Volume 26 Study G-III

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

FISHERY ENHANCEMENT OPPORTUNITIES IN SOUTHEAST ALASKA

by

Michael R. Bethers

ALASKA DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF SPORT FISH
E. Richard Logan, Director

TABLE OF CONTENTS

Study: G-III FISHERY ENHANCEMENT OPPORTUNITIES IN SOUTHEAST ALASKA

Job: G-III-A Enhancement of the Recreational Fishing Opportunities in the Juneau Area
by: Michael R. Bethers

LIST OF TABLES AND FIGURES

TABLE OF CONTENTS (CONT'D) Page

Volume 26 Study G-III

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project: F-9-17

Study: G-III Study Title: FISHERY ENHANCEMENT OPPORTUNITIES IN SOUTHEAST ALASKA

Job: G-III-A Job Title: Enhancement of the Recreational Fishing Opportunities in the Juneau Area

Cooperator: Michael R. Bethers

Period Covered: July 1, 1984 to June 30, 1985

ABSTRACT

The Juneau Roadside Enhancement Project improved local angling opportunities and set the stage for future enhancement of fisheries and the protection of fisheries habitat. Some of the Project's activities were as follows: (1) South Twin Lake was experimentally stocked with Dolly Varden char, *Salvelinus malma* (Walbaum), and landlocked coho salmon, *Oncorhynchus kisutch* (Walbaum), (2) the draft Juneau Sport Fish Enhancement Plan was produced, (3) plans were made to experimentally introduce 40,000 coho salmon and 3,000 steelhead trout, *Salmo gairdneri* (Richardson), smolts into Juneau area waters in the spring of 1985, (4) Dolly Varden out-migrating from Auke Lake were enumerated, (5) Montana Creek was reopened to Dolly Varden fishing, (6) experimental cutthroat trout, *Salmo clarki* (Richardson) introductions increased the number of cutthroat out-migrating from Auke Lake, (7) progress was made on the Juneau Fish Habitat Assessment document and (8) stipulations protecting local fish habitat and angling opportunities were provided to 56 developers and land-use planners.

KEY WORDS

Juneau, Alaska, Auke Lake, Auke Creek, Twin Lakes, Peterson Creek, Montana Creek, cutthroat, steelhead, coho, enhancement, recreational fishery.

BACKGROUND

Recreational-angling opportunity and productive fish habitat in the Juneau area has become threatened through rapid growth of the local population and associated urban and industrial development. Productive fish habitat has been lost or severely reduced in many streams. Twelve streams have been closed to angling to protect small fish populations in very accessible situations. A relatively restrictive set of fishing regulations have been applied to waters crossed by the Juneau road system to protect salmon stocks and spread the catch among more anglers.

The Juneau Roadside Enhancement Project was initiated in 1981 to relieve some of the excessive fishing pressure by experimentally enhancing existing fisheries, developing new fisheries, and protecting existing fish habitat. The Project's main success to date has been the experimental introduction of landlocked coho salmon in Twin Lakes. These lakes have been stocked annually since 1982 and have provided a major roadside-angling opportunity.

A list of common names, scientific names, and abbreviations of all species mentioned in this report is presented in Table 1.

RECOMMENDATIONS

Management

1. Continue to cooperate in land-use planning and provide stipulations to protect fish habitat and sport-fish interests.

2. Continue to monitor the Dolly Varden char out-migrations from Auke Lake to determine their abundance and length frequency for comparison with historical data.

3. Continue to investigate waters in the Juneau area and include them in the Juneau Fish Habitat Assessment Document.

4. Proceed with activities outlined in the Juneau Area Steelhead Enhancement Plan.

Research

1. Evaluate Juneau area watersheds and determine their potential for enhancement.

2. Conduct experimental fish releases in the Juneau area.

Table 1. List of Common Names, Scientific Names, and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Cutthroat trout	*Salmo clarki* (Richardson)	CT
Dolly Varden	*Salvelinus malma* (Walbaum)	DV
Pink salmon	*Oncorhynchus gorbuscha* (Walbaum)	PS
Rainbow trout	*Salmo gairdneri* (Richardson)	RT
Sockeye salmon	*Oncorhynchus nerka* (Walbaum)	RS
Chum Salmon	*Oncurhynchus keta* (Walbaum)	CS
Steelhead trout	*Salmo gairdneri* (Richardson)	SH

3. Evaluate the contribution of hatchery produced fish to the Juneau area recreational fishery.

4. Continue experimental cutthroat trout enhancement work at Auke Lake.

OBJECTIVES

1. Investigate the feasibility of improving recreational-angling opportunities in the Juneau area.

2. Develop plans for and coordinate experimental stocking of two to four Juneau roadside lakes, including:

   a) continue assessment of anadromous Dolly Varden and cutthroat trout using Auke Lake, and
   b) continue tag recovery of marked Dolly Varden and cutthroat trout using Auke Lake and Montana Creek.

3. Develop a recreational fisheries management plan for Auke Lake and Montana Creek by June 30, 1985.

4. Determine whether rearing rainbow trout in upper Peterson Creek (above the barrier falls) contributes to the steelhead fishery in the lower creek (below the barrier falls).

5. Determine the enhancement potential of the Mendenhall River ponds.

6. Complete egg takes from steelhead and cutthroat trout for experimental stocking in the Juneau area.

7. Develop a historical and current data base documenting the status of fish habitat and fish production in Juneau area drainages and identify enhancement opportunities for improving area fisheries.

8. Participate in Juneau development planning in a manner consistent with the Division of Sport Fish's goals regarding fish-habitat protection.

TECHNIQUES

Sport Fish Planning

The feasibility of improving local recreational angling opportunities was investigated. Limnological, biological, and historical stocking data on file were analyzed. Information was taken from Area and Regional stream, lake, and stocking files. Additionally, stocking information was acquired from the library at the National Marine Fisheries Service (NMFS) Auke Bay Laboratory and Bud Buddy (a longtime Juneau resident who conducted the original stocking in the Juneau area).

Stocking data recorded for each release included location, date, species, number and size of fish, brood source, hatchery mortality, and the condition of the fish. In most cases, complete data were not available, especially for historical releases. Data were recorded as completely as possible and entered in a regional Sport Fish computer data base (file FISHSORT.DTA), which is accessed by a program called STOCKSEEK.

Information on land ownership of potential enhancement sites was acquired from plats on file at the City and Borough of Juneau.

Potential stocking sites were evaluated and separated into three classes using the following criteria:

1. Physical characteristics of the site,
   a) Size (Can the area support an increased number of fishermen?),
   b) Fishing area (Can fish returning to the site be easily harvested?), and
   c) Imprinting area (Are there adequate pools for net-pen use? Are headwaters of the stream accessible for stocking fish?);

2. Public access (Is the land in public ownership and are parking and actual access to the fishing area available?);

3. Wild stocks (Does the site have wild populations of the same species that are available for stocking and, if so, how large?); and

4. Water supply (Does the site have an adequate supply of water for circulation in net pens, for imprinting, and for large numbers of returning adult salmon?).

Class-I sites meet all of the criteria listed above and are considered to be presently suitable for stocking.

Class-II sites are considered to be potentially stockable; however, they do not presently meet all of the criteria.

Class-III sites have not yet been evaluated to determine their suitability for stocking.

Arrangements were made with the regional Fisheries Rehabilitation, Enhancement, and Development Division (FRED) and NMFS for obtaining fish for experimental stocking activities.

A draft Juneau Sport Fish Enhancement Plan was produced which identifies stocking locations, species of fish for stocking, and directs the evaluation of potential enhancement sites.

The first draft of the Juneau Sport Fish Enhancement Plan was presented to the public at the annual Territorial Sportsmen meeting and at a Gastineau Channel Advisory Committee meeting. Copies were also

distributed to all local resource and governmental agencies and to the interested public for review and comment. At the time of this report, comments have been received from eight reviewers. Comments will be reviewed and, if appropriate, included in the final draft of the Juneau Sport Fish Enhancement Plan.

Development of a fisheries management plan for Auke Lake and Montana Creek was considered; however, it was decided to include them individually in the more exhaustive enhancement plan that is being prepared for the Juneau area. Auke Lake and Montana Creek will also be incorporated in the Sport Fishery Management Plans to be written in 1985.

