STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

A STUDY OF CUTTHROAT-STEELHEAD IN ALASKA

by

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Development of Techniques for Enhancement and Management of Anadromous Cutthroat Trout in Southeast Alaska

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Volume 19 Study AFS-42

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Study No.: AFS 42 Study Title: A STUDY OF CUTTHROAT-STEELHEAD IN ALASKA

Job No.: AFS 42-6-A Job Title: Development of Techniques for Enhancement and Management of Steelhead Trout in Southeast Alaska

Period Covered: July 1, 1977 to June 30, 1978

ABSTRACT

This report covers the second year of study on the development of techniques for the management and enhancement of steelhead, Salmo gairdneri Richardson, in Southeast Alaska.

Work included gathering information for a steelhead management and enhancement plan, surveys of stream systems to determine the distribution and general abundance of steelhead, surveys to determine the rearing areas of steelhead, surveys of streams suitable for potential enhancement with hatchery produced steelhead smolts, creel census to obtain information on the return of hatchery produced adult steelhead and the procurement of spring-run steelhead eggs for brood stock development.

Information was compiled for a steelhead management and enhancement plan which is presented in this report. The plan begins with a statement of need for the plan and is followed by a summary of the life histories of the various races of steelhead in Southeast Alaska. Information that was gathered for a listing of all known steelhead streams is presented together with other important data. Some streams that are suspected of having steelhead populations that are as yet unconfirmed are also listed. A section written on the management of steelhead in Southeast Alaska traces past management and regulation history of steelhead from the mid-1930's to the present and presents guidelines for future management prescriptions. It also includes a section on steelhead research which gives a summary of research findings conducted to date in Southeast Alaska and identifies areas where research will be necessary in the future.

Enhancement aspects for steelhead in Southeast Alaska are then discussed. In the selection of a brood stocks for enhancement uses, all three races of Southeastern steelhead are considered with recommendation given on how they should be obtained.

Development of facilities for the production of steelhead is also reviewed. At present, existing facilities are operating at or near maximum and additional space will be required to raise the number of steelhead necessary to begin an adequate enhancement program. Enhancement of existing steelhead fisheries and the creation of new fisheries is also discussed. Survey work done during 1977 and previous years has pinpointed potential stream systems for enhancement. Streams that should be enhanced are identified along with appropriate races of steelhead, assuming they become available in adequate numbers.

Finally, a section on the evaluation of enhancement programs in Southeast Alaska is presented. Ongoing programs at Crystal Creek, Petersburg Creek and Montana Creek are discussed.

Three appendixs are attached to the plan. One appendix is a bibliography of selected references on steelhead management and enhancement, one is a listing of steelhead streams in Southeast Alaska, and one identifies quality watersheds.

The distribution and general abundance of spring run steelhead was determined for two streams during the spring of 1977. Chuck River is a large mainland river that supports four salmon species and Dolly Varden, Salvelinus malma (Walbaum). Reports have been received that it also supports a run of spring steelhead. Surveys in 1977 in the lower 4 kilometers of Chuck River did not confirm the presence of adult steelhead even though survey conditions were nearly ideal. Rearing steelhead were trapped in the upper river areas indicating that a small run of steelhead most likely does enter the Chuck River. The Keta River system, located south of Ketchikan on the mainland, was surveyed in conjunction with ongoing programs. The discovery of large deposits of molybdenum on an adjacent ridge, with access provided through the Keta River Valley, has led to a stepped up survey of existing fish populations. A total of 20 kilometers of the Keta was surveyed, and adult and rearing steelhead were noted only in the lower 3 kilometers of river, indicating a rather restricted habitat for steelhead in the system.

Rearing fish surveys were conducted on two streams in 1977 to confirm the suspected presence of steelhead. Two additional stream systems were surveyed to define the rearing areas for steelhead. Andrews Creek, a tributary of the Stikine River, was surveyed to determine the reported population of steelhead. Baited minnow traps were fished throughout the lower 5 kilometers without capturing any rearing steelhead. On the basis of these results, it would appear that Andrews Creek is not a steelhead producing system. Duncan Salt Chuck Creek was surveyed during August 1977. Transportation was via helicopter as more than 16 kilometers of stream is available to anadromous salmonids. Baited minnow traps captured rearing steelhead throughout the system except for the lower 3 or 4 kilometers. The surveys confirm the presence of what appears to be a good run of spring steelhead. Surveys of Hatchery and Log Jam creeks were carried out to define the rearing areas for steelhead in these two systems. Hatchery Creek is a lake-stream system and contains semi-barrier falls between Sweetwater Lake and Hatchery Lake. Rearing steelhead were absent above

the falls but were quite abundant below the falls. Log Jam Creek is an extensive system without any sizeable lakes. Surveys of the lower 5 kilometers found rearing steelhead to be common throughout, except in the lower slow water areas near Sweetwater. Hatchery Creek appears to be the major steelhead producer in the Sweetwater Lake complex.

Five streams throughout Southeast Alaska were surveyed to access their potential for enhancement with hatchery produced steelhead. Pats Creek near Wrangell is accessible via the Zimovia Highway and a logging road. Pats Creek contains only limited numbers of pools that hold adult steelhead. Because of the limited holding water, Pats Creek does not rate high on the list for potential enhancement projects. Mahoney Creek, near Ketchikan, is also a small stream with limited holding and fishable water. Mahoney Creek does support a small run of wild steelhead and it is not planned for any enhancement work at the present time. Ward Creek, also near Ketchikan, was surveyed to determine its suitability for enhancement work. It has excellent access via the North Tongass Highway and Ward Creek Road. Numerous pools and holding areas are located throughout the length of Ward Creek. A small spring run of steelhead occurs in the creek; however, this run could be increased by the planting of a small number of hatchery smolts. Peterson Creek, near Juneau, is accessible via the Glacier Highway and a maintained Forest Service Trail. Peterson Creek supports a small run of spring steelhead and is quite popular with Juneau area fishermen. Limited pools and holding water dictate that enhancement of this system be kept on a small scale. Fish Creek, located on Douglas Island, is also a popular fishing stream with Juneau area anglers. Surveys of this system in 1977 pointed up the fact that Fish Creek contains very few pools and holding areas for adult steelhead. No natural run of steelhead occurs in Fish Creek and no enhancement is recommended at this time.

The evaluation of experimental steelhead enhancement was carried out at Petersburg Creek during April and May 1977. The evaluation was in the form of a weekend and holiday creel census of steelhead fishermen as other sampling methods were not available in 1977. A total of 93 anglers was contacted during the course of the census. These anglers harvested fifteen steelhead, one of which was marked as a hatchery produced smolt. Even though the 1977 return was small, it did establish that adult steelhead can be produced by the release of hatchery smolts.

The development of a spring-run steelhead brood stock continued with the trapping of wild steelhead at Falls Creek. During the last of April and throughout May a total of 61 adult steelhead were trapped at Falls Creek. A total of 50,000 eggs were obtained from 15 female steelhead and were placed in the Crystal Lake Hatchery for incubation.

BACKGROUND

Basic life history research of the spring-run steelhead at Petersburg Creek from 1971 through 1975 provided many of the answers about spring-run steelhead in a typical lake-stream system in Southeast Alaska. This research determined that the annual smolt production, from what is considered to be a good steelhead system, is no more than 1,200 annually.

It was determined that any given run of spawners is comprised of many age groups of adults with as high as 45% of the total returning to spawn for the second, third, fourth or fifth time. Initial spawners are comprised of adults that return to spawn after spending two or three years at sea and are usually five and six years of age. Literature reviews and observation of steelhead numbers in other Alaskan streams, reveal that steelhead were much more abundant in the 1930's and 1940's than they are today. Causes for the decline are not entirely known. Steelhead abundance may be directly related to the rearing habitat. In a rich habitat, more smolts are produced annually. During the 1930's and 1940's, sockeye salmon, Oncorhynchus nerka (Walbaum), abundance was high, with large annual escapements. These high escapements may have been the key to providing the enrichment necessary to produce large numbers of steelhead. Steelhead have not been subjected to intensive commercial fishing so their decline is related to other factors. It may be possible that steelhead are cyclic in abundance, as are other salmonid species that rear for any length of time in fresh water. If indeed this is the case, the declines noted at Petersburg Creek may have reached a low and may turn upward in the near future.

Comprehensive data on the majority of the steelhead systems in Southeast Alaska are not presently available. Increasing angler interest in steelhead fishing has demonstrated that good background data will be necessary to properly manage steelhead stocks. At present, most of the angling pressure is concentrated on the better known steelhead systems within easy reach of population centers. With improved access due to logging road expansion and the development of mining and oil exploration, fishing pressure will expand to areas where only light or no angling occurred 10 to 15 years ago. Increased pressure on some populations will make it hard to maintain viable populations. Present bag limits are quite restrictive (two per day) and do not leave much room for further reductions. Partial stream closures to protect spawners may be necessary on some systems to maintain adequate numbers of spawners.

Completion of the Crystal Lake Hatchery at Petersburg in 1972 provided a new dimension to the management of steelhead in Southeast Alaska. Crystal Lake Hatchery has the capability of producing steelhead smolts in about 12 months. A limited research program of spring-run steelhead production was initiated in the spring of 1974 when the first spring-run steelhead eggs were obtained from stocks at Petersburg Creek. The first smolts were liberated in the spring of 1975 in Petersburg Creek and in Crystal Creek. The Petersburg Creek and Crystal Creek smolt liberations were continued in 1976. Plants at Petersburg Creek were for experimental comparison of returns of hatchery produced steelhead with natural production. The plants at Crystal Creek were for the development of a brood stock at the Crystal Creek Hatchery. In 1976 a small plant was made in Montana Creek near Juneau. Montana Creek did not have a history of natural steelhead production, and this marked the first attempt to establish a spring-run steelhead population in a new system. Two-ocean adults did return to both Petersburg Creek and Crystal Creek in 1977; however, their numbers were disappointingly low. Monitoring of the above systems in 1978 should provide data on the success of the initial plants as both two-ocean and three-ocean fish should return.

Southeast Alaska contains numerous stream systems that support runs of fall steelhead, and three or four systems with summer-run steelhead. The run timing of these two races of steelhead make them quite attractive to the angling public. Development work on obtaining a brood stock of fall steelhead was started in 1976 without much success. Even though this initial attempt was mostly unsuccessful, much valuable data was gathered on the techniques necessary to successfully collect a brood stock of fall-run steelhead. Work on summer-run steelhead is in the planning stage and will await developments of the spring and fall-run brood stock programs.

Hatchery expansion in Southeast Alaska is just a matter of time. As these additional hatcheries become operational, more room will be created in which to raise salmonids. Allocation of space by species is yet to be determined; however, it is hoped that there will be room to raise three-quarters of a million steelhead smolts by 1980.

RECOMMENDATIONS

Management

1. Development of a brood stock of spring-run steelhead at the Crystal Lake Hatchery should be continued. The first two-ocean adults were observed at the Hatchery in the spring of 1977; however, their numbers were too low to produce the necessary eggs for brood stock. The expected return of three-ocean adults (from the 1975 release) and two-ocean adults from the 1976 release should provide enough females to produce approximately 100,000 eggs. In the event that the run fails to materialize at Crystal Creek, I recommend the trapping of hatchery adults from Petersburg Creek to provide the additional 125,000 eggs for incubation.

2. The steelhead fishery at Sitkoh Creek on Chichagof Island should be monitored. Bag and possession limit reductions enacted by the Board of Fisheries in 1977 are aimed at reducing the annual harvest of spring steelhead while still allowing for a fishery.

3. Areas being affected by various forms of development should be monitored. The development of oil fields adjacent to Yakutat, the molybdenum mine near Ketchikan, and the ever increasing spread of logging throughout Southeast Alaska will result in an influx of people into both urban and rural areas.

Research

1. The returns of spring-run steelhead to systems stocked with hatchery produced smolts should be monitored.

   The experimental stocking of spring-run steelhead in 1975 at Petersburg Creek and Crystal Creek was continued and expanded to include Montana Creek in 1976. The first two-ocean adults were expected at Crystal Creek and Petersburg Creek in the spring of 1977; however, only a few were observed. The three-ocean adults from the 1975 plant and the two-ocean adults from the 1976 plant are expected

to return in 1978. Evaluations of these returns will be monitored by weir at Crystal Creek and Petersburg Creek and by angler contact at Montana Creek. Results of these returns will provide management guidelines for future enhancement work with spring-run steelhead.

2. Gathering background data on all steelhead streams in Southeast Alaska should continue.

   Completion of the steelhead management and enhancement plan will require the gathering of a large amount of data on the many steelhead systems throughout Southeast Alaska.

3. Selected stream systems in Southeast Alaska should be investigated as to their suitability for enhancement by the use of hatchery reared steelhead.

   Background data is necessary on many systems before management decisions can be made as to the best choices for enhancement with the various races of steelhead.

4. Experimental rearing of steelhead in saltwater pens and seminatural ponds should be conducted.

   Available space in existing rearing facilities will reach capacity with priority species (salmon) in a short time. Alternate rearing facilities will need to be investigated to access their potential for steelhead smolt production.

5. Continue investigations of possible sources of fall and summer steelhead for future brood stock development.

   Several possible sources of fall-run steelhead brood stock have been identified. Additional investigational work will be required to determine which of these sources can or should be used to obtain eggs for fall-run steelhead brood stock. Summer-run steelhead brood sources pose more problems due to the limited number of populations and their locations. It appears that the best sources for summer-run brood stock are located in Canada which will require negotiations with Canadian officials before obtaining any eggs. Summer-fall runs of steelhead occur on Kodiak Island and, even though geographically far removed, many be desirable for brood stock use in Southeast Alaska if other sources are not readily obtainable.

