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FEDERAL AID IN FISH RESTORATION Job
Performance Report, Project F-73-R-5
Subproject II: Salmon and Steelhead Investigations
Study III: Anadromous Fish Inventory-Salmon River

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December, 1983

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State of: Idaho

Name: SALMON AND STEELHEAD INVESTIGATIONS

Project: F-73-R-5

Title: Anadromous Fish Inventory-Salmon River

Subproject: II

Study: III

Period Covered: 1 March 1982 - 28 February 1983

ABSTRACT

Adult spawning and juvenile surveys were conducted in Salmon River tributaries between the South and Middle Forks. Rainbow-steelhead (Salmo gairdneri) was the dominant species in Sabe, upper Bargamin, lower Cottonwood and Five Mile creeks. No juvenile chinook salmon (Oncorhynchus tshawytscha) were found in these tributaries.

Physical barriers to upstream migration of anadromous fish were located in Cottonwood, Big Mallard and Five Mile creeks.

Rainbow-steelhead from Chamberlain Creek were compared electrophoretically with other stocks in the upper Columbia River basin. Chamber-lain Creek rainbow-steelhead are more similar to steelhead from the Snake River than the Middle Fork Salmon River.

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ACKNOWLEDGEMENTS

Mel Reingold, Mary Reingold, Jack Heaton, Mark Haney and Maurice Harding assisted with collection of field data.

INTRODUCTION

The Salmon River drainage in Idaho is an important producer of chinook salmon and steelhead trout. Environmental degradation and increased harvest, both sport and commercial, have contributed to the decline of wild populations. Hatchery programs are on the increase to supplement declining populations and to mitigate for losses caused by dams.

Most of the management emphasis to date has been on the headwaters and major tributary rivers in the more accessible areas. Chinook salmon and steelhead trout spawn and rear in Salmon River tributaries between the South and Middle Forks, but the status of these tributary populations has not been ascertained. Anadromous fish have not been introduced into any of these tributaries.

In order to evaluate the status of anadromous fish populations and provide the basis for future management alternatives of these wild stocks, a study was initiated in 1981. Reingold (1982) surveyed Horse, Chamberlain, Sabe and Bargamin creeks.

OBJECTIVES

Determine relative importance of Salmon River tributary streams for steelhead and spring chinook salmon.

Assess species present, relative abundance and range in significant streams.

Determine timing of adult returns to the Salmon River tributaries in the study area.

Conduct electrophoretic analyses to compare genetic stocks of steel-head to surrounding stocks in the Salmon River system.

RECOMMENDATIONS

Harvest of adult steelhead from the Salmon River downstream of the Middle Fork should be managed to allow adequate escapement of wild fish into tributary spawning streams.

Long range management plans should address the perpetuation of wild salmon and steelhead populations in Salmon River tributaries.

Protect spawning chinook salmon in Chamberlain Creek and its West Fork and monitor status with aerial spawning surveys for five consecutive years.

DESCRIPTION OF STUDY AREA

The Salmon River, originating in the Sawtooth Mountains of central Idaho, flows in a northerly direction for approximately 180 miles to the town of North Fork, Idaho. At North Fork, the river turns directly west for 144 miles, cutting through the second deepest canyon on the North American continent, from which came the name "River of No Return". At Riggins, the river again swings north for 30 miles and west again at Whitebird for 54 miles to its confluence with the Snake River. The drainage area of the Salmon River encompasses some 13,600 square miles, making it one of the largest river systems contained within the boundaries of any one state (Welsh et. al. 1965).

From the town of North Fork, a road follows the river for 46 miles ending at Corn Creek. From there, the river canyon is roadless for the next 76 miles, to Vinegar Creek, where a road leads for 25 miles to the town of Riggins, Idaho.

