

STATE OF ALASKA

*Jay S. Hammond, Governor*

Annual Performance Report for

DEVELOPMENT OF TECHNIQUES FOR  
ENHANCEMENT AND MANAGEMENT OF  
ANADROMOUS CUTTHROAT TROUT IN SOUTHEAST ALASKA

by

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## RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations  
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Project No.: AFS-42 Project Title: A STUDY OF CUTTHROAT-  
STEELHEAD IN ALASKA

Segment No.: AFS-42-9-B Segment Title: Development of Techniques for  
Enhancement and Management of  
Cutthroat Trout in Southeast  
Alaska

Cooperator: Darwin E. Jones

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## ABSTRACT

This report covers the fifth year of study on the development of techniques for the management and enhancement of cutthroat trout, Salmo clarki Richardson, in southeast Alaska.

Work during the reporting period included surveys of potential cutthroat trout brood stock sources and the development of techniques for determining cutthroat population size in selected lakes in southeast Alaska.

Surveys were conducted on the Florence Lake system to determine its suitability as a source of cutthroat brood stock for hatchery use. Florence Lake is a medium to large land-locked lake on the west coast of Admiralty Island. A total of six inlets to Florence Lake were surveyed in 1980. All inlets appeared to contain some cutthroat habitat; however, the three inlets near the east end of the lake contained the best habitat. Potential weir/trap sites were identified on these three inlets. No spawners were identified in these inlets at the time of the survey; however, mature pre-spawners were captured in Florence Lake adjacent to the three major inlets. Pathological examination of Florence Lake cutthroat showed them to be free of both Bacterial Kidney Disease (BKD) and Infectious Hematopoietic Necrosis Virus (IHNV). The Florence Lake cutthroat population appears to contain adequate numbers of adult cutthroat to withstand at least a limited egg take.

The standing population of cutthroat trout in Jims Lake was investigated in 1980. Jims Lake, located on southcentral Admiralty Island, has long been known as an excellent cutthroat fishery. To determine the standing cutthroat population in Jims Lake, 20 days were spent employing fyke net, fry traps, and hook and line to capture, mark and release, and recapture cutthroat trout. During this period of June-September 1980, a total of 694 cutthroat were captured, marked and released. A total of 83 trout were recaptured. The estimated standing population of cutthroat trout in Jims Lake was computed to be 2,785 trout.

## BACKGROUND

Research conducted on cutthroat trout during the past 9 years on various systems throughout southeast Alaska has begun to provide the background data necessary to manage the various stocks of cutthroat.

Three important facts about cutthroat have become apparent during past investigations. First was the finding that most cutthroat systems are populated by slow growing, old fish. In southeast Alaska's cold unproductive waters, it requires an average of 5-6 years to produce a mature cutthroat over 300 mm (12 inches). This slow growth means that only a small percentage of any population spawns annually. Second, it was demonstrated at Petersburg Creek (Jones, 1976) that moderate fishing pressure caused a steady decline in cutthroat numbers under the existing liberal bag and possession limits. The decline in cutthroat numbers is not uniform throughout southeast Alaska. Studies at Lake Eva (Armstrong, 1971), a remote, lightly fished system, did not show a marked fluctuation in cutthroat numbers from year to year. Third, it has been found that the cutthroat populations in Southeast's land-locked lakes are not as large as previously thought. In addition, the numbers of cutthroat over 400 mm (16 inches), or "trophy size", are quite limited in most waters.

Cutthroat populations, both sea-run and resident, near population centers are in a general state of decline. With the ever-expanding logging road systems and the increase in air travel to land-locked lakes, cutthroat populations in the so called remote areas are coming under ever-increasing fishing pressure.

New regulations enacted in 1979 reduced the bag and possession limits of cutthroat to four per day, of which only one may be over 400 mm (16 inches). This regulation will help curb the decline of cutthroat in heavily fished areas.

The enhancement of this area's cutthroat fisheries is still several years down the road. Plans to develop cutthroat brood stocks are underway; however, no cutthroat are presently being reared at any hatchery in southeast Alaska.

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

## RECOMMENDATIONS

### Management

1. Develop brood stocks of cutthroat at the Fisheries Rehabilitation, Enhancement, and Development (F.R.E.D.) Division's hatchery facilities in southeast Alaska. Enhancement of existing cutthroat fisheries near populated areas will become necessary within the next few years. In addition, new put-and-take cutthroat fisheries may be desirable in some specific locations. To accomplish this, brood stocks of both resident and anadromous cutthroat will be required at two or more of the F.R.E.D. hatcheries in southeast Alaska.

Table 1. List of common names, scientific names, and abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Cutthroat Trout	<u>Salmo clarki</u> Richardson	CT
Dolly Varden	<u>Salvelinus malma</u> (Walbaum)	DV
Kokanee	<u>Oncorhynchus nerka</u> (Walbaum)	RS
Threespine Stickleback	<u>Gasterosteus aculeatus</u> (Linnaeus)	TS
Slimy Sculpin	<u>Cottus cognatus</u> (Richardson)	SL

2. Evaluate the four fish bag and possession limits for cutthroat in some of the popular fisheries throughout southeast Alaska.

Creel census checks of anglers fishing the more popular cutthroat systems should be undertaken to determine if the four fish per day limit is reducing the overall harvest of cutthroat.

### Research

1. Develop guidelines for the establishment of brood stocks of both resident and sea-run cutthroat.

It is recommended that work continue in southeast Alaska on the selection of wild cutthroat brood stock sources best suited to the fisheries desired and that these findings be turned over to F.R.E.D. Division for action.

2. Additional background data on cutthroat populations in southeast Alaska should be gathered on an annual basis.

Many data gaps exist on most of the cutthroat populations throughout southeast Alaska. Additional information will be needed on these cutthroat systems in order to make sound management recommendations to the Forest Service and other land use agencies. This data will also aid in evaluating systems for future enhancement with hatchery produced cutthroat.

3. Continue the development of techniques for estimating cutthroat trout populations from selected lakes in southeast Alaska.

Baseline data on standing populations of cutthroat in area lakes will be necessary in order to formulate good management programs for these waters.

### OBJECTIVES

1. Determine systems that may be suitable for obtaining cutthroat trout brood stock for use at the various hatchery facilities throughout southeast Alaska.
2. Develop techniques for estimating cutthroat trout populations from selected lakes in southeast Alaska.

### TECHNIQUES USED

To determine systems in southeast Alaska that are suitable for cutthroat trout brood stock development, the following information was gathered from Florence and Jims Lakes:

1. Approximate strength of the cutthroat spawning population.

2. General health of the cutthroat population, e.g., pathological examination of adult spawners.
3. Possible impact of egg taking operations on existing sport fisheries.
4. Capture methodology, e.g., weirs, seine, traps, etc.

Foot surveys, hook and line, and gill nets were employed to capture cutthroat from the two systems for samples.

Techniques for estimating the cutthroat trout population in Jims Lake was determined by:

1. Cutthroat were captured in Jims Lake from June through September. Capture methods included; hook and line, fyke net, and baited fry traps.
2. All captured cutthroat were measured (fork length), adipose clipped, and released.
3. All recaptured cutthroat were noted and the standing population size was estimated by using the Schumacher and Eschmeyer estimate.

## FINDINGS

### Cutthroat Brood Stock Development

The enhancement of some cutthroat trout populations and the creation of new cutthroat fisheries will be a necessary management tool in specific locations in southeast Alaska in the near future. In order to enhance these fisheries, a reliable brood source of cutthroat trout will be required at one or more hatcheries.

Surveys were made of the Florence Lake system during 1980 to determine its suitability and potential as a source of cutthroat eggs for brood stock development. The Florence Lake system, located midway up the west coast of Admiralty Island, was surveyed in late April and early May. Florence Lake (Figure 1) is a large land-locked lake with a surface elevation of 45 meters. A total of six inlets enter Florence Lake, with three of these considered major spawning streams.

An unnamed inlet enters the east end of Florence Lake (Figures 2 and 3). This stream was designated as Inlet #1 in lieu of an official name. Inlet #1 was surveyed upstream for a distance of 0.5 km above Florence Lake. The inlet, in the area surveyed, averaged 10-15 meters in width and 1 meter in depth. The stream bottom in the area surveyed was mostly sand and small gravel.

