

Informational Leaflet 72

FRAZER LAKE SYSTEM SPAWNING GROUND SURVEYS, 1964

By:

William R. Meehan
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

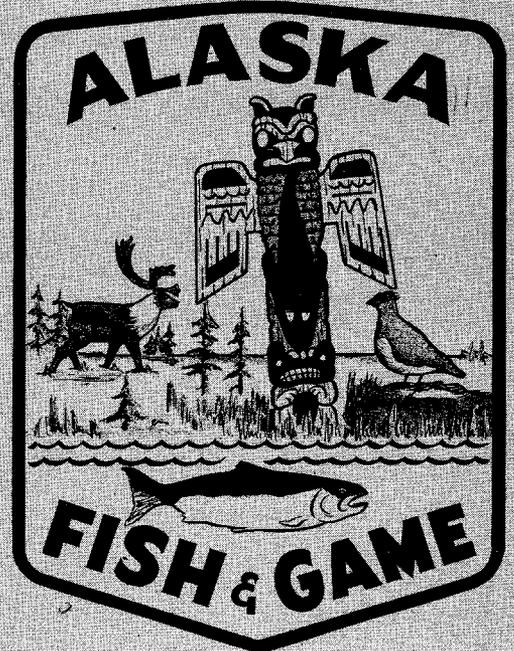
Martin F. Eaton
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

James A. Gohr
Division of Commercial Fisheries
Kitoi Bay Research Station
Kodiak, Alaska

December 31, 1965

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR

DEPARTMENT OF
FISH AND GAME
WALTER KIRKNESS - COMMISSIONER
SUBPORT BUILDING, JUNEAU



FRAZER LAKE SYSTEM SPAWNING GROUND SURVEYS, 1964

By

William R. Meehan, Fishery Biologist
Alaska Department of Fish and Game
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

Martin F. Eaton, Fishery Technician
Alaska Department of Fish and Game
Division of Commercial Fisheries
Research Section
Kodiak, Alaska

James A. Gohr, Fishery Technician
Alaska Department of Fish and Game
Division of Commercial Fisheries
Kitoi Bay Research Station
via Kodiak, Alaska

INTRODUCTION

For the past several years, the Alaska Department of Fish and Game has been planting the Frazer Lake system on the south end of Kodiak Island with sockeye salmon, in an effort to establish a run into this system. These plants have been made with eyed eggs, fry, and more recently by flying adult spawners into the system from nearby Red Lake. The recent construction of fish passage facilities on Dog Salmon River, the outlet of Frazer Lake, will facilitate entry of returning spawners into the system (Figure 1).

In anticipation of an intensive research program on the Frazer Lake system, the Division of Biological Research conducted a spawning ground survey in 1964 to determine the present utilization by spawners in the system and to determine some idea of the quality and quantity of potential spawning areas available. The results of this survey are reported here.

Adult Sockeye Salmon in System

During June, 1964, a total of 1,839 adult sockeye salmon were transported by aircraft from nearby Red Lake. Petersen disc tags were attached to 70 of these fish; three of these tagged fish were lost in Red Lake, so that actually 67 fish, or 3.6 percent of the fish moved, were tagged.



Figure 1. Map of Frazer Lake and its tributaries.

Shore Line	
	--- Rocky
	--- Gravel
	--- Sand

Salmon Spawning Grounds

An estimated 8,241 sockeye salmon adults entered the system through the fish passage facilities on Dog Salmon River; this total was based on 4 one-hour sampling periods each day and this sample multiplied by a factor of 6.045 (procedure determined by Frank Ossiander, Department Biometrician). The estimated total of natural returns and introduced fish was 10,080 sockeye.

A minimum of 13 tagged fish were observed in the spawning streams. Assuming a constant ratio of tagged to untagged fish from the Red Lake transplant, this would indicate that approximately 357 Red Lake spawners (18.4 percent of fish moved) were accounted for. A minimum of 2,949 sockeye were observed during the spawning ground surveys. Assuming that 357 of these were Red Lake sockeye, then 31.5 percent (2,592 fish) of the returning fish utilizing the fish passage facilities were accounted for.

The lower percentage of introduced Red Lake fish observed could be due to some drop-out from the system by these fish. At least two Red Lake tagged reds were reported below the Dog Salmon falls or in another system later in the year. As a result of these known instances of "drop-out" it may be more realistic to say that approximately 30 percent of the spawners in the Frazer Lake system were actually observed on the spawning grounds. This, of course, is only a rough estimate since we do not know what percentage of the sockeye in the system were beach spawners and were not in a location to be observed during the stream surveys or what percentage of the Red Lake fish left the system.

Stream Surveys

Each stream in the Frazer Lake system was surveyed to determine numbers of spawning sockeye, utilization of spawning areas, and quality and quantity of potential spawning areas, e.g., water temperature, gradient, blocks, gravel composition, etc.

For the purpose of this report, bottom types were classified as follows:

<u>Size of material</u>	<u>Designation</u>
less than 0.1 inch	sand or mud
0.1 inch to 1 inch	fine gravel
1 inch to 2 inches	medium gravel
2 inches to 3 inches	coarse gravel
3 inches to 6 inches	small rock
6 inches to 9 inches	medium rock
9 inches to 12 inches	large rock
more than 12 inches	boulders or bedrock

Dog Salmon River

This river, the outlet stream of Frazer Lake, was surveyed for a distance of 5 miles below the falls and fish passage facilities which are located 3/4 mile downstream from the lake outlet. In addition, the 3/4 mile stretch between the lake and the falls was surveyed. At a point approximately 2-1/2 miles downstream from the falls, a major tributary enters Dog Salmon River. This confluence appeared to be a separation point between chum and sockeye salmon. No sockeye were observed downstream from the confluence, and only a few chums were seen upstream.