OBJECTIVES

1. Formulate and write a management and enhancement plan for steelhead in Southeast Alaska.

2. Determine streams in Southeast Alaska that are suitable for steelhead enhancement through the use of hatchery reared steelhead smolts.

3. Evaluate adult steelhead returns to streams that have been enhanced with hatchery produced steelhead.

4. Procure spring-run steelhead eggs for hatchery rearing.

TECHNIQUES USED

Information was gathered for the management and enhancement plan for steelhead in Southeast Alaska by:

1. A summary of the life histories of the various races of steelhead in Southeast Alaska was prepared and a listing made of management both past and present with prescriptions for future management.

2. Information was compiled on the research needed to answer management problems and a summary of known data on the steelhead systems in Southeast Alaska was prepared together with a listing of selected references on steelhead management.

3. Sections on the enhancement of steelhead, brood stock selection, lists of possible donor streams and the logical development of facilities for raising steelhead were written.

4. Sections were written on prescriptions for the enhancement of existing fisheries and the establishment of new runs. These sections include the evaluation of programs for enhancement. A listing of selected references on steelhead enhancement was also compiled.

Foot surveys, hook and line, boat and aircraft were used to determine the location and general abundance of adult steelhead in selected stream systems in Southeast Alaska.

Baited minnow traps using cured salmon eggs were used to determine the presence and distribution of rearing steelhead in selected streams in Southeast Alaska. Maps of the streams were drawn noting various physical features.

Baited minnow traps and foot surveys were used to evaluate streams selected for enhancement with hatchery-reared steelhead. Rearing fish captured in the minnow traps were enumerated by species before release at the point of capture. Maps of the streams were drawn by noting the following: (a) the accessibility and fishability of the stream for anglers, (b) the amount of existing spawning area, (c) the amount and type of rearing area, and (d) the amount of holding water for adult steelhead.

Foot surveys, hook and line, and angler contacts were used at Petersburg Creek from mid-April to early June to determine the return of hatchery produced adults to the system. Angler contacts were conducted during weekends and holidays with headquarters at the weir cabin.

Weir counts were monitored at Crystal Creek to determine the return of hatchery produced steelhead to Blind Slough.

A tripod and picket weir was constructed across lower Falls Creek to capture adult spring-run steelhead for egg take purposes. Eggs obtained from these fish were placed in incubators at the Crystal Lake Hatchery for incubation.

FINDINGS

STEELHEAD MANAGEMENT AND ENHANCEMENT PLAN FOR SOUTHEAST ALASKA

Statement of Need

To adequately manage and enhance steelhead, Salmo gairdneri Richardson, populations in Southeast Alaska, there must be a coordinated plan setting out goals and objectives and a time frame in which these goals and objectives are to be met.

At present there is insufficient and unconsolidated data on many of the different races and populations of steelhead in Southeast Alaska. This lack of data has placed the Department of Fish and Game in a position of not being able to adequately manage each race or population for the highest return to the angler while maintaining a viable population of spawners. The development of this plan will bring together in an organized form all known data on steelhead systems in Southeast Alaska. Once these data are collected in a working manual, areas that require further research should become evident.

This steelhead plan will consist of two phases. Phase I will address itself to management functions together with research needed to answer management problems. Phase II will deal primarily with the enhancement aspects of steelhead in Southeast Alaska and with the timely development of facilities for the production of steelhead for enhancement purposes. Both Phase I and II will include the formulation of a manual that will be available for other staff members to help deal with problems associated with steelhead in Southeast Alaska. Such a manual will also be useful in presenting necessary regulatory proposals to local advisory committees and the Board of Fisheries.

Phase I. Steelhead Research and Management Plan

Literature Review

A search of various libraries is being conducted to secure listings on publications of the life history, habitat requirements, hatchery techniques, and various management strategies for steelhead trout. In addition, state and federal agencies involved in steelhead management and research will be contacted so that a current file of ongoing management and research can be maintained. A bibliography of steelhead management and research publications appears in Appendix A.

Steelhead Life History Summary

Three races of steelhead occur in Southeastern Alaska. They are the spring-run, summer-run and fall-run races.

Spring Steelhead:

Spring-run steelhead is a race identified as one that enters fresh water in sexually mature condition anytime from late February to mid-June. The spring steelhead is the most widespread race and is found in streams from the Yakutat area south to Dixon Entrance.

Spring steelhead is found in a variety of stream habitat types and is found in almost every streams with suitable steelhead habitat. As noted above, spring steelhead are nearing sexual maturity when they enter the streams and spawning is normally completed within 30 days. This short stay in fresh water lessens the mortality rate, and most spring steelhead populations in Southeast Alaska contain 20%-50% repeat spawners. The high number of repeat spawners in spring steelhead populations results in a large average size for the entire run with most fish exceeding 10 pounds in weight.

Summer Steelhead:

Summer-run steelhead are present in only a few streams in Southeast Alaska, and with the exception of one stream, all ascend the large glacial rivers flowing out of the interior of Canada. Summer-run steelhead ascending the large glacial rivers provide little recreation for Southeast Alaska anglers due to the remote location of their spawning areas in Canada.

The summer-run steelhead system located south of Sitka does offer the unique opportunity to angle for steelhead during July. There is some questions as to the source of this system's steelhead. It is possible that they originally were transplanted summer-run steelhead stock from Washington State that were distributed around Baranof Island in the 1930's. Whatever their background, they are presently a self-sustaining population. These summer-run fish begin entering the system in late June, peak in July, and remain until they spawn the following spring. The summer steelhead system contains a large lake which is most likely used by the steelhead to winter in. The summer-run fish on Baranof Island are not as large as the spring-run fish due primarily to the shorter time spent feeding in salt water and the long stay in fresh water. Very little work has been done on the summer-run steelhead that migrate into Canada; therefore, no comparisons can be made with local stocks.

Fall Steelhead:

Fall-run steelhead occur in scattered locations from Yakutat to Dixon Entrance with the majority of the runs occurring south of Sumner Straits. Fall-run steelhead normally begin entering fresh water in mid-September

with a peak occurring in October and November. A few fish enter as early as mid-August and as late as February. Fall-run steelhead are more specific in their habitat requirements than are spring steelhead and are almost always found occurring in systems containing a lake or lakes open to anadromous fish. Exceptions are large streams with adequate deep pools that are used as overwintering areas by the steelhead. Fall-run steelhead enter fresh water in an immature sexual condition. Sexual maturation continues throughout the winter and these fish spawn in April and May. Due to their long residence in fresh water, fall-run steelhead to not have as high a survival rate as do spring-run steelhead. Age analysis of a limited number of fall-run steelhead show repeat spawners to comprise 15%-25% of the population.

All three races of Southeast Alaska steelhead spawn at approximately the same time, anywhere from late March to mid-June depending on local conditions. Some systems contain both fall and spring-run steelhead, as far as has been determined, they do not form distinct spawning populations. On streams containing both races, it is not possible to separate the two on the spawning grounds.

Steelhead fry emerge from the gravel in July and then spend from two to five years rearing in the stream before migrating to sea. Rearing steelhead are found in a variety of habitat types with a preference for moderate current over a rubble bottom. Availability of escape cover seem to influence their habitat preferences. Rearing steelhead are seldom found in lakes and beaver ponds.

Southeast Alaskan steelhead normally migrate to sea when they reach an average size of 170 millimeters. Once at sea they spend at least two years before returning to spawn. Research on the ages of initial spawners shows that approximatley 50% return after two years at sea and 50% after three years at sea. Examination of the limited data on fall-run steelhead shows that they spend a similar amount of time at sea.

In the Pacific Northwest two races of steelhead occur. These races spawn in different locations and the fry rear in separate areas for the most part. In Southeast Alaska fall and spring-run steelhead overlap in their spawning areas and spawning time. At this time it is not clear why some fish are spring-run and some fall-run from the same system. Perhaps age at migration and ocean feeding conditions influence the migration timing.

In summary, Southeast Alaska steelhead are distributed throughout the region in most suitable habitat with the spring-run the most numerous. Southeast Alaska steelhead are slow growing fish that are normally five or six years old at maturity. Repeat spawners make up a large percentage of any population, which tends to make for a large average size. Steelhead can be found in some Southeast Alaska system almost any month of the year with peak abundance occurring from October to May.

Southeast Alaska Steelhead Streams

Known Steelhead Streams:

Southeast Alaska contains approximately 2,000 streams that are classified as anadromous fish streams. Of this total, 89 stream systems are known to contain runs of steelhead.

A known steelhead stream is defined here as a stream having a run of adult steelhead annually that has been confirmed by on the ground estimates by various investigators.

The known steelhead streams in Southeast Alaska are distributed from Yakutat to Dixon Entrance with the majority occurring south of Sumner Strait. A summary of the known steelhead streams in Southeast Alaska can be found in Appendix B.

Unconfirmed Steelhead Streams:

Southeast Alaska has 40 streams of varying sizes that are rumored or suspected to contain runs of steelhead. (Appendix B). It is unlikely that many streams with good runs of steelhead remain to be "found" in Southeast Alaska. Investigational work will proceed on an annual basis to gain data on those streams suspected to contain steelhead.

Steelhead Management in Southeast Alaska

Steelhead numbers in many stream systems today are considerably less than they were during the period between 1900 and 1940. This decline has been caused by a number of factors, many of which are not fully understood.

With local exceptions, habitat of the steelhead streams has not been altered by man to a great extent. Almost always the best steelhead runs occur in stream systems containing runs of red salmon. During the early days of salmon harvest in Southeast Alaska, sockeye salmon, Onchorhynchus nerka (Walbaum), was sought due to its high quality as a canned product. With the decline of sockeye salmon from over-fishing came a decline in the numbers of steelhead. As steelhead were not fished commercially, other biological factors have led to the decline in steelhead numbers. It is suspected that without large numbers of salmon to enrich the stream systems, the basic productivity of these systems is less and therefore not able to support as large a steelhead population as occurred in the past.

The first bag and possession limits were imposed on steelhead fishermen in the mid-1940's. At this time the limit was 20 trout or 15 pounds and 1 fish, which in effect created a 2 steelhead per day limit. Possession limit was 2 daily bag limits. This two steelhead per day limit remained in effect until the mid-1950's when the wording of the law was changed to drop the poundage limit. At that time, the limit was 20 trout per day, of which no more than 3 could exceed 20 inches in length. This, in effect, increased the steelhead limit to 3 per day with 2 daily

limits allowed in possession. The steelhead bag limit remained a 3 per day until 1975. Starting with the 1975 season the bag limit was reduced to 2 steelhead over 20 inches per day with a possession limit of 2 daily bag limits.

Research and creel census during the past few years has shown that the present 2 steelhead per day bag limit may be excessive in certain steelhead streams close to population centers and that even more restrictive management will be required to maintain spawning populations in these systems.

Steelhead Management Recommendations and Prescriptions

The proper management of wild steelhead populations in Southeast Alaska will require several different management approaches, depending upon the stream or area.

Ease of access has a decided effect on the harvest rate of steelhead. It has been recorded that once road access is created the quality of steelhead angling declines. A good example of this is the Sitkoh Creek System on Chichagof Island. Prior to the establishment of a logging camp and subsequent road building Sitkoh Creek was considered an excellent spring steelhead system. With the advent of road access plus other accesses, Sitkoh Creek has received increasing pressure which has required restrictive regulations to protect the steelhead population.

In order to identify streams when dealing with other land use agencies, the Sport Fish Division has attempted to categorize the various steelhead streams in Southeast. It has been decided that the best management for some systems would be to place them in "Quality Watershed" categories. These quality watershed categories were further broken down into first, second, and other categories.

Streams falling within the first classification constitute the best of the best and they have been recommended for restrictive management prescriptions. These prescriptions call for limited access, lack of timber harvest and road building. It is thought that these systems should be placed in this type of classification and the steelhead fishery then managed on a sustained yield fishery for wild fish. It may not be possible to retain this type of management in the future for all systems as the Forest Service has control of land use activities in these areas. A listing of these watersheds can be found in Appendix C.

Steelhead streams in the second category do not rate as high as the first category streams due to a variety of reasons. Some of these systems do not contain large runs of steelhead, some have been developed to a degree, and some have had or are receiving impacts from timber harvesting. Management of the second category steelhead streams will entail attempts to maintain the steelhead habitat and to work with the Forest Service to insure minimal disruption of the habitat during land use activities.

The remainder of the steelhead streams in Southeast Alaska that do not fall into one of the two above categories are recommended for management prescriptions that will allow controlled land use or other activities. These remaining streams are not normally considered top quality due mainly to the low number of steelhead, their small size, or their degradation due to the activites of man. Many of the streams in this category have a good potential for enhancement programs. A list of these watersheds can also be found in Appendix C.

Future management prescriptions for Southeast Alaska steelhead populations will incorporate prescriptions mentioned above and will include but not be limited to the following four prescriptions:

Mail Surveys:

A statewide survey of a randomly selected number of sport fish license holders is presently underway. Results of this survey are not available at this time. This marks the first attempt to gain management data from this form of survey. Evaluation of the responses will aid a great deal in identifying where the effort on steelhead stocks is located and should give direction on the best avenues of management.

Creel Census:

The use of creel census as a management prescription is useful only for specific systems. A creel census, to be effective, requires a considerable outlay of effort and expense. However, it is an excellent method of obtaining needed information about the harvest of steelhead on a stream by stream basis.

A creel census over a large area is not practical at this time due to the wide spread nature of the steelhead fisheries and the lack of funds. Voluntary census programs have been tried in the past and have proven unreliable in providing useful information.

