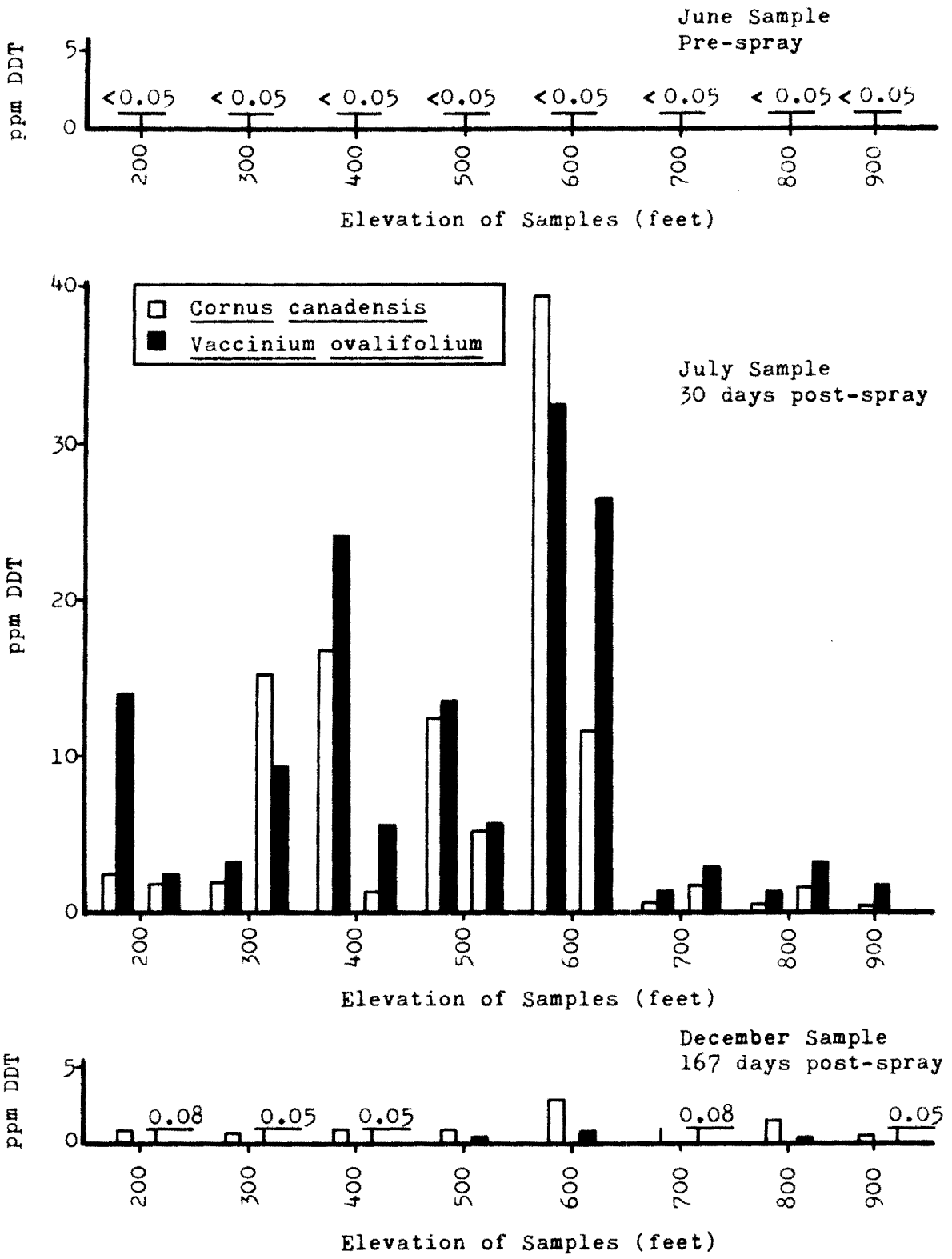


Figure 2. Residual DDT (ppm) in Vaccinium ovalifolium and Cornus canadensis samples from the south side of Cabin Creek drainage. Area sprayed with 1/4 pound DDT per acre on June 21, 1963. Two samples of each species were taken at each elevation in the June and July collections, but only one sample in the December collection.

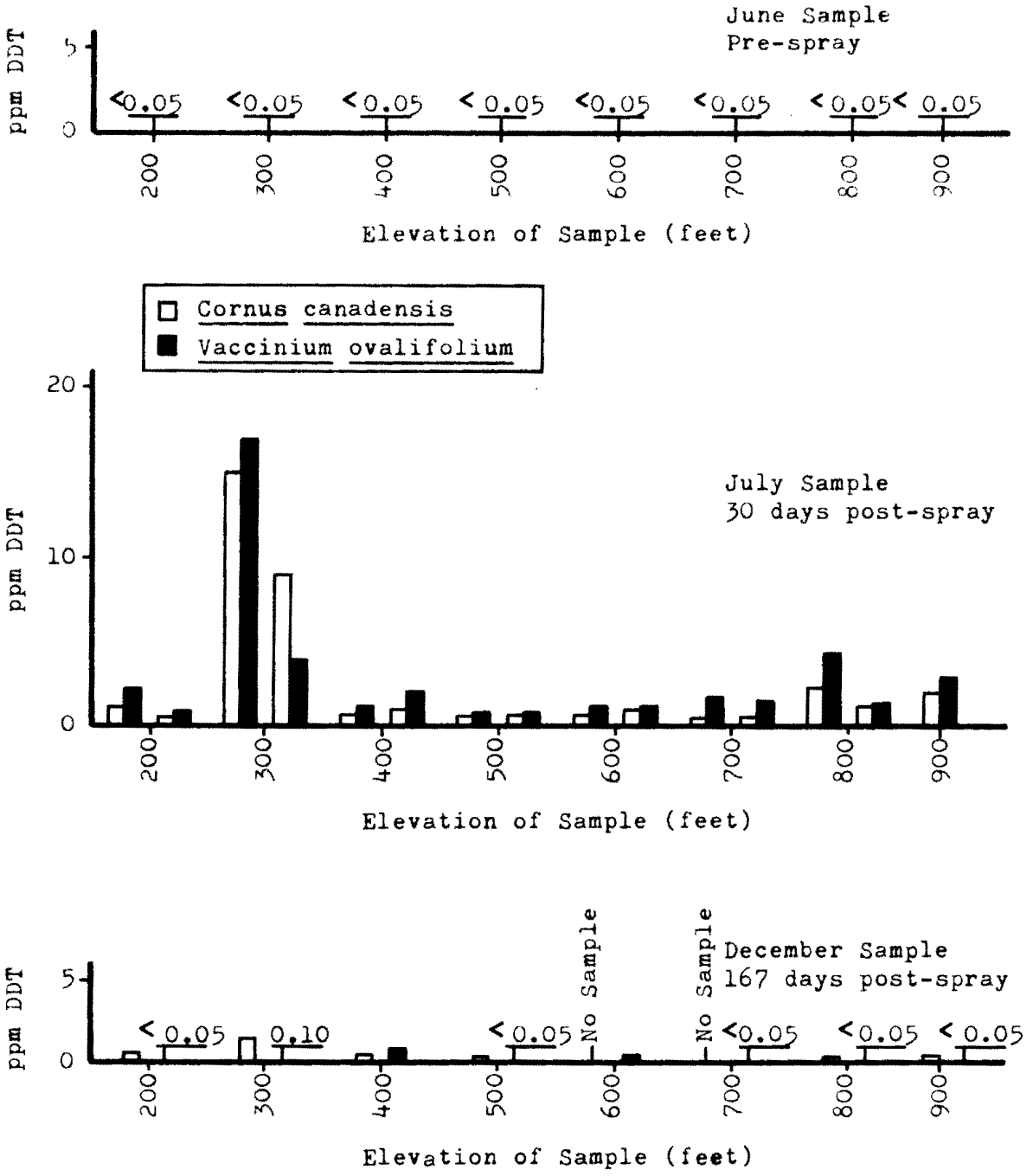


Figure 3. Residual DDT (ppm) in Vaccinium ovalifolium and Cornus canadensis samples from the north side of Cabin Creek drainage. Area sprayed with 1/4 pound DDT per acre on June 21, 1963. Two samples of each species were taken at each elevation in the June and July collections, but only one sample in the December collection.

side of the drainage was 7.55 ppm for C. canadensis and 9.75 ppm for V. ovalifolium. On the north slopes, the average for C. canadensis was 2.45 ppm and for V. ovalifolium, 2.86. Concentrations were greatest between 300 and 600 feet elevation.

In the December samples, taken 167 days after spraying, DDT residue in both plant species was either very small or absent. The highest value was 2.8 ppm and only two samples (of 29 collected) contained more than 1.0 ppm DDT. Even though relatively large amounts of DDT were present in the vegetation samples collected one month after spraying, most of it was gone within five months. Additional tissue samples from deer taken in late March (after deer have completed their seasonal use of the winter range) should show the amounts of DDT which can be expected to accumulate in Southeast Alaskan deer after a single application of 1/4 pound DDT per acre.

Appendix B gives the collection data for vegetation, birds and mammals. Animal tissue analyses have not been completed.

There was no indication of any bird or mammal mortality from the spray. No carcasses were located during either of the post-spray investigations. Small mammals were more abundant in the July than in the June collection. In pre-spray collections, 47 mice and shrews were taken in 289 trap nights or 0.16 per trap night, while in July, 73 were taken in 121 trap nights giving an average of 0.60 per trap night.

The short-billed (mew) gull and the northwestern crow were the most abundant resident birds in the vicinity of the spray site. No systematic counts were made, but both birds were at least as abundant after as before spraying. Ten gulls were collected for tissue analysis, five before and five after the spraying.

SUBMITTED BY:

Ken Neiland
Game Biologist

Harry Merriam
Game Biologist

State of Alaska
Department of Fish and Game

Wisconsin Alumni Research Foundation • **Madison, Wisconsin**

WARF Number	Sample Number	ppm DDT		WARF Number	Sample Number	ppm DDT	
3091077	** C-1-N-200-2	1.2		3091101	C-10-S-700-2	1.7	
3091078	C-2-N-300-2	15.0		3091102	C-11-S-600-2	11.7	
3091079	C-3-N-400-2	0.73		3091103	C-12-S-500-2	5.1	7/21/63
3091080	C-4-N-500-2	0.50		3091104	C-13-S-400-2	1.2	
3091081	C-5-N-600-2	0.65		3091105	C-14-S-300-2	15.2	
3091082	C-6-N-700-2	0.52		3091106	C-15-S-200-2	1.7	
3091083	C-7-N-800-2	2.2		3091107	C-1-N-200-1	<0.05	
3091084	C-8-N-900-2	2.0	7/22/63	3091108	C-2-N-300-1	<0.05	
3091085	C-9-N-800-2	1.2		3091109	C-3-N-400-1	<0.05	
3091086	C-10-N-700-2	0.65		3091110	C-4-N-500-1	<0.05	
3091087	C-11-N-600-2	1.0		3091111	C-5-N-600-1	<0.05	
3091088	C-12-N-500-2	0.73		3091112	C-6-N-700-1	<0.05	
3091089	C-13-N-400-2	1.0		3091113	C-7-N-800-1	<0.05	6/15/63
3091090	C-14-N-300-2	8.9		3091114	C-8-N-900-1	<0.05	
3091091	C-15-N-200-2	0.52		3091115	C-9-N-800-1	<0.05	
3091092	C-1-S-200-2	2.5		3091116	C-10-N-700-1	<0.05	
3091093	C-2-S-300-2	1.9		3091117	C-11-N-600-1	<0.05	
3091094	C-3-S-400-2	16.7		3091118	C-12-N-500-1	<0.05	
3091095	C-4-S-500-2	12.4		3091119	C-13-N-400-1	<0.05	
3091096	C-5-S-600-2	39.3	7/21/63	3091120	C-14-N-300-1	<0.05	
3091097	C-6-S-700-2	0.62		3091121	C-15-N-200-1	<0.05	
3091098	C-7-S-800-2	0.43		3091122	C-1-S-200-1	<0.05	
3091099	C-8-S-900-2	0.38		3091123	C-2-S-300-1	<0.05	6/13/63
3091100	C-9-S-800-2	1.6		3091124	C-3-S-400-1	<0.05	

** C(Cornus canadensis) - 1 (Sample No.) - N (North Slope) - 200 (Elevation) - 2 (July Collection)

APPENDIX A

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES

Madison, Wisconsin

Reports are submitted to clients on a confidential basis. No reference to the work, the results or to the Foundation in any form of advertising, news release or other public announcement may be made without written authorization from the Foundation.

ASSAY REPORT

Analysis for	DDT
Description of Sample	Vegetation Samples
Date Received 9-26-63 and 9-27-63	**Control Number**
Manufacturer	State of Alaska, Dept. of Fish and Game
Manufacturer's Address	Petersburg, Alaska
Submitted by	Harry R. Merriam
Claimed Content	
Results	See attached protocols

Method Analyst 86, 697 (1961)(with modifications)

Remarks

Signed [signature]

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date December 31, 1963

W. A. R. F. No. 3091077 through 3091166
3091192 through 3091221

State of Alaska
Department of Fish and Game

Wisconsin Alumni Research Foundation • **Madison, Wisconsin**

W. A. R. F. Number	Sample number	ppm DDT		W. A. R. F. Number	Sample Number	ppm DDT	
3091125	C-4-S-500-1	<0.05		3091149	V-13-N-400-1	<0.05	
3091126	C-5-S-600-1	<0.05		3091150	V-14-N-300-1	<0.05	6/15/63
3091127	C-6-S-700-1	<0.05		3091151	V-15-N-200-1	<0.05	
3091128	C-7-S-800-1	<0.05		3091152	V-1-S-200-1	<0.05	
3091129	C-8-S-900-1	<0.05		3091153	V-2-S-300-1	<0.05	
3091130	C-9-S-800-1	<0.05		3091154	V-3-S-400-1	<0.05	
3091131	C-10-S-700-1	<0.05	6/13/63	3091155	V-4-S-500-1	<0.05	
3091132	C-11-S-600-1	<0.05		3091156	V-5-S-600-1	<0.05	
3091133	C-12-S-500-1	<0.05		3091157	V-6-S-700-1	<0.05	
3091134	C-13-S-400-1	<0.05		3091158	V-7-S-800-1	<0.05	6/13/63
3091135	C-14-S-300-1	<0.05		3091159	V-8-S-900-1	<0.05	
3091136	C-15-S-200-1	<0.05		3091160	V-9-S-800-1	<0.05	
3091137	V-1-N-200-1	<0.05		3091161	V-10-S-700-1	<0.05	
3091138	V-2-N-300-1	<0.05		3091162	V-11-S-600-1	<0.05	
3091139	V-3-N-400-1	<0.05		3091163	V-12-S-500-1	<0.05	
3091140	V-4-N-500-1	<0.05		3091164	V-13-S-400-1	<0.05	
3091141	V-5-N-600-1	<0.05		3091165	V-14-S-300-1	<0.05	
3091142	V-6-N-700-1	<0.05	6/15/63	3091166	V-15-S-200-1	<0.05	
3091143	V-7-N-800-1	<0.05		3091192	V-1-N-200-2	2.2	
3091144	V-8-N-900-1	<0.05		3091193	V-2-N-300-2	17.0	
3091145	V-9-N-800-1	<0.05		3091194	V-3-N-400-2	1.1	7/22/63
3091146	V-10-N-700-1	<0.05		3091195	V-4-N-500-2	0.80	
3091147	V-11-N-600-1	<0.05		3091196	V-5-N-600-2	1.1	
3091148	V-12-N-500-1	<0.05		3091197	V-6-N-700-2	1.8	