Additional angling opportunities were provided in 1985 by reopening Montana Creek to Dolly Varden fishing. The migratory population of Dolly Varden in Montana Creek was estimated to be approximately 19,000 fish in 1983 (Neimark, 1983). It is believed that a population of this size could stand limited fishing pressure, so a proposal to reopen Montana Creek to Dolly Varden angling was submitted to the Board of Fisheries. Subsequently, it was passed at their 1985 spring meeting. In 1985, Montana Creek will be open to Dolly Varden angling with a bag limit of two fish per day. Anglers will be limited to the use of artificial lures to reduce the hooking mortality of released fish. This is the first special regulation in the Juneau area and will be evaluated via a creel survey in 1985.

Auke Lake is a documented overwintering area for mature Dolly Varden, as well as a year-round rearing area for all age classes. The overwintering population of mature Dolly Varden ranges from 4,000 to 6,000 fish annually. Because of this limited population size and high vulnerability to the winter recreational fishery, Auke Lake remains closed to Dolly Varden fishing.

Peterson Creek Rainbow/Steelhead

A study to determine whether rainbow trout reared above the Peterson Creek falls would contribute, as adults, to the steelhead fishery below the falls was originally planned; however, it was not conducted during the report period. Personnel originally planning to conduct this work were reassigned to Job D-I-A (Tongass Land-Use Management Plan/Agency Fisheries Coordination). Additionally, seasonal manpower and monetary supplies were inadequate to accomplish this objective because the original budget request was too conservative.

Twin Lake Fishery Development

A total of 1,895 Dolly Varden were experimentally stocked in South Twin Lake on June 22, 1984. These fish were survivors of a Dolly Varden rearing study conducted at Snettisham Hatchery. The fish were 1981 brood stock from Crescent Lake. They averaged 174 mm (fork length) and weighed 65 g when stocked. The Dolly Varden were adipose-fin clipped and coded-wire tagged.

The Dolly Varden were transported in a float-equipped Beaver aircraft from the Snettisham Hatchery to South Twin Lake in plastic garbage cans aerated with bottled oxygen. Arrangements were made with the Alaska State Troopers to stop traffic momentarily while the aircraft crossed Egan Drive at a low altitude on its approach to Twin Lake. Float planes landed directly on the lake, and fish were released into a net pen for an observation period of 6 hours before release in the lake. No mortalities were observed.

South Twin Lake was stocked with 3,997 landlocked coho salmon on September 5, 1984. The stocking density was 62 fish per surface acre. The fish were 1982 Berners River brood stock and averaged 171 mm (fork length). Fish were acquired from the Northern Southeast Regional Aquaculture Association's Salmon Creek Hatchery. The hatchery ceased operations in mid-June 1984; however, fish for stocking were retained in a net pen at the hatchery's Twin Lakes rearing facility and fed by Sport Fish personnel until the release date. Fish were fed Oregon moist feed according to the fish's acceptance of food. Feeding schedules provided by the manufacturer, based on fish weight, were not used. Fish were not marked.

An official recreational-harvest study was not conducted at South Twin Lake in 1984; however, a Kid's Trout Derby held at the lake on June 23 was sampled. Anglers at the lake were counted hourly, and a sample was interviewed to determine the amount of time spent fishing and the catch per angler. Sampling was not conducted according to a statistically prepared program.

Auke Lake Dolly Varden Studies

Dolly Varden and cutthroat trout out-migrating from Auke Lake were enumerated and sampled at the Auke Creek weir from March 14 through June 18, 1984.

The Auke Creek weir and a small research-oriented fish hatchery are operated under a cooperative agreement between the Alaska Department of Fish and Game, the University of Alaska, and NMFS . The weir is located about 300 feet above tidewater. The weir is operated from mid-March to mid-June to catch and sample fish leaving the Auke Lake system and from mid-June through October to enumerate in-migrant adult salmon. During the spring, weir panels of perforated aluminum plate (2.5-mm holes, 2-mm apart) are maintained in the weir. Out-migrant smolts, fry, and overwintering adult Dolly Varden and cutthroat encountering the weir pass through V-notches in the weir, which ultimately lead to a series of graders where fish are automatically sorted according to size.

Out-migrant Dolly Varden were daily enumerated from the live box at the weir, and the catch was measured every other day. Fish were released below the weir to continue their downstream migration. Dolly Varden out-migrants were inspected for fin clips and dart tags applied in a 1982 study.

Tag recovery work was not conducted in Montana Creek in 1984.

Auke Lake Cutthroat Trout Releases

Cutthroat trout were removed daily from the live box at the weir and inspected for fin clips (right and left ventral) to identify which 1983 test lot each fish came from. Sexually mature cutthroat trout were retained for spawning in a 6-foot-diameter fiberglass Swedish Pond in the hatchery building.

Sexual maturity of male cutthroats generally preceded that of females in spring, 1984. However, later in the spawning season when females were mature, only six males, which were all immature, were available for spawning. Gonadrotopin was acquired and injected into the males to induce maturity. Males were injected in the muscle tissue directly behind the dorsal fin. The dosage was 1 ml/kg of fish.

Steelhead Trout Fisheries Development

A total of 9,500 steelhead eggs were collected from four females at Peterson Creek on May 3, 1984, and milt was collected from 4 males. Mature spawners were captured from the stream by use of a gill net (5.38-inch stretch mesh) and backpack-mounted Smith-Root Electrofisher (Model VII). Eggs were taken in 500-ml plastic bottles, and sperm, in plastic Whirlpacs. Containers with gametes from individual fish were numbered so that the gametes could be identified later in the laboratory. All spawning equipment was disinfected with Wescodyne (200 ppm) after each fish was spawned. Gametes were packed in an Igloo cooler with ice and airfreighted to Anchorage. Personnel from the Pathology Laboratory quickly picked up the gametes so that minimal time was spent between the egg take and actual fertilization. Eggs were fertilized upon arrival at the Pathology Laboratory and incubated in Heath trays while undergoing pathological testing.

The spleens and sections of the kidney and hindgut from each adult fish and ovarian fluid from the females were sent to the Pathology Laboratory for testing. Samples were tested for the presence of *Aeromonas salmonicida*, *Renibacterium salmonarum*, and Infectious Hematopoietic Necrosis Virus (IHNV) using fluorescent-antibody, virology-plaque-assay, and cell-line techniques (Fish Pathology Section Accession Number 840251).

Aeromonas salmonicida, *Renibacterium salmonarum*, and IHNV were not detected in any of the fish. Eggs were, therefore, disinfected with 100 ppm iodophor and sent to Snettisham Hatchery on May 30 for continued incubation and rearing. Eggs were shipped via air to the hatchery in perforated baskets that were lined with muslin and placed in Igloo coolers. At Snettisham Hatchery, eggs were incubated in Edo incubators. Fry were reared in 2.5 m^3 circular ponds.

Admiralty Creek steelhead were collected for pathological analysis, should an alternate brood source be needed for local enhancement activities. A total of nine adults were collected by hook and line on April 30 and May 1, 1984. Samples were collected and tested as described for Peterson Creek spawners. Tissue samples from Admiralty

Creek steelhead were frozen in the field with dry ice and airfreighted to Anchorage on May 1, 1984. No pathological problems were identified in the Admiralty Creek steelhead samples.

Fisheries Habitat Assessment

Work was begun on a historical and current data base to determine the status of fish habitat in the Juneau area and protect the remaining fish habitat. Data were collected on over 50 streams, either from files or stream surveys conducted during the report period. It is anticipated that the Juneau Fish Habitat Assessment Document will contain information on over 60 streams when complete. Data were collected according to the following outline.

Creek Name
Anadromous Stream Number
Location (latitude and longitude)

1. Description
   - A) Drainage location
   - B) Salt water entry
   - C) Drainage area
   - D) Stream length and width
   - E) Gradient
   - F) Water color
   - G) Character--meanders, etc.

2. Fish species present
   - A) Present
   - B) Historical
   - C) Stocked

3. Fish Habitat
   - A) Spawning
   - B) Rearing
   - C) Cover types
   - D) Barriers

4. Public use

5. Land ownership

6. Land use
   - A) Residential
   - B) Industrial
   - C) Water
   - D) Gravel
   - E) Roads
   - F) Logging
   - G) Other impacts

7. Conclusion

8. Recommendations
   A) For habitat maintenance
   B) For improvement

Site reviews consisted of documenting fish presence through visual observation and/or minnow trapping with baited traps, identifying probable effects of proposed development, and determining opportunities to mitigate detrimental effects of proposed development.

