BACKGROUND: FISH AND WILDLIFE STUDIES RELATED TO SUSITNA RIVER HYDROPOWER PROJECT

Beginning in the 1950's, the U.S. Fish and Wildlife Service has conducted preliminary investigations of the fish and wildlife species in the Susitna basin region and its tributaries. The reconnaissance studies were in response to the potential for hydropower development in the upper basin. Additional studies have been conducted by the Alaska Department of Fish and Game to collect baseline aquatic, biological and water quality/quantity data in the Devil's Canyon/Watana project area.

The following paragraphs summarize the preliminary U.S. Fish and Wildlife Service reports of the Upper Susitna Basin.

SUMMARY OF REPORTS AND STUDIES

1. U.S. Fish and Wildlife Service, A Preliminary Statement of Fish and Wildlife Resources of the Susitna Basin in Relation to Water Development Projects; 1952. Not Listed

2. U.S. Fish and Wildlife Service, A Progress Report on the Wildlife Resources of the Susitna Basin; 1954.

This report is a genesis for future evaluation, and includes average harvest and monetary value of species by calculating the game harvest of the Susitna Basin as a percentage of the total Alaska game harvest.

3. U.S. Fish and Wildlife Service A Progress Report on the Fishery Resources of the Susitna River Basin; 1954. — NOT LISTED

In 1956, the Bureau of Reclamation resumed detailed feasibility studies of the Devil Canyon, Denali and Vee Canyon dam sites. In order to keep pace with their investigations, the Fish and Wildlife Service began detailed studies of project affects. The result -- three more progress reports, 1956, '57 and '58 field investigations.

4. U.S. Fish and Wildlife Service, Progress Report, 1956 Field Investigations Devil Canyon Damsite, Susitna River Basin: 1957.

This report includes stream surveys of tributaries downstream from Devil Canyon, and of Jay Creek located upstream. Information is very general for Gold Creek, Indian River, Jack Long Creek. Portage Creek and Devil Canyon. The objective of this study was to determine the extent anadromous species utilize the watershed and the magnitude and distribution of resident fish populations. Work during the 1956 field season was devoted to test netting.

5. U.S. Fish and Wildlife Service, Progress Report, 1957 Field Investigations Devil Canyon Damsite and Reservoir Area, Susitna River Basin; April 1959.

This report includes investigation of the streams upstream of the proposed Devil Canyon damsite, from Deadman Creek to Jay Creek. Gill nets were set to survey the species and location of the anadromous and resident fish populations.

6. U.S. Fish and Wildlife Service, 1958 Field Investigations, Denali and Vee Canyon Damsites and Reservoir Areas, Susitna River Basin: June 1959.

The report includes information on trapping pressure, game harvest, stream surveys, fish collections on the lower sections of most streams, and aerial inspections to count game.

In 1960 and 1965 the Fish and Wildlife Service prepared detailed reports under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). These reports are annotated in detail in the Wildlife Section of this Bibliography. They are as follows:

7. U.S. Fish and Wildlife Service, A Detailed Report on Fish and Wildlife Resources Affected by the Devil Canyon Project; May 1960

8. U.S. Fish and Wildlife Service, A Detailed Report on Fish and Wildlife Resources Affected by the Vee Project; February 1965.

UNITED STATES DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service
Office of the Regional Director
Juneau, Alaska

A Preliminary Report on Fish and Wildlife Resources in Relation to the Susitna Basin Plan, Alaska

Location	:	Third Judicial Division, Alaska
Sponsor	:	Bureau of Reclamation, Alaska District Office, Juneau
Sponsor's Status of Project	:	Basin Survey Report
Source of Engineering Data	:	Bureau of Reclamation
Field Investigation	:	February - May, 1952
Report Prepared	:	June, 1952

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PREFACE

1. The Fish and Wildlife Service is authorized under Public Law 732, 79th Congress (the amended Coordination Act) to investigate all Federal water-development projects to determine their effect on fish and wildlife. The law requires that recommendations based on these investigations shall be made an integral part of any report submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects. The Fish and Wildlife Service directs its investigations of water developments toward three goals: (1) prevention of loss or damage; (2) mitigation of losses; and (3) enhancement of values.

In Alaska specific authority is also conveyed by the White Act, approved June 6, 1924, which provides in part as follows:

> "Sec. 3. That it shall be unlawful to erect or maintain any dam _____ in any of the waters of Alaska at any point where the distance from shore to shore is less than one thousand feet ____ with the purpose or result of capturing salmon or preventing or impeding their ascent to the spawning grounds _____."

2. Long-standing recognition that the primary use for salmon streams is for maintenance of the fishery--Alaska's number one basic industry--makes it imperative to examine closely any proposed conflicting uses. Outside of Alaska there are streams where uses such as navigation, power production or irrigation have long been recognized as priority uses. In Alaska the reverse is true and development affecting the fishery have a direct significance in the basic economy of the territory.

3. This is a preliminary report based on the Bureau of Reclamation's basin-type report titled "Susitna River Basin," dated June 30, 1952. This report considers primarily the Devil Canyon Dam--the one most likely to be constructed in the near future. Secondarily, comments are included relating to the other dams proposed--those included in the long-range plan but not proposed for immediate construction.

4. The Fish and Wildlife Service should be advised of any alterations in the proposed plans so that the effects on fish and wildlife resources may be considered.

5. Studies of a preliminary nature have been conducted on the present fish and wildlife resources of the Susitna River Basin. Because of the limited available information on the present fish and wildlife resources, an additional period of study should precede the initiation of any development in order that a complete

analysis of the project's effects may be made and necessary measures devised to prevent loss or damage to fish and wildlife resources.

6. The investigation reported could not have been performed without the generous assistance of many interested persons and agencies.

DESCRIPTION OF THE PROPOSED PROJECT

1. The Bureau of Reclamation has under study a plan extending full hydroelectric development to the entire Susitna River Basin. This plan would impose a series of 19 potential damsites of which only the hydroelectric project on the upper Susitna River is under consideration for the immediate future. These dams are listed in Table I.

2. The power damsite, known as Devil Canyon, is approximately 3 miles above the confluence of Portage Creek at river mile 134. The information supplied by the Bureau of Reclamation indicates that the dam will be a concrete arch-gravity structure with an approximate height of crest above stream bed of 500 feet. It will have side channel spillway equipped with six 36'x50' radial gates, with an approximate initial power plant capacity of 232,000 kw.

3. The approximate stream gradient at the proposed damsite is 19 feet per mile. Drainage area above the proposed damsite is 5,830 sq. miles. Engineering data on the Devil Canyon reservoir can best be illustrated in the following manner.

	Max.	Min.	Avg.
Capacity (100 AC.-F.*)	2,510	616	2,020
Acra (Acres)	15,200	6,400	13,400
Depth at Dam (Ft)	492	291	455
Length (Miles)	26	14	24
Average width (Ft)	4,800	3,800	4,600

*These amounts include reduction in capacity to allow for estimated sediment deposition over a 100 year period, assuming no upstream reservoirs on the main stem.

Note: The above data are based on initial development of only Devil Canyon Reservoir and Power Plant.

Rev. 5-23-52

TABLE I

BASIC DATA ON SUSITNA RIVER BASIN

FOR USE BY THE FISH AND WILDLIFE SERVICE

Site	Stream	River Miles Above Mouth of Susitna River	Approx. Stream Gradient At Site (ft/mi)	Drainage Area Above Site (sq. mi.)	Approx. Res. Area At Max. Wat. Surf. (acres)	Approx. Res. Length At Max. Wat. Surf. (miles)
Denali	Susitna R.	242	8	1,240	84,000	32
Vee	" "	200	14	4,180	23,000	31
Watana	" "	165	10	5,210	15,400	32
Devil Canyon	" "	134	19	5,830	15,200	26
Olson	" "	131	10	6,020	210	3
Susitna Station	" "	22	2	19,300	106,000	16
Tyone	Tyone R.	244	2	440	30,000	24
Partin	Chulitna R.	134	23	960	1,040	5
Lucy	" "	127	18	1,030	2,500	7
Tokichitna	" "	97	9	2,560	45,000	13
Trapper	Talkeetna R.	123	34	720	3,600	8
Greenstone	" "	117	58	800	1,000	6
Granite Gorge	" "	112	43	830	650	5
Keetna	" "	101	18	1,240	4,700	11
Bearpaw	" "	95	12	1,720	4,400	6
Sheep River	Sheep R.	108	14	390	4,600	15
Skwentna No. 1	Skwentna R.	117	25	590	2,200	8
Skwentna No. 2	" "	106	25	1,070	4,900	10
Talachulitna	" "	77	10	2,240	22,000	13

4. The Tyone River reservoir damsite is located a short distance downstream from the outlet of Tyone Lake, at river mile 244. Detailed engineering data are not yet available; however, preliminary information supplied by Reclamation indicates that in the Tyone damsite area the stream gradient is approximately 2 feet per mile. The drainage area above the damsite comprises 440 square miles having an approximate reservoir area at maximum water surface of 30,000 acres. The approximate length of the reservoir at maximum water surface is 24 miles.

5. The Denali reservoir will have a drainage area of 1,240 sq. miles. It will have an approximate reservoir area at maximum water surface of 84,000 acres with an approximate length at maximum water surface of 32 miles. The stream gradient at damsite is 8 feet per mile.

6. Three additional sites are proposed on the main stem of the upper Susitna River above the Devil Canyon site and will undoubtedly be considered for future development when the demand for more power arises.

7. In the long-range plan of extending full hydroelectric development to the entire Susitna River Basin, the Bureau of Reclamation proposes six dams in the Talkeetna watershed; 3 on the Skwentna River; 4 on the Chutetna River and one on the main stem of the Susitna River, 22 miles upstream from its mouth.

8. Engineering characteristics of the proposed dams and reservoir are shown in Table II.

Table II

BASIC DATA ON SUSITNA RIVER BASIN

FOR USE BY THE FISH AND WILDLIFE SERVICE (SHEET 1)
Based on ultimate development of all reservoirs and power plants
(~~Tabulation similar to that shown in the report on Rogue River Basin, Oregon~~)

TABLE NO. II

	Site						
	Denali	Vee	Watana	Devil Canyon	Olson	Susitna Station	Tyone
Location(river miles above mouth of Susitna)	242	200	165	134	131	22	244
Stream	Susitna	Susitna	Susitna	Susitna	Susitna	Susitna	Tyone
Purpose	Storage For Power	Power	Power	Power	Power	Power	Storage For Power
Elevations above m.s.l.							
Full pool	2560	2275	1835	1417	920	140	2388
Min. pool	2360	2090	1670	1195	920	95	2358
Stream surface	2360	1860	1470	925	870	40	2358
Reservoir	-2/						
Full pool capacity (1000a.f.)	5700	2820	2240	2930	5	3450	800
Full pool area (acres)	84000	23000	15200	15200	210	106000	30000
Min. pool capacity (1000a.f.)	0	480	530	640	5	720	0
Min. pool area (acres)	0	6000	6300	5700	210	28000	500
Design							
Dam type	Earth	3/	Concrete	Concrete	Concrete	Earth	Earth
Spillway type	Off-channel, gated	Overflow, gated	Overflow, gated	Offpchannel, gated	Overflow gated	1/	1/
Power plant location	None	At dam	At dam	At dam	At dam	At dam	None
Min. flow below dam (c.f.s.)	0	1/	1/	3500	1/	1/	0

Cont. Table II

BA[illegible] DATA ON SUSITNA RIVER BASIN

FOR USE BY THE FISH AND WILDLIFE SERVICE (SHEET2)
Based on ultimate development of all reservoirs and power plants
~~(Tabulation similar to that shown in FWS Report on Rogue River Basin, Oregon).~~

TABLE NO. II CONT.

	Site						
	Partin	Lucy	Tokichitna	Trapper	Greenstone	Granite Gorge	Keetna
Location (river miles above mouth of Susitna)	134	127	97	123	117	112	101
Stream	Chulitna	Chulitna	Chulitna	Talkeetna	Talkeetna	Talkeetna	Talkeetna
Purpose	Power	Power	Power	Power	Power	Power	Power
Elevations above m.s.l.							
Full pool	1205	1105	625	1610	1410	1210	940
Min. pool	1160	1020	560	1520	1320	1090	790
Stream surface	1105	915	485	1410	1210	940	605
Reservoir							
Full pool capacity (1000 a.f.)	48	131	2550	255	72	64	765
Full pool area (acres)	1040	2500	45000	3600	1000	650	4700
Min. pool capacity (1000 a.f.)	14	12	530	53	16	14	170
Min. pool area (acres)	500	440	18000	1170	330	220	2300
Design							
Dam type	Concrete	Concrete	Concrete	Earth or Rock	Concrete	Concrete	Concrete
Spillway type	1/	1/	1/	1/	1/	1/	1/
Power plant location	At dam	At dam	At dam	At dam	At dam	At dam	At dam
Min. flow below dam (c.f.s.)	1/	1/	1/	1/	1/	1/	1/

Cf. table at #

SIC DATA ON SUSITNA RIVER BASIN

FOR USE BY THE FISH AND WILDLIFE SERVICE (SHEET 3)
Based on ultimate development of all reservoirs and power plants
(Tabulation similar to that shown in FWS Report on Rogue River Basin, Oregon)

TABLE NO. II CONT.

	Site				
	Bearpaw	Sheep River	Skwentna No. 1	Skwentna No. 2	Talachulitna
Location (river miles above mouth of Susitna)	95	108	117	106	77
Stream	Talkeetna	Sheep	Skwentna	Skwentna	Skwentna
Purpose	Power	Power	Power	Power	Power
Elevations above msl					
Full pool	605	1040	1000	810	390
Min. pool	560	880	920	685	345
Stream surface	500	690	825	535	290
Reservoir					
Full pool capacity (1000a.f.)	210	605	142 3/	645 2/	860 2/
Full pool area (acres)	4400	4600	2200	4900	22000
Min. pool capacity (1000a.f.)	60	90	35 2/	210 2/	240 2/
Min. pool area (acres)	2200	1650	1000	2600	11000
Design					
Dam type	Earth	Concrete	Concrete	Concrete	3/
Spillway type	1/	1/	1/	1/	1/
Power plant location	At dam	At dam	At dam	At dam	At dam
Min. flow below dam (c.f.s.)	1/	1/	1/	1/	1/

TABLE NO. II CONT.

BASIC DATA ON SUSITNA RIVER BASIN

FOR USE BY THE FISH AND WILDLIFE SERVICE

Notes

All figures are preliminary and subject to revision.

1/ Data not available at present time.

2/ Includes a reduction in capacity to allow for estimated sediment deposition over a 100-year period.

3/ Combination section of concrete, earth fill, and/or rock fill.

Aerial view of Devil Canyon damsite (lower foreground) and Reservoir area above.

Aerial view of approx. location of Vee Damsite; showing open hillsides, muskeg and spruce cover typical of area.

DESCRIPTION OF THE SUSITNA BASIN

9. The Susitna Basin lies in south-central Alaska, north of the farthest inland projection of Cook Inlet, between latitudes 61° - 64° and longitudes 146° - 153°.

10. The lower is bordered on the south by the waters of Cook Inlet, on the east by the Chugach and Talkeetna mountains, and on the west and north by the Alaska Mountain Range. It has an approximate length of 125 miles and an average width of 60 miles which narrows to the north. The total drainage of the basin comprises 19,300 sq. miles. From the main stem of the river toward the bordering mountains the relief of the lowlands increases, the tributary streams are more deeply entrenched, and the flat and rolling topography of the lowlands gives way to the steeper slopes of the foothills and they in turn to rugged glaciated mountains. The floor of the lowlands is surfaced with glacial deposits and stream gravel and is dotted throughout with numerous lakes.

11. The topography of the headward basin of the Susitna River differs somewhat from that of the lower basin. This area comprises 5,830 sq. miles of predominately mountainous terrain. It is floored with a thick filling of glacial moraines and gravel through which isolated mountains project. It is bordered on the south by the rugged Talkeetna Mountains, on the north by the Alaska Range, and on the east by the flat and inconspicuous Copper River plateau.

12. The main stem of the Susitna River has its source in the Susitna Glacier in the Alaska Range and flows in a meandering southerly direction for approximately 75 miles over a broad alluvial fan and plateau. At the confluence of the Oshetna River its course turns sharply westward

Looking downstream from Devil Canyon damsite, showing rapids and river gorge.

for 75 miles through a narrow continuous canyon incised in a broad high-level valley. The course for the next 125 miles is in a southerly direction through the lower Susitna Basin to Cook Inlet.

13. The principal tributaries head in high mountain glaciers and can be considered as fast flowing streams, excessively turbulent in the headward reaches but considerably calmer in the lower regions.

14. The headwaters of the Yentna River basin have their beginning in the glaciers of the Alaska Range and flows in a general southeasterly direction for approximately 95 miles entering the Susitna River at river mile 24. It is one of the largest tributaries and has numerous clear water feeder streams. Within the watershead are many clear water lakes.

15. The Talkeetna River, which enters the Susitna River 80 miles above its mouth, has its origin in the Talkeetna Mountains.

16. The Chulitna River heads in the Alaska Range and flows in a southerly direction, joining the Susitna at river mile 80.

17. The Oshetna River, one of the principal tributaries of the upper Susitna basin, heads in the Talkeetna Mountains. Its course is in a northerly direction for approximately 40 miles, where it discharges into the Susitna River at river mile 205. It is a swift flowing stream with an average gradient of 45 feet per mile being steepest in the upper reaches and flatter in the lower region.

18. The Tyone River, which discharges into the Susitna at river mile 216, heads in the low and inconspicuous divide between the Copper and Susitna watershed. Its numerous feeder streams are clear slow-moving, draining a multitude of clear water lakes. The main stem flows through

Upper Talkeetna River and Tributary - showing valley topography and spruce-birch forest.

Three of the largest lakes in the entire Susitna Basin: Louise, Susitna and Tyone.

19. The Maclaren River heads in the glaciers of the Alaska Range. Its course is in a southeasterly direction and discharges in the upper Susitna at river mile 228.

COMMERCIAL FEATURES

20. The Alaska Railroad is the only overland means of transportation through the Susitna River Basin. The McKinley Park-Paxson Highway, presently under construction, will pass through the headward portion of the Upper Susitna Basin. Access to remote portions of the Basin is managed either by air travel or by the fast-dying dog team method.

21. The population of the Basin is chiefly concentrated along the railbelt with scattered settlements of trappers and miners throughout the entire Basin. The proposed project site is located approximately midway between Anchorage and Fairbanks, the two largest cities in the Territory.

22. Most of the Susitna Basin is unappropriated, unsurveyed, public lands.

23. The economic activities are chiefly in the lower 120 miles of the basin along the railbelt. The commercial fishery tapping the Susitna salmon runs is located in Cook Inlet. Placer gold, lode gold, tungsten and construction materials are produced in this area, but only in small quantities. Coal and other minerals are present but have received little attention. Portions of the lower basin are suited for agriculture but have not seen development as yet.

GEOLOGY

24. The Alaska Range to the west and north and the Talkeetna Range to the east make up the high perimeter of the Susitna River Basin. The Alaska Range is made up of Paleozoic and Mesozoic sediments some of which have been metamorphosed in varying degrees and intruded by granitic masses. The

Talkeetna Mountain Range with peaks up to 8,000 feet is made up of a granitic batholith rimmed on the Susitna Basin side by graywackes, argillites and greenstones. Much of the interior portion of the Basin is made up of fluvial-glacial overburden materials which were deposited in advance of the great "Rivers of Ice" which carved the broad "U" shaped valleys through which its rivers now flow. These materials overlie the Tertiary sediments composed mainly of shale and sandstones with interbedded coals and lap the Paleozoic and Mesozoic sediments and lava flows making up the lower reaches of the mountain perimeter.

VEGETATION

25. The vegetation of the Susitna Basin is largely determined by the climatic and geographic conditions. The floor of the lower basin is covered with forests interspersed with low muskeg vegetation. The higher benches are timbered, with occasional glades covered with redtop grass. The mountain slopes are occupied by a dense growth of trees up to the elevation of approximately 2,000 feet. Above the timberline there are scattered thickets of alders and willows in large widespread meadows of luxuriant redtop grass which often attains the height of 6 feet. Above this zone the surface is mostly devoid of vegetation except for moss, lichens and flowers. Spruce, birch, aspen, cottonwood, willow and alder are the most common trees that are to be found in abundance in this region.

26. The common undergrowth of the forested areas consists of moss, ferns, indian paint berry, high and low bush cranberry, devils club, wild rose, buckberry, blueberry, huckleberry, currants, grass and wild flowers which grow in abundance.

27. The vegetation in the upper Susitna Basin differs somewhat from that of the lower Susitna Basin. The timber line is higher - ranging

Aerial view of the Chulitna River showing typical vegetation common to this section of basin.

Whistling Swan - **Yentna** and Skwenta Area

from 2,500 to 3,000 feet in elevation. The lowland, of swampy or poorly drained gravel flats, is covered with scrubby low spruce trees. In a few valleys of the tributaries the spruce trees grow larger, up to 2½ feet in diameter. Some birch, willows and alders are present in scattered localities but are not considered abundant. Redtop and bunch grass are present, but only in a scattered state along well drained benches. Much of the Basin is covered with muskeg and tundra.

CLIMATE

28. The climate of the Susitna Basin is definitely diversified. The latitude of the region gives it long winters and short summers and a great variation in the length of the day between winter and summer.

29. The Lower Susitna Basin owes its relatively moderate climate to the warm waters of the pacific on the south, the great barriers of the Alaska Range on the north and west and the Talkeetna Range on the east. The summers are of moderate temperature and have a large number of cloudy days with gentle rains. The winters are cold, and the snowfall is fairly heavy. Talkeetna has an annual mean temperature of 33.3° and an average annual precipitation of 30.74 inches. The entire lower Basin may be considered to have similar climatic conditions.

30. The upper Susitna Basin is separated from the coast by high mountains and the climate may be characterized as having long severe winters, moderate summers and little precipitation.

31. There are no records of the temperature and precipitation for the Basin. However, it may be considered to compare favorably with Mt. McKinley Park area, which has an average annual precipitation of 13.69 inches and an annual mean temperature of 27.2°.

HYDROLOGY

32. Stream flow in the Susitna Basin is characterized by high rate of discharge during the months of May, June, July, August and September and by low flows from October through April.

33. The high discharges are caused by rainfall, long hours of sunlight causing the snow to melt and, during the latter part of the summer, by the melting of the many glaciers. During this period, the streams carry a heavy load of silt.

34. The period of low discharge is caused by the severe winters when the temperature seldom rises above freezing. During this period the streams are fairly clear and carry little silt.

FISHERIES

PRESENT FISHERY

35. One of the foremost purposes of this report is to describe the fishery of the Susitna River Basin and to explain how these will be affected by the Bureau of Reclamation's proposed plan. The fishes that utilize the Susitna Basin can best be divided into two groups; resident and anadromous. The resident fishes are what the word implies while the anadromous are those which spend a portion of their life in the sea and return to fresh water to spawn. These runs so far as our knowledge goes, are illustrated by the map, Fig. 1. Grayling, rainbow trout, lake charr, dolly varden, whitefish, sucker and ling cod comprise the principal resident population of the Susitna Basin.

36. The anadromous group comprises five species of salmon; red, silver, king, chum and pink. Rainbow trout (steelhead) are also included in this group.

37. Commercial Fishery - Salmon posses a homing instinct and usually return to the lake or stream where their parents spawned. They ascend the fresh water streams from the ocean for only one purpose, to spawn, and after the completion of this act they die. The young salmon spend a portion of their early life in the fresh water before they migrate to the ocean. When mature they return to the fresh water to complete the cycle. The time required for the completion of this cycle in Alaskan waters varies with each species. The dominant cycle for the red salmon is 5 years, 3 to 5 years for the chums, 3 to 4 years for the silvers, 3 to 7 years for the kings and 2 years for the pinks.

38. In view of the length of time involved for salmon to complete their life cycle, a period of 7 years of study are required in order that a complete analysis of the Susitna salmon may be made.

39. The Susitna River is considered one of the pre-eminent salmon spawning streams of the Cook Inlet region. In order to fully evaluate the importance of its salmon fishery, it is necessary to develop a brief discussion of the economic importance of the annual salmon pack of Cook Inlet.

40. During the 1951 season, there were 21 salmon canneries and 5 fresh and frozen salmon operators in business in Cook Inlet. Cook Inlet annually produces approximately 6 per cent of the total salmon pack of the Territory of Alaska. In the 1951 season, the Inlet produced well over 10 per cent of the total Alaska pack. Approximately 60 per cent of the Alaska canned king salmon is produced each year in Cook Inlet.

41. From 1941 through 1950 the Inlets average annual case production

153° 152° 151° 150° 149° 148° 147° 146°

63° 62°

MT. McKINLEY NATIONAL PARK

BASIN BOUNDARY

MT. RUSSEL

Cantwell

Denali

East Fk.

Clearwater Creek

MACLAREN RIVER

← TO FAIRBANKS

Paxsons

Eldridge Gl.

Tokichitna Gl.

Ruth Gl.

Tokichitna R.

CHULITNA RIVER

ALASKA RAILROAD

Portage Cr.

Devil Cr.

Gold Creek

SUSITNA RIVER

Stephan Lk.

Clarence Lk.

Kosina Cr.

TYONE RIVER

West Fork GULKANA RIVER

Tyone Lk.

Susitna Lk.

Lake Louise

Crosswind Lk.

Gulkana

GAKONA RIVER

COPPER R.

Glennallen

Tazlina Glacier Lodge

TAZLINA RIVER

Chelatna Lk.

Kohiltna Gl.

Lake Cr.

YENTNA RIVER

Chunilna Cr.

TALKEETNA RIVER

Talkeetna

Fish Lk.

SHEEP RIVER

Montana Cr.

Sheep Cr.

KASHWITNA R.

Little Willow Cr.

Willow Cr.

Willow

DESHKA RIVER

SUSITNA RIVER

Red Shirt Lk.

Susitna

Palmer

OSHETNA R.

Tyone Cr.

SKWENTNA R.

Shell Lk.

TALUSHULITNA R.

Alexander Lake

Talushulitna Lake

Judd Lk.

KNIK ARM

GLENN HWY.

ANCHORAGE

COOK INLET

BASIN BOUNDARY

148° 147° 146°

CRW

153° 152° 151° 150° 149°

POTENTIAL DAMS AND RESERVOIRS

(1) Susitna Station
(1A) Olson
(2) Devil Canyon
(3) Watana
(4) Vee
(5) ~~xxxxxxx~~
(6) Denali
(7) Tyone
(8) Keetna
(9) ~~xxxxxxxxxx~~ Bearpaw
(10) Granite Gorge
(11) Greenstone
(12) Trapper
(13) Sheep River
(14) ~~xxxxxxx~~
(15) Partin
(16) Lucy
(17) Tokichitna
(18) Talushulitna
(19) Skwentna No. 2
(20) Skwentna No. 1

EXPLANATION

Indicates runs of anadromous fishes (Red, King, Silver, Chum and Pink Salmoon)

16 0 16 32

SCALE OF MILES

Fig. 1. Susitna Basin Showing Known Major Salmon Runs in Relation to Proposed Dams.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ALASKA DISTRICT OFFICE

SUSITNA RIVER BASIN POTENTIAL HYDRO-ELECTRIC POWER DEVELOPMENTS SALMON DISPERSION

of salmon by species was 137,320 cases of reds; 50,394 of pinks; 30,771 of chums; 31,034 of silvers and 28,772 of kings. The average annual value by species is as follows: Reds $3,913,648; Pinks $1,159,062; Chums $630,806; Silvers $636,197; and Kings $661,756.

42. The total Cook Inlet salmon pack had an average annual value from 1941 through 1950 of $7,001,461. Of this total Cook Inlet average annual pack, it is estimated that the Susitna River produces something like 60 per cent of the kings; 20 per cent of the reds; 30 per cent of the chums; 20 per cent of the silvers and 10 per cent of the pinks; having a total average annual value of something like $2,000,000.

43. The salmon begin entering the Susitna River in June and the run continues well into the month of August. There is a fall run of considerably less magnitude than the early run which is at present of little economic importance.

44. During the past four years aerial and ground surveys have been conducted in the Susitna Basin under the supervision of the district resident Fishery Management Biologist of the Fish and Wildlife Service. The primary purpose of these surveys is to determine the waters in the basin that are used as spawning grounds and the species and numbers of salmon utilizing them. A complete coverage of all the lakes and streams in the basin has not as yet been realized. However, a majority of the main tributaries have been surveyed by both the aerial and the ground mehhod. Considerable stream clearance work has been accomplished in the basin during the past few years by the ground survey parties. The basin maps covering this report, Fig. 2, illustrates the dispersion of the anadromous fishes by species and show the spawning areas listed alphabetically as to their relative importance.

153° 152° 151° 150° 149° 148° 147° 146°

63° 62°

MT. McKINLEY NATIONAL PARK

BASIN BOUNDARY

MT. RUSSEL

West Fk.

Middle Fk.

Eldridge Gl.

Cantwell

RAILROAD

Tokichitna Gl.

Ruth Gl.

Tokichitna R.

CHULITNA RIVER

Portage Cr.

Devil Cr.

Deadman Cr.

Watana Cr.

SUSITNA RIVER

Gold Creek

ALASKA

Chunilna Cr.

Disappointment Cr.

Prairie Cr.

Stephan Lk.

TALKEETNA

Talkeetna

Fish Lk.

Question and Answer Lk.

Montana Cr.

Sheep Cr.

SHEEP RIVER

Coal Cr.

Clarence Lk.

Kosina Cr.

BLACK R.

OSHETNA R.

East Fk.

West Fk.

Valdez Cr.

Denali

Clearwater Creek

MACLAREN RIVER

TO FAIRBANKS

Paxsons

Sportsmans Lodge

Gulkana Lk.

Middle Fk.

Meiers

Spring Cr.

GULKANA

Haggard

West Fork

Fish Lk.

Sourdough

GAKONA RIVER

Ewan Lk.

Crosswind Lk.

Gakona

Gulkana

COPPER R.

Glennallen

Old Man Lk.

Tazlina Glacier Lodge

Sucker Lk.

TAZLINA RIVER

TO VALDEZ

Sanona Cr. (Tyone)

TYONE R.

Tyone Lk.

Susitna Lk.

Lake Louise

Tolsona Cr.

Chelatna Lk.

West Fk.

East Fk.

KAHILTNA

Lake Cr.

Peters Creek

YENTNA RIVER

SKWENTNA R.

Shell Lk.

TALUSHULITNA R.

Alexander Lake

Talushulitna Lake

Judd Lk.

DESHKA RIVER

SUSITNA RIVER

Red Shirt Lk.

Susitna

LITTLE SUSITNA RIVER

Willow Cr.

Willow

KASHWITNA R.

Little Willow Cr.

Palmer

KNIK ARM

HWY.

GLENN

ANCHORAGE

COOK INLET

A B C D E F

POTENTIAL DAMS AND RESERVOIRS

1. Susitna Station
1A. Olson
2. Devil Canyon
3. Watana
4. Vee
5. ~~xxxxxxx~~
6. Denali
7. Tyone
8. Keetna
9. ~~xxxxxxxxxx~~ Bearpaw
10. Granite Gorge
11. Greenstone
12. Trapper
13. Sheep River
14. ~~xxxxxxx~~
15. Partin
16. Lucy
17. Tokichitna
18. Talushulitna
19. Skwentna No. 2
20. Skwentna No. 1

EXPLANATION

SPAWNING AREAS LISTED) AS TO RELATIVE IMPORTANCE

- (A) Chelatna Lake area
- (B) Willow Creek area
- (C) Fish Lake area
- (D) Red Shirt Lake area
- (E) Shell Lake area
- (F) Talkeetna River area

SCALE OF MILES 16 0 16 32

SALMON SPECIES

- [R] Red
- [K] King
- [S] Silver
- [C] Chum
- [P] Pink
- Indicates Salmon runs

Fig. 2. Priority Spawning Areas by Species for Salmon

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SUSITNA RIVER BASIN POTENTIAL HYDRO-ELECTRIC POWER DEVELOPMENTS

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45. Salmon are known to run up the main stem of the Susitna River as far as the confluence of Portage Creek which is approximately 3 miles below the proposed Devil Canyon damsite. Portage Creek supports a run of kings, silver and chum salmon.

46. Sports Fishery--Besides being regarded as one of the pre-eminent salmon spawning streams of the Cook Inlet region, the Susitna drainage supports a sports fishery of considerable economic importance.

47. Rainbow trout, grayling, dolly varden trout, and lake charr are the principal fresh water game species native to the watershed. Salmon are highly prized as a sport fish by anglers fishing these waters. Precise knowledge of the relative abundance and distribution of the game species in remote sections of the basin is lacking, however, reports from anglers returning from fishing expeditions to these remote areas indicate that there is a wide distribution of these game species and that they are abundant.

48. Because of the inaccessibility of the major portion of the watershed, only partial utilization of this resource has been realized. Streams and lakes along and adjacent to the railbelt have thus far carried the greatest burden of the ever increasing fishing pressure. During the summer months the Alaska Railroad runs a "Fisherman's Special" train to the Susitna basin in order to accommodate the mass weekend exodus from Anchorage and vicinity. Recent developments in air transportation has made it possible to reach remote areas in a few hours where it formerly took days and weeks. Daily flights are made into the basin by commercial air services from Anchorage, Fairbanks, Palmer and Talkeetna to accommodate the increasing number of anglers. The completion of the McKinley Park-Paxson Highway will allow access by automobile to the headward

portion of the basin. This new highway will open a portion of the upper Susitna drainage to motorists and recreational fishermen.

49. As previously stated and as illustrated on the dispersion map, Fig. 1, the runs of the anadromous fishes terminate at the confluence of Portage Creek. The impetuous waters which pass through the narrow 75 mile canyon above Portage Creek evidently is barrier enough to prevent the anadromous fishes from utilizing the headward basin as spawning grounds.

50. The Lake Louise area has excellent potentialities as a recreational area. The Alaska Command at present is contemplating enlarging their present rest camp at Lake Louise to a sufficient size to accommodate large numbers of military personnel and their families. Their plans also call for the construction of a highway from the Tazlina Glacier Lodge on the Glen Highway to their camp on Lake Louise. It is evident that, with this development, the fishery of Lake Louise and adjacent waters will be subject to greater concentrated fishing pressure from both the military and civilian anglers.

51. It is apparent that there will be an annual increase in fishing pressure in the Susitna Basin and only with a proper management program, will the present fishery resources be self-sustaining.

FUTURE FISHERY AFTER PROJECT COMPLETION

Devil Canyon Dam

52. The Devil Canyon Dam would be built to produce hydroelectric power, and in all probability would be the first development in the basin. The construction of this unit would have little harmful effect

on the existing fish population within its zone of influence. Table III shows unregulated and regulated runoff below Devil Canyon Dam in average cubic feet per second.

53. Since the anadromous fishes cannot utilize the upper Susitna waters above the confluence of Portage Creek, the proposed development in the above waters would not result in loss to this fishery resource. The Devil Canyon reservoir can be expected to support a fishery only of minor importance because of the tremendous fluctuations in water levels. Regulated flows and expected reduction in sediment content of the discharge waters below the Devil Canyon Dam should develop new spawning grounds for the anadromous fishes and improve the habitat of the resident fishes.

Tyone Dam

54. The proposed reservoir development on the Tyone River would result in a loss to the present sport fishery of the involved area. Areas that are now utilized by the present fish population for spawning would be partially destroyed. The dam would be a block to the migratory fishes. Considerable damage would result from contemplated draw-down during the winter months and materially alter the present sport fishery in Tyone, Susitna and Louise Lakes. Unless equal minimum flows are maintained and are equivalent to the present natural flows, serious damage may be done to the fishes inhabiting the waters below the dam-site.

55. The relationship of Tyone Dam to Devil Canyon Reservoir has a bearing on the over-all effect upon fish and wildlife habitat. If both are required for full power development, project effects will need to

TABLE III

ADDITIONAL BASIC DATA ON DEVIL CANYON RESERVOIR

FOR USE BY THE FISH AND WILDLIFE SERVICE

Runoff Below Devil Canyon Dam in
Average Cubic Feet per Second

Month	Unregulated Runoff			Regulated Runoff		
	Max. Yr.	Min. Yr.	Avg. Yr.	Max. Yr.	Min. Yr.	Avg. Yr.
Oct.	7,560	2,620	4,890	7,560	4,110	4,890
Nov.	3,130	1,090	2,020	4,230	4,340	4,250
Dec.	2,280	780	1,460	4,160	4,340	4,210
Jan.	2,280	780	1,460	4,230	4,520	4,320
Feb.	1,680	580	1,080	4,810	5,260	4,970
Mar.	2,260	780	1,460	4,460	5,070	4,680
April	2,350	810	1,510	4,740	5,700	5,280
May	18,150	6,300	11,740	8,290	5,840	4,780
June	28,910	10,030	18,700	26,440	5,660	8,250
July	34,020	11,800	22,000	34,020	4,980	21,220
Aug.	30,240	10,490	19,560	30,240	4,550	19,560
Sept.	20,320	7,040	13,140	20,320	4,490	13,140
TOTAL	12,850	4,450	8,310	12,850	4,900	8,310

Note: The above data are based on initial development of only Devil Canyon Reservoir and Power Plant

be re-evaluated on this basis.