Spawning gravel was not found in the area; however, cutthroat spawning areas most likely occur upstream from the surveyed portion. A possible weir site was located just above the lake; however, the low banks in the area would become a problem during periods of high water.

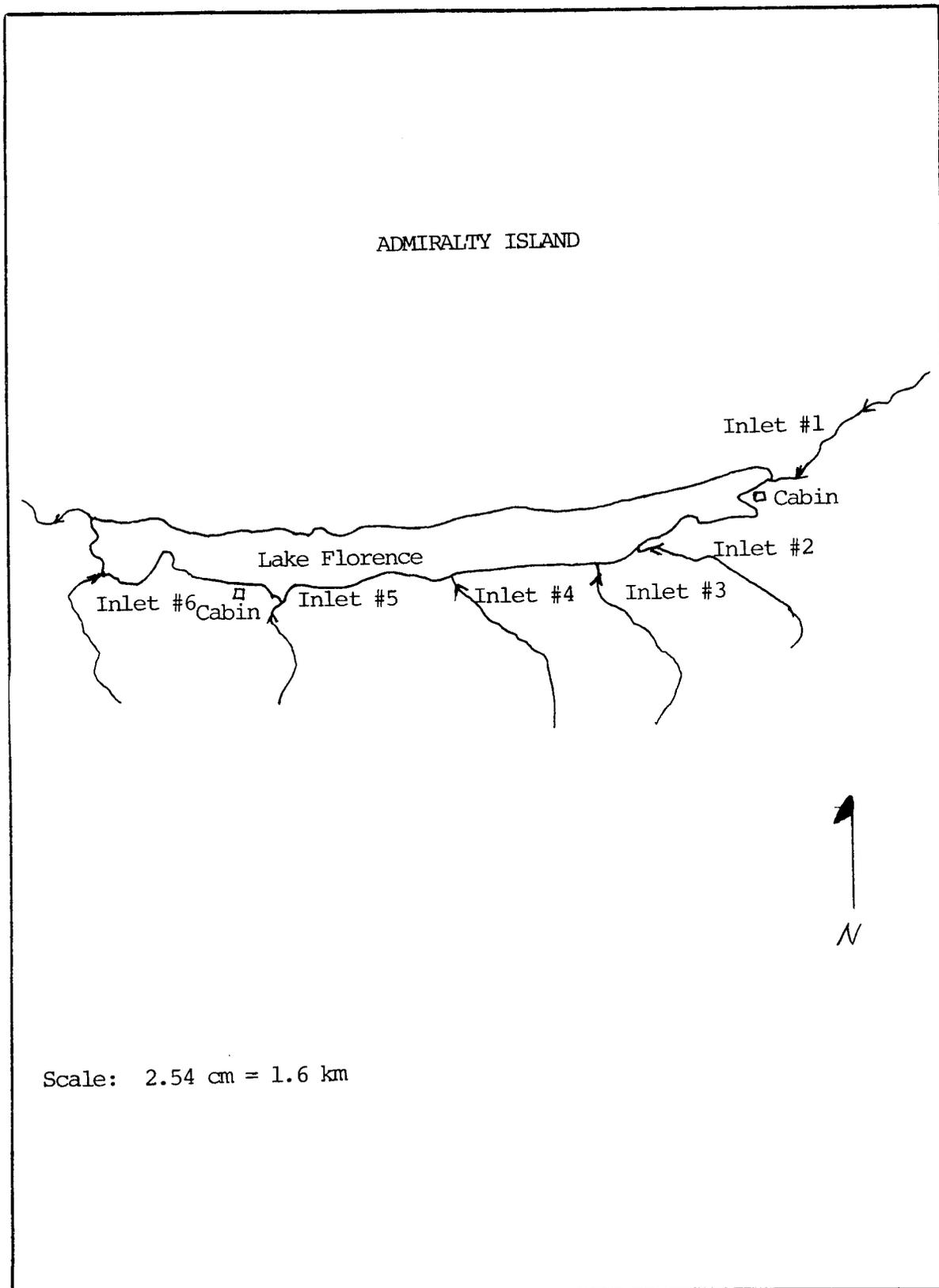


Figure 1. Florence Lake

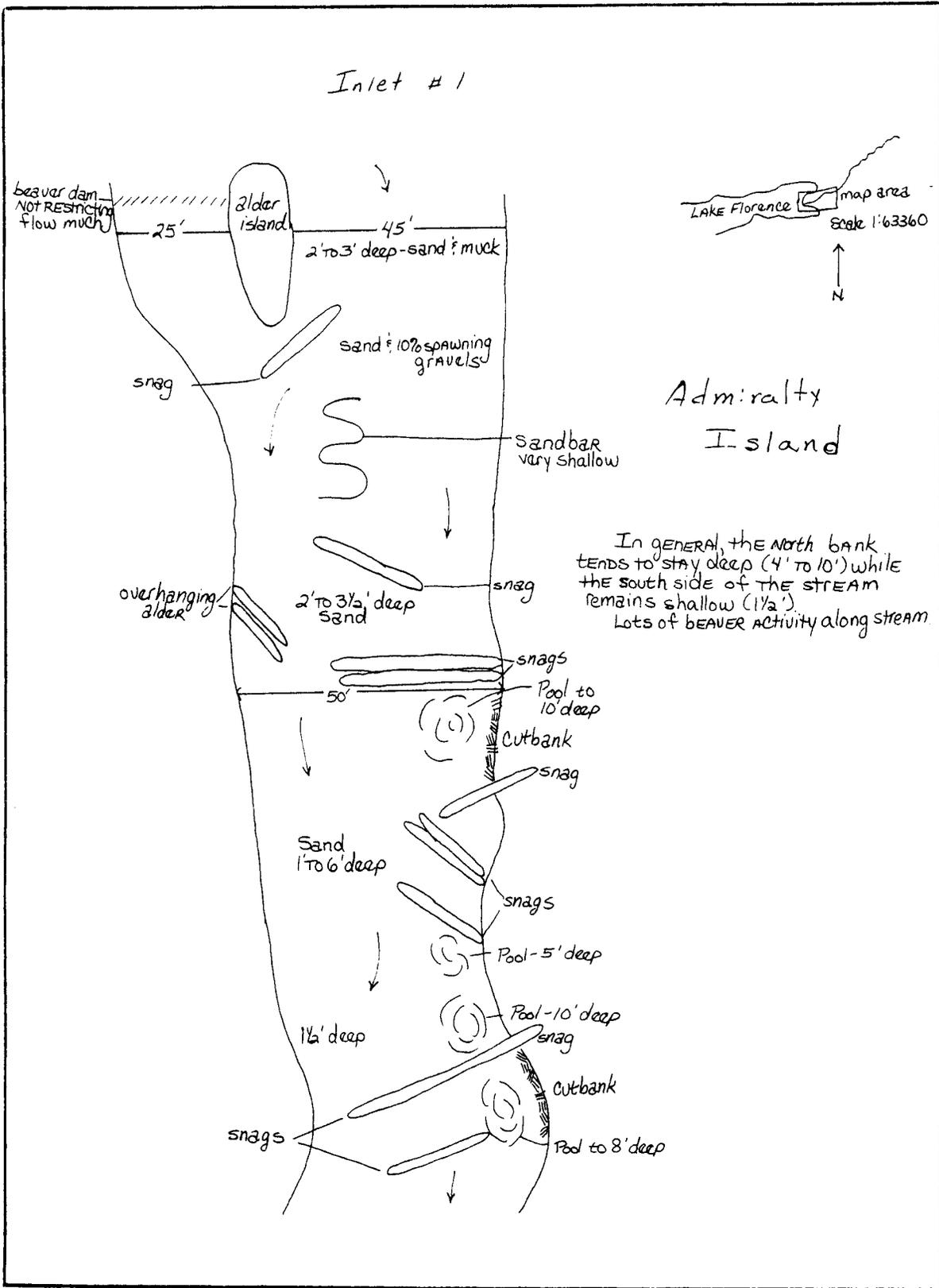


Figure 2. Florence Lake, Inlet #1

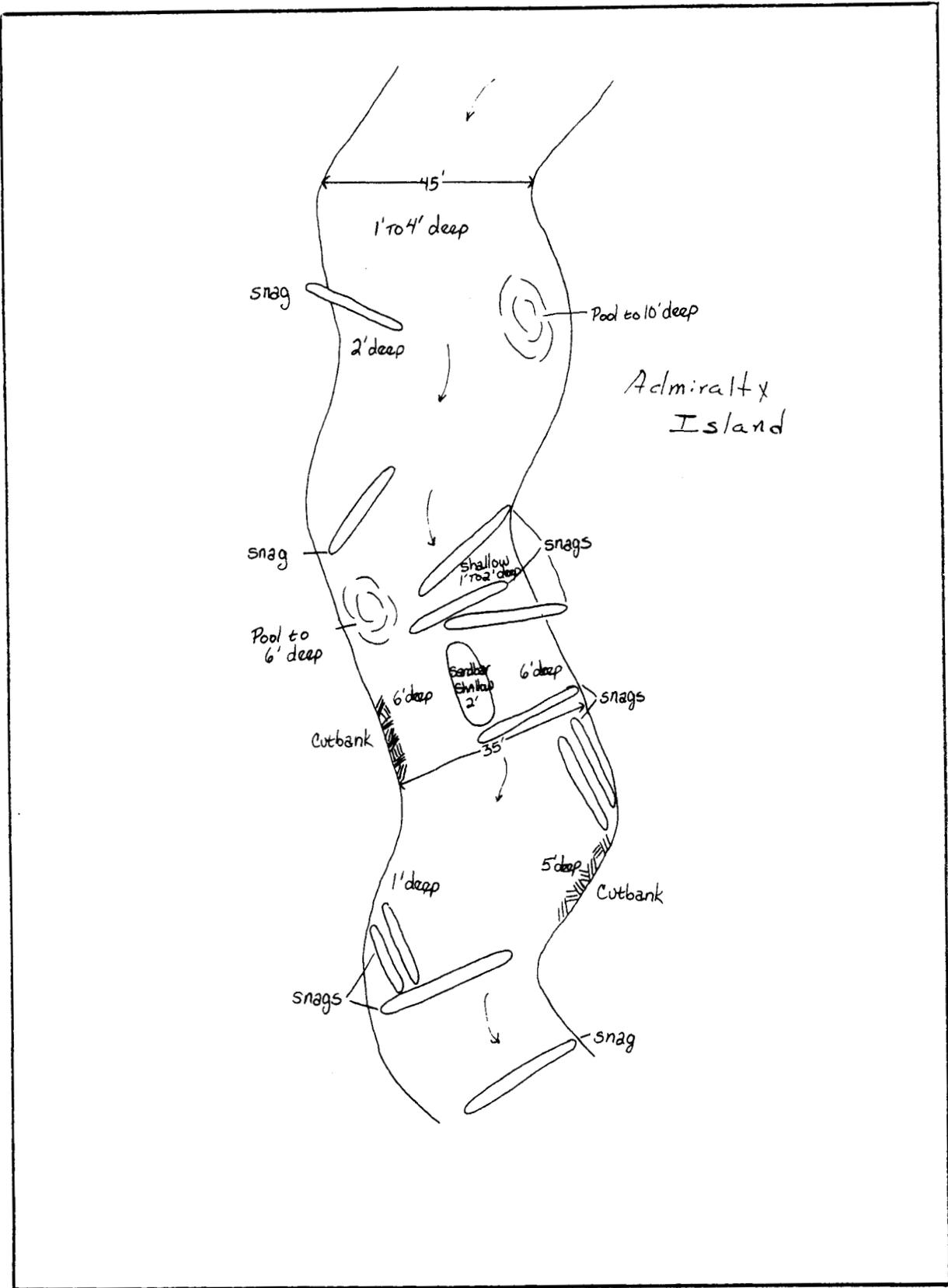


Figure 3. Florence Lake, Inlet #1 farther downstream

Unnamed Inlet #2 (Figures 4 and 5) enters Florence Lake from the south near the eastern end of the lake. Inlet #2 was foot surveyed for a distance of 0.75 km above Florence Lake. This inlet, in the area surveyed, averaged 5-8 meters in width and up to 1 meter in depth. The lower stream bottom near Florence Lake was comprised of fine sand. Approximately 0.5 km above Florence Lake the gradient increased and the substrate was comprised of suitable spawning gravel. A potential weir/trap site was located near Florence Lake.

Unnamed Inlet #3 (Figures 6 and 7) enters Florence Lake from the south near the east end of the lake. Inlet #3 was foot surveyed for a distance of 0.5 km above Florence Lake. Inlet #3, in the area surveyed, was rather small averaging no more than 3 meters in width. Only limited spawning gravel was noted in the area surveyed and it appears that this inlet is not a major spawning system for the Florence Lake cutthroat.

Unnamed Inlet #4 (Figure 8) enters Florence Lake from the south midway between the east and west ends. Inlet #4, in the area surveyed, averaged 2 meters in width. This inlet contains isolated patches of spawning gravel; however, its low discharge and small size could support only limited numbers of spawning adults. A potential weir site is present if this inlet is selected for use.

