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UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
ARNIE J. SUOMELA, COMMISSIONER

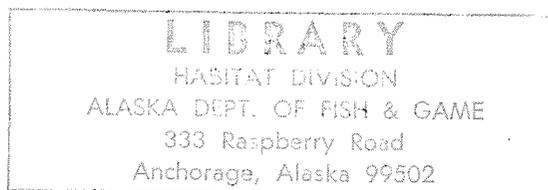


DEVIL CANYON PROJECT  
SUSITNA RIVER BASIN  
ALASKA

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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



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

ALASKA REGION  
(REGION 5)

ADDRESS ONLY  
THE REGIONAL DIRECTOR

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 damsites 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. Bakston*  
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URBAN C. NELSON  
Regional Director  
Bureau of Sport Fisheries  
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*John T. Gharrett*  
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SUBSTANTIATING REPORT

## TABLE OF CONTENTS

	<u>Page</u>
PREFACE .....	1
INTRODUCTION .....	3
Purpose of the Project .....	3
Location of the Project .....	3
DESCRIPTION OF THE AREA .....	4
Physical Features .....	4
Commercial Features .....	7
PLAN OF DEVELOPMENT .....	9
Engineering Features - Devil Canyon .....	9
Engineering Features - Denali .....	9
Operation - Devil Canyon .....	9
Operation - Denali .....	12
FISHERY .....	13
General .....	13
Without the Project - Devil Canyon .....	13
Without the Project - Denali .....	15
With the Project - Devil Canyon .....	17
With the Project - Denali .....	17
WILDLIFE .....	19
Without the Project - Devil Canyon .....	19
Without the Project - Denali .....	20
With the Project - Devil Canyon .....	22
With the Project - Denali .....	22
DISCUSSION .....	24

## LIST OF TABLES AND FIGURES

		<u>Page</u>
Table I.	Engineering and Operating Data	12
Figure 1.	Susitna River Basin Location (Map)	5
Figure 2.	Project Location (Map)	10
Figure 3.	Devil Canyon Damsite (Photo)	11
Figure 4.	Denali Impoundment Area (Photo)	11
Figure 5.	Schematic Map	14
Figure 6.	Hydraulic Barrier to Salmon (Photo)	16

## 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  $61^{\circ}$  -  $64^{\circ}$  north and longitudes  $146^{\circ}$  -  $153^{\circ}$  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.

