

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH and WILDLIFE SERVICE

JUNEAU, ALASKA

PROGRESS REPORT ✓

1956 FIELD INVESTIGATIONS

DEVIL CANYON DAMSITE, SUSITNA RIVER BASIN .

TERRITORY of ALASKA

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July, 1957  
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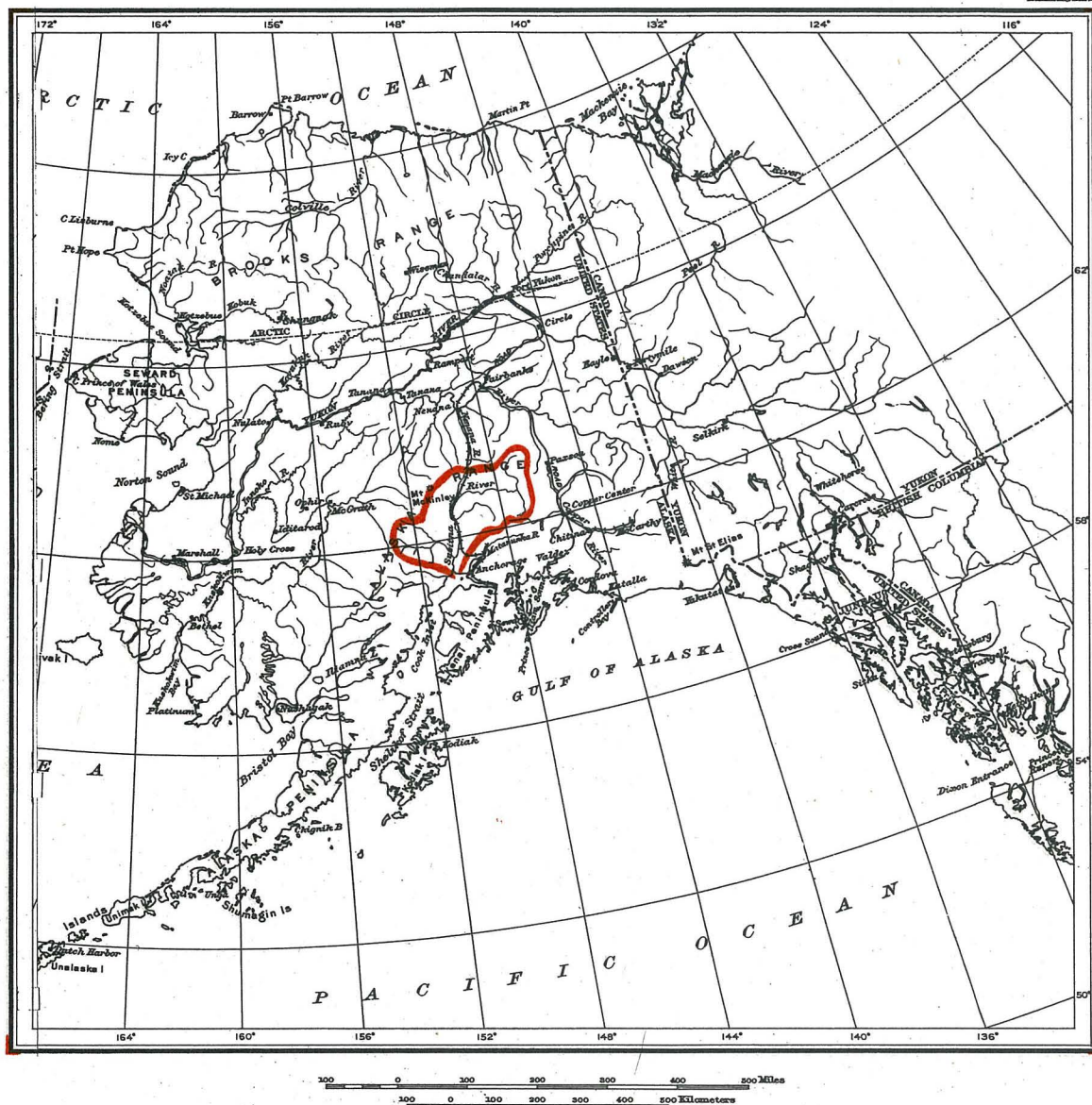
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# SUSITNA RIVER BASIN ALASKA