Unnamed Inlet #5 (Figures 9 and 10) enters Florence Lake from the south near the west end of the lake. Inlet #5, in the area surveyed, averaged less than 2 meters in width with a moderate to high flow. Inlet #5 does not contain a great deal of spawning gravel. The majority of the substrate is composed of slab bedrock larger than 150 mm in a narrow channel. No potential weir sites were found on this inlet in the area surveyed.

Unnamed Inlet #6 (Figure 11) enters Florence Lake from the south near the outlet. Inlet #6, in the area surveyed, was of a flat gradient with channel braiding. This inlet is blocked to fish movement by large beaver dams located 100 meters above Florence Lake. Fish may be able to circumnavigate the beaver dams during periods of high water to reach spawning/rearing areas. No suitable weir/trap sites were located in the area due to the flat gradient, numerous overflow channels, and low banks.

In an effort to locate cutthroat spawners, gillnets were set across the mouths of inlets #1, #2, and #3 to determine if mature cutthroat were preparing to move upstream to spawn.

Three nets were set for an average of 14 hours each. A total of 67 cutthroat, 38 Dolly Varden, and 2 kokanee salmon were captured. Sexually mature cutthroat were found to be most numerous near Inlet #1, with lesser numbers captured near inlets #2 and #3. A small number of the adult cutthroat captured were spent, indicating that spawning was underway.

A total of 60 sexually mature cutthroat were sampled for pathological examination. Samples of kidney, gastrointestinal tract, and ovarian fluid were collected and forwarded to the pathology lab for examination. Tests were conducted for the presence of BKD and IHNV. They were found to be negative for all samples.