The value of the fish production in a stream was documented through recovery of marked fish from sport and commercial fisheries (when data were available). Data concerning angler effort (when available) was also used to document public use and protect productive habitat. Estimates of coho salmon production in a stream were based on documented harvest rates of tagged stocks of fish and the spawning escapement from the stream. For example, Creek X has a spawning escapement of 500 coho which undergo a commercial harvest rate of about 50%. Therefore, the total production in the stream could be expanded to 1,000 adult coho annually, and an approximate dollar value to the fishery of the production in the stream could be established. Both dollar values and runs of 1,000 coho would be significant in defending productive fish habitat.

Time frames for work in the stream were stipulated to have least detrimental effect on fish production. In-stream work was not allowed during fry out-migration or fish spawning. In some instances, barriers were required and fish were removed from between barriers during in-water construction. When a section of stream is involved, upstream direction of construction is stipulated so that a minimum amount of the stream is effected by turbidity from the construction.

Streams not listed in the Anadromous Waters Catalog were nominated for inclusion when populations of anadromous fish were documented. Documentation of fish was accomplished by visual observation of rearing or spawning fish and by minnow trapping.

FINDINGS

Sport Fish Planning

The Juneau Sport Fish Enhancement Plan was produced in draft form. It identifies 14 sites that are currently considered suitable for stocking and 17 sites that will require further evaluation. At the time of this report, the document is being reviewed by the public and city, state, and federal agencies. Comments received will be reviewed and, if appropriate, incorporated into the final draft of the Juneau Sport Fish Enhancement Plan, which will be written in 1985. The final draft will be presented to the public and local resource and governmental agencies.

Once all potential enhancement sites have been evaluated, the Enhancement Plan will serve as an annual stocking schedule for local waters.

A copy of the draft Juneau Sport Fish Enhancement Plan is attached (Appendix A).

Experimental Dolly Varden Culture

The following are the results of experimental Dolly Varden culture at Snettisham Hatchery.

In 1981, 70,000 Dolly Varden eggs were taken from Cresent Lake brood stock, fertilized, and incubated. In 1982, 63,000 fry emerged (90% survival). Of these, 1,895 survived to smolt in 1984 (3% survival from fry to smolt). Mean fork length of the smolts was 174 mm; mean weight was 65g.

Hatchery personnel conducting this work at Snettisham Hatchery report that the fertilization of the eggs and the number of emergent fry produced were acceptable. The major problem encountered in this research was getting newly hatched fry to begin feeding. An estimated 90% of the mortality occurred during a short period and was attributed to fry not starting to feed.

Survival-to-smolt of the fry that did begin feeding properly was excellent. Only 10% of the fish that did begin to feed on time were lost through the 2-year rearing program.

Dolly Varden were reared in 6-foot-diameter Swedish Ponds and were fed Oregon Moist Mash. Chopped liver and brine shrimp were also fed in small quantities; however, a preference for a certain type of food was not observed.

The Dolly Varden fry stayed on or near the bottom of the pond and were not aggressive feeders, as salmon generally are. The fry had a very slow feeding response, which made it difficult for hatchery personnel to observe them feeding.

Further culture of Dolly Varden is not anticipated at this time. Culture techniques for successfully rearing Dolly Varden have been developed, especially in Japan. If Dolly Varden culture experiments be undertaken in the future, a complete review of hatchery culture techniques should be conducted.

Twin Lakes Fishery Development

South Twin Lake continued to be a very popular fishing location through 1984. A Kid's Trout Derby, sponsored by the Territorial Sportsmen and Chandler's Nugget Sports, was held June 23, 1984 for anglers 15-years-old and younger. During the Derby, 701 anglers fished 801 hours and caught 450 landlocked coho salmon, 27 Dolly Varden and 17 cutthroat trout, for a total of 494 fish.

Some wild coho, Dolly Varden, and cutthroat trout were present in South Twin Lake when the lake became landlocked and was originally stocked. The lake has been stocked annually since 1982, and the current fishery

is dependent on our stocking program. No marked coho salmon were recovered in the 1984 Derby nor were any marked Dolly Varden, even though marked Dolly Varden were stocked in the lake the day before the Derby. A statistically valid harvest study was not conducted throughout the 1984 season at Twin Lakes; however, cursory observations indicate heavy angler use and acceptable harvest of fish throughout the season.

High catch rates were reported by fly fishermen during insect hatches in late summer. Some fly fishermen reported catching 50-60 coho salmon per trip, they released with most or all of the fish. Fish seemed to school during the winter and provided good fishing for ice fishermen (especially when there were few people on the ice).

The South Twin Lake fishery appears to be very important to all ages and categories of local sport anglers. Because of the high level of use, it is believed that most of the fish stocked in the lake are eventually caught. Annual requests for approximately 5,000 coho salmon will be made to the FRED for continuation of the Twin Lakes fishery.

Auke Lake Dolly Varden Studies

A total of 4,512 Dolly Varden out-migrated from Auke Lake in the spring of 1984, of which 673 (15%) were probable spawners (based on their lengths). Fish greater than 310 mm fork length are assumed to be spawners (Blackett, 1968). The mean fork length of Dolly Varden out-migrants in 1984 was 231 mm. The number of out-migrants, mean length of fish and number of presumed spawners in 1984 were typical of Dolly Varden out-migrations since 1980. A comparison of these measures is presented in Table 2. Data collected since 1980 show a definite decrease in the mean length of Dolly Varden out-migrants compared to fish out-migrating in 1970 (Figure 1).

The decrease in numbers of larger Dolly Varden may be caused by increased angling pressure, decreased numbers of forage fish (sockeye) in Auke Lake, or some other factors. The length frequency of Dolly Varden out-migrants from Auke Lake is presented in Table 3.

Auke Lake Cutthroat Trout Releases

Assessment of two experimental releases of cutthroat trout in Auke Lake in 1983 continued in 1984. The stocking data associated with the two 1983 releases are presented in Table 4. The two groups were evaluated in terms of number of fish leaving the lake (Table 5). The cutthroat population in Auke Lake was not sampled.

Historical populations of cutthroat trout in Auke Lake were reportedly much larger than present populations. Research was initiated to determine if the cutthroat population could be increased by stocking hatchery-produced cutthroat and using Auke Creek Hatchery and Auke Creek cutthroat as brood stock. It is apparent that the cutthroat population has increased from these enhancement efforts because 34% of the cutthroat out-migrating in 1984 were marked. Sufficient recovery data is not yet available to make a complete comparison of the two experimental lots of cutthroat released in 1983.

Table 2. Auke Creek Weir Dolly Varden Out-Migration Data, 1970 and 1980-1984.

Year	Number of outmigrants	Mean fork Length (mm)	Number of spawners
1970	6,126	264.6	1,823 (29%)
1980	3,057	231.5	484 (15%)
1981	6,426	203.3	858 (13%)
1982	3,789	240.3	741 (19%)
1983	3,718	217.3	329 (08%)
1984	4,512	231.1	673 (15%)