Denali Dam

56. The proposed Denali reservoir development on the main stem of the Susitna River would have little serious effect on the present fishery resources of that area. It is doubtful that a fishery of any great importance would develop in the reservoir because of the glacial nature of the streams. The relationship of this reservoir to Devil Canyon and Tyone may require evaluation of all three as to over-all effects on fish and wildlife.

Talkeetna River Proposals

57. Five dam sites are proposed on the main stem of the Talkeetna River, a major tributary to the Susitna River. Talkeetna drainage represents approximately 22 per cent of the red spawning area in the Susitna drainage and 30 per cent of the king and silver spawning area. It also supports a run of chum and pink salmon besides a sports fishery of great importance. The development of one or more reservoirs on the main stem of this river would result in blocking salmon runs of considerable importance, as well as being harmful to the existing sports fishery.

Skwentna River Proposals

58. Three dams are proposed along the main stem of the Skwentna River. The Talushulitna Dam would block salmon runs of considerable economic value. Red, silver, chum, and pink salmon utilize the waters above the proposed dam site. The two proposed develppments upstream from the proposed Talsuhalitna Dam would involve the fishery resources

Aerial view of Denali Reservoir and Damsite. Damsite in foreground, Alaska Range in background, Reservoir area shown above.

to an undetermined extent.

Chulitna River Proposals

59. Four damsites are proposed on the Chulitna River, a major tributary of the Susitna River. Development anywhere along the Chulitna River would involve the fishery resources of that area to an undetermined extent.

Susitna Station Dam

60. The proposed Susitna Station dam would be located 22 miles upstream from the mouth of the Susitna River. This dam presents the greatest fishery problem of all the developments proposed by the Bureau of Reclamation. Virtually all of the anadromous fishes would be blocked from their natural spawning areas in the upper reaches of the river. It is conceivable that they might pass over the Susitna Station Dam by means of a costly fish ladder, but a high percentage of young fish migrating seaward would be destroyed as they pass through the outlet structure of the dam. The construction of hatcheries would involve tremendous expenditures, with no assurance that such a program would be successful.

61. The construction of the Susitna Station Dam would most seriously damage the most valuable resource of the entire Susitna Basin.

DISCUSSION

62. The salmon fishery of Cook Inlet is largely dependent on the Susitna watershed as a spawning ground. The imposition of another use on this River should be planned for the least interference with the existing resource. The construction of low dams across rivers are barriers to the migrating salmon, and high dams, over which salmon cannot successfully be transported, block access to the streams and lakes that were formerly utilized by their ancesters. The Susitna salmon in their spawning migrations spread to most of the lower Susitna tributaries. Any developments on the main stem of the Talkeetna, Skwentna, and the Chulitna rivers would seriously damage the present fishery. The development of the Susitna Station dam would completely block the entire spawning migration into the basin.

63. There are two compelling reasons for eliminating the lower Susitna and tributary dams from the proposed plan: The existence of alternate power sites and the need to perpetuate the fishery.

64. Considering salmon primarily, the upper Susitna dams would not affect this fishery since the runs, so far as present information goes, do not extend this far upstream. Considering the sport fishery and wildlife the effect of the upper dams is not fully known. Construction of the Devil Canyon Dam of itself will affect fish and wildlife habitat to a minor degree; a minor loss of habitat within the reservoir and a slight stream improvement downstream.

65. No further study is considered necessary on the Devil Canyon proposal; however, the other upper river dams will require additional biological investigation. If the three major upper river dams, Devil

Canyon, Tyone, and Denali to be interrelated units of one hydro-power system then the fish and wildlife evaluation should encompass all three.

66. It is doubtful that significant sport fisheries would develop in most of the proposed reservoirs because of the great fluctuation of water levels. However, it is possible that a few of the impoundments might support a trout or grayling fishery of some value. Water level fluctuation limits considerably the production of bottom dwelling organisms, upon which trout and grayling feed. Aquatic vegetation along the margins of the reservoirs seldom become well established when great water level fluctuations occur. Greater productivity and fertility of the reservoirs can be realized by keeping the water level fluctuations at a minimum, a method of operation unsuited to hydro-power reservoirs.

67. Recreational pursuits such as hunting, fishing, camping and photography have increased several fold in the past decade in Alaska. Assuming the trend will continue, necessary recreational spots must be kept prominently in mind in basin planning.

Red salmon in spawning migration. This is the most valuable species in the Cook Inlet pack.

Caribou is the outstanding big-game animal of the Upper Susitna drainage.

PRESENT WILDLIFE CONDITIONS

Caribou

68. The range of the Nelchina caribou herd lies in the Susitna Basin in the Talkeetna Mountains and east. This group is one of the most important big game herds in the Territory because: first, it is restricted to a definite range and does not indulge in long migrations as do the more northern herds; second, the Nelchina area is reasonably close to the center of population such as Anchorage, Palmer, and Fairbanks; and third, the Glenn highway and the McKinley Park road make the region accessible to hunters who only have automobiles for transportation.

69. The Nelchina caribou herd formerly numbered about 10,000 animals, but by 1948 the population had been reduced to 4,500. Since that time hunting restrictions and an intensive predator control program have allowed caribou numbers to increase to about 7,000 animals.

70. The animal kill has increased from 350 animals in 1948 to 600 in 1952. Each year the hunting pressure has increased at a much higher rate than the increased kill. Apparently the hunting restrictions and predator control has more than offset the increased hunting pressure, and the Nelchina caribou herd is increasing.

Moose

71. The lower Susitna Valley west of the Talkeetna Mountains is the home of the largest moose herd in Alaska. The Susitna moose were not numerous prior to construction of the Alaska Railroad and settlement of the Matanuska Valley when fires from these operations burned off a great deal of the original spruce-birch forest and created

a large second-growth winter range that is so important to moose.

72. The larger moose populations and increased hunting pressure in recent years have resulted in a greater kill each year. The known legal kill during the 1951 hunting season was 514 bulls.

73. The Susitna winter ranges are rapidly growing out of reach and without some new disrupting influence such as fire, there will be within the next decade only enough winter forage for greatly reduced moose numbers.

Other Big Game Species

74. Mountain goats, Dall sheep and Black, Grizzly and Alaskan Brown bears are also located in the Susitna basin. Goats and sheep are found in the higher elevations and are not numerous enough to be of great importance to hunters. Only a few are taken each year. Important big game ranges are shown on the map Fig. 3.

75. Bear are scattered throughout the entire basin with grizzlies in the mountains and black and Alaska brown bear in the low elevations. There are no great concentrations and only a few are killed by hunters each year.

Upland Game

76. Both ptarmigan and spruce grouse are found in the Susitna basin. Ptarmigan spend the summers in the mountains and migrate to the lower elevations in the winter, while grouse live in the lowlands year-round. During years of peak abundance grouse and ptarmigan are plentiful throughout the Susitna basin while during the cyclic lows they are quite scarce.

The Susitna Valley supports the largest moose herd in Alaska with the main concentrations in the Lower Susitna Yentna areas.

153° 152° 151° 150° 149° 148° 147° 146°

63° 62°

MT. McKINLEY NATIONAL PARK

BASIN BOUNDARY

MT. RUSSEL

Eldridge Gl.

Tokichitna Gl.

Ruth Gl.

Tokichitna R.

Kahiltna Gl.

Chelatna Lk.

MOOSE

Lake Cr.

YENTNA RIVER

BEAVER

SHEEP

SKWENTNA R.

Shell Lk.

MOOSE

TALUSHULITNA R.

Alexander Lake

Talushulitna Lake

Judd Lk.

BEAVER

CHULITNA RIVER

DESHKA RIVER

MOOSE

BEAVER

SUSITNA RIVER

Susitna

Cantwell

RAILROAD

ALASKA

Gold Creek

Chunilna Cr.

Portage Cr.

Devil Cr.

CARIBOU (SUMMER)

Stephan Lk.

SUSITNA RIVER

SHEEP

Clarence Lk.

Kosina Cr.

TALKEETNA

RIVER

CARIBOU (SUMMER)

GOAT

SHEEP

Talkeetna

Fish Lk.

SHEEP RIVER

Montana Cr.

MOOSE

Sheep Cr.

KASHWITNA R.

Little Willow Cr.

MOOSE

Willow Cr.

Willow

Red Shirt Lk.

Palmer

OSHETNA R.

CARIBOU (WINTER)

BASIN BOUNDARY

KNIK ARM

HWY.

GLENN

ANCHORAGE

COOK INLET

East Fk.

Denali

Creek

Clear Water Creek

CARIBOU (WINTER)

MACLAREN RIVER

TO FAIRBANKS

Paxsons

TYONE CR.

Tyone Lk.

Susitna Lk.

Tyone

Lake Louise

West Fork

GULKANA RIVER

Crosswind Lk.

Gulkana

GAKONA RIVER

COPPER R.

Glennallen

Tazlina Glacier Lodge

TAZLINA RIVER

148° 147° 146°

POTENTIAL DAMS AND RESERVOIRS

1. Susitna Station
1A. Olson
2. Devil Canyon
3. Watana
4. Vee
5. xxxxxxxx
6. Denali
7. Tyone
8. Keetna
9. xxxxxxxx Bearpaw
10. Granite Gorge
11. Greenstone
12. Trapper
13. Sheep River
14. xxxxxxxx
15. Partin
16. Lucy
17. Tokichitna
18. Talushulitna
19. Skwentna No. 2
20. Skwentna No. 1

EXPLANATION

16 0 16 32

SCALE OF MILES

Fig. 3. Important Wildlife Ranges in Susitna Bassin

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ALASKA DISTRICT OFFICE

SUSITNA RIVER BASIN POTENTIAL HYDRO-ELECTRIC POWER DEVELOPMENTS

WILDLIFE HABITATS

C.R.W.

2

77. Snowshoe hares are located throughout the basin, and as with game birds their numbers fluctuate with their cycles.

Waterfowl

78. Because the Susitna basin is relatively inaccessible and other areas closer to cities provide adequate hunting, practically all the kill is made near the roads and is not heavy.

79. Except for the mountainous areas the entire Susitna basin is dotted with a great number of lakes and ponds that provide many resting places for migrating waterfowl. The nesting population is not great compared with other locations in the Territory, but moderate production over a large area contributes a great many waterfowl. Aerial transects showed an average density of 8 breeding waterfowl per square mile in the Lake Louise area, consisting primarily of Scoters, Scaup and Mallards. Many persons from Anchorage and the Matanuska Valley hunt ducks and geese each season.

Fur Animals

80. The most important fur animal in the Susitna Basin is the beaver, particularly west of the Talkeetna Mountains and that area drained by Tyone River. Extensive growths of aspen, willow, cottonwood, and birch have created an excellent habitat and beaver are very plentiful.

81. Beaver are more commonly trapped than any other fur animal. While only a few trappers remain out for the entire fur trapping season, a great many people go out during February and March to obtain a limit of ten beaver. During the 1952 trapping season about 1,500 beaver were taken, or a bag limit of ten for 150 trappers. The value of the fur was about $30,000.

82. However, the decline in fur values in recent years and the abundance of high-salaried defense construction jobs in the vicinity of Anchorage reduced the number of trappers greatly. In 1946 about 5,000 beaver were taken in the Susitna Basin and the fur value was approximately $250,000. When defense construction tapers off or the value of beaver pelts increases, the Susitna basin will be of much greater importance than it is at present.

83. Needless to say, with such little trapping, beaver populations are increasing.

84. Other fur animals in the Susitna Basin are mink, muskrat, fox, weasel, lynx, otter, wolverine, wolf, and coyote. These are even less important than beaver with the present slump in fur values, but, of course, increased prices will enhance the worth of this fur resource. Wolves and coyotes are classed as predators and are subject to a territorial bounty of $50 for wolves and $30 for coyotes. There is no closed season on the wolverine.

FUTURE WILDLIFE CONDITIONS AFTER PROJECT COMPLETION

85. The effect of river basin projects upon the wildlife of the Susitna Basin is to a great extent a matter of conjecture. The entire basin is still a wilderness area, and even if all the proposed dams were constructed, no species would be in danger of extermination. However, the question remains as to the effect the proposed dams will have on total populations and the resulting shootable surpluses.

86. The proposed dam locations along the upper Susitna River (Denali, Tyone and Vee) lie squarely in the route of migration of the

Nelchina caribou herd between its summer range in the Talkeetna Mountains and the wintering areas near Lake Louise. While the caribou at present readily cross the Susitna River, both by swimming and across the ice and show no hesitation about crossing lakes in the vicinity, it is not known whether the dams will act as a barrier to the animals. Surely fluctuating water levels beneath a thin layer of ice would present a great hazard.

87. Probably the most serious effects of the dams in this area will be to threaten the migration pattern because of greatly increased human activity and to open the country to greatly increased hunting pressure.

88. Caribou are notoriously intolerant of human activities and their wandering habits could easily cause them to desert their present range for a more inaccessible area. The economic value of caribou herds that are not available to hunters is greatly reduced.

89. The other possibility is that construction of dams in the caribou range would subject the herd to prohibitive hunting pressure. The dams will require construction of roads into hitherto inaccessible areas that afforded the animals a measure of sanctuary. The present kill is the maximum allowable under a general open season and greater hunting pressure will necessitate drastic restrictions. The dams might also have other unforeseen effects on the Nelchina herd.

90. With one exception, it is doubtful if the proposed basin projects will have a great effect on the moose of the lower Susitna. The dams will undoubtedly destroy a certain amount of moose forage, but the shallows created in the upper reaches of the lakes will provide additional moose feed. There are sufficient landing areas for float

equipped aircraft at present, and additional ones created by the dam construction would not materially affect the hunting pressure.

91. The proposed dam at Susitna Station, located in a lowland area and creating a tremendous reservoir will flood a great deal of moose habitat, both summer and the highly important winter range. The winter ranges extend along the Yentna, Deska, and Susitna Rivers in those areas where second growth willow, birch, and aspen occur. Without adequate wintering ranges, the moose are unable to utilize the vast summer ranges, and their populations will be greatly reduced. The winter range is very limited at present and any further reduction in the lower Susitna will seriously affect the moose herds.

92. Other big game animals in the Susitna basin will not be affected greatly by the dam construction program. Sheep and goats range above the reservoir areas and the construction of roads and aircraft landing areas will increase hunting pressure in a few isolated locations. Bear are scattered throughout the basin and will be little affected.

93. There is an extensive habitat in the Susitna basin for ptarmigan, grouse, and rabbits which would be reduced somewhat by reservoir flooding.

94. There are sufficient water areas in the Susitna Basin at present to meet waterfowl needs and construction of reservoirs would have little effect upon the ducks and geese. A drastic rise in Lake Louise water levels during the period June 10 to July 10 would flood nests of Diving Ducks.

95. The most important furbearer, the beaver, would be little affected by the hydroelectric projects, except by the dam at Susitna

Station (No. 1) where a great deal of beaver habitat would be flooded. This area is relatively close to Anchorage and Palmer and even with the present low fur values many trappers utilize these locations. The cost of transportation to the lower Susitna River is much less than to other areas and because of increased transportation rates and reduced fur prices, trappers must operate on a very small margin. The loss of this area would be a severe blow to the local trappers. Other fur animals would not be greatly affected by the proposed power developments.

96. It appears that three wildlife species in the Susitna Basin would be affected by the proposed hydroelectric projects. Moose and beaver would suffer upon the completion of the Susitna Station dam. The effect of the upper river projects upon the Nelchina caribou herd remains to be seen. Probably other species will not be affected.

RECOMMENDATIONS

It is recommended that:

1. Land withdrawals from the public domain for the Susitna projects should contain a provision for public access for hunting, fishing, trapping and recreational pursuits.

2. Management of fish and wildlife resources should continue to be vested in the Fish and Wildlife Service.

3. The Devil Canyon dam be reported favorably so far as fish and wildlife is concerned. Based on preliminary surveys, it appears that salmon do not ascend beyond the Devil Canyon damsite and while this reservoir will affect wildlife species to a minor degree it will not damage any known salmon runs.

4. The minimum operating flow be continued uninterrupted below the Devil Canyon Dam in order to preserve the resident fish population in downstream reaches. This flow to be of a magnitude of about 4,000 second-feet.

5. Additional biological surveys be made on the proposed Denali and Tyone reservoirs and if either or both are essential to operation of the Devil Canyon project, recommendation number three be reconsidered.

6. The proposed Susitna Station Dam be eliminated from the basin development plan since it would exterminate the Susitna salmon runs and since alternate power sites exist.

7. Several of the proposed dams on the Talkeetna, Skwenta, and Chulitna Rivers be eliminated from the plan, however, this recommendation will be elaborated following complete biological surveys.

8. An additional period of study precede the initiation of any

river development, with the exception of the Devil Canyon Dam. This period to be governed by the life cycle of the species of salmon involved, for streams supporting king and red salmon runs the minimum period to be seven years.

9. No consideration be given to fish ladders or elevators as a means of passing fish over high dams in view of the demonstrated failure of these devices on Columbia River high dams--both for passing adult salmon upstream and young salmon back down to the sea.

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

JUNEAU, ALASKA

A Progress Report On Wildlife

of the

SUSITNA RIVER BASIN

Third Judicial Division

Territory of Alaska

February 1954

For Administrative Use Only

TABLE OF CONTENTS

GENERAL

1. The Susitna River Basin, an area of 19,300 square miles, lies in south-central Alaska, north of the farthest inland projection of Cook Inlet, between latitudes 61° - 64° and longitudes 146° - 153°.

2. During the past few years, this basin has been investigated by the U. S. Bureau of Reclamation as a possible source of hydroelectric power for the towns of Anchorage and Fairbanks and the general railbelt area. Twenty-one potential dam sites have been located although only twelve of these will be subject to more investigation.

3. This progress report deals with preliminary monetary values of the Susitna River Basin. It is comprised primarily of tables for each of the important wildlife species of the basin and short explanations of the derivation of figures for each table. The report is not complete; it is not final. Rather, it is the genesis for future evaluation reports dealing with the Susitna Basin and other drainages of Alaska.

4. The general procedure in arriving at the average harvest and value of species was as follows:

A. Total Alaska harvest or total harvest in Alaska by licensed hunters was obtained.

B. A percentage of this harvest was assigned for the Susitna Basin. In some cases, such a percentage figure was obtained for

several years; in most cases, for only one year. Interpolation was made for other years where more than one year's percentage was available. In case of only a one year percentage being available, that same percentage was used "en toto" for all other years.

C. From these percentage figures, total Susitna harvest by years was computed.

D. Annual values were determined for each species and total annual value of each species was computed.

5. Further explanations are given on the above four points for each group as they are taken up.

6. Biological investigations conducted in the basin during past years have not been included here. Such information may be compiled in the future and will form a separate report.

BIG GAME

7. Big game was found to be the most important wildlife group in the basin with an average annual kill of 742 big game animals for a value of about $210,000. Moose is the most important big game animal followed by caribou, brown or grizzly bear, and mountain sheep. Black bears, due to low hunting interest, and mountain goats, because of insignificant populations, have not been included in this report.

8. The tables following for big game are generally self-explanatory. However, a question may arise as to how certain figures were derived.

9. In the case of caribou, kill figures for the Nelchina caribou herd were available for several years as a result of checking stations or other work. When kill figures were not available, estimates were made. As a result, an eleven year period of record was used to determine average annual kill. Twenty-five percent of this kill is attributable to the Susitna Drainage, the other 75 percent to the Copper River Drainage. The unit value of $175.00 is an estimate, based on general economic data gathered during the 1953 hunting season. During the next year, this figure will be more accurately determined.

10. Moose, bear, and sheep kills are premised on a percentage figure based on the 1942 season and are shown in red on the tables. These "known" figures are based on information contained in The

Seventeenth Annual Report of the Executive Officer to the Alaska Game Commission, 1942. In the case of moose and bear, the unit value was taken from the River Basin Manual. The sheep value is based on general economic data of the same nature as caribou and subject to rivision by 1955.

11. Inescapably, there is great room for error in the kill figures. However, it is interesting to note that their relationship to one another is reasonable and that average kills so computed compare very favorably with estimates made by biologists familiar with kills during the past few years.

TABLE 1

BROWN OR GRIZZLY BEAR

YEAR	TOTAL ALASKA HARVEST BY LICENSED HUNTERS	PERCENT FROM SUSITNA	TOTAL SUSITNA HARVEST	UNIT VALUE	ANNUAL SUSITNA VALUE
1942	399	.125	50	$136.00	$ 6,800
1943	350*	.125	44	136.00	5,984
1944	313	.125	39	136.00	5,304
1945	559	.125	70	136.00	9,520
1946	766	.125	96	136.00	13,056
1947	877	.125	110	136.00	14,960
1948	524	.125	66	136.00	8,976
1949	724	.125	91	136.00	12,376
1950	866	.125	108	136.00	14,688
1951	731	.125	91	136.00	12,376
1952	700*	.125	88	136.00	11,968
Total	6,809	.125	853		$116,008
Average	619	.125	78	$136.00	$ 10,546

*Estimated

TABLE 2

CARIBOU

YEAR	TOTAL MEICHINA KILL	UNIT VALUE	ANNUAL MEICHINA VALUE
1947	200	$175.00	35,000
1948	275	175.00	48,125
1949	350	175.00	61,250
1950	475	175.00	83,125
1951	600	175.00	105,000
1952	424	175.00	74,200
1953	625	175.00	109,375
Total	2,949		$516,075
Average	421		$ 73,675
75% to Copper	316		$ 55,300
25% to Susitna	105		18,375

TABLE 3

MOOSE

YEAR	TOTAL ALASKA HARVEST BY LICENSED HUNTERS	PERCENT FROM SUSITNA	TOTAL SUSITNA HARVEST	UNIT VALUE	ANNUAL SUSITNA VALUE
1942	1,460	.226	330	340.00	112,200
1943			295*	340.00	100,300
1944	1,147	.226	259	340.00	88,060
1945	1,428	.226	322	340.00	109,480
1946	2,415	.226	546	340.00	185,640
1947	2,569	.226	581	340.00	197,540
1948	2,422	.226	547	340.00	185,980
1949	2,229	.226	504	340.00	171,360
1950	3,241	.226	732	340.00	248,880
1951	3,123	.226	706	340.00	240,040
1952	2,880	.226	651	340.00	221,340
1953			489*	340.00	166,260
Total	22,914		5,962		$2,027,080
Average	2,291	.226	497	340.00	$ 168,923

*Estimated

TABLE 4

MOUNTAIN SHEEP

YEAR	TOTAL ALASKA HARVEST BY LICENSED HUNTERS	PERCENT FROM SUSITNA	TOTAL SUSITNA HARVEST	UNIT VALUE	ANNUAL SUSITNA VALUE
1942	352	.267	94	$150.00	$14,100
1943	300*	.267	80	150.00	12,000
1944	Closed Season				
1945	253	.267	68	150.00	10,200
1946	385	.267	103	150.00	15,450
1947	272	.267	73	150.00	10,950
1948	188	.267	50	150.00	7,500
1949	No Take				
1950	196	.267	52	150.00	7,800
1951	320	.267	85	150.00	12,750
1952	300*	.267	80	150.00	12,000
Total	2,566		685		$102,750
Average	233	.267	62	$150.00	$ 9,341

*Estimated

TABLE 5

SUSITNA BIG GAME

SUMMARY OF VALUES

SPECIES	AVERAGE ANNUAL TAKE	UNIT VALUE	AVERAGE ANNUAL VALUE	AVERAGE PERCENT OF TOTAL LICENSED ALASKAN HARVEST
Moose	497	$340.00	$168,923	.226
Caribou	105	175.00	18,375	.25 of Nelchina Harvest
Grizzly or Brown	78	136.00	10,546	.125
Sheep	62	150.00	9,341	.267
Total Value			$207,185	
Rounded			$210,000	

SMALL GAME

12. Ptarmigan and grouse are the only two small game animals included for economic purposes. Rabbits have not been included since few are taken in the Susitna for sport or fur. Small game constitutes the next to lowest valued resource with an average annual value of about $44,000.

13. The period of record used in arriving at the average Susitna takes was ten years. No estimates were made for 1943. The starting point, subject to the same errors as big game, was 1942. Unit values used are from the River Basin Manual.

14. An interesting observation here is that grouse were worth three times as much as ptarmigan. This is probably due, at least in part, to the ptarmigan still being in the high country when the hunters are afield and therefore inaccessible; and partly due to the less cyclic nature of grouse.

TABLE 6

GROUSE

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	UNIT VALUE	ANNUAL SUSITNA VALUE
1942	27,847	.101	2,825	6.80	19,210
1943	Not available - no estimate made				
1944	54,000	.101	5,454	6.80	37,087
1945	41,000	.101	4,141	6.80	28,158
1946	53,000	.101	5,353	6.80	36,400
1947	47,109	.101	4,758	6.80	32,354
1948	40,000	.101	4,040	6.80	27,472
1949	28,000	.101	2,828	6.80	19,230
1950	50,000	.101	5,050	6.80	34,340
1951	70,000	.101	7,070	6.80	48,076
1952	70,000	.101	7,070	6.80	48,076
Total	480,956		48,616		$330,403
Average	48,096	.101	4,862	$6.80	$ 33,040

PTARMIGAN

1942	52,262	.030	1,645	6.80	11,186
1943	Not available - no estimate made				
1944	50,000	.030	1,500	6.80	10,200
1945	57,000	.030	1,710	6.80	11,628
1946	36,000	.030	1,080	6.80	7,344
1947	53,354	.030	1,600	6.80	10,880
1948	60,000	.030	1,800	6.80	12,240
1949	50,000	.030	1,500	6.80	10,200
1950	58,000	.030	1,740	6.80	11,832
1951	55,000	.030	1,650	6.80	11,220
1952	78,000	.030	2,340	6.80	15,912
Total	549,616		16,565		$112,642
Average	54,962	.030	1,657	$6.80	$ 11,264
Total Small Game Value					$44,304
Rounded					$44,000

FUR BEARERS

15. The following tables give the estimated annual take of all fur animals in the Susitna drainage except hare, squirrel, and marmot. It has been assumed that these three species, although present, have not been of significant worth to noticeably change the overall average value of peltries from the basin. Such pelts are worth about $87,000 annually and fur bearers constitute the second most important group in the drainage.

16. The basic procedure in determining the number of pelts taken by species was as follows:

17. Total Alaska take of pelts was obtained from annual reports and Alaska Game and Fur Harvest Statistics. For certain years, either the known take of skins from the Susitna or a percentage figure was available. These figures are shown in red on the tables. Using these known points as a base, interpolation was made for other years by percent and an estimated harvest was computed. Fur prices were available from annual reports from 1925 through 1947. From 1948 to 1953, an estimated price was determined, which in most cases was about the same as the 1947 average. Based on these figures, average annual values were computed.

18. As has been explained previously, there is chance for error in using one year's percentage over a period of several years or in making interpolation between two known percentages. However, there exists a reasonable relationship from species to species which lends

a certain amount of credence to this method of determining average takes.

TABLE 7

BEAVER

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925**	3,949	.154	213	20.00	4,260
1926**	1,047	.154	161	22.50	3,623
1927	24,602	.154	4,794	25.79	123,637
1928	32,712	.133	4,259	26.00	110,734
1929**	1,547	.133	206	26.25	5,408
1930**	476	.133	63	20.00	1,260
1931	13,499	.184	2,334	16.00	37,344
1932	15,609	.178	2,778	9.23	25,641
1933	30,159	.171	5,157	12.70	65,494
1934	44,823	.156	6,992	8.48	59,292
1935	11,138	.141	1,570	8.10	12,717
1936	25,046	.126	3,156	12.40	39,134
1937	1,882	.111	208	13.00	2,704
1938	30,889	.096	2,965	11.25	33,356
1939	31,397	.081	2,543	14.75	37,509
1940	14,630	.066	966	18.00	17,388
1941	20,606	.051	1,050	25.50	26,775
1942	17,593	.036	642	26.00	16,692
1943	15,146	.036	545	30.00	16,350
1944	8,516	.036	307	30.00	9,210
1945	11,339	.036	408	30.00	12,240
1946	18,929	.038	719	50.00	35,950
1947	25,088	.040	1,004	26.00	26,104
1948	20,133	.042	846	23.88	20,202
1949	23,394	.045	1,053	21.75	22,903
1950	17,619	.056	995	21.75	21,641
1951	17,506	.056	980	26.26	25,735
1952	18,617	.056	1,042	19.32	20,131
1953	15,163	.056	849	19.32*	16,403
Total	513,054		48,805		$849,637
Average	17,692	.095	1,683	$21.18	$ 29,305

*Estimated
**Closed Season

TABLE 8

CROSS FOX

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	577	.038	22	90.00	1,980
1926	611	.038	23	100.00	2,300
1927	1,085	.038	41	111.14	4,553
1928	761	.038	29	116.19	3,370
1929	1,069	.038	41	139.71	5,728
1930	1,149	.038	44	95.43	4,199
1931	664	.038	25	87.96	2,199
1932	922	.038	35	43.05	1,507
1933	919	.038	35	39.15	1,370
1934	1,014	.038	39	46.23	1,803
1935	1,355	.038	51	43.72	2,230
1936	1,573	.038	60	45.00	2,700
1937	1,031	.038	39	40.00	1,560
1938	1,103	.038	42	29.50	1,239
1939	614	.038	23	26.50	610
1940	632	.038	25	27.00	675
1941	1,484	.038	56	13.00	728
1942	1,264	.038	48	13.50	648
1943	1,240	.038	47	18.50	870
1944	1,831	.038	70	20.00	1,400
1945	1,614	.038	61	16.00	976
1946	1,096	.038	42	16.00	672
1947	785	.038	30	14.00	420
1948	510	.038	19	9.25*	176
1949	518	.038	20	4.50	90
1950	250	.038	10	4.50	45
1951	740	.038	28	4.00	112
1952	625	.038	24	3.00	72
1953	275	.038	10	2.72*	27
Total	27,311		1,039		$44,259
Average	942	.038	36	$42.05	$ 1,526

*Estimated

TABLE 9

RED FOX

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	19,489	.022	429	17.00	7,293
1926	22,976	.022	505	20.00	10,100
1927	21,945	.022	483	28.18	13,611
1928	26,907	.022	592	38.28	22,662
1929	21,023	.022	463	49.60	22,965
1930	16,288	.022	358	34.40	12,315
1931	12,003	.022	264	22.98	6,067
1932	10,450	.022	230	10.88	2,502
1933	12,794	.022	281	12.07	3,392
1934	14.909	.022	328	12.71	4,169
1935	16,192	.022	356	9.65	3,435
1936	19,937	.022	439	11.75	5,158
1937	21,549	.022	474	10.80	5,119
1938	15,076	.022	332	9.25	3,071
1939	21,366	.022	470	7.50	3,525
1940	9,031	.022	199	7.00	1,393
1941	12,574	.022	277	9.50	2,632
1942	12,345	.022	268	11.00	2,948
1943	4,916	.022	108	16.00	1,728
1944	6,916	.022	152	16.00	2,432
1945	7,605	.022	167	12.50	2,088
1946	4,754	.022	105	12.00	1,260
1947	3,071	.022	68	4.00	272
1948	1,530	.022	34	3.57*	121
1949	1,560	.022	34	3.13	106
1950	2,220	.022	49	2.94	144
1951	1,875	.022	41	3.00	123
1952	1,250	.022	28	2.72	20
1953	825	.022	18	2.72*	13
Total	343,376		7,552		$140,664
Average	11,841	.022	260	$13.83	$ 4,851

*Estimated

TABLE 10

LYNX

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	7,920	.067	531	17.00	9,027
1926	7,495	.067	502	20.00	10,040
1927	9,809	.067	657	29..7	19,362
1928	10,173	.067	682	45.25	30,861
1929	7,575	.067	508	61.10	31,039
1930	2,980	.067	200	57.00	11,400
1931	623	.067	42	43.50	1,827
1932	502	.067	34	23.29	792
1933	591	.067	40	21.25	850
1934	723	.067	48	21.44	1,029
1935	1,338	.067	90	21.50	1,935
1936	2,421	.067	162	36.25	5,873
1937	2,089	.067	140	31.60	4,424
1938	2,130	.067	143	36.00	5,148
1939	2,705	.067	181	37.50	6,788
1940	1,698	.067	114	43.50	4,959
1941	781	.067	52	43.00	2,236
1942	639	.067	43	45.00	1,935
1943	713	.067	48	48.00	2,304
1944	990	.067	66	50.00	3,300
1945	955	.067	64	60.00	3,840
1946	1,195	.067	80	55.00	4,400
1947	965	.067	65	24.00	1,560
1948	1,110	.067	74	16.90*	1,251
1949	854	.067	57	9.81	559
1950	680	.067	46	10.07	463
1951	900	.067	60	14.47	8.68
1952	600	.067	40	7.33	293
1953	900	.067	60	7.33*	440
Total	72,054		4,829		$168,803
Average	2,485	.067	167	$32.30	$ 5,821

*Estimated

TABLE 11

MARTEN

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA FURRIES
1925**					
1926**					
1927**					
1928**					
1929**					
1930**					
1931	7,054	.159	1,124	16.35	18,377
1932	3,289	.157	516	12.29	6,342
1933	4,022	.145	583	13.90	8,104
1934	4,866	.133	647	14.06	9,097
1935	3,314	.121	401	14.80	5,935
1936	1,306	.109	142	20.00	2,840
1937	16,969	.097	1,646	27.35	45,018
1938	9,237	.085	785	24.75	19,429
1939	1,287	.073	940	26.00	24,440
1940	9,626	.061	587	32.00	18,784
1941	707	.056	396	39.00	15,444
1942**	240	.051	12	34.00	408
1943	8,812	.046	405	44.00	17,820
1944	13,352	.041	547	45.00	24,615
1945	453	.036	16	60.00	960
1946	2,670	.031	828	80.00	66,240
1947	13,413	.031	416	40.00	16,640
1948	10,883	.027	294	35.72*	10,502
1949	14,141	.023	325	31.44	10,218
1950	8,200	.033	271	30.07	8,149
1951	9,500	.061	580	30.27	17,557
1952	6,350	.027	171	17.80	3,044
1953	5,500	.023	127	17.80*	2,261
Total	155,191		11,759		$352,224
Average	6,747	.076	511	$30.72	$ 15,314

* Estimated
**Closed Season

TABLE 12

MINK

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	59,504	.036	2,142	7.00	14,994
1926	44,674	.040	1,787	12.00	21,444
1927	45,466	.047	2,137	14.52	31,029
1928	32,353	.054	1,747	15.87	27,725
1929	26,695	.060	1,602	20.70	33,161
1930	27,785	.054	1,500	8.50	12,750
1931	30,431	.047	1,430	9.60	13,728
1932	43,207	.040	1,728	5.69	9,832
1933	50,812	.036	1,829	6.05	11,065
1934	57,858	.036	2,083	9.16	19,080
1935	60,501	.036	2,178	7.20	15,652
1936	44,016	.036	1,585	10.50	16,643
1937	52,436	.036	1,888	12.40	23,411
1938	39,866	.036	1,435	11.50	16,503
1939	42,883	.036	1,544	9.75	15,054
1940	43,702	.036	1,573	8.50	13,371
1941	31,782	.036	1,144	10.50	12,012
1942	30,919	.036	1,124	9.75	10,959
1943	33,705	.036	1,213	12.50	15,163
1944	61,038	.036	2,197	11.00	24,167
1945	46,188	.036	1,662	18.00	29,916
1946	48,088	.037	1,731	30.00	51,930
1947	53,000	.037	1,961	16.25	31,866
1948	36,662	.037	1,356	19.33*	26,211
1949	39,348	.049	1,928	22.40	43,187
1950	28,000	.062	1,736	28.13	48,834
1951	22,000	.061	1,342	31.43	42,179
1952	39,200	.060	2,352	21.09	49,604
1953	25,000	.060	1,500	21.09*	31,635
Total	1,197,119		49,434		$713,135
Average	41,280	.041	1,705	$14.50	$ 24,590

*Estimated

TABLE 13

MUSKRATS

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	395,142	.013	5,137	.85	4,366
1926	183,320	.013	2,383	1.40	3,336
1927	155,041	.013	2,016	1.95	3,931
1928	197,957	.013	2,573	1.33	3,422
1929	190,377	.013	2,475	1.02	2,525
1930	411,934	.013	5,355	.56	2,999
1931	455,897	.013	5,927	.62	3,675
1932	500,640	.013	6,508	.36	2,343
1933	154,573	.013	2,009	.55	1,105
1934	133,312	.013	1,733	.73	1,265
1935	127,901	.013	1,663	.80	1,330
1936	153,772	.013	1,999	1.25	2,499
1937	231,842	.013	3,014	1.15	3,466
1938	291,140	.013	3,785	.66	2,498
1939	417,442	.013	5,427	.82	4,450
1940	453,300	.013	5,893	1.10	6,482
1941	266,001	.013	3,487	1.60	5,579
1942	267,356	.013	3,476	1.75	6,083
1943	212,352	.013	2,761	2.00	5,522
1944	142,530	.013	1,853	2.00	3,706
1945	147,536	.013	1,918	1.80	3,452
1946	145,099	.013	1,886	2.25	4,244
1947	160,312	.013	2,084	2.00	4,168
1948	125,233	.013	1,628	1.62*	2,637
1949	142,843	.013	1,857	1.25	2,321
1950	198,000	.013	2,574	1.66	4,273
1951	261,000	.013	3,393	1.88	6,379
1952	163,000	.013	2,119	1.12	2,373
1953	138,000	.013	1,794	1.12*	2,009
Total	6,822,852		88,727		$102,438
Average	235,271	.013	3,060	$1.28	$ 3,532

*Estimated

TABLE 14

LAND OTTER

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	3,265	.031	101	19.00	1,919
1926	2,932	.031	91	21.00	1,911
1927	2,783	.031	86	22.80	1,961
1928	2,191	.031	99	24.68	2,443
1929	2,943	.031	91	31.58	2,898
1930	3,491	.031	108	23.00	2,484
1931	2,432	.031	75	18.00	1,350
1932	2,284	.031	71	7.93	563
1933	3,211	.031	100	11.37	1,137
1934	3,897	.031	121	13.56	1,641
1935	3,224	.031	100	13.30	1,330
1936	3,235	.031	100	14.00	1,400
1937	3,007	.031	93	14.00	1,302
1938	2,892	.031	90	12.75	1,148
1939	2,792	.031	87	11.00	957
1940	2,804	.031	87	10.50	914
1941	2,188	.031	68	14.50	986
1942	2,821	.031	88	13.00	1,144
1943	1,547	.031	48	17.50	840
1944	2,772	.031	86	20.00	860
1945	2,246	.031	70	20.00	1,400
1946	2,836	.031	88	30.00	2,640
1947	2,986	.031	93	30.00	2,790
1948	2,799	.031	87	22.57*	1,964
1949	2,287	.031	71	15.14	1,075
1950	2,660	.031	82	18.90	1,550
1951	2,400	.031	74	27.86	2,062
1952	2,950	.031	91	20.86	1,898
1953	2,340	.031	73	20.86*	1,523
Total	81,215		2,519		$46,090
Average	2,801	.031	87	$18.61	$ 1,589

*Estimated

TABLE 15

WEASEL (Ermine)

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	13,418	.065	872	.80	698
1926	10,387	.065	675	1.60	1,080
1927	8,663	.065	563	1.85	1,042
1928	10,253	.065	666	2.04	1,359
1929	17,467	.065	1,135	1.74	1,975
1930	11,582	.065	753	1.15	866
1931	15,358	.065	998	1.15	1,148
1932	17,536	.065	1,140	.44	502
1933	11,372	.065	739	.56	414
1934	14,278	.065	928	.69	640
1935	19,279	.065	1,253	.55	689
1936	11,012	.065	716	.70	501
1937	8,453	.065	549	.80	439
1938	9,755	.065	634	.55	349
1939	13,828	.065	899	.60	539
1940	9,895	.065	643	.60	386
1941	8,580	.065	558	.85	474
1942	11,280	.065	730	.90	657
1943	3,892	.065	253	1.10	278
1944	5,508	.065	358	1.00	358
1945	5,737	.065	373	1.40	522
1946	6,298	.065	409	1.50	614
1947	5,722	.065	372	1.25	465
1948	7,852	.065	510	1.42*	724
1949	8,801	.065	572	1.59	909
1950	6,740	.065	438	1.59	696
1951	8,000	.065	520	1.78	926
1952	5,230	.065	340	1.75	595
1953	3,000	.065	195	1.75*	341
Total	289,176		16,791		$20,986
Average	9,716	.065	648	$1.16	$ 729

*Estimated

TABLE 16

SUSITNA FUR BEARERS

SUMMARY OF VALUES

SPECIES	ANNUAL AVERAGE TAKE	AVERAGE PRICE OF PELT	AVERAGE ANNUAL VALUE	AVERAGE PERCENT OF TOTAL ALASKA TAKE
Beaver	1,683	$21.18	$29,305	.095
Mink	1,705	$14.50	$24,590	.041
Marten*	511	$30.72	$15,314	.076
Lynx	167	$32.30	$ 5,821	.067
Red Fox	260	$13.83	$ 4,850	.022
Muskrat	3,060	$ 1.28	$ 3,532	.013
Land Otter	87	$18.61	$ 1,589	.031
Cross Fox	36	$42.05	$ 1,526	.031
Weasel	648	$ 1.16	$ 724	.065
Total Value			$87,252	
Rounded			$87,000	

*Based on 23-year period of record.
All others based on 29-year period.