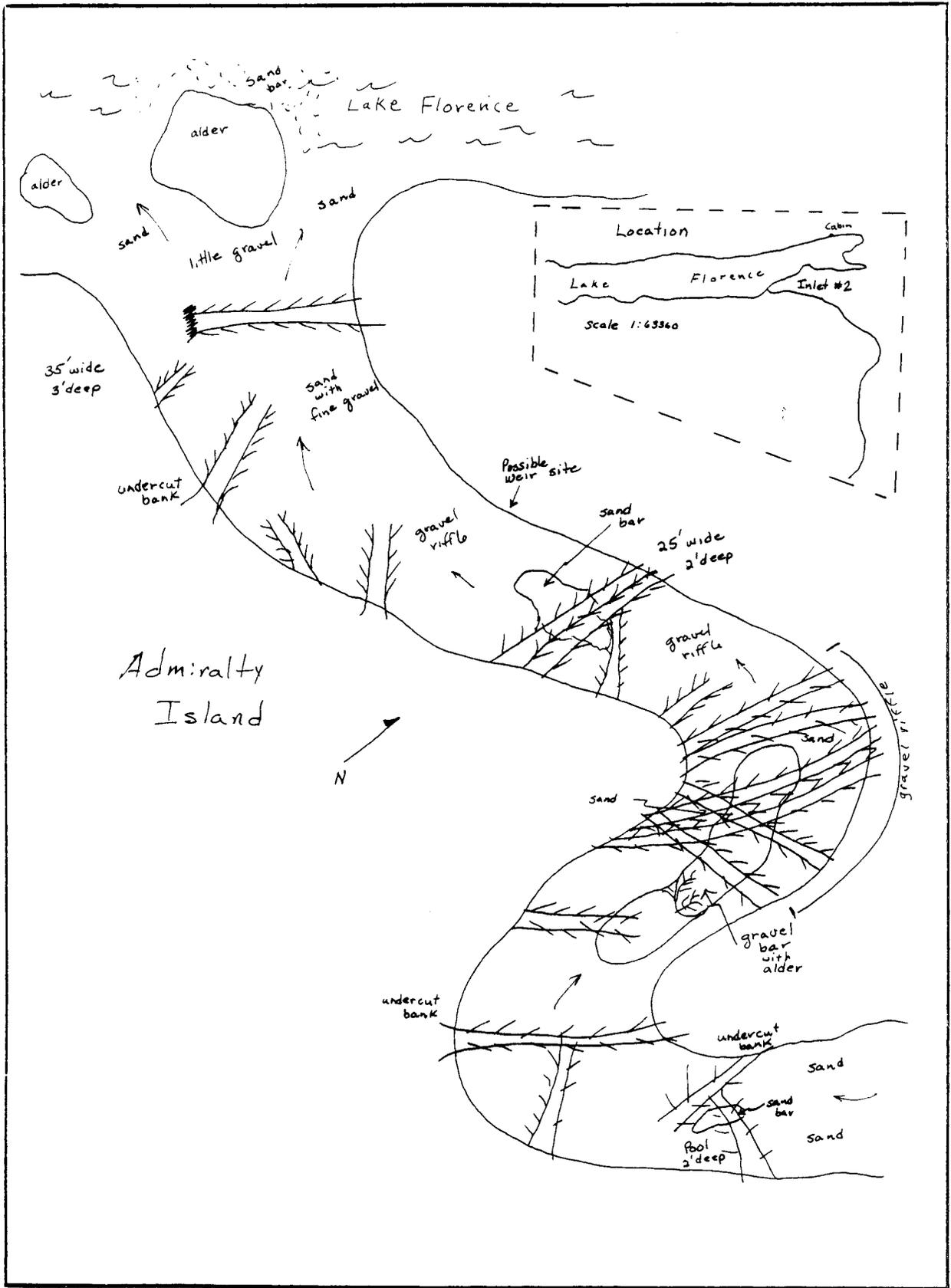


Figure 4. Florence Lake, Inlet #2

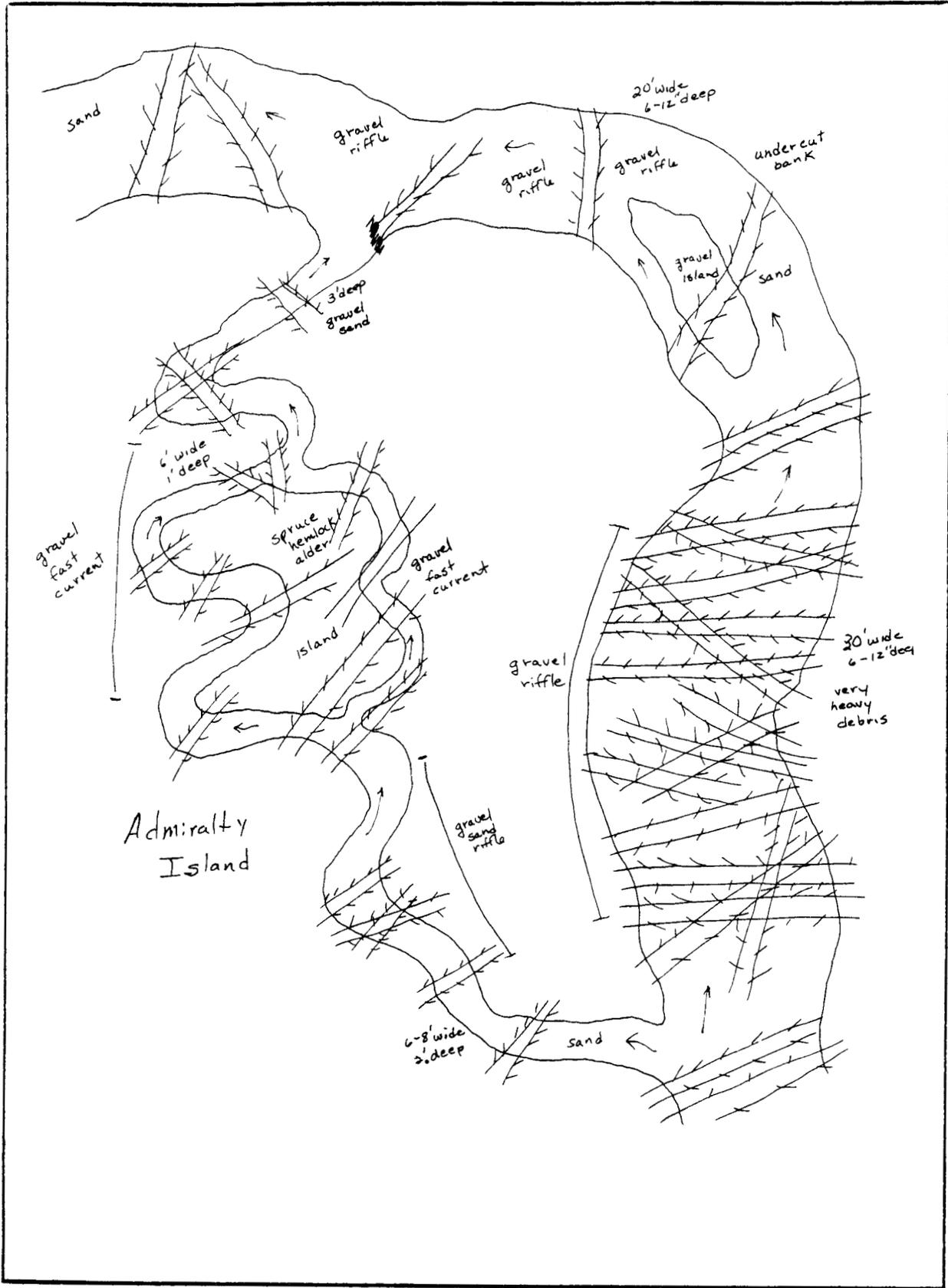


Figure 5. Florence Lake, Inlet #2 farther upstream

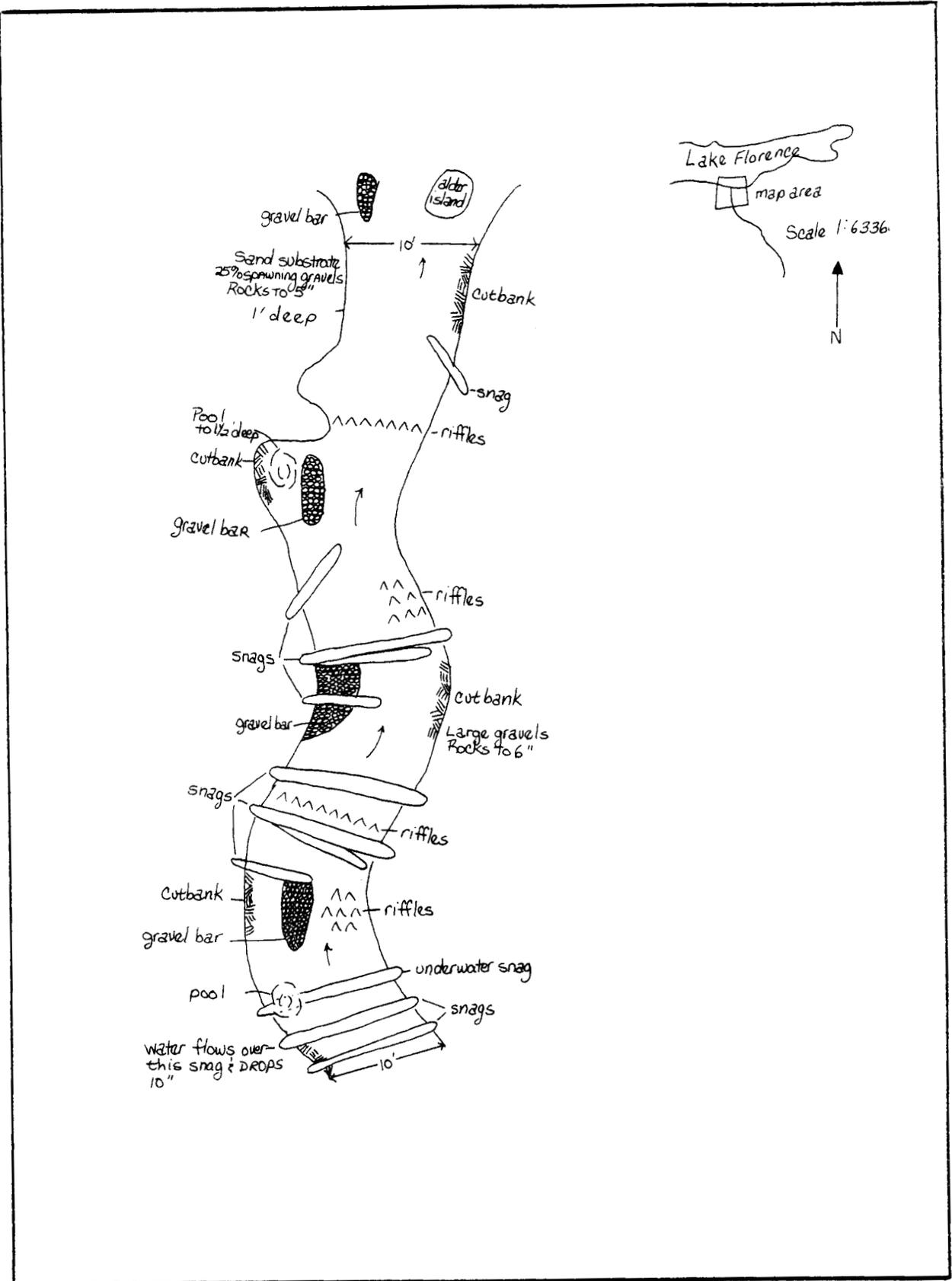


Figure 6. Florence Lake, Inlet #3

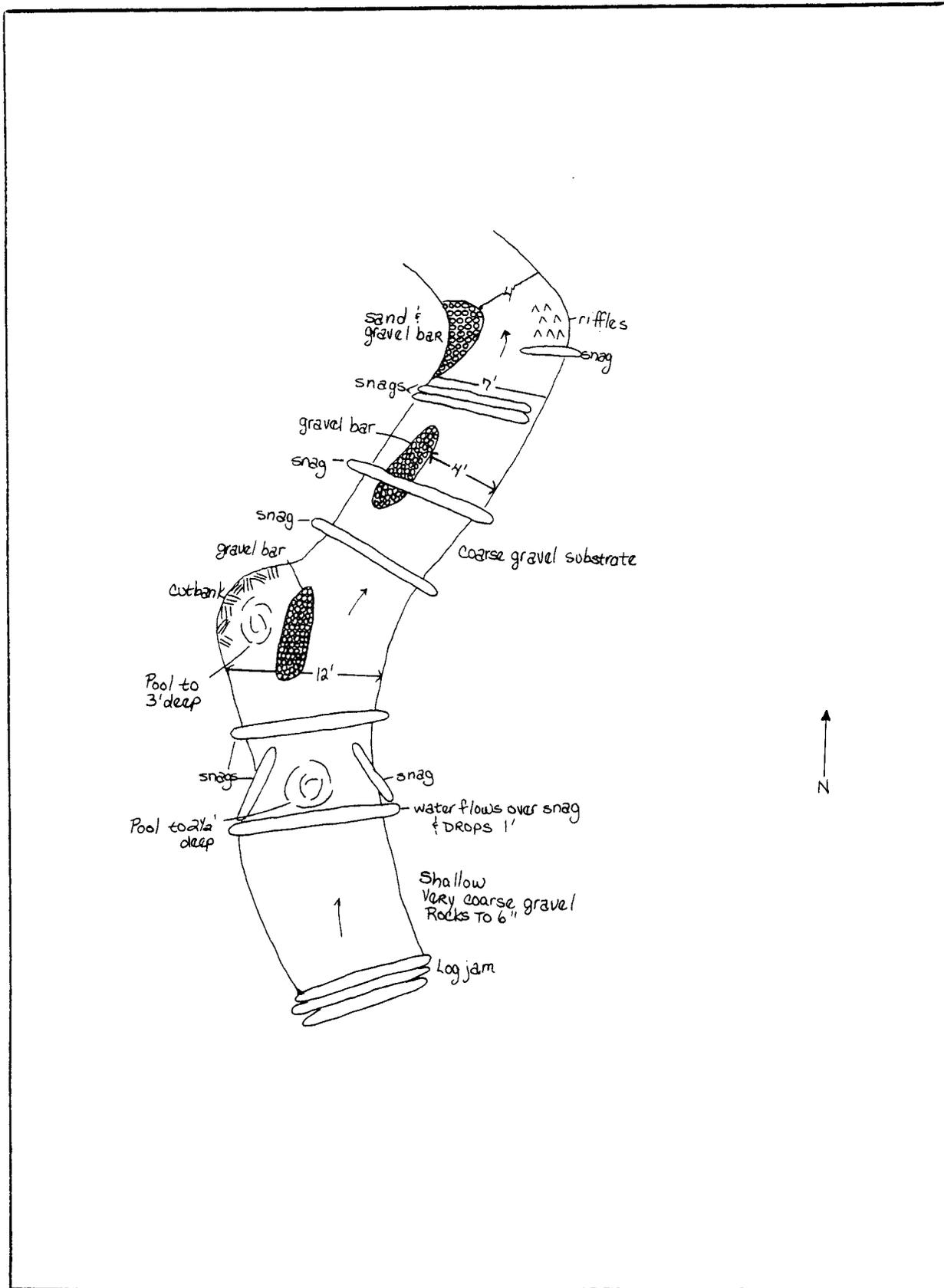


Figure 7. Florence Lake, Inlet #3 farther upstream

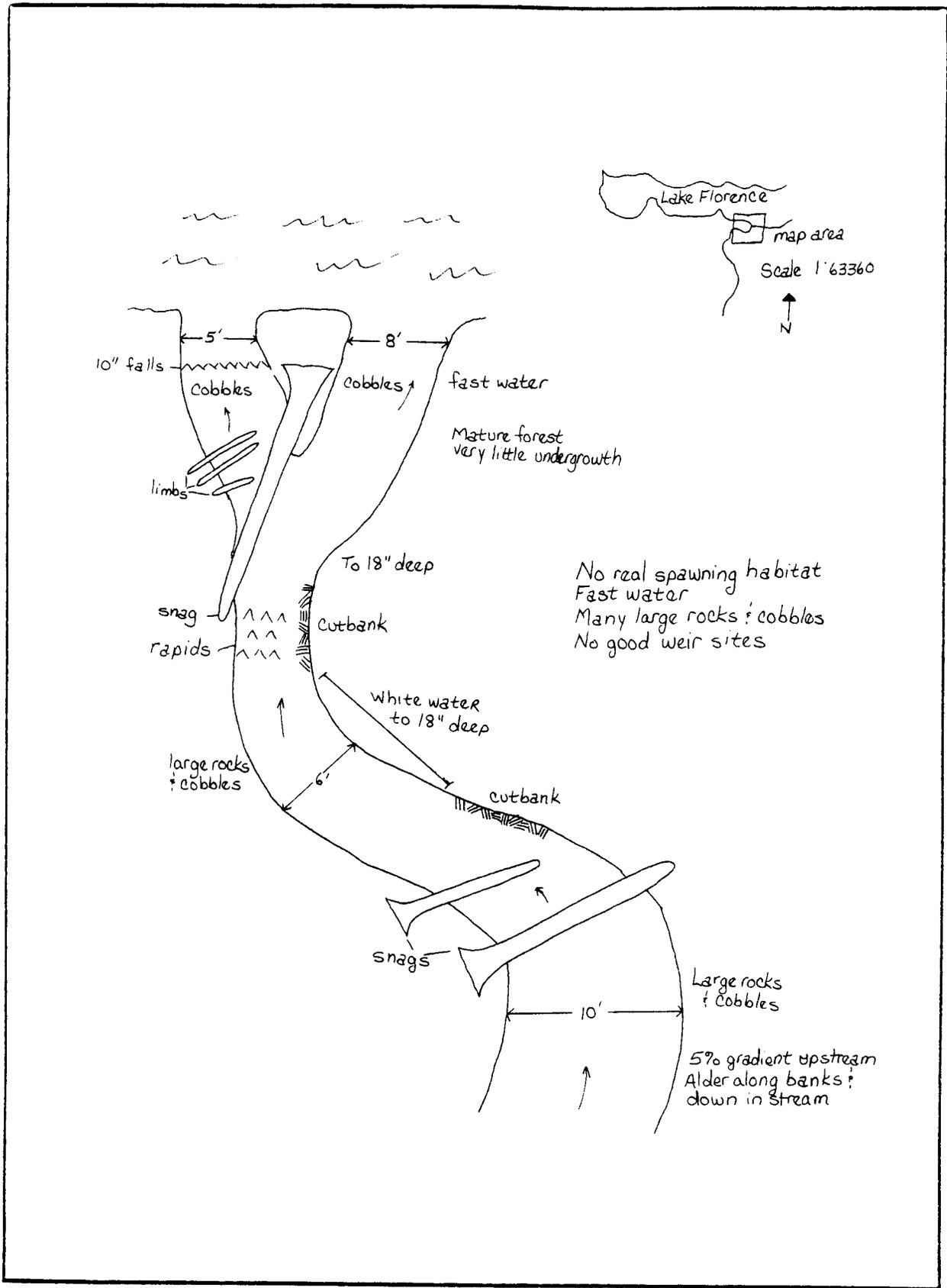


Figure 8. Florence Lake, Inlet #4

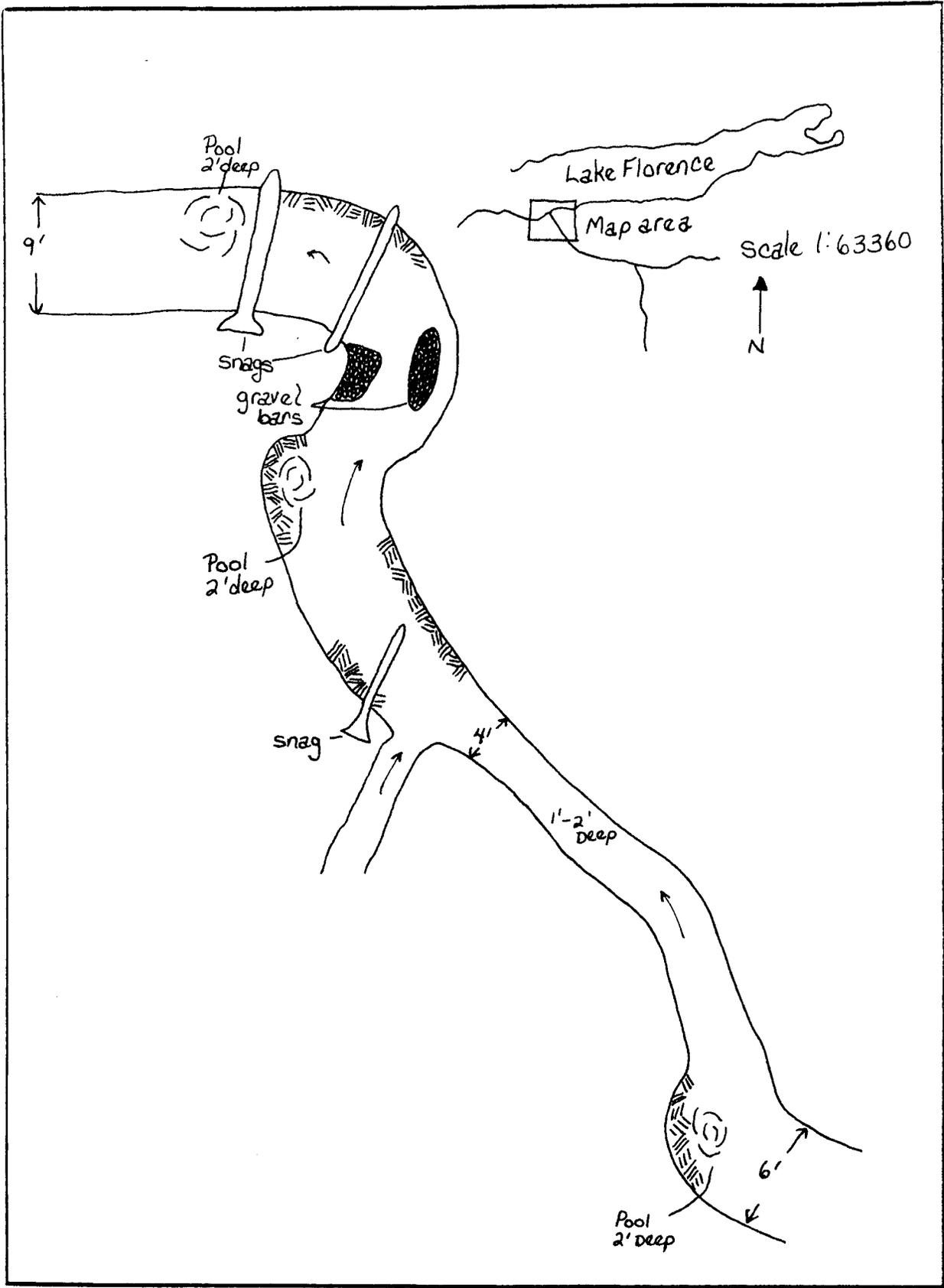


Figure 9. Florence Lake, Inlet #5

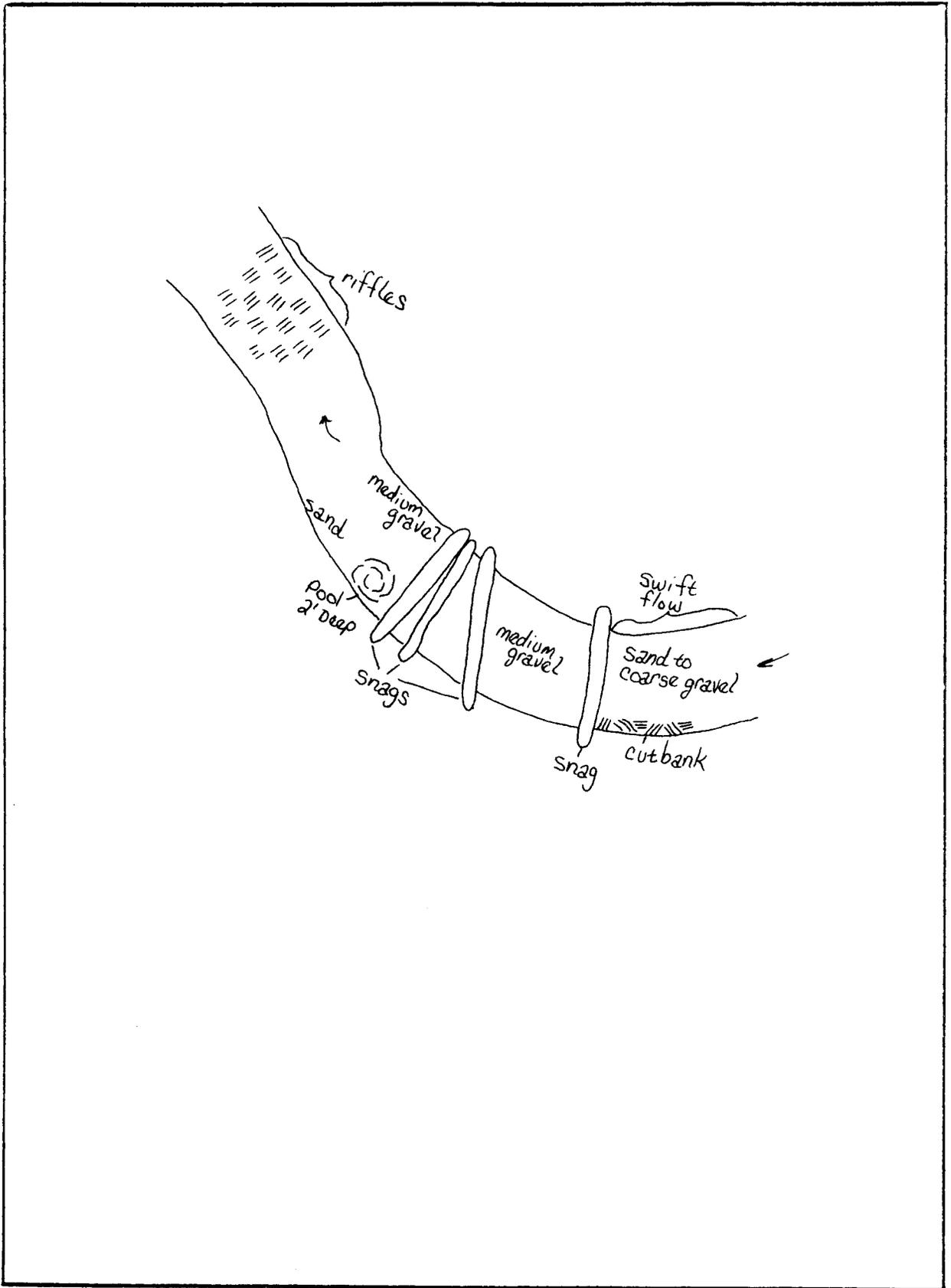


Figure 10. Florence Lake, Inlet #5 farther upstream

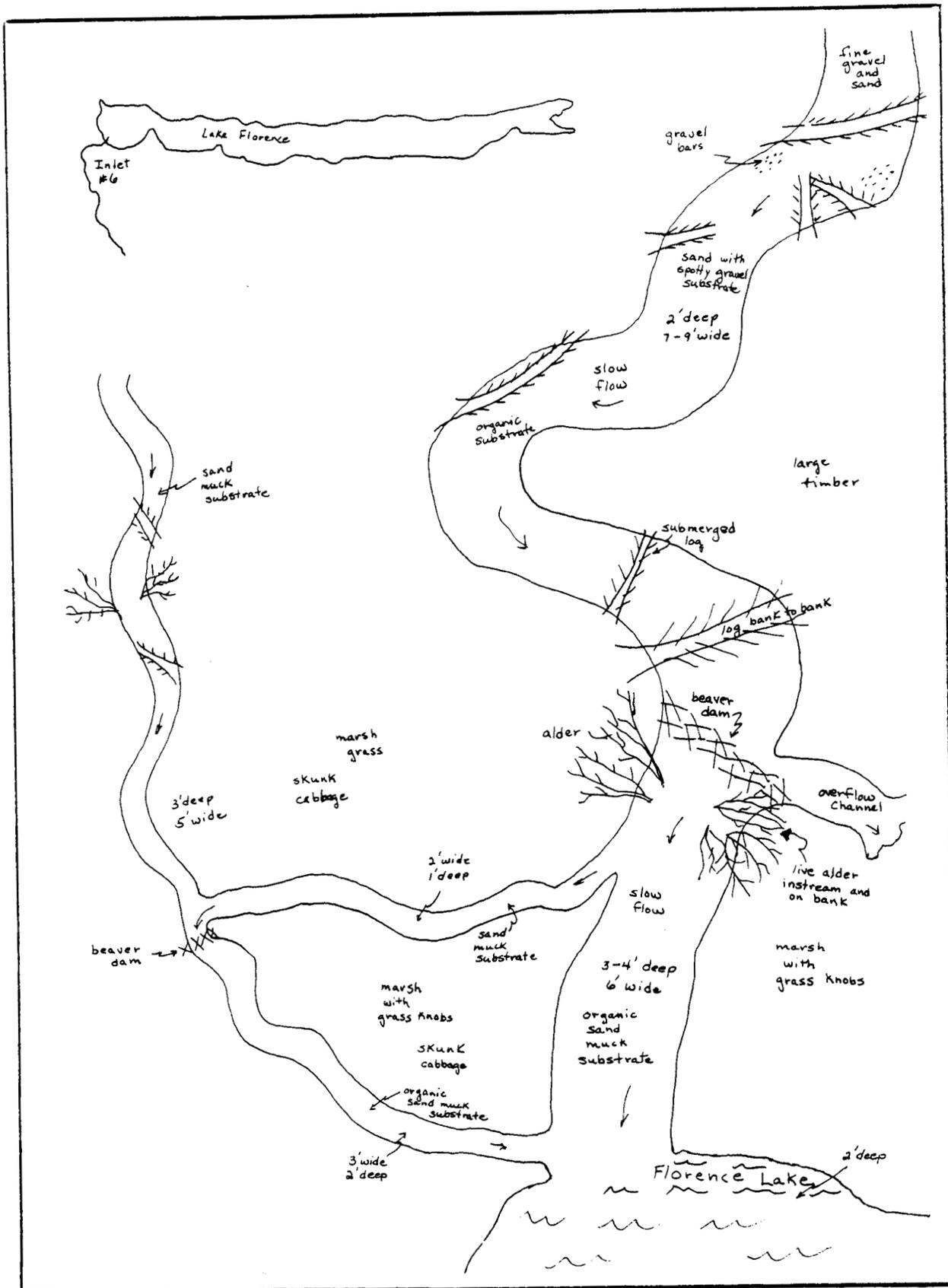


Figure 11. Florence Lake, Inlet #6

Tests indicate that the Florence Lake cutthroat population is essentially disease free and could be used for brood stock at a hatchery in southeast Alaska.

A random sample of 30 cutthroat were selected for age-length relationships. These cutthroat ranged in size from 165 mm and age 3 to 298 mm and age 6 (Table 2). Half of the cutthroat sampled were between 220 mm and 285 mm and were age 5.