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W. A. R. F. Number	Sample No.	ppm DDT	
3091198	V-7-N-800-2	4.3	
3091199	V-8-N-900-2	2.9	
3091200	V-9-N-800-2	1.4	
3091201	V-10-N-700-2	1.5	
3091202	V-11-N-600-2	1.2	7/22/63
3091203	V-12-N-500-2	0.77	
3091204	V-13-N-400-2	2.1	
3091205	V-14-N-300-2	3.9	
3091206	V-15-N-200-2	0.96	
3091207	V-1-S-200-2	14.0	
3091208	V-2-S-300-2	3.1	
3091209	V-3-S-400-2	24.0	
3091210	V-4-S-500-2	13.5	
3091211	V-5-S-600-2	32.3	
3091212	V-6-S-700-2	1.2	
3091213	V-7-S-800-2	1.2	
3091214	V-8-S-900-2	1.6	
3091215	V-9-S-800-2	3.1	7/21/63
3091216	V-10-S-700-2	2.9	
3091217	V-11-S-600-2	26.5	
3091218	V-12-S-500-2	5.6	
3091219	V-13-S-400-2	5.5	
3091220	V-14-S-300-2	9.3	
3091221	V-15-S-200-2	2.4	

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES

Madison, Wisconsin

ASSAY REPORT

Analysis for DDT

Description of Sample Vegetation

Date Received 1-28-64 Control Number

Manufacturer

Manufacturer's Address

Submitted by Paul Garceau, State of Alaska, Dept. of Fish and Game, Petersburg, Alaska

Claimed Content

Results See attached protocol

Jack C. Didrickson
ALASKA DEPT. OF FISH & GAME
National Airport Road

Method Analyst 86, 697 (1961)(with modifications)

Remarks

Signed

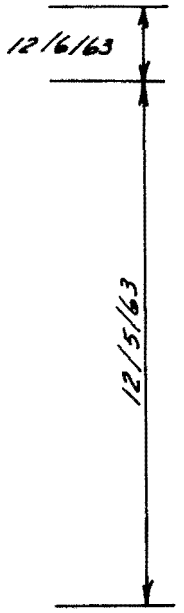
by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date February 26, 1964

W. A. R. F. No. 4011243 through 4011271

W. A. R. F. Number	Sample Number	DDT ppm	
4011243	V-1-N-200-3	Less than 0.05	
4011244	V-2-N-300-3	0.10	
4011245	V-3-N-400-3	0.85	
4011246	V-4-N-500-3	Less than 0.05	
4011247	V-5-N-600-3	0.38	
4011248	V-6-N-700-3	Less than 0.05	
4011249	V-7-N-800-3	Less than 0.05	
4011250	V-8-N-900-3	Less than 0.05	12/6/63
4011251	C-1-S-200-3	0.91	
4011252	C-2-S-300-3	0.79	
4011253	C-3-S-400-3	0.95	
4011254	C-4-S-500-3	0.97	
4011255	C-5-S-600-3	2.8	
4011256	C-7-S-800-3	1.5	
4011257	C-8-S-900-3	0.45	12/5/63
4011258	C-1-N-200-3	0.56	
4011259	C-2-N-300-3	1.3	
4011260	C-3-N-400-3	0.45	
4011261	C-4-N-500-3	0.17	
4011262	C-7-N-800-3	0.19	12/6/63

W. A. R. F. Number	Sample Number	DDT ppm
4011263	C-8-N-900-3	0. 25
4011264	V-1-S-200-3	0. 08
4011265	V-2-S-300-3	0. 05
4011266	V-3-S-400-3	0. 05
4011267	V-4-S-500-3	0. 26
4011268	V-5-S-600-3	0. 85
4011269	V-6-S-700-3	0. 08
4011270	V-7-S-800-3	0. 29
4011271	V-8-S-900-3	0. 05



APPENDIX B

Specimen Collection Data - Cabin Creek Spray Site

Vegetation

Date	Slope	Number of Samples	
		Cornus	Vaccinium
6/13/63	south	15	15
6/15/63	north	15	15
7/21/63	south	15	15
7/22/63	north	15	15
12/ 5/63	south	7	8
12/ 6/63	north	6	8

Sitka Black-Tailed Deer

Date	Sex	Age
6/14/63	F	2+
7/18/63	F	1+
7/22/63	F	3+
12/ 6/63	M	3+

Mink

Date	Sex
6/18/63	F
6/18/63	M
7/21/63	M
7/22/63	M
7/23/63	M
7/23/63	F

APPENDIX B - continued

Small Mammals - Pre-spray

Date	Number of Traps	Genus			Total Catch
		Microtus	Peromyscus	Sorex	
6/14/63	75	1	9	9	19
6/15/63	70	0	4	5	9
6/16/63	71	2	6	3	11
6/17/63	73	1	4	3	8
Totals	289	4	23	20	47
Ave. per trap night		0.01	0.08	0.07	0.16

Small Mammals - Post-spray

Date	Number of Traps	Genus			Total Catch
		Microtus	Peromyscus	Sorex	
7/20/63	33	2	15	3	20
7/21/63	30	0	12	4	16
7/22/63	27	1	18	3	22
7/23/63	31	0	14	1	15
Totals	121	3	59	11	73
Ave. per trap night		0.02	0.49	0.09	0.60

Birds

Date	Species	Number
6/17/63	Short billed Gull	5
6/18/63	Bald Eagle	1
7/23/63	Short billed Gull	5

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 6 TITLE: Disease Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

ABSTRACT

One hundred and seventy-one mammals, birds and fish were examined for parasites and disease organisms. All of 52 lynx and 26 of 27 sea otter were parasitized. The intensities of some of the infections and the parasites involved both suggested significant pathology or possible impairment of nutrition during periods when prey species were scarce. A rabbit taken by a hunter in the Palmer area had a well developed case of verminous pneumonia involving a species of lungworm (probably Protostrongylus sp. [?] and Corynebacterium renale).

Moose appeared to be more commonly infected with a species of tapeworm of the genus Moniezia than in past years. A road-killed cow moose in very poor condition was observed to be suffering a hemolytic-streptococcal pneumonia.

Bison taken during a limited hunt in October were observed to have noticeably fewer lungworms and to have eaten markedly less garbage than in 1961. None of nineteen animals was serologically positive for brucellosis or leptospirosis.

RECOMMENDATIONS

Miscellaneous vertebrates should continue to receive attention as time allows. Rabbits, furbearing rodents and carnivores (particularly sea otter) and other animals important economically or as reservoirs of diseases of humans or wildlife should be surveyed whenever such work will not interfere with more important projects.

Field work on the parasites and diseases of moose has reached a point where it is possible to isolate specific problems which

should be studied in greater detail. These include Paramphistomiasis, Nematodirelliasis and brucellosis in animals using caribou range.

We should continue in the future to examine and do blood tests on all bison taken during the hunts or that otherwise become available.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: D TITLE: Statewide Data Collections

JOB NO.: 6 TITLE: Disease Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963

OBJECTIVES

To determine the incidence and distribution of potential pathogens in Alaskan wildlife species, and alternate host species.

To determine the extent that such organisms may contribute to mortality or lowered productivity or economic value in the host species.

To determine the extent that pathogens depreciate the value of game animals for use as food by humans.

TECHNIQUES

Field collections of host species are conducted largely in conjunction with other investigations. Members of all divisions of the Department, as well as the public and other State or Federal organizations, have been requested to send in suspected pathological specimens or in certain instances to obtain material of special interest. Such material is handled in our laboratory, or in some cases referred to other specialists for diagnosis. Special attention is given to material which offers the possibility of contributing information of greatest originality or immediate application to problems at hand. In each instance an effort is made to correlate data on pathogens with all other variables.

FINDINGS

A. Miscellaneous vertebrates

The incidence of potential pathogens in 131 miscellaneous

vertebrates is summarized in Table 1. Observations of special interest are briefly considered below.

1. Lynx canadensis

At the present time the lynx and its primary prey species, the snowshoe hare, are both at or near population highs. The hare is an intermediate host for taeniid cestodes which mature in lynx and only three of the 52 lynx examined were free of tapeworms. Twenty-two infections exceeded 20 tapes per animal and many of these included from 45 to 80 worms. In addition to cestodes, up to 105 ascarid roundworms per animal were observed in 49 of the lynx. No doubt the relatively severe parasitisms observed will contribute to the eventual decline of the predator population by aggravating nutritional problems as the principal prey species becomes scarcer.

2. Lepus americanus dalli

Occasionally hunters bring in hare carcasses which appear abnormal to them. Most often these have large taeniid tapeworm cysts between the muscles of the hind legs, or, in heavy infections, the front legs or back. However, recently a set of lungs was brought in that showed symptoms similar to those associated with tularemia. The specimen was referred to the bacteriologist at the Arctic Health Research Center who diagnosed verminous pneumonia involving primary invasion by a lungworm (probably a species of Protostrongylus) and secondary infection by Corynebacterium renale. Since the animal was acting normally when taken by the hunter one can only speculate regarding the outcome of the infection. However, if verminous pneumonia in hares is comparable to that in sheep, the disease might well be a significant factor contributing to declines of hare populations.

3. Enhydra lutris

Sea otters are only rarely parasite free. Examination of 27 stomachs collected for food habit studies revealed only one free of anisakid roundworms. As many as 242 worms were recovered from a single stomach. Many of these were larval stages which are known among various anisakid species to cause severe visceral larval migrans when they wander out of the hosts alimentary tract. Various species of fish serve as intermediate host to anisakids before they gain entry into fish-eating fish, birds, or mammals. The commonness of anisakids in Aleutian Sea Otter suggests a diet in which fish are regularly included. It is very likely that these parasites significantly contribute to

natural mortality of otters wherever they eat considerable quantities of fish.

Table 1. The occurrence of pathogens in miscellaneous Alaskan vertebrates.

Species	Incidence of pathogens*		
	Number Examined	Positive	Negative
Mammals:			
Canis latrans	1	1	-
Citellus sp.	8	1	7
Enhydra lutris	27	26	1
Erethizon dorsatum	2	2	-
Lepus americanus dalli	3	3	-
Lynx canadensis	52	52	-
Mustela erminea	1	-	1
Ochotona collaris	6	6	-
Odocoileus hemionus Sitkensis	1	1	-
Sorex sp.	1	1	-
Tamiasciurus hudsonicas	4	1	3
Ursus arctos	2	2	-
Birds:			
Anas creca carolinensis	1	1	-
Asio glammeus	1	1	-
Lagopus lagopus	3	3	-
Mareca americana	5	4	1
Fish:			
Catostomas sp.	1	1	-
Coregonus pidschian	12	2	10
Total	131	108	23

*Includes primarily helminths, but also other parasites or disease organisms.

)le 2. Incidence of helminths in moose and bison examined during 1963.

Species	Locality	Hydatid	Cysticerci	Moniezia	Lungworm	Rumen Fluke	Gastro-Intest. Nematodes
Moose	Denali Hwy.	2/15	3/9	7/14	1/14	1/12	8/17
Moose	Tanana Flats	1/4	-	2/4	1/4	3/4	-
Bison	Big Delta	0/15	0/15	0/15	2/15	0/15	0/15

B. Moose

A limited number of hunter-killed moose were available for examination last fall along the Denali Highway. In sharp contrast with earlier observations, the incidence of a species of tapeworm, (Moniezia sp.) was much higher (50% vs. 3%) than has been previously recorded. Too few animals were examined to determine whether host age significantly affects incidence of the parasite. However, most of the infected moose were adults unlike caribou in which only calves carry the parasite.

The incidence of rumen flukes in a few moose collected on the Tanana Flats is consistent with the gross ecology of this generally swampy area and the life cycle requirements of the parasite. In heavier infections it appears that erosion of the rumen lining may take place. However, it is likely that the most significant pathology associated with rumen fluke infections involves the mucosa of the upper small intestine and abomasum. In this instance, the infective stage of the parasite after hatching in the intestine from cysts on vegetation has been reported to burrow in the lining of the intestine and abomasum as it migrates to the rumen, its final position in the host. In order to make meaningful observations in this regard, it will be necessary to examine animals early in the summer soon after they are again exposed to infective vegetation following the thaw.

Relatively little is known regarding infectious diseases in Alaskan moose. Recently the lungs of a road-killed adult cow moose were observed to have hardened areas which closer examination revealed to be pneumonic abscesses. The specimen was referred to the Arctic Health Research Center for bacteriological culture and identification. A species of hemolytic Streptococcus was isolated, but definite identification of the

species has not yet been accomplished. It is of interest that the animal was in very poor condition lacking even intra-orbital fat.

C. Bison

During the limited bison hunt in October it was possible to examine 15 of the 20 kills and get blood samples from 19. The blood samples were tested by the Alaska Medical Laboratories for brucellosis and leptospirosis and all proved negative in both instances.

The data on helminths from these bison are summarized in Table 2. It was surprising that only two of fifteen animals had lungworms while in 1961 two-thirds of over forty animals were infected. The apparent absence of gastro-intestinal nematodes continues to be unexpected. Evidently the roundworm found in about 90% of the moose in the same area used by the bison is highly host-specific.

Of particular interest was the relative lack of garbage in the animals taken in 1963. Except for a large bull which had eaten about 10 plastic bread wrappers and a part of someone's clothes line including some lightweight socks, refuse was not observed to any degree. Prior to the first hunt in 1961, the herd spent considerable time feeding on refuse at the town garbage dump. As a consequence, most of the animals taken at that time carried a wide assortment of indigestible trash in their rumens. One animal had survived a .30 caliber gunshot wound in the paunch and was in excellent condition. That the wound had resulted in severe peritonitis was evidenced by the massive adhesions involving the rumen, diaphragm and liver. The bullet was found encapsulated on the outside surface of the rumen. A very old trophy bull had a small kidney stone but it did not appear that it was source of irritation. Another animal had survived a wound of some sort resulting in a large encapsulated abscess associated with the liver and kidney and an active fistula involving the intestine. The animal was a large bull and in good condition.

SUBMITTED BY:

Kenneth A. Neiland
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: G-a TITLE: Marine Mammal Studies

JOB NO.: 3 TITLE: Seal Biology and Harvest Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963.

ABSTRACT

Information obtained from bounty records indicates that the harvest of hair seals during the period August 1, 1962 to July 31, 1963, in the Second and Fourth Judicial Districts of Alaska was 19,169 animals. It is estimated that the harvest in this area during the present hunting year (ending July 31, 1964) will reach 25,000 animals. Increased demand and high prices being paid for seal skins are responsible for the increased hunting effort.

Prior to June 1963, ring seal skins were worth an average of $8.00 and spotted seals of corresponding size, $10.00. At present, the value of these skins is $20.00 and $25.00. Estimated value to the hunter of seals harvested (exclusive of the value of meat) has risen from less than $172,000.00 during the hunting year of August 1, 1961 to July 31, 1962 to an estimated $345,040.00 during the hunting year of August 1, 1962 to July 31, 1963. If the predicted harvest of 25,000 seals is realized, they will be worth an estimated $450,000.00. Values include the $3.00 per seal which is presently being paid as a bounty.

The seasonal distribution of the ringed seal, and the composition of the kill are such that hunting is not concentrated on any particular segment of the population, and should not result in over-exploitation.

Studies of the reproductive biology of the bearded and ribbon seals remained in the initial stages of specimen collection and examination.

RECOMMENDATIONS

The present regulations of no closed season and no limit should be continued.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: G-a TITLE: Marine Mammal Studies

JOB NO.: 3 TITLE: Seal Biology and Harvest Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963.