Large numbers of sockeye were observed in the first large pool and riffle below the falls and fish ladder.

Sockeye utilizing the fish passage facilities appear to continue immediately to the lake, since they were seldom seen in the river above the falls.

Table 1. Water temperatures of Dog Salmon River.

Distance from fish pass (miles)	Water temperature (°F) July 20
0.75 upstream (Lake outlet)	55.0
0.25 upstream	54.5
Fish pass	54.0
0.25 downstream	54.0
1.50 downstream	54.0
4.00 downstream	52.0

Stream Number 1.

This stream was walked for 2-1/2 miles from its mouth; about 2 miles of this distance appears to contain excellent spawning areas (Figure 2). A 5-1/2 foot falls is present 1-1/2 miles from the mouth (Figure 3). Since no salmon were observed above this point, the falls may be a barrier to fish passage. Most of the salmon were observed within 3/4 mile from the mouth of the stream.

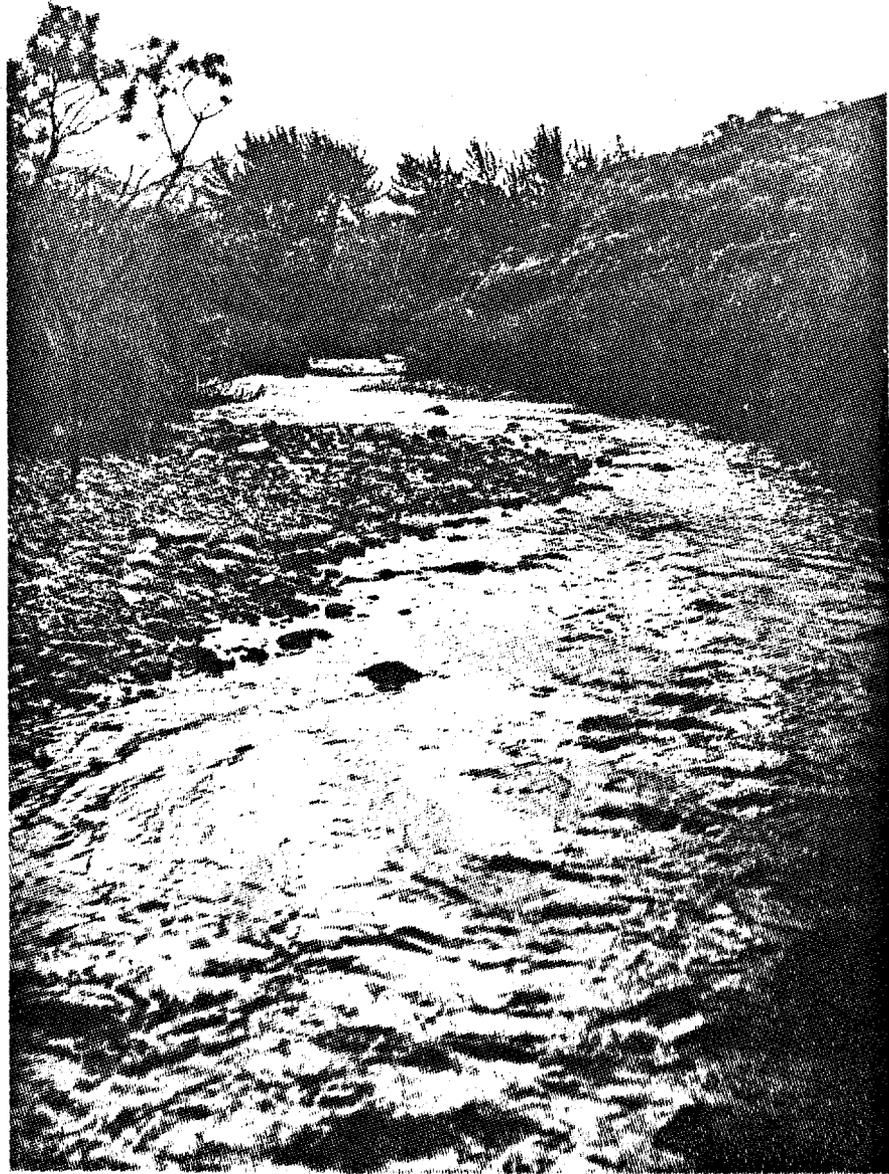


Figure 2. Stream number 1, typical spawning area.