PREDATORY-TYPE ANIMALS

19. Wolf, coyote, and wolverine have been separated from the fur bearer class since they represent a rather unique category insofar as wildlife is concerned. Although River Basin policy does not evaluate predators, it is believed that Alaska represents a special case and values should be considered. The take by Fish and Wildlife Service agents has not been considered in the total Alaska take; neither has the amount paid in bounties been considered in computing values. This group has an estimated average annual value of about $2,900, the lowest valued group in the basin.

20. As was true for other groups, 1942 (shown in red) has been the common starting point and the same percentage was used for the entire 29-year period of record.

TABLE 17

COYOTE

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA FURRIES
1925	61	.207	13	7.00	91
1926	113	.207	23	7.00	161
1927	191	.207	40	13.40	536
1928	621	.207	128	16.25	2,080
1929	480	.207	99	20.50	2,030
1930	306	.207	63	13.00	819
1931	206	.207	43	9.48	408
1932	216	.207	45	4.11	185
1933	299	.207	62	4.73	293
1934	439	.207	91	5.76	524
1935	297	.207	61	5.25	320
1936	1,098	.207	227	6.70	1,521
1937	1,330	.207	275	8.25	2,269
1938	1,355	.207	280	5.75	1,610
1939	1,507	.207	312	4.50	1,404
1940	2,080	.207	430	5.00	2,150
1941	1,208	.207	250	4.50	1,125
1942	757	.207	157	6.25	981
1943	376	.207	78	8.50	663
1944	797	.207	165	8.00	1,320
1945	713	.207	148	8.00	1,184
1946	1,020	.207	211	6.00	1,266
1947	1,308	.207	271	4.00	1,084
1948	1,034	.207	214	5.00*	1,070
1949	355	.207	73	5.00*	365
1950	706**	.207	146	5.00*	730
1951	619**	.207	128	5.00*	640
1952	402**	.207	83	5.00*	415
1953	347**	.207	72	5.00*	360
Total	20,241		4,188		$27,604
Average	698	.207	144	$ 6.61	$ 952

*Estimated

**Exclusive of FWS Take

TABLE 18

MOLT

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA RETURNS
1925	247	.060	14	12.00	168
1926	232	.060	14	12.00	168
1927	468	.060	16	23.90	382
1928	536	.060	32	26.00	1,214
1929	688	.060	41	41.55	1,704
1930	355	.060	21	26.00	546
1931	263	.060	16	26.00	416
1932	258	.060	15	22.00	330
1933	387	.060	23	8.00	184
1934	757	.060	45	22.00	990
1935	642	.060	39	21.25	829
1936	904	.060	54	19.50	1,053
1937	730	.060	44	23.70	1,043
1938	640	.060	38	15.50	589
1939	405	.060	24	17.00	408
1940	444	.060	27	18.00	486
1941	599	.060	36	15.00	540
1942	620	.060	37	13.50	500
1943	351	.060	21	20.00	420
1944	418	.060	25	15.00	375
1945	851	.060	51	20.00	1,020
1946	1,055	.060	63	10.00	630
1947	1,563	.060	94	20.00	1,880
1948	793	.060	48	19.04*	914
1949	488	.060	29	18.03	523
1950	904**	.060	54	18.12	978
1951	581**	.060	35	19.13	670
1952	779**	.060	47	25.00	1,175
1953	485**	.060	29	25.00*	725
Total	17,440		1,032		$20,860
Average	601	.060	36	$19.73	$ 719

*Estimated

**Exclusive of FWS Take

TABLE 19

WOLVERINE

YEAR	TOTAL ALASKA HARVEST	PERCENT FROM SUSITNA	SUSITNA HARVEST	AVERAGE ALASKA PRICE	VALUE OF SUSITNA PELTRIES
1925	360	.252	91	8.00	728
1926	468	.252	118	15.00	1,770
1927	809	.252	204	22.10	4,508
1928	831	.252	209	21.27	4,445
1929	873	.252	220	19.95	4,389
1930	495	.252	125	10.50	1,313
1931	406	.252	102	8.74	891
1932	234	.252	59	3.60	212
1933	281	.252	71	4.50	320
1934	279	.252	70	3.50	245
1935	260	.252	70	5.50	385
1936	290	.252	73	7.40	540
1937	369	.252	93	6.20	577
1938	2484	.252	62	6.00	372
1939	228	.252	57	5.50	314
1940	326	.252	82	5.50	451
1941	232	.252	58	5.75	334
1942	246	.252	62	7.00	434
1943	92	.252	23	8.50	196
1944	87	.252	22	15.00	330
1945	482	.252	121	15.00	1,815
1946	746	.252	188	15.00	2,820
1947	630	.252	159	11.00	1,749
1948	527	.252	133	12.19*	1,621
1949	369	.252	93	13.37	1,243
1950	490	.252	123	18.12	2,229
1951	500	.252	126	20.63	2,599
1952	350	.252	88	27.50	2,420
1953	400	.252	101	27.50*	2,778
Total	11,908		3,003		$42,028
Average	411	.252	104	$12.06	$ 1,449

*Estimated

TABLE 20

SUSITNA - PREDATORY TYPE ANIMALS

SUMMARY OF VALUES

SPECIES	ANNUAL AVERAGE TAKE	AVERAGE PRICE OF PELT	AVERAGE ANNUAL VALUE	AVERAGE PERCENT OF TOTAL ALASKA TAKE
Wolverine	104	$12.06	$1,449	.252
Coyote	144	$ 6.61	$ 952	.207
Wolf	36	$19.73	$ 719	.060
Total Value*			$3,120	
Rounded			$3,100	

*Bounty Payments Not Included

WATERFOWL

21. About $61,000 annually could be assigned to ducks and geese in the Susitna on a hunter-take basis. This method was used in lieu of adequate duck-day or goose-day information. As annual transects are run in the Lake Louise and Lower Susitna areas, information will then become available on which to make duck-day or goose-day estimates. Undoubtedly, evaluation by the day-use method will result in a much lower value than that being given in this report.

TABLE 21

DUCKS

YEAR	TOTAL ALASKA HARVEST BY LICENSED HUNTERS	PERCENT FROM SUSITNA	TOTAL SUSITNA HARVEST	UNIT VALUE	ANNUAL SUSITNA VALUE
1942	80,045	.111	8,915	8.16	72,746
1943	60,000*	.111	6,660	8.16	54,346
1944	51,653	.111	5,733	8.16	46,781
1945	50,405	.111	5,595	8.16	45,655
1946	71,830	.111	7,973	8.16	65,060
1947	69,416	.111	7,705	8.16	62,873
1948	52,552	.111	5,883	8.16	48,005
1949	60,025	.111	6,627	8.16	54,076
1950	64,077	.111	7,113	8.16	58,042
1951	65,860	.111	7,310	8.16	59,650
1952	60,000*	.111	6,660	8.16	54,346
Total	685,863	.111	76,174	$8.16	$621,580
Average	62,351	.111	6,925	$8.16	$ 56,508

GEESE

1942	13,118	.031	410	$16.32	$6,691
1943	9,000*	.031	279	16.32	4,553
1944	6,098	.031	189	16.32	3,084
1945	8,934	.031	277	16.32	4,521
1946	12,429	.031	385	16.32	6,283
1947	10,628	.031	329	16.32	5,369
1948	9,920	.031	308	16.32	5,027
1949	8,653	.031	268	16.32	4,374
1950	9,807	.031	304	16.32	4,961
1951	9,008	.031	279	16.32	4,553
1952	9,000	.031	279	16.32	4,553
Total	106,595		3,307		$53,969
Average	9,690	.031	301	16.32	4,912

Total Waterfowl Value $61,420

Rounded $61,000

*Estimated

TABLE 22

SUMMARY OF GROUP VALUES

GROUP	AVERAGE ANNUAL GROUP VALUE
Big Game	$207,185
Small Game	44,304
Fur Bearers	87,252
Predatory Type Fur Bearers	3,120
Waterfowl	61,420
TOTAL	$403,281
ROUNDED	$400,000

PROPOSED WORK PLAN

22. Since the Bureau of Reclamation has halted field investigations in the Susitna Drainage, field work will be curtailed during the next year. However, certain work is planned during the next twelve months.

1. A limited economic survey was initiated incidental to the sheep, moose, and caribou checking station activities. When this data is compiled and analyzed, unit values for these three species in the Susitna and Copper River Basins, as well as the rest of the Territory, will be available.

2. A delineation of high value wildlife lands is planned in order that the impact of future land or water-use development upon wildlife resources of the basin may be more readily determined.

3. Total kill of big game animals, the most important wildlife group is essential for accurate reporting. During the next hunting season, it has been recommended that big game hunters be required to report their kills by species, location, and date. Such information would be tabulated by the River Basins staff in Anchorage.

4. Waterfowl transects measuring production are planned for the Lake Louise and Lower Susitna areas. In addition, dates and numbers during the migration season will be gathered as time and monies permit.

5. The trend of wildlife and potential values will receive some consideration.

23. The next progress report should include the above as salient features of the report as well as revision of the annual harvest and values as more specific information becomes available.

LITERATURE CITED

Anonymous

SEVENTH ANNUAL REPORT of the EXECUTIVE OFFICER to the ALASKA GAME COMMISSION for the period NOVEMBER 1, 1930 to OCTOBER 31, 1931

FIFTEENTH REPORT of the EXECUTIVE OFFICER to the ALASKA GAME COMMISSION for the period JANUARY 1, 1940 to DECEMBER 31, 1940

SIXTEENTH ANNUAL REPORT of the EXECUTIVE OFFICER to the ALASKA GAME COMMISSION for the period JANUARY 1, 1941 to DECEMBER 31, 1941

SEVENTEENTH ANNUAL REPORT of the EXECUTIVE OFFICER to the ALASKA GAME COMMISSION for the period JANUARY 1, 1942 to NOVEMBER 30, 1942

SECOND ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1940 to JUNE 30, 19

THIRD ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1941 to JUNE 30, 1942

FOURTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1942 to JUNE 30, 1943

FIFTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1943 to JUNE 30, 1944

SIXTH ANNUAL REPORT of THE ALASKA GAME COMMISSION toTHE SECRETARY OF THE INTERIOR for the period JULY 1, 1944 to JUNE 30, 1945

SEVENTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1945 to JUNE 30, 1946

EIGHTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1946 to JUNE 30, 1947

NINTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1947 to JUNE 30, 1948

TENTH-ELEVENTH ANNUAL REPORTS of THE ALASKA GAME COMMISSION to THE SECRITARY OF THE INTERIOR for the period JULY 1, 1948 to JUNE 30, 1949-JULY 1, 1949 to JUNE 30, 1950

TWELFTH ANNUAL REPORT of THE ALASKA GAME COMMISSION to THE SECRETARY OF THE INTERIOR for the period JULY 1, 1950 to JUNE 30, 1951

ALASKA GAME AND FUR HARVEST STATISTICS, July 1, 1944 to 1953, U. S. D. I., Fish and Wildlife Service, Juneau, Alaska

PITTMAN-ROBERTSON QUARTERLIES, 1949-1953, U. S. D. I., Fish and Wildlife Service, Region 6, Juneau, Alaska

The document *A Progress Report on the Fishery Resources of the Susitna River Basin, Alaska* (1954) is not yet available.

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH and WILDLIFE SERVICE

JUNEAU, ALASKA

PROGRESS REPORT

1956 FIELD INVESTIGATIONS

DEVIL CANYON DAMSITE, SUSITNA RIVER BASIN

TERRITORY of ALASKA

July, 1957

For Administrative Use Only

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SUSITNA RIVER BASIN
ALASKA

SUSITNA REPORT

1. For many years, the Susitna Basin has been an area of extreme interest to the people of the Territory as a potential source of hydro-electric power for South Central Alaska. The basin lies north of the farthest inland projection of Cook Inlet between latitudes 61° - 64° and longitudes 146° - 153°. Its total drainage area comprises 19,300 square miles of virtually uninhabited lands. This area is bordered on the south by the waters of Cook Inlet; on the east by the Chugach and Talkeetna Mountains; and on the west and north by the Alaska Range.

2. The main stem of the Susitna River, from its source in the Alaska Range to its point of discharge into Cook Inlet, is approximately 275 miles long. The principal tributaries have their origin in glaciers high in the mountains and, for the most part, are turbulent in the upper reaches and slow-flowing in the lower regions. Most of the tributaries carry a heavy load of glacial silt.

3. In August of 1952, the Bureau of Reclamation published a report entitled "Report on the Potential Development of Water Resources in the Susitna River Basin of Alaska". Their plan of development included 19 potential damsites, widely distributed throughout the Basin. However, only 12 of the original 19 sites are presently being considered for development. The one currently considered most feasible and most likely to be developed first is the site at Devil Canyon, Figure 1.

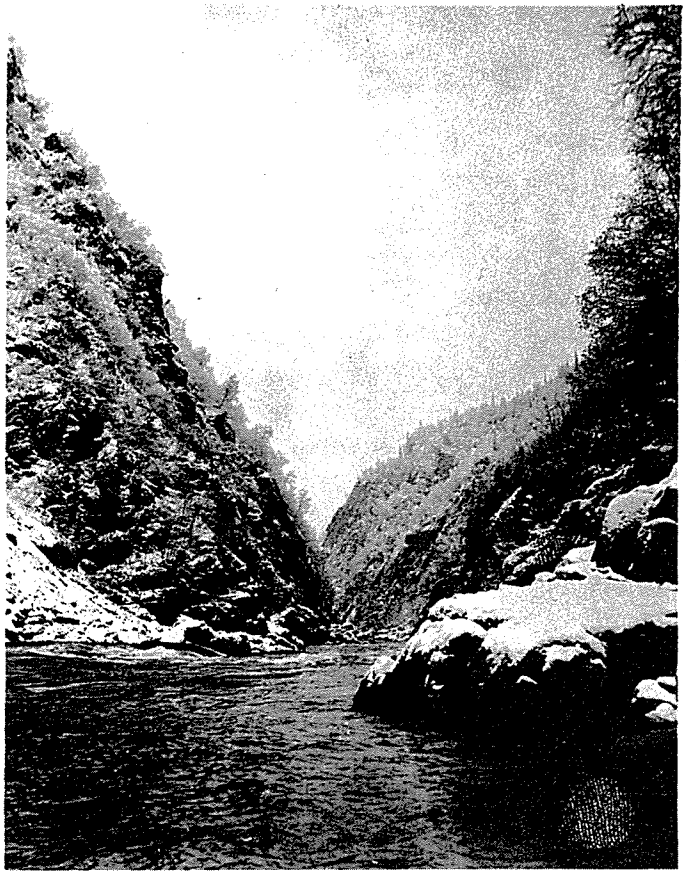

Figure 1. View of proposed Devil Canyon Damsite, showing rapids and river gorge. *

4. The proposed Devil Canyon Dam would consist of a concrete arch-gravity structure having a crest height of approximately 500 feet above the existing stream bed. A side channel spillway equipped with 36- x 50-foot radial gates and an initial power plant capacity of 232,000 KWH are also planned.

5. Approximate stream gradient at the proposed damsite is 19 feet per mile and the drainage area above the damsite includes 5,830 square miles. Dimensions of the proposed reservoir are presented in Table 1.

*Photo by Bureau of Reclamation.

Table 1. Dimensions of the proposed Devil Canyon Reservoir

	Max.	Min.	Avg.
Capacity (100 AC.-F*	2,510	616	2,020
Area (Acres)	15,200	6,400	13,400
Depth at Dam (Ft)	492	291	455
Length (Miles)	26	14	24
Average Width (Ft)	4,800	3,800	4,600

*These amounts include reduction in capacity to allow for estimated sediment deposition over a 100-year period, assuming no upstream reservoirs on the main stem.
NOTE: The above data are based on initial development of only Devil Canyon Reservoir and Power Plant.

6. The Susitna River is considered one of the most important salmon spawning streams in the Cook Inlet region and annually contributes a major portion of the Cook Inlet salmon pack. This contribution is valued in excess of $1,900,000 annually.

7. Investigations of a preliminary nature were conducted by the Fish and Wildlife Service in the Basin in 1952 and 1953 and the following reports were prepared:

1. A Preliminary Statement of Fish and Wildlife Resources of the Susitna Basin in Relation to Water Development Projects, 1952.

2. A Progress Report on the Wildlife Resources of the Susitna Basin, 1954.

3. A Progress Report on the Fishery Resources of the Susitna River Basin, 1954.

8. In the summer of 1956, the Bureau of Reclamation resumed detailed feasibility studies of this damsite. In order to keep pace with their investigations, the Fish and Wildlife Service began detailed

studies of project effects the same year. Although earlier reconnaissance indicated that anadromous species did not utilize the watershed above the Devil Canyon Damsite, detailed studies were required to verify our previous conclusions. The primary objectives of this study are as follows:

1. To determine the extent anadromous species utilize the Susitna River above the proposed Devil Canyon Damsite for spawning and rearing purposes.

2. To determine the extent anadromous species utilize the watershed between the damsite and the town of Curry.

3. To obtain general information relative to magnitude and distribution of resident fish populations that would be affected by project development.

4. To determine whether access blocks to anadromous species exist on the main stem of the Susitna River above the proposed site.

9. The area covered by these investigations was that section of the Susitna River between Curry and the confluence of Jay Creek, Figure 6. In this section, the river is confined to a narrow, steep-walled canyon. Mountains rise abruptly to elevations exceeding 2,000 feet above the stream bed. The stream gradient is relatively steep, with the steepest grade occurring between the confluence of Devil Creek and Portage Creek. It is in this area where hydraulic barriers to migratory fish may occur, as shown in Figures 2, 3 and 4.

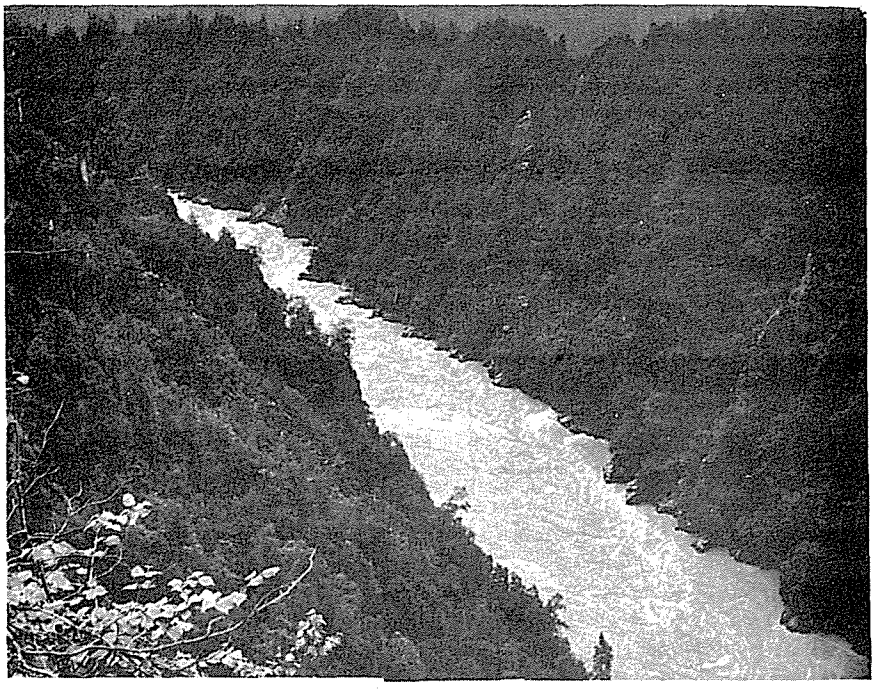

Figure 2. West end of Devil Canyon, showing steepness of canyon walls.

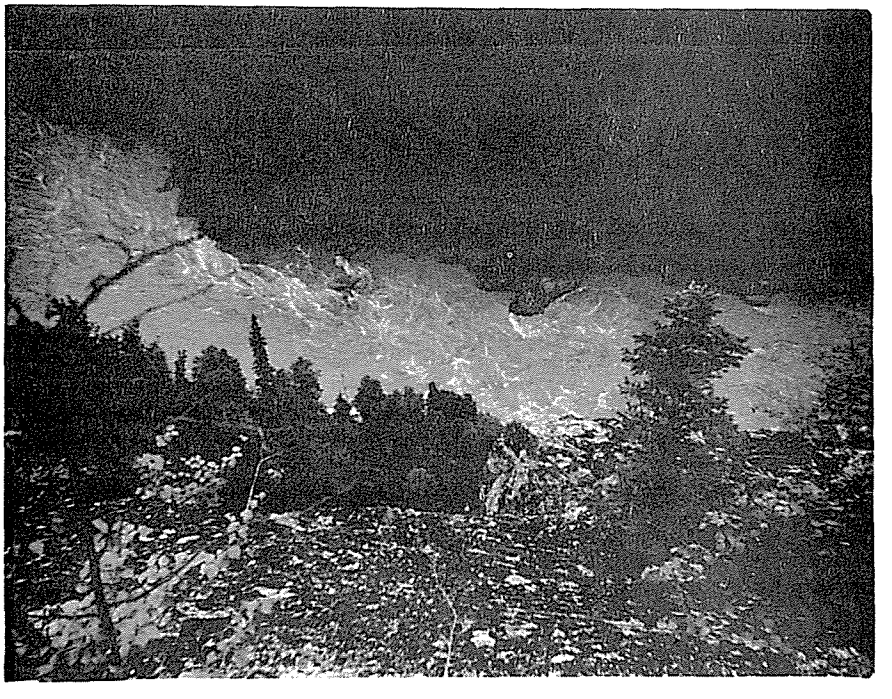

Figure 3. Susitna River approximately 3 miles upstream from the Devil Canyon Damsite.

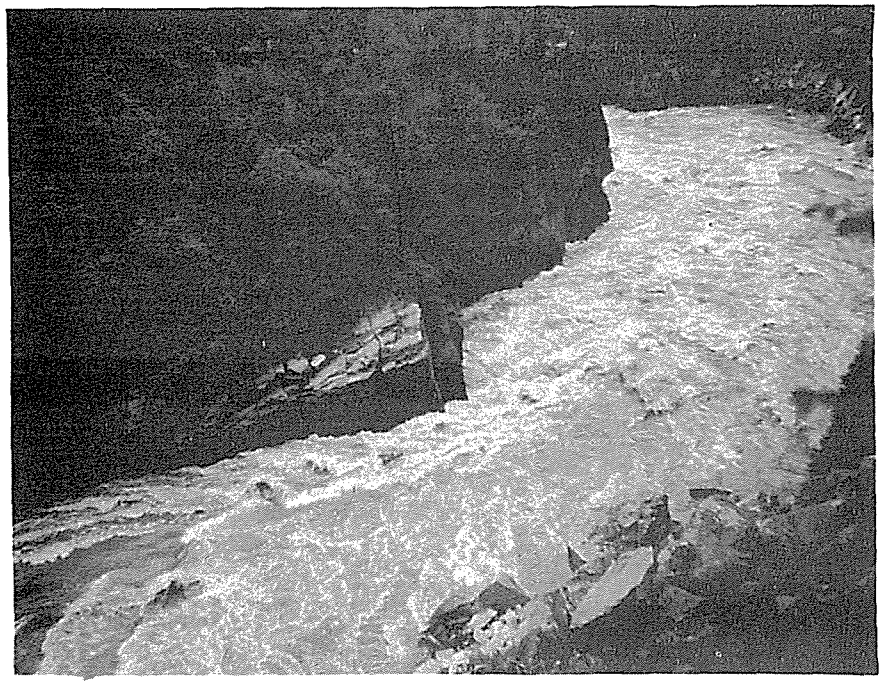

Figure 4. Possible hydraulic barrier to ascending salmon several miles above Devil Canyon Damsite. Note slide lower right.

10. Two methods were used to determine the value of the fishery resources of this section of the river. Gillnetting during the period of salmon migration provided direct evidence of their presence below the damsite, Figure 5. Resulting catch rates gave some indication of their abundance. Tributary streams were surveyed from the air and ground to provide counts of spawning salmon and to estimate the extent of suitable spawning gravels. Observations were also made to determine the presence of natural obstructions to migrating salmon, both in the tributary streams and in the main stream of the Susitna.

11. In addition to the use of gillnets, sampling was also done by means of a minnow seine and hook and line fishing. Representative samples of all species were weighed, measured, and sexed, and scale samples were taken for age and growth analysis.

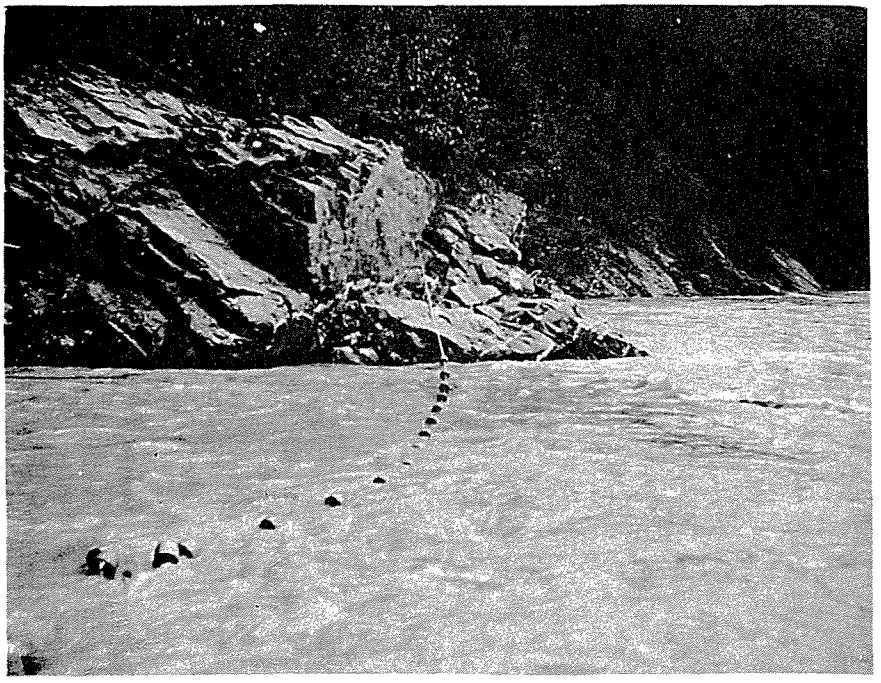

Figure 5. View of gillnet set in eddy in Devil Canyon below damsite.

GILLNETTING RESULTS

12. On June 16, king salmon nets were set in the locations indicated on the map, Figure 6. Sets were made both above and below Portage Creek. The first king salmon was netted on July 7, and the last on July 17. The peak of the run, as indicated by daily gillnet catches, was approximately July 12. Red salmon nets were set on the 19th and 20th of August and fished until the 9th of September. The locations of these sets are also presented in the map, and the catches of both species below the damsite are recorded in Table 2.

Table 2. The amount of gillnet fished; the number of hours fished; and the catch of each species above and below Portage Creek.

Fathoms of Gillnet	Total Hours Fished	Area between Damsite and Portage Creek					Area Below Portage Creek				
		King	Red	Silver	Chum	Pink	King	Red	Silver	Chum	Pink
13	1749	4	0	0	0	0					
16	2207						18	0	0	0	0
10.8	574	0	4	2	23	0					
3.3	544						0	3	53	61	1
		4	4	2	23	0	18	3	53	61	1

13. Catch rates were determined for gillnets set above and below Portage Creek. The following formula was used in these computations:

$$\text{catch rate} = \frac{\text{total hours fished x fathoms of gillnet.}}{\text{catch}}$$

To indicate relative abundance, the resulting catch rate for each species above Portage Creek was divided by its respective catch rate below Portage Creek, thus yielding a percentage figure. These computations follow:

King Salmon

Below: $\frac{2207 \times 16}{18} = 1962$ gear hours per fish captured.

Above: $\frac{1749 \times 13}{4} = 5684$ gear hours per fish captured.

$\frac{5684}{1962} = 290\%$ faster rate of catch per unit gear hours below Portage Creek than above.

Chum Salmon

Below: $\frac{544 \times 3.3}{61} = 29.4$ gear hours per fish captured.

Above: $\frac{574 \times 10.8}{23} = 269.5$ gear hours per fish captured.

$\frac{269.5}{29.4} = 920\%$ faster rate of catch per unit gear hours below Portage Creek than above.

Red Salmon

Below: $\frac{544 \times 3.3}{3} = 598.4$ gear hours per fish captured.

Above: $\frac{574 \times 10.8}{4} = 1{,}549.8$ gear hours per fish captured.

$\frac{1549.8}{598.4} = 259\%$ faster rate of catch per unit of gear hours below Portage Creek than above.

Silver Salmon

Below: $\frac{544 \times 3.3}{53} = 33.9$ gear hours per fish captured.

Above: $\frac{574 \times 10.8}{2} = 3099.6$ gear hours per fish captured.

$\frac{3099.6}{33.9} = 914\%$ faster rate of catch per unit of gear hours below Portage Creek than above.

STREAM SURVEYS

14. The tributary streams surveyed during the 1956 season are discussed in order, beginning with Gold Creek and proceeding upstream. All these tributaries, with the exception of Jay Creek, are located downstream from Devil Canyon. Jay Creek is located approximately 55 miles upstream from Devil Canyon. All tributary streams from Indian River upstream to Jay Creek, inclusive, were surveyed from the air and no salmon were observed.

15. Gold Creek

This stream was not surveyed, but information regarding it was obtained in an interview with Michale Boddner, a homesteader in the area. He stated that a few king salmon spawn in this creek and that 32 chum salmon were spawning at the mouth on September 1. According to Boddner, grayling, rainbow trout, and Dolly Varden trout are also found in Gold Creek.

16. Indian River

This is a clear, fast stream approximately 25 feet wide and of about $3\frac{1}{2}$ feet average depth. Aquatic vegetation includes algae and mosses, while shoreline vegetation is composed chiefly of willow, poplar and alder. The first mile upstream from the mouth possesses a gradient considered too steep for salmon spawning. However, suitable spawning areas were observed in the section from $1\frac{1}{2}$ to 5 miles upstream from the mouth. Four surveys of this section were made: Two were prior to salmon migration, the third was near the peak of the king salmon run, when 22 of this species were observed, and the last was near the end of August, when all runs--with the exception of the silver salmon migration--

were nearly complete. During this final survey, 94 chum, 9 pink and 6 silver salmon were observed alive; while 1 king, 67 pink, and 193 chum salmon were found dead. Aside from its value to spawning salmon, Indian River also provides habitat for grayling and rainbow trout.

17. Jack Long Creek

This tributary possesses a steep gradient and contains clear, slightly yellow-tinged water. Its bed is largely boulders and cobbles and its banks are quite steep. Shoreline vegetation consists chiefly of willow, cottonwood, and a variety of annuals. No salmon were seen nor were their spawning beds observed. Four spawned-out pink salmon, however, were found at the mouth of Jack Long Creek. This stream also supports small grayling and rainbow trout populations.

18. Portage Creek

This creek is 40 to 60 feet wide and 5 to 8 feet deep. Its waters are clear, blue-tinged, and the stream bed contains bottom materials of all sizes, including gravels suitable for spawning salmon. Deep pools are present throughout most of the length of Portage Creek. Some of these are of such depth that spawning salmon could easily have been missed by both aerial and ground observers. Shoreline vegetation is composed chiefly of birch, willow, cottonwood and annuals. Aquatic vegetation is largely moss and algae. Slide areas were noted on the right bank going upstream.

19. The first survey of Portage Creek was made at the beginning of the king salmon run, and 3 of this species were observed. During the last survey, which was made on September 9, 1 live chum, 1 pink and 3 silver salmon were observed moving upstream. A total of 10 chum and 11 pink

salmon were observed on the spawning gravels. A minimum of 30 red salmon were seen spawning at the mouth of Portage Creek.

