United States
Department of
Agriculture

Forest Service

**Intermountain
Forest and Range
Experiment Station
Ogden, UT 84401**

Research Note
INT-324

January 1983

Inventory of Salmon, Steelhead Trout, and Bull Trout: South Fork Salmon River, Idaho

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ABSTRACT

Aquatic habitats and respective fish populations were studied in the South Fork Salmon River during the summer of 1977. From the Warm Lake Bridge to the headwaters the channel consisted of 74 percent riffle and 26 percent pool, with surface substrate of 21 percent boulder, 40 percent rubble, 24 percent gravel, and 15 percent fine sediment. Below the Warm Lake Bridge to the confluence of the Secesh River the channel consisted of 55 percent riffle and 45 percent pool, with surface substrate of 32 percent boulder, 35 percent rubble, 16 percent gravel, and 17 percent fine sediment. Juvenile chinook salmon and rainbow-steelhead trout were found throughout the river, except in the upper 5 miles (8 km), where only bull trout were found. The river reach in the Stolle Meadows contained the highest densities of fish, with juvenile chinook salmon and sculpin the most numerous fish present. Chinook salmon and rainbow-steelhead trout densities were lower than reported in most other Idaho streams having anadromous fishes. Of the habitat attributes measured, only stream width showed any correlation with fish populations. As stream width increased in the river reach above the Warm Lake Bridge, bull trout numbers decreased.

KEYWORDS: fish, bull trout, anadromous, sediments, aquatic habitat, standing crop

INTRODUCTION

Adult summer chinook salmon (*Oncorhynchus tshawytscha* [Walbaum]) and steelhead trout (*Salmo gairdneri* Richardson) returning from the ocean to the South Fork Salmon River (SFSR) to spawn have steadily declined in numbers since 1957. This decline resulted in a sport fishing closure on both species and caused their present consideration for classification as a "threatened or endangered" species in the Salmon River drainage. There is no evidence that populations have stabilized or that the downward population trend will not continue. Decline of salmon populations in the Salmon River drainage has been caused mainly by impoundments (upstream-downstream passage problems) in the lower Snake and Columbia Rivers. Fish populations in the SFSR have also been adversely affected by past deposition of large amounts of sediments.

Idaho Department of Fish and Game monitors adult summer chinook salmon runs into the SFSR by annual redd counts. Knowledge of success in rearing juvenile chinook salmon and steelhead in the SFSR drainage has been limited to studies conducted in the tributaries (Platts and Partridge 1978). Little information is available concerning rearing success in the main river. This report evaluates the aquatic habitat, fish densities, and fish growth in the SFSR and discusses the river rearing areas used by juvenile chinook salmon and rainbow-steelhead trout.

[1]Research fishery biologists, located at the Intermountain Station's Forestry Sciences Laboratory, Boise, Idaho, and Idaho Department of Fish and Game, Bonners Ferry, Idaho, respectively.

STUDY AREA

The 80-mile-long (130 km) SFSR is a major tributary of the Salmon River and drains a 1,270-mi^2 (3 290-km^2) watershed representative of much of the forested mountainous terrain found in central Idaho. The study area covers the upper 45 mi (72 km) of the river. Channel elevations of the study sites range from 6,850 ft (2 090 m) in the headwaters to 3,620 ft (1 100 m) at the confluence of the Secesh River. The river is low in mineral content (total dissolved solids about 60 to 100 mg/liter) because of the dominant granitic bedrock in the watershed. The river's tributary waters average only 60 mg/liter total dissolved solids (Platts 1974).

The SFSR historically contained Idaho's largest chinook salmon run,which is composed entirely of summer chinook salmon. This race has been reduced from 10,000 returning adults in the mid–1950's (personal communication with Howard Metsker, U.S. Dep. Interior, Fish and Wildlife Serv.) to about 300 returning adults in 1980. Most of the SFSR chinook salmon spawn in the river, with a few spawning in tributary streams. Juvenile chinook salmon rear in the SFSR and in the lower portions of the main tributaries (Platts and Partridge 1978).

Fish populations in the SFSR are composed of chinook salmon, rainbow-steelhead trout, bull trout (*Salvelinus confluentus* [Suckley]), brook trout (*Salvelinus fontinalis* [Mitchill]), cutthroat trout (*Salmo clarki* Richardson), mountain whitefish (*Prosopium williamsoni* [Girard]), sculpin (*Cottus* spp.), dace (*Rhinichthys* spp.), sucker (*Catostomus* spp.), and Pacific lamprey (*Entosphenus tridentatus* [Gairdner]).