Inlets #1, #2, and #3 appear to support the majority of the cutthroat spawning run from Florence Lake. Trap or weir sites are present on all three. Inlet #1 contains the largest flow and would most likely be the best location for a trap site, if the Florence Lake system is selected as a future brood source for cutthroat trout.

#### Development of Techniques for estimating Cutthroat Trout Populations from Selected Southeast Alaska Lakes

The standing population size of cutthroat trout in lakes in southeast Alaska has only begun to be documented. The development of techniques for estimating lake cutthroat populations were begun by Schmidt (1979) at Red Bay Lake and by Jones (1980) at Virginia and Harveys lakes. This program was continued in 1980 to study the cutthroat population of Jims Lake.

#### Jims Lake

Jims Lake is located on southcentral Admiralty Island approximately 20 km east of the village of Angoon. Jims Lake has long been known for its excellent cutthroat fishing with an excess of 200 man-days of fishing pressure annually. The objectives of the study of Jims Lake were two-fold. The first objective was to determine the standing population of cutthroat in a semi-remote trout fishery and the second objective was to gather baseline background data on the system in response to a proposed hydroelectric project on the watershed.

Jims Lake (Figure 12) has a surface area of approximately 112 ha and sits at an elevation of 71 meters above sea level. An 8-meter falls between the lake and Hasselborg River prevents anadromous fish access to the lake.

Jims Lake contains numerous small inlet streams that enter the lake from the hillsides and two main inlets, both of which enter the lake at the southern end. The inlet stream that enters from the east drains an alpine lake and has a 10-meter falls approximately 100 meters above Jims Lake. This tributary contains very limited cutthroat habitat. The inlet that enters Jims Lake from the south is approximately 12 meters wide, meandering, and slow flowing. This inlet contains excellent cutthroat habitat for 2 km upstream.

The lake outlet (Jims Creek) was surveyed for 2 km downstream. Jims Creek contains excellent cutthroat habitat in the form of deep pools, log jams,

Table 2. Age-Length Relationship of Cutthroat, Florence Lake, April 1980.

Fork Length (mm)	Age (Number of Annuli)				Total	Percent of Total*
	3	4	5	6		
161 - 180	2	...	...	...	2	6.7
181 - 200	2	...	...	...	2	6.7
201 - 220	4	...	...	...	4	13.3
221 - 240	...	4	6	...	10	33.3
241 - 260	...	2	7	...	9	30.0
261 - 280	...	...	...	1	1	3.3
281 - 300	...	...	1	1	2	6.7
TOTAL	8	6	14	2	30	100.0
PERCENT OF TOTAL*	26.7	20.0	46.7	6.7	100.1	
AVERAGE FORK LENGTH (mm)	194.9	239.0	245.4	280.0		

\* Percentages rounded to nearest tenth.