20. A king salmon gillnet was set diagonally across the mouth of Portage Creek and was fished for eight days during the peak of the run. Only four king salmon were taken and these were netted during the first 24 hours of the set. An observation post overlooking a clear section of Portage Creek was manned for 46 hours during the run, and no king salmon were observed. An aerial reconnaissance survey covering the total length of the stream was made and no salmon were visible from the air. However, as noted previously, spawning salmon may have been present in the deep pools where they could not be discerned. Observations indicated that grayling were abundant in Portage Creek while rainbow trout were relatively scarce.

21. Devil Canyon

While the flow through this section of the Susitna is very rapid and turbulent, it was found that side eddies exist along the canyon wall which permitted the passage of a boat upstream well into the gorge. It appeared that this area should provide no obstruction to migrating salmon. If hydraulic obstructions do exist, they are probably located at the proposed damsite and in the canyon area 8 miles above the site, Figures 2, 3 and 4.

22. Jay Creek

The gradient of this stream is quite gradual to a point approximately two miles upstream from its mouth, where there is a decided increase in gradient. Its waters are yellow and turbid and about 2 to 3 feet deep. Its sandy, rocky shoreline is bordered by stands of white

spruce, cottonwood, willow, and alder. Neither salmon nor their spawning beds were observed in the seven-mile section of Jay Creek which was surveyed. Three gillnets were fished for a period of 494 hours in locations adjacent to the mouth of Jay Creek, and no salmon were taken, indicating the possibility that they were unable to migrate this far upstream in the Susitna.

SUMMARY

25. Field investigations conducted in the Susitna River and its tributaries during the 1956 season provided the following information:

1. Appreciable numbers of all five species of salmon were captured by gillnet in the Susitna below the confluence of Portage Creek.

2. In a stream section extending from Portage Creek almost to the Devil Canyon Damsite, no pink salmon were taken, and only small numbers of king, red, and silver salmon were netted. However, an appreciable number of chum salmon were caught in this section.

3. At Jay Creek, 55 miles upstream from Devil Canyon, three gillnets set for 494 hours captured no salmon.

4. Aerial surveys of all tributary streams from Indian River to Jay Creek, inclusive, failed to reveal the presence of salmon.

DISCUSSION

26, Field investigations during 1956 were intended to determine whether salmon migrate up the Susitna River beyond the Devil Canyon Damsite. All five species of salmon were captured in gillnets which were set downstream from the damsite. Those gillnet sets located nearest the proposed site, however, took very few fish of only four species, the pink salmon not being represented. Gillnets fished near the mouth of Jay Creek, 55 miles upstream from Devil Canyon, failed to take salmon although they were set for 494 hours during the estimated peak of the migration. Furthermore, extensive aerial surveys of the tributary streams failed to reveal the presence of salmon upstream from Devil Canyon. However, it is not believed that present data warrant the conclusion that an obstruction definitely exists. Further field investigations will be conducted in suitable spawning streams above Devil Canyon during the summer of 1957.

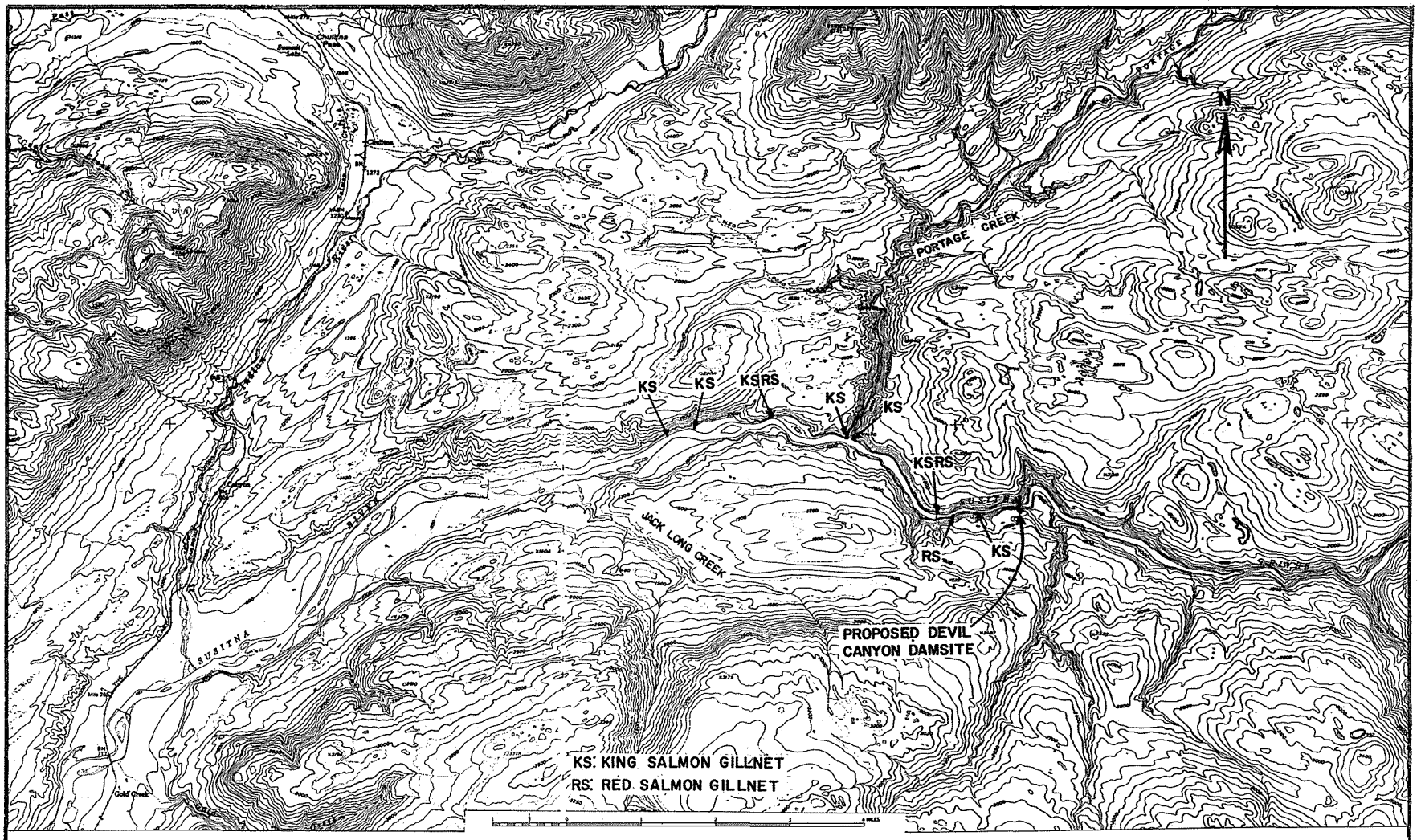

FIGURE 6. THE SECTION OF THE SUSITNA RIVER IN WHICH FIELD INVESTIGATIONS WERE CONDUCTED DURING 1956.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Arnie J. Suomela, Commissioner

PROGRESS REPORT
1957 FIELD INVESTIGATIONS
DEVIL CANYON DAM SITE AND RESERVOIR AREA
SUSITNA RIVER BASIN.

STATE OF ALASKA

Juneau, Alaska
April 1959
For Administrative Use Only

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INTRODUCTION

1. Interest in the Susitna River Basin, a potential source of hydroelectric power for south-central Alaska, is intense and should become more so as population, industry, and national defense create needs for more power (Fig. 1). The Susitna River, about 275 miles long, originates in the Alaska Range, flows to the southwest, and empties into Cook Inlet near Anchorage. The few human inhabitants in the 19,300 square mile drainage area are concentrated in the Lake Louise area and along the Alaska Railroad which runs north and south bisecting the basin and paralleling the Susitna River from 44 to 122 miles above its mouth. A few roads on the fringes of the area provide opportunities for other means of mechanized ground travel.

2. The eastern one-third of the basin probably furnishes over half the range for the Nelchina caribou herd. Censusing in 1955 indicated a population of about 40,000. These animals, which are reasonably close to population centers and accessible from time to time to hunters with automobiles, swamp buggies, and tractors as means of transportation, furnish more sport hunting than any other caribou herd in the State. Moose, fairly abundant throughout the basin, provide hunting along the railbelt and the few roads and elsewhere to hunters with airplanes and boats. Other big game present and furnishing a limited amount of hunting are Dall sheep, mountain goat, black bear, grizzly bear, and brown bear.

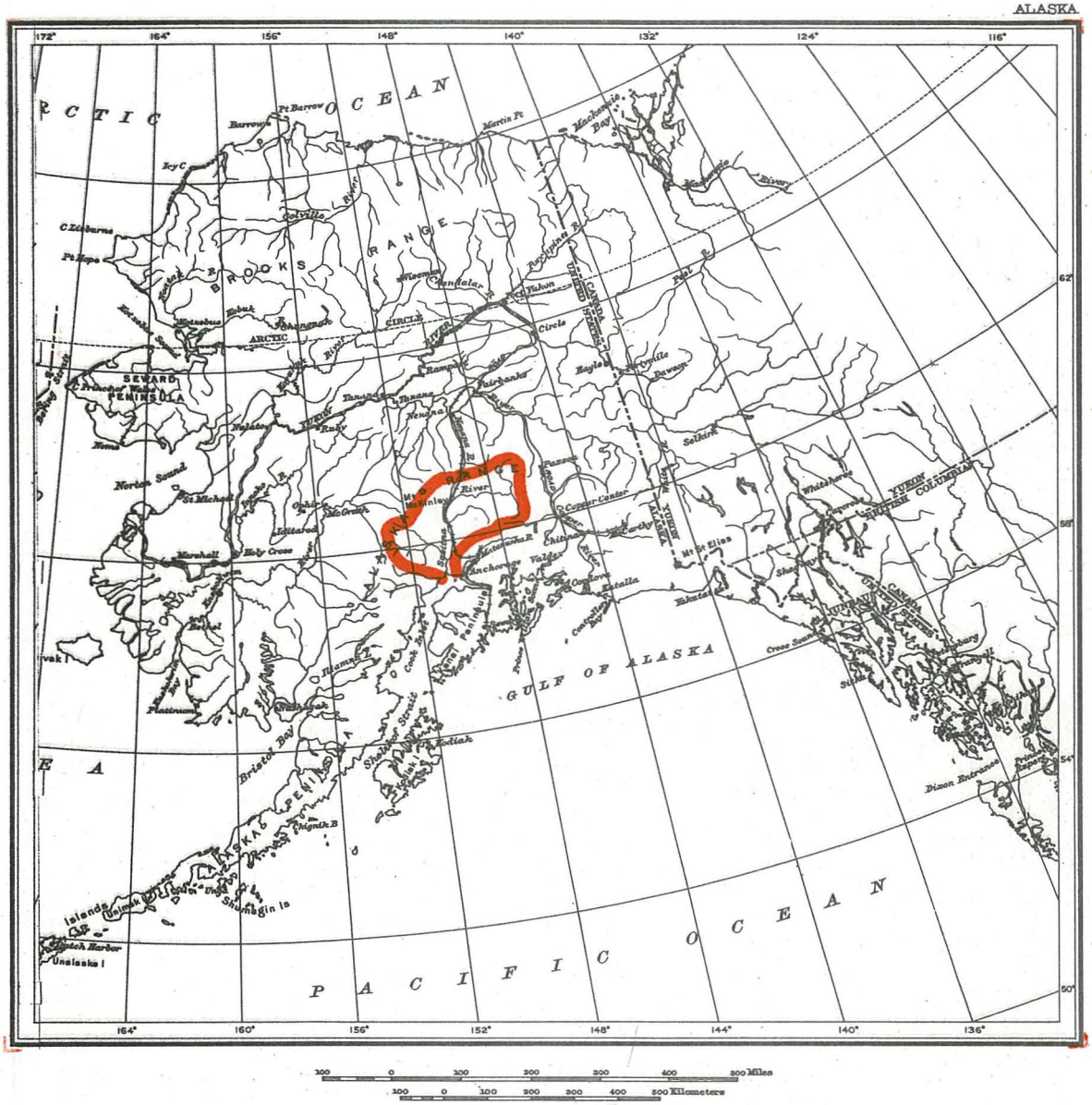


Figure 1. Susitna River Basin, Alaska (Location map)

3. Ptarmigan, spruce grouse, and snowshoe hare, all of whose numbers fluctuate periodically, are found throughout the region. Some waterfowl use the area for nesting as well as for resting during migration. Hunting for these species is limited by inaccessibility.

4. Fur bearers present are beaver, mink, muskrat, red fox, weasel, lynx, otter, wolverine, wolf, and coyote. Harvest of these species varies depending on current fur prices and availability.

5. The Susitna River watershed provides spawning grounds for a substantial portion of the salmon which are taken commercially in Cook Inlet. Estimated percentages of the annual pack contributed by the Susitna River production by species during the 10-year period, 1946 through 1955, are as follows:

Red salmon	39%
King salmon	19%
Pink salmon	20%
Coho salmon	14%
Chum salmon	8%

These figures are computed from estimates furnished by John Skerry, Fishery Management Supervisor for Cook Inlet District, and data in the Fishery Report for Kenai Peninsula (1957).

6. The Bureau of Reclamation (1952) has described 19 potential dam sites for ultimate hydroelectric power development of the Susitna Basin. Results of ensuing preliminary Fish and Wildlife Service investigations were presented in three reports issued during 1952 and 1954.

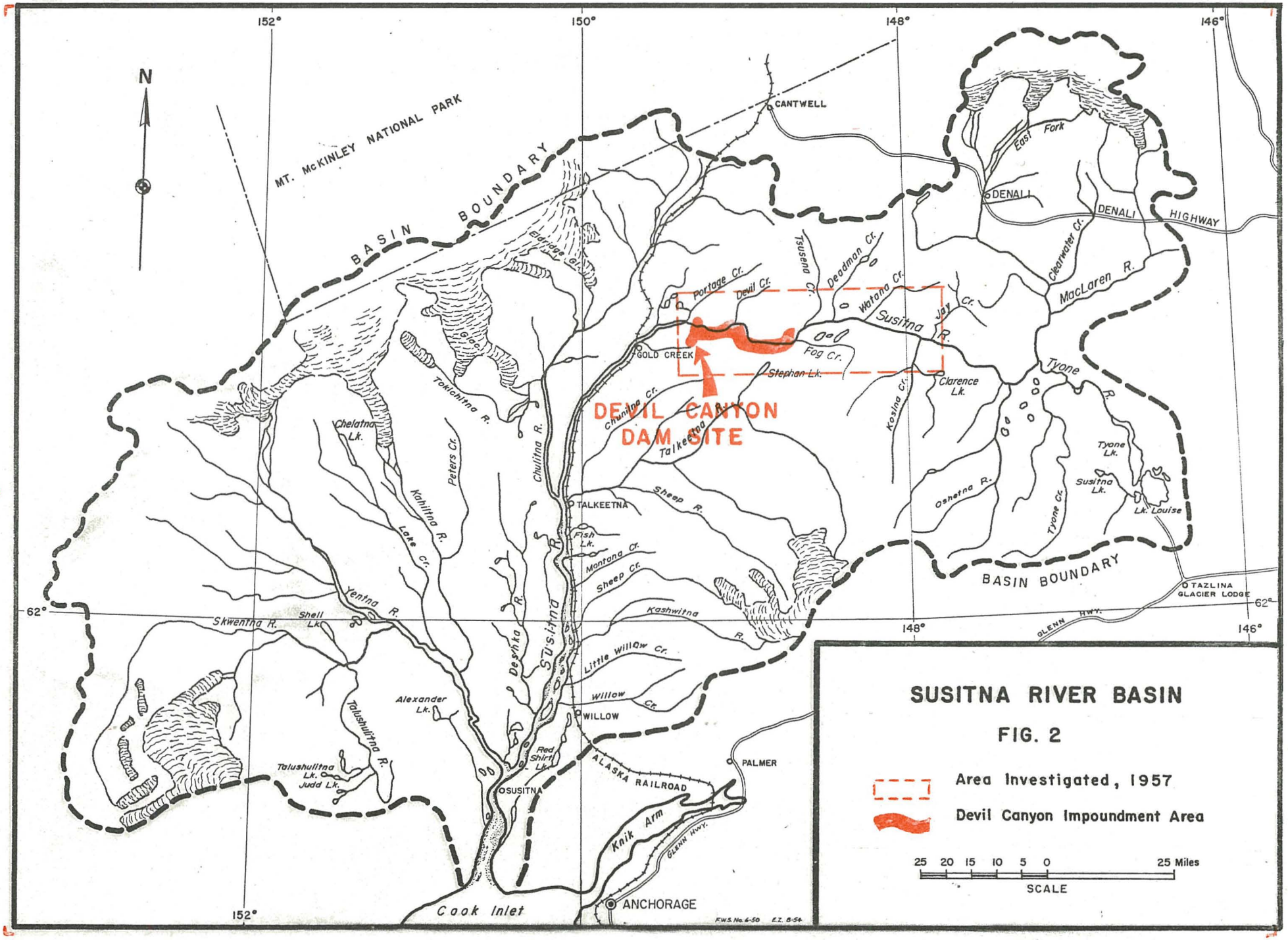
7. The Devil Canyon site has been selected by the Bureau of Reclamation for initial development. Located 134 miles above the river's mouth and 12 miles above Gold Creek railroad station, the site is about midway between the population centers of Anchorage and Fairbanks (Figs. 2 and 4).

8. The dam would be a concrete arch-gravity structure about 500 feet high with a crest length of 1,100 feet. A power plant located at the foot of the dam would have a capacity of 232,000 KW and annual firm output of 1,150,000,000 KW-hours.

9. The reservoir, 25 miles long and between one-half and three-fourths miles wide, would have a total capacity of 2,930,000 acre-feet of which 1,950,000 acre-feet would be available for power storage capacity. These figures are based upon development without upstream storage reservoirs. Complete data for the Devil Canyon project alone and in conjunction with upstream reservoirs are presented in the Bureau of Reclamation Susitna Basin Report (1952).

OBJECTIVES

10. The overall objective of the River Basin Studies investigations was to determine the effects of a dam and impoundment on the fish and wildlife resources of the area with primary emphasis on whether a dam would affect significant runs of anadromous fish. In order to meet these


N
152°
150°
148°
146°
62°
MT. McKINLEY NATIONAL PARK
BASIN BOUNDARY
CANTWELL
East Fork
DENALI
DENALI HIGHWAY
Clearwater Cr.
MacLaren R.
Tsusena Cr.
Deadman Cr.
Portage Cr.
Devil Cr.
Watana Cr.
Jay Cr.
Susitna R.
Fog Cr.
Stephan Lk.
GOLD CREEK
DEVIL CANYON DAM SITE
Clarence Lk.
Kosina Cr.
Tyone R.
Tyone Lk.
Susitna Lk.
Lk. Louise
Oshetna R.
Tyone Cr.
BASIN BOUNDARY
TAZLINA GLACIER LODGE
GLENN HWY.
Eldridge Gl.
Toklatna R.
Chelatna Lk.
Peters Cr.
Kahiltna R.
Lake Cr.
Yentna R.
Skwentna R.
Shell Lk.
Chulitna R.
Churitna Cr.
Talkeetna R.
TALKEETNA
Sheep R.
Fish Lk.
Montana Cr.
Sheep Cr.
Kashwitna R.
Little Willow Cr.
Willow Cr.
WILLOW
Deshka R.
Susitna R.
Alexander Lk.
Talushultna R.
Talushultna Lk.
Judd Lk.
Red Shirt Lk.
SUSITNA
ALASKA RAILROAD
PALMER
Knik Arm
GLENN HWY.
ANCHORAGE
Cook Inlet
F.W.S. No. 6-50 E.I. 8-54
SUSITNA RIVER BASIN
FIG. 2
Area Investigated, 1957
Devil Canyon Impoundment Area
25 20 15 10 5 0 25 Miles
SCALE

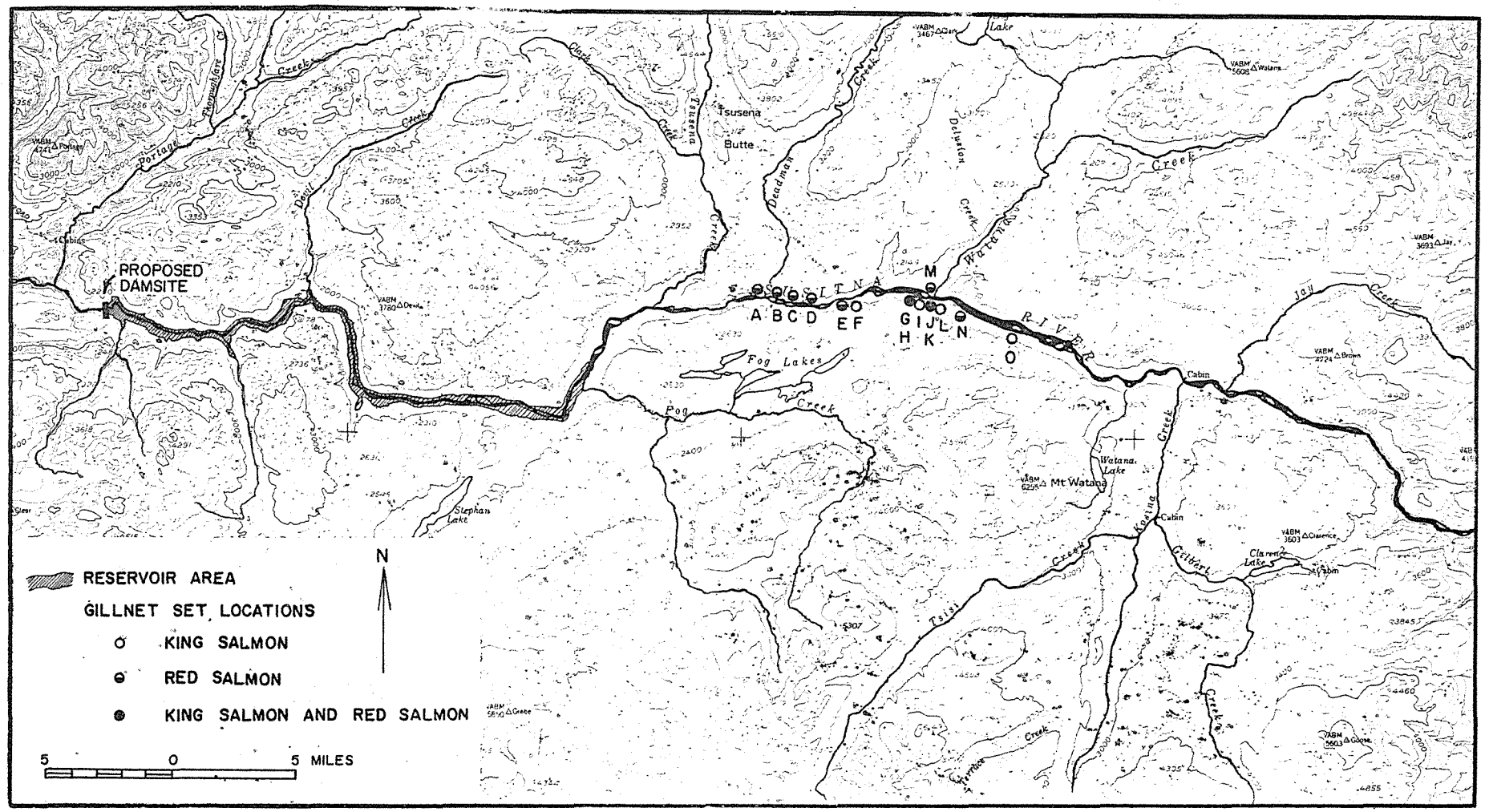
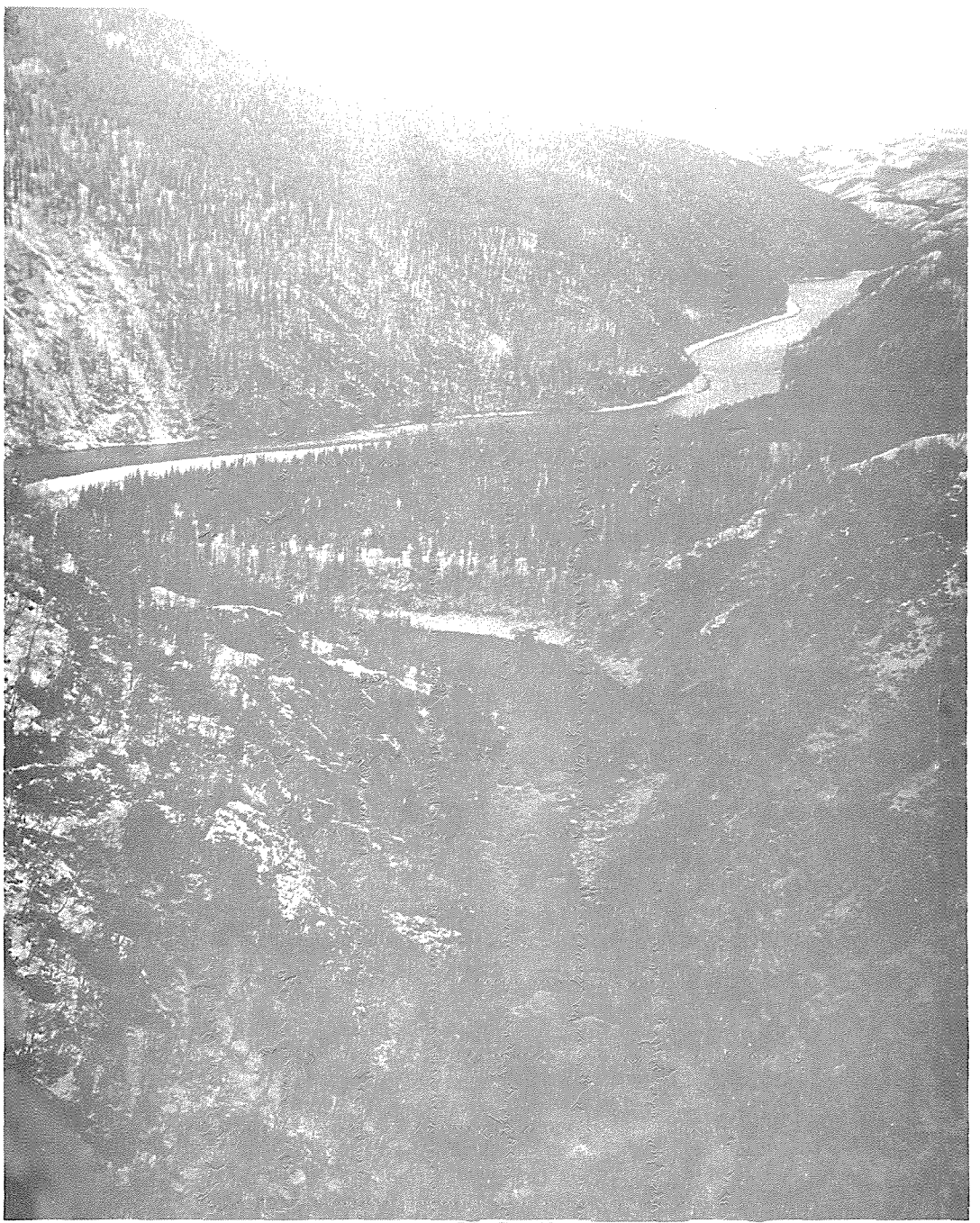


Figure 3. The Susitna River from Portage to Jay Creek. This section contains the proposed Devil Canyon dam site and 1957 area of investigation.



U.S. Bureau of Reclamation photo

Figure 4. Aerial view of Devil Canyon dam site (lower foreground) and reservoir area above.

objectives, a two-year study was initiated. The work during the 1956 field season was devoted to test netting in the Susitna River and its tributaries immediately below the dam site, and at Jay Creek, 55 miles above the dam site. From this work it was determined that there was a possibility of a limited number of salmon passing through Devil Canyon to spawn. Complete findings may be found in the 1956 Field Investigations Progress Report (1957).

11. The primary objective of the 1957 program was to test net above the dam site to further determine if anadromous fish were passing through Devil Canyon. Incidental to this, information was to be gathered on other fish and game species.

DESCRIPTION OF AREA

12. The area investigated during the summer was the Susitna River and tributaries from Deadman Creek to Jay Creek, inclusive. The lower end of this 20-mile section is about $8\frac{1}{2}$ miles above the upper end of the Devil Canyon impoundment area, (Figs. 2 and 3). This area was chosen for study because it contains more potential spawning streams; also, logistics would be less difficult than in the 25-mile long proposed impoundment area. The two areas are believed sufficiently similar that data obtained for resident fish and game populations and game utilization on the study area are applicable to the impoundment area.

13. Stream bottoms and low river bottoms support black spruce-aspen stands. White spruce occurs on the steep side hills in conjunction with paper birch, scrub birch, black spruce, and occasional stands of aspen and cottonwood. Scrub birch is present in the rolling country on each side of the canyon. Willow occurs infrequently throughout the entire study area. Understory includes blueberry, low-bush cranberry, narrow-leafed Labrador tea, crowberry, fireweed, mosses, and lichens.

METHODS

14. Fifteen gill nets, 6 feet in depth and averaging 28 feet in length, were set in the 10-mile section of the Susitna River from the mouth of Deadman Creek to 3 miles above the mouth of Watana Creek (Fig. 3 and Table 1). Six of these sets were of $8\frac{1}{2}$-inch mesh king salmon web; nine sets were of $5\frac{1}{2}$-inch mesh red salmon web. The nets were set with one end anchored and one end free in eddies of the Susitna River and at the mouths of Deadman and Watana Creeks, both potential salmon spawning streams. The first set was made on June 16. Each net was checked on the average of every seven days. A boat accident and the subsequent loss of equipment limited field work to the extent that no nets were checked from July 10 to 22. Nets were removed August 28 and 29 resulting in a total of 7,314 fishing hours [1/] (4,320 with $8\frac{1}{2}$-inch web; 2,994 with $5\frac{1}{2}$-inch web). Although hampered somewhat by fluctuating

1/ 1 fishing hour = 1 gill net fished for 1 hour.

water levels, the gill nets fished with a satisfactory degree of efficiency.

Table 1. Gill Net Sets, Susitna River, 1957

Location No. (Fig. 3)	Dates Fished	Hours Fished $8\frac{1}{2}$" mesh (king web)	Hours Fished $5\frac{1}{2}$" mesh (red web)	Fish Taken
A	July 3- July 4		24	None
	July 7- July 10		72	None
B	July 27- July 30		72	None
C	July 6- July 29		552	None
D	July 28- July 29		24	None
E	June 23- July 11		252	None
F	June 20- June 26	144		None
G	June 20- August 30	1,704		None
H	July 28- August 2		120	None
I	July 24- July 25	24		None
J	July 22- August 1		240	None
K	July 24- July 25	24		None
L	July 24- August 30	888		None
M	July 29- August 29		744	None
N	June 16- July 21		894	None
O	June 27- August 30	1,536		None
	Totals	4,320	2,994	
	Grand Total	7,314 hours		None

15. Ten small fish collections were made (Table 2). Seven of these were from the mouth of Watana Creek, one from Watana Creek two miles upstream from its mouth, one from the Susitna River one mile below Watana Creek, and one from the mouth of Deadman Creek.

16. The lower portions of Deadman, Watana, and Kosina Creeks were surveyed periodically throughout the summer for evidence of

Table 2. Summary of 10 small fish collections, Susitna River Basin, 1957.

PERMANENT FISH AND WILDLIFE SERVICE COLLECTION NUMBER	DATE	LOCATION	METHOD OF CAPTURE	SPECIES					
				Catostomus catostomus (Forster) Northern sucker	Cottus cognatus (Richardson) Sculpin	Coregonus cylindraceus (Pallas) Whitefish	Coregonus lavaretus pidschian (Gmelin) Whitefish	Thymallus arcticus signifer (Richardson) Grayling	Lota lota leptura (Hubbs & Schultze) Burbot
RB57-1	6/25/57	Mouth of Watana Creek	Seine	X	X		X	X	
RB57-2	6/21/57	Mouth of Deadman Creek	Seine, Rod & Reel				X	X	
RB57-3	7/21/57	Watana Creek 2 miles upstream from mouth	Rod & Reel					X	
RB57-4	7/26/57	Mouth of Watana Creek	Seine	X	X	X	X	X	
RB57-5	8/1/57	Mouth of Watana Creek	Seine			X	X	X	
RB57-6	7/6/57	Mouth of Watana Creek	Seine	X		X		X	X
RB57-7	7/8/57	Mouth of Watana Creek	Seine	X		X			X
RB57-8	7/11/57	Mouth of Watana Creek	Seine	X	X	X	X		
RB57-9	7/17/57	Mouth of Watana Creek	Seine	X		X	X		X
RB57-10	not recorded	Susitna River 1 mile below Watana Creek	(not recorded)			X		X	

anadromous and resident fish. Descriptions of physical characteristics of the streams were obtained during these surveys.

17. Wildlife observations were made while traveling and working on the river. The area between Deadman and Watana Creeks was covered intensively on foot, and wildlife species and range conditions were noted.

18. During the winter three aerial surveys were made to determine species and numbers of game animals on and adjacent to the reservoir area. A super-cub was used on January 21, 1958, and a Pacer on February 12 and March 11. Three parallel transects the length of the impoundment area on the first flight and two transects on succeeding flights, resulted in nearly complete coverage of the area each time.

FINDINGS

Fishery Investigations

19. No fish were taken in gill nets during their 7,314 fishing hours. About 4,300 hours of this fishing was with $8\frac{1}{2}$-inch mesh net and about 3,000 hours with $5\frac{1}{2}$-inch mesh net. Fishing efficiency of the nets declined from July 10 to July 22, when a boat accident and loss of equipment prevented their being tended. Unfortunately, this occurred at a time corresponding to the period July 7 to 17 of the previous year when king salmon were netted in the Portage Creek area about 35 miles downstream. However, had appreciable numbers of king salmon come upstream during this

time, it is believed late-running fish would have been taken after July 22, when nets were again fishing effectively. The nets were fished until August 29. During the previous year, all species of salmon, other than king, were taken below the dam site between August 19, when red nets were first set, and August 29.

20. No downstream migrant or temporarily resident young salmon or steelhead were present in ten fish collections obtained in Watana Creek, Deadman Creek, and the Susitna River (Table 2). No evidence of salmon or steelhead was found by walking the lower portions of Deadman, Watana, Kosina, and Jay Creeks during August. Michael Boddner, a homesteader in the Gold Creek area who is familiar with the Susitna River and its major tributaries, has never observed salmon above the proposed dam site.

21. There are two unverified reports of salmon above the dam site. Two sportsmen interviewed during August supposedly identified head bones and other skeletal structures found in the spring of the year near Jay Creek as belonging to salmon. A Bureau of Reclamation employee reported seeing salmon late in July or early August at the mouth of a small tributary which enters the Susitna River from the south about 3/4 mile above the dam site. The fish were not identified as to species, but salmon which might have traveled above the dam site at that time would probably have been chums or kings.

22. Lack of success in netting adult salmon or seining immature salmon, or in finding evidence of salmon in clear tributary streams indicates that during the summer of 1957 few salmon spawned above the dam site.

Stream Surveys

23. Deadman Creek, about 30 miles long, is a clear stream bordered by spruce, cottonwood, willow, and alder. Numerous pools and a bottom with many rocks and large boulders characterize the lower section. Air and water temperatures, respectively, were 65.0°F. and 53.5°F. on June 21; 71.0°F. and 54.0°F. on June 30. Aquatic and terrestrial insects were abundant. Schools of grayling were seen in its frequent pools. Grayling and whitefish (Coregonus lavaratus pidschian) were seined at the creek's mouth.

24. Watana Creek is about 20 miles long and 1 to 5 feet deep. Water flow at the mouth, where it is about 40 feet wide and 1 to 2 feet deep, was 150 to 160 c.f.s. (metered flow) on August 5. Its waters are clear and green-tinged. Bottom material includes gravel suitable for salmon spawning. Occasional deep pools are interspersed with many riffle areas and slide areas are present on the west bank. The stream exhibits marked fluctuations in water level. Mean of water temperatures recorded daily between 8:00 and 10:00 a.m. from June 20 to August 30 was 52.0°F. Mean of corresponding air temperatures was 63.4°F.

Extreme water temperatures were 48.5°F. on July 25 and 47.0°F. on August 11. Corresponding air temperatures were 49.0°F. and 69.0°F.

25. The prominent plant species bordering Watana Creek are birch, willow, and spruce; the main aquatics are moss and algae. Grayling and whitefish were seined 2 miles above the creek mouth. These same species, plus numerous fine-scaled suckers and an occasional burbot and sculpin (Cottus cognatus) were seined at the stream's junction with the Susitna River.