## SUSITNA REPORT

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

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

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

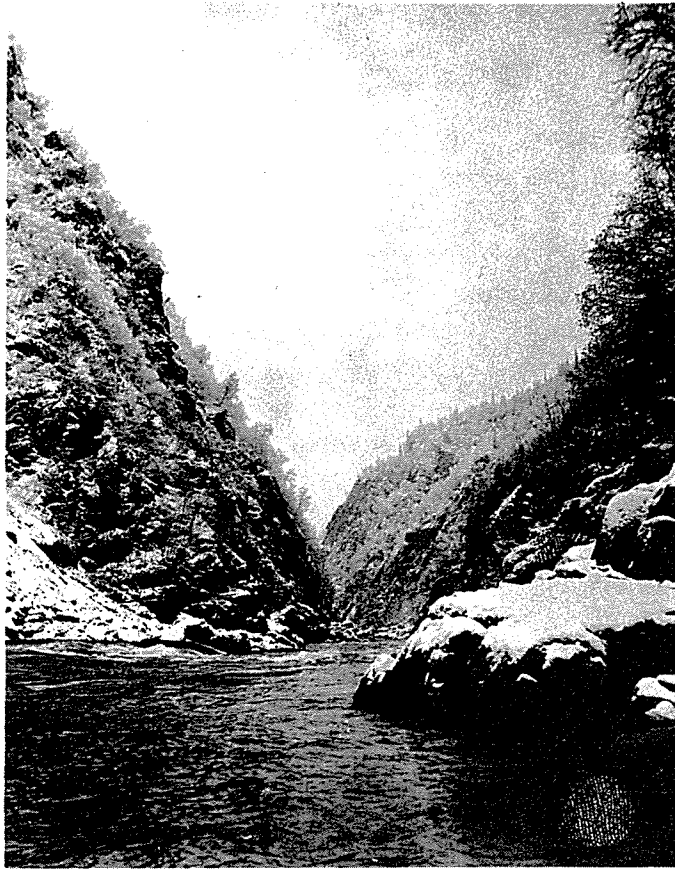


Figure 1. View of proposed Devil Canyon Damsite, showing rapids and river gorge. \*

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

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

\*Photo by Bureau of Reclamation.

Table 1. Dimensions of the proposed Devil Canyon Reservoir

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

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

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

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

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

1. A Preliminary Statement of Fish and Wildlife Resources of the Susitna Basin in Relation to Water Development Projects, 1952.
2. A Progress Report on the Wildlife Resources of the Susitna Basin, 1954.
3. A Progress Report on the Fishery Resources of the Susitna River Basin, 1954.

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

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

1. To determine the extent anadromous species utilize the Susitna River above the proposed Devil Canyon Damsite for spawning and rearing purposes.
2. To determine the extent anadromous species utilize the watershed between the dams site and the town of Curry.
3. To obtain general information relative to magnitude and distribution of resident fish populations that would be affected by project development.
4. To determine whether access blocks to anadromous species exist on the main stem of the Susitna River above the proposed site.