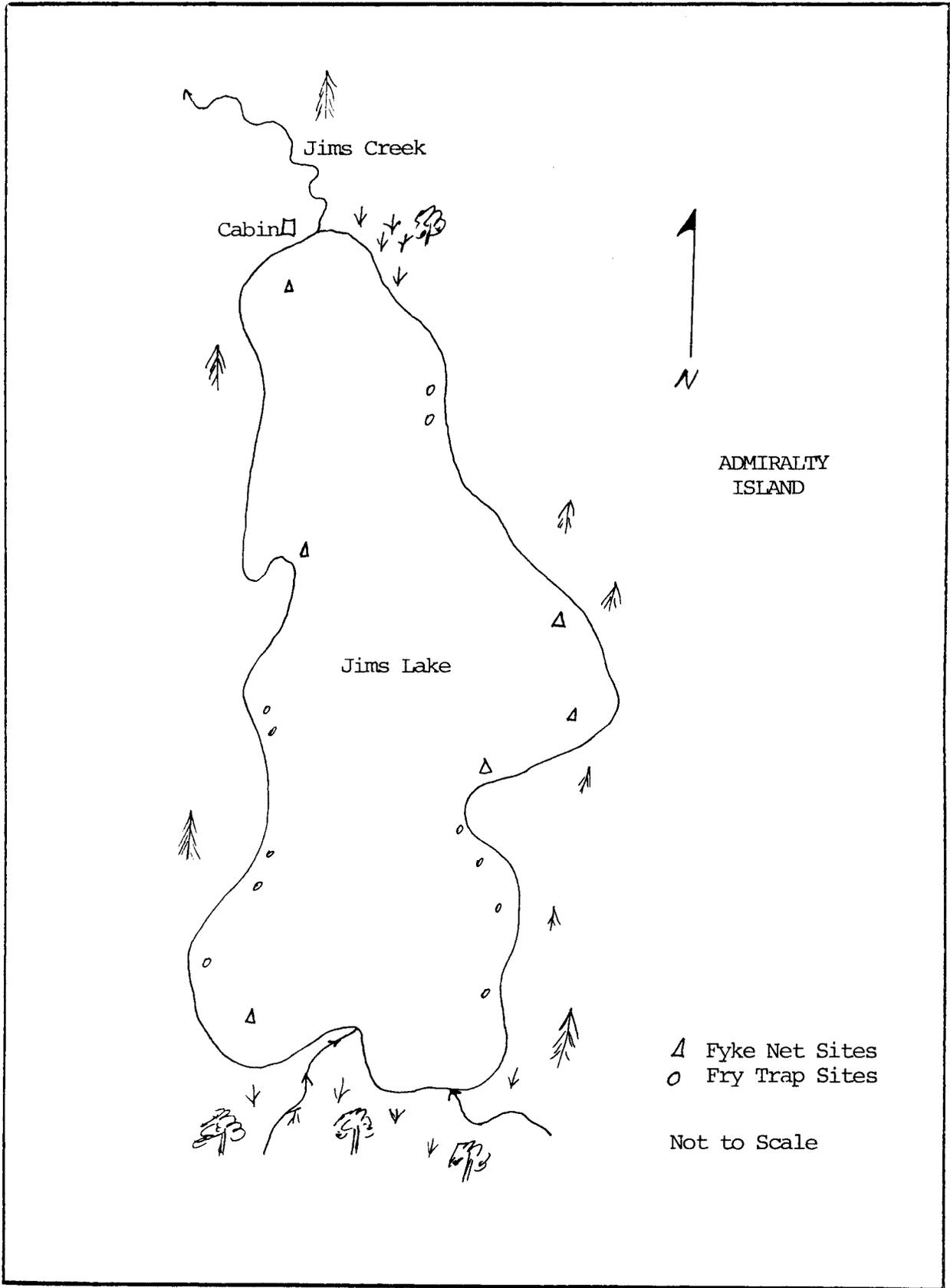


Figure 12. Jims Lake

and spawning riffles. The shoreline of Jims Lake is of a gradual slope and supports large beds of emergent and submergent vegetation. These areas are considered excellent cutthroat habitat.

A total of 20 days were spent at Jims Lake between June 2 and September 12, 1980 gathering cutthroat population data. Capture gear employed for the population analysis included: fyke net, fry traps, and hook and line (Table 3).

Of the three types of capture gear employed, hook and line proved to be the most effective in terms of the number of fish caught. Fry traps and fyke nets were considerably less effective. Hook and line tended to capture cutthroat over 200 mm while the minnow traps and fyke nets captured cutthroat from 93 to 520 mm. The most successful capture areas for all gear types were near the inlet in the southern end of Jims Lake.

All cutthroat captured were marked by removal of the adipose fin and released in the area of capture. All other fish species were enumerated and released. During the study in 1980, a total of 694 cutthroat were captured, marked, and released (Table 4). A total of 83 marked trout were recovered at least once during the study.

A Schumacher-Eschmeyer (1943) mark and recapture method was used to estimate the cutthroat population size in Jims Lake. Using this data the mean value of the Jims Lake cutthroat population was estimated to be 2,785 fish with a 95 percent confidence interval of 2,511 to 3,126. A total of 694 cutthroat trout, or 25 percent of the mean estimate, were captured during the 20-day sampling period. Also, 1,659 threespine sticklebacks, 372 sculpins, 201 kokanee salmon, and 99 Dolly Varden were captured.

Schumacher-Eschmeyer estimate of Jims Lake cutthroat population:

$$\frac{1}{N} = \frac{\sum(MtRt)}{\sum(CtMt^2)} = \frac{32,856}{91,489,943} = 0.0003591$$

$$S^2 = \frac{\sum(Rt^2/Ct) - \sum(MtRt)/\sum(CtMt^2)}{M - 1}$$

$$S^2 = 0.1403$$

$$S = 0.374566$$

t = 2.093 for 19 degrees of freedom

$$N = 2,785$$

$$S_1/N = \sqrt{\frac{0.1403}{91,489,943}} = 0.0000392$$

$$95\% \text{ C.I. } \left(\frac{1}{N}\right) = 0.0003591 \pm 0.0000392$$

$$95\% \text{ C.I. } (N) = 2,511 \text{ to } 3,126$$

Table 3. Capture Methods and Cutthroat Captured, Jims Lake, 1980.

Date	Number of Cutthroat Captured			Hours Fished
	Fry Traps	Fyke Nets	Hook & Line	
6/2-6/6	32	16	72	205
6/10-6/12	7	9	79	103
7/8-7/11	19	19	115	179
7/21-7/24	23	16	146	179
9/9-9/12	19	37	82	160
TOTALS	100	97	494	826

Table 4. Jims Lake Cutthroat Trout Population Estimate, 1980.

Date	Number of Cutthroat Captured	Number of Recapture	Hours Fished	Average Length mm	Length Range mm
6/2-6/6	120	2	205	200	93-520
6/10-6/12	95	8	103	198	112-415
7/8-7/11	153	16	179	178	113-400
7/21-7/24	185	28	179	184	113-490
9/9-9/12	138	29	160	185	105-430
TOTALS	691	83	826	189	93-520

Table 5. Age-Length Relationships of Jims Lake Cutthroat Trout, 1980.

Fork Length (mm)	Age (Number of Annuli)								Total	% of Total
	2	3	4	5	6	7	8	9		
101-120	2	6	6	1	...	...	...	...	15	45%
121-140	...	3	4	4	...	...	...	...	11	33%
141-160	...	...	...	...	1	...	...	...	1	3%
161-180	...	...	...	...	...	...	...	...	0	-
181-200	...	...	1	...	1	1	...	...	3	9%
201-220	...	...	...	...	...	1	...	...	1	3%
221-240	...	...	...	1	...	...	...	...	1	3%
241-260	...	...	...	...	...	...	...	...	0	-
261-280	...	...	...	...	...	...	...	...	0	-
281-300	...	...	...	...	...	...	...	1	1	3%
TOTALS	2	9	11	6	2	2	0	1	33	
% of Total	6%	27%	33%	18%	6%	6%	-	3%		
Average Fork Length	114 mm	116 mm	125 mm	143 mm	169 mm	200 mm	-	287 mm		

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