26. Average daily water fluctuations of the Susitna River at Watana Creek was 3.3 inches. The greatest rise in water level recorded in 24 hours was 7 inches; the greatest drop, 14 inches. Water level of the Susitna River dropped 42 inches from June 21 to August 16. Mean temperature of the Susitna River at Watana Creek was 54.0°F. while mean air temperature was 63.0°F. Extreme river temperatures were 50.0°F. on June 23 and 58.0°F. on June 28 with corresponding air temperatures of 69.0°F. and 82.0°F. on these same days.

27. Kosina Creek, about 35 miles in length, has a steep gradient and contains clear, slightly yellow-tinged water. The stream is characterized by a bed of rocks and boulders, steep banks, and numerous riffles. Water fluctuations were slight except for a noted drop in September. Water and air temperatures on August 16 were 53.0°F. and 63.0°F. respectively. Shoreline vegetation is mainly cottonwood, spruce, and a

variety of annuals. Grayling were readily taken with hook and line.

Wildlife Investigations

28. Moose were observed throughout the area during the summer with an indication of movement out of the river bottom during the middle of July. This was possibly a shift to higher elevations to avoid insects. Numbers of moose seen in the proposed impoundment area on winter flights are recorded in Table 2. Similar low densities were noted in areas adjacent to the proposed reservoir. Condition of browse species indicates that the area has supported a high moose population at some time during recent years. Scrub birch, the most abundant browse species, showed moderate to heavy use. The bark of nearly every aspen tree was scarred, indicating moose utilization. The occasional willow showed heavy or severe use. Portions of paper birch which could have furnished browse had grown out of reach.

Table 3. Animals seen in proposed Devil Canyon impoundment area on three aerial surveys.

Date	Moose	Caribou
January 21, 1958	1	12
February 12, 1958	2	10
March 11, 1958	2	24

29. Segments of the Nelchina caribou herd periodically range on both sides of the Susitna River as far west as the impoundment area. Between July 20 and August 20, an estimated 1,500 caribou were observed

crossing the river from north to south in the vicinity of Watana Creek. Although the river here is swift and from 70 to 100 yards wide, the animals, including calves, crossed with ease and at times even swam upstream to find a suitable place to climb on shore. Table 3 shows numbers of caribou seen in the proposed reservoir area on winter flights. No large concentrations or movements of caribou toward the impoundment area were noted in adjacent areas.

30. Black bear were sighted singly or in groups of up to four (female with three cubs) throughout the study area. They were observed more often and droppings were more common late in the summer. Two grizzly bear were seen.

31. Beaver were present in sloughs along the river. The rapid current and ice flow during spring break-up probably restricts them to the sloughs or tributaries most of which provide fair habitat. Sparce otter and mink sign were seen. Fox and coyote sign, although not common, were noted at high elevations. Wolf tracks were common. Other possible fur bearers whose presence was not definitely determined were lynx, martin, wolverine, muskrat.

32. Waterfowl, with the exception of a few merganser which nest in tributaries, were not found in the study area. Few spruce grouse were seen. Bald eagles and a variety of hawks, owls, and song birds were noted.

SUMMARY

33. Field investigations were conducted on the Susitna River and tributaries from Deadman Creek to Jay Creek during 1957 primarily to determine if anadromous fish were present in these waters.

34. No fish were taken by gill net during 7, 314 fishing hours. About 4, 300 hours of this fishing was with $8\frac{1}{2}$-inch mesh net and about 3, 000 hours with $5\frac{1}{2}$-inch mesh net. No downstream migrant or temporarily resident young salmon were taken by seining. No evidence of salmon was observed during ground surveys of clear tributary streams made in August. Grayling, whitefish, sucker, burbot, and sculpin were seined.

35. Moose, caribou, and grizzly and black bear were noted along the Susitna River above the Devil Canyon dam site in varying numbers throughout the year. Fur bearers noted were wolf, coyote, fox, beaver, otter, and mink. Few waterfowl and grouse were observed. Other bird species noticed were bald eagles, hawks, owls and song birds.

LITERATURE CITED

Anonymous

1952. A report on potential development of water resources in the Susitna River Basin of Alaska. U. S. Bureau of Reclamation report.

1952. A preliminary report on fish and wildlife resources in relation to the Susitna River Basin Plan, Alaska. U. S. Fish and Wildlife Service report.

1954. A progress report on wildlife of the Susitna River Basin. U. S. Fish and Wildlife Service report.

1954. A progress report on the fishery resources of the Susitna River Basin. U. S. Fish and Wildlife Service report.

1957. A special report on fishery resources of the Kenai Peninsula. U. S. Fish and Wildlife Service report.

1957. 1956 Field investigations, Devil Canyon dam site, Susitna River Basin. U. S. Fish and Wildlife Service progress report.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Arnie J. Suomela, Commissioner

1958 FIELD INVESTIGATIONS
DENALI AND VEE CANYON DAM SITES AND RESERVOIR AREAS
SUSITNA RIVER BASIN

STATE OF ALASKA

Juneau, Alaska
June 1959
For Administrative Use Only

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BACKGROUND

1. The coming era is regarded by many as one of population expansion and industrial growth for Alaska with an attendant demand for increased and cheaper electrical power. Development of the hydroelectric potential of the Susitna Basin, located between the population centers of Anchorage and Fairbanks, appears to be one of the most feasible means of meeting the anticipated power demands in this area (Fig. 1). The Susitna River, glacial in origin, and 275 miles long, drains a relatively uninhabited area of about 19,300 square miles. This river flows generally to the southwest between the Alaska Range lying to the north and west, and the Talkeetna Mountains lying to the southeast. The Alaska Railroad, running north and south through the middle of the Basin, and the Denali Highway cutting the northern fringe, are the main facilities developed for ground travel.

2. The Bureau of Reclamation (1952) has described 19 potential dam sites for ultimate power development of the Susitna River Basin. Three preliminary Fish and Wildlife Service reports dealing with basin-wide aspects of the fish and game resources were issued in response to this Bureau of Reclamation report. The first dam to be constructed would be at Devil Canyon at river mile 134. Results of Fish and Wildlife Service investigations to determine effects of a dam at Devil Canyon on fish and wildlife were presented in progress reports issued in 1957 and 1959. Investigations are being

Figure 1. Susitna River Basin, Alaska.

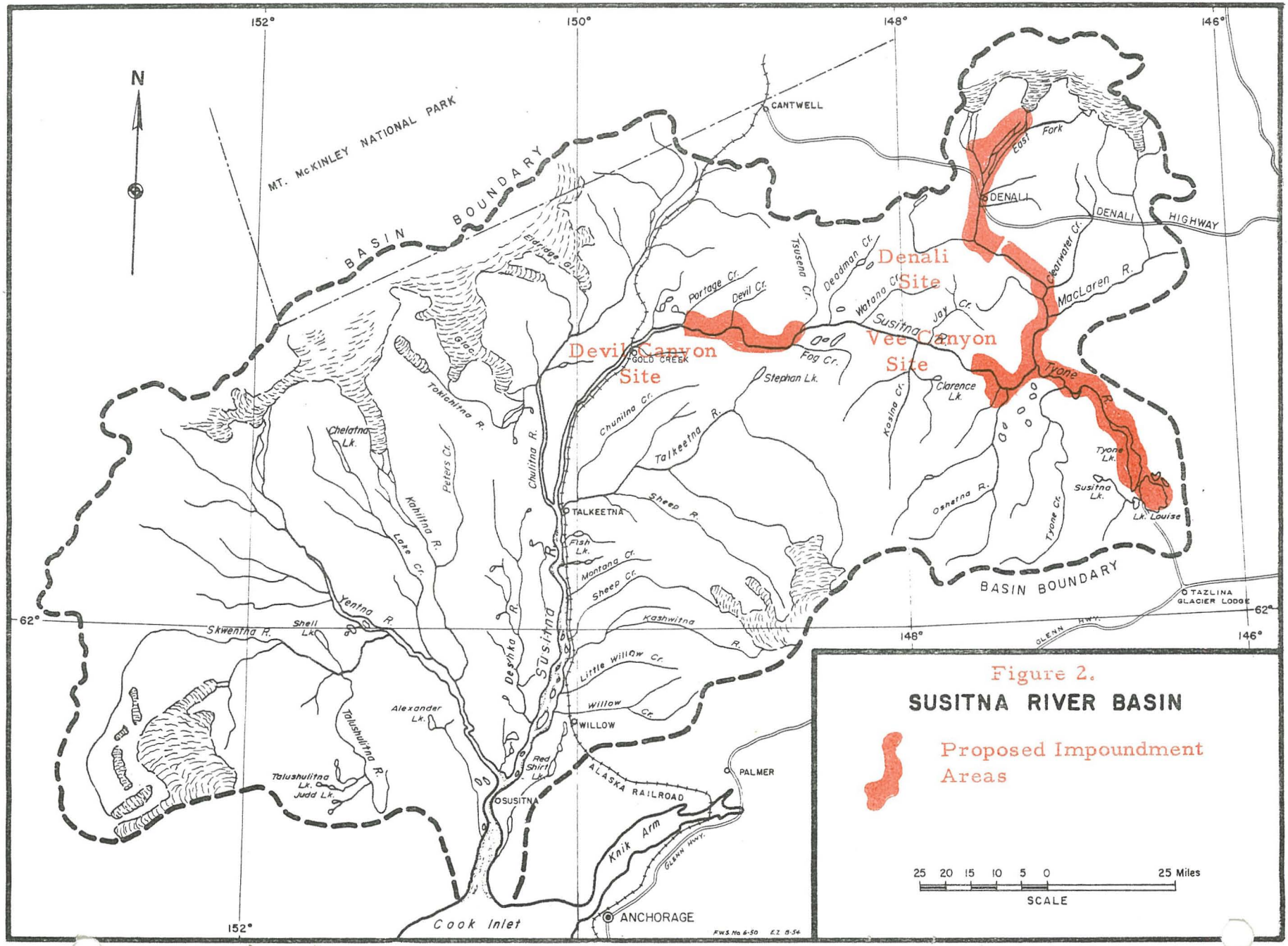
continued to determine downstream effects on fish and game of an impoundment at Devil Canyon.

3. A second dam in the Bureau of Reclamation's plan of ultimate development for the Basin would be located at the Denali site on the upper section of the river at mile 245 (Figs. 2 and 3). This unit would function as a storage reservoir to provide regulated water releases for power generation at Devil Canyon.

4. The earth dam planned for Denali would be 205 feet high and would have a crest length of 1,900 feet. The reservoir would be 2 to 6 miles wide, 29 miles long, and would extend almost to the headwater glaciers if the maximum reservoir capacity of 6,700,000 acre-feet were developed. This would inundate approximately 120 square miles. Inasmuch as the reservoir would be intended primarily for storage, it is probable that no power plant would be installed.

5. A third dam, Vee Canyon, at river mile 200 would be a concrete, arch-gravity structure with a height of 425 feet and crest-length of 1,400 feet. The most recent figures obtained from the Bureau of Reclamation list 2,400 feet as the probable maximum reservoir elevation. This would inundate between 95 and 100 square miles, backing water up the main stem of the Susitna River a distance of 50 miles to the headwaters of the Tyone system at Lake Louise. With ultimate development of the Susitna Basin, a power plant with a productive capacity of 260,000 kilowatts would be installed at Vee Canyon.

6. Studies to determine feasibility of the Denali site were started by the Bureau of Reclamation in 1958. Concurrently, the Branch of River Basin Studies began field investigations to determine what effects the


152°
150°
148°
146°
N
MT. McKINLEY NATIONAL PARK
BASIN BOUNDARY
CANTWELL
East Fork
DENALI
DENALI HIGHWAY
Clearwater Cr.
MacLaren R.
Denali Site
Devil Canyon Site
Vee Canyon Site
Portage Cr.
Devil Cr.
Tsusena Cr.
Deadman Cr.
Watana Cr.
Jay Cr.
Susitna R.
Fog Cr.
GOLD CREEK
Stephan Lk.
Clarence Lk.
Kosina Cr.
Tyone R.
Tyone Lk.
Susitna Lk.
Lk. Louise
Oshetna R.
Tyone Cr.
Eldridge Glacier
Tokichitna R.
Chelatna Lk.
Peters Cr.
Kahiltna R.
Lake Cr.
Chulitna R.
Chunilna Cr.
Talkeetna R.
TALKEETNA
Sheep R.
Fish Lk.
Montana Cr.
Sheep Cr.
Kashwitna R.
Little Willow Cr.
Willow Cr.
WILLOW
Yentna R.
Shell Lk.
Skwentna R.
Alexander Lk.
Talushulitna R.
Talushulitna Lk.
Judd Lk.
Deshka R.
Red Shirt Lk.
SUSITNA
ALASKA RAILROAD
PALMER
Knik Arm
GLENN HWY.
ANCHORAGE
Cook Inlet
TAZLINA GLACIER LODGE
62°
FWS No 6-50 E.Z. 8-54
Figure 2.
SUSITNA RIVER BASIN
Proposed Impoundment Areas
25 20 15 10 5 0 25 Miles
SCALE

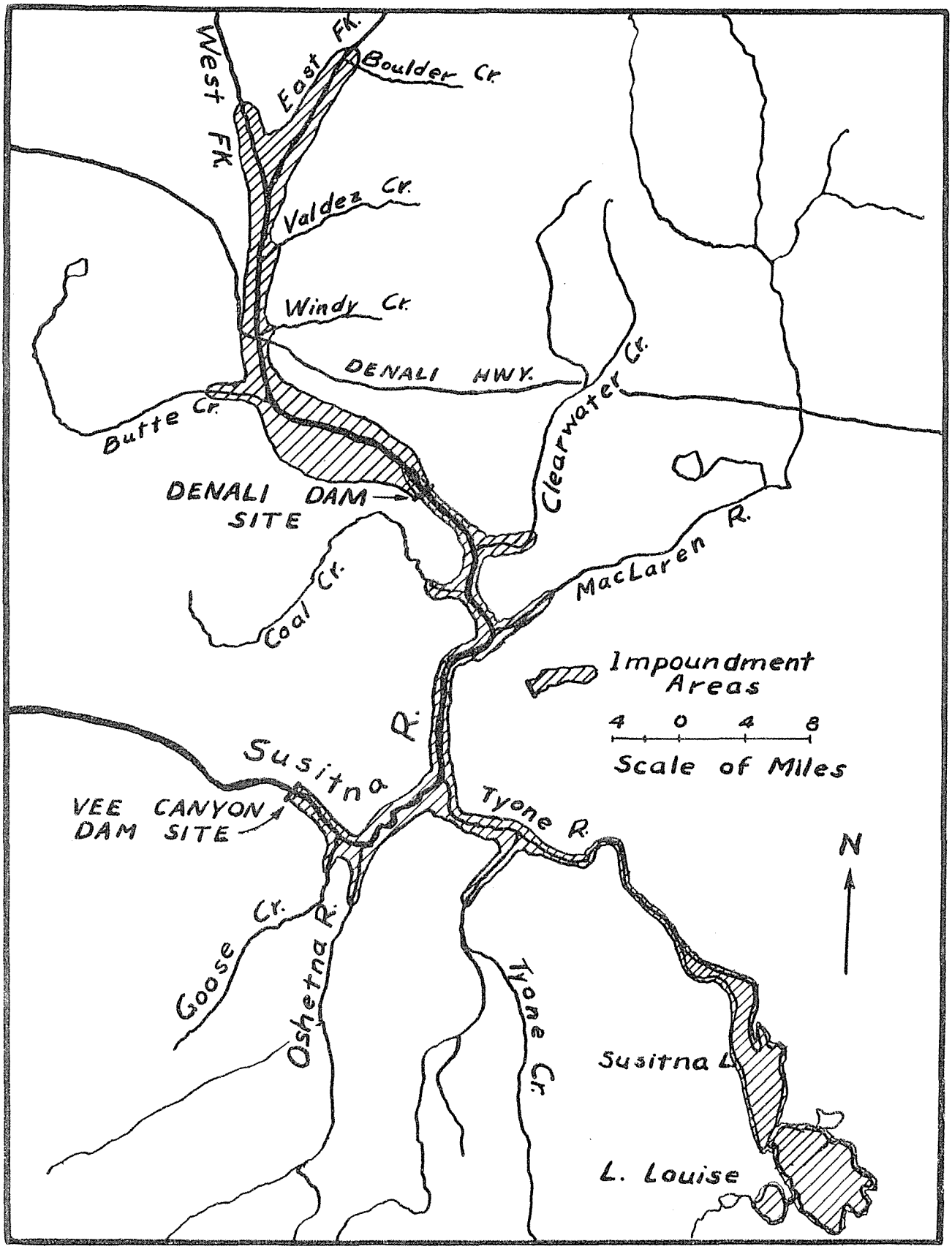


Figure 3. Susitna River, showing Denali and Vee Canyon dam sites.

proposed development would have upon the fish and wildlife resources. Because of the proximity of the Denali and Vee Canyon sites, the Fish and Wildlife Service program was expanded to include similar determinations for the Vee Canyon impoundment.

OPERATIONS AND METHODS

7. Semi-permanent camps were established for summer field investigations at the Denali Highway crossing of the Susitna River and at the mouth of the Tyone River. River travel was accomplished with a 30-foot river boat powered with a 35-horsepower outboard motor. Areas inaccessible by boat were covered on foot by the two or three crew members who separated, sometimes for several days. The routes followed on foot were laid out so that impoundment areas could be adequately cover-typed and the larger water bodies surveyed for the presence of fish, fur bearers, and waterfowl.

8. Interviews with residents of the area gave information on trapping pressure and winter harvest of game.

9. In cooperation with the Bureau of Sport Fisheries and Wildlife, an intensive effort was made to contact hunters in and adjacent to the Denali impoundment area during the first few days of the hunting season which opened August 20. Hunters were then interviewed periodically until the end of the first moose season, September 20. Information recorded was hunter name, type of transportation, residence, camp location, kind and number of game animals desired, kind and number of game animals killed, location hunted, and location in which game was killed. In addition, each hunting party was asked for a total cost estimate of direct expenses for the trip, not including non-expendable items. A total of 282 hunters (273 resident,

9 non-resident) were interviewed. Total trip-cost estimates were obtained from 262 hunters. Additional information relative to expenditures for transportation, food, ammunition and miscellaneous items was obtained from 81 of these 262. Twenty individuals were unable to determine costs associated with their hunting.

10. Stream surveys and fish collections were made on the lower sections of most streams which would be affected by impoundment. Stream flows were computed by the floating chip method. Fish were collected by means of a $\frac{1}{4}$-inch seine, minnow traps, and hook and line.

11. Counts of game present in the impoundment areas were obtained during aerial transects. Nine counts were made in the Denali area; three in the Vee Canyon area. Original plans were to obtain 50 percent coverage by flying transects one mile apart and recording animals in a $\frac{1}{2}$-mile wide strip, $\frac{1}{4}$ mile on each side of the plane. Plans were changed on 2 flights to give 25 percent coverage by flying at 2-mile intervals and counting a $\frac{1}{4}$-mile strip on each side of the plane. Spacing between transects was maintained quite consistently by flying at right angles between transects for the length of time required to travel the desired distance at the plane's particular speed. However, in open areas it was noted that animals were being recorded in locations nearly adjacent to the previous transect. Therefore, 1/8 mile was added to the width of the counting strip on each side of the plane. This provided 75 percent coverage when a 1-mile interval was

maintained between transects and 37.5 percent coverage when a 2-mile interval was maintained. These percentage figures have been expanded to obtain an estimate of total numbers of animals in the impoundment areas.

FINDINGS
DENALI AREA

Description and Range

12. The upper portion of the proposed Denali reservoir area extends nearly to the headwaters of the East and West Forks of the Susitna River and is confined largely to an old flood-plain. Both forks are spread out and braided. The outermost channels of the East Fork are from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles apart; those of the West Fork range from a single channel to channels $1\frac{1}{2}$ miles apart. Nearly pure stands of sedge or willow, and stands of sedge and willow together are the dominant vegetative types in this upper 15-mile long section. Game animals in the past have browsed this willow lightly to moderately. Current usage appeared light.

13. About 2 miles below the junction of the East and West Forks the river and impoundment area narrow. Sedge and willow are the dominant vegetation in the river bottom. Glandular scrub birch, scattered spruce, and a heath formation composed of blueberry, low-bush cranberry, Labrador tea, and crowberry occur on the side hills. Willow showed light to moderate use (Fig. 4).

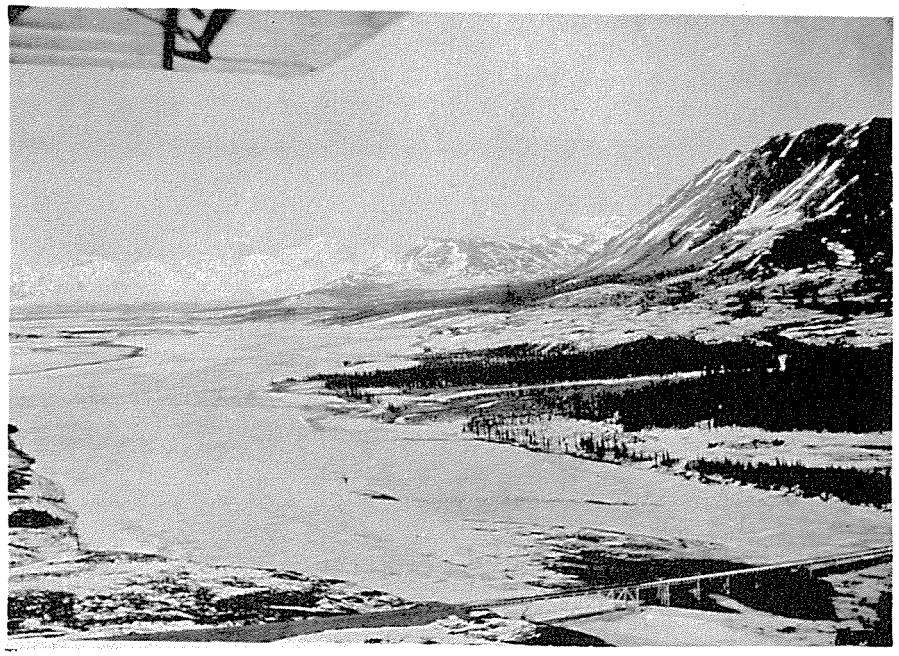


Figure 4. Upper section of Denali impoundment area looking north from Denali Highway bridge crossing of Susitna River to headwater glaciers.

14. The Susitna River is confined to a $\frac{1}{2}$-mile wide channel for 4 miles below the Denali Highway crossing. The impoundment area is $1\frac{1}{2}$ to 2 miles wide in this section. Glandular scrub birch and heath plants are the dominant vegetation. Spruce is scattered through the area with willow and sedge prominant along water bodies.

15. Topography changes below the mouth of Butte Creek; in this area, hills do not encroach on the river as closely as in upper sections. The impoundment area reaches its greatest width, $1\frac{1}{2}$ to $4\frac{1}{2}$ miles, in this locale and contains numerous lakes, potholes, and marsh areas, separated by higher well-drained land. Sedge and willow form pure stands in

the wet, low areas and also occur together and with spruce. Spruce and scrub birch are the dominant plants. Heath plants and lichens occur as an understory throughout the better-drained sections.

16. In the lower three miles of the Denali area, the impoundment would be confined by hills to a strip $\frac{1}{4}$ to $\frac{1}{2}$ mile wide. This is an area of scrub birch with scattered spruce and willow and a heath plant understory.

Big Game

17. Indication of the numbers of big game animals utilizing the impoundment areas was obtained by means of aerial surveys. Counts of moose in the Denali impoundment area and the expanded population estimates are presented in Table 1. The northern half of the Denali impoundment area is part of the Denali Reserve, a section 80 miles long north of the Denali Highway which is closed to big game hunting.

Table 1. Moose counted in the Denali impoundment area on nine flights and expanded population estimates.

Date	Coverage	Area	Moose Counted	Expanded Population Estimate
11-20-57	75%	Reserve	55	73
		Open	2	3
		Total	57	76
1-8-58	75%	Reserve	21	28
		Open	4	5
		Total	25	33
2-12-58	75%	Reserve	44	59
		Open	7	9
		Total	51	68
3-11-58	75%	Reserve	31	41
		Open	13	17
		Total	44	59

Table 1. (continued)

Date	Coverage	Area	Moose Counted	Expanded Population Estimate
4-28-58	75%	Reserve	7	9
		Open	3	4
		Total	10	13
5-2-58	75%	Reserve	26	35
		Open	17	23
		Total	43	57
7-28-58	37.5%	Reserve	17	45
		Open	22	59
		Total	39	104
10-23-58	37.5%	Reserve	16	43
		Open	15	40
		Total	31	83
12-1-58	75%	Reserve	88	117
		Open	8	11
		Total	96	128

18. Factors which might contribute to the variation in numbers of animals recorded in the period from November through April, when snow and sighting conditions were considered good, are 1) animals movement in and out of the impoundment area and 2) inconsistencies of pilot and observer in sighting moose. Snow cover was poor on the May flight. Moose were relatively easy to sight in July although there was no snow on the ground. Sighting and snow conditions were good on the October and December 1958 flights.

19. Sexual differentiation, exclusive of calves, was possible during three of the counts when visible antlers were present on the bulls. These counts and sex and calf ratios are presented in Table 2.

Table 2. Sex and age composition of moose counted in the Denali impoundment area.

Date	Section	Bulls	Cows	Calves	Bulls/ 100 cows	Calves/ 100 cows
11-20-57	Reserve	23	24	8	96	33
	Open		1	1	0	100
	Total	23	25	9	92	36
7-28-58	Reserve	7	7	3	100	43
	Open	6	9	7	67	78
	Total	13	16	10	81	63
10-23-58	Reserve	7	7	2	100	29
	Open	3	6	6	50	100
	Total	10	13	8	76	61

Ratio of bulls to cows, which is higher in the reserve than in the open area, probably reflects bull removal under a "bulls only" hunting restriction. Number of animals observed are too few to permit comparison of calf:cow ratios in the reserve and open areas. However, from fall count ratios of the entire impoundment area, calf productivity, as defined by Rausch (1958), may be considered good in 1957 and excellent in 1958.

20. Table 3 lists counts and estimates of numbers of caribou in the Denali impoundment area based on aerial transecting. Most of the variation in caribou counts is probably due to the nomadic nature of these animals.

Table 3. Caribou counted in Denali impoundment area on nine flights and expanded population estimates.

Date	Percent Coverage	Caribou Counted	Total Estimate
November 20	75	702	936
January 8	75	3,680	4,907
February 12	75	753	1,004
March 11	75	258	344
April 4	75	175	233
May 21	75	193	257
July 28	37.5	13	35
October 23	37.5	270	720
December 1	75	195	260

21. Hunting season began August 20 for moose, caribou, and black bear and September 1 for grizzly bear. The most intensive hunting pressure occurred along the Denali Highway, the only portion of the proposed impoundment area which could be reached by automobile. Of the 282 hunters interviewed in or adjacent to the Denali impoundment area, 243 (86%) were hunting moose and 266 (95%) of the same 282 hunters desired caribou. Table 4 presents the interview data according to number of caribou desired.

Table 4. Number of caribou desired and obtained by 282 hunters in and adjacent to the Denali impoundment area. In general, hunting trips of those interviewed were roughly one-half completed. (Bag limit: 3)

No. of Caribou desired	No. of hunters	Caribou killed		
		one	two	three
1	83 (30%)	24		
2	65 (24%)	24	8	
3	105 (39%)	19	14	17
Uncertain	7 (3%)			

22. At the time of the interviews, 16 moose had been killed, resulting in a success ratio of 3.7 percent. A total of 110 hunters had killed at least 1 caribou at the time of the interview; these figures yield a success ratio of 41 percent. Data for both moose and caribou, including success ratios presented here, were obtained in field interviews after approximately one-half the hunting effort of those interviewed had been expended. Total harvest figures and success ratios would have been higher had hunters been contacted at the conclusion rather than the middle of their hunt.

23. Less than 1 percent of those persons interviewed were specifically hunting bear but 27 percent said they would take a black bear and 9 percent said they would take a grizzly bear should they have the chance while hunting moose and caribou.

24. Days spent hunting, excluding figures from the few who did not know how long they would hunt, ranged from 1 to 30. Average length of hunting trip was 5 days. The length of hunting trips most frequent in the interview data (22 percent) was 2 days.

25. A cost estimate for the particular trip to the Susitna area was obtained from 262 of the 273 resident hunters interviewed. Average cost per hunter for food, transportation, ammunition, film, and miscellaneous expendable items was $53 per trip. A breakdown of expenditures obtained from 81 hunters gave a total cost-per-hunter figure of about $37. This smaller sample figure is less than the $53 figure obtained for 262 hunters.

Table 5 presents this breakdown.

Table 5. Trip expenditures of hunters on foot in and adjacent to the Denali impoundment area in 1958.

	(81 hunters) Average time spent hunting--4.3 days.		
	Expend. / Trip	Expend. / Day	%
Transportation	$19.78	$4.60	53.5
Food	12.23	2.84	33.1
Lodging			
Ammunition, misc.	4.96	1.15	13.4

26. Expenditures of 8 non-resident hunters averaged $500 apiece. Of the resident hunters interviewed, 60 percent resided in the Anchorage area, 20 percent in the Fairbanks area, and 20 percent in other localities in south-central Alaska.

27. Figures quoted thus far are for hunters who did not utilize services of weasel and swamp buggy operators along the Denali Highway either for the initial hunt or for hauling game which had been killed while hunting on foot. According to the three operators who worked fairly intensively in the Denali area, approximately 75 percent of their hunters took caribou. Cost for an unsuccessful trip was $10 to $25. Average price for hauling a moose was $50; a first caribou, $25; and additional caribou, $10 to $25 each.

Small Game

28. Snowshoe hare, whose numbers fluctuate periodically, are reported to inhabit the impoundment area although none were observed during the period of investigation. None of the hunters interviewed were hunting this species.

29. Likewise, game bird populations were at a low level of abundance. One spruce grouse and approximately ten broods of ptarmigan were the total numbers seen during the field season. Less than 1 percent of hunters interviewed were hunting only small game but 30 percent were interested in hunting game birds in addition to big game. Six ptarmigan taken by two hunters constituted the total harvest among hunters interviewed. No hunting pressure was observed for Wilson's snipe, present throughout the area.

Fur Bearers

30. Wolf, red fox, wolverine, beaver, muskrat, and river otter were seen in the Denali impoundment area. Wolf numbers have been reduced in recent years by bounty hunters and by the Predator Control Division of the Fish and Wildlife Service. The proposed impoundment location is in a study area where wolves are protected to obtain information on their life history and ecology. Beaver, distributed through most of the impoundment area, appear to have the greatest potential value of the fur bearing species. One or two year-round residents, who trap

occasionally for beaver near the Denali Highway crossing of the Susitna River, now exert the only known trapping pressure in the Denali impoundment area. These people estimated that their average annual take does not exceed 20 beaver.

Waterfowl

31. The first waterfowl observations in the Denali area were made on a flight May 21 in conjunction with moose and caribou counting. At this time, about one-third of the total water area was ice-free. Approximately 450 ducks--mostly scaup--in groups of from 20 to 75 were counted. Other ducks, mostly paired, including mallards and pintails, were noted in vegetation along edges of water bodies but a complete count was not obtained.

32. Ground observations of waterfowl were recorded from June 15 through August 16 in the Denali area from the dam site to the mouth of Valdez Creek. An aerial survey on August 28 sampled the area above the junction of the East and West Forks which was not covered from the ground. Tables 6 and 7 summarize these data, which are not total numbers but are considered representative of waterfowl composition of the area. Most of the ducks observed early in the season were groups of molting males. Broods were more readily observed as the season progressed. Since pintails are among the first to migrate and those observed in the aerial survey of August 28 were in large flocks, they may not have nested in the impoundment area.

Table 6. Waterfowl recorded from the ground in the Denali impoundment area from June 15 through August 16, 1958.

Species	Adults without young	Broods		
		Adults	Young	Avg. young/brood
Swan		4	several	
Canada goose	2			
Scaup	111	22	180	8.2
Widgeon	75	4	22	5.5
Mixed scaup & widgeon	423			
Green-winged teal	28	2	4	2
Mallard	20			
Pintail	11	1	5	5
Bufflehead	7	1	6	6
Shoveller	6			
Canvasback	3			
American goldeneye	2			
White-winged scoter	31	3	19	6.3
Old squaw		1	3	3
American merganser	28			
Unidentified	225			

Table 7. Waterfowl counted from the air on the East and West Forks of the Susitna River in Denali impoundment area, August 28, 1958.

Swan	11	Shoveller	5
Pintail	263	Green-winged teal	15
Mallard	81	White-winged scoter	14
Scaup	67	American merganser	33
Widgeon	48	Unidentified	579

33. The areas of greatest waterfowl concentration were in the upper 10-mile section of the impoundment area, and on and adjacent to Goose Island, a marshy area with many lakes and potholes about 12 miles below the Denali Highway crossing of the Susitna River. Lack of food apparently

limited waterfowl use in other areas. Star duckweed and pondweed were the principal waterfowl food species in the Goose Island area.

34. Swans nesting in this area are believed to be trumpeters, inasmuch as all nesting swans and eggs which have been identified by personnel of the Fish and Wildlife Service waterfowl division south of the Alaska Range have been trumpeters. Measurements made June 12, 1958 of an egg from a clutch near the mouth of the Oshetna River and of 2 eggs from a clutch near Crosswind Lake, 13 miles east of Lake Louise definitely established these clutches as trumpeter rather than whistling swans (Hansen, 1958).

35. Residents report that sizeable numbers of a small species of Canada goose rest and feed in the impoundment area on their way south in the fall.

36. The waterfowl hunting season opened September 1; hunting pressure was negligible.

Stream Surveys and Fisheries

37. The Susitna River is glacial in origin and flows generally through flat bottom land. In the Denali impoundment area, it is characterized by many shifting channels and a silt-mud bottom. Water levels were measured daily at the Denali Highway bridge. Day to day fluctuations ranged from 0 to 8 inches, and the total range observed was 16 inches. No overall upward or downward trend was evident during the period from June 18 through August 15. Sun, which melted the glaciers, or rain,

caused the river to rise; cooler weather without rain caused the river to drop. Cold weather after August 15 caused a steady drop to the September 11 level, which was 28.5 inches lower than the highest recorded in July.

38. A continual record of air and water temperatures was obtained for the Susitna River at the Denali Highway bridge. Mean daily high and low water temperatures and range in daily fluctuations by two-week periods are tabulated in Table 8.

Table 8. Susitna River temperatures in degrees Fahrenheit at Denali Highway bridge.

Period	Mean Daily High	Mean Daily Low	Range in Daily Fluctuations
June 18 - 30	47.1	42.5	1 - 8
July 1 - 15	46.9	42.1	2 - 8
July 16 - 31	45.4	41.6	2 - 7
August 1 - 15	44.1	40.9	2 - 6
August 16 - 31	42.5	39.2	2 - 5
September 1 - 14	41.5	38.7	2 - 4

39. Few, if any, anadromous fish occur in the Susitna River system above Devil Canyon. None were found above Vee Canyon during the period of investigation. Sport fish are not sought in the silty main stem of the Susitna River. Burbot were the only fish collected in the main stem of the Susitna River in the Denali area.

40. Tributaries, portions of which would be flooded by a dam at Denali site, are described beginning with the furthest upstream and working downstream. Flows have been computed using a factor of 0.8 for these streams which all have rough bottoms.

41. Boulder Creek, flowing into the East Fork of the Susitna River, is about 13 miles long. It is glacial in origin, has clear water tributaries, and receives no fishing pressure. The lower 1/2 mile would be inundated by dam construction at Denali site. Due to the inaccessibility of Boulder Creek, the stream was surveyed from the air and no discharge measurements were made.

42. Valdez Creek, 14 miles long, enters the Susitna River from the east about 5 miles below the junction of the East and West Forks. Placer operations at the gold mining site of Denali, about 3 miles above the mouth of Valdez Creek, have silted the gravels in the lower section. The stream above is clear with many riffle areas, few pools, and a steep gradient. Bottom types are gravel and rubble. Water temperature at 3:30 p.m. on August 16 was 58°F.; corresponding air temperature was 49°F. Average velocity of a cross section in the lower 2 miles subject to inundation was 6.3 feet per second, average depth was 1 foot, and average width was 20 feet to give a flow of 101 c.f.s.

43. Mayflies, the dominant aquatic insect, were fairly numerous. One whitefish (Coregonus cylindraceus (Pallas)) was seined at the mouth

of Valdez Creek. Fishing pressure is negligible since the stream is 5 miles from the Denali Highway and may be reached only by persons on foot or using track or four-wheel drive vehicles.