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



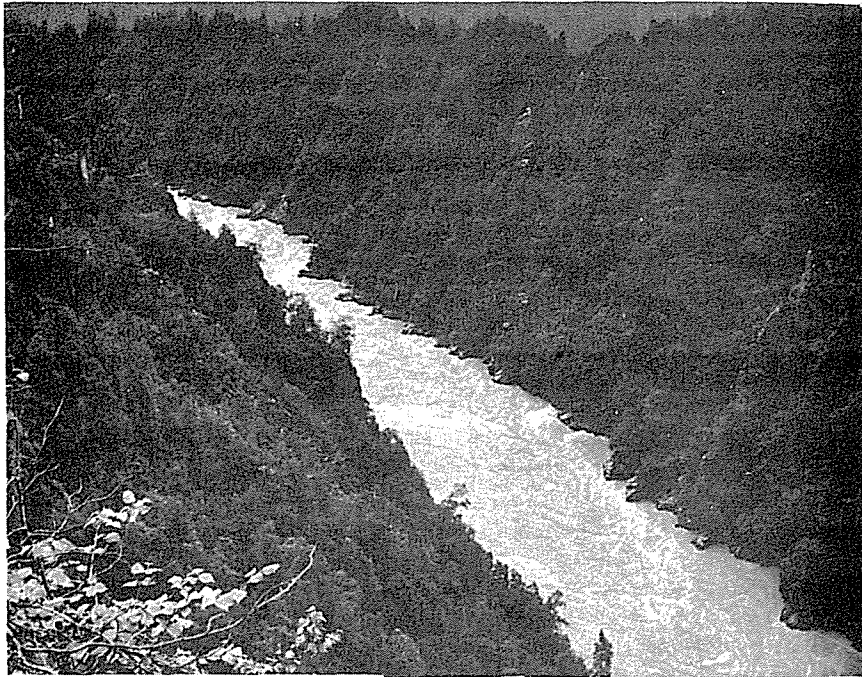


Figure 2. West end of Devil Canyon, showing steepness of canyon walls.

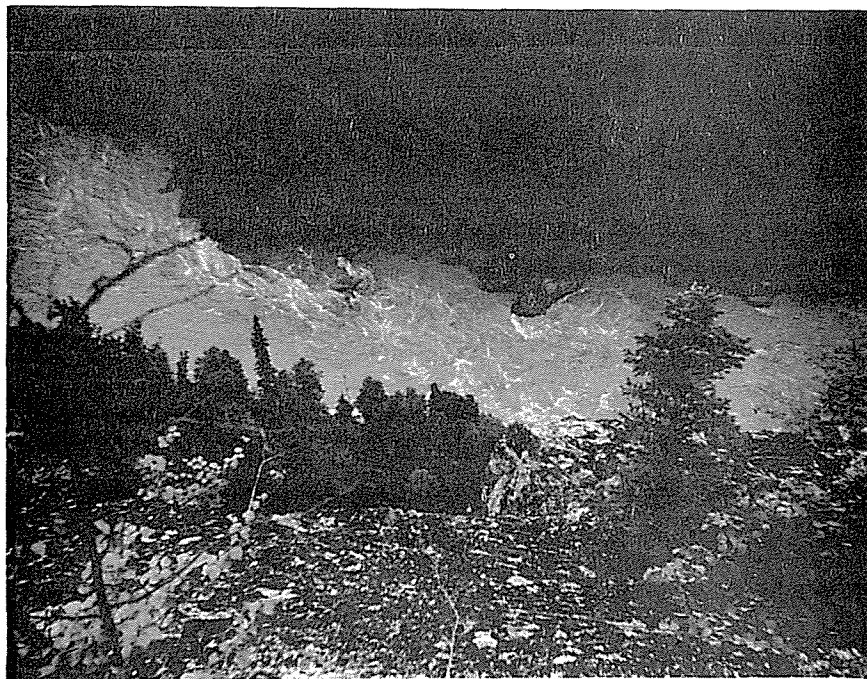


Figure 3. Susitna River approximately 3 miles upstream from the Devil Canyon Damsite.