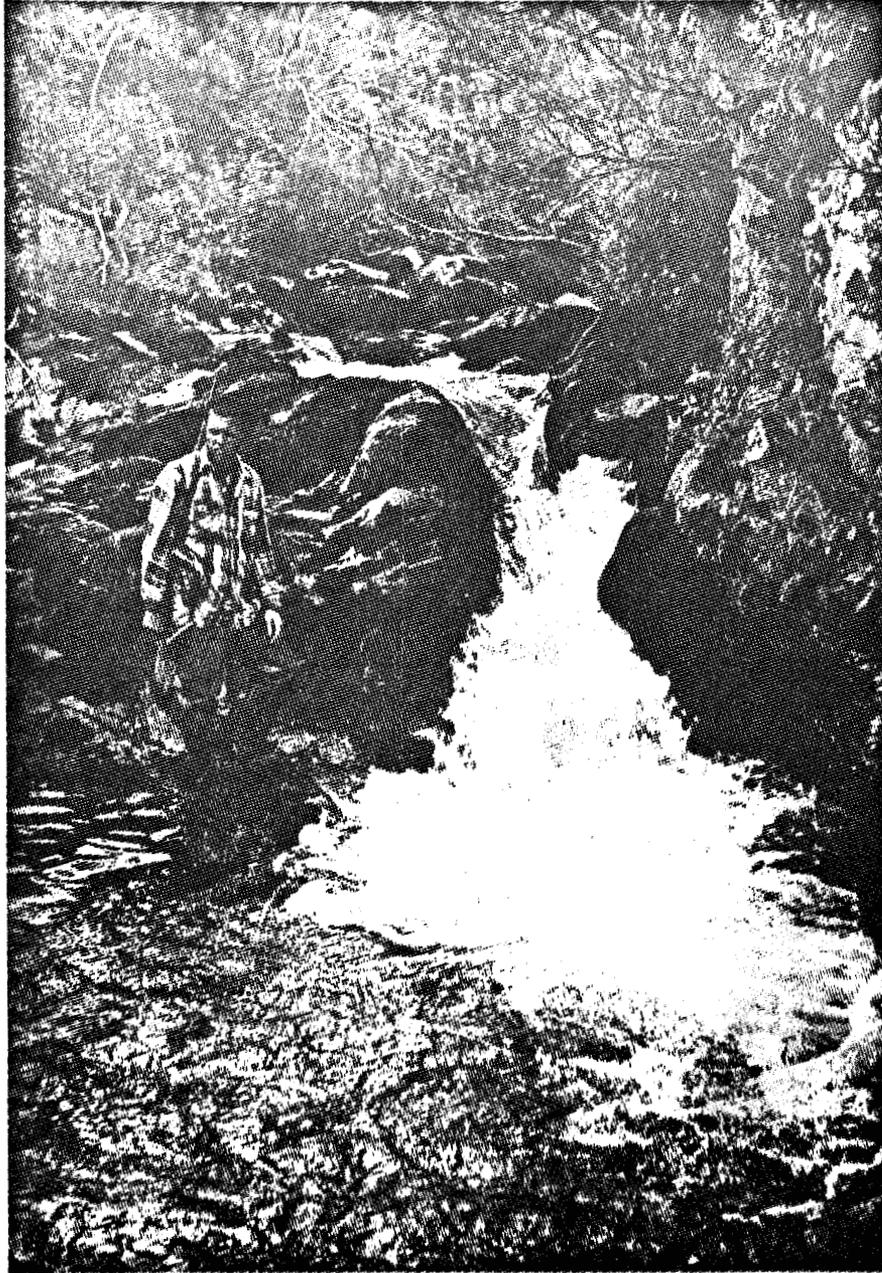


Figure 3. Falls on stream number 1, located 1-1/2 miles from mouth of stream.

Table 2. Physical characteristics of stream Number 1.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	small rock	16.0	20.5
0.25	med. gravel, some large rock	9.5	19.0
0.50	small-med. gravel	10.0	14.0
0.75	small-med. gravel	5.5	21.0
1.00	med. gravel-small rock	10.0	15.0
1.25	med. gravel-small rock	6.0	24.0
1.50	med.-large rock	17.0	19.0
1.75	large rock-few boulders	5.0	18.5
2.00	small-med. gravel	8.0	12.0
2.25	large rock	9.0	11.0
2.50	sand-small gravel	14.0	11.0

Table 3. Water temperatures of stream Number 1.

Distance from mouth (miles)	July 21	Water temperature (°F)		
		July 29	August 6	August 14
Mouth	49.0	53.0	53.0	53.0
0.25	49.0	53.0	52.0	53.0
0.50	49.0	53.0	52.0	53.0
0.75	49.0	53.0	52.0	53.0
1.00	48.0	52.5	52.0	53.0
1.25	48.0	52.5	52.0	53.0
1.50	47.0	52.5	52.0	53.0
1.75	47.0	52.0	52.0	53.0
2.00	45.0	-	-	-
2.25	46.5	-	-	-
2.50	46.0	-	-	-

Stream Number 7

At a distance of 1/8 mile from its mouth, a series of 8 falls were encountered; the highest one was 8 feet and would be impassable to salmon. Although

no salmon were observed in this stream it appeared to be suitable for spawning below the falls.

Table 4. Physical characteristics of stream Number 7.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	med. rock	5.0	6.0
0.125	solid bedrock	7.0	8.0

Table 5. Water temperatures of stream Number 7.

Distance from mouth	Water Temperature (°F) July 30
Mouth	46.0
0.125	45.5

Stream Number 9

A distance of 4 miles was surveyed, from the mouth of this stream to 2 lakes where it originates. The entire distance appeared to maintain excellent spawning areas (Figure 4). A 2-foot falls is located 1/8 mile from the mouth of the stream. The stream is overhung by dense growths of alder and grass throughout much of its course (Figure 5). No salmon were observed more than 2-1/2 miles upstream from the mouth.

About 1/4 mile from its mouth, stream number 9 forks and actually has two outlets into Frazer Lake. This fork is about 24 inches deep and 5 feet wide with a mud bottom. This fork appears to attract fish better than the main stream, since about 150 sockeye were seen at the mouth. The fish use this fork to gain entry to the main stream.

The shores of the two lakes are composed primarily of medium-sized gravel, and may be potential spawning areas.