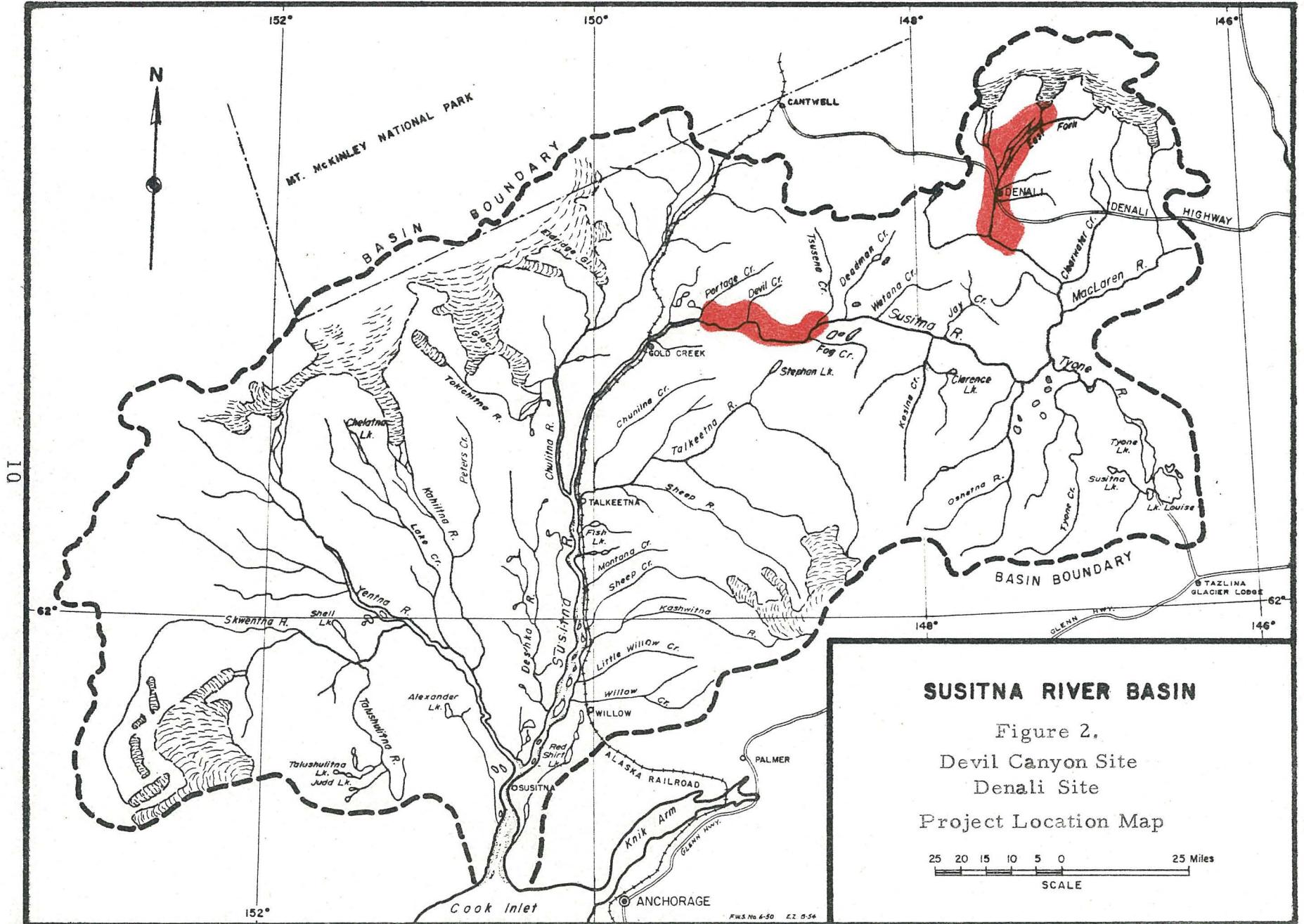
30. The reservoir will be about 29 miles long and between 0.25 and 0.75 mile wide. At a normal full pool water surface elevation of 1,450 feet, it will have a surface area of 7,550 acres and an initial total capacity of 1,100,000 acre-feet. During a 100-year period, the average minimum operating pool 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.

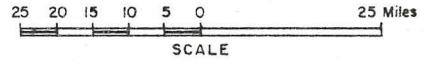
### Operation - Devil Canyon

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





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

	<u>Devil Canyon</u>	<u>Denali</u>
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 <sup>1/</sup>	6,800 (when re- leases are made)

<sup>1/</sup>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).