OBJECTIVES

To determine: the magnitude and characteristics of the harvest of various species of hair seals in northwestern Alaska; the factors affecting seasonal movements, abundance and distribution of the ringed seal (Pusa hispida), and the age and sex composition of the harvest in the Nome area. Also to obtain information on the reproductive physiology of the bearded seal (Erignathus barbatus), and the ribbon seal (Histriophoca fascita).

TECHNIQUES

The magnitude and distribution of the hair seal harvest in western and northwestern Alaska was determined through analysis of bounty reports. Harvest information from southern Alaska is not included in this report. Information concerning seasonal movements, abundance and distribution of the ringed seal was obtained through personal observation, bounty information, and hunter reports. The study of the life history of the bearded and ribbon seals is still in the initial stages of specimen collection and analysis. Specimens have been acquired from hunters at the villages of Gambell, Savoonga, King Island, Little Diomede Island and Nome. To date most of these specimens are from animals taken during April, May and June. It is hoped that some late fall and winter specimens can be acquired.

FINDINGS

The recorded harvest of hair seals from the coastal villages in Game Management Units 18, 22, 23 and 26 (the villages from Platinum in Kukokwim Bay, north to Barter Island), during the

period August 1, 1962 to July 31, 1963, was 19,169 animals (Table 1). Data for this time period are used as they represent the most suitable approximation of the seal hunting year. The most productive seal hunting in western Alaska occurs during the fall, spring and early summer months, and there is often a lag between the time when seals are taken, and the scalps are submitted for bounty. However, most scalps obtained during the spring and early summer are submitted by July 31.

Villages most strategically located with respect to migratory routes and favorable ice conditions traditionally produce the largest catches of seals. These villages include Point Hope, Kivalina, Kotzebue, Shishmaref, Teller, Nome and Hooper Bay.

As pointed out in the 1963 completion report (Burns, MS.) the demand for hair seal skins from Alaska started increasing during the fall of 1962. By the spring of 1963, average ringed seal pelts were worth $8.00 and spotted seals (Phoca vitulina) of corresponding size were worth $10.00. As of this writing (March 1964) values have more than doubled. At present, average ringed seal pelts are worth $20.00 and spotted seals of corresponding size and quality, $25.00.

The increase in demand for Alaskan hair seals is the result of several factors, the most important being the increasing demands of the European markets, in the face of a decreasing supply from the traditional hunting areas (the North Atlantic and Arctic Oceans). Seal skins procured in Alaska are sent to Europe (notably West Germany and Norway) for processing, marketing and garment manufacture. At present, the greatest retail market seems to be in the Scandinavian Countries. Seal skins are used in the manufacture of shoes, purses, coats, hats and other items of over-clothing.

In northwestern Alaska the most common seal is the ringed seal. For home and local use, skins of these seals were usually stretched and dried. Although some skins are still handled in this manner, most are now fleshed, salted and frozen. Marketing in the undried condition represents a considerable saving in time and effort on the part of hunters and their wives.

The increased demand for seals from western Alaska has resulted in a great increase in hunting effort, and in some instances a return to the productive methods of former years. At present, a few hunters are using nets for taking seals, a method that was almost totally displaced by the introduction of firearms. Under certain conditions, nets have been very productive.

Table 1. Harvest of Hair Seals in Western and Northern Alaska From August 1, 1962 to July 31, 1963

Village	No. of Seals Taken	Village	No. of Seals Taken
Barrow	412	Noatak	106
Buckland	94	Nome	1,019
Candle	30	Platinum	19
Chevak	555	Point Hope	2,752
Deering	188	Point Lay	148
Eek	26	Savoonga	685
Elim	179	Scammon Bay	300
Gambell	605	Shaktoolik	195
Golovin	88	Shishmaref	4,537
Goodnews Bay	126	St. Michael	64
Hooper Bay	869	Stebbins	307
King Island	24	Teller	1,046
Kivalina	998	Unalakleet	38
Kotzebue	1,465	Wainwright	573
Little Diomede	427	Wales	617
Mekoryuk	656	White Mountain	2
N. E. Cape	19		
TOTALS			19,169

Unfortunately, bounty information for the period August 1, 1962 to July 31, 1963 does not reflect current hunting pressure, because the high prices for skins, and the increased hunting effort they caused occurred subsequent to the latter date.

In the face of the present demand for seal skins, I feel that the harvest in western Alaska, for the seal hunting year extending from August 1, 1963 to July 31, 1964, will be about 25,000 skins.

Value of the Harvest

Estimates of the total value of the seal harvest in northwestern Alaska indicate only the amount of money that could have been realized from the sale of skins. No attempt is made to calculate the intangible but high value of meat, or the value of skins used in the villages for the manufacture of clothing, hunting equipment and other articles for which seals are used.

Seals, especially the ringed seal, are the mainstay of the economy of coastal Eskimos in this area. The primary objective of the hunt is to provide food for consumption by human and dogs. Sale of skins is, at present, of secondary importance even though it is an important source of income. Unlike the situation in southern Alaska, hunting seals solely for the skins and the bounty is done only after the requirements of a good food supply have been satisfied. The food requirements are seldom met as there is always someone in the villages that can use the meat.

On the basis of three dollars for each scalp, and an average value of $15.00 per skin, a conservative estimate of the potential cash value to the hunters, of the seal harvest during the hunting year indicated in Table 1, is $345,042. If the predicted harvest of 25,000 seals is realized during the current seal hunting year, the harvest will be worth an estimated $450,000, exclusive of the value of meat.

Characteristics of the Harvest

Since Alaska hair seals have recently become an important source of income, and the hunting pressure for them is increasing, it would probably be worthwhile to compare some conditions existing with respect to harvests from different areas.

Certain species of hair seals present in the North Atlantic and adjoining waters of the Arctic Ocean are hunted extensively for their skins. The harp seal (Pagophilus groenlandicus) and

the hooded seal (Cystophora cristata) have sustained the heaviest depredations by man. These seals are hunted with modern, well equipped vessels primarily during the breeding and moulting seasons when they occur in large herds. Annual catches have been as high as several hundred thousand animals. The tendency of forming large herds has been a factor responsible for the large annual harvests, and the subsequent decline in population levels.

Both of the above mentioned species breed on the ice and the pups are much sought after by the hunters. As a result, hunting is concentrated on the reproductively active females, and their off-spring.

Seasonal distribution of the ringed seal in northwestern Alaska is such that the present hunting pressure will not be detrimental to our stocks of this species. Hunting is restricted to areas along the coastline, and seals inhabitating the off-shore areas are safe from all hunters except those from St. Lawrence, King and Little Diomede Islands. Observations at St. Lawrence Island and Little Diomede Island indicate that the seals occupying off-shore areas are largely immature or non-reproducing.

The harvest during the fall and early winter is composed of all age groups. As the breeding season approaches, the pregnant females search out areas suitable for giving birth and raising their pups. Suitable areas exist where large stretches of land-fast ice occur. The pregnant females in the pupping areas are, for the most part, safe from hunters. Pups are born in dens (see McLaren, 1958) during mid-March and early April and are also relatively safe from hunters.

In the vicinity of Nome, most of the seals taken during late February, March and April are juveniles of both sexes, or rutting males apparently traveling in search of females.

Although we have no conclusive evidence it appears that the situation with respect to composition and spatial distribution of the harvest is good from the standpoint of population welfare.

Conclusions

In view of the abundance, distribution, and factors affecting the distribution, of hair seals in western and Arctic Alaska, the present regulations of no closed season and no limit should be continued.

LITERATURE CITED

Burns, J. J. Seals, magnitude and characteristics of harvest. Federal Aid Comp. Report, Alaska Department of Fish and Game. (MS)

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SUBMITTED BY:

John J. Burns
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: G-b TITLE: Marine Mammal Studies

JOB NOS.: 1, 2, 3

PERIOD COVERED: July 1, 1963 to December 31, 1963

ABSTRACT

Beluga Whales

Two whales - a 5 foot male and an 11 foot female - were collected by driving the animals into shallow water and harpooning them. Both animals were measured, the reproductive tracts collected and preserved and the stomachs examined for food habit information.

During a two hour flight over Cook Inlet in a Piper Supercub, 84 belugas were sighted, indicating that aerial surveys may be a feasible method of determining the abundance and distribution of belugas in Alaska.

Sea Lion

As part of a breeding biology and movement study, 799 Steller sea lion pups were tagged on Sugarloaf Island in the Gulf of Alaska. Marking was accomplished by driving the adults to the water, then attaching a cattle ear tag to the right front flipper of a pup which had been run down and captured by hand.

An aerial survey of southeastern Alaska made during July 1964, revealed the presence of 8,340 animals. The count is similar to those obtained during past years and indicates the population may be at its carrying capacity for the habitat.

Sea Otter

The reproductive tracts, stomachs and pelage specimens were taken from 20 sea otters collected on Amchitka Island during July 31 - August 3, 1963 and are now being analyzed.

RECOMMENDATIONS

No recommendations relating to management can be made at this time.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: G-b TITLE: Marine Mammal Studies

JOB NOS.: 1, 2, 3

PERIOD COVERED: July 1, 1963 to December 31, 1963

OBJECTIVES

To determine the abundance and distribution of beluga whales; assess the present harvest by natives; and gather additional information on breeding biology, age and food habits.

To classify the rookeries and hauling grounds of Steller sea lions and investigate their breeding biology and food habits.

To determine the abundance and distribution of sea otter in selected areas of the State and to gather information on the breeding biology, molt, and food habits of the animal.

TECHNIQUES

During August, field activities were conducted in Bristol Bay primarily to learn the habits of beluga whales, and to become familiar with collecting methods. Capture of the whales is accomplished by driving the animals into shallow water with the aid of a small outboard and skiff, then harpooning them with a hand thrown harpoon. The animal is then dispatched with a rifle bullet placed about a foot posterior to the blowhole.

On July 18, a reconnaissance flight was made over Cook Inlet to check the feasibility of measuring beluga abundance and distribution by aerial surveys. The flight was carried out in a Piper "150" Supercub Model PA-18 equipped with floats and flown at an airspeed of approximately 75 mph. Flight altitude was maintained at 400 feet above the water which was calm.

To aid in the investigation of the breeding biology and movements of sea lions, 799 pups were tagged on Sugarloaf Island in the Gulf of Alaska. Marking was accomplished by using cattle ear tags (Style 19 M of National Band and Tag Company, Newport, Kentucky) made of monel metal with dimensions before folding 0.036 x 3/8 x 6 1/2 inches. Tags were applied to the rear margins of the right fore flippers where furred skin ends and bare skin begins.

Aerial surveys were made in July to locate rookeries and gauge the abundance of sea lions in southeast Alaska.

Reproductive tracts, stomachs, and pelage specimens were obtained from 20 sea otters collected on Amchitka Island during July and August. By cooperative agreement these materials are being analyzed by a biologist of the U. S. Fish and Wildlife Service.

FINDINGS

This, the initial year of beluga whale, Steller sea lion and sea otter investigations, was in large measure devoted to familiarization with the animals and areas of work, and to the development of techniques and procedures of study. A significant portion of the study period was devoted to reviewing and compiling pertinent literature. The studies were collateral to management phases of marine mammals investigations during which three hundred sea otter pelts were fleshed and otherwise prepared for test marketing.

Beluga Whales

Breeding Biology and Food Habits

Although field work in Bristol Bay during the period August 15 - 25, was hampered by inclement weather, two belugas - a 5 foot male and an 11 foot female - were captured and processed. The stomach of the male was empty and that of the female contained one shrimp. Standard length, girth and flipper measurements were taken (1961 Jour. Mamm. 42 (4) 471-476) and the reproductive tracts examined.

During a two hour flight over Cook Inlet on July 18, eighty-three belugas were observed. Of the total, 16 were seen in the estuary of the Beluga River and 54 were observed in the estuary

of the Susitna. It was noted that the whales could be seen from a considerable distance and could be counted with little difficulty. On the basis of this one survey it appears that aerial observation is a feasible method of estimating beluga abundance and distribution. Relatively calm conditions are essential, however, to obtain counts and to provide some measure of safety in the event of aircraft failure.

Sea Lion

Breeding Biology

During the periods June 18 - 21, and July 9 - 10, 799 Steller sea lion pups were tagged on Sugarloaf Island located in the Gulf of Alaska. The rookery is one of the largest in Alaska with an estimated population between 14,000 and 15,000 adults and 9,000 to 10,000 pups.

The tagging operation was facile and did not require any special facilities or equipment. The adults and pups were first separated by driving the adult animals into the water. The pups were then run down, captured by hand, and held to the ground while a cattle ear tag was attached to the right front flipper. On occasion a bull or cow refused to move and had to be by-passed in order to get to the pups.

Although the tagging operation frequently resulted in the trampling and knocking around of pups when the adults scrambled for the water, induced pup mortality appeared to be low. An accurate dead pup count was not taken but it was estimated that the mortality did not exceed 100 animals in an area where more than 6,000 live pups occurred.

During the tagging operation the sex of pups was noted and a random sample of 895 animals revealed a sex ratio of 52.4 per cent males.

Recapture of some of the tagged animals in future years should provide invaluable data on their breeding biology as well as information on growth rates, mortality, and seasonal movements.

A tagging program is again planned for June 1964.

Abundance and Distribution

An aerial survey of southeastern Alaska from Dixon Entrance to Cross Sound was made during July and 8,340 animals were

counted. Table 1 gives the location and number of adult sea lions sighted.

Table 1. Numbers and location of adult Steller sea lions counted during an aerial survey of southeast Alaska during July 19 - 20, 1963.

Cape Cross	300	First Kekur	100
White Sisters	800	Hazy Islands	1,500
Sea Lions Island	12	Timbered Island	100
Jacobs Rock	8	Cape Addington	15
North Rock	4	Forrester Island	5,500
Total Number of Sea Lions	8,339		

The results of the survey are similar to those conducted in former years and suggest the population may be at its carrying capacity for the habitat.

Sea Otter

The investigation of the food habits, molt, and breeding biology of sea otters was first initiated in 1962, under Project No. W-6-R-3. Although the major objective of this project was the development of harvest and handling techniques for purposes of determining potential commercial values, stomachs, reproductive tracts and pelage specimens were also collected and preserved for future analysis. Three previous collections during which 477 animals were taken had been carried out between the months of October and April in an attempt to determine when the pelts were at their peak of primeness. Since no summer collections had been made it was deemed advisable to fill this gap in our information of the food habits, reproduction and molt of the animal.

Collections

A field trip was made to Amchitka Island during the period July 30 - August 8, and twenty animals were collected. Table 2 presents in tabular form the sex, age classes, weights, measurements and areas of collection. All reproductive tracts, stomach and pelage specimens were preserved for analysis. As a result of a cooperative agreement between the U. S. Fish and Wildlife Service and the State of Alaska, the Bureau of Sport Fisheries and Wildlife has the responsibility of analyzing all digestive and reproductive tracts of animals collected adjacent

ıble 2. The sex, age, weights, and measurements of sea otter collected on Amchitka Island in July and August 1963.

Date	Seal No.	Sex	Age	Weight in lbs.	Body Length in cms.	Pelt Length in cms.	Location of Collection
7/31/63	505	F	Ad	43	125	163	St. Markarius Pt.
8/ 1/63	506	F	Ad	43	120	170	Rifle Range
"	507	F	Ad	44	120	175	"
"	508	F	Ad	44	112	173	"
"	509	F	Ad	51	--	168	"
"	510	F	Ad	45	117	178	"
8/ 2/63	511	F	Ad	56	124	180	Kirilof Bay
"	512	F	Ad	35	112	163	"
"	513	F	Ad	64	122	183	"
"	514	F	Ad	45	122	178	"
"	515	F	Ad	51	122	180	"
"	516	M	Ad	55	130	185	"
"	517	F	Ad	52	120	175	"
"	518	F	Ad	48	122	173	"
"	519	F	Ad	49	124	183	"
"	520	F	Ad	53	122	178	"
8/ 3/63	521	F	Ad	46	124	170	Constantine Pt.
"	522	F	Ad	46	109	168	"
"	523	F	Ad	47	122	178	"
"	524	F	Ad	43	120	170	"

to the Aleutian Islands National Wildlife Refuge. Mr. Karl Kenyon of the Bureau of Sport Fisheries and Wildlife is now processing the data.