The first spawn-outs were observed on this stream.

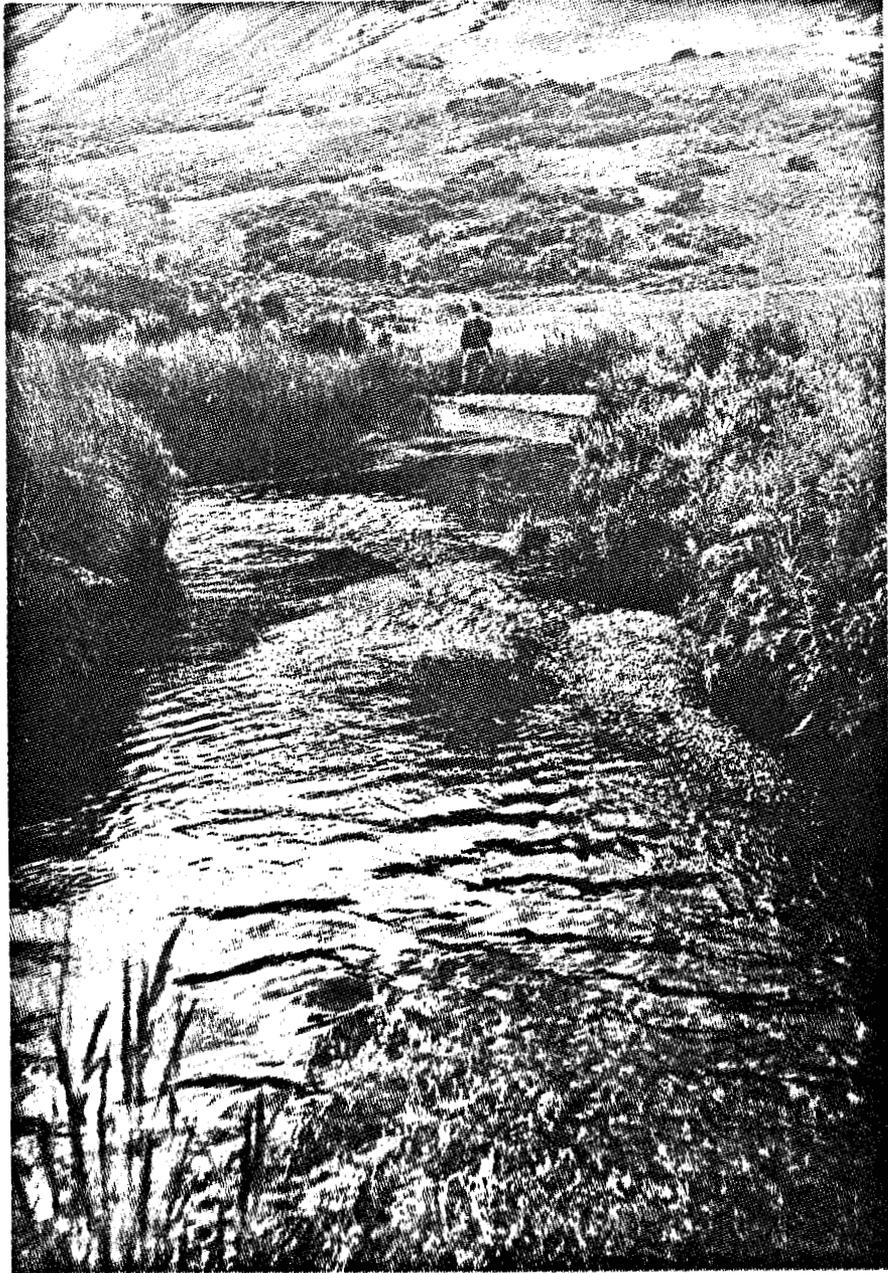


Figure 4. Stream number 9, typical spawning area.



Figure 5. Stream number 9, showing dense alder growths over hanging stream.

Table 6. Physical characteristics of stream Number 9.

Distances from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	fine-med. gravel	19.5	16.0
0.25	fine-med. gravel	8.0	18.0
0.50	med. gravel-med. rock	14.0	17.0
0.75	med. gravel-med. rock	10.0	20.0
1.00	med. gravel-small rock	9.0	17.0
1.25	small gravel-med. rock	12.0	16.0
1.50	small gravel-med. rock	9.0	17.0
1.75	small gravel-med. rock	9.0	20.0
2.00	small gravel	12.0	13.0
2.25	small-large rock	11.0	13.0
2.50	med. gravel-large rock	8.0	12.0
2.75	med. gravel-med. rock	17.0	10.0

Table 7. Water temperatures of stream Number 9.

Distance from mouth (miles)	Water Temperature (°F)			
	July 24	July 31	August 8	August 15
Mouth	53.0	51.0	52.0	52.0
0.25	52.0	50.5	52.0	51.5
0.50	56.0	51.0	52.0	-
0.75	52.0	51.0	53.0	-
1.00	52.0	51.0	54.5	-
1.25	52.0	52.0	56.0	-
1.50	53.0	52.0	57.0	-
1.75	53.0	52.0	-	-
2.00	53.0	53.0	-	-
2.25	54.0	-	-	-
2.50	53.0	54.0	-	-
2.75	54.0	-	-	-
3.00	-	54.0	-	-

Stream Number 10

This stream, referred to also as Pinnell Creek, is the largest inlet stream to Frazer Lake (Figure 6). A distance of 8 miles was surveyed on the



Stream #10
and its Forks

Figure 6. Map of stream number 10 (Pinnell Creek) and its forks.

main stream, and in addition four tributaries to this stream were surveyed; only one of these, Fork 10-B, appeared to be a potential spawning area (Figure 7).