Study Sites

Randomly selected study sites used since 1967 (Platts 1972; Megahan and others 1980) to monitor stream channel substrate changes over time in the SFSR were used in this study (fig. 1). The 48 study sites averaged about a mile (1.6 km) apart, starting at the headwaters and ending at the confluence with the Secesh River. Five grouped transects crossing the river at 50-ft (15-m) intervals comprised one study site. Aquatic structural data were collected along each of the 240 transects. Corresponding fishery data were collected from the entire 200-ft (61-m) site at each of the even-numbered sites.

The Warm Lake-Cascade Bridge was used to divide the study area into two reaches. The river reach downstream from the bridge to the confluence of the Secesh River is referred to as the downstream reach and the river above the bridge as the upstream reach. Eight fish study sites in the 14 mi (22 km) of river in the upstream reach were sampled for fish by electrofishing; the 16 sites in the 31 mi (50 km) of downstream reach were sampled by snorkeling.

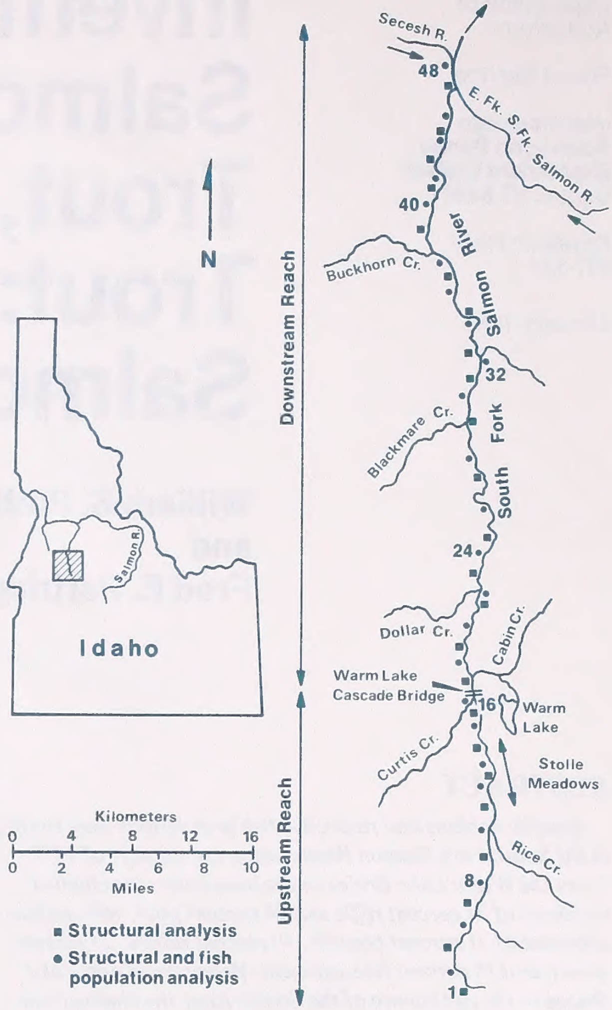

Figure 1. Location of study sites on the South Fork Salmon River, Idaho.

STUDY METHODS

Aquatic Habitat

Environmental measurements and conditions were recorded as follows:

1. Stream, pool, and riffle widths
2. Stream depth
3. Pool quality ratings
4. Stream channel materials
5. Stream channel embeddedness

Stream width along a given transect was measured to the nearest foot (0.3 m) and classified as either pool or riffle. The pools were classified as to suitability for fish environments as follows:

Description	Rating
Maximum pool diameter exceeds average stream width. Pool is more than 3 ft (0.9 m) in depth, or more than 2 ft (0.6 m) deep with abundant fish cover.	5
Maximum pool diameter exceeds average stream width. Pool is less than 2 ft in depth, or if between 2 and 3 ft, lacks fish cover.	4
Maximum pool diameter is less than the average stream width. Pool is more than 2 ft in depth, with intermediate to abundant cover.	3
Maximum pool diameter is less than the average stream width. Pool is less than 2 ft in depth and has intermediate to abundant cover.	2
Maximum pool diameter is less than the average stream width. Pool is less than 2 ft in depth and is without cover.	1

The dominant streambed material at each 1-ft (0.3-m) interval on the transect was classified as follows:

Particle diameter	Classification
12 inches or over (304.8 mm or over)	Boulder
3 to 11.99 inches (76.1 to 304.7 mm)	Rubble
0.185 to 2.99 inches (4.7 to 76.0 mm)	Gravel
0.184 inch and less (less than 4.7 mm)	Fine sediment

Channel material embeddedness was rated as follows:

Rating	Rating description
5	The gravel, rubble, and boulder particles have less than 5 percent of their perimeter (surface) covered by fine sediment.
4	The gravel, rubble, and boulder particles have between 5 and 25 percent of their perimeter (surface) covered by fine sediment.
3	The gravel, rubble, and boulder particles have between 25 and 50 percent of their perimeter (surface) covered by fine sediment.
2	The gravel, rubble, and boulder particles have between 50 and 75 percent of their perimeter (surface) covered by fine sediment.
1	The gravel, rubble, and boulder particles have over 75 percent of their perimeter (surface) covered by fine sediment.