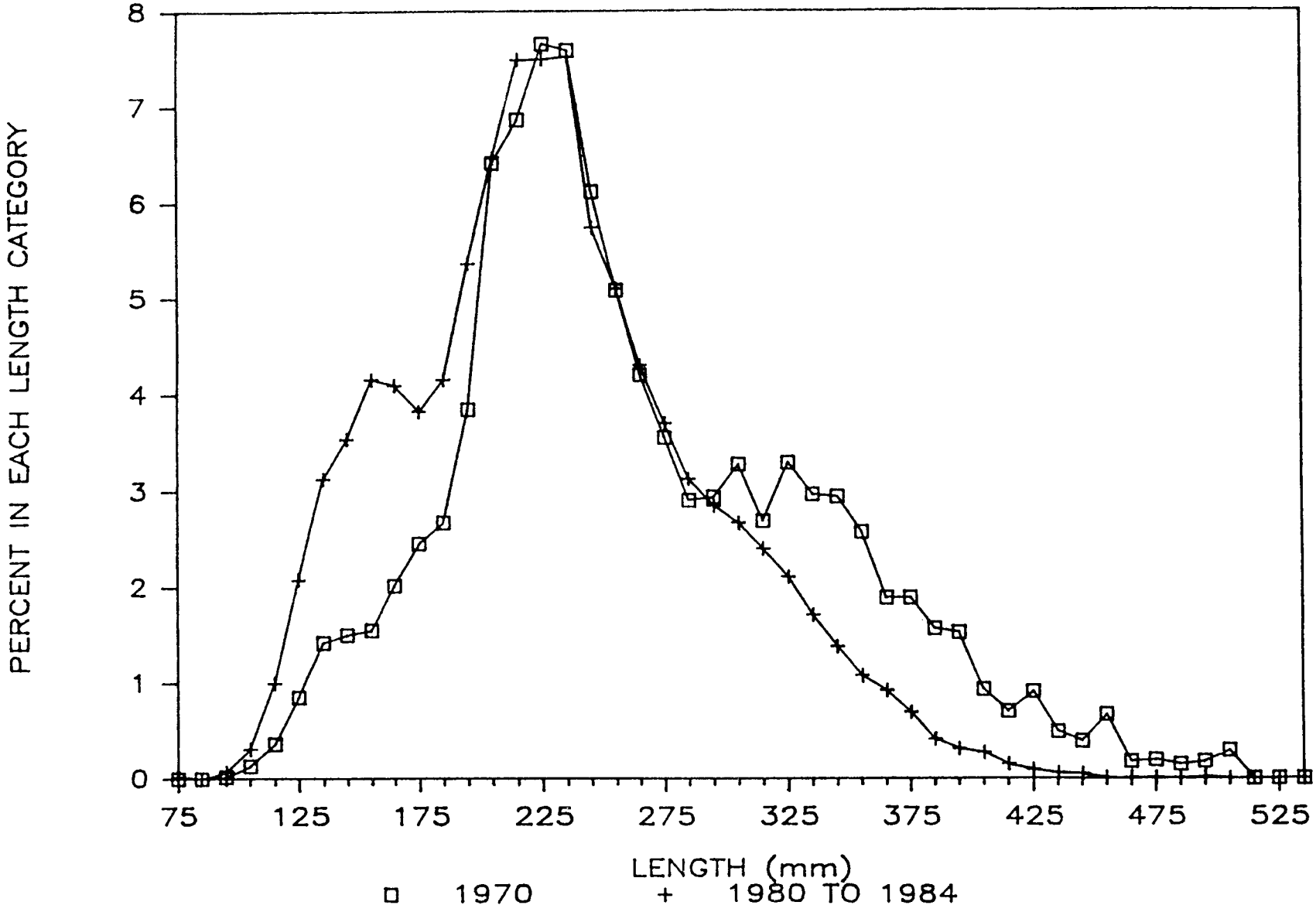

Figure 1. Auke Creek Dolly Varden Length Frequencies, 1970 and 1980-1984 (average).

Table 3. Length Frequency of Dolly Varden Out-Migrants from Auke Lake, 1970 and 1980-1984.

Fork Length Range (mm)	Fork Length Midpoint (mm)	Number in each category, by year					
		1970	1980	1981	1982	1983	1984
71-80	75	0	0	0	0	3	1
81-90	85	0	0	0	0	0	0
91-100	95	1	3	4	0	7	0
101-110	106	8	8	9	16	20	13
111-120	116	22	40	31	37	71	35
121-130	125	52	108	84	83	89	81
131-140	135	87	176	101	116	148	131
141-150	145	92	121	190	104	173	170
151-160	155	95	139	235	117	150	252
161-170	165	124	114	240	103	139	283
171-180	175	151	108	255	131	133	194
181-190	185	164	113	276	163	168	172
191-200	195	236	142	318	169	252	270
201-210	205	393	143	424	216	318	287
211-220	215	421	171	522	228	373	311
221-230	225	469	152	585	263	298	311
231-240	235	465	170	558	271	297	318
241-250	245	375	182	450	231	185	184
251-260	255	312	173	349	222	161	191
261-270	265	258	140	290	194	120	181
271-280	275	218	126	211	153	119	186
281-290	285	178	124	191	127	86	144
291-300	295	180	120	185	104	78	124
301-310	305	201	99	176	112	66	120
311-320	315	165	68	150	114	62	121
321-330	325	202	72	151	89	48	93
331-340	335	182	46	116	85	35	84
341-350	345	181	42	91	78	31	53

Table 3. (Cont.) Length Frequency of Dolly Varden Out-Migrants from Auke Lake, 1970 and 1980-1984.

Fork Length Range (mm)	Midpoint (mm)	Number in each category, by year					
		1970	1980	1981	1982	1983	1984
351-360	355	158	19	65	73	33	42
361-370	365	116	24	38	63	17	55
371-380	375	116	18	29	60	10	31
381-390	385	96	16	15	30	10	17
391-400	395	94	10	16	17	4	19
401-410	405	57	16	5	7	6	23
411-420	415	43	11	3	8	3	8
421-430	425	56	11	0	1	3	5
431-440	435	30	9	0	1	0	2
441-450	445	24	9	1	1	0	0
451-460	455	41	2	1	0	0	0
461-470	465	11	1	0	1	1	0
471-480	475	12	3	0	0	0	0
481-490	485	9	3	0	0	0	0
491-500	495	11	2	1	1	0	0
501-510	505	18	1	0	0	0	0
511-520	515	0	0	0	0	0	0
521-530	525	0	1	0	0	0	0
531-540	535	0	1	0	0	0	0
Total		6,126	3,057	6,366	3,789	3,717	4,512
$\bar{X}$ (mm)		264.6	231.5	230.3*	240.3*	217.3*	231.1
No. >310 mm**		1,823	484	858	741	329	673
(Probable spawners)** (%)		29	15	13	19	8	15

* These values calculated by multiplying the midpoint of range by the number of entries in that range.

** Fish >310 mm fork length were considered spawners.

Table 4. Auke Lake Cutthroat Trout Stocking Data, 1983.

	Lot A	Lot B	Total
Stocking date	04/26/83	08/03/83	...
Brood year	1981	1982	...
Age when stocked	2 years	1 year	...
Mean length	126 mm	97 mm	...
Number per lot	1,256	4,078	5,334
Mark	RV*	LV**	...

* Right ventral-fin clipped.

** Left ventral-fin clipped.

Table 5. Auke Creek Weir Cutthroat Trout Out-Migration Data, 1980-1984.

Year	RV*	LV**	Not marked	Total
1980***	...	...	0	85
1981***	...	...	0	157
1982***	...	...	0	157
1983	77 total		151	228
1984	40	64	198	302

* Right ventral-fin clipped.
** Left ventral-fin clipped.
*** Outmigration was made up of wild fish and thus, there were no marked fish in the population.

Male cutthroat have been observed to out-migrate from the lake earlier than females but in a less sexually mature condition. At one point, 40 female and 15 male cutthroat were being retained for spawning; however, these fish were plagued by infection with *Saprolegnia*, a fungus. When a heavy infection was observed on a fish, it was released and, ultimately, only six unripe males were left in the tank. All six males were injected with gonadotropin, and three of them were injected again on the next day. All males became sufficiently mature for spawning within 3 days of the first injection. The injection technique will be repeated earlier in the run in 1985 so that mature males should be available throughout the run.

Eight females and six males were spawned and 8,000 eggs were collected and incubated in heath trays. Unfortunately, an infestation of freshwater hydra (species unknown) developed on the screen on the water intake in Auke Lake and washed down into the incubators where they killed the cutthroat eggs.

The colony was physically removed by divers, and hydra have not been a major problem in the hatchery since. Subsequently, the quality of the hat hery's intake water has been closely monitored. Anytime hydras appear in the Heath trays, the trays are filled with salt water for 1 hour. This treatment is 100% effective in killing the hydras and does not harm the cutthroat eggs.

It is recommended that a study be conducted to determine whether mature cutthroat trout out-migrants caught at Auke Creek weir are actually enroute to seawater or whether they are just moving into the outlet of the lake (Auke Creek) to spawn. It would be much more desirable to take spawn from known lake-resident cutthroat than to take spawn from anadromous fish because progeny of lake-resident fish would be available to the lake sport fishery much longer than the progeny of anadromous fish.