Punch Cards:

The use of punch cards as a management tool for steelhead has a long history of use in the states of Washington and Oregon. Alaska has had a punch card fishery in the past for king salmon, Oncorhynchus tshawytscha (Walbaum), in the Cook Inlet area but as yet has not used them for other species.

The use of mandatory punch cards for steelhead management has met with varying degrees of success in the Pacific Northwest. It has been found to be a way of gathering a great deal of harvest data at a cost considerably lower than other creel census methods. Some of the faults of a punch card census are that information is sometimes not recorded accurately and there may be problems involved with printing, distributing and collecting the cards.

Special Regulations:

The use of special regulations on a stream by stream basis or for a small geographic area has been and will continue to be an important tool for steelhead management in Southeast Alaska.

These special regulations have taken the form of reduced bag and possession limits beginning in 1975 with the reduction of the possession limit from 4 to 2 in possession for the Situk River. Up until 1978 this was the only special regulation in force in Southeast Alaska for steelhead. Beginning with the 1978 season a special management regulation was enacted for the Sitkoh Creek steelhead fishery. The daily bag limit was reduced from 2 per day and 4 in possession to 1 per day and in possession with a minimum length of 33 inches. This special regulation was adopted to reduce the heavy pressure on the spawning population in Sitkoh Creek.

Other areas recommended for the use of special management regulations are as follows:

Naha River:

The Naha River, east of Ketchikan, is one of the best steelhead streams in southern Southeast Alaska. Its location and ease of access contribute to probably the heaviest angler use of any steelhead system in Southeast. The steelhead run to the Naha is comprised of a strong fall migration with a lesser run occurring in the spring. The fall-run enters as early as mid-August which makes it unique for fall-run Steelhead systems in Southeast Alaska. The Naha River system is also being considered as a prime source for steelhead eggs for brood stock development. With the above in mind, the following special management regulations are proposed for the Naha system: (1) reduce the bag limit from 2 steelhead per day and 4 in possession to 1 steelhead per day and 2 in possession and (2) close the Naha River or portions of it to steelhead fishing from March 15 to June 15 each year to protect spawning steelhead.

Karta River:

The Karta River System, in Kasaan Bay on Prince of Wales Island, is another prime steelhead system in close proximity to Ketchikan. Heavy angler use of this system and declining numbers of steelhead dictate that the following special management regulations be adopted: (1) reduce the bag and possession limits for steelhead from 2 and 4 to 1 per day with 2 in possession and (2) close portions of the spawning grounds from March 15 to June 15 each year.

Petersburg Creek:

Intensive life history research at Petersburg Creek has demonstrated a decline in the numbers of steelhead. This decline has been caused by a number of factors among which is an ever increasing amount of angling pressure. Petersburg Creek has long been famous for its large size steelhead, and the following special mangement regulations may be necessary to maintain this population: (1) reduce the bag limit to 2 steelhead

daily and in possession, only 1 of which may be less than 33 inches in length. Petersburg Creek steelhead have a high degree of survival after the initial spawning migration, and this regulation would allow more smaller steelhead to escape and return as large repeat spawners. Removal of the larger repeat spawners would have less adverse impact on future spawning runs as their chance of returning for a third time are considerably less than that of initial spawners.

Pleasant Bay Creek:

Pleasant Bay Creek is one of only a few steelhead systems on Admiralty Island and as such has received increasing fishing pressure during the past few years. The steelhead run to this system is not large, usually numbering less than 100 adult fish annually. Continued heavy fishing pressure has the potential to reduce the spawning population to a point below that necessary to maintain a run. It is recommended that the following special management regulations be formulated: (1) reduce the bag limit to 1 per day with 2 in possession and (2) close the creek to fishing on May 20 to June 15 each year to protect the remaining spawners.

Steelhead Research in Southeast Alaska

System Exploration and Evaluation:

The management of wild steelhead stocks in Southeast Alaska will require a considerable amount of data. Some data is now available; however, information is lacking on the majority of steelhead systems. To gain adequate management data, research will be required on a number of key systems in the next few years.

This research will most likely take the form of the assessment of adult numbers to specific systems together with the assessment of rearing steelhead numbers in other systems.

Assessment of the adult steelhead run to any system in Southeast Alaska is a difficult, expensive, and time consuming undertaking. Most systems are large and difficult to survey. Steelhead adults are difficult to see, and past experiences has shown that less than 10% of the population is usually counted by a foot survey. The only other reliable survey method is the construction of a counting weir. This method is limited by its expense and is used only when answers cannot be obtained by other methods.

The Naha River and the Situk River both present management problems that may be answered by research using weirs and other survey techniques. Research on these two systems will be major projects; however, these data will be necessary to properly manage these systems.

The assessment of the steelhead run to a system using rearing fish for an index is a management tool that has not been perfected as yet. Research needs to be conducted on rearing fish tagging, release and recapture in order to provide an index for total population numbers. This mangement tool will be quite useful in that population estimates can be made in many streams with a minimum expenditure of time and money.

Research of the Southeast Alaska steelhead should continue. Data provided by this research will give management biologists the tools and information necessary to make decisions when dealing with land use agencies.

Research has been conducted on the spawning and rearing habitat requirements of spring-run steelhead. Research on fall and summer-run steelhead is incomplete at present and should be continued as time permits.

Commercial Harvest of Steelhead in Southeast Alaska

Steelhead have been and will continue to be harvested by the commercial salmon fishing fleet in Southeast Alaska. Steelhead are considered a sport fish while in fresh water and are subject to sport fish management.

Steelhead in salt water are not afforded any protection when taken as an incidental catch along with the target salmon species. Records of commercial steelhead catches have been maintained by the state since 1960. A summary of these catches appears in Figure 1.

As shown in Figure 1, the catch of steelhead by commercial fishermen has varied from a low of 404 fish in 1975 to a high of 4,824 fish in 1968. This wide range in steelhead catches does not necessarily reflect the abundance of steelhead in any one year but rather the amount of fishing time allowed commercial salmon fisheries. During years of light salmon runs (1965, 1975) fishermen were allowed very limited fishing time with a subsequent low harvest of steelhead. During good salmon years (1968, 1970) fishermen were allowed additional time with a higher attendant steelhead harvest.

The majority of the steelhead harvested by commercial fishermen are taken along the west coast of Prince of Wales Island and near the mouths of the Stikine and Taku rivers. The catch occurs primarily during the months of July and August. These fish are primarily summer-run steelhead bound for streams in Canada as most Southeast Alaska steelhead are not found in coastal waters during that period.

The number of steelhead sold by commercial fishermen each year (Figure 1) is not the total harvested by commercial gear. Prices paid for commercial steelhead are usually quite low in comparison to salmon. This results in the retention of most steelhead by crew members. The actual catch may be considerably higher than the above figures. Even though steelhead are taken incidentally to other commercial species, the catch is usually higher than the sport fish harvest.

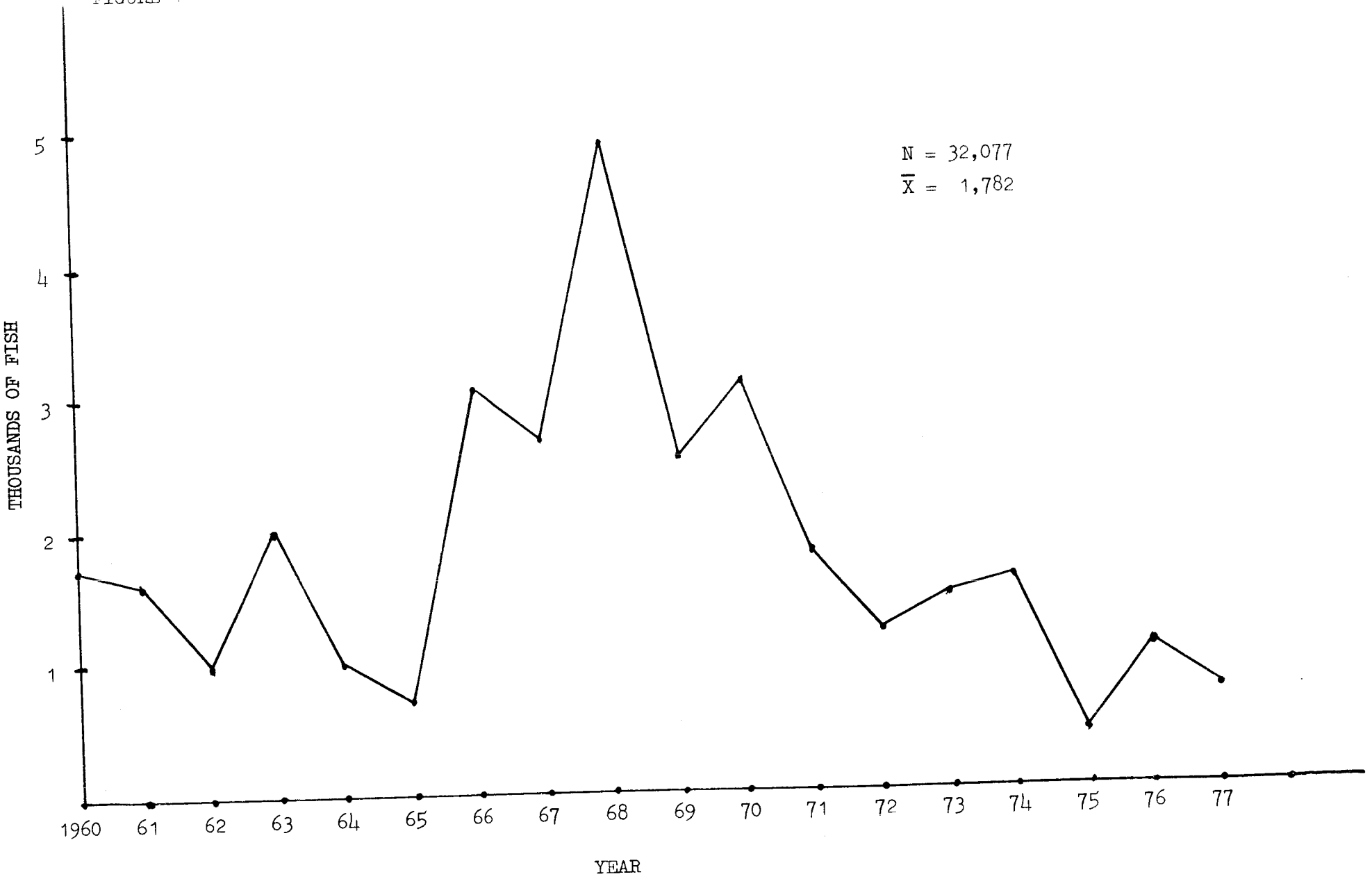
Phase II. Steelhead Enhancement Plan

Literature Review

The enhancement of steelhead populations by various techniques has been a practice in the Pacific Northwest for many years. A considerable amount of published information exists on this enhancement. A search of various libraries and contacts with state and federal agencies are

FIGURE 1

COMMERCIAL CATCH OF STEELHEAD - SOUTHEAST ALASKA 1960-1977



being conducted to obtain a bibliography of steelhead enhancement work. Listings obtained to date appear in Appendix A.

Southeast Alaska Steelhead Brood Stock Selection

The selection of a steelhead brood stock for the enhancement of the sport fishery in Southeast Alaska must meet several criteria.

Southeast Alaska contains three races of steelhead (spring, summer, fall) with the spring-run the most common and wide spread.

Selection of a source of spring-run steelhead brood stock has been initiated with the taking of eggs from the Petersburg and Falls Creek populations. The use of these two populations was done more as a convenience than anything else.

The ideal source for spring-run steelhead would be from a population that had a run timing beginning in April and continuing through mid-June. The brood source would also ideally be composed of steelhead that returned to spawn for the first time after spending two winters at sea instead of three winters as occurs for 50% of the Petersubrg Creek stock. The site selected as a brood source should also be more or less centrally located so that transplants to northern or southern Southeast Alaska would not be too much of a geographical displacement.

With the above criteria in mind, it is recommended that Falls Creek and Crystal Creek be used as the source of spring-run steelhead. The search for another suitable source of spring-run steelhead brood stock should continue if the above sources fail.

Fall-run steelhead are the second most common race of steelhead in Southeast Alaska. They occur from Yakutat to Dixon Entrance in specific locations with the greatest number of streams occurring south of Sumner Straits.

Selection of a fall-run system for a brood stock would be limited to the following:

The run should begin entering the system in September with a peak of abundance occurring in late October. This run timing would provide the best part of the fall for angling opportunity. The fall-run population selected for brood should be comprised of one- and two-ocean adults as this feature would substract a full year off the enhancement cycle. Ideally the brood source should be located in the same geographical area where enhancement is planned. Ideally the brood source for fall-run steelhead will come from a system containing only a run of fall fish. Unfortunately, it is not known for sure that any system in Southeast Alaska contains only fall-runs.

The Naha River system near Ketchikan best fits the above criteria. The run enters the Naha as early as the second week in August and peaks in October. The run is composed of mostly one- and two-ocean adults with a small percent of three-ocean adults.

The Situk River at Yakutat is recommended as the second choice for the use for fall-run steelhead brood stock. The Situk River does have many of the required criteria; however, it has the drawbacks of not being centrally located and containing a sizable spring-run of steelhead.

The third choice for development of a fall-run steelhead brood stock would be Eagle Creek on Prince of Wales Island. This system would be easy to trap and it contains adequate numbers of fish. Eagle Creek is centrally located; however, it does contain a spring-run of steelhead that would cause race separation difficult at spawn taking time.