Electrofishing

The large size of the river below the Warm Lake Bridge prevented accurate estimates of fish populations with the Smith-Root Model VII[2] backpack electrofishers. Therefore, the river section below the bridge was snorkel censused and the river section above the bridge was electrofished. The two-step depletion method as described by Seber and LeCren (1967) was used in the electrofishing. This method resulted in wide confidence intervals around the population estimates. Therefore, to make the data meaningful only the actual number of fish collected are used as the population numbers. This estimate is less than the true population. Also, unless special efforts are made, such as using the optimum voltage, frequency, and pulse to collect small fish, electrofish sampling can miss a greater proportion of the small young-of-the-year fish. Because we did not always make a special effort to collect small fish, results of our study are probably biased toward the larger fish.

During July 1977 two electrofishing collections were made at each site using three fish netters. One collection was made moving upstream through the site, and immediately another collection was made electrofishing downstream through the site. Fish from the two collections were combined to give the total fish for the study site. We estimate that we were collecting less than 80 percent of the fish in each site sampled. All game fish collected were identified, individually weighed, and total length measured. Sculpin, dace, and lamprey were sorted, counted, and each species recorded to gain total and average weights.

Snorkeling

Fish numbers and species in the downstream reach were determined by two observers who snorkeled upstream through each site. Each snorkeler observed 20 ft (6 m) of river channel. One snorkeler took 20 ft on the left side of the river and the other snorkeler took 20 ft on the right side. This resulted in a 40-ft-wide (12-m) band of river, over the 200-ft-long (61-m) site, being observed for each site. Each snorkeler made one upstream pass counting and identifying all the fish observed in that section. All snorkeling counts were made in September 1977. The actual number of fish recorded would be less than the true population number. Small fish and especially sculpin and dace were difficult to observe in the boulder-rubble substrates.

[2]Use of trade names is for reader information only, and does not constitute endorsement by the U.S. Department of Agriculture of any commercial product or service.

RESULTS

Aquatic Habitat

In the upstream reach (sites 1–16), the mean riffle area in the even-numbered sites was 79 percent as compared to 74 percent for all study sites (table 1). Percent of riffle area was less in the downstream river reach (sites 17–48) than the upstream reach, with 51 percent at the even-numbered sites and 55 percent for all study sites (table 2). The similarity between the means from the even-numbered sites with the means from all sites suggests no bias was introduced from fish collection at only even-numbered stations.

Pool quality improved in the downstream reach because of the larger size of the pools resulting from higher stream flows. The percentage of boulder and fine sediment composing the channel surface in the downstream reach was greater than in the upstream reach, while rubble and gravel was less in the downstream reach of the river. The stream embeddedness rating was slightly less in the downstream reach.

Fish Populations

UPRIVER REACH

Fish occupied all study sites, with only bull trout occupying the headwaters downstream to site 4 (table 3). Bull trout, of which only three were young-of-the-year, accounted for 6.3 percent of the total fish collected, averaging 4.4 inches

Table 1.—Stream attributes by site for the SFSR above the Warm Lake Bridge, 1977

Site	Width	Depth	Riffle	Pool	Channel substrate: Boulder	Rubble	Gravel	Fine	Channel embeddedness	Pool quality
	Feet		Percent							
1	12	0.2	83	17	43	7	36	14	4	1
2	11	.5	73	27	27	36	18	18	3	2
3	19	.6	79	21	26	42	16	16	3	1
4	26	1.2	50	50	0	16	52	32	4	2
5	32	.5	88	12	56	44	0	0	5	1
6	26	.7	81	19	68	28	4	0	5	2
7	32	.8	88	12	58	35	3	3	5	1
8	49	.4	80	20	2	18	55	24	3	2
9	31	1.0	68	32	0	45	35	19	3	2
10	39	.5	90	10	0	42	50	8	4	1
11	43	1.2	35	65	0	38	36	26	2	5
12	40	.7	82	18	2	79	8	10	4	2
13	42	1.3	60	40	0	26	33	40	3	3
14	49	.6	88	12	34	44	18	4	5	2
15	35	1.0	60	40	19	58	5	17	4	3
16	52	.8	85	15	4	81	10	4	5	1
Mean values Stations 1–16	33.6 (10.2 m)	.8 (0.2 m)	74.1	25.8	21.3	40.1	23.8	14.8	3.9	1.9
Even-numbered stations	36.5 (11.1 m)	.7 (0.2 m)	78.6	21.4	17.1	43.0	26.9	12.5	4.1	1.8