Steelhead Trout Fisheries Development

In 1984, a total of 9,500 steelhead eggs were taken from Peterson Creek. Of these, 6,000 became eyed and produced only 3,200 emergent fry. About 3,100 steelhead fingerlings from the 1984 egg take are presently rearing in Snettisham Hatchery. Technicians at the hatchery feel there was evidently a problem in fertilizing the eggs because only 63% became eyed and only 53% of the eyed eggs survived to the emergent fry stage. Since hatching at Snettisham Hatchery, survival of this lot of fry has been 97%. Poor fertilization may have been caused by defective males or poor quality eggs; i.e., the females may have already been partly spawned. At this point, poor fertilization is not considered to be caused by the method of gamete transport. In 1985, special attention will be given to the quality of spawners from which eggs are taken. Furthermore, gametes will not be taken from fish that have commenced natural spawning.

Pathology samples (a section of kidney and hindgut from all fish, plus ovarian fluid from the females) were taken from adult Admiralty Creek steelhead in 1984 and found to be disease free; however, samples from

60 juvenile steelhead must be analyzed before the stock can be officially approved as a donor stock. It is recommended that the sample of juvenile steelhead be collected in 1985 for pathological analysis.

Fisheries Habitat Assessment

Data were collected on 50 streams in the Juneau area in 1984 for inclusion in the Juneau Fish Habitat Assessment Document. Stream surveys were conducted on 14 local streams that are within areas scheduled for land-use development. A summary of data collected on stream surveys in 1984 is presented in Table 6. A summary of fish species present and a habitat analysis for local streams surveyed in 1984 is presented in Table 7.

When complete, the Juneau Fish Habitat Analysis Document will contain information on about 60 streams.

Tables will be prepared to show survey information, trap data, fish species present, and habitat analysis of individual streams. Additionally, stream descriptions, maps, escapement counts, stocking histories, and management prescriptions will be included in chapters on individual streams. An individual stream chapter on Jordan Creek is attached (Appendix B) as an example.

During the report period, two local streams were nominated for inclusion in the Anadromous Waters Catalog and additional species were reported for 10 streams (Table 8).

Table 6. Summary of Stream Surveys Conducted in Juneau, 1984. Abbreviations used are listed in Table 1.

Stream	Section	Survey Dates	Number of traps set	Catch*/trap	Species observed only*
Jordan Creek	Lower	5/28/85	5	9.8 SS, 8.4 DV	...
	Middle	7/6-10/84	22	23.7 SS, 9.4 DV	...
	Upper	7/20-22/84	12	24.0 SS, 3.3 DV	...
Vanderbilt Creek	Lower	8/6/84	0	0	FL,SS,CS,CD
	Middle	8/13,27,21/84	13	4.7 SS, 12.7 DV, 1.75 B	
	Upper	8/15/84	0	0	SS,DV
Switzer Creek	Lower	7/25,27-28,31/84	14	3.9 SS, 11.3 DV	SS,FL,CD
	Middle	7/31,28/84	13	13.1 SS, 26.1 DV, 0.2 CT	...
	Upper	8/1,7/84	11	9.9 SS, 18.4 DV, 0.1 CT	...
Peterson (O.P.) Creek	Lower	4/8/85	Not recorded	15.5 SS, 3.5 DV, 0.1 CT	...
	Middle	4/10,11/85	Not recorded	11.9 SS, 4.9 DV, 1.5 CT	...
	Upper**	4/11,15,17-18,22/85	Not recorded	5.9 SS, 3 DV, 1.1 CT	...
Montana Creek	Lower		0	0	...
	Middle	4/10-12/84	Not recorded	62.3 SS, 9.3 DV	...
	Upper	9/17/84	Not recorded	15.6 SS, 5.1 DV	...
Eagle Creek	Lower	8/16/84	2	2.0 SS, 8.5 DV	...
	Upper**	8/16/84	1	0	yes
Mile 3.05 North Douglas Highway	Lower**	8/17/84	5	0	...
	Upper**	8/17/84	5	0	...
Falls Creek	Lower	8/22/84	5	5.6 DV	no
	Upper	8/22/84	0	0	yes
Ninemile Creek	Lower	8/29/84	0	handnet yielded 33 SS, 1 DV	...
	Upper	8/29/84	0	0	...
Hendrickson Creek	Lower	8/31/84	4	1.8 SS, 6.8 DV, 2.3 CT	...
	Upper	8/31/84	5	1 SS, 5.8 DV, 3.6 CT	...
Johnson Creek	Lower	8/30/84	1	3 SS, 3 DV	...
	Upper	8/30/84	5	1.6 SS, 2.6 DV, 1.6 CT	...
Nielson Creek	Lower	9/7/84	3	0.3 SS, 11.7 DV	no
	Upper	9/7/84	0	0	...

Table 6. (Cont.) Summary of Stream Surveys Conducted in Juneau, 1984. Abbreviations used are listed in Table 1.

Stream	Section	Survey Dates	Number of traps set	Catch/trap	Species Observed only
Bessie Lake and Creek	Lower	7/12/84	4	6.3 CT	...
	Upper	7/12/84	1	2.5 CT	...
Duck Creek	Lower	7/24/84, 4/2/85	14	1.1 SS, 0.1 DV	...
	Middle	5/14, 6/22, 7/24/84	38	17.5 SS, 0.3 DV, 0.1 CT	...
	Upper	1/14, 4/2-3,9/85	14	4.4 SS, 0.1 DV	...
Engineer's Cutoff Creek	Lower	4/4/85	2	4 SS, 2 DV	...
	Upper	4/4/85	7	1.3 SS, 0.1 DV	...
Casa Del Sol Creek	Lower	4/4-5/85	6	8.7 SS, 0.3 DV	...
	Upper	4/4-5/85	4	3.5 SS, 1.0 DV	...

* Species observed but no trap data.

** Section not mapped or photographed.

Table 7. Species Present and Fish Habitat Index of Streams in the Juneau Area. Abbreviations for Species are Listed in Table 1.

Stream	Section	Species Present								Habitat index*								Total
		SS	PS	CS	RS	DV	CT	SY	FL	WW	GR	RA	BD	MN	LG	UD	ID	
Jordan Creek	Lower	X		X		X	X			5+3	5	5+3	0	0	0	5	5+3	34
	Middle	X		X		X	X			5+3	0	5+3	0	0	5	5+3	0	29
	Upper	X		X		X	X			5+3	5	5+3	0	0	3	5+3	5	37
Vanderbilt Creek	Lower	X		X		X			X	5	5	5	0	0	0	5	5+3	28
	Upper	X		X		X			X	5	5+3	5+3	0	0	0	3	5+3	29
Switzer Creek	Lower	X		X		X		X		5	0	5+3	0	0	0	5+3	5+3	29
	Upper	X		X		X		X		5+3	0	5+3	0	0	5	5+3	0	29
Peterson (O.P.) Creek	Lower	X	X	X		X	X			5	0	5	0	0	0	5	0	15
	Middle	X	X	X		X	X			0	0	3	0	0	1	3	0	7
	Upper	X	X	X		X	X			0	0	3	0	0	1	3	0	7
Montana Creek	Lower	X	X	X		X				5	0	5	0	0	0	5	0	15
	Middle	X	X	X		X				5+3	0	5+3	0	5+3	0	5+3	0	32
	Upper	X	X	X		X				0	0	5	0	5+3	3	0	0	16
Eagle Creek	Lower	X	X	X		X				5+3	0	5	5	0	0	5+3	5	31
	Upper	X	X	X		X				0	0	3	0	0	0	3	0	6
Falls Creek	Lower					X				5+3	0	5	0	0	0	5+3	0	21
	Upper					X				5+3	0	5+3	5	0	0	5+3	0	29
Ninemile Creek	Lower	X		X		X				0	0	5	0	0	0	5	0	10
	Upper	X		X		X				5+3	0	5+3	0	0	0	5	0	21
Hendrickson Creek	Lower	X	X			X	X			5	0	5+3	0	0	0	5	0	18
	Upper	X	X			X	X			5+3	0	5	0	0	0	5+3	0	21
Johnson Creek	Lower	X	X			X	X			5	0	5	0	0	0	5+3	0	18
	Upper	X	X			X	X			5+3	0	5+3	0	0	0	5+3	0	24
Nielsen Creek	Lower	X			X					5+3	0	5	0	0	0	5	5	23
	Upper	X			X					5+3	0	5+3	5	0	0	5+3	0	29

Table 7. (Cont.) Species Present and Fish Habitat Index of Streams in the Juneau Area. Abbreviations for Species Are Listed in Table 1.