Streams on the lower Kenai Peninsula and on Kodiak Island contain runs of fall steelhead. These races should be considered as alternate sources for brood stock as they are known to be pure fall-run systems. Their long distance from Southeast Alaska would be a major drawback in their development as a brood stock source for use in Southeast Alaska.

Summer-run steelhead are quite rare in Southeast Alaska, occurring in only one island system and in two or three of the large mainland rivers. Summer-run steelhead brood stock development will be a lower priority than the development of spring and fall steelhead.

The Plotnikof River System on Baranof Island contains the only known run of summer steelhead on the Islands of Southeast Alaska. Development of this population is possible if time and money are available; however, it won't be easy due to the size of the system and its remote location.

Summer-run steelhead ascend the large mainland rivers of Southeast Alaska. These steelhead enter the lower river in August but do not reach clear headwaters until October. All of these summer-run steelhead spawn in Canada and procurement of these fish will require approval of the Canadian Government. Spawning areas have been identified in the Taku River System that would lend themselves to exploitation if permission is obtained. The use of these long-run summer steelhead for brood stock for enhancement of short-run Southeast Alaska systems may prove unworkable; however, a small scale experiment should be undertaken as the run timing of summer steelhead (July-August) would fill a needed gap in the stream fisheries of Southeast Alaska.

Development of Facilities For Steelhead Production

At the present time there are three state and/or federal facilities in Southeast Alaska capable of producing steelhead smolts. Of these three only the Crystal Lake Hatchery at Petersburg is currently raising steelhead.

The present production at Crystal Lake is comprised of spring-run stock from Petersburg Creek and Falls Creek and is being developed for brood stock.

Recent reevaluation of priorities within the F.R.E.D. Division have resulted in the decision to produce maximum numbers of king and coho salmon at facilities capable of raising smolt size fish. This decision will result in a decrease in the amount of available space for steelhead

production. Since steelhead have been raised at Crystal Lake for the past four years, it is unlikely that they will be excluded entirely; however, the numbers raised probably will not be large enough to support an extensive enhancement program.

Other fish rearing facilities, namely the Deer Mountain Hatchery at Ketchikan and the Little Port Walter facility, are not now raising steelhead and may be used for that purpose, at least on a limited scale.

It is proposed that a fish rearing facility be constructed or an existing facility expanded for the express purpose of raising non-salmon species. This facility should be large enough to raise approximately 750,000 smolts of various species annually.

Costs of such a facility are difficult to determine at this time and would not be available until a decision is made regarding the location and whether or not it would be a new facility or an expansion of an existing facility.

Until a trout hatchery can be built, it is recommended that the Crystal Lake Hatchery be utilized to produce spring-run steelhead in whatever numbers are compatible with other species but should not fall below 50,000 smolts annually.

As sources of summer and fall-run steelhead are developed, it is recommended that the summer-run brood stock be developed at Little Port Walter and the fall-run stock at the Deer Mountain Hatchery. The small rearing station located at the Sheldon Jackson College may be considered as an alternate to the previous two locations.

The use of saltwater pens for smolt production has been tested in Southeast Alaska with salmon and in Washington State with both salmon and cutthroat trout, Salmo clarki Richardson. This type of rearing facility must still be classified as experimental and cannot be considered for planned production of steelhead at this time. Saltwater pens do have the advantage of being initially less expensive to construct and should be considered as a viable alternate to shoreside rearing facilities.

Enhancement of Existing Fisheries and Establishment of New Runs

The enhancement of existing and/or depleted runs and the creation of new runs of steelhead is a common and long practiced management tool in the Pacific Northwest. In Alaska, all steelhead runs have been comprised of wild fish with management aimed at perpetrating these populations. Increased popularity of steelhead together with more people with more money and better means of access have caused declines in some steelhead populations. To offset this, a small scale program was begun in 1975 to determine if hatchery produced steelhead runs could be established in streams without a history of steelhead production. In addition hatchery produced smolts were liberated in streams with existing wild steelhead runs to determine the conributions to the fishery.

This program was hampered by the small number of steelhead smolts available annually and was done primarily on an experimental basis. Results of these experimental releases are not complete to date.

As sufficient smolts become available from the various races of steelhead, it is recommended that the following streams be stocked with spring steelhead: Montana Creek near Juneau, Indian River near Sitka and White River near Ketchikan. The following streams are recommended for stocking with fall-run steelhead: Cowee Creek and Montana Creek in the Juneau area, Indian River in the Sitka area, and Ward Cove Creek in the Ketchikan area.

When sufficient numbers of smolts become available, the following existing steelhead fisheries are recommended for stocking: Peterson Creek on the Juneau road system would benefit by the addition of a small plant of spring steelhead smolts. Salmon Creek and Eva Creek in the Sitka area should be stocked with spring-run steelhead. In the Petersburg area both Falls Creek and Ohmer Creek may benefit from plants of spring steelhead. In the Ketchikan area Ward Cove Creek, White River and Hydaburg River should receive plants of spring-run steelhead.

Additional systems throughout Southeast Alaska undoubtedly would benefit from enhancement with the various races of steelhead. These systems will be surveyed and cataloged as to the best race to use and put into production when adequate numbers of the various races of steelhead smolts become available.

Evaluation of Steelhead Enhancement Programs in Southeast Alaska

Basic to any enhancement program is the evaluation of the results. Experimental plants of spring steelhead smolts have been made in Petersburg Creek, Blind Slough and Montana Creek. At the time this plan is being written, it is not known what the results will be. Whatever the results, they should go a long way toward answering many questions on proper brood stock selection, release timing, imprinting and homing, and size at release.

Hatchery produced steelhead must contribute to the sport fishery. Monitoring of Montana Creek and Petersburg Creek during the spring of 1978 will give answers to the hatchery fish contribution to the local sport fisheries.

Evaluations of rearing facilities and brood stocks in the various facilities should be made on a annual basis with a continuing program of upgrading both rearing techniques and stock selection.

Last but not least, an evaluation should be made of the contribution to the population made by hatchery steelhead reproducing in the planted system. Inter-actions with other rearing salmonids must be evaluated to determine the overall effect of hatchery steelhead on the stream system.

Adult Spring-Run Steelhead Surveys

Surveys were conducted on two stream systems during the spring of 1977 to determine the presence, distribution and general abundance of spring-run steelhead.

Chuck River:

Chuck River, located at the head of Windham Bay, was surveyed in mid-May 1977. Transportation was via fixed wing aircraft to Windham Bay.

Chuck River is a large mainland river system approximately 15 kilometers long. Several extensive tributaries enter the Chuck River throughout its length with the largest being Sylvia Creek (Figure 2). The lower stretches of the Chuck River average 30 meters in width and approximately .5 meter in depth. Sylvia Creek is 10-12 meters wide by .5 meter deep where it joins the Chuck River. Approximately 4 kilometers above tidewater the river enters a narrow canyon with many small falls and rapids. Above this section Chuck River Valley opens out into a more moderate gradient.

Foot surveys during May 1977 were limited to the first 4 kilometers. The area surveyed was comprised of long riffles interspaced between several large pools. Near the upper limit of the survey area the stream changed into a deep swift boulder studded canyon.

Reports of the existence of a run of spring steelhead in the Chuck River have been received for several years; however, no actual steelhead caught in Chuck River were ever forthcoming.

Weather and water conditions during the May survey were nearly ideal. Careful observation and extensive hook and line sampling failed to produce any steelhead. It is possible that the steelhead had passed through the area surveyed and were already in the upper reaches of Chuck River.

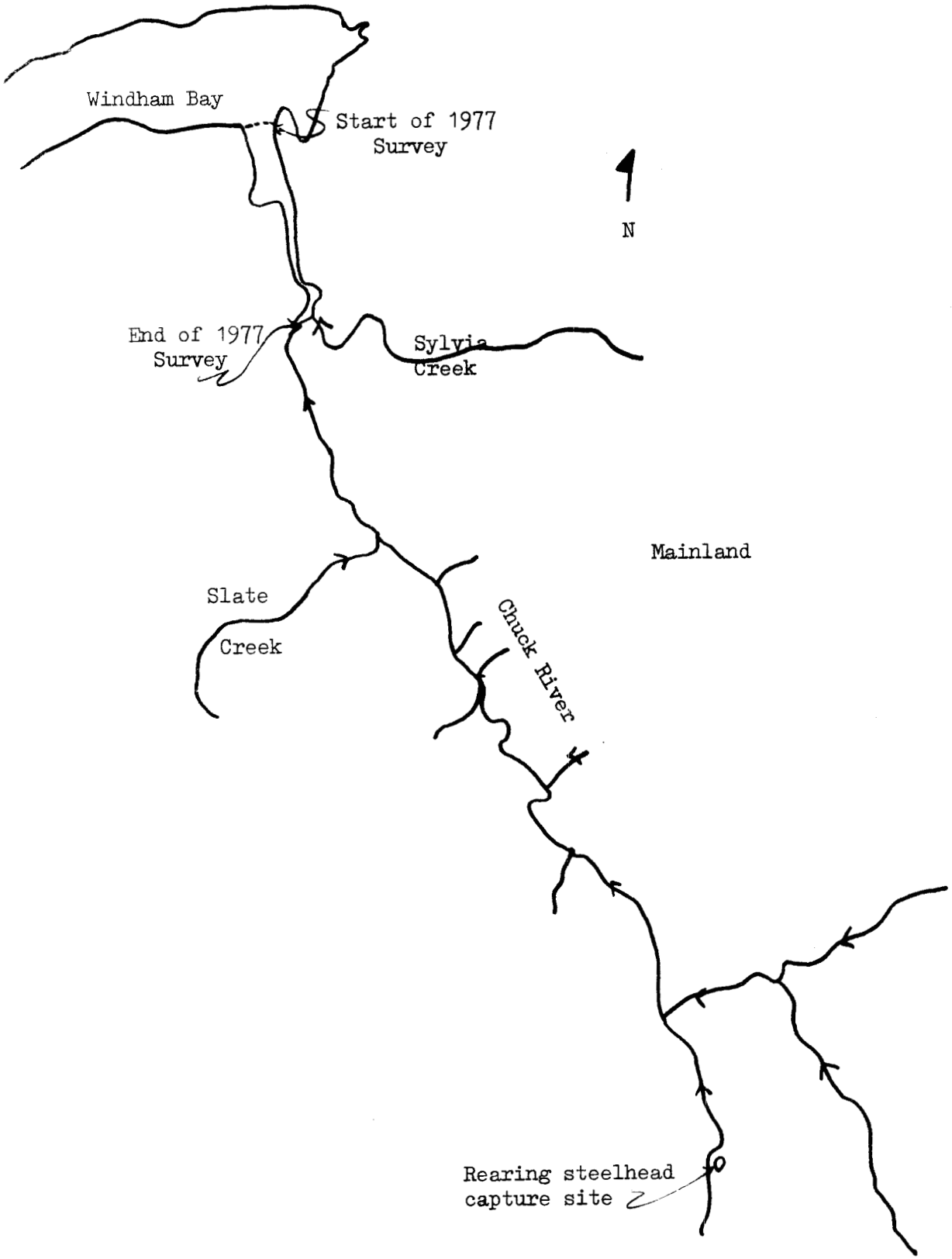
Investigations of all existing data on file for the Chuck River turned up the results of a rearing fish survey conducted via helicopter throughout the system in 1973. During the course of this survey, rearing steelhead were captured at one location approximately 10 kilometers upstream. Total numbers captured were small, indicating that the steelhead run is small and may consist of only a token population.

Keta River:

Keta River, located at the head of Boca De Quadra, on the mainland south of Ketchikan has been forced to the front due to the large deposit of molybdenum located on the ridge between the Keta and Blossom rivers. Removal of this molybdenum deposit may have lasting effects on the fish habitat of the Keta.

Surveys of the adult spring-run steelhead population were conducted during the first week of June 1977. Transportation throughout the 20 kilometers

Figure 2. Chuck River System



of the river surveyed was by helicopter, which afforded the only feasible means of surveying the whole system.

The Keta River is a large mainland system 25-30 kilometers long with several large tributaries. The area surveyed ranged from 5-6 meters wide by .5 meter deep in the upper reaches to over 30 meters wide by 2 meters deep in the lower reaches (Figure 3).

Extensive low level surveying from helicopter and foot surveys in the upper areas of Keta River did not turn up any adult steelhead. The only adult steelhead was noted approximately 3 kilometers above tide water. This fish was observed from the helicopter on a spawning riffle in 1 meter of water. Extensive hook and line sampling in the many excellent pools failed to capture any additional adult steelhead. Adult steelhead were captured on hook and line on a previous survey in 1975 in approximately the same area.

Baited minnow traps were fished throughout the length of the Keta River during 1977. Rearing steelhead were captured in moderate numbers in an area 2 to 3 kilometers above tide water. Excellent rearing areas are available throughout the Keta; however, rearing steelhead are found in only a very small restricted amount of the total area available to them. The adult run of spring steelhead to the Keta River appears small and probably would not exceed 50 fish annually.

Rearing Steelhead Surveys

During the 1977 field season, surveys were made on two systems in Southeast Alaska to confirm the suspected presence of steelhead. Surveys were conducted on two additional stream systems to define the rearing areas for steelhead.

Andrews Creek:

Andrews Creek, a tributary to the Stikine River, is located on the south side of the river approximately 15 kilometers above the mouth of the Stikine. Andrews Creek is a medium size clearwater system consisting of two forks. The north fork is blocked to anadromous fish by a high falls just above its confluence with the south fork. The south fork of Andrews Creek is of moderate gradient and originates in the snow fields of the mainland peaks. The south fork is accessible to anadromous fish for more than 12 kilometers (Figure 4).