Table 2.—Stream attributes by site for the SFSR from the Warm Lake Bridge downriver to the confluence of the Secesh River, 1977

Site	Width	Depth	Riffle	Pool	Channel substrate: Boulder	Channel substrate: Rubble	Channel substrate: Gravel	Channel substrate: Fine	Channel embeddedness	Pool quality
	----- Feet -----		------------------- Percent -------------------							
17	65	2.3	5	95	0	29	23	48	1	5
18	53	1.4	47	53	49	28	6	17	4	4
19	63	.9	70	30	20	54	17	9	4	2
20	69	.6	93	7	7	88	4	0	5	1
21	70	.7	73	27	10	70	12	9	5	3
22	66	.8	59	41	31	49	13	6	5	3
23	64	.7	91	9	20	69	8	2	5	1
24	102	.6	88	12	24	66	6	5	5	2
25	52	1.4	29	71	61	13	6	19	4	5
26	60	1.1	60	40	67	20	3	10	5	3
27	83	1.5	43	57	31	41	8	19	4	3
28	71	1.9	0	100	13	31	25	32	3	5
29	48	1.4	27	73	48	31	6	15	4	3
30	77	1.0	0	100	2	16	35	58	2	4
31	81	.7	73	27	21	55	9	15	4	3
32	92	.6	64	36	57	36	1	7	4	3
33	135	.5	55	45	4	18	33	45	2	4
34	54	1.6	22	78	36	30	6	28	3	4
35	97	.7	60	40	5	18	50	27	2	3
36	66	.6	71	29	0	0	76	24	2	2
37	66	1.0	77	23	80	11	1	7	4	3
38	60	1.0	40	60	60	13	2	25	4	4
39	148	.4	64	36	6	86	4	3	4	2
40	131	.7	53	47	9	78	8	4	4	3
41	71	1.4	27	73	35	31	3	31	3	5
42	53	1.5	8	92	43	30	4	23	3	5
43	159	.3	89	11	3	17	68	11	4	2
44	160	.7	62	38	6	31	52	11	2	3
45	101	1.6	2	98	13	37	18	32	2	5
46	76	1.7	62	38	72	21	3	4	5	4
47	107	2.0	64	36	88	6	1	4	5	3
48	85	2.3	82	18	98	2	0	0	5	3
Mean values										
Stations 17-48	83.9 (25.6 m)	1.1 (0.3 m)	54.9	45.1	31.9	34.9	16.0	17.2	3.7	3.3
Even-numbered stations	79.7 (24.3 m)	1.1 (0.3 m)	50.7	49.3	35.9	33.7	15.3	15.9	3.8	3.3
Stations 1-48	67.1 (20.5 m)	1.0 (0.3 m)	58.1	41.9	28.4	36.6	18.6	16.4	3.8	2.8

Table 3.—Observed fish numbers and densities in the South Fork Salmon River above the Warm Lake Bridge, July 1977

Site	River area	Bull trout		Rainbow trout		Chinook salmon		Brook trout		Dace		Whitefish		Sculpin		Lamprey		Total fish	
	Ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2	No.	No./ft^2
2	2,200	31	0.014	0		0		0		0		0		0		0		31	0.014
4	5,080	38	.007	0		0		0		0		0		0		0		38	.007
6	5,200	16	.003	6	0.001	2	0.004	0		0		0		0		0		24	.005
8	9,760	12	.001	64	.006	214	.022	5	0.0005	5	0.0005	2	0.0002	19	0.002	0		321	.033
10	7,800	0		3	.0004	163	.021	0		0		1	.0001	139	.018	0		306	.039
12	7,920	0		39	.005	169	.021	0		2	.0002	2	.0002	206	.026	25	0.003	443	.056
14	9,800	1	.0001	20	.002	76	.008	2	.0002	13	.001	6	.0006	36	.004	0		154	.016
16	10,480	0		10	.001	98	.009	0		4	.0004	0		112	.011	2	.0002	226	.022
Total	58,240 ($5\,430\ m^2$)	98	.002 ($0.018/m^2$)	142	.002 ($0.026/m^2$)	722	.012 ($0.133/m^2$)	7	.0001 ($0.0013/m^2$)	24	.0004 ($0.0044/m^2$)	11	.0002 ($0.0020/m^2$)	512	.009 ($0.095/m^2$)	27	.0005 ($0.0049/m^2$)	1,543	.026 ($0.285/m^2$)
Percent of total		6.3		9.2		46.8		0.4		1.6		0.7		33.2		1.8			