SUBMITTED BY:

John Vania
Game Biologist

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: J TITLE: Furbearer Studies

JOB NOS.: 1 and 3 TITLE: Beaver Management Studies

TITLE: Wolverine and Lynx Productivity and Breeding Biology Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963.

ABSTRACT

Beaver

The 1963 harvest of 19,691 beaver represents an increase of 4,432 pelts over the 1962 season. Mild weather and good prices for fur encouraged trapping, which accounts for most of the increase.

Wolverine and Lynx

There have been no significant accomplishments since the W-6-R-4 report. A considerable number of specimens await analysis.

RECOMMENDATIONS

Beaver

The beaver affidavit analysis project should be continued.

Wolverine and Lynx

No management recommendations.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: J TITLE: Furbearer Studies

JOB NOS.: 1 and 3 TITLE: Beaver Management Studies

TITLE: Wolverine and Lynx Productivity and Breeding Biology Studies

PERIOD COVERED: July 1, 1963 to December 31, 1963.

OBJECTIVES

Beaver

To estimate beaver population levels, trends, and rates of exploitation.

Wolverine and Lynx

To determine factors relating to the breeding and productivity of these species.

TECHNIQUES

Beaver

Analysis of beaver sealing certificates provided data on the number, distribution, and other aspects of the 1963 harvest. All beaver taken in Alaska must be sealed and trappers are required to attest to the number of beaver taken, the dates of taking, and other information at the time the sealing certificates are completed.

Live trapping and tagging of beaver was attempted on selected tributaries of the Kuskokwim River.

FINDINGS

Beaver

The 19,691 beaver harvested during the 1963 season represented an increase of 4,432 over the 1962 season, but were well below the six year average (1957-1962) of 21,582. The increased catch is in direct proportion to an increased effort. Approximately 500 more trappers participated in the 1963 season than trapped in 1962. The increased effort may have been influenced by the better market prospects and the mild winter.

Harvest statistics for all Game Management Units are presented in Table 1. The results of efforts to establish a beaver live trapping and tagging program in the Kuskokwim drainage where beaver still are an important factor in local economics are not reported here due to the untimely death of the field worker in charge of the project. These data and the results of a program to analyze the beaver affidavits on the basis of drainage will be reported in the comprehensive beaver report.

Wolverine and Lynx

Information obtained from carcasses collected during the 1962-63 field season was reported on in W-6-R-4. A considerable number of specimens had become available by December 31, but processing has not been completed. The results of this year's studies will be reported in W-6-R-6.

SUBMITTED BY:

Robert A. Rausch
Game Biologist

Table 1. Analysis of 1963 Beaver Sealing Certificates

Game Mgt. Unit	Bag Limit	Per Cent Kits (Under 54")	Per Cent Kits & Yearlings (54-59")	Per Cent Adults (Over 59")	Total No. of Beaver	No. of Trappers	Av. No. Beaver/ Trapper
1	15	12.4	31.3	68.6	180	20	9
2	15	21.1	53.7	46.1	52	8	10.4
3	15	31.6	57.9	42.1	21	5	4.2
4					16	1	16
6	50	13.7	24.4	75.6	305	11	27.7
7	20	24.5	45.2	54.7	106	15	7.1
8	No limit	22.7	42.4	55.6	268	22	12.2
9	15	19.9	34.9	65.1	2,080	161	12.9
11	20				16	3	5.3
12	15	22.7	32.5	67.5	255	67	3.8
13	20	19.1	40.6	59.4	335	51	6.6
14	40	24.9	48.1	51.9	789	83	9.5
15	40	18.1	33.2	66.8	254	25	10.1
16	40	18.1	38.3	61.7	1,305	66	19.7

Analysis of 1963 Beaver Sealing Certificates - Continued

Game Mgt. Unit	Bag Limit	Per Cent Kits (Under 54")	Per Cent Kits & Yearlings (54-59")	Per Cent Adults (Over 59")	Total No. of Beaver	No. of Trappers	Av. No. Beaver/ Trapper
17	15	23.3	36.8	63.2	2,172	189	11.5
18	10	33.3	50.1	49.9	1,503	202	7.4
19	15	20.0	34.9	65.1	2,250	196	11.4
20	20	9.6	21.7	78.3	1,514	133	13.3
21	20	14.5	29.1	70.9	4,638	343	13.5
22	20						
23	15					1	3
24	25	9.5	27.9	72.1	965	70	13.7
25	20	14.6	27.9	72.1	464	63	7.4
TOTAL		18.5	34.0	66.0	19,619	1,739	11.3

6 year average (1957-64): 21,582
6 year range (1957-62): 14,344-26,504

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 1 TITLE: Population Dynamics & Related Physiological Status of Snowshoe Hares

OBJECTIVES

To determine the physiological condition of the snowshoe hare at various population levels by measurement of several blood and urine constituents.

TECHNIQUES

This job was inactive during the reporting period.

SUBMITTED BY:

David R. Klein
Leader, Coop. Wildlife Research Unit

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 2 TITLE: Ecology & Economic Importance of the White Fox

PERIOD COVERED: July 1, 1963 to June 30, 1964

ABSTRACT

The average yearly harvest of white fox in Alaska during 1912-1963 was 4,072 pelts. The 1952-1962 yearly average was 1,381, which represents a substantial decrease from the long term average. The islands of the Bering Sea have yielded the greatest annual harvest of white fox per unit area, with the Arctic Slope region being of secondary importance.

The value of white fox pelts has maintained a yearly average of $24.18 from 1912-1963 with the lowest value of $12.50 occurring in 1963. During the past eleven years the white fox has ranked 7th in economic importance among the 11 major furbearers of Alaska, while during the same period it ranked 8th in numbers of pelts harvested. On the Arctic Slope the white fox is the furbearer of primary economic importance.

Increased opportunity for wage earning among Barrow Village residents has been a major factor in reducing trapping effort there. Secondarily, lowering value of white fox pelts has further contributed to the low take in recent years.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 2 TITLE: Ecology & Economic Importance of the White Fox

PERIOD COVERED: July 1, 1963 to June 30, 1964

OBJECTIVES

To determine the life history, distribution and abundance of the white fox in north coastal Alaska.

To examine factors affecting availability and value of this fur animal to local trappers.

TECHNIQUES

Harvest data were obtained from U. S. Fish & Wildlife Service and Alaska Department of Fish & Game fur harvest statistics, from the Seattle Fur Exchange, as well as from local traders and trappers. A questionnaire form was used to obtain trapping information from trappers from Barrow Village. Economic statistics were obtained from state and federal welfare agencies and by personal interviews with store keepers and others at Barrow.

Den ecology information obtained during the summer field seasons and fox population and pelt primeness data will be reported in a subsequent segment report.

FINDINGS

ECONOMIC IMPORTANCE OF THE WHITE FOX IN NORTHERN AND WESTERN ALASKA

Total Harvest Statistics

Considerable variation exists in the yearly harvest of Alaskan white fox. Between 1912 and 1963, Alaska maintained an average annual harvest of 4,072 white fox pelts. The largest harvest of white fox, 16,658, occurred in 1925, and the lowest harvest, 460, in 1956.

Between 1952 and 1962, an average annual harvest of 1,381 white fox pelts was maintained. This is a harvest decrease of 66 per cent from the 1912-1951 average, indicating either a declining white fox population or less trapping pressure.

Between 1960 and 1962, 4,277 white fox furs were reported shipped to fur buyers. Almost all fur buyers lived outside of Alaska. These sales, 86 per cent of the estimated 1960-1962 total harvest, indicate that most Alaskan white fox furs are sold and utilized outside of Alaska.

There is little local market for white fox furs now, other than for use in the manufacture of tourist souvenirs, and decorative trims for parkas, mukluks, and slippers. With the existing economic conditions, it is doubtful that a local market of significant size for white fox furs will develop in Alaska.

Fur records are best considered as indications, or trends, of the fur picture in Alaska, rather than an exact record of fur harvest. Fur export and fur buyer records, required by law when purchasing or exporting Alaskan raw furs, are used to compile Alaska's fur harvest. Comparison of these records shows that the fur buyer reports are consistently lower in fur harvest estimates than are the fur export records. The lack of adequate enforcement of these regulations has not helped produce complete, dependable fur records.

Sporadic reporting of fur shipments and purchases to the agencies responsible for managing Alaska's fur resources renders any fur harvest statistics questionable at best. It is impossible with present harvest data to estimate accurately what per cent of the total harvest the fur records really represent, and compensate accordingly.

Not all Alaskan furs are shipped or sold during the same trapping season in which they were taken. Based on studies at Barrow Village, there was no such long hold-over of furs, in this Eskimo village in northern Alaska. Almost all furs taken there were either sold during the trapping season or shortly after its end.

The practice of reporting fur take where trappers purchase the trapping license can produce a distorted idea of trapping pressure and yield from the fur districts. Furs may be sold several districts from their source, again producing misleading fur harvest data.

Fur harvest is reported on a calendar year, rather than on a fiscal year basis. Variations due to estimating the portion of fur harvest occurring during various times of the trapping season, and the conversion of these data to a yearly report, may produce discrepencies in the actual fur harvest pattern.

Reluctance by trappers to keep accurate records on their fur take, and opposition to reporting consistently this annual take, often based on the fear of more trapping restrictions, hinders the development of accurate harvest data.

Home usage, loss from predation on trapped furbearers, improper care of pelts, and the failure to sell unprime, small, or low-quality pelts to fur buyers all tend to alter the existing harvest statistics from the actual harvest.

Area Harvest Statistics

In determining the present distribution of the white fox harvest in Alaska the state was divided into three separate geographic areas: the Arctic Slope, encompassing the area north of the crest of the Brooks Range; Islands, primarily those located in the Bering Sea off the western coast of Alaska; and Western Alaska, that portion of the state bordering on the Bering Sea, and extending south of the southern boundary of the Arctic Slope into the Bristol Bay region (Table 1).

The islands produce the highest catch of white fox per unit area of any of the three geographic divisions. Based on data from 1959-62 fur export records, 31 per cent, 898 pelts, were shipped from the Islands, while 42 per cent, 1,238 pelts, were exported from the Arctic Slope. The remaining 798 pelts, 27 per cent of the total white fox exported during 1959-62, were obtained from Western Alaska.

Table 1. Distribution of the White Fox Harvest in Alaska During 1959-1962, Based on Fur Export Records of the Alaska Department of Fish & Game.

1959-1960

Area	Harvest	Per cent
Arctic Slope	890	48.0
Islands	595	32.0
Western Alaska	379	20.0
	1864	100.0

1960-1961

Area	Harvest	Per cent
Arctic Slope	153	52.0
Islands	47	16.0
Western Alaska	94	32.0
	294	100.0

1961-1962

Area	Harvest	Per cent
Arctic Slope	195	25.0
Islands	256	33.0
Western Alaska	325	42.0
	776	100.0

1959-1962

Area	Harvest	Per cent
Arctic Slope	1238	42.0
Islands	898	31.0
Western Alaska	798	27.0
	2934	100.0

St. Lawrence Island produces the largest number of white fox furs of the Island group. The harvest of white fox on the Arctic Slope is concentrated near the coast. Little white fox trapping is done in the central portions of the region. In Western Alaska, the white fox trapping is also concentrated along the coastal area.

Arctic Slope Harvest

To determine the harvest of white fox in northern Alaska, an intensive reporting system was organized during 1960-1963 in the stores buying furs at Wainwright and Barrow, Alaska. The store owners were contacted, and agreed to conduct this count, tallying the sex and number of white fox pelts purchased each month during the trapping season and on into spring after the closure of the trapping season. Store records were obtained from the Barrow Village area for the 1960-61, 1961-62, and 1962-63 trapping seasons. As shown by Table 2, 1,824 white fox pelts were purchased by these stores during these 3 trapping seasons.

These pelts comprised 42.7 per cent of the total estimated harvest for the last 3 trapping seasons in Alaska, 61.5 per cent of the last 2 trapping seasons, and 34.3 per cent of the 1963 trapping season.

Table 2. Harvest of White Fox at Barrow and Wainwright, Alaska (1960-1963).

	VILLAGE						
	Barrow			Wainwright			Total
Year	Male	Female	Total	Male	Female	Total	Harvest
1960-61	225	264	489	--*	--*	--*	489
1961-62	110	116	226	340	291	631	857
1962-63	61	54	115	218	145	363	478
Total	396	434	830	558	436	994	1,824
Three-year Average	132.0	144.7	276.7	186.0	145.3	331.3	608

*No record kept at village store during 1960-1961

The most interesting point of this census is that in 1962, the white fox harvest from Barrow and Wainwright of 857 pelts, exceeded the estimated state harvest of 776 pelts. Evidently, not all fur sales and shipments at Barrow and Wainwright are reported. Contact with those conducting the census at Barrow, and continued correspondence with the men at Wainwright, leave little doubt that these store counts, conducted in 1961-1963, are very accurate.

If anything, the store counts must be regarded as yielding a minumum harvest estimate. About 90 per cent of the white fox taken by Barrow trappers are sold at the local stores, with the remainder being used in local homes or sold outside of Barrow to itinerant fur buyers. A few pelts may be sold to tourists during the summer months.

Value of White Fox Furs

Trapping effort shows a direct relationship to furbearer value and variations in the harvests of white fox appears to follow this principle. White fox values have fluctuated markedly, reaching values over 40 dollars occasionally, but usually being valued less than 20 dollars per pelt.

Between 1912 and 1963, an average value of 24.18 dollars per pelt was maintained for white fox. The highest value, 60.25 dollars per pelt, was obtained in 1929, the lowest value, 12.50 dollars per pelt, in 1963.

In comparing prices from 1952-1962 with the 1912-1951 prices, it is clear that white fox values have decreased significantly. Between 1952-1962, white fox pelts brought an average price of 15.55 dollars, 36 per cent below the 1912-1951 average price. This amounts to a decrease in value per pelt of 11.30 dollars.

It is necessary to consider the decreasing value and harvest in the past 11 years if the economic status of the white fox in northern Alaska is to be viewed properly. Considering only the 40 year average between 1912-1951, an annual value of 130,974 dollars is obtained. But if the annual value and harvest figures from the past 11 years are substituted for the 40 year averages, an annual value of only 21,475 dollars results. This is a decrease in value of over 83 per cent.

Although advertised values for raw furs may show general

price trends, these prices do not accurately indicate potential trapper income. Few furs succeed in reaching the top grades of the fur buyer, and thus actually receive the premium prices advertised in fur buyer brochures. Most furs are graded into middle and low fur grades.

White fox pelts from northern and western Alaska receive higher prices per pelt than do white foxes taken in the lower Yukon-Kuskokwim River areas. Increased pelt size and quality of fur apparently are responsible for this differential price.

Economic Status of the White Fox in Alaska

Determination of the white fox's economic importance in comparison with other furbearers in Alaska is based on two factors: value of pelt and size of harvest. Although it is difficult to draw sharp boundaries in regard to furbearer status in Alaska, their general importance is clear.

Two periods, 1925-1951 and 1952-1962, have been used to determine furbearer status in Alaska. Consideration of the 1925-1951 era includes the "fur boom", and when only these average values are used, produces a misleading Alaskan fur picture. The 1952-1962 period shows the status of the fur animals during the past 11 years, and how the 11 year average contrasts with the 27 year average.