The lower 5 kilometers of Andrews Creek were surveyed during June 1977. Baited minnow traps were fished throughout the area in all different types of habitat. Andrews Creek averaged 10 meters wide by .5 meter deep in the survey area with some pools in excess of 2 meters in depth. Rearing coho salmon, Onchorhynchus kisutch (Walbaum), king salmon and Dolly Varden, Salvelinus malma (Walbaum), were the only species trapped. Water temperatures during the June survey were low (6°C) and may have influenced trap catches. A later survey in July when water temperatures were warmer (12°C) also produced only low catches of salmon and Dolly Varden. If steelhead do in fact use Andrews Creek as a spawning site,

Figure 3. Keta River

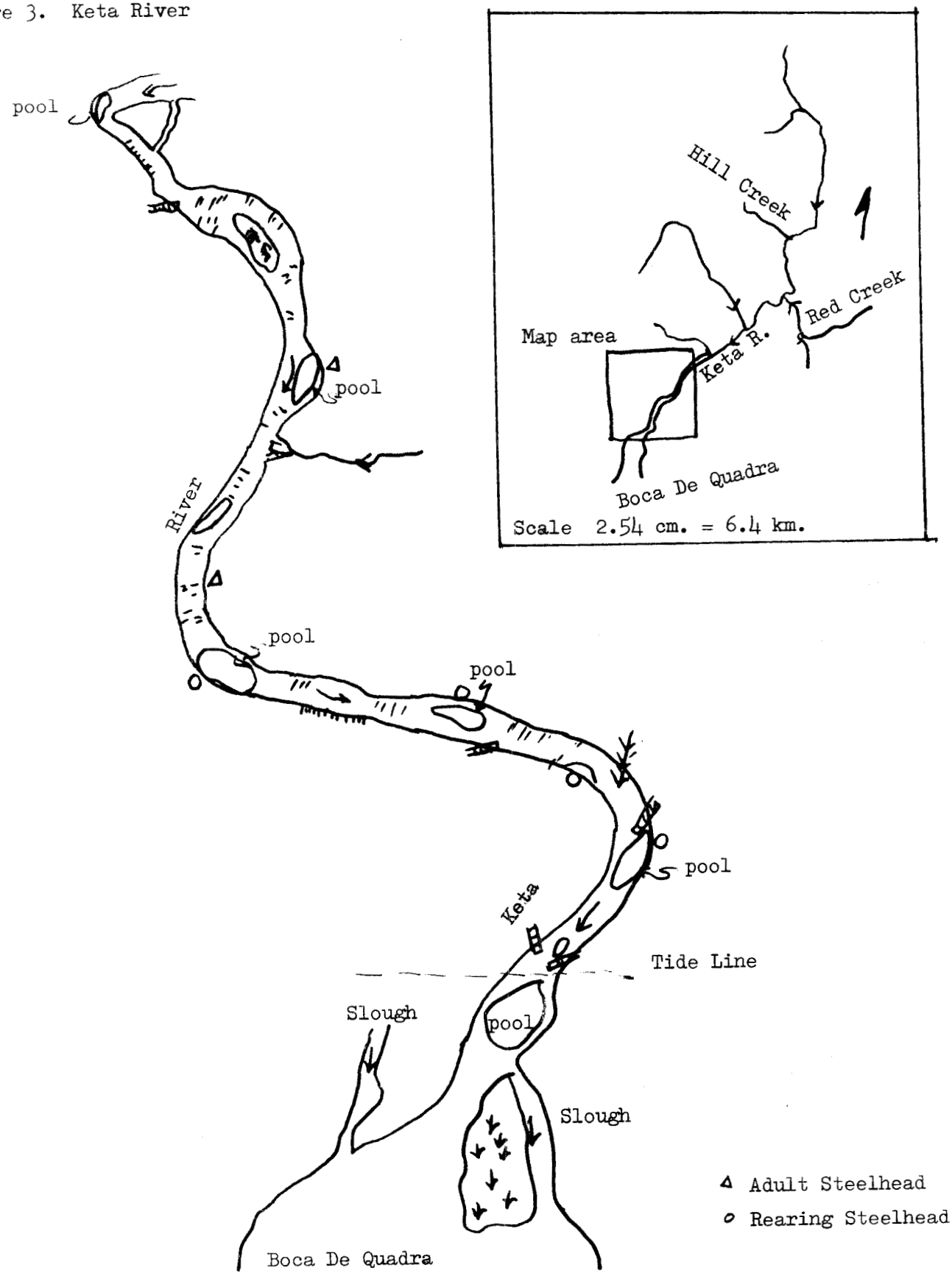
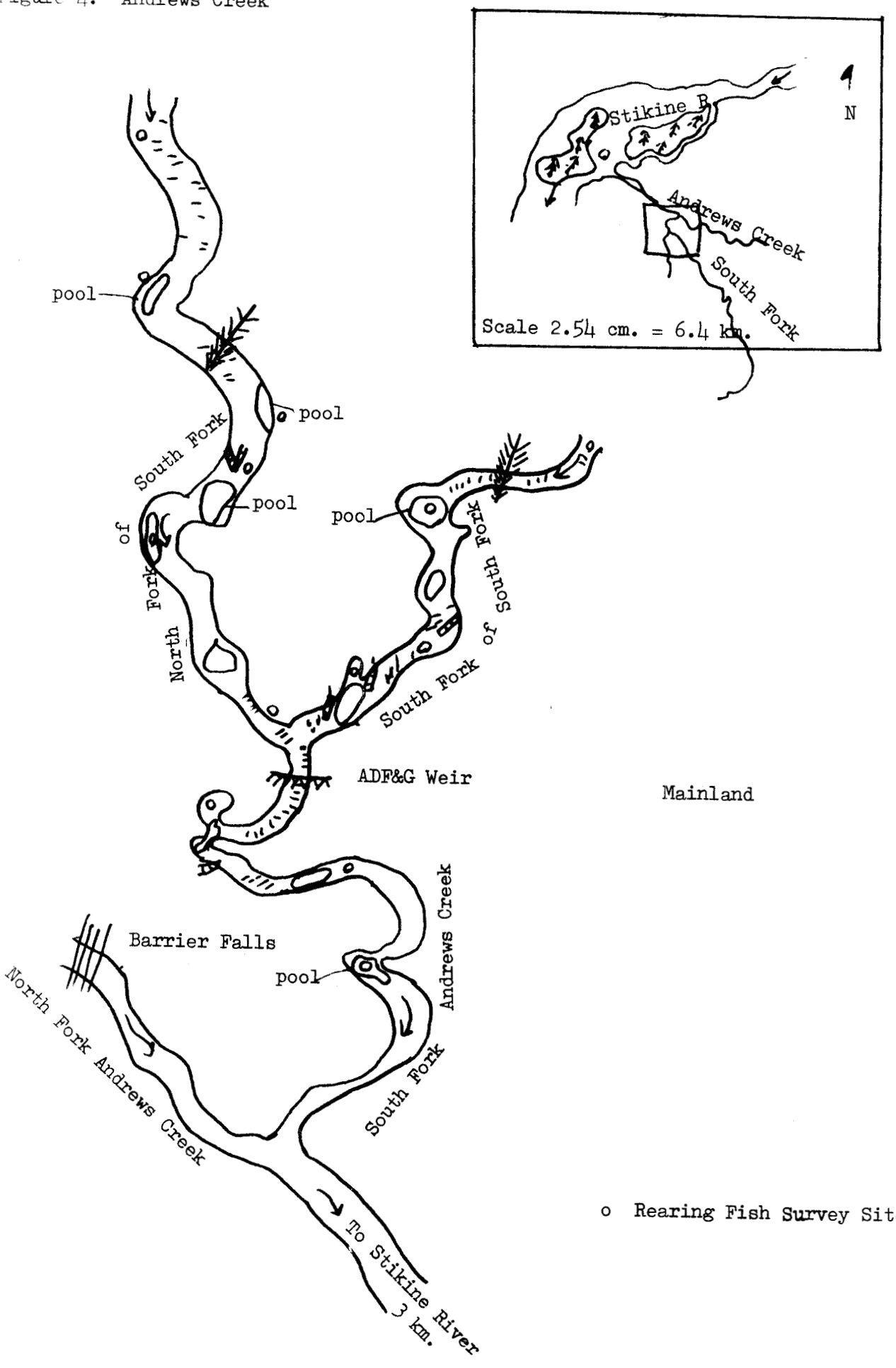


Figure 4. Andrews Creek



the resulting fry rear elsewhere in the Stikine System. Until data indicate otherwise, Andrews Creek will not be included in the listings of steelhead systems.

Duncan Salt Chuck Creek:

Duncan Salt Chuck Creek, located at the head of Duncan Canal Kupreanof Island, had been reported to contain a run of spring steelhead. Surveys were made in August to insure adequate water temperatures to attract rearing species.

Duncan Salt Chuck Creek heads in Bohemian Lake and flows approximately 16 kilometers before entering Duncan Canal through the Salt Chuck. Anadromous salmonids are able to ascend the main stem stream for a distance of 14.5 kilometers and an additional 10 kilometers in three major and minor tributaries (Figure 5).

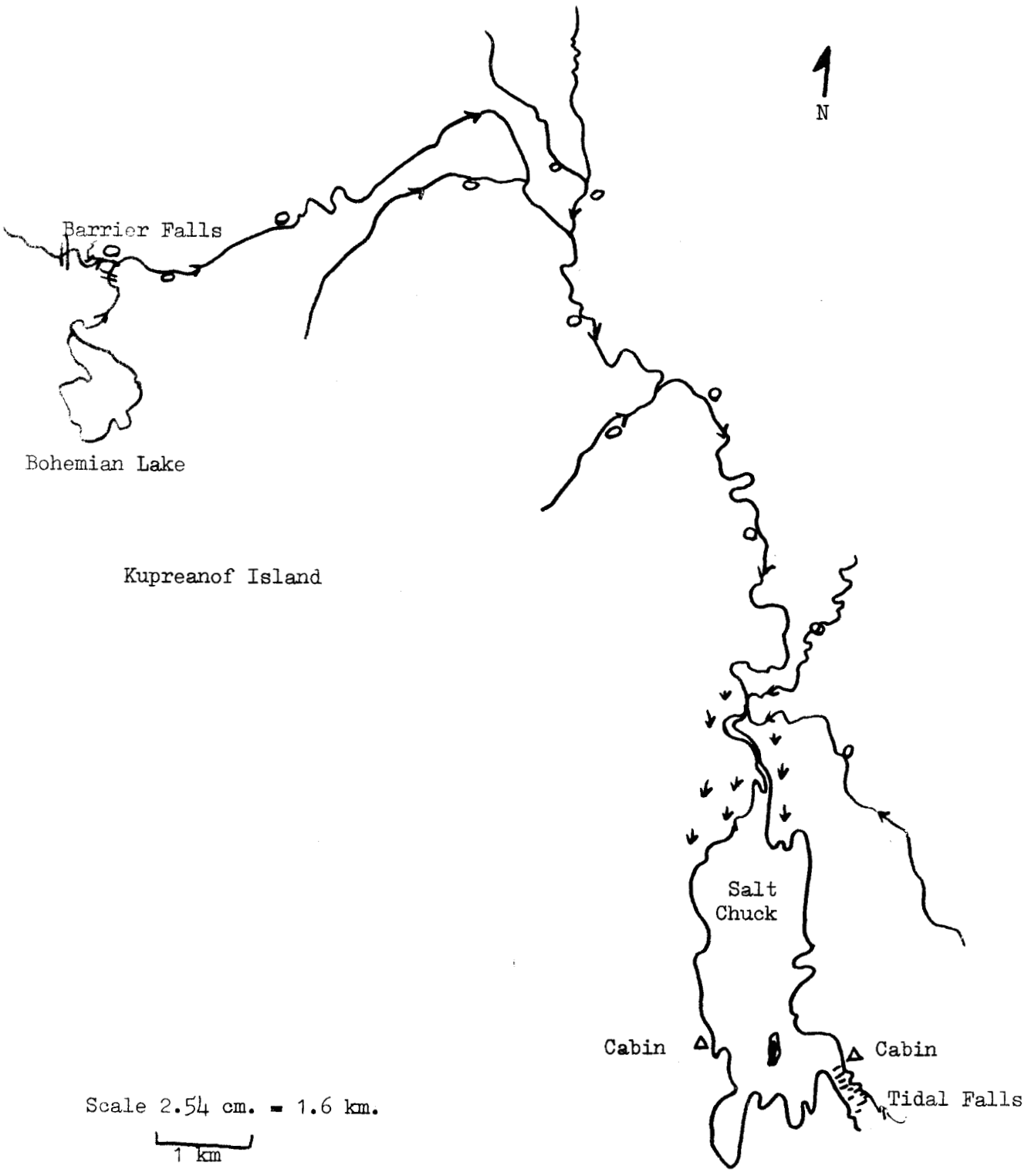
Access throughout this large system was via helicopter which enabled a complete coverage of the accessible main stem and the lower reaches of the larger tributaries.

Duncan Salt Chuck Creek drains a large muskeg area which stains its waters a dark brown. The stream is of low gradient with the 60 meter elevation occurring 14 kilometers upstream. The upper 4 or 5 kilometers of Duncan Salt Chuck Creek averages 10 meters wide and less than .5 meter in depth with a substrate of bedrock and a few pools and spawning riffles. The middle section of the stream has less exposed bedrock, more riffles and a few more pools. Log jams and down timber abound in the middle area causing difficulty in access. The lower reaches of the stream has more pools interspaced with short riffles. Pools in the lower stream often exceeded 2 meters in depth. Side tributaries surveyed were of low gradient in their lower reaches with many pools and short connecting riffles.