The main stream appeared to contain excellent spawning facilities for the full 8 miles that were surveyed (Figures 8, 9, and 10).

Table 8. Physical characteristics of stream Number 10.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	mud-sand	18.0	39.0
1.0	small-med. gravel	15.0	19.0
2.0	small-med. gravel	12.0	40.0
3.0	med.-large gravel	12.0	19.0
4.0	small-large gravel	9.0	16.0
5.0	small-med. gravel	17.0	17.0
6.0	med.-large gravel	8.0	21.0
7.0	med. gravel-med. rock	9.0	15.0
8.0	small-med. gravel	9.0	11.0

Table 9. Water temperature of stream Number 10

Distance from mouth (miles)	Water Temperature (°F)		
	August 2	August 10	August 15
Mouth	47.0	51.0	53.0
1.0	48.0	51.0	53.5
2.0	48.0	52.0	55.0
3.0	50.0	52.0	55.0
4.0	51.0	-	-
5.0	52.0	-	-
6.0	52.0	-	-
7.0	52.0	-	-
8.0	51.0	-	-

Stream Number 11

The 1/2 mile length of this stream was very shallow and the bottom was choked with obstacles such as logs, brush, etc. Gravel seemed to be



Figure 7. Fork 10-B of stream number 10, facing upstream at mouth.

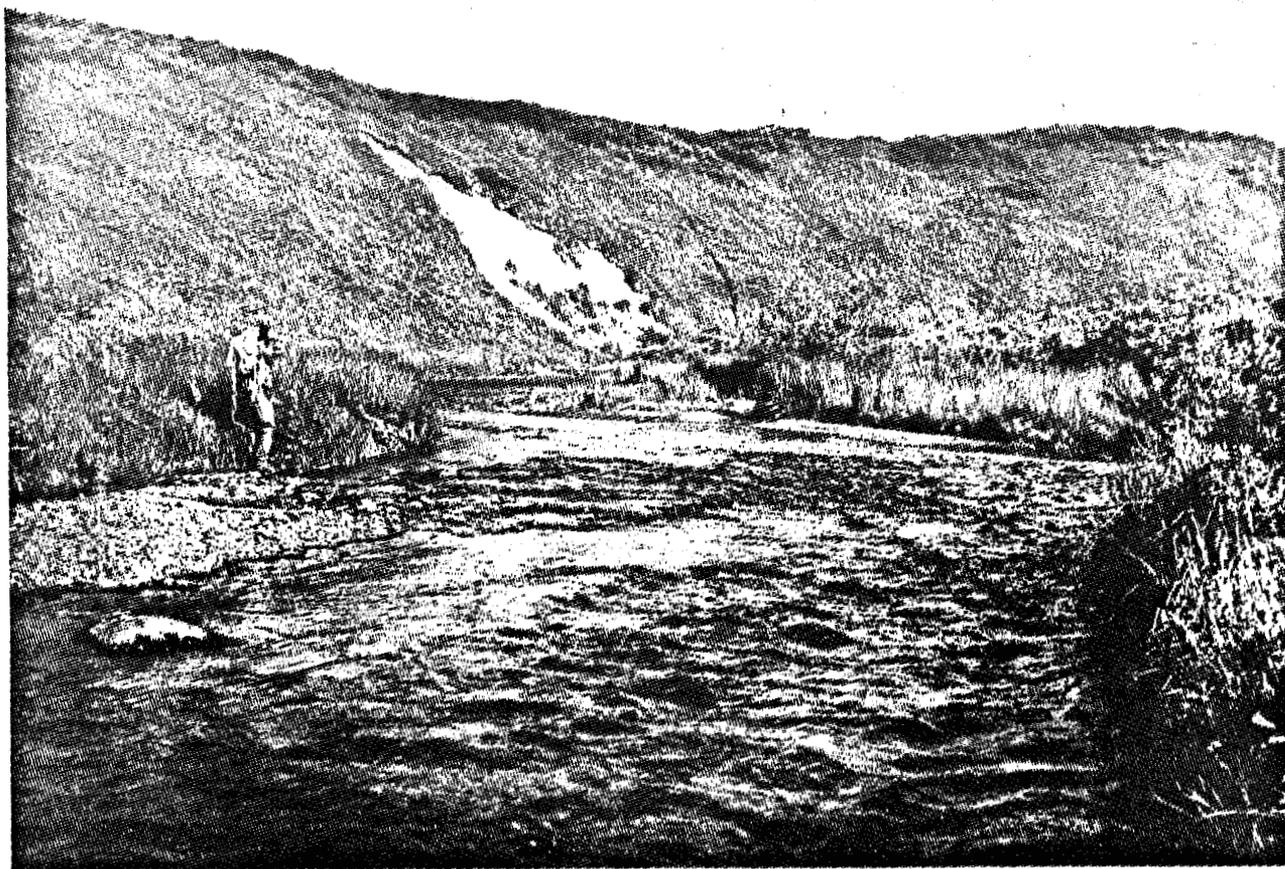


Figure 8. Stream number 10, facing upstream at a point 1-1/4 miles from mouth.