(112.8 mm) (fig. 2). Rainbow-steelhead trout and chinook salmon first appeared in the river in the downstream direction at site 6. Site 8, which is located at the upstream end of Stolle Meadows, contained all fish species found in the river except larval lamprey (amnocoetes). At this site rainbow-steelhead trout and chinook salmon were the most numerous species, with bull trout accounting for only 4 percent of the population. Only two bull trout were observed in the remainder of the river studied, perhaps because of inability to compete with other fish species under these habitat conditions.

Juvenile chinook salmon were the most numerous fish found in the upstream reach and made up about 47 percent of the total fish collected. They were present in site 6 upstream from the Stolle Meadows, and were the most numerous salmonid in sites 8 through 16. Only sculpin occurred in greater numbers at sites 12 and 16. Somewhere between site 6 and site 4 anadromous fish were no longer present; the remainder of the river upstream is not used for the spawning or rearing of chinook salmon or steelhead trout.

One percent of the chinook salmon collected were over 3.9 inches (100 mm) in length and were classified as precocious males that did not smolt and migrate to the ocean. The rest of the chinook salmon were young-of-the-year, with an average length of 2.1 inches (54.2 mm) (fig. 3).

Rainbow-steelhead trout (resident and anadromous) comprised 9.2 percent of the fish collected. They occurred in all sites in which chinook salmon were found. Rainbow trout outnumbered chinook salmon only in site 6, the farthest upstream site in which either species was found.

Seventy-three percent of the rainbow trout collected were classified as 1-year-old fish (fig. 4). This could be expected, since part of this population is composed of anadromous steelhead trout, that will migrate to the ocean after 1 or 2 years in the river.

Sculpin were the second most numerous fish collected, making up 33 percent of the total fish collected. The actual percentage of sculpin in the total fish population is probably higher because of difficulties encountered in collecting sculpin by electrofishing. Sculpin were found in all sites where rainbow trout and chinook salmon occurred except site 6, the farthest upstream site.

Brook trout, dace, and whitefish made up less than 3 percent of the fish collected. Dace and whitefish were found in four sites and brook trout in two sites. Larval lamprey were also collected in sites 12 and 16. Brook trout were the only nonnative fish found. If brook trout increase and move upstream, they might compete with the native bull trout population.

Observed fish densities in the upper river reach varied from 0.005 fish/ft^2 ($0.054/m^2$) in site 4 to $0.056/ft^2$ ($0.603/m^2$) in site 12 (table 3). Sites 8, 10, and 12, located in the upper, middle, and lower sections of the Stolle Meadows, had the highest densities, with chinook salmon, rainbow-steelhead trout, and sculpin accounting for 95 percent of the total fish population.

Chinook salmon averaged $0.012/ft^2$ ($0.129/m^2$) for all sites but were the most numerous in sites 8 through 12, where they averaged $0.021/ft^2$ ($0.226/m^2$). These values are similar to density estimates found in the six most productive SFSR tributary streams in 1972 (Platts and Partridge 1978). The lower chinook salmon densities ($0.009/ft^2$ [$0.097/m^2$]) found in sites 14 and 16 were still higher than the values found in the less productive tributaries (0.005 salmon/ft^2 [$0.055/m^2$]) (Platts and Partridge 1978). Although higher than in the tributaties, densities of summer chinook salmon in the SFSR were not as high as in other Idaho streams. In Capehorn, Elk, and Marsh Creeks, tributaries of the Middle Fork Salmon River, spring chinook salmon densities averaged about $0.034/ft^2$ ($0.368/m^2$) in August 1972 and 1973 (Bjornn and others 1974). Salmon runs were higher in 1973 than in 1976 and could account for the difference. Bull trout and rainbow-steelhead trout each averaged 0.002 fish/ft^2 ($0.018/m^2$) for the upstream reach. Bull trout densities were highest in the uppermost site and decreased in the downriver direction. Rainbow-steelhead trout, which were not found in