Baited minnow traps were fished throughout the entire system in all types of habitat. Rearing steelhead were trapped at the very upper limits of accessible streams and were abundant in most habitat types throughout the tributaries and the upper and middle portions of Duncan Salt Chuck Creek. The lower 4 or 5 kilometers of the stream held only a few rearing steelhead as this habitat was not to their liking. Cutthroat trout were more abundant in the lower reaches of the system. Rearing coho salmon were present throughout the system in large numbers. Dolly Varden were also widespread throughout.

The presence of large numbers of rearing steelhead suggests that Duncan Salt Chuck Creek supports a moderate run of spring steelhead. Access across the flats at the stream mouth is subject to tidal action which may account for the lack of effort by steelhead anglers. Many excellent steelhead holding pools are located in the first 2 kilometers and should offer excellent angling.

Figure 5. Duncan Salt Chuck Creek



Hatchery and Log Jam Creeks:

Hatchery and Log Jam creeks enter the Sweetwater Lake complex through a common estuary. Hatchery Creek drains a large lake complex while Log Jam Creek has only small non-anadromous lakes in its headwaters. Both creeks drain approximately the same area on Prince of Wales Island but due to their different makeup support different runs of fish.

Hatchery Creek:

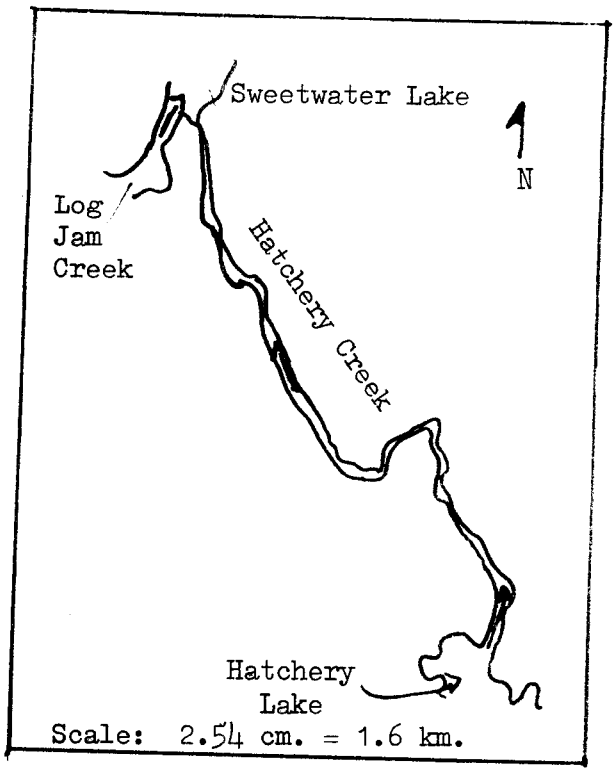
Hatchery Creek drains three major lakes (Galea, Middle and Hatchery), and several lesser unnamed muskeg ponds (Figure 6). Hatchery Creek was surveyed in June 1977 to determine the distribution of rearing steelhead in the system. The area surveyed began at the outlet of Hatchery Lake and terminated at Sweetwater Lake, a distance of 9.5 kilometers. Hatchery Creek below Hatchery Lake for a distance of 2.4 kilometers was of low gradient with many pools and a few connecting riffles. Undercut banks and log jams are common in this section with excellent rearing habitat. Baited minnow traps fished throughout this section captured coho salmon, Dolly Varden and cutthroat trout. No rearing steelhead were captured either on hook and line or in the minnow traps. The middle section of Hatchery Creek contains two semi-barrier falls. This section of stream is of a higher gradient with abundant short rapids, long steep boulder laced riffles and a few deep pools. Just below the falls minnow traps and hook and line began to capture rearing steelhead which increased in number as the survey proceeded downstream. The lower 2.5 kilometers of Hatchery Creek is again of moderate gradient with many excellent riffles and deep pools. Extensive blow down and small log jams occur throughout this section which makes access difficult but adds significantly to the rearing habitat. Rearing steelhead were abundant in this section but rearing cutthroat were totally absent. It would appear from this survey that the steelhead rearing habitat is primarily below the falls on Hatchery Creek. Adult steelhead should be able to jump the falls and, in fact, may do so. It appears, however, that most of the fry rear in the area below the falls. Time did not permit a survey of the stream between Hatchery Lake and Galea Lake as this area does not appear to be prime steelhead rearing habitat.

Log Jam Creek:

Log Jam Creek originates in a series of small muskeg ponds and tributaries and flows approximately 20 kilometers before entering Sweetwater Lake. Anadromous salmonids are able to ascend nearly to the headwaters on the main stem and tributaries.

Due to limited access points (no lake) only the lower 5 kilometers of Log Jam Creek were surveyed in 1977 (Figure 7). A new logging access road parallels Log Jam Creek for this distance and crosses the creek at a point 4.5 kilometers above Sweetwater Lake. Log Jam Creek in the area surveyed averaged 12 meters wide by .5 meter deep. Its waters were stained a dark brown by the surrounding muskeg.

Figure 6. Hatchery Creek



Hatchery Lake

Logging Road

2 meter falls

pool

4 meter falls

pool

Price of Wales
Island

pool

pools

pool

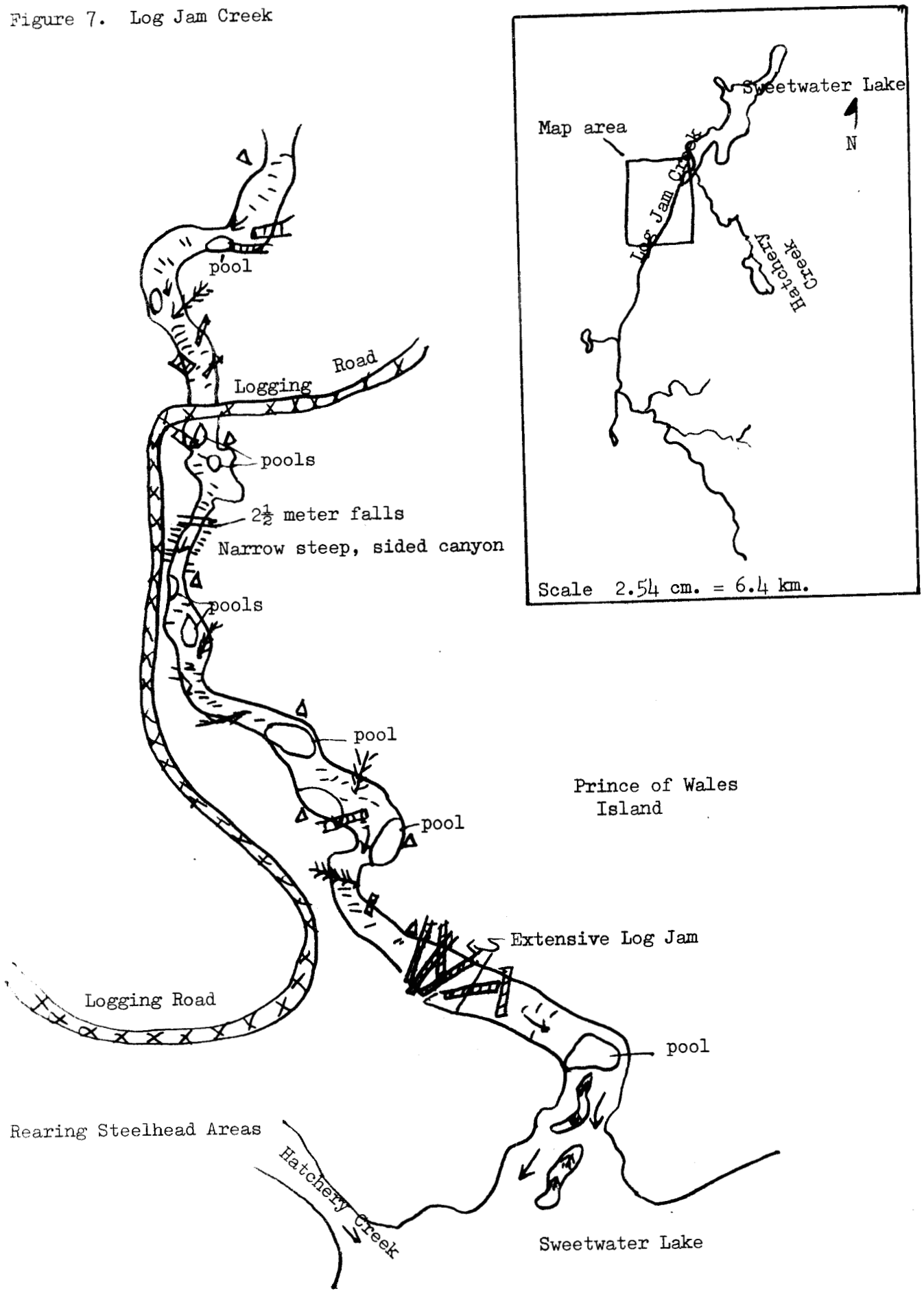
pool

Log Jam Creek

Δ Rearing steelhead areas

Sweetwater
Lake

Figure 7. Log Jam Creek



Log Jam Creek is of a moderate gradient in the area surveyed with stretches of fast, deep water alternating with pools and shallow riffles. A 2.5 meter falls is located just below the logging road bridge and may present a block to certain species of salmon. Minnow traps and hook and line were employed to capture rearing species. Rearing steelhead together with Dolly Varden, coho salmon and cutthroat trout were captured at the start of the survey. Rearing steelhead were present in most habitat types throughout the surveyed section, but were most abundant in the upper and middle sections where the gradient was higher. Rearing steelhead were captured in small numbers near Sweetwater Lake where there was little or no current. Cutthroat were quite numerous in the lower, slower sections. The extent of rearing habitat for steelhead in Log Jam Creek is unknown but appears to be quite extensive. Total numbers of rearing steelhead captured in Log Jam Creek did not equal those captured in Hatchery Creek. At this point, it appears that Hatchery Creek is the major producer of steelhead in the Sweetwater System.

Steelhead Enhancement Surveys

The enhancement of existing steelhead runs and the creation of new populations through the use of hatchery produced smolts is presently in the formulative stages. Once adequate numbers of steelhead smolts are available on an annual basis, the stocking of selected streams throughout Southeast Alaska will begin. Surveys were conducted on five streams in Southeast Alaska to determine their suitability for future enhancement work. To date a total of nine streams have been cataloged (Jones 1977) throughout Southeast Alaska for possible steelhead enhancement programs.

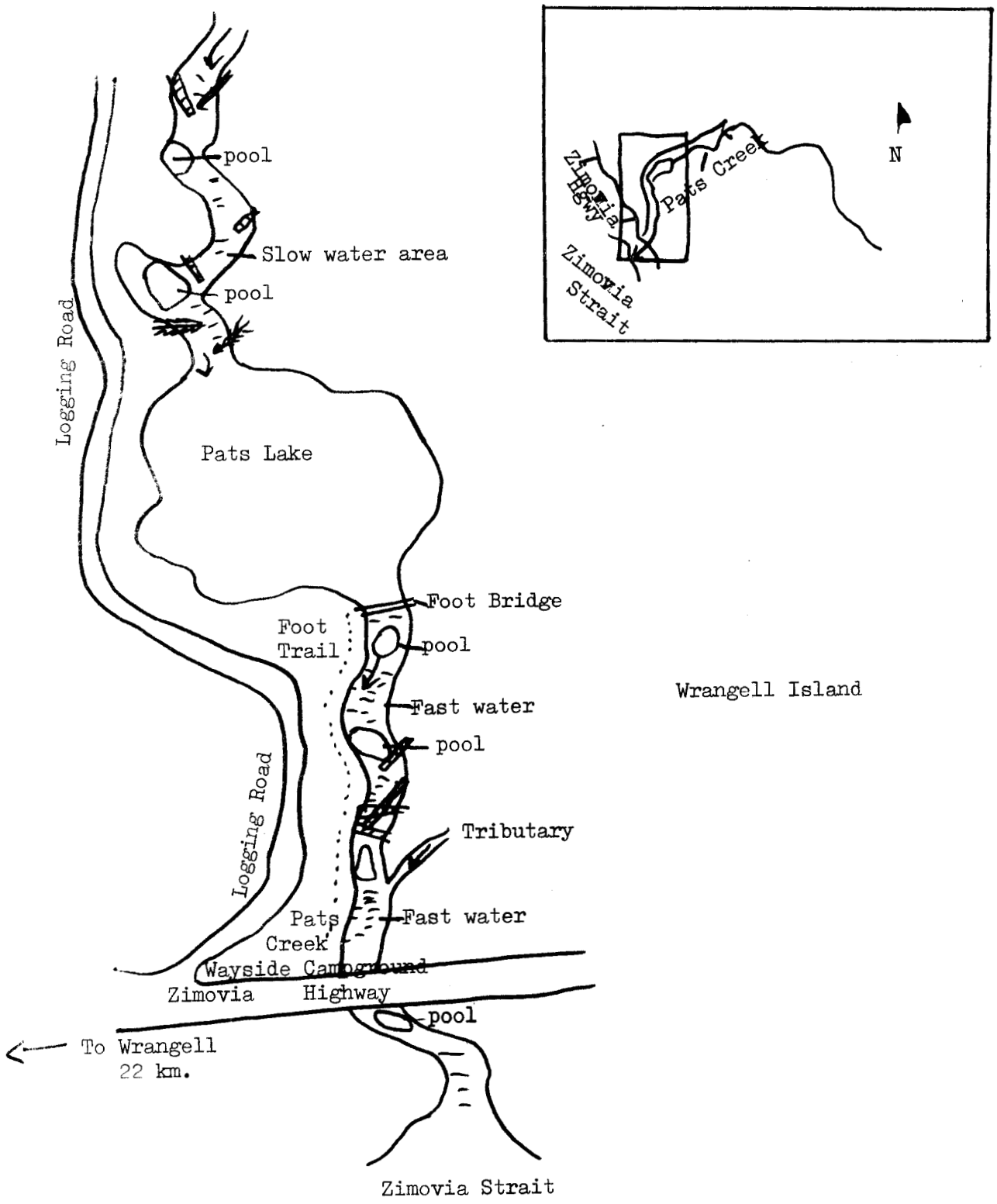
Pats Creek:

Pats Creek, located on the northwest side of Wrangell Island, is adjacent to the Wrangell Highway system and is a popular recreation area for residents of Wrangell.