44. Windy Creek, a clear stream about 14 miles long, flows into the Susitna River from the east about 1 mile above the Denali bridge. The lower 2-mile section, which would be inundated, has pool and riffle areas interspersed and a gravel-rubble bottom. Water and air temperatures at 10:30 a.m. on August 16 were 46°F. and 51°F., respectively. Based on an average depth of 0.8 feet, a cross section averaging 50 feet in width with an average velocity of 3.5 f.p.s., the stream flow in the lower section was computed to be 112 c.f.s.

45. Mayflies, caddis flies, and stone flies were the dominant aquatic insects present. Accessible from the Denali Highway by a short walk, Windy Creek probably received more fishing pressure than any other stream in the impoundment area. All of this angling was for grayling, which were readily taken and which ranged up to 16 inches in length. Fishing effort and success were noted from late June through mid-September.

46. Butte Creek, a clear-water stream about 28 miles long, drains an area of rolling hills to the west of the Susitna River. Much of Butte Creek drainage can be traversed with swamp buggies and track vehicles. A dam at Denali site would inundate the lower 7 miles of Butte Creek. Pools about 4 feet deep and 10 feet long occur about every 50 feet in this

section and are interspersed with riffle areas. Stream bottom types are gravel and rubble. A cross section taken in the proposed impoundment yielded an average velocity of 2.5 f.p.s., average depth 2.5 feet, and average width 30 feet for a calculated flow of 150 c.f.s. Water and air temperatures on August 27 at 2:00 p.m. were 47°F. and 59°F., respectively.

47. Caddis flies were abundant; stone flies, mayflies, and black flies were also present. Grayling, whitefish, and cottids were seined and grayling were observed in pools. Fishing pressure, most of which was incidental to other activities such as hunting or prospecting, was light. Access was by swamp buggy or track vehicles.

48. Raft Creek, which drains a wet, lowland area to the east of the Susitna River would have its lower 2 miles inundated by the proposed Denali dam. This stream is clear with an almost imperceptible current. Bottom material is largely organic. No fish were observed in the section which would be inundated.

49. Shallow, bog, brown-water lakes scattered throughout the Denali impoundment area apparently support fish only if connected to a stream system. Suckers and grayling were observed in several of these lakes.

50. A clear-water lake of about 200 surface acres and having a sand and rubble bottom is located about two miles south of the Denali

Highway on the west side of the Susitna River. Designated locally as Sand Lake, it supports lake trout and receives a moderate amount of fishing pressure. Anglers reach the lake by means of tundra vehicles or walking, and fish for grayling and whitefish in the outlet stream.

51. Another clear-water lake approximately the same size as Sand Lake is located in the impoundment area about ten miles south of the Denali Highway. It is nearly inaccessible except by plane.

FINDINGS
VEE CANYON AREA

Description and Range

52. The Bureau of Reclamation has indicated that the Vee Canyon impoundment probably would have a maximum elevation of 2,400 feet. At this level, the reservoir would extend about $1\frac{1}{2}$ miles above the Denali site and be essentially confined to the present river bed in this uppermost area (Figs. 5 and 6).

53. Most of the Vee Canyon reservoir would be confined by side-hills to a strip 1/4 to 2 miles wide on each side of the Susitna River and tributaries. Here the Susitna is 1/8 to 1/4 mile wide and flows in a narrower, deeper channel than in the Denali area. The impoundment area bordering the river has spruce and glandular scrub birch interspersed as dominants with occasional stands of aspen on the better-drained sites. Heath plants form the understory. Willow and sedge are present on wetter

Figure 5. Vee Canyon dam site looking upstream.

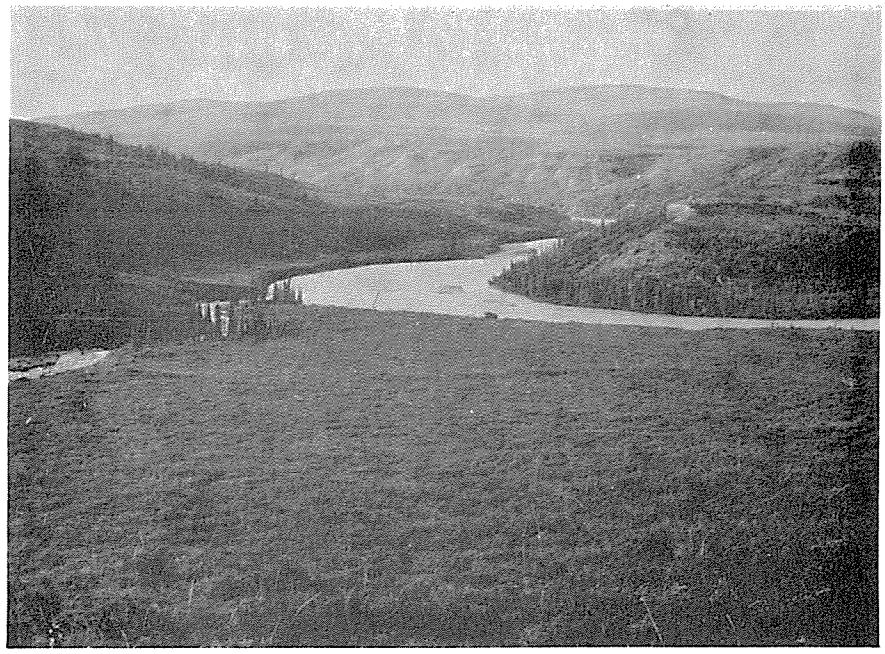


Figure 6. Vee Canyon dam site looking downstream with Goose Creek flowing in from left.

sites and bog cotton grass is an occasional dominant. Lichens present throughout the area are most numerous in the Coal Creek and MacLaren River areas but are only moderately abundant in those locales.

54. Willow in that portion of Clearwater Creek which would be impounded has been utilized in past years to the extent that some plants are dying and resprouting. Moderate use was noted on current growth at the time of survey. Scrub birch had been utilized slightly.

55. The portion of the impoundment area which extends into the Coal Creek drainage is a wet, lowland type characterized by intermingled willow, spruce, sedge, and Sphagnum bogs. Scrub birch is dense on slopes and ridges. Lichens are fairly abundant along ridges which run further back from the creek. Willow shows moderate to heavy use on past growth. Light use was noted on current growth.

56. A dam at Vee Canyon would inundate lowlands having willow, aspen, spruce, and sedge cover in the MacLaren River drainage. Willow and aspen show moderate to heavy past use with some willow having been killed out and resprouting. Current browse use was moderate. Slopes have heavy growths of scrub birch and a few spruce. Scrub birch in some areas shows moderate use on past growth. Lichens are fairly abundant.

57. The proposed impoundment will back water up the Tyone River system but it will be generally confined to present shorelines in Lake Louise, Susitna Lake, Tyone Lake and the upper Tyone River. Land

bordering the lower Tyone River and Tyone Creek which would be flooded has extensive areas of bog cotton grass and some sedge in addition to the widespread willow, spruce, scrub birch, and heath cover. Spruce are small due to a relatively recent burn. Willow shows moderate to heavy use on past growth. Light use was noted on recent growth.

58. Alders are intermingled with willow, scrub birch, heath plants, and spruce in the portion of the Oshetna drainage which would be inundated. Browsing in the past has been heavy on willow; current use had been light to moderate at the time of survey.

59. Willow and scrub birch are the dominant species in that portion of Goose Creek which would be flooded. In this area, willow showed heavy past use.

Big Game

60. Table 9 summarizes moose and caribou counts in the Vee Canyon impoundment area. The limited data suggest that moose calf production is excellent. Black and grizzly bear were present throughout the area.

Table 9. Aerial counts of moose and caribou in Vee Canyon impoundment area and expanded population estimates.

Date	Coverage	Counted	Estim. Total	Bulls	Cows	Calves	Bulls/ 100 cows	Calves/ 100 cows
MOOSE:								
7-29	37.5%	7	19	2	2	3	100	150
10-23	37.5%	34	91	2	20	12	10	60
12-1	75%	73	97					
CARIBOU:								
7-29	37.5%	1	3					
10-23	37.5%	129	344					
12-1	75%	22	29					

61. The most intensive hunting in the Vee Canyon area was centered in the upper Tyone River section. Lake Louise can be reached by road and Lake Louise and the connecting Susitna and Tyone Lakes are popular for hunting from boats. Due to inaccessibility, hunting throughout the rest of the Vee Canyon area is limited to boat and float plane operations and is not intensive. Boat hunting, confined largely to the Tyone system, is not intensive below Tyone Lake due to difficulties imposed by shallow water sections of the Tyone River. Planes are able to land and take off from several areas of the Susitna River; however, lakes adjacent to the impoundment area are utilized to a greater extent than the river. As in the Denali area, moose and caribou are the species most sought.

Small Game

62. Snowshoe hare and spruce grouse, populations of which fluctuate periodically, are reportedly present in the area. None were observed during the period of investigation. Ptarmigan, another cyclic species, were not abundant. One adult and eight young were the total seen in the impoundment area. Wilson's snipe were distributed throughout the area.

Fur Bearers

63. Evidence of wolf, fox, lynx, wolverine, river otter, beaver, and muskrat was seen in the Vee Canyon area. A moderate amount of trapping in the Lake Louise area constitutes the major pressure currently exerted to harvest these species. Beaver, perhaps, have the highest potential

value of the fur bearing species. Wolves have been reduced in numbers in recent years but are presently protected as part of a study to learn more of their life history and ecology.

Waterfowl

64. Waterfowl recorded in the Vee Canyon area, exclusive of Lake Louise, Susitna Lake, and the Tyone River above the mouth of Tyone Creek, are presented in Table 10.

Table 10. Waterfowl recorded from the ground in Vee Canyon impoundment area from July 11 through August 2, 1958.

Species	Adults without young	Broods		
		Adults	Young	Average Young/Brood
Canada goose	2			
American merganser	33	1	9	9
White-winged scoter	12	2	19	9.5
Scaup	8	1	5	5
Bufflehead	8	1	6	6
American goldeneye	4	1	7	7
Pintail	3	4	13	3.3
Mallard	3	1	8	8
Widgeon		4	26	6.5
Green-winged teal	1	3	12	4
Surf scoter		1	4	4
Old squaw	1			
Unidentified	7	1	1	1

These data, obtained while covering the impoundment area by boat and on foot, are not total numbers of waterfowl utilizing the reservoir site, but are considered representative of the composition of waterfowl present in

the locale. Water suitable for nesting is limited in the Vee Canyon area, much of which is confined to the Susitna River bottom and immediate side hills. Many of the lakes or potholes which would otherwise be suitable lacked food for waterfowl. Nearly all lakes with food produced at least one brood; however, broods generally were small. Pondweed, water milfoil, and bur reed were the most abundant duck food. Water lily was also abundant in the shallow, bog lakes.

65. Hansen (1958) reports a clutch of trumpeter swan eggs in the impoundment area at the mouth of the Oshetna River and another near Crosswind Lake 13 miles east of Lake Louise.

Stream Surveys and Fisheries

66. The Susitna River in the Vee Canyon impoundment area is confined by hills with moderate to steep slopes and has formed one or two deep, permanent channels in most sections. Bottom materials include rocks, boulders, mud, and silt. Flow data obtained for a cross section of the Susitna River just above the mouth of Tyone Creek July 27 are: average velocity, 5 f.p.s.; average depth, 6 feet; average width, 225 feet; discharge, 5400 c.f.s. A constant of 0.8 for a rough bottom is used in calculating the discharge. Grayling, fine-scaled sucker, cottid, and burbot were seined in shallow-water areas of the Susitna River 4 miles above the mouth of Tyone River.

67. Clearwater Creek, about 34 miles long would have its lower 5 miles inundated by a dam at Vee Canyon. This lower section, which drains an area of low hills and ridges, has many deep, long pools interspersed with riffle areas. Willow and Equisetum are the predominant shore vegetation; spruce and glandular scrub birch are the dominant surrounding country vegetation. Water flow data were obtained July 21 from a cross section of stream. Average velocity was 5 feet per second, average depth was 2 feet, and average width was 90 feet, while discharge of 720 c.f.s. was calculated. Grayling, burbot, and cottids were taken by seine and minnow trap. The lower section, inaccessible except by boat or float plane, receives little or no fishing pressure.

68. Coal Creek, about 28 miles long, drains a relatively low area west of the Susitna River. The lower 5-mile section of Coal Creek which would be inundated, possesses a wet, lowland type terrain containing willow, spruce, and sedge bogs. This clear stream has a gravel-rubble bottom and many pools from 5 to 30 feet long and 1 to 5 feet deep interspersed with riffle areas. A cross section measurement indicated an average stream velocity in the area which would be inundated of 2.2 f.p.s.; average depth, 1 foot; and average width, 25 feet, resulting in a calculated discharge of 44 c.f.s. Caddis flies and May flies were the dominant aquatic insects. Grayling and cottids were taken by seining; a run of adult suckers was observed moving upstream on July 20. Fishing pressure is nearly nonexistent due to inaccessibility.

69. The MacLaren River, a major tributary of the Susitna River, enters from the east and originates at MacLaren Glacier 50 miles above its junction with the Susitna. The lowlands in the 5-mile section which would be flooded by a dam at Vee Canyon are interspersed with willow, aspen, spruce, and sedge. The turbid river has many long, deep pools interspersed with riffle areas; glacial mud and gravel are the stream bottom types present. Average depth of a cross section near the mouth was 3 feet; average width, 150 feet; velocity, 5 f.p.s.; and the discharge was computed to be 1800 c.f.s. Burbot and cottids taken with minnow trap and seine were the only fish species noted. No fishing pressure is known to occur on the MacLaren.

70. The Tyone system would lose more clear water through inundation than any other stream in either impoundment area. Tentative Bureau of Reclamation figures list 2,400 feet as the probable maximum Vee Canyon reservoir water level. If this is attained, the water levels of Tyone Lake (elevation 2,361 feet m.s.l. from 1:63,360 USGS maps issued in 1952), Susitna Lake (2,361 feet m.s.l.), Lake Louise (2,362 feet m.s.l.) and Little Lake Louise (2,375 feet m.s.l.), all at the upper end of the Tyone River, would be raised.

71. Lake Louise, accessible by 18 miles of gravel road from the Glenn Highway, provides boat access to Susitna Lake and Tyone Lake. This area is becoming increasingly popular; private cabins are appearing along

much of the available lake frontage and Army and Air Force recreation camps have been established here. The lake trout fishery is a major reason for this popularity. Allin (1956) states that, from records supplied by the military, it is computed that 211 man-days of pressure took about 459 lake trout in 1955. Military personnel exerted about 75% of the fishing pressure at that time. Other species present are grayling, whitefish, fine-scaled sucker, and burbot. Allin (1956, 1957) more fully describes the Lake Louise fishery.

72. The lower ten miles of the Tyone River were surveyed. Willow, spruce, and Equisetum are the dominant shore species with glandular scrub birch and spruce dominant on surrounding hills. The river is clear and flows over gravel and rubble with pools from 1 to 8 feet long about every 100 yards. Riffle areas are abundant. The water level fluctuates greatly depending on rainfall. Flow data obtained from a cross section in this area are: average velocity, 1.4 f.p.s.; average depth, 2 feet; average width, 30 feet; and discharge, 67 c.f.s. Caddis flies were the dominant aquatic insect. Water temperature on June 22 at 10:00 a.m. was 58°F.; air temperature was 59°F. Grayling, fine-scaled sucker, burbot, and cottids were taken with seine and minnow trap at the mouth of the Tyone River. Although the lower Tyone River is accessible by boat from Lake Louise, little fishing pressure was exerted here.

73. The Oshetna River, which flows north for 50 miles before emptying into the Susitna River, would have its lower 6 miles flooded by a dam at Vee Canyon. Willow, alder, and glandular scrub birch are the dominant vegetative types in this section. Pools are infrequent in this fast, clear stream which flows over gravel, rubble, and boulders. Stream flow data obtained when the river was high due to rains are: average velocity, 6 f.p.s.; average depth, 4 feet; average width, 100 feet; and discharge, 1920 c.f.s. Water temperature on July 31 at 7:30 a.m. was 48°F. Caddis flies were abundant in the stream and grayling were present. Little or no fishing occurs in this drainage due to inaccessibility.

74. Goose Creek, a clear stream flowing north to the Susitna River, would have 3 miles of its total length of 15 miles flooded by a dam at Vee Canyon. This lower section, bordered by willows and alders, has a stream bed of mixed gravel, rubble, and boulders and contains many pool and riffle areas. Water temperature at 1:00 p.m. July 31 was 52°F. Average velocity of a cross section measured when the stream was high due to rain was 5 feet per second, average depth was 2 feet, average width was 25 feet, and flow was 200 c.f.s. Fishing pressure is non-existent due to inaccessibility.

75. Shallow potholes and brown-water bog lakes, present throughout the Vee Canyon area but less numerous than in the Denali area, apparently contain fish only if accessible from a stream system. Temperature of most of these lakes was about 60°F.

CONCLUSION

76. Investigations were conducted in the Denali and Vee Canyon project areas of the Susitna River Basin to ascertain the species of fish and wildlife present. The species identified are summarized by area in Tables 11 and 12.

77. The information contained herein, along with the findings of subsequent studies, will eventually be used in the preparation of reports for the Bureau of Reclamation dealing with the effects of the proposed projects on the fish and wildlife resources.

Table 11. Fish and Wildlife species observed in the Denali and Vee Canyon impoundment areas.

Area	Water Turbidity	Fish							Big Game				Small Game				Furbearers							Waterfowl												
		Burbot	Cottids (Cottus cognatus)	Grayling	Lake trout	Fine-scaled sucker	Whitefish (Coregonus cylindraceus (Pallas))		Black bear	Caribou	Grizzly bear	Moose	Ptarmigan	Snowshoe hare	Spruce grouse	Wilson's snipe	Beaver	Fox	Lynx	Muskrat	River otter	Wolf	Woverine	Swan	Canada goose	American goldeneye	American merganser	Bufflehead	Canvasback	Green-winged teal	Mallard	Old squaw	Pintail	Scaup	Shoveller	Surf scoter	White-winged scoter	Widgeon
DENALI																																				
Main Stem Susitna	glacial	x							x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Boulder Creek	glacial																																			
Valdez Creek	clear						x																													
Windy Creek	clear			x																																
Butte Creek	clear		x	x			x																													
Raft Creek	clear																																			
Sand Lake	clear			x	x		x																													
VEE CANYON																																				
Main Stem Susitna	glacial	x	x	x		x			x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x
Clearwater Creek	clear	x	x	x																																
Coal Creek	clear		x	x		x																														
MacLaren River	glacial	x	x																																	
Tyone System (Lakes Louise, Susitna, and Tyone)	clear	x	x	x	x	x	x																													
Oshetna River	clear			x																																
Goose Creek	clear																																			

Table 12. Non-game birds recorded in Denali and Vee Canyon areas.

Species	Denali area	Vee Canyon area
Common loon	x	
Pacific loon	x	
Horned grebe	x	
Swainson's hawk	x	
Redtailed hawk	x	x
Golden eagle		x
Bald eagle	x	x
Marsh hawk		x
Osprey		x
Golden plover	x	
Semi-palmated plover	x	
Hudsonian curlew	x	
Spotted sandpiper	x	x
Lesser yellowlegs	x	x
Northern phalarope	x	
Shortbilled gull	x	x
Franklin gull	x	x
Arctic tern	x	x
Horned owl		x
Hawk owl		x
Snowy owl	x	
Flicker		x
Hairy Woodpecker		x
Kingfisher	x	x
Cliff swallow	x	x
Robin	x	x
Hermit thrush		x
Russet-backed thrush		x
Ruby-crowned kinglet	x	
Bohemian waxwing	x	x
Myrtle warbler	x	x
Purple finch	x	
Whitewinged crossbill		x
Tree sparrow	x	x
White crowned sparrow	x	x
Song sparrow		x
Slate colored junco	x	x

LITERATURE CITED

Anonymous

1952. A report on potential development of water resources in the Susitna River Basin of Alaska. U. S. Bureau of Reclamation report.

1952. A preliminary report on fish and wildlife resources in relation to the Susitna River Basin Plan, Alaska. U. S. Fish and Wildlife Service report.

1954. A special report on economic aspects of the Nelchina Caribou Herd. U. S. Fish and Wildlife Service report.

1954. A progress report on wildlife of the Susitna River Basin. U. S. Fish and Wildlife Service report.

1957. 1956 field investigations, Devil Canyon dam site, Susitna River Basin. U. S. Fish and Wildlife Service progress report.

1959. 1957 field investigations, Devil Canyon dam site and reservoir area, Susitna River Basin. U. S. Fish and Wildlife Service progress report.

Allin, R. W.

1956. Catch distribution, composition, and size structure, sport fishing Anchorage area. Federal Aid in Fish Restoration quarterly progress report.

1957. Preliminary lake survey of Lake Louise and Little Lake Louise. Federal Aid in Fish Restoration quarterly progress report.

Hansen, H. A.

1958. Annual waterfowl report, Alaska. U. S. Fish and Wildlife Service report.

Rausch, R. A.

1958. Herd composition surveys--Susitna and Copper River valleys, moose management studies. Federal Aid in Wildlife Restoration job completion report.

This electronic copy of the report includes the revised pages that were distributed in the Sept. 19, 1960 memorandum: p. 3, p. 4, and p. 25.

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

ARNIE J. SUOMELA, COMMISSIONER

DEVIL CANYON PROJECT

SUSITNA RIVER BASIN

ALASKA

A ED REPORT ON THE FISH AND WILDLIFE RESOURCES

United States Department of the Interior
Fish and Wildlife Service
Bureau of Commercial Fisheries
Juneau, Alaska

A Detailed Report on Fish and Wildlife Resources

affected by the

DEVIL CANYON PROJECT

Alaska

Branch of River Basin Studies
May 1960

ALASKA REGION
(REGION 5)

ADDRESS ONLY
THE REGIONAL DIRECTOR

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

BOX 2021
JUNEAU, ALASKA

May 2, 1960

Memorandum

To: District Manager, Bureau of Reclamation
Juneau, Alaska

From: Regional Director, Bureau of Commercial Fisheries
Juneau, Alaska

Regional Director, Bureau of Sport Fisheries and Wildlife
Juneau, Alaska

Subject: Devil Canyon Project, Susitna River Basin, Alaska

This is our detailed report of our studies concerning effects of the Devil Canyon Project upon the fish and wildlife resources. Both facilities of the project, the Devil Canyon Dam and Reservoir and the Denali Dam and Reservoir, are located in the Susitna River Basin of south-central Alaska. This report has been prepared in accordance with the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.

We have studied the fish and wildlife resources in connection with this project for effects as well as with a view toward mitigating those losses which may result from project construction and operation. Further, we have explored the possibilities for enhancement of these resources. This letter, which briefly summarizes our findings and contains our recommendations, is supported in detail by the attached substantiating report.

Big game, small game, fur animals, waterfowl, and both resident and anadromous fish will be affected by project construction. Approximately 61,000 acres of land will be inundated, most of which is moose range. Although the Nelchina caribou herd presently utilizes the impoundment area as winter range, only about 33,000 acres is considered to be of good quality for this usage. Movement patterns of the herd are such that it is believed the species will not be seriously affected by project development and operation.

Some loss of small game and fur animal habitat is expected in the project area. Harvest of these species, which is presently light, due primarily to inaccessibility, may increase in adjacent areas with project development as a result of improved access.

Some waterfowl nesting and rearing habitat will be destroyed by inundation. Similar habitat will probably not develop around the reservoir perimeters due to fluctuating water levels. It is possible that the two impoundments will receive more use by migrating birds than the water bodies destroyed by inundation.

Fish present in the project area will be affected in a variety of ways. Below the Devil Canyon and Denali damsites, alteration of natural stream flow and temperature patterns will produce unknown effects on the fish present in these areas.

At Devil Canyon, the planned operational releases are considered adequate to preserve fish habitat. During the period of dam construction, initial reservoir filling, and in the event of an unforeseeable cessation of power production, however, water releases will be necessary to preserve the downstream fishery. Therefore, a recommendation for minimum flows is made. These minimum flows, as well as power flows during project operation, should be released gradually to avoid flushing or scouring the channel. The Susitna River below the Devil Canyon Dam serves as a migration route for salmon ascending to the spawning tributaries. Releases of water either colder or warmer than normal stream temperatures could affect the attraction of salmon to such tributaries. The Bureau of Reclamation should explore the feasibility of modifying the intake structure to permit drawing water from selected temperature strata in the Devil Canyon Reservoir.

Under project operation, no water releases are planned from the Denali Dam from about April to September of each year, depending on runoff and power requirements. Stream dewatering in this section could be deleterious to summer fish usage. However, it is believed that fish populations here are minimal due to the turbidity of the Susitna River. Also, this section of stream is located very close to the headwaters and thus there are few tributaries above the damsite to which fish movement may occur in summer months. For these reasons, no minimum release during the period from

April through September, inclusive, is requested from the Denali Dam. Winter habitat will probably improve in this area as a result of increased flows. If the Denali Reservoir proves to be relatively clear in the winter, enhancement of this area as fish habitat may result. During the period of construction, initial reservoir filling, and project operation, a minimum flow is recommended from October through March, inclusive, to maintain the downstream fishery. These minimum flows, as well as the flows for power during project operation, should be released gradually to avoid the flushing or scouring of the channel.

Loss of stream habitat through inundation will be partially offset by creation of two large reservoirs. However, the plan of operation indicates rather wide fluctuations in the impoundment levels and these fluctuations will probably limit fish production. Also, since glacial silt tends to remain in suspension, it is probable that these waters will be turbid. The degree of turbidity is impossible to predict at this time, although it may be generalized that the greater the turbidity, the less productive the waters will be of fish life.

Investigations of the Fish and Wildlife Service both above and below the Devil Canyon damsite failed to reveal any evidence that anadromous fish migrate through or above Devil Canyon. Therefore, no recommendation for a fish ladder or other fish passage device is included. However, the possibility exists that the Louise, Susitna, and Tyone Lake system, as well as certain other lakes in the basin, could sustain a red salmon run. Also, the many clear-water streams tributary to the Susitna River above Devil Canyon damsite may possess a potential for spawning and rearing of other salmonine species. Additional studies to determine potential spawning areas are planned by the Fish and Wildlife Service in the future. Should these studies indicate a reasonable probability that the area can be developed for production of anadromous fish, and should it appear justified economically, then some type of fish passage facility may be recommended for Devil Canyon Dam at a later date.

This report and the following recommendations have been endorsed by the Alaska Department of Fish and Game as indicated in the letter to us dated May 6, 1960 from Acting Commissioner Walter Kirkness of that Department, a copy of which is appended to the substantiating report.

In order to minimize adverse effects to fish and wildlife resources with project development and operation, it is recommended that:

1. During project development, reservoir filling and operation, a minimum flow of not less than 2,000 c.f.s. be maintained at all times in the Susitna River below the Devil Canyon Dam. However, should the initial reservoir filling occur during the period October through April, inclusive, only 1,000 c.f.s. would be required.

2. During the period of construction, reservoir filling and project operation a minimum flow of not less than 150 c.f.s. be maintained in the Susitna River below the Denali Dam for the period October through March, inclusive.

3. Abrupt changes in the volume of water discharged be avoided at both dams; such changes should be made gradually or in a series of slight increases or decreases.

4. The following language be incorporated in the recommendations of the report of the District Manager of the Bureau of Reclamation:

   a. "That additional detailed studies of fish and wildlife resources affected by the project be conducted as necessary after the project is authorized in accordance with the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.; and that such reasonable modifications in the authorized project facilities be made by the Secretary as he may find appropriate to conserve and develop these resources."

   b. "That Federal lands and project waters in the project area be open to free use for hunting and fishing so long as title to the lands and structures remains in the Federal Government, except for sections reserved for safety, efficient operation, or protection of public property."

   c. "That leases of Federal land in the project area reserve the right of free public access for hunting and fishing."

5. The report of the District Manager, Bureau of Reclamation, include the preservation and propagation of fish and wildlife resources among the purposes for which the project is to be authorized.

The analysis of project effects as set forth in the substantiating report is based on engineering data available April 12, 1960. The Fish and Wildlife Service should be advised of any changes in engineering plans so that the effects of such changes on the fish and wildlife resources of the project area may be determined.

Very truly yours,

by Dan H. Ralston
URBAN C. NELSON
Regional Director
Bureau of Sport Fisheries
and Wildlife

John T. Gharrett
JOHN T. GHARRETT
Regional Director
Bureau of Commercial
Fisheries

SUBSTANTIATING REPORT

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PREFACE

1. This is a detailed report concerning the probable effects of the Devil Canyon Project upon the fish and wildlife resources of the project area. The overall project consists of two primary features; the Devil Canyon Dam and Reservoir, and the Denali Dam and Reservoir. These features are considered as separate facilities throughout this report. Engineering data and operational plans on which this report is based were obtained from the Bureau of Reclamation on April 12, 1960.

2. Fish and Wildlife field investigations have been conducted intermittently in the project area since 1952 and, in part, concurrently with Bureau of Reclamation feasibility studies. The fish and wildlife resources that will be affected by the Devil Canyon and Denali features are discussed as they would probably exist without and with project development.

3. No major water development project exists in a subarctic location which will provide a basis for predicting the effect of the Devil Canyon project on the fish and wildlife resources. Further, only limited information concerning life histories and populations of the various species involved is available. Thus, only generalized predictions of project effects are possible.

4. Appreciation is expressed to the many members of the various branches of the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries for supplying needed information during the preparation of this report.

5. Since January 1, 1960, the State of Alaska has assumed control of the fish and wildlife resources of the new State. Staff members of the Alaska Department of Fish and Game have indicated a desire and willingness to contribute further information in the continuation of studies of this project.

6. Previous reports prepared by the U. S. Fish and Wildlife Service that pertain to the Devil Canyon and Denali features are as follows:

> A Preliminary Report on Fish and Wildlife Resources in Relation to the Susitna River Basin Plan, Alaska. 1952

A Progress Report on the Fishery Resources of the Susitna River Basin, Alaska. 1954

A Progress Report on the Wildlife Resources of the Susitna River Basin, Alaska. 1954

Progress Report, 1956 Field Investigations, Devil Canyon Damsite, Susitna River Basin, Alaska. 1957

Progress Report, 1957 Field Investigations, Devil Canyon Damsite and Reservoir Area, Susitna River Basin, Alaska. 1959

1958 Field Investigations, Denali and Vee Canyon Damsites and Reservoir Areas, Susitna River Basin, Alaska. 1959

INTRODUCTION

Purpose of the Project

7. The purpose of the Devil Canyon Project will be to provide power to interior and south-central Alaska. Ultimate power capacity of the Devil Canyon Project will be 580,000 kilowatts; however, the initial capacity will be limited to 217,500 kilowatts.

Location of the Project

8. Devil Canyon Project, consisting of two dams and reservoirs, will be located in south-central Alaska, about midway between the two population centers of Anchorage and Fairbanks. More specifically, the Devil Canyon damsite is located on the Susitna River 14.5 miles upstream from the Alaska Railroad section at Gold Creek or at river mile 134. This development will provide the source of power generation. The Denali damsite will be located on the Susitna River at mile 248, or 15 miles below the Denali Highway crossing of the Susitna River. The reservoir formed by this dam will provide for water storage and regulation of flows to be utilized downstream at the Devil Canyon site.

DESCRIPTION OF THE AREA

Physical Features

9. The Susitna River Basin lies in south-central Alaska, north of the farthest inland projection of Cook Inlet between latitudes 61° - 64° north and longitudes 146° - 153° west (Fig. 1). The total drainage of the basin comprises about 19,300 square miles of relatively uninhabited lands. The basin is bordered on the south by the waters of Cook Inlet and the Talkeetna Mountains, on the east by the Talkeetna Mountains and the Copper River plateau, and on the west and north by the Alaska Range.

10. The main stem of the Susitna River from its source in the Alaska Range to its point of discharge into Cook Inlet is about 275 miles long. It flows southward from the Alaska Range for about 60 miles; thence, in a general westerly direction through the Talkeetna Mountains for about 100 miles, and then south for the remaining 115 miles to its mouth at Cook Inlet.

11. Principal tributaries of the lower basin have as their origin glaciers high in the surrounding mountain ranges. These streams are for the most part turbulent in the upper reaches and slower flowing in the lower regions. Most of the tributaries carry a heavy load of glacial silt.

12. The Yentna River, one of the largest tributaries, begins in the mountains of the Alaska Range, flows in a general southeasterly direction for approximately 95 miles and enters the Susitna River 24 miles upstream from its mouth.

13. The Talkeetna River has its origin in the Talkeetna Mountains. It flows in a westerly direction and discharges into the Susitna River 80 miles upstream from its mouth.

14. The Chulitna River heads in the Alaska Range and flows in a southerly direction, joining the Susitna River opposite the Talkeetna confluence.

15. Principal tributaries of the upper Susitna drainage are the Oshetna, Tyone, and Maclaren Rivers. For the most part, these tributaries have numerous feeder streams that drain many clear-water lakes.

Figure 1. Susitna River Basin, Alaska

16. Stream flow in the Susitna Basin is characterized by a high rate of discharge from May through September and by low flows from October through April. High discharges are caused by snow melt, rainfall, and glacial melt. Streams carry a heavy load of glacial silt during the summer. During the winter when low temperatures retard water flows, streams are silt free.

17. The Alaska Range to the west and north, and the Talkeetna Range to the east make up the high perimeter of the lower Susitna River Basin. The Alaska Range is made up of sedimentary rocks, some of which have been metamorphosed and intruded by granitic masses. The Talkeetna Mountains are primarily granitic. The floor of the lower basin is largely covered with glacial stream deposits.

18. The upper basin, predominantly mountainous, is bordered on the west by the Talkeetna Mountains, on the north by the Alaska Range, and on the south and east by the flat Copper River plateau. Valleys are floored with a thick fill of glacial moraines and gravels.

19. The climate of the Susitna Basin is rather diversified. The latitude of the region gives it long winters and short summers with great variation in the length of the daylight between winter and summer.

20. The lower Susitna Basin owes its relatively moderate climate to the warm waters of the Pacific on the south and the barriers of surrounding mountains. The summers are characterized by moderate temperatures, cloudy days, and gentle rains. The winters are cold and the snowfall is fairly heavy. Talkeetna, representative of the lower basin, has an annual mean temperature of 33.2°F., and an average annual precipitation of 28.85 inches.

21. The upper Susitna Basin, separated from the coast by high mountains, has a somewhat more severe climate than the lower basin. The nearest weather station at Mount McKinley Park has an annual mean temperature of 27.5°F., and an annual precipitation of 14.44 inches.

22. Spruce, birch, aspen, cottonwood, willow, and alder are found throughout the lower basin up to about 2,000 feet. These are interspersed with low muskeg vegetation on the floor of the

basin and grassy meadows on higher benches. Understory of timbered areas consists of moss, ferns, high and low bush cranberry, devil's club, wild rose, blueberry, currants, grass, and wildflowers. Above timberline, thickets of alder and willow occur interspersed with grassy meadows. Above this zone vegetation consists of moss, lichens, and wildflowers.

23. Spruce occurs throughout the upper basin up to the 2,500- to 3,000-foot timberline. Low, scrubby, black spruce grows on the poorly drained bottomland, while the larger white spruce is found on better drained sites. Dwarf birch is distributed throughout the upper basin, and willow occurs along water bodies. White birch and alder occur in limited amounts. The understory includes blueberry, low-bush cranberry, Labrador tea, crowberry, fireweed, mosses, and lichens. Muskeg is interspersed throughout the bottomland and tundra is present throughout better drained areas.

24. Mount McKinley National Park, containing about 3,030 square miles and second in size only to Yellowstone National Park, lies some 50 miles to the northwest of the project area. It was created by an act of Congress in 1917 and has as one of its objectives the protection of the great herds of mountain sheep and caribou in this portion of the Alaska Range. Mount McKinley, the highest mountain in North America, is the principal scenic feature of the park. This lofty peak rises 20,269 feet above sea level, and soars some 17,000 feet above the surrounding forested plateau; it is the only mountain in the world to rise so high from its own base.

25. The Denali Game Reserve, extending from the north side of the Denali Highway to the crest of the Alaska Range and from the eastern boundary of the Maclaren River drainage westward to a point 10 miles east of Cantwell, was established in 1957. Currently, the reserve is closed to the taking of big game animals.

Commercial Features

26. The population of the basin is chiefly concentrated along the railbelt with scattered settlements of trappers and miners throughout the entire basin. The proposed project features are located approximately midway between Anchorage and Fairbanks,

the two largest cities in the State. It has been estimated that these two areas contain about 125,000 people or about 60 percent of the entire State's population.