Based on the 1925-1951 summary of fur values and harvest (Table 3), the white fox ranks sixth in economic importance out of the 11 major furbearers in Alaska. It ranks sixth in harvest size, and fourth in pelt value.

When the averages from the past 11 years are considered (Table 4), the white fox ranks 7th in economic importance, ranking 7th in pelt value, and 8th in harvest size. If the 50 dollar bounty value is added to the wolf's average pelt value of 24.73 dollars, the white fox slips to 8th place in the ranking of fur animal importance in Alaska. The wolf moves up into 7th place.

Status of the White Fox on the Arctic Slope

When geographic distribution and density of furbearer populations are examined the true importance of the white fox on the Arctic Slope is shown.

Table 3. Average Annual Fur Harvest Within Alaska (1925-1951)

Species	Price Per Pelt	State Harvest	
		Number	Value
Mink	$15.04	41,959	$631,063
Beaver	22.76	18,418	419,194
Muskrat	1.34	250,654	335,876
Red Fox	15.22	15,130	230,279
Marten	29.30	5,519	161,707
White Fox	25.99	4,909	127,585
Lynx	35.73	2,613	93,362
Otter	18.31	2,788	51,048
Weasel	1.20	10,414	12,497
Wolf	18.78	613	11,512
Wolverine	13.11	415	5,441

Table 4. Average Annual Fur Harvest Within Alaska (1952-1962)

Species	Price Per Pelt	State Harvest	
		Number	Value
Mink	$32.05	23,581	$755,771
Beaver	23.91	17,217	411,658
Muskrat	.96	100,566	96,543
Wolverine	29.45	3,188	93,887
Marten	21.00	4,372	91,812
Otter	26.91	2,849	76,667
White Fox	15.55	1,381	21,475
Wolf	24.73	716	17,706
Lynx	11.09	1,509	16,735
Red Fox	8.14	914	7,439
Weasel	1.83	2,714	4,967

Only 5 of the 11 economically important furbearers found in Alaska regularly occur on the Arctic Slope: red fox, white fox, wolf (Canis lupus), weasels (Mustela spp.), and wolverine (Gulo luscus). Only one record exists for mink from the Arctic Slope, near Chandler Lake (Rausch, 1950), but this furbearer, the top animal for fur value in Alaska, has no economic importance on the Arctic Slope. Although these furbearers occur throughout the Arctic Slope, all, except the white fox, either sparsely populate the area, or tend to concentrate in the foothills and mountains of the Brooks Range. Few trappers penetrate the latter areas. Adverse winter conditions, and the distance from villages, most of which are located along the coast of northern Alaska, restrict intensive trapping in the interior portions of the Arctic Slope.

Thus, on the coastal plain of northern Alaska, only the white fox occurs in large enough numbers to be subject to intensive trapping effort. Consequently, because of high pelt value, periodic high populations, and availability to local trappers, the white fox must be considered as the top furbearer of the Arctic Slope of Alaska.

ECONOMIC IMPORTANCE OF THE WHITE FOX AT BARROW VILLAGE, ALASKA

Barrow Village's economic structure was studied in three ways: personal interviews with residents; questionnaries mailed to village trappers; and a review of the pertinent literature.

Description of Barrow Village

Barrow Village, 71°17'18" N, 157°16'16" W, is 330 miles north of the Arctic Circle on the farthest north point of land in the United States. It is the largest Eskimo village in North America, having a native population of 1,314.

Four miles north of Barrow Village, a large camp has been built. It is composed of the Arctic Research Laboratory, operated by the Navy and the University of Alaska, and two construction companies, Puget Sound and Drake, and the Federal Electric Company, suppliers of the Distant Early Warning sites in northern Alaska. This camp provides considerable cultural and economic exchange with Barrow. It gives residents of Barrow Village employment and a market for goods and services throughout the year. The nearby Distant Early Warning site, Pow Main, provides similar opportunities.

Barrow Village homes, 1-2 story wood frame buildings, are scattered in a helter-skelter fashion over the low tundra along the Arctic Ocean. Now, the village has no organized streets, water, gas, or sewage systems. A variety of facilities exist in the village: five general stores, two summer hotels, two restaurants, an airline office, a bank, two churches, a movie theater, and a combination fire hall-community building. Federal agencies, including weather bureau, post office, Public Health Service hospital, and the Bureau of Indian Affairs school provide additional services for residents.

Barrow Village, incorporated as a fourth class village, secures revenues with a two per cent sales tax on local business transactions. A seven member village council, elected yearly, provides local government. One member serves as its president. A state-appointed deputy magistrate, and a city clerk complete Barrow's government. A member of the State Police is stationed at Barrow and attends to law enforcement.

Supplies reach the village by either commercial airline, or annual Alaska Native Service freighter which arrives during the short ice-free period in mid-August. One airstrip now serves Barrow Village and the Navy camp, but another is being built at Barrow's outskirts. Completion of the new airstrip may result in a reduction of air freight charges now expensive at 15 cents per pound from Fairbanks, Alaska, and improve air service to Barrow Village.

Village electricity is provided intermittently by several groups. Unsuccessful attempts have been made by residents to establish a dependable power source by forming an electrical cooperative in the village. No modern sewage or water systems are present at Barrow, making sanitation a problem. Water is hauled to local homes from fresh-water lakes 3-5 miles east of the village. Village homes are heated by either fuel oil or low grade coal which is mined free of charge at Meade River coal mine. Developing nearby natural gas reserves would provide cheap power and heat for Barrow residents. This would have a profound effect on the economic climate, decreasing the second highest living expense, heating, and enabling Barrow's limited incomes to buy more material goods per dollar than is now possible.

Extensive changes are being planned and have been begun by private and government agencies at Barrow Village, Alaska. Complete village reorganization is planned by the Bureau of Indian Affairs, the end result being a modern city in northern

Alaska. Natural gas resources near the village have been made available by congressional action for use by Barrow Village residents. The technical planning and research needed to implement this development is now underway at the University of Alaska, College, Alaska, under the supervision of the Bureau of Indian Affairs. Village reorganization is the first necessary step in the modernization of the area. It is needed to permit safe distribution of the natural gas to village homes. Modern water and sewage systems will also be installed in the homes after the reorganization is completed and the installation of natural gas has begun. High school construction will begin in the summer of 1964. When completed this new school will provide needed educational facilities for Eskimos in the northern area of Alaska. Completion of a new electrical system at Barrow is pending. Presently, a disagreement over whether a private group, Golden Valley Electric Association, Fairbanks, Alaska, or the Bureau of Indian Affairs will supply power to the area. These changes may result in a totally different economic and sociologic climate at Barrow Village than existed during 1961-1963.

The 1960 census provides the best data on Eskimo economic and social conditions in election district 21. This district, including 58,512 square miles of northwestern Alaska, contains the only two large Eskimo villages, Barrow and Wainwright, found in northern Alaska. It was here in election district 21 near and east of Barrow Village I concentrated field work on the white fox study.

Because most persons interviewed by census takers were Barrow Village residents, the census information for election district 21 is assumed also to reflect accurately conditions at Barrow Village. About 50 per cent of the population of election district 21 is concentrated at Barrow Village.

The Barrow Eskimo population is rapidly increasing. Average family size is 5.9, with 73.1 per cent of the families including one or more children less than 6 years old. Barrow's native population was 1,314 in 1960, 961 in 1950, and 363 in 1939. The 1960 cumulative fertility rate, 1,178 children born per 1,000 females between the ages 15-44, was 70 per cent greater than Alaska's cumulative fertility rate of 692. The rapid population increase is a reflection of the high cumulative fertility rate.

Education levels of young residents are being raised. In 1960, 416 Eskimo children within election district 21 attended school, 396 in grades 1-8, and 20 in either high school or college.

Older Eskimos have a low educational attainment. Of 534 Eskimos over 25 years old within the election district, 119 had no schooling, 216 had 1-4 years, 72 had finished grade 5 or 6, 33 had finished grade 7, and 55 had finished grade 8. Sixteen Eskimos within this group had attended high school 1-3 years, while 23 finished 4 years. A median of 3.7 years schooling was achieved by the group.

Although presently low, the literacy of the Eskimo must be raised to the highest possible level. Those having little formal education will remain in the low-income group dependent upon welfare support and subsistence hunting.

Economic Structure of Barrow Village

Barrow Village, like other native villages in Alaska, is in a state of economic and social change. This change, from independent subsistence hunting to reliance on other people for basic needs, has produced a complex mosaic of social and economic reactions in the Eskimo community.

No native village, regardless of similarities in location, size or past history, can safely be compared economically or sociologically with another. Each has evolved separately and uniquely in the characteristic harsh environment of northern Alaska and under varying degrees of contact with white culture and mores.

Woolford (1951) states that a native economy is based upon variables. Some of these are: availability and extent of the wildlife resource; availability and extent of local and outside employment; and the degree of dependence upon government aid for the relief of children, the aged, and the unemployed. Geographic location, tribal mores, length of association with whites, educational advancement, and general health also influnece village economy.

Barrow Village falls into the Class 2 village of Woolford:

> In this category are the villages characterized by long association with the whites. Local

> industries and activities of the whites have provided a substantial amount of seasonal employment and to a lesser degree, continuous employment. Villagers have become dependent upon one another for services such as the furnishing and hauling of water and fuel. The wildlife resource is heavily utilized and all available sources of government disbursements for relief are avidly tapped...

In a generation, the Barrow Village has changed from almost a total hunting economy to one where only 25 per cent depend primarily on hunting. Now Barrow's economy is based on federal government operations: Navy's Arctic Research Laboratory, Air Force, Federal Electric Company, Distant Early Warning sites, Puget Sound and Drake, Weather Bureau, Bureau of Indian Affair aids, and state welfare checks. Table 5 gives detailed information on the cash income at Barrow Village. Tables 6-10 give income statistics for the Barrow election district 21.

A sparse native population characterizes the area. The 1960 Eskimo population in election district 21 was 1,605. At least 158, 85.4 per cent of all employed Eskimos, worked in election district 21 during 1960.

A high unemployment rate exists for Eskimo workers. More men are employed than women.

Of the 444 Eskimo males, 14 years or older living during 1960 in election district 21, 240 were potential workers. Only 152 were employed, at least part-time, while 88, 36.6 per cent, were not employed at all during 1960. About 33 per cent of the 1960 employed workers were either foremen or craftsmen.

Table 5. Summary of Economic Survey of Barrow Village, Alaska, During 1961 (Bowler, 1962)

BARROW VILLAGE FACTS

	1958	1961
Total Number of Families	169	217
Total Population	1500	1529
Eskimo (1961) 1502		
Non-Eskimo (1961) 27		
Total Number of Private Businesses	19	22
Total Income	$612,774	#1,166,387
Total Fuel Expenditures	$155,107	$ 249,374
Present and Future School Attendance		
Present-Barrow Native School, Beginners Through Sixth Grade	346	
Student Sent Outside of Village	152	
Total Students	498	
Future Estimates-Barrow Native School,		
Grades 1-8, 1962-1963	470	
Grades 1-12, 1965-1966	700	

SOURCE AND AMOUNT OF OUTSIDE INCOME TO BARROW VILLAGE, 1961

	Gross
Arctic Research Laboratory	
Native Payroll	$144,000
Baby Sitter	$ 3,750

Table 5. (Continued)

	Gross
Purchases	
Arctic Research Laboratory	$ 3,000
Arctic Research Laboratory Personnel	$ 3,000
Wein Alaska Airline and Alaska Communications Service	$ 66,000
Weather Bureau	
1 Native Employee	$ 10,000
6 Non-Native Employees Spent 10% of Pay in Barrow Village	$ 5,500
Public Health Service	
22 Employees, Native	$144,000
11 Non-Native Employees Spent 10% of Pay in Barrow Village	$ 6,000
Bureau of Indian Affairs	
Total Staff Payroll, 113,272 Estimate 60% Spent in Barrow Village	$ 67,963
PD & C Construction, 45 Natives Employed at Varying Periods	$155,250
Bureau of Standards	
1 Native Employee	$ 5,500
INCOME FROM TOURIST ACTIVITIES AT BARROW VILLAGE, 1961	
Native Store, "Top of World Hotel"	$ 14,221
Brower Hotel (estimated)	$ 14,000
Native Store Cafe (only open one meal per day for tourists only)	$ 9,387

Table 5. (Continued)

Other Restaurants for Tourists and Hunters		$ 90,000
Kriers Al Hopson Steve Hopson Browers Cafe		
Gift Shop, Glady's Originals		$ 50,000
	TOTAL	$177,608

STATE AND FEDERAL AID AND RELIEF, 1961

Bureau of Indian Affairs Branch of Welfare	$ 23,000
Social Security	$ 19,200
State Unemployment Benefits	$ 21,200
Other State Aids	$ 52,856
TOTAL	$155,456

TOTAL OUTSIDE INCOME AT BARROW VILLAGE	$1,166,387
AVERAGE 1961 INCOME PER FAMILY AT BARROW VILLAGE	$ 5,370

Table 6. Occupations of the Total Employed Non-White Work Force of Election District 21, 1960 (Department of Commerce, 1961)

Occupation	Number Employed	Per Cent
Construction	57	34.1
Professional and Related Services	32	19.2
No Industry Reported	22	13.2
Wholesale and Retail	21	12.6
Mining	20	11.9
Transportation and Communication	10	6.0
Public Administration	5	3.0
	167	

Table 7. Occupations of Employed Male Eskimos, Barrow Election District 21, 1960 (Department of Commerce, 1961)

Occupation	Number Employed	Per Cent
Foreman and Craftsman	50	32.9
Laborer	25	16.5
Operators	22	14.5
No Occupation Reported	22	14.5
Clerical	15	9.9
Service Workers	13	8.6
Management	5	3.3
	152	

Table 8. Previous Occupations of Total Experienced Non-White Unemployed Workers in Barrow Election District 21, Alaska, 1960 (Department of Commerce, 1961)

Occupation	Number Employed	Per Cent
Laborer	44	40.0
Service Worker	32	29.1
Craftsman	26	23.6
Clerical and Sales	8	7.3
	110	

Table 9. Distribution of Family Income During 1959 in the Barrow Election District 21, Alaska (Department of Commerce, 1961)

Amount	Number of Families	Per Cent	Cumulative %
Less than 1,000 Dollars	18	7.6	7.6
1,000-1,999	63	26.6	34.2
2,000-2,999	27	11.4	45.6
3,000-3,999	24	10.1	55.7
4,000-4,999	23	9.7	65.4
5,000-5,999	19	8.0	73.8
6,000-6,999	23	9.7	83.5
7,000-7,999	8	3.4	86.9
8,000-8,999	32	13.5	100.0
	237		

Table 10. Distrubution of Individual Income During 1959 in the Barrow Election District 21 (Department of Commerce, 1961)

Amount	Number of Individuals	Per Cent	Cumulative %
Less than 500 Dollars	93	19.6	19.6
500-999	70	14.8	34.4
1,000-1,499	73	15.4	49.8
1,500-1,999	41	8.6	58.4
2,000-2,499	10	2.1	60.5
2,500-2,999	18	3.8	64.3
3,000-3,499	27	5.7	70.0
3,500-3,999	15	3.2	73.2
4,000-4,499	26	5.5	78.7
4,500-4,999	10	2.1	80.8
5,000-5,999	24	5.1	85.9
6,000 and over	67	14.1	100.0
	474		

Of the 339 Eskimo females, 14 or older living in election district 21 during 1960, 37 were available for work, with 15, 40.5 per cent, actually being employed. All were service workers.