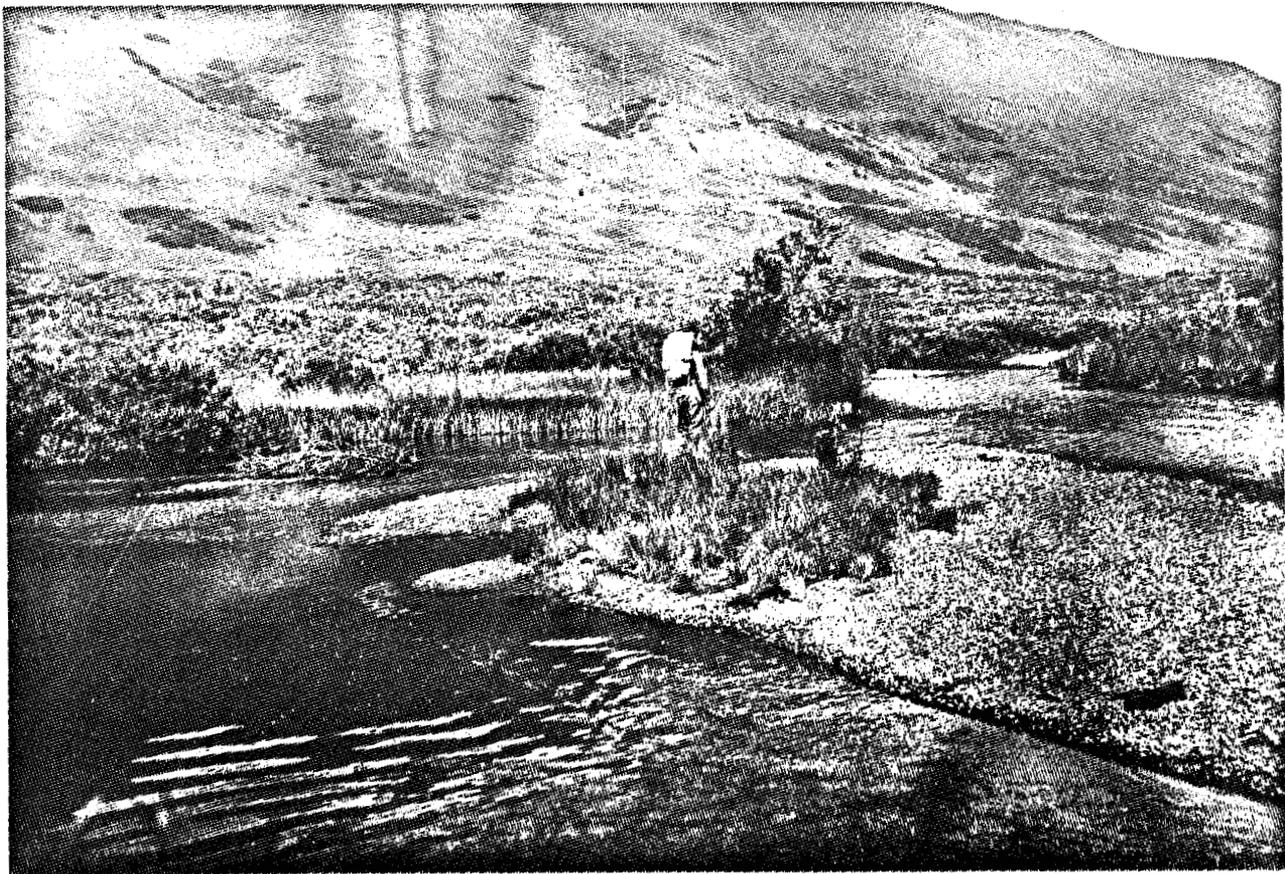


Figure 9. Stream number 10, facing upstream at a point 1/8 mile above confluence of fork 10-A.