Access through the roadless section of river canyon is limited to horse and hiking trails or travel by float craft or whitewater jet boat. Several major rapids within the river canyon reduce casual access by boaters unfamiliar with or underequipped for the hazards involved. A few backcountry airstrips are located in the canyon and are limited to light aircraft. Two unimproved roads enter the canyon from side drainages. The Mallard Creek road enters from Elk City, Idaho, and terminates at Whitewater Ranch at river mile 149. A road from Dixie, Idaho, crosses the river on a suspension bridge at river mile 135 and leads to Mackay Bar. Neither of these roads attract much traffic to the river due to their length and difficulty.

There are 108 named tributary streams between Corn Creek and Vinegar Creek. Over 90% of these are small, steep, intermittent streams and have little or no fishery values (Reingold 1970). During 1981, field work was accomplished in Horse Creek, Chamberlain Creek, Sabe Creek, Bargamin Creek and Big Mallard Creek. These streams were selected on the basis of size, known or suspected presence of anadromous fish and the lack of known barriers to anadromous fish in their lower reaches. Between the Middle Fork and South Fork Salmon only Chamberlain Creek is known to have supported substantial numbers of anadromous fish in past years, both salmon and steelhead. Steelhead trout and salmon have historically been known to spawn in Horse Creek although numbers have never been documented. Adult steelhead are known to spawn in Bargamin Creek. No comprehensive information on juvenile populations or densities or other species present has been documented (Reingold 1982).

Physical data on Horse, Chamberlain, Sabe, Bargamin and Big Mallard creeks were reported by Reingold (1982).

Cottonwood Creek

Cottonwood Creek enters the Salmon River from the south at river mile 183.5. This stream is approximately 26 km long and has an average gradient of about 43 km/mile. No flow information is available.

Access to Cottonwood Creek is primarily by the airstrip at Cold Meadows and trails. There is maintained trail along the upper 15 km of the stream. There is no trail access to the lower 11 km.

Black Lake is a large lake in Peak Creek, which joins Cottonwood Creek about 4.5 km from the mouth.

Five Mile Creek

Five Mile Creek enters the Salmon River at river mile 138 and is about 14 km long. No flow data is available. Five Mile Creek drains about 67 square kilometers. Gradient is steep, except at the very lower end.

There is trail access only to the lower one km of Five Mile Creek. There is one diversion that transports water to a small hydropower facility. This facility provides power to a residence on private land near the mouth of the creek. The residence has been vacant for several years and it is unknown if the hydropower facility is still operable.

TECHNIQUES USED

Adult Surveys

Aerial surveys were conducted for both salmon and steelhead during the spawning season. These surveys were accomplished by trained observers flying at low elevation in a Super Cub. Observations of adult fish and redds were attempted to document the primary spawning time and location.

Juvenile Surveys

Species composition and size distribution were documented by angling and visual surveys. Due to the remoteness of the area, its wilderness classification, and low specific conductance, no electrofishing was attempted. All fish caught by hook and line were identified, measured and released. During these surveys, observations of barriers and major areas of spawning gravel were recorded.

FINDINGS

Adult Steelhead Surveys

On 21 April 1982 we conducted aerial reconnaissance surveys on Cotton-wood Creek, West Fork Chamberlain Creek, Big Mallard Creek, upper Bargamin Creek and upper Horse Creek near Gatlin Ranch. The timing for this survey was based upon observations of adult steelhead at the tributary mouths in mid-April 1981 (Reingold 1982).

No adults or redds were observed in the streams we surveyed on 21 April. Winter conditions prevailed in all of the streams on this date and the spring freshet had not begun.

A waterfall was observed about 1 km upstream from the mouth of Big Mallard Creek. This waterfall appears to be a complete barrier to upstream migration at all water stages.

The spring freshet commenced very rapidly and due to the high snow and water content in these drainages, no later surveys were attempted.

Adult Salmon Survey

On 7 September 1982, we surveyed the lower 5 km of the West Fork of Chamberlain Creek. This stream reach has excellent spawning gravels, but no adult fish or redds were observed. The basis for the timing of this survey was the large numbers of redds reported by Welsh et al. (1965).
They surveyed this stream reach in early September during 1957 through 1963.