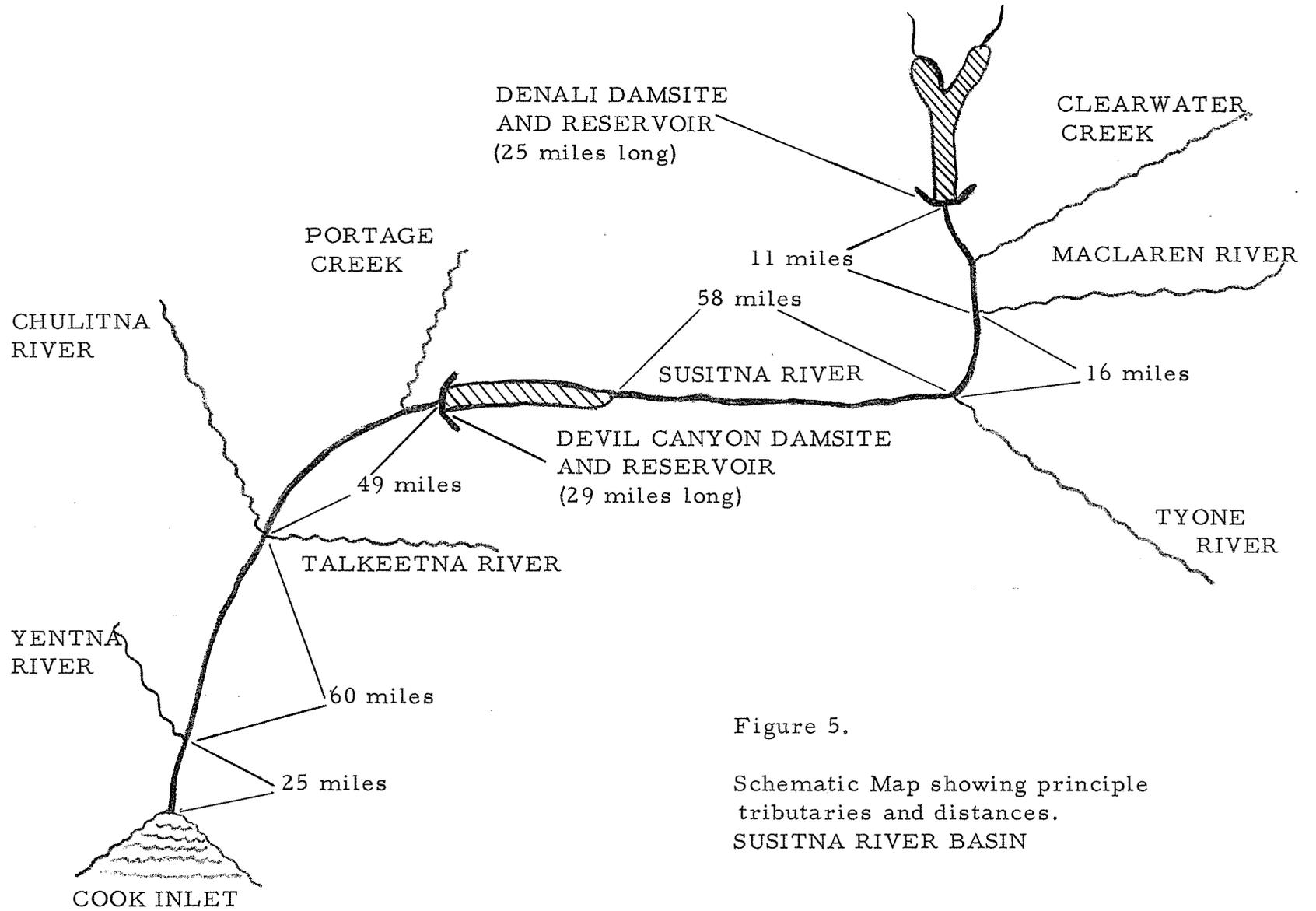


Figure 5.

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.

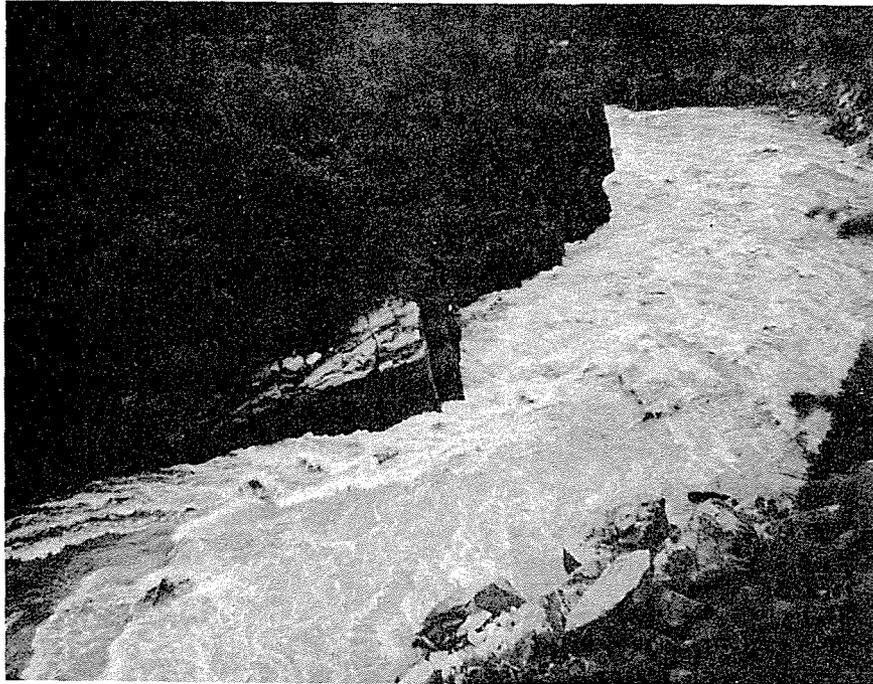


Photo by Dick Hensel

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 fur 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.

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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