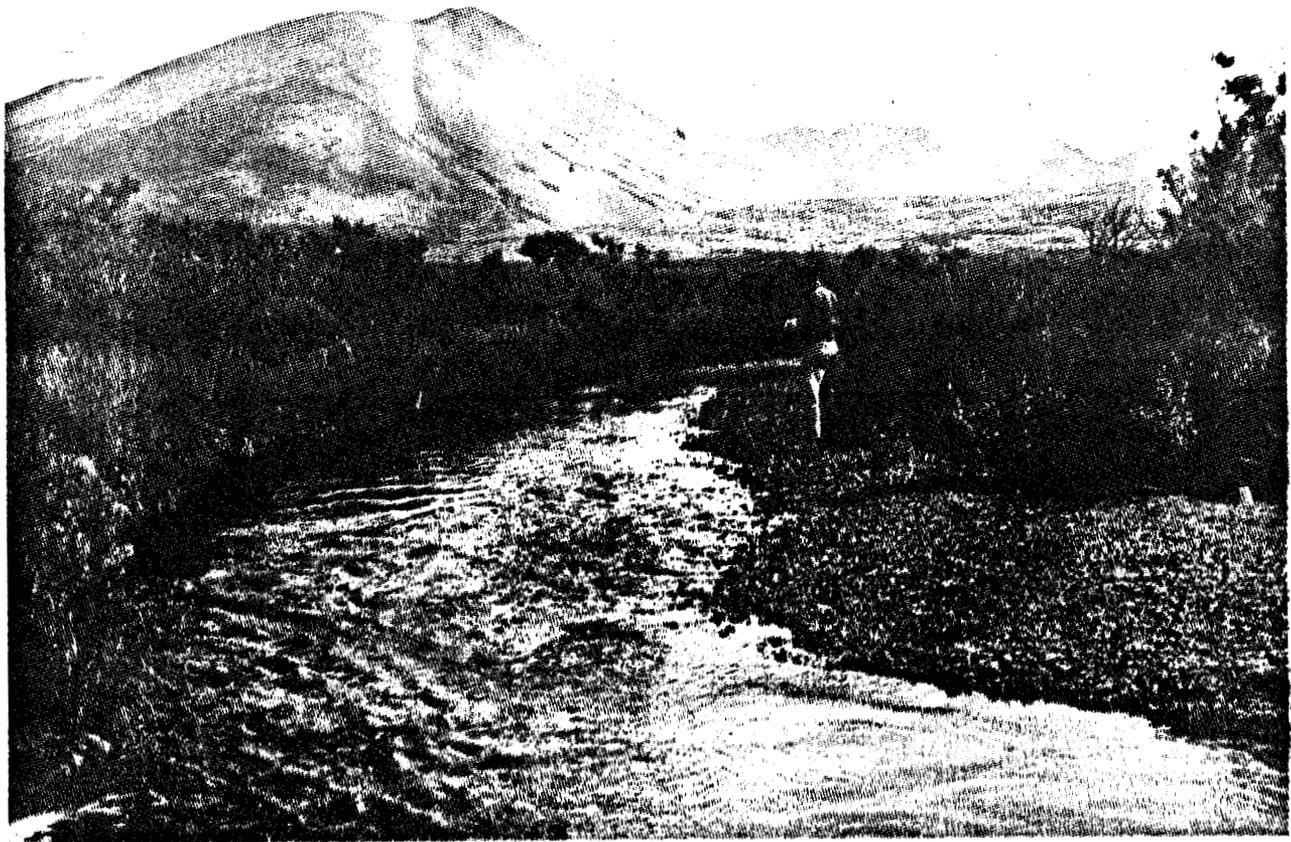


Figure 10. Stream number 10, facing upstream at the confluence of fork 10-C.

suitable where present. No salmon were observed in this stream, and it did not appear to have much potential as a spawning area.

Table 10. Physical characteristics of stream Number 11.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	med. gravel	5.5	7.5
0.25	med. gravel-med. rock	4.5	9.0
0.50	large rock-boulder	5.0	8.0

Table 11. Water temperatures of stream Number 11.

Distances from mouth (miles)	Water temperature (°F) - July 30
Mouth	43.5
0.25	43.0
0.50	43.0

Stream Number 12

A total of 1-1/4 miles of this stream were walked. The entire stream appeared to be well-suited to spawning, and in general the gravel was clean and the stream fast-flowing. Two small falls (each about 2 feet high) were encountered 3/4 of a mile from the mouth, and three more falls were observed 1-1/16 miles from the mouth (2 feet, 4 feet and 4 feet in height, respectively); all falls appeared to be passable, although all sockeye observed were within 1/4 mile of the mouth of the stream. The stream is overhung by brush and trees for most of its length (alder and cottonwood, primarily).

Table 12. Physical characteristics of stream Number 12.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	med. gravel	8.0	9.0
0.25	small gravel	7.0	16.0
0.50	med. gravel-med. rock	11.0	12.0
0.75	sand; small gravel-small rock	11.0	15.0
1.00	small gravel	10.0	18.0

Table 13. Water temperatures of stream Number 12.

Distance from mouth (miles)	Water Temperature (°F)			
	July 22	July 30	August 7	August 14
Mouth	45.5	46.5	47.0	48.0
0.25	46.0	46.5	47.0	47.0
0.50	45.5	46.0	47.0	47.0
0.75	45.0	45.5	46.0	48.0
1.00	45.0	45.5	46.0	47.5

Stream Number 13

The 1/4 mile of this stream which was surveyed showed good gravel, but water too shallow and gradient too steep to afford suitable spawning conditions. Snow-melt appeared to be the main source of flow. No salmon were observed in this stream.

Table 14. Physical characteristics of stream Number 13.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	sand-fine gravel	3.0	4.0
0.25	fine gravel-med. rock	4.5	7.5

Table 15. Water temperatures of stream Number 13.

Distance from mouth (miles)	Water Temperature (°F) - July 26
Mouth	45.0
0.25	45.0

Stream Number 14

This stream was surveyed for a distance of 1/2 mile from its mouth. While gravel appeared to be suitable in some areas, the shallowness and lack of resting pools and cover made it appear to be a poor spawning stream. No salmon were seen in this stream.

Table 16. Physical characteristics of stream Number 14.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	sand-fine gravel	5.0	7.0
0.25	med. gravel-small rock	4.0	5.0
0.50	solid bedrock	6.0	4.0

Table 17. Water temperatures of stream Number 14.

Distance from mouth (miles)	Water Temperature (°F) - July 26
Mouth	46.0
0.25	46.0
0.50	45.5

Stream Number 15

Stream number 15 was surveyed for a distance of 2-1/4 miles from its mouth. No salmon were observed in this stream, and although some suitable spawning areas were observed the quality of spawning gravels appeared to be poor.

Table 18. Physical characteristics of stream Number 15

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	mud-sand	30.0	38.0
0.25	sand-large rock	31.0	36.0
0.50	small-med. gravel	10.0	13.0
0.75	mud-small gravel	2.5	12.0
1.00	small-med. gravel	3.0	7.0
1.25	small-large gravel	3.0	6.0
1.50	small gravel	1.5	6.0

Table 19. Water temperatures of stream Number 15.