Even though no redds or adult fish were observed on 7 September, there were some adult salmon taken illegally from this stream in August. These fish were either killed prior to spawning or spawned sufficiently early so that the redds were not recognizable by the time of the survey.

Juvenile Surveys

Chamberlain Creek

We collected 108 juvenile rainbow-steelhead from Chamberlain Creek on 22 September 1982, for electrophoretic comparison with other steelhead stocks in the Columbia River drainage. The fish were caught on hook and line and placed immediately on ice. Within 10 hours of time of collection, they were placed in a freezer and kept frozen until dissected for electrophoresis.

Electrophoretic analysis was conducted by Wishard and Seeb {1983). They thawed the fish and extracted eye, liver and muscle tissue. After homogenization, electrophoresis was used to separate several protein loci.

Wishard and Seeb (1983) compared the electrophoretic results of other steelhead in the Columbia River basin with their results from Chamberlain Creek. Standard mathematical techniques were used for these comparisons. Chamberlain Creek steelhead trout did not stand out as a unique genetic stock. At most loci, Chamberlain Creek steelhead trout appear to more closely resemble Snake River steelhead than steelhead from Middle Fork Salmon River tributaries.

Genetic comparison of fish stocks in the Columbia River drainage are compiled from many individual studies and subsequent mathematical analysis. Results of the Chamberlain Creek electrophoresis add to the data base and knowledge of the genetic differences between steelhead stocks.

Cottonwood Creek

Between 13 and 17 July 1982, we surveyed Cottonwood Creek from Cold Meadows to one-half km downstream of Peak Creek and Peak Creek from Black Lake to Cottonwood Creek. A large cascade and waterfall about four meters high was located between Mirage and Peak creeks. The waterfall is a total barrier to upstream migration at all flows. Upstream of the barrier, Cottonwood Creek has a dense population of brook trout (Salvelinus fontinalis) which were stocked in the late 1940's. We measured 143 brook trout above the barrier and their mean length was 145 mm (Table 1). No other species was caught or observed from this stream reach.

Black Lake, in the head of Peak Creek, has naturally reproducing rain-bow. Rainbow trout were stocked in 1949, 1975 and 1981. We caught rainbow trout from this lake up to 450 mm long. Brook trout were also historically stocked in Black Lake, but have not established a self-sustaining population. Cottonwood Creek, downstream from Peak Creek, is predominately rainbow trout. The possibility exists that resident rainbow trout could have reproduced with steelhead trout in lower Cottonwood Creek.

Upper Bargamin Creek

On 4 August 1982, we surveyed about 4.5 km of Bargamin Creek upstream of Poet Creek campground. This stream reach is predominately low gradient and meanders through mountain meadows. Copious quantities of spawning gravel are available along with sufficient pools to rear large numbers of juvenile fish.

We caught and measured 79 fish from upper Bargamin Creek that averaged 148 mm total length (Table 2). No species except rainbow was caught or observed during the survey.

Although there is an abundance of spawning and rearing habitat in upper Bargamin Creek, fish production is restricted by low productivity and a short growth season.

Sabe Creek

We surveyed upper Sabe Creek, one km above and below Hamilton Creek and about one km of Hamilton Creek from the mouth upstream. On 13 July 1982, we caught 106 fish which we identified as: rainbow-steelhead 92 (87%); cutthroat trout 10 (9%); bull trout 3 (3%) and rainbow-cutthroat hybrid 1 (1%).

The 92 rainbow-steelhead we caught and measured had a mean length of 191 mm (Table 3).

Table 1. Length frequency of brook trout caught from Cottonwood Creek, July, 1982.

Total Length (mm)	No. Fish	Sample Percent
100-109	2	1
110-119	12	9
120-129	19	13
130-139	18	13
140-149	33	23
150-159	27	19
160-169	20	14
170-179	6	4
180-189	3	2
190-199	3	2
Total	143	100%

Mean Length = 145 mm

Table 2. Length frequency of rainbow-steelhead caught in upper Bargamin Creek, August 1982.