Compared to the national average, most Eskimo families and individuals have a very low monetary income. The 1959 median income for 237 election district 21 Eskimo families was 3,438 dollars. Bowler (1962) computed an average family income during 1961 at Barrow Village of 5,370 dollars. An average income of 3,985 dollars was earned in 1959 by Eskimo families in election district 21, with 2.7 per cent earning more than 10,000 dollars, and 43.1 per cent earning less than 3,000 dollars.

Of 474 election district 21 Eskimos earning income, more than 50 per cent earned less than 1,500 dollars during 1959. The combined median income for men and women in 1959 was 1,512 dollars. When only male income is used a median income of 1,984 dollars was achieved. Individual Eskimos had an average 1959 income of 3,985 dollars.

Federal and state welfare aids comprise a large part of the annual income. Barrow's unearned income for 1962, from unemployment compensation, social security, BIA general assistance, and welfare, was 187,600 dollars (Table 11). Each Barrow family received an average unearned income during 1962 of 1,042 dollars.

Barrow's living costs are very high. A cost-of-living estimate was obtained from Barrow prices listed for basic supplies, food, fuel, and ammunition, that are required for minimum family subsistence. Twelve food items cost 27.70 dollars at Barrow Village, but only 12.96 in Seattle, Washington. Computed at Barrow prices (Table 12), 18 basic items cost 40.20 dollars. These same items cost 28.70 dollars in Fairbanks, Alaska. A 40 per cent increased cost-of-living exists in the Barrow community over that of Fairbanks. But all items are not equally inflated in price. Food prices were 14 per cent above Fairbanks prices, ammunition costs were equal, and Barrow fuel costs were 88 per cent higher.

Food, heating, and clothing, in that order, are the most expensive living costs at Barrow (Spencer, 1959). Because most Eskimo families lack a careful budget, it is difficult to estimate the income needed for a satisfactory living standard at Barrow.

Spencer (1959) learned during his 1952-1953 Barrow study that a family of 5, having an ample supply of game, could spend

50 to 140 dollars a month on food, depending on how much the group was using introduced store foods. If no game was available, food costs could reach 300 dollars a month. Today, these prices would be slightly higher, reflecting the overall cost-of-living increase throughout the state. Assuming the family purchased only staples, spending approximately 40 dollars a week, the yearly food cost for 5 persons at Barrow would be 1,920 dollars.

An estimate of heating costs for a 3-room frame dwelling is 5 gallons of fuel oil per day (Spencer, 1959). Assuming that this full heating cost would be borne for 8 months, heating of such a home would cost 780 dollars a year. Bowler (1962) estimates the annual heating cost of the families at Barrow Village to be 1,147 dollars a year.

Table 11. Sources and Amount of Unearned Income at Barrow, Alaska. 1962*

Source	Amount
Unemployment Compensation	$ 53,373
Social Security	22,800
Bureau of Indian Affairs General Assistance	24,535
Welfare Payments	
Old Age Assistance	29,652
Aid to the Blind	1,176
Aid to Dependent Children	56,064
	$187,600

*Information from personal communications with various agencies responsible for administrating this aid

Table 12. Comparison of Barrow and Fairbanks, Alaska, Prices Charged for Basic Food and Supply Needs, as an Index to Cost-of-Living During November, 1962.

Item	Price			
	Barrow	Fairbanks	Seattle	U. S. Average
25 lb. white flour	4.55	4.50	3.20	2.90
1 lb. butter	1.25	.89	.74	.75
1 dozen eggs	1.25	.86	.53	.58
1 lb. coffee	1.00	.84	.67	.70
10 lbs. white sugar	2.00	1.64	1.26	1.17
1 lb. bacon	1.25	.95	.78	.71
1 loaf white bread	.60	.49	.36	.32
1 303 can peas	.65	.33	.22	.22
1 case evaporated milk	11.00	5.28	3.84	3.84
10 lbs. potatoes	2.50	.90	.60	.60
1 lb. corn meal	1.00	.29	-	-
1 303 can fruit cocktail	.65	.34	.26	.25
1 lb. beef hamburger	1.00	.49	.50	.53
1 box 20 30-06 shells	5.00	5.25	-	-
1 box 25 12 gauge shot shells	3.85	3.80	-	-
1 box 50 .22 long rifle shells	1.00	.98	-	-
1 gallon motor gas	1.00	.55	-	-
1 gallon fuel oil	.65	.33	-	-
	40.20	28.71		

No accurate figures for the exact living costs or additional income received by Eskimo families for the sale of crafts, wild game, or subsistence gained by trading or working for needed items are available for Barrow residents. The Eskimo philosophy of generosity also provides for many of the less fortunate members of the Barrow community, but just what impact this action has on the area's economic picture is unclear. It may provide additional expenses for those families who are obtaining sufficient income to meet their needs, and could lower their standard-of-living accordingly. Van Stone (1962) reports this result in family interactions at Point Hope.

It is clear that today most of Barrow Village's Eskimo families have low monetary incomes while facing very high living costs. Dollar income does not always match dollar expenses, but the substitution of subsistence gains for monetary needs has helped shorten, if not bridge, this gap. Barrow Village is essentially functioning under two economies: a money economy and a subsistence economy. It is those families who can adapt to both systems that are today enjoying a high standard-of-living in the village.

Economic Trends at Barrow, Alaska

Increasing construction and oil exploration on the Arctic Slope will continue to provide more full-time employment for Barrow residents. During the winter of 1962-63, 40 per cent of the Barrow men were employed full time, and another 25 per cent were employed part-time (Nayokok, viva voce).

Due to increased employment, trapping effort for white fox and other furbearers should continue to decrease. Market hunting and the sale of game, mainly seals and caribou, to employed men who lack time to hunt for their own families, may continue to provide increasing income for the remaining subsistence hunters of the village. Only a marked increase in fur prices, raising trapping income to a comparable level with available construction incomes, could begin the resumption of intensive fur trapping at Barrow Village.

Economic Impact of the White Fox at Barrow Village, Alaska

Few Barrow Village men are now trapping regularly. During the 1962-1963 trapping season, 39 trapping licenses were sold at the Barrow Native Cooperative Store, the only one selling them in the village. Of these 39 men, 25 answered the trapping questionnaire that was mailed to each. Only 6 men stated they

were trapping regularly, while 5 more reported that they were trapping part-time. Nayokok (viva voce) estimated that there were no more than 10-20 men trapping full-time in the village during the 1962-1963 season. Similar estimates were also given by other residents in the area (Brower, viva voce; Hopson, viva voce). It is likely that no more than 20 men are intensively trapping white fox in the Barrow area today.

Full-time employment, and poor health were the main reasons given for not trapping regularly, with the low price of fur and bad weather also mentioned as primary reasons for not trapping. Those trapping part-time were all employed full-time by various agencies around the Barrow community.

Few young men are now trapping in the Barrow area (Table 13). The average age of the 36 Eskimos purchasing trapping licenses at Barrow was 42.4 years (24-70). The average age of the 11 men trapping either full- or part-time was 47 years. As noted by Hughes (1960), trapping skills are not being passed on to the young men. The stablizing effect of attendance at public school has prevented young men from traveling with the older men on hunting and trapping trips, thereby preventing the learning of necessary techniques and territory from which, as adults, they will be able to secure a living. Unless raised in a subsistence hunting and trapping environment, a young man who has no guidance or previous experience in fur trapping has only a 50:50 chance of succeeding financially at trapping (Edwardson, viva voce).

A significant change in trapping procedure has developed. In the 1920's 2-3 families located in a central trapping camp, 10-15 miles from other similar camps along the coast, to trap white foxes (Jenness, 1957). A radius of 5-7 miles around the camp was trapped intensively, with each member of the camp receiving an equal portion of the circle around camp in which to set his traps. Now families remain at Barrow Village, and the trapper sets and checks his traps alone, out on his trapline. The concentration of natives at Barrow Village was first due to native and commercial whaling, and later because of the establishment of stores, churches, and schools (Spencer, 1959).

When trapping, an average of 73 traps (6-200) was maintained on the trapline. Trapline lengths varied between 5 and 175 miles long, having an average length of approximately 63 miles. Part-time trappers maintained shorter traplines, usually less than 10 miles long, using an average of 12 traps on each line.

A variety of trap sets are used by Barrow Village trappers in taking white fox. Less skill is required to take white fox

in traps than for red fox. Steel traps, number 1 1/2 or 2 longspring, are used in the fox sets. Some foxes are shot, but most are taken with steel traps. Snares, deadfalls, and pit-traps were all used before 1900 to capture white foxes, but now these have been replaced by steel traps. Traps are set either on sea ice or on land.

On ice, the trapper buries a 3 foot stick, threaded through the trap chain, in a narrow trench cut in the ice. This trench is covered with snow and packed tightly, eventually freezing solid, securing the trap. The trap is buried about an inch below the ice's surface, and covered with white tissue paper or a sheet of crystaline snow. The snow cover is scraped to a thin sheet, .25 inches thick or less, before being laid over the trap depression. Care is taken to place the trap so that drifting snow will not clog its mechanism. Bait, usually sea mammal meat, is placed near the trap pan but windward to the trap, favoring the prevailing east-west wind. The bait is partially covered with a heavy block of ice. By covering the bait, the trapper forces the fox to feed at the bait's exposed edge, near the trap pan, and increases the chances of catching the animal. Care is taken to prevent the dark trap from showing through the opaque snow cover, and warning the fox. A trap marker, placed several yards from the trap, completes the set. Ice sets are very effective in March when placed along opening leads, areas that foxes usually follow when seaching for food out on the ice.

Table 13. Age Distribution of Trappers At Barrow, Alaska 1962-1963.

Age	Number of Men
20-25	2
26-30	8
31-35	4
36-40	5
41-45	3
46-50	6
51-55	0
56-60	2
61-65	3
65 and over	3
	36

On land, fox traps are set only on the low mounds or other elevations standing out against the uniform flatness of the land. Tracks show that foxes invariably visit these elevations. As a result of this habit, sets here produce high trapping success. Bait, scent-post, or a combination of both sets may be used when trapping on land.

The bait set is similar to the ice set. The trap is secured by a 3 foot stick buried in the frozen ground, or by a long metal spike driven into it. Buried slightly below the surface, the trap is covered with snow or white tissue paper. Large soil lumps are scraped away from the trap, and fine soil is spread uniformly over the trap, effectively hiding its location. Any meat, although marine mammal is usually not used inland, is used as bait for land sets. The bait is placed approximately 8 inches from the trap on its windward side. Often, to attract the foxes attention, a large clod of soil is turned over near the trap. A trap marker completes the set.

The scent-post set is basically the same as the bait set, except that an upright stick or caribou antler replaces the bait. Commercial or home-made scents may or may not be sprinkled on the set and post. Several traps may be set around the scent post, near its base, increasing the chances of trapping any white fox that visits it.

A combination scent-post-bait set has the initial scent-post set plus bait located a few feet from the scent post. No traps are set at the bait. After the foxes have fed on the bait, they approach the scent post to leave sign, and are trapped.

Trapped foxes are killed by suffocation. The trapper stands on the animal's chest, collapsing the lungs, until it dies. Death occurs within a few minutes. By killing the fox this way, no blood stains the white pelt, which would decrease the pelt value.

Three main forms of transportation were used by the Barrow Village trapper to check traps: motor vehicles (48 per cent), such as snow travelers, weasels, and snow mobiles; dog teams (30 per cent); and walking (22 per cent). The greatest distance traveled by dog teams usually ended approximately 75 miles from Barrow, with greater distances, up to 175 miles of trapline, being completed with motor vehicles. Walking was confined to within a 5 mile radius of Barrow Village.

Over many years, an average catch of 56 foxes per trapper was reported. Jenness (1957) reported that in the 1920's

trappers took between 20 and 50 foxes during their trapping. Averages of 50 and 100 foxes per trapper are known from St. Lawrence Island (Hughes, 1960). One trapper at Barrow, noted as one of the best in the village, took over 150 white fox during the 1959-1960 season (Geist, viva voce). Trapping success is dependent on a number of factors: skill of the trapper, density of the foxes, weather conditions, length of trapline, and perhaps luck, so it is difficult to derive a meaningful estimate of catch per trapper. With reasonable effort, it could be expected that in an average year a Barrow trapper would take around 50 white foxes.

A majority of trappers checked their traplines at least once a week (13 out of 15) while only 1 out of 15 did not check his traps for at least a month after setting them.

White fox, red fox, wolverine, wolf, polor bear (Thalarctos maritimus), and dog (Canis familiaris) were all listed as known predators on white fox in traps. Losses due to this predation varies directly with the care a trapper exercises in checking his traps regularly, but most trappers lose at least 1-5 white fox every year to this predation. Some have lost more.

Thirteen trappers stated that they usually caught at least one or more unprime foxes, primarily young animals, during the first few weeks of the trapping season. White fox are usually prime until the 1st and 2nd week in April.

White fox are skinned out through the mouth rather than cased as are most other furbearers. By skinning through the mouth, blood and fat are more easily kept off the pelt than when the animal is cased. As much fat as possible is scraped from the skin, the feet are skinned out, the tail split, and the animal is stretched, skin out, to dry. When partially dry, the skin is taken off the stretcher, turned right side out, and hung up to finish drying. After drying, the pelt may be cleaned with corn meal and flour, or if extremely bloody or dirty, washed in gasoline or luke-warm soapy water. Stains from sea mammal fat turn the white fur pale yellow. Badly stained, pelts are discounted by fur buyers up to 50 per cent of their original value. Fat stains are common only on foxes taken on sea ice.

Ninety per cent of the white fox pelts taken in the Barrow area are sold to Barrow Village stores. A limited sale of pelts to tourists and local furriers also occurs.

Home utilization of white fox pelts is low, consisting usually of 1-5 pelts per family. Ruffs and trim for clothing are frequently made from damaged pelts. These sell for about 10 dollars and therefore salvages some of the loss that might occur if these damaged white fox pelts were sold intact. Families also often keep these damaged pelts for their own use rather than sell them for a low price.

The money value of the white fox at Barrow has declined in recent years. In 1959-1960, 681 white fox pelts brought an average price of 30 dollars at Barrow. During 1960-1962, white fox pelts were being sold to local stores for 17 dollars. A low price of 12.50 dollars for white fox was paid in 1962-1963. Almost all fur trade at Barrow stores is for credit rather than cash. Pelts sold to tourists during summer months receive an average price of 20 dollars.

Presently, the trapping of white fox has little impact on the overall economic picture of Barrow, Alaska. The few men trapping, the low fur value of white fox pelts, and the low harvest over the past few years, indicate that this is not a dominant source of income among Barrow residents at the present time.

White fox trapping could become important again if the present high employment rates ceases and/or the price of white fox again rises to that of the 1920 fur boom. In other villages of northern Alaska where there are not employment opportunities similar to those that exist at Barrow Village, the white fox is often the only source of monetary income during the winter months, with the exception of welfare aids.

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 3 TITLE: Ecology of the Beaver

PERIOD COVERED: July 1, 1963 - June 30, 1964

ABSTRACT

The destruction of a large portion of a salmon run in Hidden Creek was observed. This loss resulted from the washout of a beaver dam with associated stranding of salmon in shallow water areas. Salmon escapement into the study area was considerably reduced over last year.

The fall aerial beaver census on the Kenai National Moose Range showed no significant changes in populations over the 1962 level. Variation in census technique in the last two years suggests the need for standardization of methods.