Stream	Section	Species present								Habitat index*								Total
		SS	PS	CS	RS	DV	CT	SY	FL	WW	GR	RA	BD	MN	LG	UD	ID	
Bessie Lake/Creek	Lower						X			5	0	5	0	0	5	5+3	0	23
	Upper						X			0	0	5	0	0	5	0	0	10
Duck Creek	Lower	X	X	X		X	X			5+3	5	5+3	0	0	0	5+3	5+3	37
	Middle	X	X	X		X	X			5+3	5	5+3	0	0	0	5+3	5+3	37
	Upper	X	X	X		X	X			5+3	5	5+3	0	0	0	5+3	0	29
Engineer's Cutoff Creek	Lower	X				X												
	Upper	X				X												
Casa Del Sol Creek																		
	Lower	X				X												
	Upper	X				X												

* WW = water withdrawal
GR = gravel removal
RA = road access
BD = barrier dams
MN = mining
LG = logging
UD = urban development
ID = industrial development

0 = none
1 = considered
3 = planned
5 = existing

Table 8. Juneau Area Streams Nominated for Inclusion in Anadromous Waters Catalog or Reported to Contain Additional Species in 1984. Abbreviations for Species Are Listed in Table 1.

Stream	Additional species
Vanderbilt Creek 111-40-10120	CS
Hendrickson Creek 111-50-10980	SS, CT, PS
Nielson Creek 111-50-10960	SS
Johnson Creek 111-50-10660	PS, CT
Ninemile Creek 111-50-10670	SS, CS
Peterson Cr. (Outer Pt) 111-50-10750	CT
Switzer Creek 111-40-10070	CT
Jordan Creek 111-50-10620	CT
Duck Creek 111-50-10600	CT, CH
Montana Creek 111-50-2003	SH
Unnamed* 111-50-	SS, DV
Unnamed* 111-50-	SS, DV
Unnamed 111-50-10370	CT, DV, CS

* Nominated for inclusion in Anadromous Waters Catalog.

APPENDIX A

DRAFT JUNEAU AREA SPORT FISH ENHANCEMENT PLAN

The goals of this plan are to maximize recreational angling opportunities and the number of fish available to anglers fishing along the Juneau road system. This plan identifies fishery enhancement opportunities, identifies numbers and species of fish for stocking and directs efforts to evaluate potential stocking sites.

Local recreational anglers will benefit from the efforts outlined in this Plan in that fishery enhancement projects will be developed and maintained.

According to this Plan, fish released will usually be for harvest only and harvest of adults returning to terminal areas will be maximized through advertisement and management of the sport fishery. There will not be a need to protect returning adults for brood stock, except where indicated in the original plan. All lots of fish will be tagged before release, and return rates of stocked fish to the Juneau roadside fishery, other fisheries, and to the rearing station will be determined through tag recoveries. The success of these stocking activities will be determined by the numbers of fish provided to the recreational fisheries.

The Area Sport Fish Biologist will take the lead role in identifying local enhancement projects and will make an annual request to the Area FRED Biologist for fish for stocking. It is assumed that fish for stocking in the Juneau area will come from State hatcheries; however, requests may be made to other agencies when the State hatcheries can not fulfill these requests. Projects outlined in this plan will have priority for State hatchery production that is not obligated for State hatchery release or other State projects.

Other agencies interested in local fishery enhancement may participate in such activities either in cooperation with the State or independently (with a plan reviewed and approved by Area Sport Fish and FRED Biologists). Fish Transport Permits will be required of all agencies implementing enhancement activities.

This plan is intended for long-term use and will be updated annually as new data become available.

Site Selection

Stocking programs for recreational enhancement in the Juneau area will address the following criteria and concerns.

It will be necessary to select locations with adequate and suitable water supplies, public access, and physical characteristics. It is equally important to select areas where acceptable recreational catch rates can be obtained.

It must be recognized that a successful sport fishery requires both an abundance of fish and a harvest rate that satisfies participating anglers. Therefore, it is intended that fish returning to an enhancement site will be of acceptable numbers, quality, and timing to generate desired harvest rates.

The effect of (and on) other fisheries must be taken into consideration when implementing recreational fishery enhancements.

Recreational fisheries are generally less effective in harvesting fish than commercial fisheries. Thus, to provide acceptable recreational harvest rates after the fish have passed through one or more commercial fisheries, it may be necessary to pass a greater number of fish through the fisheries that are actually commercially harvested. This number of fish will likely be much larger than the number ultimately harvested by the terminal recreational fishery.

In certain locations, it may not be possible to produce sufficient numbers of fish, after commercial harvest, to provide acceptable recreational harvest rates. Continuation of enhancement in locations where such situations exist will be critically examined.

Mixed-stock situations should be avoided when developing enhancement programs.

Simultaneous enhancement of different stocks and species in the same area or location could complicate fishery management and adversely impact local, wild stocks of fish. If a particular enhancement program is very successful, the probability exists that, in order to adequately harvest artificially produced fish, natural stocks in the system could be overfished. In most instances, every effort should be made to safeguard natural fish stocks, either by limiting the number of hatchery produced returns or by locating enhancements of a particular species in areas where substantial natural returns of that species do not occur.

The physical capabilities and limitations of our enhancement sites must be considered when planning enhancement programs.

In some sites, it may be feasible (and very easy) to produce numbers of fish exceeding those necessary for an acceptable sport fishery. For example, an artificial return of 20,000 coho salmon to a small stream with restricted public access may be undesirable because the site is unable to accommodate the numbers of anglers such a return would attract. However, such a large return in a larger system or one with public, marine-shoreline access would be very desirable.

Enhancement sites must be readily accessible to recreational anglers. Public facilities, the amount of public property, and the number of anglers that an area can accommodate must be carefully considered in planning any fishery enhancement project.

Recreational fishery enhancements should be located as close as possible to the existing road system. When developing marine- shoreline fisheries, it will be desirable to select sites near harbor facilities or where small craft can be easily launched.

Provisions for acquisition of lands to meet recreational access requirements may be necessary to develop the full potential of some sites.

Selection of the appropriate species and genetic strain of fish is important to the success of the enhancement activity.

Local anglers are interested primarily in chinook, coho, and pink salmon and steelhead trout. Sport-fish enhancement efforts will work primarily with chinook and coho salmon and steelhead trout. Most enhancement efforts will consist of releasing smolts of these species. We have no plans for local enhancement of pink salmon. Wild stocks and local Private Non-Profit hatcheries should satisfy recreational fishery needs of this species.

It is important to select stocks for enhancement that will enter recreational fisheries in prime condition during a time period that will allow maximum utilization of the fish. Races of fish that arrive late in the season or in a very mature condition should be avoided.

We should continually strive to develop stocks that will be available to the fisheries for the maximum amount of time, while keeping in mind that stocks with different timing may undergo different levels of exploitation before returning to terminal-area fisheries.

We should work with salmon stocks that tend to rear in local marine waters, rather than with stocks that migrate out of the local areas. Release studies should be implemented to develop proper timing and techniques that will increase local marine-rearing tendencies of released fish.

It is important to select donor stocks for enhancement efforts that are genetically adapted to the area, e.g., similar timing and similar size and type of stream. Egg-take schedules should be strictly adhered to. Donor stocks from outside the enhancement area could be used on an experimental basis; however, such programs must be critically evaluated.

Implementation and continuance of enhancement activities may have great effects on recreational opportunities and fish-producing facilities.

The following concerns should be considered in planning enhancements which use hatchery-produced fish.

> Enhancement programs should be restricted to small or moderate size until the effectiveness and feasibility of the particular operation is assessed to ensure best use of hatchery production. This is especially important in activities that are dependent on wild systems for brood stock. It is important that egg-take schedules be adhered to, and, if appropriate, a portion of hatchery reared smolts should be returned to the donor system, especially in small systems.

Evaluation of the contribution of an enhancement program to the recreational fishery warrants the most critical assessment.

> Enhancement sites should be selected so that the enhancement to the target fishery and other factors affecting the contribution to the target fishery can be fully evaluated.
>
> Funding of enhancement evaluation should be recognized as essential, and funds should be secured before implementation of the actual enhancement effort. This program component, if overlooked, may necessitate unplanned diversion of funds from other critical programs.
>
> Analysis of program effectiveness in providing fish to the recreational fishery will require marking of released smolts and recovery of marked adult salmon from all user groups harvesting fish returning to the target fishery. Evaluation of enhancement programs via tag recovery will be conducted for at least two or three generations of fish or until the success of the program has been determined.