27. The Alaska Railroad is the only overland means of transportation through the lower Susitna River Basin. The Denali Highway passes through the headwater portion of the upper Susitna Basin. Although other secondary roads are being developed, access to remote areas is still possible only by air and boat travel.

28. Economic activities are chiefly centered in the lower 100 miles of the basin along the railbelt. The commercial fishery utilizing the Susitna salmon runs is located in Cook Inlet. Placer and lode gold, tungsten, and construction materials are produced in this lower area, but only in limited quantities. Coal and other minerals are present but have received little attention due to high development costs. Much of the basin is under lease by oil interests. Portions of the lower basin are suited for agriculture and forest industries, which still await full development.

PLAN OF DEVELOPMENT

Engineering Features - Devil Canyon

29. Devil Canyon damsite, located on the Susitna River at mile 134 (Fig. 2), will be the initial development. The dam, rising 635 feet above its foundation and 565 feet above the normal water surface of the river (Fig. 3), will be of a concrete-arch design. Although the ultimate installed power capacity will be 580,000 kilowatts, the initial capacity will be 217,500 kilowatts.

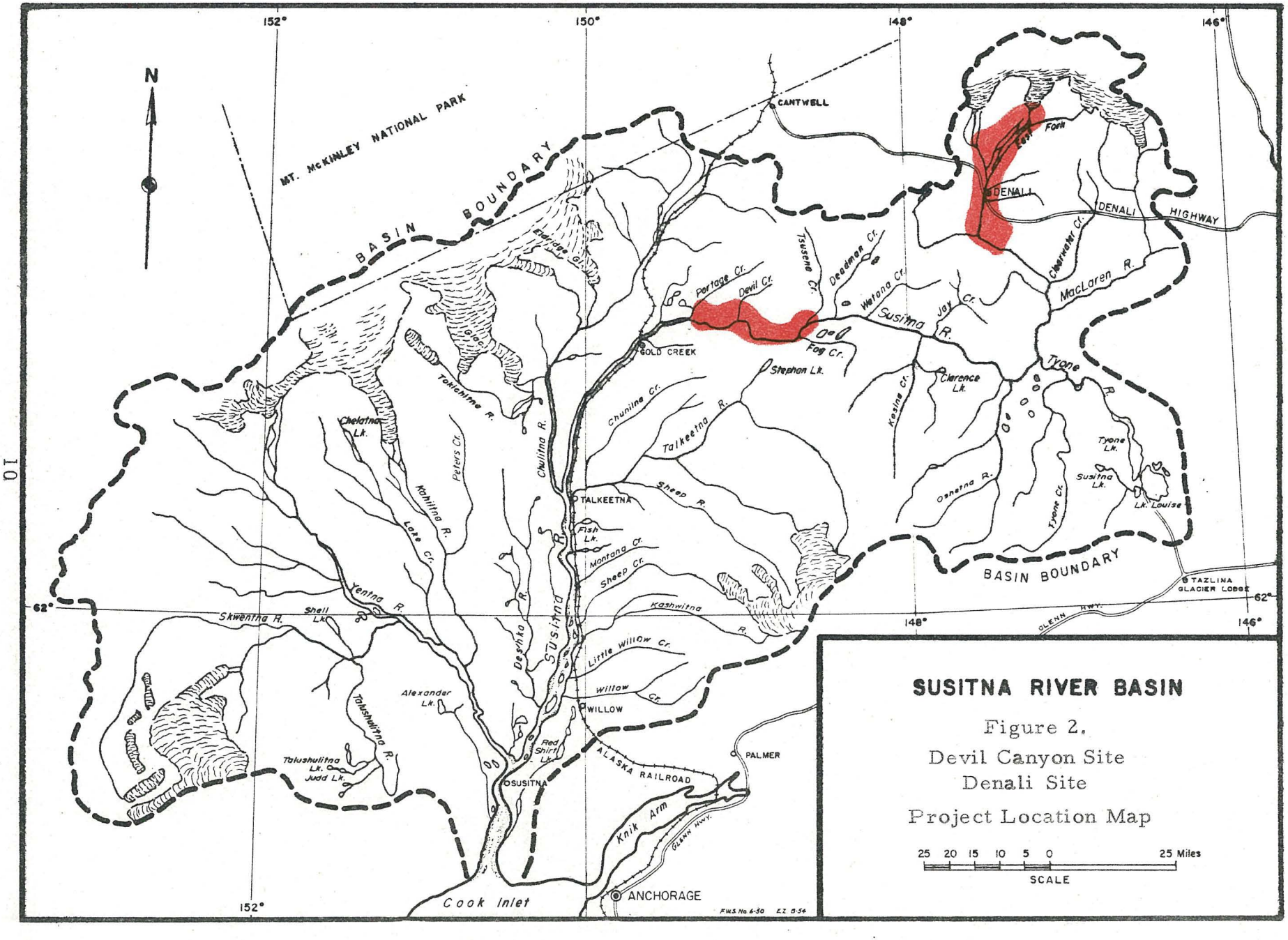
30. The reservoir will be about 29 miles long and between 0.25 and 0.75 mile wide. At a normal full pool water surface elevation of 1,450 feet, it will have a surface area of 7,550 acres and an initial total capacity of 1,100,000 acre-feet. During a 100-year period, the average minimum operating pool level is estimated at 1,284 feet m.s.l. At this level, the reservoir would have a capacity of 205,000 acre-feet and a surface area of about 1,900 acres. The dead storage pool will have an initial surface area of 2,100 acres and a storage capacity of 293,000 acre-feet, at an elevation of 1,275 feet.

Engineering Features - Denali

31. The Denali Dam will be an earth and sand/gravel structure about 290 feet in height above the bottom of the cutoff trench and 219 feet above the river bed. Its location will be approximately 15 miles downstream from the Susitna River crossing of the Denali Highway, or at river mile 248 (Fig. 2). With normal full pool water surface elevation of 2,552 feet, a reservoir 2 to 6 miles wide and about 25 miles long will be created. This will cover about 61,000 acres and store 5,400,000 acre-feet of water (Fig. 4). For a 100-year period, the average minimum operating pool level would be 2,484 feet m.s.l.; at this elevation, the reservoir will cover 34,000 surface acres and contain 1,650,000 acre-feet. Initially, 100,000 acre-feet of water will remain in the dead pool, which will cover 300 acres at an elevation of 2,368 feet. The dead pool storage will decline to zero over a 100-year period, due to sedimentation.

Operation - Devil Canyon

32. Maximum monthly power releases from the Devil Canyon Dam will occur during December when an average of 10,525 c.f.s.



SUSITNA RIVER BASIN

Figure 2.

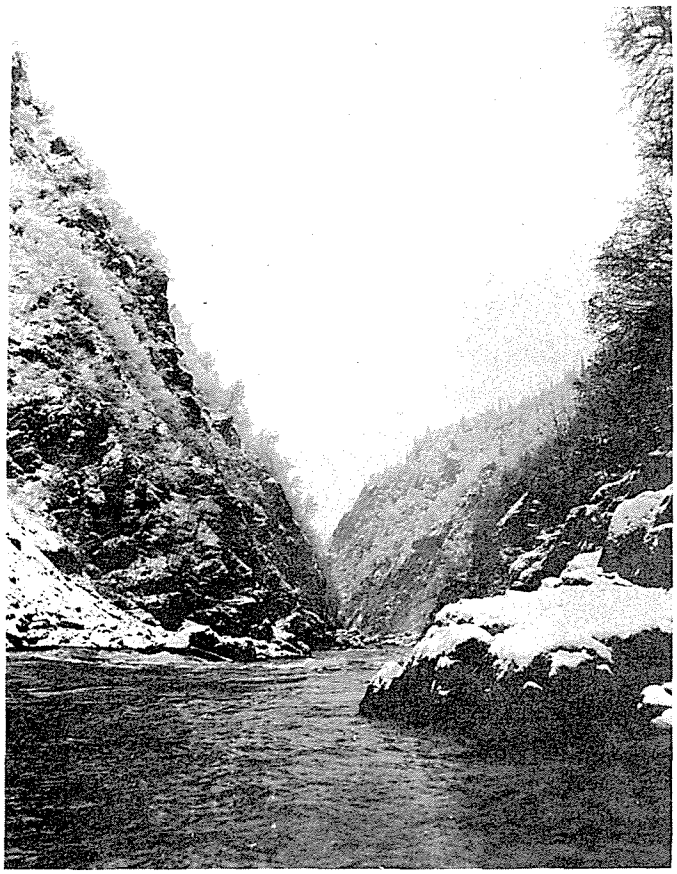
Devil Canyon Site

Denali Site

Project Location Map

25 20 15 10 5 0 25 Miles

SCALE



U.S.B.R. Photo

Figure 3. View of proposed Devil Canyon Damsite, showing rapids and river gorge.

Photo by Jack Lentfer

Figure 4. Upper section of Denali impoundment area looking north from Denali Highway bridge crossing of Susitna River to headwater glaciers.

will be discharged. Minimum monthly power releases averaging 7,930 c.f.s. will occur during July. The average annual release will be 9,125 c.f.s.

Operation - Denali

33. Water will be stored in the Denali impoundment during spring and summer for release in the fall and winter. Only incremental flows will occur for about a six-month period in that section of the Susitna River between the two impoundments. The month of maximum discharge will be December when an average of 9,400 c.f.s. will be released. The average release from the Denali Dam during the period of operation will be 6,800 c.f.s.

34. Salient features of engineering and operation are presented in Table I.

TABLE I

PERTINENT ENGINEERING AND OPERATING DATA
DEVIL CANYON AND DENALI DAMS AND RESERVOIRS

	Devil Canyon	Denali
Height of Dam (feet above foundation and bottom of cutoff)	635	290
Maximum Pool Elevation (feet m.s.l.)	1,455	2,562
Surface Area (acres)	7,750	65,000
Storage Capacity (acre-feet)	1,140,000	6,055,000
Normal Full Pool Elevation (feet m.s.l.)	1,450	2,552
Surface Area (acres)	7,550	61,000
Storage Capacity (acre-feet)	1,100,000	5,400,000
Average Min. Op. Elevation (feet m.s.l.)	1,284	2,484
Surface Area (acres)	1,900	34,000
Storage Capacity (acre-feet)	205,000	1,650,000
Top of Dead Pool Elevation (feet m.s.l.)	1,275	2,368
Surface Area (acres)	2,100	300
Storage Area (acre-feet)	293,000	100,000
Average Min. Monthly Release (c.f.s.)	7,930 (July 1)	-0- (April-Sept)
Average Max. Monthly Release (c.f.s.)	10,525 (Dec)	9,400 (Dec)
Average Release (c.f.s.)	9,125 1/	6,800 (when releases are made)

1/Does not include spills

FISHERY

General

35. During the warmer months of the year, the Susitna River is silt-laden throughout its entire course due to its glacial origin. Sport fishing is thereby limited to the clear-water tributaries and areas in the main Susitna River near the mouths of these tributaries. The principal fresh-water sport fish present in the Susitna Basin are rainbow and lake trout, Dolly Varden char, and grayling. Other species of lesser importance are burbot, sucker, sculpin, and two species each of stickleback and whitefish. King, red, pink, chum, and coho salmon are found in varying abundance in major tributaries of the Susitna River below the Devil Canyon damsite. During the past 10 years, the first wholesale value of the Cook Inlet salmon case pack has averaged over $7,300,000 annually. Of this, the Susitna River system is estimated to produce annually 38 percent or about $2,774,000.

36. Sport fishing pressure in the Susitna Basin is light, with the primary limitation being that of access. Many lakes and rivers afford landing sites for float-equipped aircraft, and fishermen using this method of transportation are frequently rewarded with limit or near-limit catches. The Alaska Railroad, the primary means of access to the lower basin, parallels the Susitna River from Nancy at railroad mile 181 to Gold Creek at railroad mile 263, and crosses many fine fishing streams tributary to the main river. During the summer season, trains make unscheduled stops at these streams to accommodate fishermen. The completion of the Denali Highway in 1957 opened the upper Susitna Basin to fishermen. The Tyone River, originating at Lake Louise and flowing northwest to the Susitna River, is proving increasingly popular with boat fishermen.

Without the Project - Devil Canyon

37. The areas affected by this proposed project feature are best discussed when considered as two separate sections; from the confluence of the Susitna, Talkeetna, and Chulitna Rivers at river mile 85, upstream to the Devil Canyon damsite at river mile 134, a distance of 49 river miles, and the Devil Canyon impoundment area about 29 river miles in length (Fig. 5).

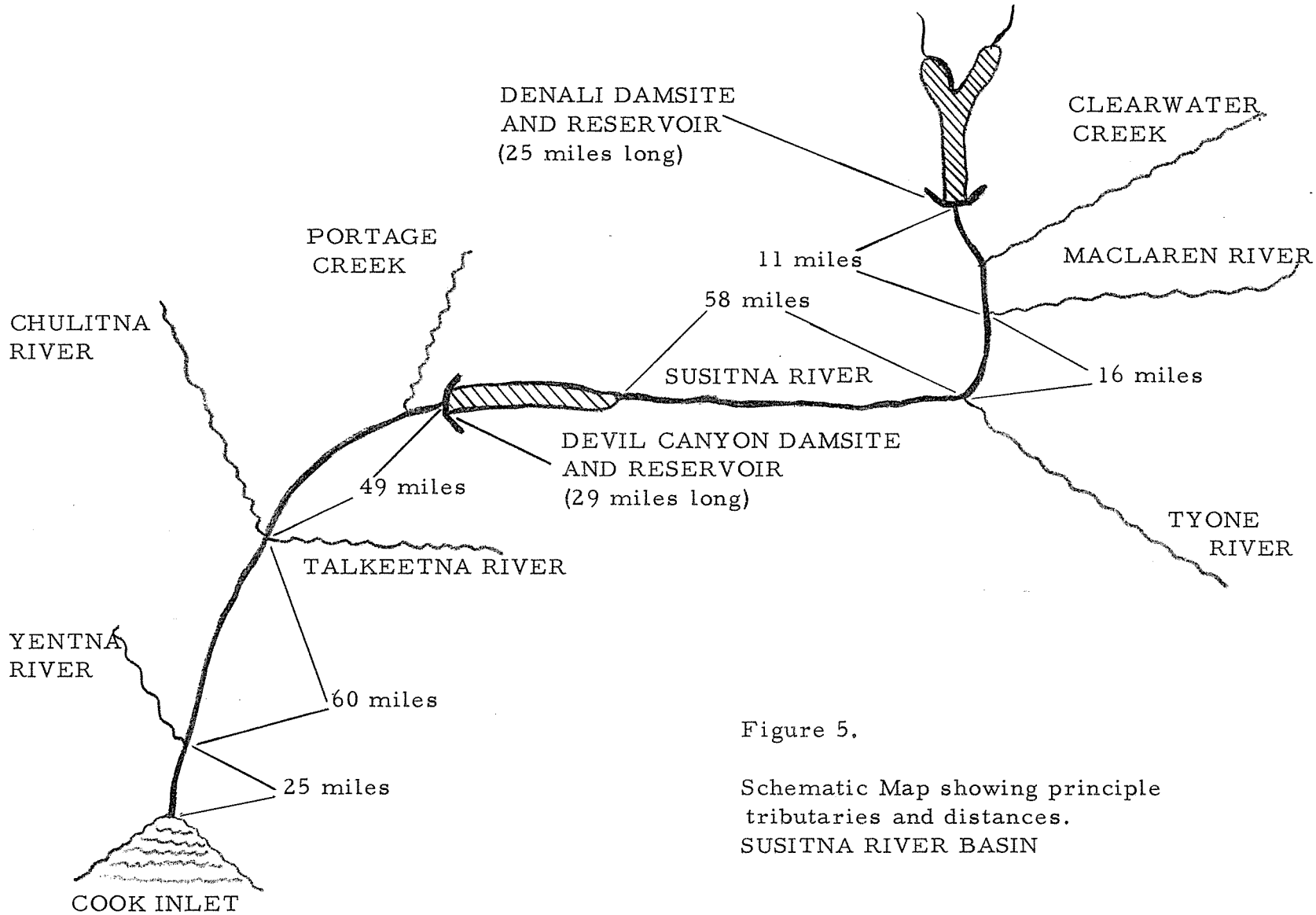


Figure 5.

Schematic Map showing principle tributaries and distances.
SUSITNA RIVER BASIN

38. That section of the Susitna River downstream from Devil Canyon to its confluence with the Talkeetna and Chulitna Rivers is fed by a few clear tributary streams which furnish habitat for rainbow trout, grayling, lake trout, Dolly Varden char, and burbot, and spawning and rearing grounds for the five species of Pacific salmon. Portage Creek, 3 miles below the damsite, is the last tributary upstream on the Susitna River where significant numbers of spawning salmon have been noted. It is not known how extensively the main stem Susitna below the damsite is utilized for spawning, but such usage is probably light due to the silt-laden water and the relatively muddy, sandy nature of the channel. Sport fishing between the damsite and confluence of the Susitna, Talkeetna, and Chulitna Rivers is limited to the mouths of a few clear-water tributaries. It is presumable that no significant changes in either fish spawning or sport fishing will occur without the project.

39. The Devil Canyon impoundment area is a rugged, narrow canyon with several rapids and a few clear-water tributaries, the largest being Fog Creek and Devil Creek. Grayling, whitefish, burbot, suckers, and cottids occur in these tributaries and in the main river. Due to a paucity of sizeable tributary streams and remoteness of the area, sport fishing is practically non-existent. Little change is anticipated in fish populations or fishing pressures without project development.

40. Investigations conducted by the Fish and Wildlife Service intermittently from 1952 to 1958 failed to reveal the presence of adult or young salmon above the proposed Devil Canyon damsite. No actual waterfalls or physical barriers have been observed in or above the Devil Canyon area which would preclude salmon from utilizing the drainage area above the damsite. However, the most logical reason for the absence of salmon from the area is the probability of a hydraulic block resulting from high water velocities for several river miles within Devil Canyon (Fig. 6). It is doubtful that the area above Devil Canyon will become accessible to and utilized by anadromous fish without project development.

Without the Project - Denali

41. In the Denali area, the affected sections are considered in two parts; the area from the head of the Devil Canyon Reservoir to the Denali damsite at river mile 248, for a distance of 85 main stem miles, and the Denali impoundment area, which is about 25 miles long.

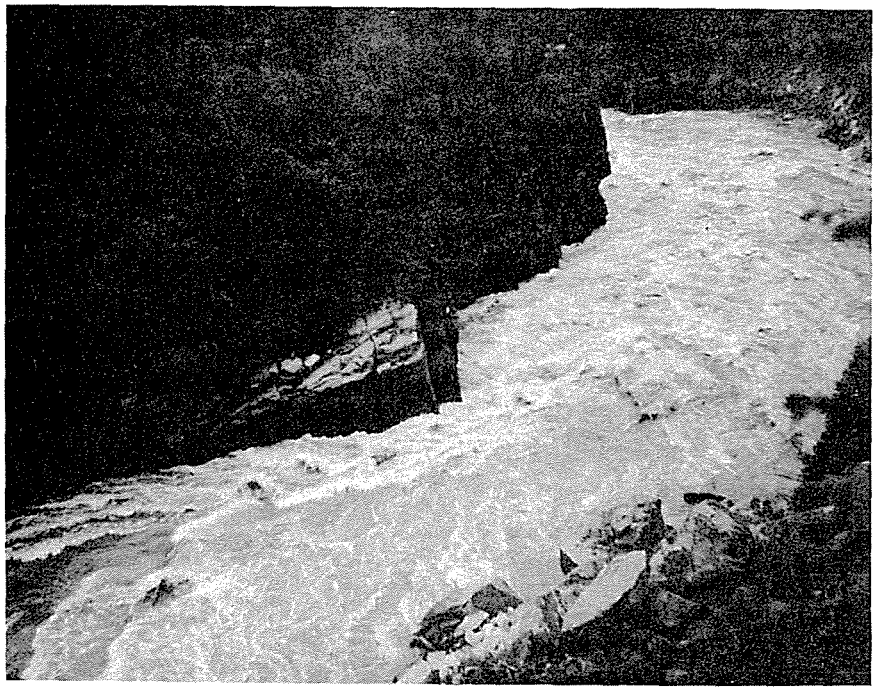


Photo by Dick Hensel

Figure 6. Possible hydraulic barrier to ascending salmon several miles above Devil Canyon Damsite. Note slide lower right.

42. From the Devil Canyon Reservoir upstream to the Denali impoundment, several tributaries enter the Susitna River. The largest of these are the Maclaren River, which is glacially turbid, and the Oshetna and Tyone Rivers which are clear. Smaller streams include Deadman, Watana, Kosina, Jay, Goose, Coal, and Clearwater Creeks. In this section of the Susitna, only burbot have been captured during the summer. Clear tributary streams contain grayling, whitefish, burbot, suckers, and cottids. Lake trout are present in certain of the tributary drainages which contain deep lakes. Fishing pressure on the mainstem Susitna is negligible and limited to the mouths of some of the clear-water tributaries. It is expected that this pressure will show only a slight increase without the project.

43. In the Denali impoundment area, the major tributaries to the Susitna River are Raft, Butte, Windy, and Valdez Creeks which are clear and Boulder Creek which is turbid. The clear streams contain grayling, whitefish, burbot, suckers, and cottids. Lake trout are found in some of the small lakes adjacent to the river. Anadromous fish are not present. Stream fishing, principally for

grayling, is not extensive and is generally confined to the mouths of clear tributaries. Sand Lake, easily accessible from the Denali Highway, is fished for lake trout. Opening of the Denali Highway has provided access to this area and establishment of tourist facilities and trails portends increasing fishing pressure.

With the Project - Devil Canyon

44. In that area from the confluence of the Susitna, Chulitna, and Talkeetna Rivers to the damsite at Devil Canyon, it is doubtful that any significant changes to the sport fishery will occur. However, the Susitna River in this area serves as the migration route for salmon ascending to the spawning tributaries. Releases of water, either colder or warmer than normal stream temperatures, could affect the attraction of salmon to such tributaries. Possible flushing and scouring action that would occur as a result of sudden changes in discharge from the Devil Canyon Reservoir may alter production of insects and other fish food.

45. From available records of water contribution of the Susitna, Chulitna, and Talkeetna Rivers, it appears that the project will have no effects to the anadromous fish runs or sport fish below this confluence to the river's mouth at Cook Inlet.

46. In the reservoir to be formed by the Devil Canyon Dam, it is doubtful that any significant effects will be sustained by the fishery resources. Inundation of the lower portions of clear-water tributaries may have a limited detrimental effect on some species. However, this may be offset by elimination of falls near the mouths of some of these streams which will be flooded, thereby permitting increased fish movement and utilization. Although the reservoir will improve access, fluctuating water levels and turbid waters will limit both fish production and fishing pressure.

With the Project - Denali

47. In the area from the Devil Canyon impoundment upstream to the Denali damsite little change in the overall fishery is anticipated, even though water will not be released from the Denali Reservoir from April through September. This will result in virtual dewatering of the 11 miles of the Susitna River between the dam and the mouth of the Maclaren River. This section currently

contributes little to game fish production. Under project development, it may serve as a wintering area for fish. Reduced flows will have less effect on fish movement and food production below the mouth of the Maclaren River, and these effects will become progressively less severe downstream as each tributary adds more water.

48. Fall and winter flows in this section of the Susitna River may consist of turbid glacial water stored in Denali Reservoir, in contrast to the normal clear water at this time of year. This possible change from clear to turbid water could affect the wintering habitat with attendant effects to the fish species utilizing the river. Should releases from the Denali Reservoir be relatively clear, winter fish habitat may improve since flows will be substantially increased. Improvement is particularly likely if these releases are controlled to minimize fluctuations.

49. The Denali Reservoir will inundate 25 miles of the Susitna River, several small lakes, and 13 miles of the lower portions of several clear-water streams which presently support an expanding sport fishery. However, the middle stretches of these streams will become accessible due to the availability of the reservoir for boat travel and float-plane landing. The Bureau of Reclamation estimates that only about 14 percent of the inflow will be glacial, with the remaining percentage being snow-melt runoff and spring-fed waters. Retention of water in the reservoir throughout the summer months will permit some warming to occur. The degree of turbidity to be expected from the glacial inflow is not known; however, observations elsewhere indicate that glacial silt tends to remain in suspension rather than settle out. Further observations generally indicate that turbid lakes are not only less productive of fish life than clear lakes, but less attractive to sportsmen. Therefore, the degree of turbidity will partially determine the fishery productivity and utilization of the impoundment area. Fluctuating water levels will further limit fish life by restricting food production in the shoal areas of the reservoir.

WILDLIFE

Without the Project - Devil Canyon

50. The dominant vegetative cover throughout the Devil Canyon impoundment area is spruce. Low bottomland along the main river and the tributaries supports black spruce-aspen stands. White spruce occurs on the steep side hills in conjunction with paper birch, dwarf birch, black spruce, and occasional stands of aspen and cottonwood. Dwarf birch is present in the rolling country on each side of the canyon, while willow occurs infrequently throughout the entire area. The understory includes blueberry, low-bush cranberry, narrow-leaved Labrador tea, crowberry, fireweed, mosses, and lichens.

51. Game populations are limited in number along the steep canyon walls which comprise most of the area to be flooded. A few moose and black and grizzly bear are present. Segments of the Nelchina caribou herd periodically range throughout the impoundment area. However, at no time of the year are caribou resident to the area nor is the area located on any recently-utilized migration route.

52. A limited number of spruce grouse inhabit the area. Ptarmigan would probably be present during peak population periods.

53. Beaver, present in sloughs along the river, are probably the most abundant fur bearers. Other species of fur animals present in sparse numbers include land otter, mink and fox. Wolves occasionally travel through the area. Other bur bearers that may be present are lynx, marten, wolverine and muskrat.

54. Waterfowl use of the area is limited to a few mergansers which nest in tributaries to the Susitna River.

55. Hunting and trapping in the impoundment area are virtually non-existent due to inaccessibility and low populations of wildlife. This condition can be expected to remain without project development. Even with road building and settlement of the region, game species would probably not be sought in the impoundment area due to low numbers and difficulties associated with hunting the steep canyon walls and traveling on the relatively turbulent Susitna River.

Without the Project - Denali

56. The upper section of the Denali impoundment includes extensive river bottomland containing abundant sedge and willow vegetation. Below the mouth of Valdez Creek, the area narrows with sedge and willow in the river bottom, and spruce, dwarf birch, and a heath plant formation composed of blueberry, low-bush cranberry, Labrador tea, and crowberry on the side hills. The impoundment area spreads out below the mouth of Butte Creek and contains lakes, potholes, and marshes, separated by higher well-drained land. Spruce and dwarf birch occur throughout with heath plants and lichens as an understory on the better drained sections, and sedge and willow along water bodies.

57. The Denali impoundment area supports a moose population of slightly less than one moose per square mile throughout all seasons of the year. Without the project, and based on moose productivity studies elsewhere in Alaska, the moose population will probably increase for the next several years and then stabilize at a higher density level.

58. The Denali impoundment area is located within the range of the Nelchina caribou herd, estimated to number over 50,000 animals. Scattered bands and stragglers may occur anywhere throughout the range, including the impoundment area, at any time of the year. However, the principal calving and summering grounds lie outside the impoundment area to the south. Historically, wintering grounds for the main segment of the Nelchina herd have been the Lake Louise Flats. An unexplained, westward shift in winter range use has been evident in recent years. As many as 20,000 caribou have been observed in Monahan Flats for limited periods. This is an area of about 400 square miles which comprises about 2 percent of the total Nelchina caribou range. That section of the impoundment area north of Valdez Creek includes the eastern one-eighth of Monahan Flats. Intermittent caribou utilization of the Monahan Flats, which includes the northern section of the impoundment area, will probably continue without project development. Sedge and lichens, which are highly important winter food plants for caribou, are generally in better condition in this locale than in areas utilized by wintering caribou in past years. Therefore, Monahan Flats is a desirable wintering area. The remainder of the impoundment area is utilized less by caribou than this northern section.

59. The southern half of the impoundment area is in one of the most popular big game hunting regions in the State, due to its accessibility from the recently completed Denali Highway and the availability of moose and caribou close to the road. The northern half of the Denali impoundment is part of the Denali Reserve, an area now closed to hunting. This reserve extends east and west for 80 miles and is situated on the north side of the Denali Highway. Several moose are harvested each year from within and adjacent to the open section of the project area. Without project development, hunting pressure for moose in the open areas will increase. Should recurrent suggestions to open the Denali Reserve and/or an either-sex moose season be adopted by the Alaska Department of Fish and Game, additional increases in the moose harvest will follow.

60. That section of the project area lying south of the Denali Highway is part of a region which receives rather intensive hunting for caribou during the first part of the season. The harvest, which varies from year to year depending on the distribution and movement of the caribou, would probably not be increased either by further liberalization of the present limit (3 caribou) or extension of the season. Hunting pressure, however, is expected to increase without project development. Should the Denali Reserve be opened to big game hunting, hunting pressure for caribou could be expected in the northern half of the impoundment area.

61. The area supports both black and grizzly bear; their harvest is mainly incidental to other big game hunting.

62. Spruce grouse, ptarmigan, and snowshoe hare, whose numbers fluctuate periodically, are present throughout the area but have not been abundant in recent years. Hunting for these species has been light and generally incidental to big game hunting. Hunting pressure may be expected to increase somewhat with an increase in human population, but harvest will still be largely dependent upon bird numbers.

63. Wolves, red fox, wolverine, beaver, muskrat, and land otter are present in the area. Other fur bearers possibly present include mink, marten and coyote. The present annual fur harvest probably does not exceed 20 beaver taken by one or two year-round residents near the Denali Highway crossing of the Susitna River. The potential fur yield is far greater than this and, with increased settlement, trapping would probably increase substantially.

64. The impoundment area furnishes nesting and rearing habitat for waterfowl. Species nesting in the area include the trumpeter and whistling swan, Canada goose, scaup, baldpate, green-winged teal, mallard, pintail, bufflehead, goldeneye, old squaw, harlequin, shoveller, canvasback, white-winged scoter, and American merganser. Migrant waterfowl use the area for feeding and resting during both spring and fall flights.

65. Waterfowl hunting at present is negligible. Without project development, the area would continue to furnish nesting, rearing, and resting habitat. Hunting pressure may increase with an increase in human population.

With the Project - Devil Canyon

66. Limited amounts of moose, caribou, bear, spruce grouse, and fur animal habitat will be inundated and destroyed. Fluctuating water levels and the precipitous topography of the area will preclude creation of new game habitat. Access to the area will be improved by a road from the Alaska Railroad section at Gold Creek to the damsite and by creation of the 29-mile long reservoir, which will furnish a surface for boat and plane operation. This improved access will undoubtedly attract some hunters and, perhaps, trappers, and result in an increased yield of the presently lightly harvested game of the surrounding area.

With the Project - Denali

67. About 61,000 acres of land will be inundated. Most of this is moose habitat, the use of which varies according to the season. Since it is unlikely that the surrounding area can support the displaced animals, the moose population of the impoundment area will be lost. With project development, a new road will be constructed around the lower half of the reservoir. This road, as well as the lake itself, which will afford boat and plane operation, will add to the accessibility and harvest of moose from the range surrounding the project area.

68. About 33,000 acres of good caribou winter range, which receives intermittent winter use by the Nelchina caribou herd, will be destroyed by inundation. An additional 28,000 acres of less valuable range, which receives intermittent use throughout the year, will also be inundated. Although substantial numbers of

caribou occasionally use this overall area, the range that will be destroyed is apparently not of major importance when compared with other segments of the Nelchina range. No main caribou travel routes will be inundated. Improved accessibility as a result of project development will probably increase the caribou harvest in the surrounding area.

69. Spruce grouse, ptarmigan and snowshoe hare habitat will be inundated and lost by project development.

70. A minor hazard to game animals may be created if a series of ice shelves is formed around the perimeter of the reservoir as water is drawn down during the winter.

71. Inundation will destroy fur bearer habitat and areas used by waterfowl for nesting and rearing. A fluctuating waterline will preclude creation of alternate habitat around the reservoir shoreline to replace these losses. The impoundment will furnish increased resting areas for waterfowl, particularly during the fall migration. With a lake for boat and float-plane operations, the area will probably become increasingly important for waterfowl hunting as the population of Alaska increases.

DISCUSSION

72. The Devil Canyon Project, if constructed, will result in relatively insignificant losses to the fishery resources of the Susitna River Basin.

73. Reservoirs formed as a result of the Devil Canyon and Denali Dams will inundate about 54 miles of the main stem Susitna River, a minimum of 15 miles of clear-water tributaries, and some lake habitat. Fluctuating water levels in both reservoirs will limit maximum development of impoundments for fish habitat. A further restriction to optimum fishery habitat development will be the turbid waters caused by glacial silt runoff. The degree of this turbidity cannot be predicted on the basis of available data; however, fishery production will decrease in proportion to turbidity. Although access will be improved by project development, only limited increases in sport fishing are anticipated where the clear-water tributaries enter the impoundments. It is anticipated that the paucity of clear streams, the fluctuating water levels, and the presence of better fishing in adjacent areas will preclude high usage of the impoundments by anglers.

74. If water released from Devil Canyon Dam for power generation is different in temperature from that of the natural river, the attraction and migration of salmon and other fish to the tributaries between the confluence of the Susitna, Chulitna, and Talkeetna Rivers and the dam may be altered. Limited spawning and other fish usage of this area would be reduced by the introduction of cooler water, while warmer waters would result in increased fish food production and fish utilization in this area. For these reasons, water releases should be made, if feasible, from a reservoir level that corresponds as nearly as possible to normal or warmer than normal river temperatures.

75. The releases indicated in the Bureau of Reclamation Operating Plan for the Devil Canyon Dam will be adequate to sustain fish habitat in the Susitna River downstream from the project. However, during dam construction, reservoir filling, and throughout the life of the project, flows of not less than 2,000 c.f.s. should be maintained. If the initial reservoir filling occurs during the period October through April, inclusive, the minimum flow requirement would be 1,000 c.f.s. Sudden changes in water discharge should be avoided to prevent scouring of the channel.

76. Stream ecology and fish life will be modified in the 85 miles of the Susitna River between the Devil Canyon Reservoir and the Denali Dam. The plan of operation calls for water above Denali Dam to be impounded during the spring and summer and to be released during the fall and winter. Changes will be most profound in the 11 miles of the Susitna River from the Denali Dam to the Maclaren River. However, during the summer months when such flows will be stored, this section of stream apparently receives little usage by fish; therefore, this summer dewatering may be of little consequence. Below the Maclaren River, it is most likely that summer fish usage increases. Water records indicate that incremental flows from the various tributaries in this section are normally greater than the flow of the Susitna River at Denali Dam. Even without flow in the Susitna River from Denali Reservoir, the amount of water from the tributaries is believed adequate to sustain fish habitat and fish life.

77. During the fall and winter months, flows between Denali Dam and Devil Canyon Reservoir will exceed normal flows without the project. Such increases will probably be of benefit to wintering fish populations in the Susitna River, particularly if the flow from Denali Dam is relatively clear. However, if this water is glacially turbid, it may be of less value than the normally clear water which currently occurs.

78. Although minimum year-round releases from the Denali Dam would probably reduce the changes in the stream habitat, such alteration of habitat without minimum flows will not be particularly adverse to the fishery resources. Therefore, minimum flows are not required during spring and summer months when the project is in operation. In order that fish habitat may be preserved during the construction and initial filling period and project operation, flows of not less than 150 c.f.s. should be maintained from October through March. When the project is fully operational, flows released from the dam for power generation downstream at Denali will be adequate to maintain the winter fish habitat.

79. Although there have been two reports of fish above the Devil Canyon Dam that could have been salmon, no verified report exists of salmon above this site. A strong probability exists that a hydraulic block (comprised of swift water for several miles) prevents the movement of anadromous fish to the Susitna River drainage above the Devil Canyon damsite. It may be that, with some

special water condition which might exist periodically, an occasional salmon is able to traverse the area. There are no indications, however, that any significant numbers of salmon or other anadromous fish will be blocked by construction of the Devil Canyon Dam; therefore, no fish ladder or other fish facility is recommended for inclusion in the plans for the Devil Canyon Dam at this time.

80. Above the Devil Canyon damsite, there are many clear-water tributaries and lake systems that may be utilized by salmon for spawning and rearing purposes. Elimination of the hydraulic block by inundation together with some type of fish-handling device might make it possible to bring the middle and upper Susitna drainage area into salmon and steelhead trout production. Detailed studies will be conducted to determine the feasibility and opportunities for enhancement features to utilize these potential spawning areas.

81. Limited amounts of wildlife habitat will be destroyed by inundation with attendant losses to the wildlife species dependent on these habitats. Because of generally low populations and poor accessibility, these losses are considered to be of a minor nature. The topography of the reservoir perimeters as well as the season, duration, and severity of fluctuating water levels in the two reservoirs make mitigation of such limited losses by development of replacement habitat improbable. It is possible that, as a result of project construction and operation, access to currently remote areas will improve with increased utilization of the game and fur species by hunters and trappers.