Pats Creek has a history of steelhead runs and also provides good angling for Dolly Varden, cutthroat and coho salmon. Pats Creek was surveyed for a distance of 1 kilometer above Pats Lake to tide water. Pats Creek above Pats Lake was of low gradient with numerous pools and shallow riffles. Access to the area is offered by the logging road that parallels the stream. Pats Creek below Pats Lake is of higher gradient with many fast water sections interspaced with deep pools. Riffles are common in the area just above the tide line (Figure 8). Pats Creek is small as streams go in Southeast with an average width of less than 10 meters and an average depth of less than .5 meter.

From an enhancement standpoint, Pats Creek should be placed fairly high on the priority list. Roadside angling is at a premium in the Wrangell area and the establishment of a small run of spring steelhead would add to the area's overall recreational opportunity.

Figure 8. Pats Creek



Mahoney Creek:

Mahoney Creek, located on the George Inlet side of Revillagigedo Island, was surveyed during 1977. Mahoney Creek system presently supports a small run of spring steelhead; it was surveyed to determine the advisibility of enhancing this system with hatchery produced steelhead.

Mahoney Creek heads in Mahoney Lake and flows approximately 2 kilometers to George Inlet. Mahoney Creek is of a high gradient dropping over 27 meters in the 2 kilometers to George Inlet. Mahoney Creek is one of the steepest streams in Southeast Alaska that is accessible to anadromous fish passage. There are several deep pools and two deep water runs that would provide holding water for steelhead. Access to Mahoney Creek is via skiff or fixed wing aircraft and a foot trail parallels the stream for a portion of its length (Figure 9). The short length together with the lack of holding pools does not rank Mahoney Creek highly for enhancement with steelhead.

Ward Creek:

Ward Creek, located on the Tongass Narrows side of Revillagigedo Island, heads in Connell Lake and flows 6.5 kilometers to Ward Cove.

Ward Creek emerges from behind the Ketchikan Pulp Company Dam on Connell Lake. Water flow is regulated by the water needs at the pulp mill and does not experience the extreme high and low flows common in undeveloped streams in the area. The upper section of Ward Creek is of fairly high gradient with many rapids and small falls. Pools are interspaced throughout the stretch and would provide holding water for adult steelhead. The middle section of Ward Creek flows through a narrow valley with a few pools connected by numerous fast water rapids. Ward Creek then slows down before entering Ward Lake. Upon leaving Ward Lake, the stream is confined in a shallow canyon with a few rock studded pools and lots of fast water.

Access to Ward Creek is excellent throughout its entire length (Figure 10). Ward Cove Road runs parallel to the stream from the Tongass Highway to Connell Lake. A developed campground and recreation area is located at Ward Lake. Ward Creek contains a small run of spring steelhead that could be enhanced with additional hatchery reared smolts. When fall-run steelhead smolts become available, Ward Creek will be an excellent location to initiate enhancement with this race of steelhead.

Peterson Creek:

Peterson Creek originates in Peterson Lake and flows approximately 7 kilometers before dumping into the waters of Lynn Canal. Approximately 3 kilometers above salt water is located a 15 meter falls that halts any further upstream movement by anadromous fish. A survey conducted during 1977 began at the base of the falls and proceeded to tide water.

Peterson Creek in the upper reaches of the survey contained a moderate gradient 5-10 meters wide with several pools, some fair riffles and many large boulders and fallen logs. The best pool in the upper section was the one at the base of the falls. This pool appeared to be quite popular with

Figure 9. Mahoney Creek

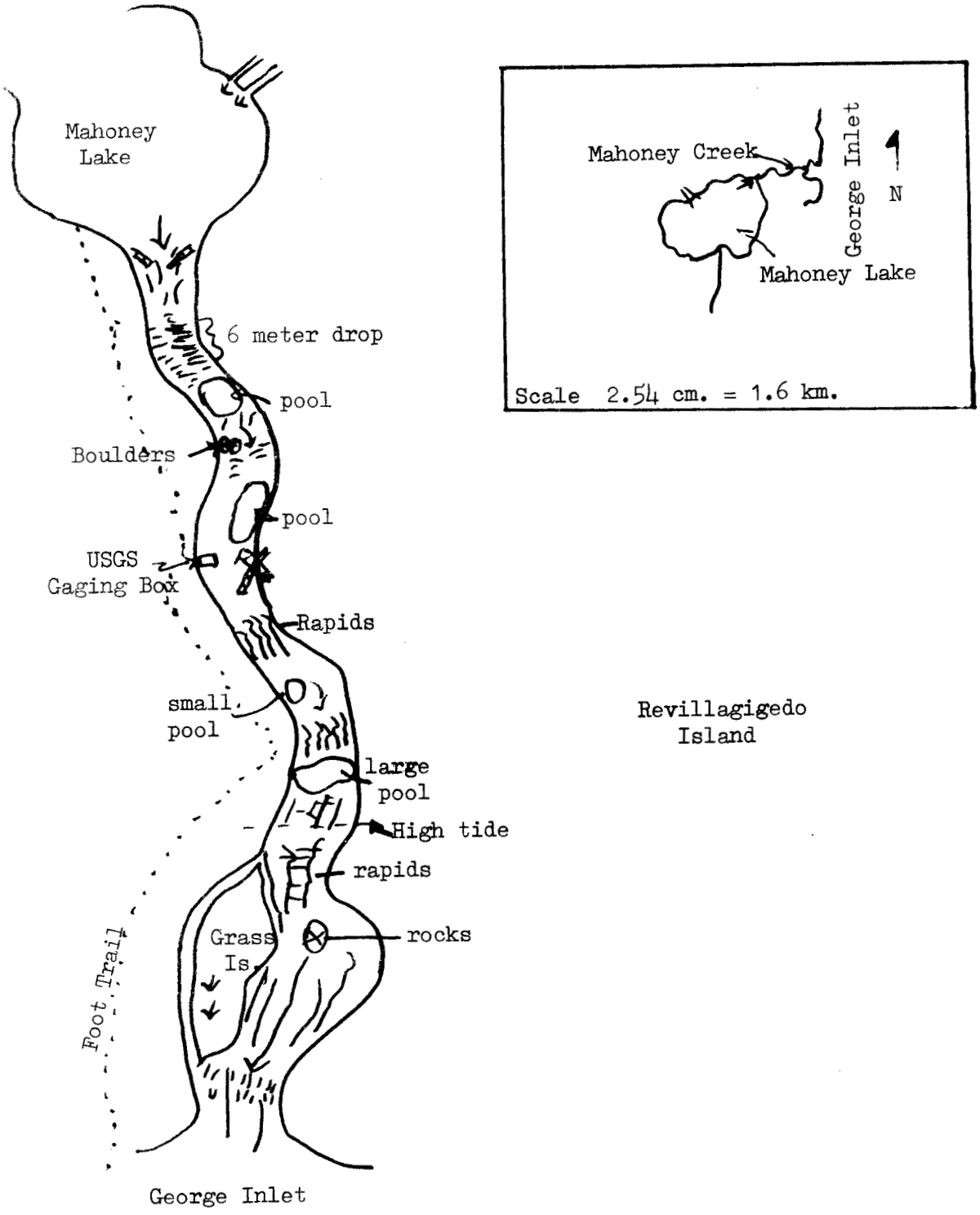
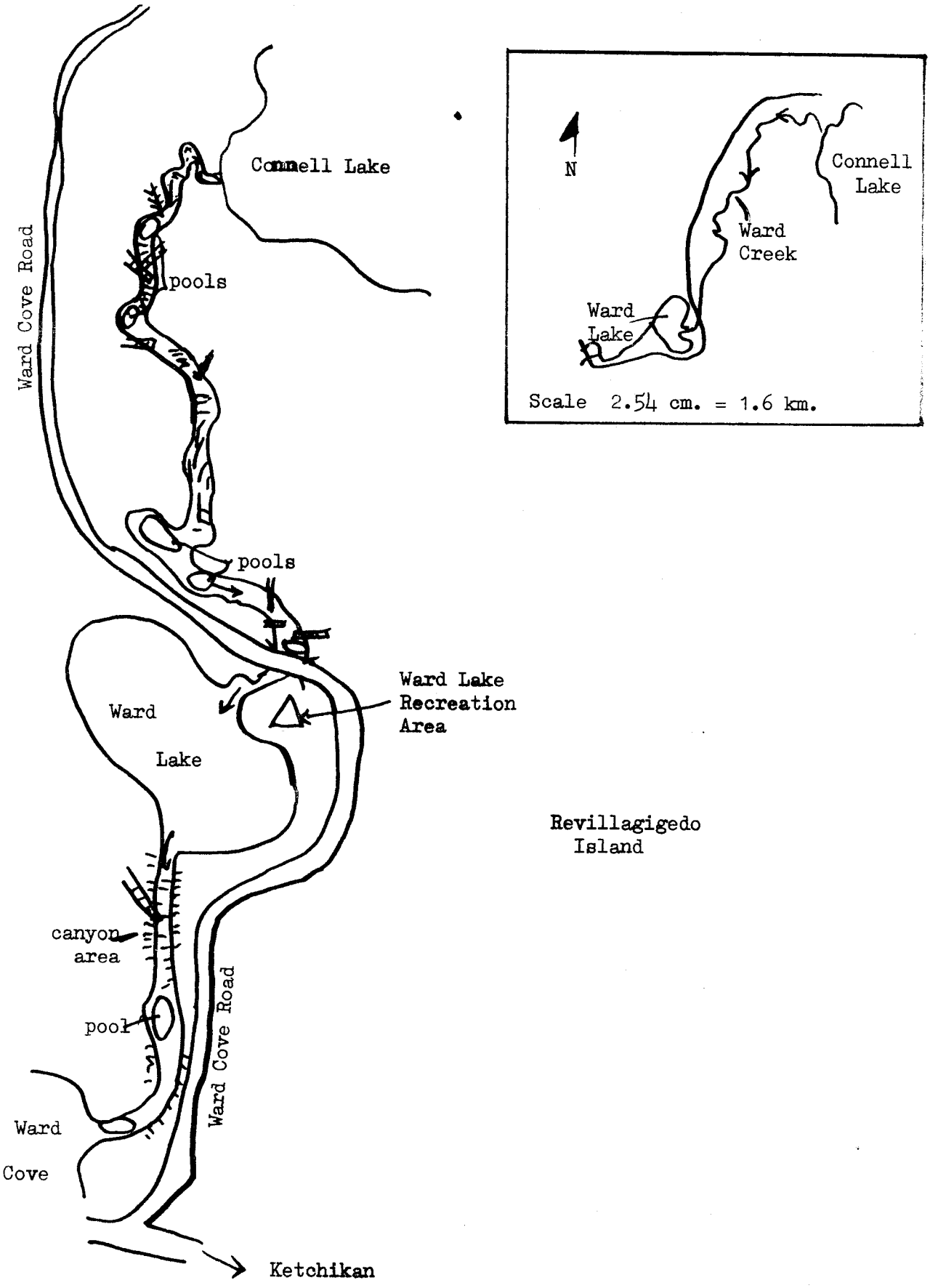


Figure 10. Ward Creek



local anglers and showed heavy foot traffic and debris accumulation. Proceeding downstream, the stream widened a bit with a few side sloughs and braided sections. Pools were not common in the area with only two or three large enough to hold resting steelhead. The lower reaches of Peterson Creek are of a low gradient with more side sloughs and more large pools connected by shallow riffles. Peterson Creek enters a small salt lake before dumping in Lynn Canal (Figure 11).

Peterson Creek supports a small native run of spring steelhead. This is the only steelhead run accessible by auto from Juneau and therefore receives heavy fishing pressure.

Access to Peterson Creek is good via a Forest Service trail that leaves the Glacier Highway near the highway bridge. Access is also available via a dirt road that terminates in a recreation area near the salt lake.

The enhancement of Peterson Creek with hatchery steelhead smolts has the possibility of increasing the fishing opportunity for Juneau area anglers. A small plant is all that is necessary as there is limited room for adult steelhead in Peterson Creek and not a great amount of fishable water.

Fish Creek:

Fish Creek, located on the northern end of Douglas Island, was surveyed in 1977 to assess its potential for enhancement with hatchery produced steelhead. At present, Fish Creek does not contain a steelhead run; however, its salmon and Dolly Varden population make it one of the more popular sport fishing areas on the Juneau road system.

Fish Creek is an extensive stream with headwaters in the mountains of Douglas Island. Approximately 9 kilometers of Fish Creek is accessable to anadromous fish and the lower 6 kilometers were surveyed during 1977.