Local Opportunities

All local stocking sites and their potentials are not presently known. Because of this, potential freshwater and seawater sites are separated into three categories depending on:

1. Information on sites available,

2. Feasibility and logistics of stocking, and

3. How well the site meets stocking-site criteria.

Class-I Sites:

These sites have been determined to be feasible stocking sites with no known problems with public access or other factors that would reduce the effectiveness of enhancement activities. A proposed stocking schedule for Class-I sites is presented in Table A-1. Locations are given in Figure A-1. A list of stocking sites by priority is given in Table A-2.

Table A-1. Enhancement Planned for the Juneau Recreational Fishery. FW = freshwater; SW = seawater.

Location	Release site	Coho salmon	Chinook salmon	Steelhead trout	Cutthroat trout
		1985			
Dredge, Moose Lake	F W	20,000	0	0	0
Montana Creek	F W	0	0	3,000	0
Fish Creek	F W	0	0	0	0
Salmon Creek	F W	20,000	0	0	0
Auke Lake	F W	0	0	0	0
Twin Lakes	F W	3,000	0	0	0
Fish Creek Ponds	F W	0	0	0	0
Glacier, Moraine Lakes	F W	0	0	0	0
Peterson Creek (25 mile)	F W	0	0	0	0
Auke Bay	S W	0	0	0	0
Lena Cove	S W	0	0	0	0
Fritz Cove	S W	0	0	0	0
Gastineau Channel					
Salmon Creek	S W	0	0	0	0
Sheep Creek	S W	0	0	0	0
		1986			
Dredge, Moose Lake	F W	50,000	or 50,000	0	0
Montana Creek	F W	0	50,000	5,000	0
Fish Creek	F W	50,000	or 50,000	0	0
Salmon Creek	F W	50,000	0	0	0
Auke Lake	F W	0	0	0	5,000
Twin Lakes	F W	10,000*	0	0	0
Fish Creek Ponds	F W	1,000*	0	0	0
Glacier, Moraine Lakes	F W	0	0	0	1,000
Peterson Creek (25 mile)	F W	0	0	0	0
Auke Bay	S W	0	50,000	0	0
Lena Cove	S W	0	0	0	0
Fritz Cove	S W	0	0	0	0
Gastineau Channel					
Salmon Creek	S W	50,000	0	0	0
		or			
Sheep Creek	S W	50,000	0	0	0

* Landlocked.

Table A-1. (Cont.) Enhancement PLanned for the Juneau Recreational Fishery. FW = freshwater; SW = seawater.

Location	Release site	Coho salmon	Chinook salmon	Steelhead trout	Cutthroat trout
		1987			
Dredge, Moose Lake	F W	50,000	or 50,000	0	0
Montana Creek	F W	0	50,000	5,000	0
Fish Creek	F W	50,000	or 50,000	0	0
Salmon Creek	F W	50,000	0	0	0
Auke Lake	F W	0	0	0	5,000
Twin Lakes	F W	5,000*	0	0	0
Fish Creek Ponds	F W	0	0	0	0
Glacier, Moraine Lakes	F W	0	0	0	0
Peterson Creek (25 mile)	F W	0	0	2,000	0
Auke Bay	S W	0	50,000	0	0
Lena Cove	S W	0	50,000	0	0
Fritz Cove	S W	0	0	0	0
Gastineau Channel					
Salmon Creek	S W	50,000	0	0	0
		or			
Sheep Creek	S W	50,000	0	0	0
		1988			
Dredge, Moose Lake	F W	100,000	or 100,000	0	0
Montana Creek	F W	0	100,000	20,000	0
Fish Creek	F W	100,000	or 100,000	0	0
Salmon Creek	F W	100,000	0	0	0
Auke Lake	F W	0	0	0	10,000
Twin Lakes	F W	10,000*	0	0	0
Fish Creek Ponds	F W	1,000*	0	0	0
Glacier, Moraine Lakes	F W	0	0	0	1,000
Peterson Creek (25 mile)	F W	0	0	2,000	0
Auke Bay	S W	0	100,000	0	0
Lena Cove	S W	0	100,000	0	0
Fritz Cove	S W	0	0	0	0
Gastineau Channel					
Salmon Creek	S W	100,000	0	0	0
		or			
Sheep Creek	S W	100,000	0	0	0

* Landlocked.

Table A-1 (Cont.) Enhancement Planned for the Juneau Recreational Fishery. FW = freshwater; SW = seawater.

Location	Release site	Coho salmon	Chinook salmon	Steelhead trout	Cutthroat trout
		1989			
Dredge, Moose Lake	F W	100,000 or	100,000	0	0
Montana Creek	F W	0	100,000	20,000	0
Fish Creek	F W	100,000 or	100,000	20,000	0
Salmon Creek	F W	100,000	0	0	0
Auke Lake	F W	0	0	0	10,000
Twin Lakes	F W	5,000*	0	0	0
Fish Creek Ponds	F W	0	0	0	0
Glacier, Moraine Lakes	F W	0	0	0	0
Peterson Creek (25 mile)	F W	0	0	2,000	0
Auke Bay	S W	0	100,000	0	0
Lena Cove	S W	0	100,000	0	0
Fritz Cove	S W	0	0	0	0
Gastineau Channel					
Salmon Creek	S W	100,000	0	0	0
		or			
Sheep Creek	S W	100,000	0	0	0

Table A-2. Juneau Fish-Stocking Sites, Prioritized by Species, Location and Year. SS = coho salmon; KS = chinook salmon; SH = steelhead trout; CT = cutthroat. FW = freshwater; SW = seawater.

Location	Release site	1985				1986				1987*				1988 and 1989*			
		SS	KS	SH	CT	SS	KS	SH	CT	SS	KS	SH	CT	SS	KS	SH	CT
Dredge, Moose Lakes	F W	1	...	...	...	1	1	...	...	1	1	...	...	1	1	...	...
Montana Creek	F W	...	...	1	...	...	3	1	...	...	3	1	...	...	3	1	...
Fish Creek	F W	...	...	...	...	4	4	...	...	4	4	3	...	4	4	3	...
Salmon Creek	F W	2**	...	...	...	2	...	...	...	2	...	...	...	2	...	...	...
Auke Lake	F W	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	1
Twin Lakes	F W	1**	...	...	...	1**	...	...	...	1**	...	...	...	1**	...	...	...
Fish Creek Ponds	F W	...	...	...	...	2**	...	...	...	...	...	...	...	2**	...	...	...
Glacier/Moraine Lakes	F W	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	2
Peterson Creek (25 mile)	F W	...	...	...	...	...	...	2	...	...	...	2	...	...	...	2	...
Auke Bay	S W	...	...	...	...	...	2	...	...	...	2	...	...	...	2	...	...
Lena Cove	S W	...	...	...	...	...	...	...	...	...	5	...	...	...	5	...	...
Fritz Cove	S W	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gastineau Channel																	
Salmon Creek	S W	...	...	...	...	3 or	...	...	...	3 or	...	...	...	3 or	...	...	...
Sheep Creek	S W	...	...	...	...	3	...	...	...	3	...	...	...	3	...	...	...

*** Landlocked.

** 20,000 fish minimum per release lot. If not available, all fish go to first priority site.

* Priority of stocking sites may change depending on performance of earlier releases.

Class-II and Class-III stocking sites are not presently included in these stocking plans because biological or public access investigations must be conducted before the sites are considered suitable for stocking. Evaluation efforts will be directed toward Class-II and Class-III sites. Eventually, all sites will be determined to be either stocking sites and included in stocking plans or will be dropped from Enhancement Plans. Once all enhancement opportunities are known, the final Juneau Area Fish Stocking Plan can be written.

Class-II Sites:

The following waters are considered viable stocking sites, however, concerns about public access or other factors must be addressed before these sites are included in stocking plans.

Location	Concern
Cowee Creek	Public access. Site has outstanding biological potential.
Peterson Creek (25 mile)	Public access. Steelhead will be stocked only to maintain brood stock. 2,000 smolts will be stocked annually beginning 1986.
Gastineau Channel	
(off Gold Creek)	Parking.
(off Eagle Creek)	Access, parking.
(off Kowee Creek)	Access, parking.
Marshall Pond	Public access.
Mitchell Pond	Public access.
Riverside Drive Pond	Dissolved oxygen.
Floatplane Lake	Public access, fish containment.
Mendenhall Campground Lake	Wild vs. hatchery stocks fish containment.
Tee Harbor (off Waterfall Creek)	Water depth, access.
Norton Lake	Anadromous fish access.