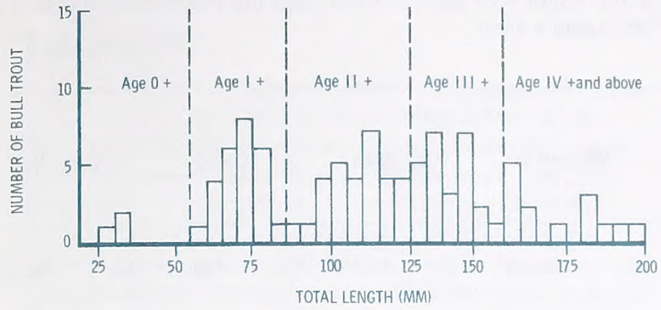

Figure 2. Length frequency of 98 bull trout collected in the South Fork Salmon River in July 1977 with estimated age classes.

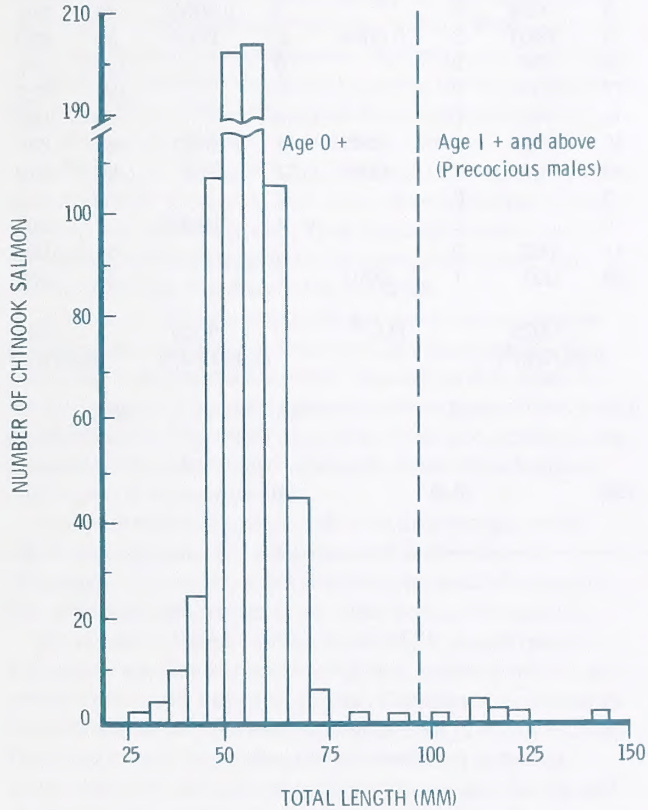

Figure 3. Length frequency of 722 chinook salmon collected in the South Fork Salmon River in July 1977, with estimated age classes.

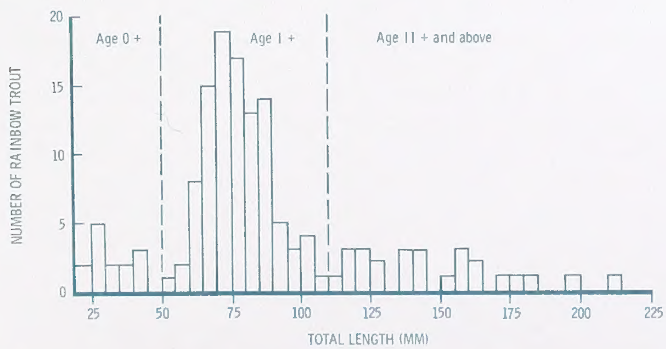

Figure 4. Length frequency of 142 rainbow trout collected in the South Fork Salmon River in July 1977, with estimated age classes.

the upper two stations, were most abundant in site 8. Rainbow-steelhead trout densities were fairly consistent except for site 10 where numbers were exceptionally low. Sculpin averaged $0.009/ft^2$ ($0.095/m^2$) for all sites. At site 12 they were the most abundant fish, averaging $0.026/ft^2$ ($0.280/m^2$). Brook trout, whitefish, dace, and lamprey densities averaged less than $0.001/ft^2$ ($0.011/m^2$), although they occurred in significant numbers at some sites.

DOWNSTREAM REACH

Estimating fish numbers in the downstream reach by snorkeling proved to be less effective than the electrofishing estimates in the upstream reach. Although the water was generally clear, fish observations were hampered by physical barriers. Rubble and boulders hid small fish. This was especially evident with fish species that do not maintain themselves in the water column. Sculpin and dace were rarely seen, although they were known to be present. Because they usually occupy a higher position in the water column, a greater proportion of chinook salmon were observed than other species. Their actual and observed numbers were different, especially in riffle areas because of water depths and irregular substrates. For these reasons the information presented here for fish densities in the upper and lower sections of the SFSR are not directly comparable.