STATE OF ALASKA
DEPARTMENT OF FISH AND GAME
229 ALASKA OFFICE BUILDING JUNEAU, ALASKA
C. L. ANDERSON, COMMISSIONER

May 6, 1960

Mr. John T. Gharrett, Regional Director
Bureau of Commercial Fisheries

and

Mr. Urban C. Nelson, Regional Director
Bureau of Sport Fisheries and Wildlife
U.S. Fish and Wildlife Service
Box 2481, Juneau, Alaska

Gentlemen:

The Department has reviewed the report of the U.S. Fish and Wildlife Service dated May 4,1960 concerning the Bureau of Reclamation's planned Devil Canyon Project on the Susitna River Basin. We agree with your findings as to the effect of the project on fish and game, and concur in the recommendations for the protection of these resources as outlined in this report.

Sincerely,

ALASKA DEPARTMENT OF FISH & GAME

Walter Kirkness

Walter Kirkness,
Acting Commissioner

WK:kp

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

CLARENCE F. PAUTZKE, COMMISSIONER

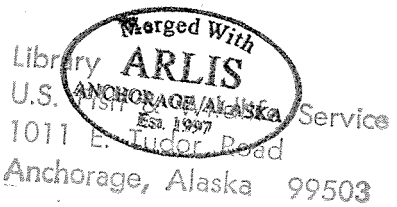
VEE PROJECT

SUSITNA RIVER

ALASKA

EPORT ON FISH AND WILDLIFE RESOURCES

UNITED STATES
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Clarence F. Pautzke, Commissioner



A DETAILED REPORT ON FISH AND WILDLIFE RESOURCES

AFFECTED BY

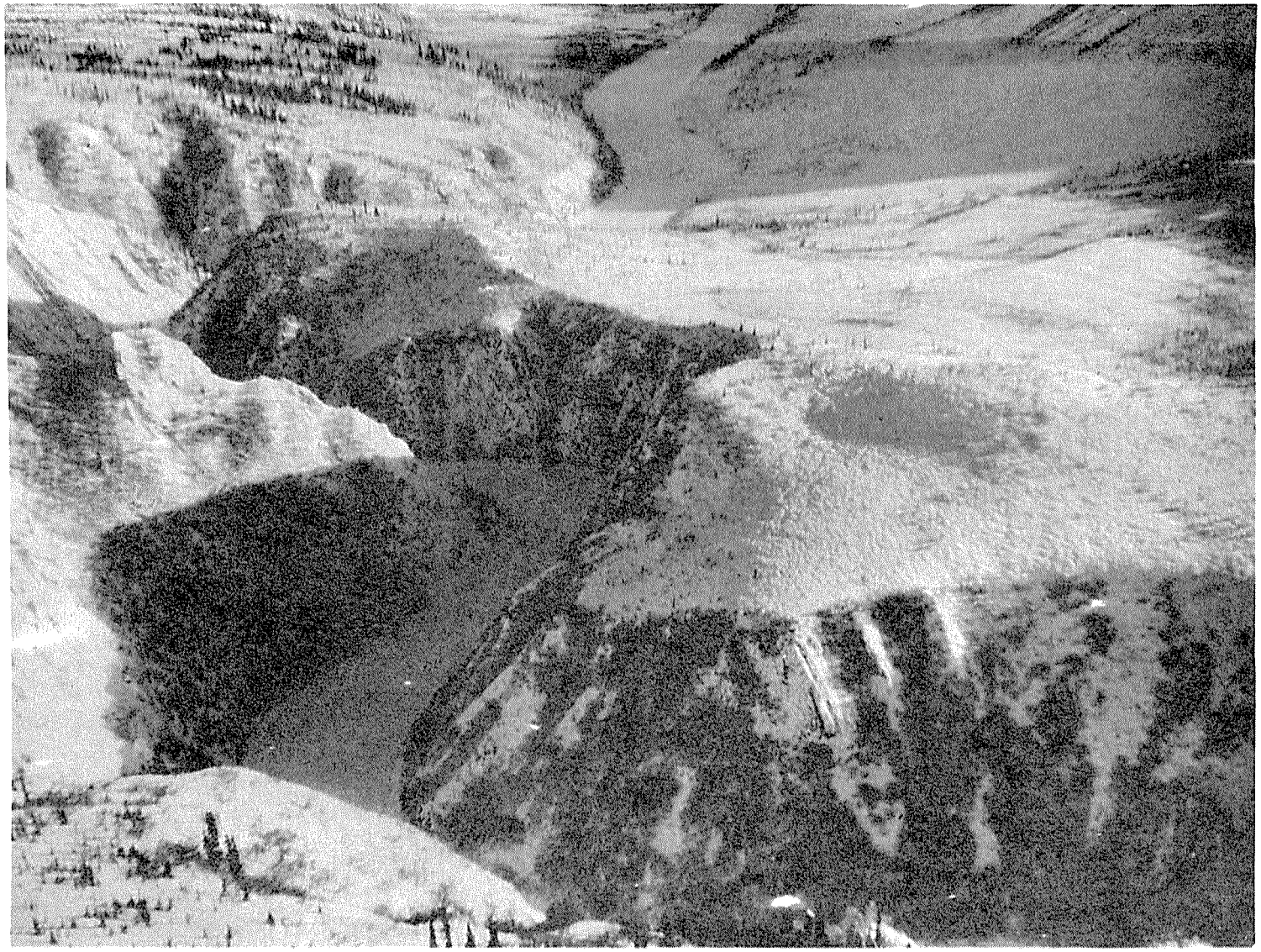
VEE PROJECT

SUSITNA RIVER

ALASKA

Juneau, Alaska

February 1965



View of Vee Canyon damsite.

(looking upstream)

REPORT OF THE REGIONAL DIRECTOR

Bureau of Commercial Fisheries

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES
Juneau, Alaska

ADDRESS ONLY THE
REGIONAL DIRECTOR

FEB 9 1965

District Manager
Bureau of Reclamation
Juneau, Alaska

Dear Sir:

This is the detailed report of the U.S. Fish and Wildlife Service concerning effects of Vee Dam and Reservoir project, Susitna River, Alaska, on fish and wildlife resources. This letter, which summarizes information concerning fish and game species present in the project area and effects of project construction on fish and game, is supported in more detail in the attached substantiating report. The letter and substantiating report have been prepared under the authority of and in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Construction and operation of Vee project would inundate 42 miles of glacial river habitat and 27.5 miles of clear or slightly turbid stream habitat. Grayling, burbot, suckers, and sculpins occur in these waters; whitefish possibly occur; and lake trout inhabit waters which drain into the impoundment area. Fishing pressure does not occur in the project area and without project development is not expected to occur during the period of analysis. This lack of fishing pressure results from the availability of better fishing in other more accessible areas.

The project would form a deep reservoir in which lake trout, whitefish, and burbot might become established; however, fluctuating reservoir levels and water which is expected to be glacially turbid would not provide optimum conditions for development. Grayling, which are particularly susceptible to turbid water, would not be expected to develop significant populations.

An important sport fishery would not be likely to develop, even if populations of fish were to become established in the reservoir, since fishing in streams and clear lakes is preferred by most anglers.

The Susitna River is now glacially turbid during the summer but is clear during the winter. The extent to which fish inhabit this clear water during winter when tributary flows are reduced is not known. Denali Reservoir, which is the second phase of the Devil Canyon project, would probably retain glacial silt in suspension throughout the winter and winter flows downstream from the Denali Dam would be somewhat turbid. Construction of Vee Dam would not alter this condition. Turbid waters would extend downstream for 46 miles to the upper end of Devil Canyon Reservoir. Any sudden spilling of water past Vee Dam might have a slight adverse effect on fish by scouring and flushing food organisms from the channel below the dam.

Anadromous fish do not occur in the project area and would not be affected.

The reservoir would inundate approximately 26.5 square miles of wildlife habitat. The project would ultimately result in loss of habitat which now winters a population of about 50 moose. Caribous use the impoundment area throughout the year in their travels but individual animals do not remain for extended periods. The reservoir would not seriously hinder their movements, because they could swim across it in summer and cross on the ice in winter. Some mortality might be expected as a result of attempted crossings during periods of thin ice. Black and grizzly bears occur in the area and probably make use of the reservoir site.

Willow ptarmigan, spruce grouse, and snowshoe hare, the small game species in the impoundment area, would suffer reduction of habitat as a result of project construction.

Fur animal species of the area are beaver, muskrat, otter, mink, lynx, fox, wolf, wolverine, and weasel. Although the area is not considered good quality fur-animal habitat, the project would destroy more habitat than it would create. Fluctuating water levels and the steep sides of the reservoir would not favor development of fur-animal populations.

Waterfowl habitat now present in the impoundment area is of low value. Steep banks and a fluctuating shoreline would preclude extensive nesting on the project reservoir. The reservoir might be used for resting by fall-migrating birds but such habitat is not needed urgently because adequate natural water areas occur nearby.

The area presently supports light hunting pressure for big game by hunters using boats and aircraft. Small game is harvested only incidentally to big game hunting. There is no hunting for waterfowl or trapping of fur animals. Without project development these activities will probably increase slightly during the period of analysis. With project development, access to areas surrounding the impoundment would increase and result in increased hunting. The fur harvest might also increase, especially during periods of higher fur prices.

This report and the following recommendations have been endorsed by the Alaska Department of Fish and Game as indicated in the letter to us dated January 11, 1965, from Deputy Commissioner E. S. Marvich, a copy of which is appended to the substantiating report. The report has also been read and approved by the Regional Director, Bureau of Sport Fisheries and Wildlife, Portland, Oregon.

In order to minimize adverse effects to fish and wildlife resources with project development and operation, it is recommended that:

1. During the construction, filling, and operating phases of the project, a minimum flow of 500 c.f.s. be maintained at all times in the Susitna River below the dam.

2. Abrupt changes in the volume of water discharged past the dam be avoided; such changes should be made gradually or in a series of slight increases or decreases.

3. The following language be incorporated in the recommendations of the report of the District Manager, Bureau of Reclamation:

   a. "That additional detailed studies of fish and wildlife resources affected by the project, be conducted as necessary, after the project is authorized, in accordance with Section 2 of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and that such reasonable modifications in the authorized project facilities be made by the Secretary of the Interior as he may find appropriate for the conservation, improvement, and development of these resources."

   b. "That Federal lands and project waters in the project area be open to public use for hunting and fishing so long as title to the lands and structures remains in the Federal Government, except for sections reserved for safety, efficient operation, or protection of public property."

   c. "That leases of Federal land in the project area reserve the right of public use of such land for hunting and fishing."

The analysis of project effects as set forth in the substantiating report is based on engineering data made available through November 6, 1964. The Fish and Wildlife Service should be advised of any changes in engineering plans so that effects of such changes on fish and wildlife resources of the project area may be determined.

Very truly yours,

Harry L. Rietze

Harry L. Rietze
Regional Director
Bureau of Commercial Fisheries

SUBSTANTIATING REPORT

TABLE OF CONTENTS

PREFACE

1. This report of the U.S. Fish and Wildlife Service appraises fish and wildlife resources which would be affected by Vee project, Susitna River, Alaska. It substantiates conclusions and recommendations contained in the letter from the Regional Director of the Bureau of Commercial Fisheries to the District Manager, Bureau of Reclamation. This report is based on engineering data received from the Bureau of Reclamation by letter dated November 6, 1964. It has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

2. Previous reports issued by the U.S. Fish and Wildlife Service that pertain to Vee project are as follows:

1. 1952. A Preliminary Report on Fish and Wildlife Resources in Relation to the Susitna River Basin Plan, Alaska.
2. 1954. A Progress Report on the Fishery Resources of the Susitna River Basin, Alaska.
3. 1954. A Progress Report on the Wildlife Resources of the Susitna River Basin, Alaska.
4. 1959. 1958 Field Investigations, Denali and Vee Canyon Damsites and Reservoir Areas, Susitna River Basin, Alaska.
5. 1960. A Detailed Report on Fish and Wildlife Resources Affected by the Devil Canyon Project, Alaska.

INTRODUCTION

3. The Susitna River is a major drainage of southcentral Alaska, the most populous section of the state. To meet existing and predicted power needs in this area, the Bureau of Reclamation is investigating the development of the Susitna Basin's power potential. The Devil Canyon project, with

dams and reservoirs at the Devil Canyon and Denali sites, would be the first two units to be constructed. This project would have an installed capacity of 580,000 kilowatts. A report issued by the U.S. Fish and Wildlife Service in 1960 concluded that Devil Canyon project would have only minor effects on fish and wildlife resources. If power needs in southcentral and interior Alaska develop as predicted, Vee project would be considered as the third stage for development. The installed capacity of this project would be 338,000 kilowatts.

4. Vee project would be located in southcentral Alaska midway between the population centers of Anchorage and Fairbanks. The dam would be located at Susitna River mile 209 between the Devil Canyon and Denali Dams (see location map). A possible fourth stage in development of the Susitna Basin water power resource is the Watana project. It might be built after Vee project in the section of the basin lying between Vee and Devil Canyon.

DESCRIPTION OF THE AREA

5. The Susitna River drains about 19,300 square miles of land having only a small human population. The Susitna Basin is bordered on the south by Cook Inlet and the Talkeetna Mountains, on the east by the Talkeetna Mountains and the Copper River Plateau, and on the north and west by the Alaska Range. From its glacial origin in the Alaska Range, the river flows south for about 60 miles, then west through the Talkeetna Mountains for about 100 miles, and then south for 115 miles to Cook Inlet. The drainage can be separated into upper and lower basins at approximately river mile 100.

6. Topography in the upper basin ranges from gentle slopes and a high, poorly drained plateau in the east to rolling hills and mountainous terrain in the west. The Maclaren River, which is turbid because of its glacial

source, is the largest tributary. Other tributaries in the upper basin are either clear or possess only slight glacial turbidity.

7. The lower basin is a broad valley bordered on each side by mountains. Both large, glacially turbid streams and smaller, clear tributaries discharge into the Susitna River in the lower basin.

8. The Talkeetna Mountains, which border the lower Susitna Basin on the east, are primarily granitic. The Alaska Range, bordering the basin on the north and west, is composed of sedimentary rocks, some of which have been metamorphosed and intruded by granitic masses. Valleys of the upper basin are filled to considerable depth with glacial materials. The floor of the lower basin is filled largely by glacial stream deposits.

9. Stream flows in the Susitna Basin are high from May through September and low from October through April. Snow melt, rainfall, and glacial melt contribute to flows. Glacier-fed streams are turbid during summer but clear in winter.

10. The northwest section of the basin lies in Mount McKinley National Park. The 3,030 square mile park, established in 1917, preserves a wide variety of wild game animals in their natural tundra and mountain habitats. Mount McKinley Park is one of the most visited tourist attractions of the entire state.

11. The Alaska Railroad extends north and south through the lower Susitna Basin and affords the only means of overland transportation through it. A highway paralleling the railroad is now under construction. The Denali Highway passes through the headwater portion of the upper basin. The only additional routes of access are limited to a few roads and trails on the fringes of the drainage. Boats are used for travel on portions of

the main river and tributaries, and aircraft are used throughout the drainage wherever landings and takeoffs are feasible.

12. The human population is concentrated along the railbelt. Scattered settlements of trappers, miners, and persons providing services to hunters are present throughout the drainage.

13. Economic activities associated with the Susitna drainage include the harvest of Susitna River salmon in Cook Inlet, trapping, mining, and some businesses that furnish services to hunters and fishermen. Oil and timber are two resources of the basin that have potential for future development.

PLAN OF DEVELOPMENT

14. Engineering data for Vee project were received from the Bureau of Reclamation by letter dated November 6, 1964. The dam would be a concrete arch structure with a maximum structural height of 605 feet at crest elevation of 2,360 feet m.s.l. It would involve a main dam across the river and an earthfill saddle dam on the left abutment with a gated spillway provided on the right abutment. The reservoir would inundate about 17,000 acres (26.5 square miles) and contain 1,760,000 acre-feet of water at maximum pool elevation of 2,355 feet m.s.l. Maximum drawdown would be 215 feet and the average operating head would be 431 feet. The tailwater elevation would be 1,905 feet m.s.l. A powerplant with an installed capacity of 338,000 kilowatts would be constructed with prime power production expected to be 189,000 kilowatts. Maximum and minimum water releases would be 10,000 and 1,800 c.f.s. respectively, with an average of 6,580 c.f.s. Spilling might occur from June to September.

FISH RESOURCES

Without the Project

15. The Vee project area includes the area which would be inundated and the section of the Susitna River extending below the dam to the upstream end of the Devil Canyon Reservoir.

16. The project area contains two types of fish habitat: (1) glacial waters of the Susitna River and the Maclaren River, the largest tributary, and (2) clear or slightly turbid waters of the other tributaries (table 1).

Table 1. Fish Habitat Affected by Vee Project Reservoir.

Drainage	River Miles Above Damsite	Total Stream Length (Miles)	Stream Length Flooded (Miles)	Character of Water
Susitna River		275	41.0	Heavy glacial turbidity
Goose Creek	7	20	2.5	Clear
Oshetna River	9	51	4.5	Light glacial turbidity
Tyone River	21	52[1/]	15.5	Clear
Tyone Creek	[2/]	82	3.0	Clear
Maclaren River	34	50	1.0	Heavy glacial turbidity
Coal Creek	37	28	1.5	Clear
Clearwater Creek	39	34	0.5	Clear

1/ Includes length of lakes.
2/ Tributary to Tyone River.

17. About 42 miles of glacial river habitat lie within the proposed reservoir boundaries. These flows are turbid in summer but clear during winter, when glacial melt ceases. The dam upstream from Vee Canyon at Denali, however, would probably cause somewhat turbid flow at Vee Canyon

to continue year-around, because glacial silt would probably remain suspended in Denali reservoir throughout the winter. Winter turbidity is expected to be considerably less than during summer, however, for high summer flows sustain substantial amounts of coarser materials. Grayling, burbot, sculpins, and suckers have been captured in the mainstem Susitna in the project area. Abundance and extent of movement of these fish in the Susitna and Maclaren Rivers are unknown. Some fish in tributaries may respond to diminished winter flows by moving downstream to the mainstem Susitna River. Turbidity precludes sport fishing in the summer and inaccessibility and availability of better fishing elsewhere preclude winter angling in these glacial rivers.

18. Tributaries other than the Maclaren are clear except for the Oshetna River which has a slight glacial turbidity produced by small glaciers at its headwaters. The proposed Vee Reservoir would inundate a total of 69.5 miles of tributary streams. Grayling, burbot, sculpins, and suckers have been captured in these tributaries. Whitefish and lake trout occur in lakes of the upper Tyone system and lake trout occur in Black Lake in the Oshetna drainage. Tyone Lake, Susitna Lake, and Lake Louise form a series along the upper Tyone River in the section extending from 14 to 36 miles upstream from the proposed reservoir. These lakes are accessible by automobile from the Glenn Highway and they sustain fishing pressure that is heavy by Alaskan standards, primarily for lake trout. Black Lake in the Oshetna drainage sustains light pressure for lake trout by fishermen who fly in with float-equipped aircraft. Few or no fishermen travel by boat downstream from Tyone Lake to fish in the section of the Tyone River that lies within the proposed reservoir area because of (1) difficulties of boat travel and (2) the availability of good fishing in the lakes. For these same reasons also, very few fishermen travel

on the Susitna to reach inaccessible tributary streams. A few hunters traveling by boat may fish incidentally to hunting.

19. The Susitna River between the Vee damsite and the upper end of the Devil Canyon Reservoir receives flows from five major clear-water tributaries: Jay, Kosina, Watana, Deadman, and Tsusena Creeks. Stream survey data for this section are limited; however, grayling, whitefish, burbot, suckers, and sculpins are probably present. Fishermen do not use this section because of difficult access and availability of good fishing elsewhere. Vee Canyon at the upper end of this stream section and Devil Canyon at the lower end preclude boat travel. Pilots are reluctant to land aircraft on the river here, also.

20. Changes in access and in the human population must be considered in predicting fishing and hunting pressures in the project area. Means of access to the upper project area are increasing as new trails develop through the use of swamp buggies and tracked vehicles for hunting. This trend can be expected to continue and extend to the lower project area if present human population predictions are correct. Population projections vary, but all show increases. Expanded human populations will result in greater use of aircraft and boats within the project area. Expanded human populations, coupled with improved means of access, will produce increases in fishing pressure, much of which is incidental to hunting. The presence of better fishing elsewhere will continue to limit the number of people traveling to the project area primarily to fish. Further, the glacial waters of the mainstem Susitna and Maclaren Rivers will preclude summer fishing and the extreme cold and discontinuous ice cover on these rivers will deter any significant winter fishery.

21. Investigations conducted intermittently by the U.S. Fish and Wildlife Service during the period 1952 to 1958 revealed that salmon migrate upstream only to the lower end of Devil Canyon at river mile 134. They were not found beyond this point. It was assumed that the long stretch of swift, turbulent water in Devil Canyon constitutes a hydraulic block to fish migration. Therefore, fish passage facilities were not recommended in the Service Report on the Devil Canyon project. Since facilities were not recommended at Devil Canyon, they clearly are not required at Vee Dam. The earlier reports noted, however, the possibility that the Louise, Susitna, and Tyone Lake series, as well as certain other lakes in the basin, might possess a potential for producing sockeye salmon. Also, the many clear-water streams tributary to the Susitna River above the Devil Canyon and Vee damsites might sustain other salmonid species. This Service plans additional studies to determine the extent of potential spawning areas. Should studies indicate a reasonable probability that the area can be developed for production of anadromous fish, and should this be economically justified, then some type of fish passage facility might later be recommended for both Devil Canyon and Vee Dams. If passage over these dams is infeasible, then the prevailing lack of salmon in the upper basin will continue.

With the Project

22. Construction and operation of Vee project would inundate 42 miles of glacial river and 27.5 miles of clear or slightly turbid stream habitat. Fish known to occur in the project area include grayling, burbot, suckers, and sculpins. Whitefish possibly also occur here, and lake trout are known to inhabit waters which drain into the project area.

23. The project reservoir would be deep, a condition which would favor development of a lake trout population. Burbot and whitefish might also

become established in the reservoir and if so, would offer some sportfishing value. Conditions would not be optimum for these species, however, since the reservoir would be steep-walled and have little food-producing shoal area. Drawdown would also restrict food production. Lakes of somewhat the same size in other glacial drainages (Tazlina, 21 miles long, 3 miles wide; and Klutina, 16 miles long, 2 miles wide) remain turbid throughout the year. It is assumed that Vee Reservoir would also remain turbid. Turbidity would suppress development of a grayling population.

24. Present distribution of fishing effort suggests that even if fish populations were to develop in the turbid reservoir, fishing pressures would be fairly light because most anglers prefer streams and clear lakes. If a fishery developed, it would probably be limited to (1) casting and trolling for lake trout in summer and (2) fishing through the ice for lake trout and burbot in winter.

25. Construction and operation of Vee project would affect 46 miles of the Susitna River from Vee Dam to the upper end of Devil Canyon Reservoir. Any stoppage of flows during the construction and filling period would eliminate nearly all fish use of this section because incremental flows constitute only a small percentage of the main river flow. Since the project would not be placed in operation until after construction of Denali Dam, flows would probably be little changed, although the flow regime would reflect regulation for power production at Vee. Vee tailrace flows are expected to remain somewhat turbid throughout the year.

26. During project operation, fish movement in the river below the dam would not be impeded. However, sudden changes in spill volume could result in scouring of the channel with detrimental effects on production of fish food organisms. Access roads constructed for the project would encourage

people to visit the area and some summer fishing would develop in tributaries downstream from the dam. However, year-round turbidity would limit fishing in the main river.

27. Anadromous fish are apparently unable to pass through Devil Canyon and thus do not occur in the Vee project area. Controlled water releases at Devil Canyon could compensate for any possible adverse effects to anadromous or resident fish downstream.

WILDLIFE RESOURCES

Without the Project

28. The proposed Vee project reservoir area contains approximately 26.5 square miles. The area includes four major wildlife habitat types: (1) bars and islands of the main river, (2) flat bottom land along the main river, (3) relatively steep sidehills on each side of the river, and (4) bottom land along tributary streams.

29. Big game species of the project area are moose, caribou, black bear, and grizzly bear.

30. Quantitative data on moose numbers are limited. However, the habitat of the proposed impoundment area, though limited in extent, is of good quality. An average population of about 50 moose winters there. Hunting pressure for moose is light and is exerted by hunters using boats on the Tyone and Susitna Rivers and by a few hunters using aircraft. Hunting pressures and success for moose are increasing at present, just as they are throughout the state as a result of extended season lengths. Significant habitat changes in the project area will probably not occur during the period of project analysis. Hunting of moose will increase as overland access improves and as the human population increases.

31. Segments of the Nelchina caribou herd inhabit areas surrounding the impoundment site; their abundance on these areas fluctuates seasonally. Caribou use of the impoundment area is limited mainly to transient animals traveling from one to another of these surrounding areas. Lack of suitable lichen growth probably deters caribou use of the impoundment area itself. Although seasons are long and the bag limit of three animals of either sex is liberal, harvests of the Nelchina caribou herd are considered inadequate for proper management. This results in part from the limited access to the area which causes hunters to confine their activities largely to locations near the road system. Hunting in the impoundment area is light, being limited to hunters using boats on Tyone River and Creek. During the period of project analysis caribous will continue to use the impoundment area as a route of travel between surrounding tracts of desirable habitat. The present liberal seasons will probably be continued until harvests reach levels adequate for proper management of the herd. As improved means of access develop and as the human population increases, the impoundment area and the area surrounding it will sustain more hunting pressure for caribous.

32. There is little hunting specifically for black bears in the Nelchina area, although a few are taken incidentally by hunters seeking other game. Some hunting is done specifically for grizzly bears in the Nelchina area, mostly by hunters using aircraft. Because of the small size of the impoundment area, the total number of bears involved is very small. The area, however, is probably visually searched each year by several hunters using aircraft and any grizzly bear seen is subject to being hunted. Grizzlies are also taken in the Nelchina area incidentally to moose and caribou hunting. Probably more black bears will be killed as the number of people visiting the

area increases. Grizzly bear populations will probably decline as civilization encroaches the area.

33. Small game species in the impoundment area are willow ptarmigan, spruce grouse, and snowshoe hare. Populations of all three fluctuate periodically. No change in species or habitat is expected without the project. Hunting pressure is now negligible and is expected to increase only slightly in the future because big game hunting will probably continue to receive primary emphasis.

34. Fur animal species that have been identified in or adjacent to the project area are beaver, muskrat, otter, lynx, fox, wolf, and wolverine. Other species which probably also occur here are mink and weasel. The area is not considered good quality fur-animal habitat. There are few ponds which would favor aquatic species and the dominant cover of spruce does not favor terrestrial species. There is no trapping because other, more accessible areas possess better populations of fur animals. The area would possibly receive light trapping pressure if access were to improve and if fur values increased during the period of project analysis.

35. The Vee impoundment area has low value as waterfowl habitat owing mainly to the lack of pond and marsh areas. No changes in habitat are expected during the period of analysis. Waterfowl hunting is not now pursued here and is not expected in the project area during the period of project analysis.

With the Project

36. Wildlife habitat sustaining variable numbers of animals would be inundated by Vee Reservoir.

37. Good winter moose habitat would be destroyed. This would result ultimately in the loss of about 50 moose which now winter in this habitat.

This loss is not considered serious owing to the small size of the flooded area relative to the amount of adjacent range. The hunter population is expected to increase, and would use all means of access constructed as project facilities. Improved access would include both overland trails to the damsite and the reservoir itself, which would be used for boat and float plane operations. More hunting pressure on moose in areas surrounding the reservoir would thus develop.

38. Caribou use of the reservoir area is largely limited to transient animals moving between blocks of habitat around the impoundment. The project reservoir would probably not impede this movement. Caribous are strong swimmers and would encounter no difficulty swimming the narrow reservoir. In winter they could cross the reservoir on the ice. Some mortality might occur because of attempted crossings during periods when the ice is thin. An expanding human population utilizing the improved access afforded by the project would hunt the herd more heavily. Increased human activity associated with the project might cause caribous in adjacent areas to move to less disturbed portions of the Nelchina range.

39. Grizzly and black bear habitat would be inundated. This loss is not considered significant owing to the small size of the reservoir compared to the amount of suitable habitat available nearby. Increased numbers of hunters using access created by the project would probably harvest a few more bears than are now taken from areas surrounding the impoundment.

40. Habitat for limited numbers of willow ptarmigans, spruce grouse, and snowshoe hares would be destroyed. Areas surrounding the reservoir would support displaced animals for a period of time but eventually populations would decline to former levels and the number of animals which had been supported in the reservoir area would be lost.

41. Habitat for beavers, muskrats, minks, otters, lynx, foxes, wolves, wolverines, and weasels would be lost by inundation. Some marginal habitat would be created for aquatic species by formation of shoal areas at the upper end of the reservoir and at the mouths of tributaries. Productivity of this habitat would be severely limited by reservoir drawdown. Habitat for aquatic fur animals around the remainder of the reservoir would be limited by steep banks and reservoir drawdown. The project would not create new habitat for terrestrial species. The area surrounding the impoundment might receive light trapping effort, especially during periods of higher fur prices.

42. Only low value waterfowl habitat would be flooded by a dam at Vee Canyon. A limited amount of habitat would be created by the formation of shallow water areas at the upper end of the impoundment and in the upper ends of bays formed in tributary valleys. However, reservoir drawdown would limit food production and successful nesting in these shoal areas. Nesting around the rest of the reservoir would be limited by steep exposed banks and reservoir drawdown.

43. Waterfowl would probably use the reservoir for resting during their fall migration and might also use it during their spring migration. Spring use would depend on whether the reservoir had open water areas before or at the same time as nearby lakes and potholes. Although use for resting by migrating birds would be a project benefit it would not be significant since numerous lakes and potholes adjacent to the project area presently furnish adequate resting areas.

44. Limited waterfowl hunting might occur with project development. However, the area would never be prime habitat and waterfowl hunting would be incidental to other activities in the area.

DISCUSSION

45. The project would replace 42 miles of glacial river habitat and 27.5 miles of clear or nearly clear tributary habitat, with a deep reservoir 41 miles in length and 0.65 miles average width. The reservoir would remain turbid year around. Sport fish populations might become established in the reservoir. Habitat would not be optimum, however, since glacial turbidity, fluctuating water levels, and lack of shoal areas would limit fish food production. Turbidity, fluctuating water levels, and availability of better fishing in adjacent areas would preclude intensive angler use of the reservoir.

46. Anticipated effects of Vee project on the fishery resources are not regarded as serious. Mitigation measures are not recommended, and feasible means of enhancement cannot now be foreseen. The most serious effects foreseeable as a result of Vee project would be (1) destruction of fish habitat by severe reduction or stoppage of flows downstream from the dam, and (2) scouring fish food organisms from the river by excessive releases. These effects could extend downstream 46 miles to the upper end of Devil Canyon Reservoir. To assure maintenance of fish habitat in this section of the river, a minimum flow of 500 c.f.s. should be maintained in the river downstream from the dam during project construction and operation. Also, changes in water releases should be made gradually, so as to minimize flushing and scouring of the channel.

47. Passage facilities at Vee Dam might be recommended as an enhancement measure at a later date if future studies should demonstrate the feasibility of developing salmon runs in the Louise, Susitna, and Tyone Lake series, as well as certain other lakes in the basin. Implementation of such a plan would require fish passage facilities at both Vee Dam and Devil Canyon Dam.

48. Vee project would inundate approximately 26.5 square miles of habitat used to varying degrees by wildlife. The small area involved and the present and anticipated low hunting pressure sustained by the affected wildlife populations minimize the importance of such losses. Perhaps the most serious effect of the project upon wildlife would be destruction of a small area of moose winter range. Nonetheless, feasible means of mitigating these losses of wildlife habitat are not known and no mitigation measures are recommended.

STATE OF ALASKA

WILLIAM A. EGAN, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER / SUBPORT BUILDING—JUNEAU

January 11, 1965

Harry L. Rietze, Regional Director
Bureau of Commercial Fisheries
U. S. Fish and Wildlife Service
P. O. Box 2481
Juneau, Alaska 99801

Dear Mr. Rietze:

The Alaska Department of Fish and Game has reviewed the Bureau's draft copy of a detailed report on the fish and game resources that would be affected by a hydroelectric project at Vee Canyon on the Susitna River.

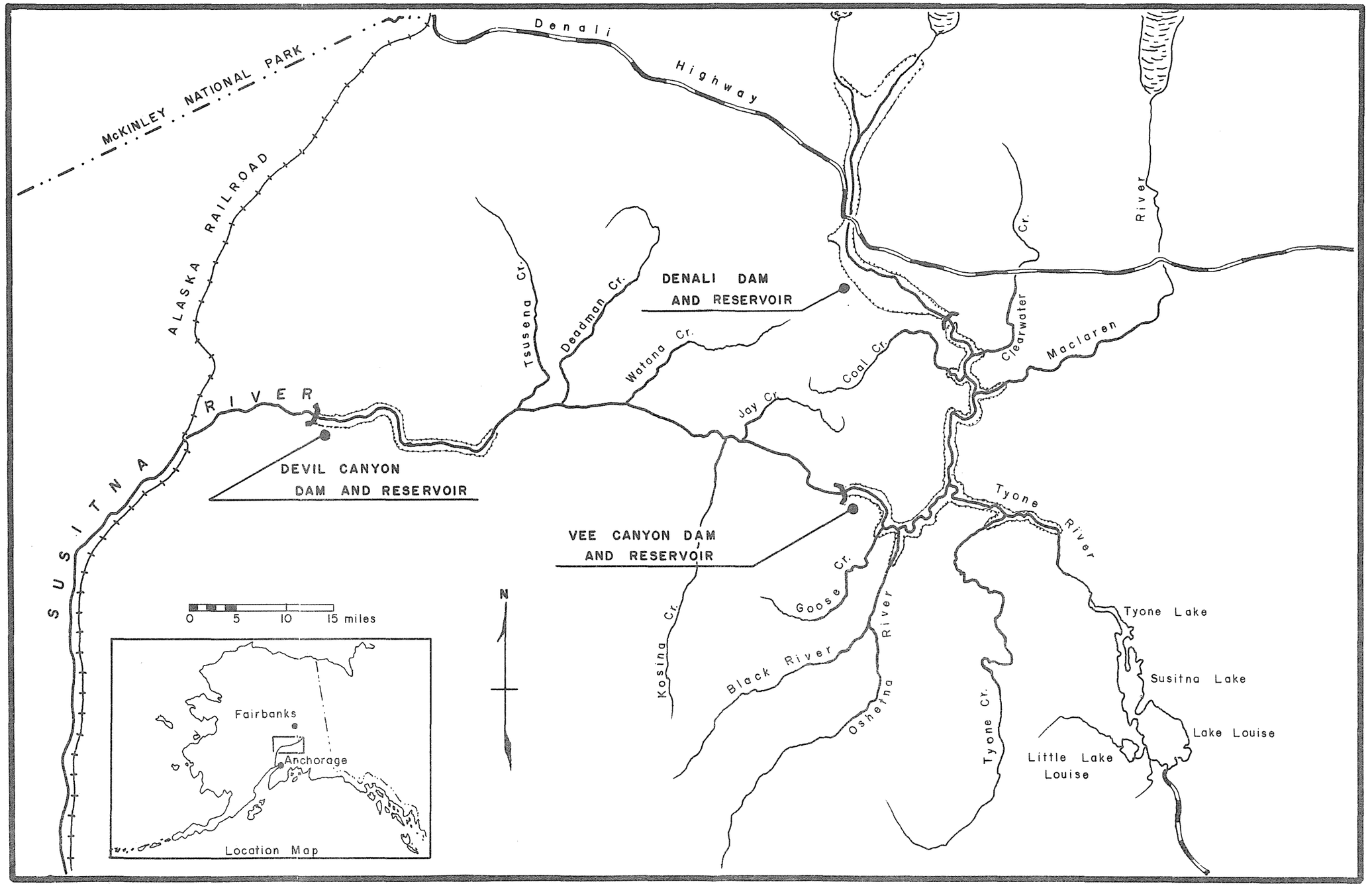
We agree with the findings as to the effect of the project on fish and game and concur in the recommendations for the protection and enhancement of these resources as outlined in the report.

Sincerely,

ALASKA DEPARTMENT OF FISH AND GAME

E. S. Marvich, Deputy Commissioner

cc: Frank Stefanich, ADF&G, Anchorage
Jim Rearden, ADF&G, Homer



Location map, Vee Canyon project.