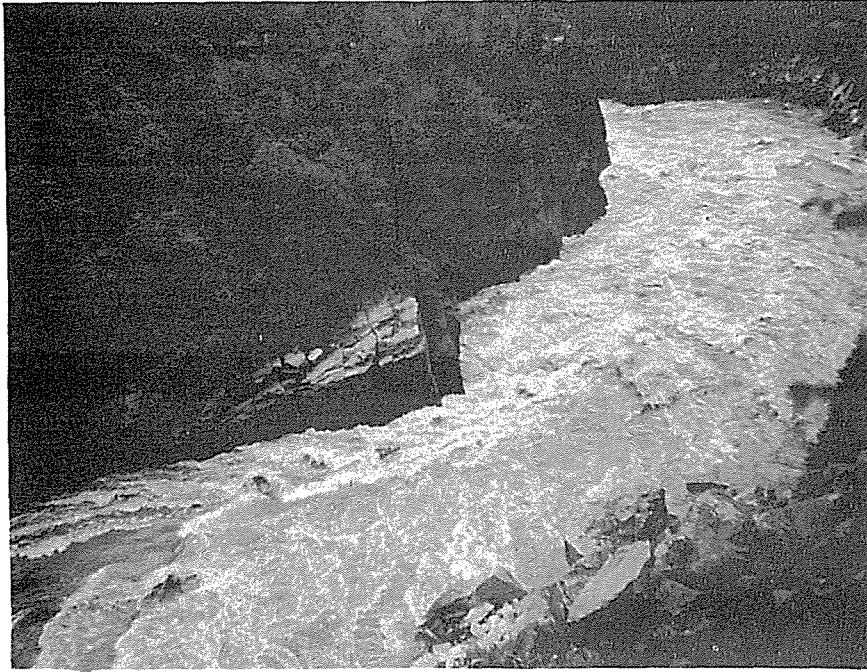


Figure 4. Possible hydraulic barrier to ascending salmon several miles above Devil Canyon Damsite. Note slide lower right.

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

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

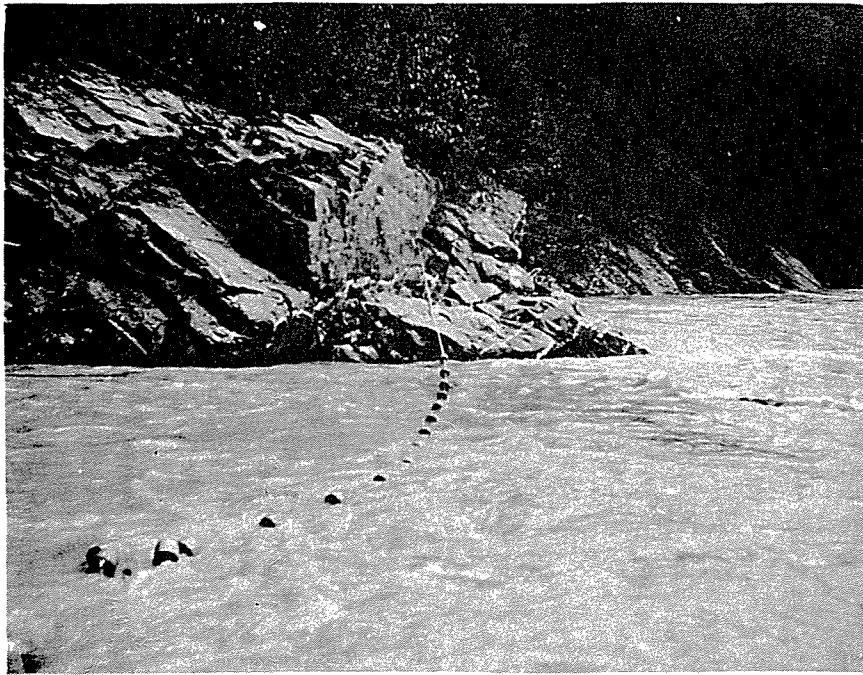


Figure 5. View of gillnet set in eddy in Devil Canyon below damsite.

#### GILLNETTING RESULTS

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

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

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

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

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

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

King Salmon

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

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

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

### Chum Salmon

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

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

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

### Red Salmon

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

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

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

### Silver Salmon

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

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

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

## STREAM SURVEYS

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

### 15. Gold Creek

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

### 16. Indian River

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

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

17. Jack Long Creek

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

18. Portage Creek

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

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

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

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

21. Devil Canyon

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

22. Jay Creek

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



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

#### SUMMARY

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

1. Appreciable numbers of all five species of salmon were captured by gillnet in the Susitna below the confluence of Portage Creek.
2. In a stream section extending from Portage Creek almost to the Devil Canyon Damsite, no pink salmon were taken, and only small numbers of king, red, and silver salmon were netted. However, an appreciable number of chum salmon were caught in this section.
3. At Jay Creek, 55 miles upstream from Devil Canyon, three gillnets set for 494 hours captured no salmon.
4. Aerial surveys of all tributary streams from Indian River to Jay Creek, inclusive, failed to reveal the presence of salmon.