Sixteen river sites from the Warm Lake Bridge to the Secesh River were snorkeled for fish counts, with fish observed in 15 of the sites (table 4). Fish were not observed at site 42, although a large school of whitefish was observed immediately above the site.

Juvenile chinook salmon and whitefish were observed in 13 sites, although they did not always occur in the same site. Rainbow-steelhead trout were observed in ten sites, sculpin in five, dace in four, and bull trout and brook trout in one site each. Adult chinook salmon were also observed but not included in the fish numbers.

Juvenile chinook salmon were the most numerous fish observed, accounting for 49 percent of the total fish. Second were whitefish accounting for 38 percent, followed by rainbow-steelhead trout (8 percent), and dace (4 percent). Sculpin, bull trout, and brook trout together totaled only 1 percent of the fish observed. It was interesting that the west slope cutthroat trout (*Salmo clarki* Richardson) was not observed in the 45 miles of river. They occur in the tributaries and in the lower SFSR below the confluence of the Secesh. Their numbers must be extremely limited, or they would have been observed in the sampling.

Using 8,000 ft^2 (740 m^2) as the estimated area (20 ft [6 m]) in each site observed along each shoreline, a rough density estimate was established (table 4). The densities for all fish species per site ranged from 0 to 0.025 $fish/ft^2$ ($0.269/m^2$), with a mean of $0.007/ft^2$ ($0.075/m^2$). Chinook salmon densities ranged from 0 to $0.013/ft^2$ ($0.140/m^2$), with a mean of $0.0033/ft^2$ ($0.032/m^2$); whitefish ranged from 0 to $0.012/ft^2$ ($0.129/m^2$), with a mean of $0.0025/ft^2$ ($0.028/m^2$); and rainbow-steelhead trout ranged from 0 to $0.002/ft^2$ ($0.022/m^2$), with a mean of $0.0005/ft^2$ ($0.005/m^2$). Edmundson (1967) observed steelhead densities of $0.005/ft^2$ ($0.05/m^2$) on Johnson Creek, a tributary to the East Fork South Fork Salmon River. In the Lochsa River drainage, he reported higher densities of steelhead trout, ranging from $0.01/ft^2$ ($0.13/m^2$) in Crooked Fork Creek in 1966 to $0.05/ft^2$ ($0.51/m^2$) in the Lochsa River in 1965. Edmundson (1967) also reported a chinook salmon density of $0.02/ft^2$ ($0.22/m^2$) in Crooked Fork Creek in 1966, much higher than we found in the SFSR.

Table 4.—Number and density (fish/ft^2) of fish observed by snorkeling in the South Fork Salmon River from the Warm Lake Bridge to the Secesh River (density calculated using an estimated 8,000 ft^2 per sample area)

Site	Chinook salmon[2]		Rainbow trout		Bull trout		Brook trout		Whitefish		Sculpin		Dace		Total fish	
	No.	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*	*No.*	*No./ft^2*
18	36	0.005	0		0		0	0.0001	11	0.001			0		48	0.006
20	11	.001	0		0		0		0		0		0		11	.001
22	26	.003	2	0.0003	0		0		2	.0003	0		0		30	.004
24	31	.004	3	.0004	0		0		8	.001	0		0		42	.005
26	46	.006	3	.0004	0		0		14	.002	0		0		63	.008
28	24	.003	3	.0004	0		0		3	.0004	0		4	0.0005	34	.004
30	11	.001	8	.001	0		0		1	.0001	3	0.0004	2	.0003	25	.003
32	44	.006	9	.001	0		0		50	.006	0		0		103	.013
34	104	.013	18	.002	0		0		77	.009	0		0		199	.025
36	0		0		0		0		16	.002	0		0		16	.002
38	21	.003	11	.001	0		0		92	.012	1	.0001	1	.0001	126	.016
40	37	.005	9	.001	0		0		13	.002	1	.0001	22	.003	82	.010
42	0		0		0		0		0		0		0		0	
44	1	.0001	2	.0003	0		0		0		0		4	.0005	7	.001
46	34	.004	2	.0003	1	0.0001	0		14	.002	0		0		51	.006
48	0		0		0		0		25	.003	1	.0001	4		26	.003
Mean		.0033 (0.0355/m^2)		.0005 (0.0057/m^2)		N.C.[2]		N.C.[2]		.0025 (0.0270/m^2)		N.C.[2]		.0009 (0.0097/m^2)		.007 (0.076/m^2)
Total	426		70		1		1		326		6		33		863	
Percent of Total	(49)		(8)		(0.1)		(0.1)		(38)		(0.8)		(4)			

[1]Does not include adult salmon.
[2]Number too small to tabulate.