Class-III Sites

The following sites may be potential stocking sites; however, biological evaluations on the waters must be conducted and concerns over land ownership and public access must be addressed before the sites are included in the stocking plan: Point Bridget Lakes, Herbert Glacier Lakes, Red Sam Gravel Pit, Smith's Gravel Pit and the J.R.M. Gravel Pit.

APPENDIX B

JORDAN CREEK

Anadromous Catalog Number: 111-50-62
Location: Lat. 58°21'25" N Long. 134°34'10" W (east side of the Mendenhall Valley)

Description

Jordan Creek drains the east side of the Mendenhall Valley . It flows through a culvert under the runway at the Juneau Municipal Airport and enters Gastineau Channel on the downstream side of the runway. The stream drains an area of 1,700 acres and is about 3 miles long. The width of the main stem varies from 5 feet to 20 feet, and the depth varies from 4 inches in riffles to more than 8 feet in beaver ponds.

Three small, spring-fed tributaries combine to form Jordan Creek. The flow in the spring areas is intermittent. Water color in the headwaters is clear; however, just upstream from the beaver dams, water becomes colored from muskeg drainage.

Jordan Creek is a low-gradient system, and meanders are common throughout the length of the stream. The normally slow-flowing stream provides excellent habitat for salmonids requiring extended freshwater rearing.

Fish species present include coho and pink salmon, Dolly Varden, cutthroat trout, sticklebacks, and cottids. Table B-1 shows the minnow-trap catch data for coho and Dolly Varden. Table B-2 presents the historical coho-escapement data. Historically, the stream was reported to have had a small run of sockeye salmon. Brook trout were introduced into Jordan Creek in 1953; however, they are not presently found in the system (Table B-3). Coho salmon were stocked in 1970. The reasons for, and results of, the coho plant are not known.

Good rearing and spawning habitat is found throughout the Jordan Creek system. There are many pools and riffles. Streamside cover is generally excellent, with overhanging willow and alder in the upper areas and overhanging grass in the lower sections. A system of three active beaver ponds covering about 10 acres is located midway between Egan Drive and the stream headwaters. There are no fish barriers on Jordan Creek.

Jordan Creek provides excellent areas for children to play and explore. There are several small swimming holes in the upper reaches. Water fowl, mink, marten, black bear and several species of song birds are frequently found along the stream above Egan Drive. Historically, Jordan Creek was a good place to fish for coho salmon, Dolly Varden, and cutthroat trout. The stream was closed to angling in 1983 to protect declining fish stocks, which had been depleted partially because of encroaching residential developments and the loss of habitat.

Land Ownership-Land Use

Most of the property bordering Jordan Creek is in private ownership; however, the City and Borough of Juneau has holdings near the stream mouth and on the east side of the stream above Egan Drive.

Many private residences are located on the west side of Jordan Creek above Egan Drive. Even though residences are quite close to the stream, there is usually a good vegetation buffer to naturally filter surface drainage.

A gravel pit, about 2 acres in size and 70 feet deep, was excavated directly over one of the tributaries in the Jordan Creek headwater. From the mid-1970s until 1983, the pit was used as a refuse dump. Decomposition of garbage and trash in the pit produced dissolved oxygen levels in the pit of less than 1 ppm. In 1983, Jordan Creek was routed around the pit, which is now being filled with only wood and soil; however, oxygen deficient drainage from the pit still drains into Jordan Creek.

An old timber clear-cut exists on the east bank of Jordan Creek opposite Nancy Street. Large quantities of tree limbs and slash were deposited in Jordan Creek. In some spots, water flow is greatly restricted by logging litter still in the stream.

From Egan Drive downstream, Jordan Creek is flanked by a major business and industrial area. Between Egan Drive and Old Glacier Highway, development has occurred up to the stream bank in many places. In this section, streamside vegetative buffers are often less than 10 feet wide.

A 270-foot-long culvert was recently placed under Old Glacier Highway for Jordan Creek to run through. The section of habitat which was replaced by the culvert was documented to contain the highest density of rearing coho salmon found in southeast Alaska.

Directly downstream from Old Glacier Highway, a 1,000-foot-long section of Jordan Creek was channeled in 1970. This section of stream has recovered from the excavation. It currently has good streamside cover and is productive fish habitat.

The culvert through which Jordan Creek runs under the Fire Station to the runway access road is reported to have been set 2 feet too high in elevation. Because of this, pools upstream from the culvert are acting like settling basins and filling in much more rapidly than they would naturally.

Jordan Creek downstream from Egan Drive has periodically dried up for several years. This could be caused by water withdrawal, natural uplift, or both.

Conclusion

Even though Jordan Creek has been adversely impacted by land-use activities in the past, it remains one of the most productive fish systems in the Juneau area. Substantial areas of streamside habitat remain in near-natural condition. With proper management of the streamside habitat and stream enhancement, fish production in Jordan Creek can be maintained at current levels or even increased.

Recommendations

1. Streamside greenbelts of at least 25 feet should be established along each side of Jordan Creek, its tributaries, and important flood plains and channels. The ADF&G, having regulatory authority of state waters, will identify important flood plains. Streamside greenbelts would remain in natural condition and would be considered public property.

2. The old gravel pit in the headwaters of Jordan Creek should be filled in as quickly as possible. Impermeable barriers should be placed on the Jordan Creek side of the pit to prevent lateral seepage from the pit into Jordan Creek.

3. Limbs and slash from the old clearcut near Nancy Street should be removed from Jordan Creek to facilitate stream flow. Removal of this material could serve as mitigation for some future development along this section of Jordan Creek.

4. Only bridges or bottomless culverts should be used in future road crossings of Jordan Creek. Bottomless culverts should be used only in locations where floodplains are narrow. In locations where floodplains are wide, pile-supported bridges should be used, and the entire flood channel should be spanned. Streamside floodplains must be maintained to facilitate water flow. Furthermore, fill material in these areas should not be permitted.

5. Downstream from Egan Drive, deep roots are needed for fish refuge during periods when this section of the creek is dry. Construction of the pools could serve as mitigation for some future developmental activity along this section of Jordan Creek.

6. Withdrawal of water from Jordan Creek or groundwater within 25 feet of the stream should not be permitted.

7. Jordan Creek should be cleaned annually to remove all refuse and debris from the stream and greenbelt areas. Such a project would require public participation and should be organized by a local governmental agency or resource-oriented group.

Table B-1. Minnow-Trap Catch as of Coho Salmon and Dolly Varden in Jordan Creek.

Area	Date	Traps (No.)	Coho Salmon (No.)	Dolly Varden (No.)
Runway to Yandukin Drive	11/13/84	4	70	11
Yandukin Drive to Old Glacier Highway	11/13/84	2	30	19
Old Glacier Highway to Egan Drive	05/28/85	5	49	42
Egan Drive to Nancy Street	07/06/84	7	223	40
Nancy Street to Hays Way	07/09/84	9	235	115
Hays Way to Amalga Street	07/10/84	6	63	51
Amalga Street to East Fork headwater	07/20/84	8	178	32
Remaining headwaters	07/22/84	6	108	3

Table B-2. Escapement Counts for coho salmon in Jordan Creek. No Chum, Pink, or Sockeye Salmon were counted.

Date	Coho
10/14/69	6
10/08/76	50
10/31/78	87
10/29/79	51
10/20/80	31
10/20/81	482
10/12/82	368
10/31/83	182
10/22/83	184
10/26/84	250

Table B-3. Fish-Stocking Record For Jordan Creek.

Date	Species	Total	Water Temp. (°F)	Source	Planted By
6/30/53	Brook trout	3,000 fry	66°	...	Territorial Sportsmen
7/7/55	Coho salmon	5 males, 5 females	...	Duck Creek	...
5/20/70	Coho salmon	4,800	...	...	...

LITERATURE CITED

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Prepared by:

Michael R. Bethers
Fishery Biologist

Approved by:

E. Richard Logan, Ph.D, Director
Division of Sport Fish

Louis S. Bandirola, Deputy Director
Division of Sport Fish