Abstract of the proposed beaver management plan:

1. The beaver is primarily important as a modifier of environment, but also has both economic and aesthetic value.
2. Streams on the Moose Range make a substantial contribution in spawning area to all species of salmon in Cook Inlet. The Kenai and Kasilof drainages contain approximately 55% of the spawning area for Cook Inlet red salmon.
3. Ponds created by beaver provide suitable habitat for vegetation highly attractive to moose and waterfowl.
4. Beaver dams and ponds can be both beneficial and detrimental to salmon, depending primarily on the species of salmon. Red salmon are most adversely effected by dams as they commonly make their spawning migration when water levels are low.
5. Beneficial effects of beaver ponds for salmon include:
   a. Nursery areas for young salmon.
   b. Aid in stabilizing water levels in streams.

6. Detrimental effects of beaver dams on salmon include:
   a. Prevent or delay salmon in reaching spawning areas.
   b. Increase susceptability to predation by concentrating fish at base of dam.
   c. Mechanical injury may be inflicted on salmon attempting to pass over or through the dam.
   d. Fish may be forced to spawn in unsuitable areas below the dam.
7. Beaver dams blocking salmon runs can be safely removed with dynamite after the downstream migrants have left the stream and prior to the return of the adults. On the Moose Range this period would fall between the first of May and the last of June. Prior to or after this period the dams should be pulled by hand in such a manner as to gradually lower the head of water.
8. Beaver populations can be adequately censused from the air by counting the active lodges in the fall of the year. By establishing permanent survey routes and with a map indicating the location of each lodge, it is possible to determine the population trend.
9. Drainages known to contain important runs of salmon, primarily red salmon, should be managed for this resource. Beaver in these areas should be removed when found in conflict with the salmon.
10. Beaver numbers should be controlled by licensed trappers during the regular season. Beaver in areas where they can be enjoyed by the public should be protected for their aesthetic value. The trapping effort should be adjusted so as to prevent a concentration of effort in any one area.
11. Nusiance beaver can be removed by live-trapping, destroying or by permit, depending upon the need for establishment of new colonies, available time and numbers of beaver involved.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 3 TITLE: Ecology of the Beaver

PERIOD COVERED: July 1, 1963 - June 30, 1964.

OBJECTIVES

1. To assemble historical records on beaver of the Kenai Moose Range and concurrent pertinent records of other animal life with particular emphasis on moose, waterfowl, and salmon.

2. To record habitat conditions with respect to suitability of moose, waterfowl, and salmon in various successional stages of the beaver dam.

3. To determine present populations of beaver and the three major animal species of concern under various habitat conditions.

4. To develop management recommendations toward securing a satisfactory balance between beaver numbers and location and maintenance of desirable habitat of the three major species.

TECHNIQUES

Field activities were concentrated on the Kenai Moose Range. Observations were made of limnological conditions within beaver impoundments and wildlife utilization of beaver ponds was recorded. Test netting was done in several impoundments to obtain information on the use of waters by young salmon and other fish. During salmon spawning migrations observations were made on the effect of beaver dams in obstructing the movement of salmon.

An excellent opportunity for the study of beaver-salmon relations was afforded on July 16, when an unusually large run of red salmon, Oncorhynchus nerka, entered Hidden Creek. This creek, one of the more important streams on the Moose Range, has a long history of beaver-salmon conflict. At the time of the spawning migration, a series of five beaver dams was located in a one-mile stretch of this creek. The largest of these dams was 4' 10" high. This dam formed a complete barricade to the salmon. Salmon were able, with some difficulty, to ascend the three smaller dams downstream from the large dam.

The fall aerial beaver survey was conducted for the second year on the Moose Range. This survey is designed to show trends of beaver abundance and to indicate drainages which could sustain or require trapping. In the absence of the investigator, the survey was made by members of the Refuge staff between October 31, and November 19.

FINDINGS

An estimated 7,000 red salmon entered this Hidden Creek betwen July 16-28. The intent of the investigator was to permit all but a couple of hundred to pass over the dam to the spawning grounds. The fish to be left below the dam were to be observed periodically to determine what happens when salmon are stranded below a dam. During the above period, a total of 4,673 salmon was counted going over the flume constructed by the investigator.

During a two-day absence of the investigator, this dam washed out, resulting in a large but brief rise of water level in the area below the dam. Evidently, fish waiting at the outlet of this creek seized this opportunity to ascend to the spawning grounds. After this head passed, the fish were left stranded either high and dry or in pools. The large numbers of fish concentrated in the pools soon used up all the available oxygen and expired. A survey of the aftermath disclosed a total of 3,567 dead salmon and 867 live. A small dam near the headwater lake was opened and the head drawn from the lake was sufficient to allow some of the 800 to reach their spawning grounds.

While a disaster, this facet of the beaver-salmon relations might have gone undetected if this had not occurred.

The Whiskey Lake study area was visited between August 19-23. Water levels were six inches lower than the lowest recorded last year. The beaver dam that maintained adequate water levels over the spawning grounds washed out last fall and the beaver made no

attempt to replace it. The low water is imposing a severe handicap to the present spawners as some of these fish are unable to reach their spawning grounds. Some of the areas where redds were dug this spring to determine over-wintering mortality of eggs and fry were completely dry.

The escapement of red salmon into the study area was considerably below that of last year. A total of 122 salmon was counted on the spawning grounds with another 100 estimated in the old impoundment waiting for higher water levels. This same area last year contained nearly 1,000 red salmon.

Brown bears were observed chasing the spawners. At the present water levels, these fish have little chance of evading the bears and gulls.

Age determinations of red salmon smolts collected in the Hidden Creek beaver impoundment were received from Dr. DiCostanzo of the Auke Bay Laboratory of the Bureau of Commercial Fisheries. The age-length correlation of this sample was as follows:

Fork length	Age
137mm	1
138	1
140	1
144	11
150	1
155	1
164	11
166	11
210	11
214	11
241	11
253	11

Dr. DiCostanzo notes that the larger fish, 210mm and above, possessed considerable growth beyond their last winters check.

Aerial Beaver Survey

Results of the 1963 aerial survey are shown in Table 1 in comparison with the 1962 survey results.

Table 1. Beaver activitiy per mile of stream surveyed - 1962 & 1963

	1962			1963		
Beaver Activity	No.	No. Miles Surveyed	No./Mile	No.	No. Miles Surveyed	No./Mile
Active Lodges	27	240	1/8.9	32	297	1/9.3
Inactive Lodges	13	"	1/18.4	7	"	1/42.3
Active Dams	38	"	1/6.3	94	"	1/3.1
Inactive Dams	27	"	1/8.9	50	"	1/5.9

Individual drainages showing an increase in numbers of active lodges in 1963 include Nickolai Creek, Moose River system, Chickaloon River and Swanson River (Table 2).

The 1963 beaver population, as indicated by numbers of active lodges per mile, shows no significant change from that of 1962 (Table 2). At the same time the number of active and inactive dams have doubled. There are a number of factors that might explain this situation. Probably the primary factors being the lack of defined survey boundary on each drainage, different observers and the time of year surveyed.

The 1963 survey was made nearly a month later than the 1962 survey. However, what effect this might have is unknown as the time of optimum survey conditions can vary from year to year depending, primarily, on climatic conditions.

Survey routes for each drainage were mapped during the course of the 1962 survey, but the exact starting and stopping points were not available for this year's survey. Hence, the 297 miles flown in 1963 as versus 240 miles in 1962.

It is expected that with experience this survey will become more accurate and provide a good basis for beaver management. Suggestions to aid in improving the accuracy of these surveys include: correlation of aerial surveys with those made by foot and boat; marking each lodge and dam (indicating if active or inactive) on a large scale map; stratify each drainage as to the amount of beaver habitat, thus determining the numbers of beaver colonies per mile of habitat type

Table 2. Distribution of active and inactive beaver lodges on the major drainages of the Kenai National Moose Range 1962-1963

Drainage	Lodges - 1962			Lodges - 1963		
	Active	Inactive	No. Miles	Active	Inactive	No. Miles
Moose Creek	0	0	11	0	0	10
North Fork Indian Cr.	0	0	7	0	0	7
South Fork Indian Cr.	0	0	6	0	0	8
Bear Creek	0	0	7	1	0	14
Nickolai Creek	0	1	16	4	2	28
West Nickolai Creek	1	0	5	0	0	7
Fox Creek	0	0	2	0	0	4
Funny River	0	0	23	1	1	26
Killey River	3	0	26	3	0	29
Upper Russian Creek	0	0	4	0	0	5
Russian River	0	0	6	0	0	6
Skilak Glacier Flats	4	0	7	4	0	9
Hidden Creek	1	0	3	0	1	3
N. Fork Moose River*	4	1	14	4	2	16
E. Fork Moose River	4	0	9	5	0	11
W. Fork Moose River	0	0	4	1	0	4
Chickaloon River	0	0	31	2	0	30
Pincher Creek	1	0	5	0	0	16
Bedlam Creek	0	1	4	0	1	6
Miller Creek	0	0	3	0	0	4
Swanson River	0	7	32	3	0	34
Bishop Creek	5	3	8	3	0	8
Beaver Creek	4	0	7	1	0	12
	27	13	240	32	7	297

*Omitted in 1962 report.

RECOMMENDATIONS

PROPOSED BEAVER MANAGEMENT PLAN FOR THE KENAI NATIONAL MOOSE RANGE

A beaver management plan on the Kenai National Moose Range should be designed to consider not only the beaver itself, but the beaver's effect upon the environment and in turn this environmental effect upon other wildlife forms; principally the anadromous fishes, fur bearers, and moose.

At the present time, the beaver's primary value probably lies in its ability to modify environment. Its former importance as a valuable fur bearer is now secondary. However, the trapping aspect should not be overlooked as it still affords income and recreation to the local populace. The beaver also has a very real aesthetic value, which will become even more important with increased public use of the Moose Range. With the exception of where salmon are blocked from their spawning areas, the dam building and creation of impoundments by beaver is of beneficial value. In areas where there are no fish runs, beaver activity should be encouraged.

The salmon runs in Cook Inlet are a valuable resource with an estimated case pack value in excess of two million dollars. Drainages on the Moose Range make a substantial contribution to spawning and rearing areas for these fish. The Kenai and Kasilof drainages contain approximately 55% of the spawning area for Cook Inlet red salmon.

Those drainages on the Moose Range containing large salmon spawning areas should be managed primarily for this resource. Therefore, in initiating a beaver management plan, one of the first steps should be to designate those drainages on the Moose Range to be of primary importance for salmon. Beaver occurring in these areas would be of secondary importance and should be removed when found interfering with the salmon runs.

THE EFFECT OF BEAVER DAMS AND IMPOUNDMENTS

On Habitat for Moose, Waterfowl, and Fur Bearers.

A pond created by the construction of a beaver dam across a stream results in flooding of the area and an increase of "edge" and water area. In most cases this has the beneficial effect of providing habitat for various aquatic plants and such high moisture requiring vegetation as sedges, rushes, willows, etc.

Flooding may also drown out undesirable stands of mature woody plants. This creates an environment that is highly attractive to moose, waterfowl, and fur bearers such as mink and muskrat. With time, if the dam stays in place, a gradual filling occurs and a meadow is formed. Until succession in the meadow reaches a climax stage of woody plants, the area will remain a source of food for moose.

On Salmon

Beaver dams and impoundments can have either beneficial or detrimental effects upon salmon streams, depending primarily upon the species of salmon utilizing the stream. The Moose Range streams are utilized by all five species of Pacific salmon: red salmon (Oncorhynchus nerka), king salmon (O. tschawtscha), chum salmon (O. keta), pink salmon (O. gorbuscha) and silver salmon (O. kisutch). Due to the timing of the runs and the location of their spawning grounds on the Moose Range, not all species are similarly affected by dams. Red salmon are the most likely to be effected as their runs generally occur in late July, August, and early September when water levels are likely to be low. The red salmon is the most important species on the Range both in numbers and in value. The Kenai River and its drainages alone support an estimated 27% of the Cook Inlet red salmon escapement, valued at $606,000 annually.

Pink and chum salmon generally utilize spawning grounds close to salt water and are not likely to be confronted with beaver dams. King and silver salmon enter the spawning streams in early spring or late fall when water levels are high and they are usually able to negotiate all but the most formidable dams.

1. Beneficial Effects of Beaver Dams and Impoundments
   A. Nursery areas for young salmon: red, king, and silver salmon young may spend up to three years in fresh water before starting their migration to the sea. Usually this time is spent in lakes or ponds below the spawning grounds. On the Moose Range, young salmon were found in all beaver ponds sampled that were located on a salmon stream. Smolts up to the age of two plus years were recovered in one pond. All ponds checked were well within the tolerance range of young salmon for temperature, dissolved oxygen and pH.
   B. Stabilization of water flow: during periods of low precipitation, beaver impoundments may provide a continuing flow of water. In some instances adequate water levels over an upstream spawning ground may be maintained by a beaver dam.

2. Detrimental Effects of Beaver Dams and Impoundments

A. Prevent salmon from reaching spawning grounds: this occurs generally only when water levels are low or the dam is so well constructed, or silted in as in the case of old dams, that little or no water is flowing over, around or through the dam. Dams that are low or loosely constructed serve as only minor obstacles. These dams are passed either by burrowing through the dam, jumping over the spillway or going around via any existing channel.

B. Delay migration: the fish may be delayed by a dam for such a period that their spawn becomes over ripe resulting in decreased fertility.

C. Mechanical injury: salmon will continue to attempt to jump or burrow into a dam as long as they are able. In so doing they are inflicted with numerous wounds and abrasions. These wounds frequently become infected and result in the death of the individual.

D. Susceptability to predation: a large school of salmon splashing in the shallow waters below a dam soon attracts such predators as bears, gulls, and eagles. Under these circumstances the fish are easy prey.

E. Spawning below an impassible dam: spawning below a dam was not observed; however the following results might be expected:
   1. Overcrowding and superimposition of redds.
   2. Spawning on low quality areas such as unsuitable gravel, insufficient waterflow to keep eggs from freezing in winter, etc.
   3. Possibility of dam washing out and either scouring out eggs or covering them with a layer of silt.

THE CONTROL OF BEAVER DAMS

Beaver dams forming a complete barricade to migrating salmon should be removed. The best time for the removal of dams would be after the young salmon have hatched and prior to the arrival of the adults. On the Moose Range this would normally be in early summer, between the first of May and the last of June. During this period a dam could be safely removed with dynamite. Past experience has shown that a dam blown from bank to bank is seldom replaced. As dam building activity usually reaches a peak in fall, a dam blown in early summer would probably remain open long enough for the adult salmon to reach the spawning ground. Under normal circumstances the young salmon have little difficulty in passing downstream over a dam.

Should a dam be discovered with adults enroute to their spawning grounds at its base, the best procedure would be to pull the dam by hand. Care should be exercised in pulling a dam so as to prevent a rapid out-rush of water. A large head of water suddenly released from a beaver pond will carry with it large amounts of silt and debris. The action of the rushing waters can scour out gravel, ruining spawning beds and leaving heavy deposits of silt. A rapid lowering of water level can also cause fish to become stranded in shallow ponds.

The recommended method of removing a dam by hand is to lower the water gradually by making several small holes in the dam. These holes should be made in the wings of the dam as well as at the channel of the stream.

BEAVER MANAGEMENT

The first step in initiating an active beaver management plan on the Moose Range is to determine the size of the beaver population. This can be readily accomplished by aerial surveys in which the numbers of active lodges are counted and this figure multiplied by four--the average number of beaver per lodge (average number of beaver in interior Alaska lodges and should be checked for Kenai). For best results these surveys should be conducted annually, preferably in the fall after freezing weather has cleared much of the summers plant and leaf growth and has lowered water levels. At this time occupied lodges are evidenced by fresh cuttings on lodges, dams, and feed piles.