### DISCUSSION

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

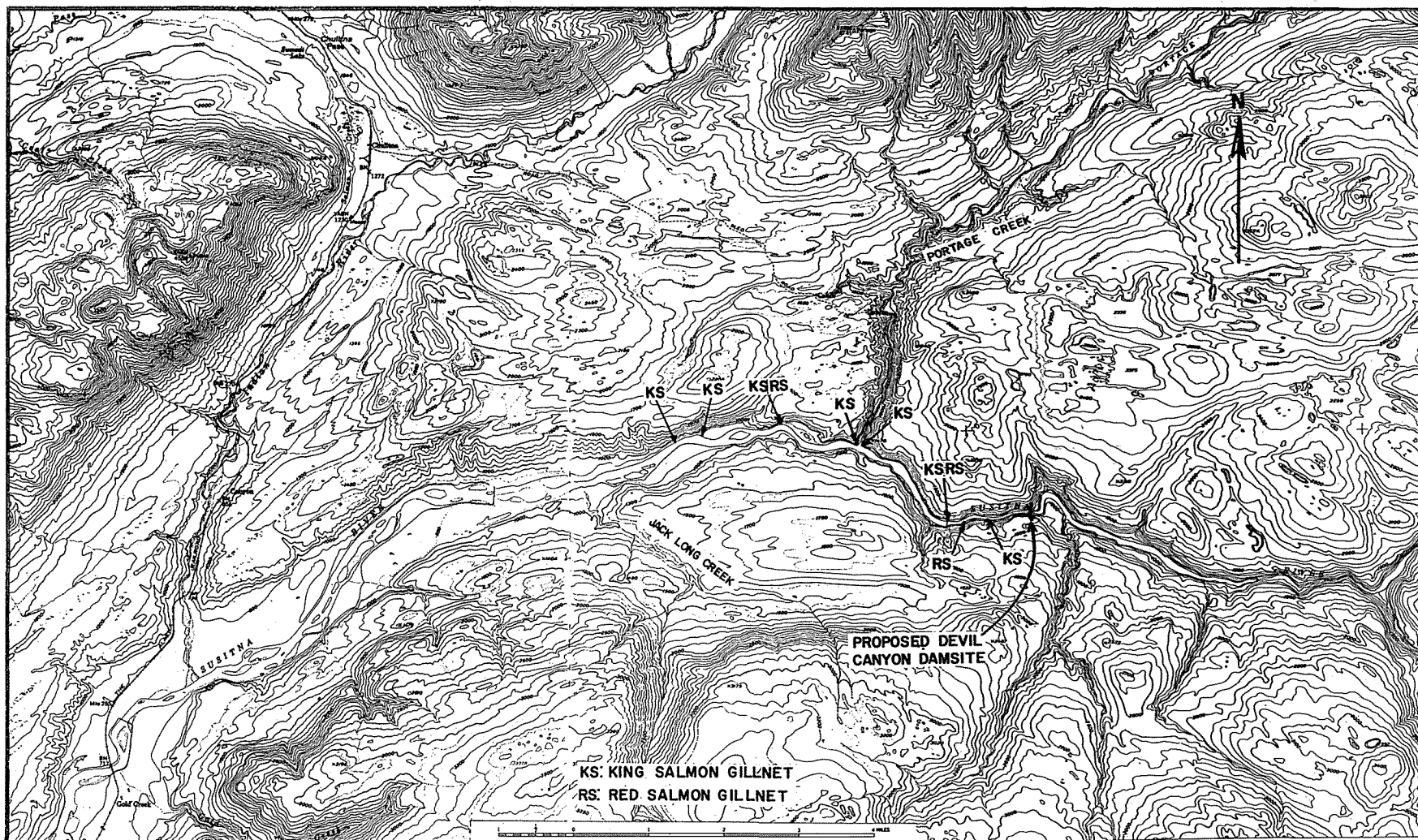


FIGURE 6. THE SECTION OF THE SUSITNA RIVER IN WHICH FIELD INVESTIGATIONS WERE CONDUCTED DURING 1956.