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.

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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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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.