Beaver surveys on the Moose Range will be conducted on two main habitat types--streams and lakes. Consequently certain techniques will differ with each type of habitat. The following suggestions are recommended for lake and stream surveys:

1. Stream Surveys
   Initial surveys along the primary salmon producing streams and the larger non-salmon streams have disclosed certain criteria which should be adhered to for maximum accuracy:
   A. Survey routes with well-defined starting and termination points should be drawn on a map and these exact routes should be followed each year.
   B. Only streams with suitable beaver habitat should be considered for each survey. And only those portions of each stream that contain beaver habitat should be surveyed.

C. If possible, streams selected for beaver survey should have had a preliminary survey by boat or foot. This ground count would be for the purpose of locating and noting on a large scale map all active and inactive lodges and dams.
D. Insofar as it is possible the surveys should be conducted in the same manner each year i.e., same observer, type of aircraft, time of year, etc.

2. Lake Surveys

No lake surveys were conducted during the 1961-63 study period, consequently the following proposed methods of survey will be in the form of recommendations.
With the large number of lakes and ponds on the Moose Range, a complete survey would be prohibitive in terms of time and money. Several methods employing the combined use of air and ground counts should be attempted and the most accurate and efficient selected. Suggested methods include:

A. Stratified random sample: lakes would be stratified as to size i.e., less than 5 acres, more than 5 but less than 20 etc. and by location i.e., lakes north of the Kenai River and lakes south of the Kenai River. These are only arbitrary stratifications and there are perhaps others that should be considered.
B. Line or circular transects: due to the large number of lakes an adequate sample could probably be obtained by surveying every fourth or fifth lake bisected by the transect line. Where possible, it would be desirable to land on each lake to accurately determine if the lodge or lodges are active or inactive and record this information on the survey map.
C. Plot sampling: sections representative of the various vegetative types should be selected and all lakes within the boundaries of this plot surveyed. Knowing the relative area of each vegetative type it would be possible to estimate the numbers of beaver on each type.

Classification of Management Areas for Beaver and Salmon

A necessary step in establishing a beaver management plan is the classification of areas or drainages where beaver are beneficial and should be encouraged.

Drainages heavily utilized by salmon should be classified of primary importance to this resource and managed accordingly. The

main drainages of salmon production are well known and could be immediately designated as such. These areas and the salmon species present are listed below:

MOOSE RANGE WATERS OF PRIMARY IMPORTANCE FOR SALMON PRODUCTION

System	Portion utilized for spawning	Species of salmon
Kenai		
Moose River	East Fork	Red and silver
Hidden Creek and Lake	Entire*	Red, silver, king
Russian River	Entire	Red, silver, king, pink
Kasilof		
Bear Creek	Lower 2/3	Red
Moose Creek	Lower 2/3	Red
Seepage Creek	Entire*	Red
Nickolai Creek	Unknown	Red
Chickaloon River	Entire*	Red, silver, king, pink
Mystery Creek	Middle 1/2	Red, silver, pink
Swanson River	Lower 1/2 ?	Red, silver, pink
Bishop Creek	Entire	Red, ?

*Spawning occurs primarily near headwaters, hence entire stream must be free of obstructions.

Other Moose Range streams containing smaller runs of salmon and of lesser importance due to size or characteristics of the run include:

System	Species
Beaver Creek	Red, king, silver
Bedlam Creek	Steelhead
Skilak Glacier Streams	Red, silver
Killey River	King
Funny River	King

Periodic stream surveys should be conducted on the above streams to determine if classificiation as a primary salmon resource stream is warranted.

Certain sections and tributaries of those streams classified as being of primary importance as salmon producers, are not utilized by salmon. Beaver in these unused areas would not be harmful as long as they were permitted to move into or block off salmon spawning grounds.

As a start all those streams not designated as being salmon streams could be considered to be of value to beaver. With continued censusing it should be possible to determine the relative value of each of these drainages by their ability to support beaver populations, value of fur produced or for aesthetic value.

REGULATION OF BEAVER NUMBERS

The most satisfactory method of regulating beaver numbers is by licensed trappers during the established trapping season. Presently trapping effort on the Moose Range is relatively light; however, some of the more accessible areas along the road system are rather heavily trapped. From the viewpoint of management and aesthetics, it would be advisable to encourage trappers to direct their efforts away from the roads. This might be accomplished by advising the trappers where there are beaver populations that could withstand trapping. Another possible approach would be to assign trappers to certain areas or drainages. A closed area adjacent to the road could be established, thus protecting beaver where they could be enjoyed by campers and photographers.

As more information is obtained through beaver censusing it should become apparent which areas or drainages can withstand trapping pressure. With this data a logical step would be to manage these populations as separate units, by establishing limits or quotas for each area.

As beaver will leave an area when the available food supply is exhausted, a trapping program designed to keep the population in line with their food supply would aid in maintaining a relatively constant population over a large segment of the Range.

At times nuisance beaver will be encountered. These animals can be removed by live-trapping, destroying or by permit trapping. If time and money are available and if there is an area where it would be desirable to establish beaver, then live-trapping would have merit. If this is not the case, the most expeditious method would be to trap or shoot the offending individuals. If several beaver are involved then it might be advantageous to issue a special trapping permit to some responsible individual for their removal.

SUMMARY OF RECOMMENDATIONS

1. Streams and rivers known to contain major spawning areas should be designated as being of primary importance to this resource. The Moose Range systems recommended for this designation include: East Fork of Moose River, Hidden Creek, Russian River

system, Bear Creek, Moose Creek, Seepage Creek, Nickolai Creek, Swanson River and Bishop Creek. These streams are primarily red salmon streams as this species of salmon is most commonly found in conflict with beaver dams.

Those beaver found building dams that block the fish runs on these systems should be removed.

2. The fall survey of active and inactive beaver lodges should be continued as a permanent part of the Moose Range surveys. However, the area surveyed should be modified to include only that which contains beaver habitat.

   A survey to determine the numbers of pond beaver should be established and made a part of the regular fall beaver survey.

3. The beaver population should be controlled by trappers during the regular season. Beaver in areas receiving high public use, as around campgrounds or near road systems should be protected for their aesthetic value.

   The concentration of trappers in any one area should be discouraged. This might be accomplished by giving area permits or establishing a system of registered trap lines.

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 4 TITLE: Growth & Development of Waterfowl

PERIOD COVERED: July 1, 1963 - June 30, 1964

ABSTRACT

Broods were color marked by injecting dye into the eggs so that known age broods could be identified and their rates of growth and plumage development recorded. Nest predation and mobility of broods greatly reduced the number of broods that could be followed through their complete development. Canvasbacks attained flight at 47 to 50 days. Buffleheads were flying after 40 days and Lesser Scaup were in Class 11B after 30 days. This indicates a faster rate of plumage development for the Canvasback when compared with rates observed at lower latitudes.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 4 TITLE: Growth & Development of Waterfowl

PERIOD COVERED: July 1, 1963 - June 30, 1964

OBJECTIVES

To determine the rates of growth and plumage development of various species of dabbling and diving ducklings.

To compare these rates with those already determined at lower latitudes.

TECHNIQUES

Nests were located by systematically searching edges of ponds, lakes, and rivers. Approximate dates of hatching were estimated for each nest by candling the eggs. A short time prior to hatching, the eggs of each nest were injected with dye. Fast Green FCF, Brilliant Blue FCF, and Crocein Scarlet MOO were used. The actual date of hatching of each clutch was recorded and when possible the development of the plumage of the ducklings was recorded.

Attempts at periodic capture of ducklings were unsuccessful so occasional specimens were collected from known age broods.

A record was kept of size and plumage class of all broods observed. In some cases, broods were observed over a sufficiently long period of time that the the length of time spent in a particular plumage class could be determined even though the actual age of the brood was not known.

Attempts at capturing the hen and brood on the nest at the time of hatching were for the most part successful with Lesser Scaup.

No attempts were made with any other species. This technique will be used in the future and the broods will be placed on a holding pond.

FINDINGS

A total of 63 nests was found. This included 13 Canvasback, 27 Lesser Scaup, 5 Bufflehead, 5 Baldpate, 4 Green-winged-Teal, 6 Pintail, and 3 Mallard nests. Of these, only 16 clutches were known to hatch. This was due primarily to predation by black bears. Disturbance of the area around the nests including defecation on or near the nest by the hen when flushed undoubtedly increased the incidence of predation considerably. Other factors which reduced the number of successful nests were other predators, possibly raven and red fox, desertion and injection of the eggs too early in incubation.

Very little mortality of embryos occurred when they were injected within four days of hatching. Best results were obtained when the head and bill were visible in the air space of the egg before the dye was injected. All marked broods could be easily recognized however, under certain conditions ducklings dyed with Brilliant Blue FCF were difficult to distinguish from ducklings dyed with Fast Green FCF.

In most cases, colored broods were too mobile to be followed throughout their entire development. Due to lack of nesting success and brood mobility, no reliable data were collected for any of the four species of dabbling ducks.

Canvasbacks exhibited a faster plumage development rate than observed in southern Manitoba. They attained flight at 47 to 50 days. This is between one and two weeks faster. Specimens collected were not noticeably heavier than those of the same age in Manitoba. The most noticeable increase in plumage development rate appeared to be in class 11 ducklings; however, no actual measurements of feathers were made because of the difficulty of catching wild ducklings.

Buffleheads were able to fly after about 40 days. There is no comparable data from lower latitudes. However, this is not much different from other species of similar size at the lower latitudes.

Lesser Scaups were in class 11B after 30 days. This is the same as observed in South Dakota and in the Northwest Territories.

A search of the literature was conducted and plans have been made to use several different techniques which should restrict the movements of broods and reduce the effect of bear predation on nests.

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 5 TITLE: Population Ecology of the Harbor Seal

PERIOD COVERED: July 1, 1963 - June 30, 1964

ABSTRACT

Between 18 June and 1 November data on 103 harbor seals were collected in the Aialik Bay area, west of Seward, Alaska.

Pupping in the Aialik Bay area was over before 18 June, but nursing continued as late as 4 July. Moulting seals were observed as early as 11 July and as late as mid-September.

Embryos collected in the last week of October ranged from four to eight weeks old. The development of two fetuses from seals collected early in November in the Bering Sea indicate that the annual reproductive cycle of harbor seals in the Bering Sea is advanced relative to that of seals in the Gulf of Alaska. Preliminary age estimates of harbor seals based on dental annuli correlated well in a general way with body sizes.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 5 TITLE: Population Ecology of the Harbor Seal

PERIOD COVERED: July 1, 1963 - June 30, 1964

OBJECTIVES

Devise and implement a reliable and practical age determination technique.

Determine the annual reproductive cycle and obtain an estimate of population productivity.

Determine the post-natal growth pattern.

TECHNIQUES

During the summer and fall (1963), emphasis was placed on collecting biological specimens and measurements. Specimens were acquired by hunting alone from a skiff or by accompanying commercial seal hunters on their hunts.

Total weight, standard length, combined hind flipper span, and blubber thickness measurements were taken from each seal. Reproductive tracts (♀) were examined fresh, then preserved in either AFA or formalin; later AFA was used for all reproductive material. The lower right canine tooth was routinely collected for age determination, but additional canine teeth were occasionally collected for comparison. Stomachs were routinely checked for food, and the degree of round worm infection in the stomach was noted. Pelage condition (if moulting, and degree of moulting) was noted.

Essentially the same information will be collected during the 1964 field season (April to August), but the operation will be largely land-based to facilitate direct observations of relatively undisturbed seals, and to simplify processing.

FINDINGS

By the 18th of June, harbor seals in Aialik Bay, west of Seward, had finished pupping. Nursing continued as late as 4 July, when one nursing pup was taken. By 1 July most pups were by themselves or in small groups scattered widely about the ice pack. No field evidence was obtained on the breeding season and analysis of reproductive material is incomplete at this time.

A mature female seal was beginning to moult when taken on 11 July, and two seals taken during the second week in August were moulting heavily. A seal taken about 15 September was moulting. Thus the moulting season may extend from the second week in July to about mid-September.

A collection of 52 seals taken during the last week in October yielded four pregnant females which contained embryos ranging from approximately four to approximately eight weeks old. The advanced development of two fetal harbor seals taken in the Bering Sea in early November indicate that the annual reproductive cycle in the Bering Sea is considerably advanced compared to that of seals in the Gulf of Alaska.

A small sample of teeth was saw-sectioned and polished for use in age determination. Preliminary estimates of age using dental annuli correlated well in a general way with body size.

Data on reproductive material and age determination are presently incomplete.

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 6 TITLE: Growth and Nutrition of Northern Mammals

OBJECTIVES

To determine the characteristics of growth and the physiological status of arctic and subarctic mammals under varying nutritional regimens and environmental conditions.

TECHNIQUES

This job was inactive during the reporting period.

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 7 TITLE: Bird and Mammal Populations and Distribution

PERIOD COVERED: July 1, 1963 - June 30, 1964

ABSTRACT

Pelage characteristics of 24 red squirrels (Tamiasciurus hudsonicus) of known sex and age were examined as possible criteria to enable separation of wild-caught live juveniles and adults during the fall and winter. Very little correlation was found to exist between pelage characters (dorsal stripe, lateral line, development of ear tufts and degree of furring of the feet) and age among the squirrels examined.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-5 TITLE: Alaska Wildlife Investigations

WORK PLAN: L TITLE: Wildlife Research Unit Studies

JOB NO.: 7 TITLE: Bird and Mammal Populations and Distribution

PERIOD COVERED: July 1, 1963 - June 30, 1964

OBJECTIVES

To continue the collection of data and specimens in connection with problems where opportunity for information acquisition is extremely slow, of an unexpected nature and not associated with major projects.

TECHNIQUES

Fourteen female and ten male red squirrels, divided approximately equally between juveniles and adults were held in captivity partly in conjunction with other studies. The squirrels were fed a standard ration of laboratory chow and were housed in outdoor enclosures since their capture. Characteristics of the pelage were examined and recorded in mid-October and again in late December of 1963.

FINDINGS

In most experimental work with red squirrels it is desirable to know if the squirrels used are adults or young-of-the-year. After about 1 November, by which time most of the season's young have reached adult size, the adults and young-of-the-year look remarkably alike. With the hope of determining a method of distinguishing between the two age classes, it was decided to observe closely several prominent pelage characteristics of known-age red squirrels (dorsal red stripe, black lateral line, ear tufts, and fur on the feet), once in late fall and again in mid-winter.

It is clear that with respect to the gross aspect of the dorsal red stripe, the black lateral line, ear tufts, and fur on feet there is marked overlap between adults and young-of-the-year both in late fall and in mid-winter. On 12 October 63 five of the six juveniles had "distinct" dorsal red stripes as did four of the six adults. On the same date the black lateral line of one young-of-the-year was recorded as being "obscured," and two others were recorded as having black lateral lines "partially obscured" and "fairly distinct," respectively; while of the six adults the black lateral lines of two were "obscured," those of another were "partially obscured," and those of three others were "fairly distinct." On 21-23 December 63 the dorsal red stripe of the two of the six juveniles was recorded as "average," while that of three of the six adults was also recorded as "average." During the same period the black lateral lines of four of the six juveniles and all six of the adults were recorded as being "well obscured." The ear tufts and foot fur demonstrated even more overlap than did the dorsal red stripe and the black lateral line.

Since on 23 December 63 the black lateral lines of all six of the known adults were "well obscured" and those of only four of the six known juveniles were "well obscured" (the black lateral lines of the other two juveniles were "partially obscured"), it could be that future study will demonstrate that a red squirrel caught in the winter and having only partially obscured black lateral lines can be assumed with certainty to be a young-of-the-year. It is suggested that this possibility be followed up and that the search be continued.

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