Total Length (mm)	No. Fish	Sample Percent
110-119	12	15
120-129	9	11
130-139	15	19
140-149	7	9
150-159	6	8
160-169	8	10
170-179	5	6
180-189	11	14
190-199	2	3
200-209	2	3
210-219	1	1
220-229	1	1
Total	79	100%

Mean Length = 148 mm

The predominant habitat type in Sabe Creek (near Hamilton Creek) and lower Hamilton Creek is boulders. Streambanks show evidence of extensive scouring. Many streams experienced record flows in 1974 and it is likely that is when the scouring occurred. There is very little spawning potential in this stream section for anadromous fish.

Cutthroat trout (Salmo clarki) were caught from both Hamilton and Sabe creeks. Where the habitat was predominately boulders, cutthroat trout were scattered and ranged in size from 125 to 240 mm. About one-half km downstream from the mouth of Hamilton Creek is a large pool associated with an intrusion of bedrock. I caught and released four cutthroat from this pool as I proceeded downstream. The two larger fish were 295 and 320 mm long and were caught near the bedrock shelf. About one hour later on the way back upstream, I fished this large pool again and caught two cutthroat that were 295 and 320 mm long from along the bedrock shelf. It is very likely they were the same fish that were caught previously. The cutthroat trout were very similar in appearance to cutthroat from the Middle Fork Salmon River.

Since the large pool was unique in a stream reach full of boulders, I felt it was worthwhile to spend more time investigating pool habitat. The boulder habitat was saturated with small rainbow and a few cutthroat and bull trout (Salvelinus confluentas). The deep pool yielded both rainbow and cutthroat, but only from the lower half of the pool. Repeated attempts to catch fish from the upper half of the pool with a dry fly were futile. As I returned upstream, I again attempted to catch a fish from the excellent pool habitat in the upper half of this long, deep pool. I caught a 165 mm rainbow near the center of the pool. As the fish flashed in the water, a large bull trout charged downstream from the head of the pool and grabbed the rainbow trout crosswise in its mouth. I estimated the bull trout to be about 600 mm long and it hung on to the rainbow for 10 minutes. I attempted to beach the fish so I could measure it, but it released the rainbow. as I was sliding it in to shallow water.

The two other bull trout I caught and released were 160 and 210 mm. High gradient habitat often has large numbers of bull trout, but they are not as easily caught on dry flies. I t s likely they were more abundant than the samples indicate.

Five Mile Creek

We surveyed the lower end of Five Mile Creek on 15 September 1982. I planned to count juvenile fish with a wet suit and snorkel, but the stream was too small to duplicate the techniques used on other streams. Rainbow-steelhead was the only species we caught from the stream, but cutthroat and bull trout have been caught from this stream (Mark Haney, personal communication). The 16 rainbow-steelhead caught from the stream averaged 171 mm (Table 4).

Except for a short distance above the mouth, Five Mile Creek has a high gradient and the substrate is predominately boulders. There is no spawning gravel for anadromous fish except at the mouth. Apparently, chinook salmon spawned in the lower end of the stream, but none have been observed for several years (Mark Haney, personal communication).

Table 3. Length frequency of rainbow-steelhead caught in Sabe and Hamilton creeks, August 1982.

Total Length (mm)	No. Fish	Sample Percent
120-129	1	1
130-139	0	0
140-149	4	4
150-159	6	6
160-169	8	9
170-179	7	8
180-189	8	9
190-199	21	23
200-209	14	15
210-219	8	9
220-229	7	8
230-239	7	8
240-249	1	1
Total	92	101%

Mean Length = 191 mm

Table 4. Length frequency of rainbow-steelhead from Five Mile Creek, September 1982.

Total Length (mm)	No. Fish	Sample Percent
130-139	1	6
140-149	1	6
150-159	2	12
160-169	4	24
170-179	3	18
180-189	2	12
190-199	2	12
230-239	1	6
Total	16	100%

Mean Length = 171 mm

About 1.2 km upstream from the mouth, there are two barriers to upstream migration. The upper barrier is called the "Pothole". The creek pours over a bedrock shelf and falls more than two meters into a large pool. The downstream barrier is not as picturesque as the Pothole, but is the upper limit of upstream fish migration at all flows.