SUMMARY

All of the randomly selected fishery study sites contained fish in or near them, showing that fish are using all areas of the river for rearing. The fish species composition was different in the upstream reach than in the downstream reach. Bull trout were the only fish found in the two upriver sites, but in the remainder of the river studied they were almost nonexistent. Juvenile chinook salmon and rainbow-steelhead trout were found throughout the river in almost all habitat types, except in the headwater area. The greatest fish densities were in the Stolle Meadows area. Chinook salmon were the most numerous fish found in the upstream reach, followed by sculpin.

In the downstream reach the numbers of sculpin observed were considerably lower than in the upper river; this was probably due to the snorkeling techniques, which will not determine the true size of sculpin populations. Whitefish and dace were found from the Stolle Meadows downriver to the confluence of the Secesh River. Whitefish populations were higher in the downriver reach. Brook trout numbers were small and were found mainly in the Stolle Meadows area. Larval lamprey were observed in the upstream reach where the electrofisher brought them up out of the substrate. They could not be observed by snorkeling so did not appear in the downstream reach. Cutthroat trout were not observed in the SFSR.

The aquatic habitat analysis did not reveal any correlation between any of the habitat conditions and the respective fish populations, except stream width. This tells us that either we are not measuring the correct variables or we must refine our habitat analysis. We would guess that we are not measuring the needed family of attributes to pinpoint correlations between habitat and fish populations.

As stream width increased, bull trout numbers decreased. The linear regression ($Y = a + bx$) had an R^2 value of 62 percent. This decrease was probably the result of competition with other fish species in the wider downriver reaches.

The number of species of fish in the SFSR should remain consistent over time but numbers of each species would be expected to fluctuate from year to year. Densities of anadromous chinook salmon and rainbow-steelhead trout juveniles will vary from year to year, depending on the number of spawning adults returning, the survival of their embryos and alevins, and rearing conditions faced during the juvenile presmolt stage.

Fish were found to occupy almost all areas of the river. The Stolle Meadows area was the most important site in the SFSR, per unit of area, for summer rearing of juvenile chinook salmon. The lower numbers of chinook salmon and rainbow-steelhead trout observed compared to earlier studies in the Salmon River drainage probably reflect the constantly declining anadromous fish runs into the SFSR. Based on our sample means, in July 1977 there was a minimum of 25,000 juvenile salmon rearing in the upper reach and 45,000 juvenile salmon rearing in the lower reach. Only about 4,000 juvenile rainbow-steelhead trout were rearing in the upper reaches and about 7,000 juveniles in the lower reaches. These would be minimum estimates because of the methodology used and because we captured less than 80 percent of the population. Regardless of the low capture rates, the low numbers of juveniles in 1977 could help explain their low return from the ocean as adults in 1979.

PUBLICATIONS CITED

Bjornn, T. C., M. A. Brusven, Myron Molnaw, F. J. Watts, and R. L. Wallace. 1974. Sediment in streams and its effects on aquatic life. Res. Tech. Compl. Rep., OWRR Project B-025-IDA, 47 p. Water Resour. Res. Inst., Univ. Idaho, Moscow.

Edmundson, E. H., Jr. 1967. Diurnal and diel movements of juvenile steelhead trout and chinook salmon in two Idaho streams. Master's thesis. Univ. Idaho. 35 p.

Megahan, W. F., W. S. platts, and B. Kulesza. 1980. Riverbed improves over time: South Fork Salmon River. *In* Symposium on Watershed Management, vol. 1. p. 380–395. Am. Soc. Civ. Eng.

Platts, William S. 1972. Aquatic environment and fishery study South Fork Salmon River, Idaho, with evaluation of sediment influences. Progress Rep. II (mimeo rep.) 206 p. USDA For. Serv., Intermt. Reg., Ogden, Utah.

Platts, William S. 1974. Geomorphic and aquatic conditions influencing salmonids and stream classification – with application to ecosystem management. 199 p. USDA For. Serv., SEAM Program, Billings, Mont.

Platts, William S., and Fred E. Partridge. 1978. Rearing of Chinook salmon in tributaries of the South Fork Salmon River, Idaho. USDA For. Serv. Res. Pap. INT-205, 11 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Seber, G. A. F., and E. D. LeCren. 1967. Estimating population parameters from catches large to the population. J. Animal Ecol. 36:631–643.

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