Distance from mouth (miles)	Water Temperature (°F) - July 20
Mouth	55.0
0.25	58.0
0.50	57.0
0.75	57.0
1.00	54.5
1.25	49.5
1.50	47.0

Stream Number 16

This stream was surveyed for a distance of 1-1/4 miles from its mouth. It is fed by a small lake and melting snow; the mouth is choked by horsetail rushes, and combined with low water flow this makes entry

into the stream impossible. No salmon were observed in the stream. A series of 8 falls are present about 1/8 mile from the mouth, ranging from 2 to 3 feet in height; they all appear to be passable. Because of the shallowness and slow water flow of this stream it does not appear to have any real potential as a spawning stream for sockeye.

Table 20. Physical characteristics of stream Number 16.

Distance from mouth (miles)	Bottom Type	Stream Depth (inches)	Stream Width (feet)
Mouth	small-med. gravel	9.0	14.0
0.25	med. gravel	11.0	6.0
0.50	med. gravel	6.5	7.0
0.75	small gravel	4.0	5.0
1.00	small gravel	7.0	8.0

Table 21. Water temperatures of stream Number 16.

Distance from mouth (miles)	Water temperature (°F) - July 25
Mouth	54.0
0.25	53.0
0.50	53.0
0.75	50.0
1.00	49.0

Table 22. Number of fish seen in all streams during survey,
by species.

Stream	Date	Number Fish Seen					Tags (Sockeye)	Bear kills (Sockeye)	Spawmed out (Sockeye)
		Sockeye	Chum	Dolly Varden	Rainbow				
Dog Salmon	July 20	520	25	135	5	1 <u>1/</u>	2	8 <u>2/</u>	
Stream # 1	July 21	40	0	14	0	0	5	0	
	July 29	34	0	39	0	3	23	0	
	August 6	170	0	100	0	4	17	18	
	August 14	59	0	32	few	2	0	0	
Stream # 7	July 30	0	0	0	0	0	0	0	
Stream # 9	July 24	99	0	11	0	1	0	0	
	July 31	592 <u>4/</u>	0	33	0	1	23	6	
	August 8	878	0	29	0	1	64	223	
	August 15	0	0	13	0	0	numerous remains	numerous remains	
Stream # 10	August 2	784	0	47	9	8	15	1	
	August 10	739	0	11	1	5	27	38	
	August 15	16	0	21	0	0	0	0	
Stream # 11	July 30	0	0	0	0	0	0	0	
Stream # 12	July 22	31 <u>3/</u>	0	14	0	0	1	0	
	July 30	32	0	38	0	0	7	0	
	August 7	28	0	38	0	0	0	1	
	August 14	2	0	14	0	0	0	0	
Stream # 13	July 26	0	0	0	0	0	0	0	
Stream # 14	July 26	0	0	0	0	0	0	0	

Table 22. Number of fish seen in all streams during survey,
by species.

Stream	Date	Number Fish Seen						Spawmed out (Sockeye)
		Sockeye	Chum	Dolly Varden	Rainbow	Tags (Sockeye)	Bear kills (Sockeye)	
Stream # 15	July 20	0	0	few fry	0	0	0	0
Stream # 16	July 25	0	0	41	0	0	0	0

1/ 1 mile downstream from fish pass.

2/ Unspawned, not bear kills.

3/ Additional 15 sockeye off mouth of stream.

4/ Additional 150 sockeye off mouth of stream.

Table 23. Sex composition of sockeye throughout study period.

<u>Sex</u>	<u>Untagged</u>	<u>Tagged</u>	<u>Bear Kills</u>
Males	955	2	68
Females	802	6	70
Jack	18	0	0
Sex undetermined	2,798	18	49
TOTAL	4,573	26	187

Table 24. Egg retention in spawned-out females.

	<u>Females</u>	
	<u>Number</u>	<u>Percent</u>
Completely spawned	113	86.3
1-2 eggs retained	2	1.5
15-20 eggs retained	2	1.5
Completely unspawned	14	10.7
TOTAL	131	100.0

Bear Predation

Bear activity along the spawning streams began to appear extensive about July 25, and continued throughout August. The most numerous signs of bear activity were on streams number 1, 9 and 10; bears appeared to be present to a lesser extent on stream number 12.

In several instances bears ate the entire body of the fish but did not touch the head. Sex products seemed to be the choicest portions, and in most cases were eaten first. Towards the latter part of the season it was difficult to determine the extent to which fresh fish were taken by bears as well as the

number of spawned-out carcasses which were eaten. Whenever there was a doubt as to the condition of the fish eaten, the observation was not included either as a bear-kill or as a spawn-out.

Since many of the fish recorded in the four streams which were surveyed more than once were undoubtedly replicate observations (i.e. streams number 1, 9, 10 and 12), the total number of fish observed on the day in which the most fish were seen gives a more accurate estimate of minimum total number of spawners. Considering the data in this manner, a total of 2,939 sockeye were observed throughout the study period. Bear killed and/or ate approximately 6.4 percent of these fish; however, as previously mentioned, the actual percentage which were killed before they spawned is not known, but is probably considerably less than 5 percent.

SUMMARY

From the observations made in the summer of 1964, only four streams were utilized by spawning sockeye salmon, numbers 1, 9, 10 and 12; in addition, a 1/8 mile section of stream number 7 and possibly certain areas of stream number 15 appeared to contain potential spawning areas.

Bear predation in the Frazer Lake system in 1964 was not a serious consideration.

A maximum of 30 percent of the fish in the system were observed on the spawning grounds. This figure is probably high, due to the possibility of beach spawners which would still have been in the lake during the stream surveys.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.