Above the Pothole, Five Mile Creek has an abundant population of rainbow trout. There is a mountain lake (Little Sheepeater) in the drainage, but I was unable to locate any stocking records for rainbow trout. Rainbow-cutthroat hybrids were stocked into Little Sheepeater Lake in 1980 by the Department of Fish and Game. In 1977 or 1978, cutthroat trout were reported from the lake (Edgar Allen, Fire Management Officer, U.S. Forest Service).

DISCUSSION

Adult Surveys

Adult steelhead enter tributary streams to spawn in the spring after overwintering in the Salmon River. Reingold (1982) observed adults at the tributary mouths in mid-April, 1981. Fishermen familiar with the roadless portion of the Salmon River have been quite successful in catching steelhead from these staging areas even during years when steelhead runs are small. Shortly after a freshet, the staging areas appear to be devoid of fish, at least for a few days. The increase in waterflow is a stimulus for upstream migration and the fish proceed up the tributary streams. But, the flow increase also stimulates upstream movement of fish in the river to proceed toward their respective spawning tributaries.

Fluctuating air temperatures in April and May and highly variable snow-packs and water content in the high country can cause spring runoff to be highly erratic between years. Several freshets can be separated by periods of stable or reduced flows in tributary streams. Consequently, several small "runs" of steelhead can enter tributary streams in a given year. The variability and the turbidity which accompanies runoff makes it very difficult to quantify numbers of spawning steelhead or redds.

Aerial spawning surveys are useful in assessing major spawning areas, but several counts per year for several years are necessary to describe spawning patterns, location and timing.

Chinook salmon are in a severe depressed state in middle Salmon River tributaries. It may be that fish numbers in most of these tributaries are below the minimum threshold for maintaining a viable population. Due to the variability between age classes, surveys should be conducted in Chamberlain Creek and the West Fork Chamberlain Creek for five consecutive years to document the status of this chinook population.

Juvenile Surveys

Juvenile rainbow-steelhead are the dominant species in all mid-Salmon River tributaries except where a barrier limits upstream migration (e.g. Cottonwood Creek). Since we have found adult steelhead trout and mature rainbow less than 250 mm in the same stream, I conclude that both resident and anadromous fish are populating the streams. Reingold (1982) believed that the rainbow were predominately juvenile steelhead and that resident and anadromous behavior may alternate between generations. The lack of large rainbow supports this idea, but there are many examples of early maturing resident rainbow in infertile streams that are lightly exploited and produce few large individuals. The question of anadromy will not be answered until a methodology is developed to separate resident from anadromous rainbow and extensive studies carried out to assess abundance.

Reingold (1982) found no evidence of a reproducing cutthroat population in his work on Horse, Chamberlain, Sabe and Bargamin creeks. He felt that the cutthroat he observed were transients, and that the Middle Fork could be the only significant source of westslope cutthroat in the mid-Salmon River. The cutthroat trout I observed in Sabe Creek were about 11-12 km upstream from the mouth and ranged in size from 125 to 320 mm. I believe there is a small self-sustaining population of cutthroat trout in Sabe Creek that is genetically pure and distinct. This population is not larger because there is not a large quantity of cutthroat habitat.

General

Native wild stocks of steelhead trout from mid-Salmon River tributaries will continue to be self-perpetuating as long as adequate spawning escapement is assured. These stocks of steelhead are currently below optimum levels, but improved downstream survival through or past hydroelectric dams and reduced exploitation through differential harvest regulations should allow these populations to increase.

Chinook salmon populations are currently at a very depressed level and may already be lost from some tributaries. Complete protection should be sustained until downstream mortality has been reduced. Those populations that have been eliminated or reduced to levels too low to respond will have to be supplemented if they are to be restored.

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