Fish Creek is of a fairly high gradient throughout the area surveyed. The upper section averaged 15 meters in width and 1 meter in depth. Many small falls and short, steep rapids occur in the upper section. Very few pools or holding water occurs in this area. The middle section contained more pools and also the first good riffles. The lower section was of lower gradient with more riffles and several good large holding pools (Figure 12).

Access to Fish Creek is via the North Douglas Highway, 14 kilometers from Douglas, then via an improved trail that parallels the stream for the first 3 kilometers followed by an unimproved bear trail for the remainder of the area surveyed.

Enhancement of Fish Creek with hatchery produced steelhead has the possiblity of creating additional angling opportunities for the Juneau area. The lack of holding water in Fish Creek, however, places it low on the priority list of enhancement streams. Creation of a steelhead run would tend to cause crowded fishing conditions when anglers concentrate in the few available pools.

Figure 11. Peterson Creek

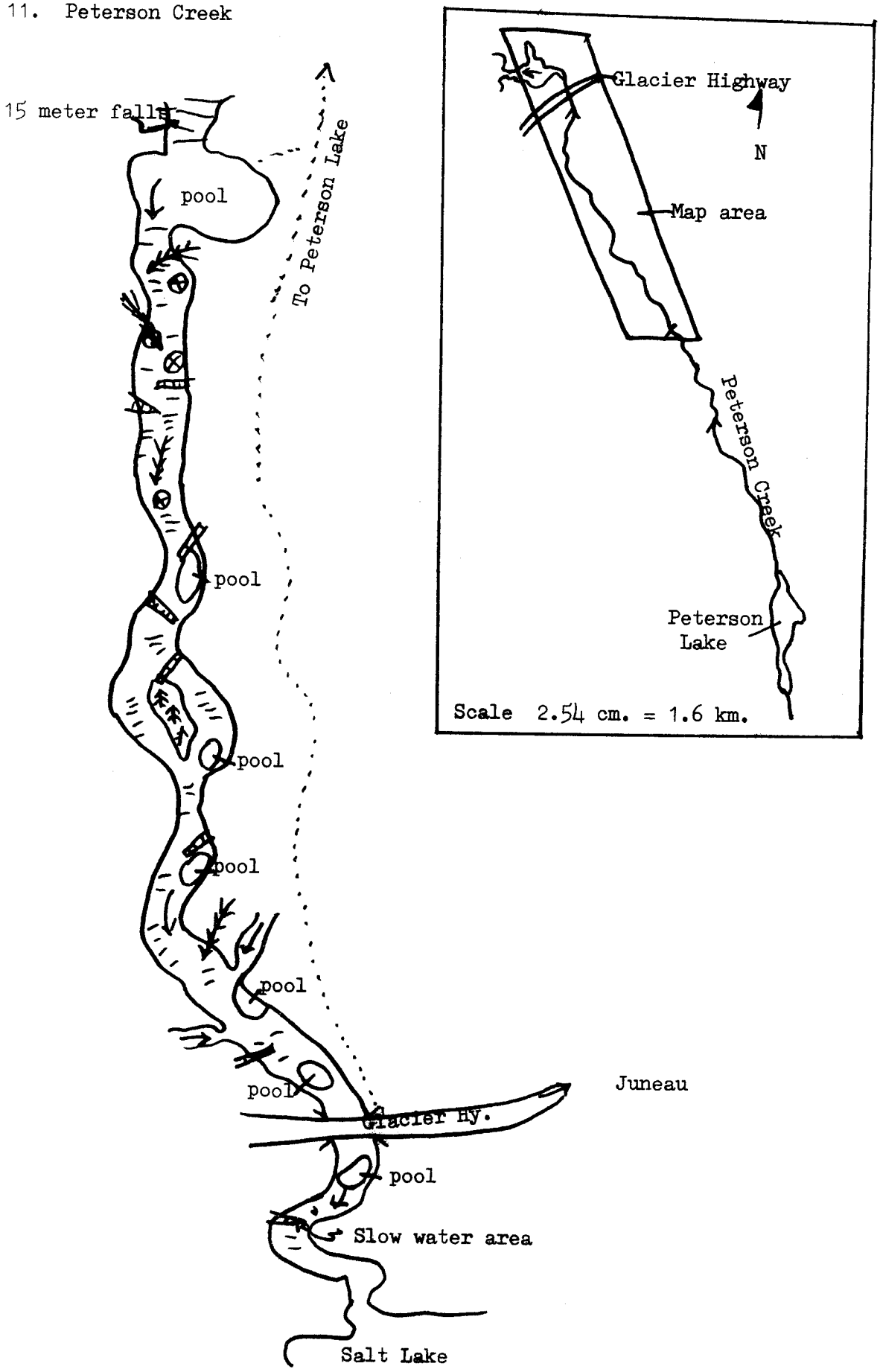
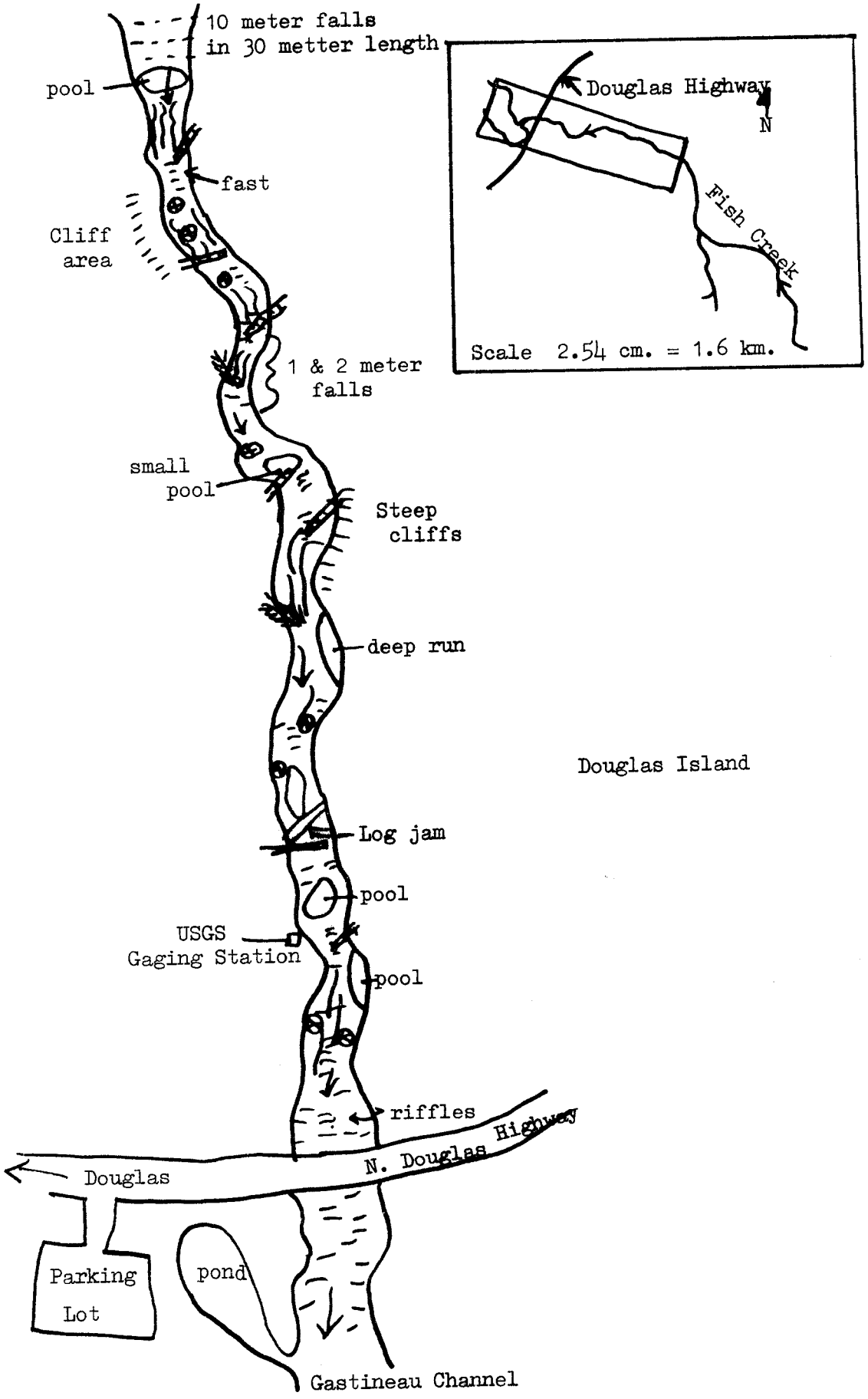


Figure 12. Fish Creek



Steelhead Enhancement Evaluation

The enhancement of spring-run steelhead with hatchery produced smolts is in the early stages of development in Southeast Alaska. Crystal Lake Hatchery, located at Petersburg, has the capability of producing smolt-size steelhead in a little less than one year.

Experimental enhancement programs were initiated in 1975 with the release of 8,000 hatchery produced smolts in Petersburg Creek. Due to various problems at the hatchery, these smolts averaged only 142 millimeters which is below the minimum deemed necessary for good success (Buchanan, 1976 and Royal, 1972). A high rate of residualism was noted in Petersburg Creek during the summer of 1975. A second plant of 6,500 steelhead smolts averaging 170 millimeters were released in Petersburg Creek during the early spring of 1976. These smolts did not exhibit any degree of residualism.

A program was initiated in April of 1977 to determine the contribution to the steelhead run in Petersburg Creek from the hatchery smolts. This evaluation was initially designed around the use of a weir; however, this sample method was not allowed. Evaluation methods were limited to a creel census of steelhead fishermen. This form of evaluation should be considered as an indicator at best and not a totally reliable method of assessment.

Census of steelhead anglers on Petersburg Creek began on the weekend of April 22, 1977 and continued on all weekends and holidays through the second weekend in June. A census taker was stationed at the weir cabin and contacted steelhead anglers as they left the creek.

During the census period a total of 93 anglers was censused. These anglers caught a total of 15 steelhead. One of the steelhead censused has an adipose fin clip indicating that it had been one of the original release group in 1975.

Results of the census are not particularly encouraging, as only one hatchery steelhead was noted. In view of the small size of the smolts released in 1975 and the tools used for evaluation, it appears that a small number of hatchery steelhead did return to Petersburg Creek as two-ocean adults in 1977.

Evaluations will continue at Petersburg Creek in the spring of 1978. a weir will be employed to attempt to assess the return of three-ocean adults from the 1975 release and two-ocean adults from the 1976 release. Results of the 1978 evaluation will provide background data necessary to formulate future enhancement programs.

Steelhead Brood Stock Development

The Department of Fish and Game policy of not allowing the importation of trout or salmon eggs into the State of Alaska has made it necessary to develop brood stocks from native Alaskan steelhead.

The development of a brood stock of spring-run steelhead was initiated in 1974 using stock from Petersburg Creek and Falls Creek. Eggs were obtained from these sources through 1975 when steelhead were no longer trapped at Petersburg Creek. To continue the program, a pickett weir was again constructed on lower Falls Creek in late April 1977. The weir was operated until the first week in June when it became apparent that the run was over. The 1977 run of spring steelhead to Falls Creek was disappointingly low as only 61 adult steelhead were trapped. Approximately 50,000 eggs were collected from a total of 15 female steelhead. These eggs were placed in incubators at Crystal Lake Hatchery for development.

It was anticipated that the first of the hatchery produced steelhead brood stock would return to Crystal Creek in the spring of 1977. Close observation of Crystal Creek turned up only two returning adults. Causes for the low return are not known but may be due to the small size of the 1975 smolts or other factors not yet defined.

DISCUSSION

From background information gathered at Petersburg Creek and other streams it is apparent that to adequately manage and enhance steelhead populations in Southeast Alaska a comprehensive plan must be formulated. This plan will define problem areas and provide methods and means for solving management problems.

The management and enhancement plan will remain flexible to enable the addition of new data, ideas and techniques for the management and enhancement of steelhead in Southeast Alaska. A great deal of the enhancement plan for steelhead in Southeast Alaska will depend on the expansion of facilities or the building of new facilities for the raising of salmonids. Present facilities are operating at capacity with priority being given to rearing of the various salmon species. Creation of additional room to raise steelhead will be necessary before an extensive enhancement program can be undertaken.

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APPENDIX A

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APPENDIX B.

APPENDIX B

Steelhead streams listed in Appendix B have been cataloged by geographic regions and are generally listed in order from North to South in each region. Some streams listed under each region have been reported to contain runs of steelhead; however, these runs have not been confirmed to date. These unconfirmed populations are noted at the bottom of each survey sheet.

The geographic regions for the steelhead streams in Southeast Alaska are as follows:

Yakutat - The mainland from Yakutat Bay to the southern boundary of the Glacier Bay National Monument.

Taku - The mainland from Glacier Bay National Monument to the Stikine River.

Stikine-Unuk - The mainland from the Stikine south to Portland Canal.

Chichagof - All steelhead streams on Chichagof - Yakobi Islands.

Baranof - All steelhead streams on Baranof Island.

Admiralty - All steelhead streams on Admiralty Island.

Kupreanof - All steelhead streams on Kupreanof and Mitkof Islands.

Kuiu - All steelhead streams on Kuiu Island.

Wrangell - All steelhead streams on Wrangell, and Etolin Islands.

Prince of Wales - All steelhead streams on Kosciusko, Prince of Wales, and Dall islands.

Revillagigedo - All steelhead streams on Gravina and Revillagigedo islands.

YAKUTAT

Stream	Location	
	Latitude	Longitude
Situk River	59°30'N	139°40'W
Lost River	59°25'N	139°40'W
Humpback Creek	59°41'N	139°31'W
Seal Creek	59°25'N	139°25'W
Ahrnklin River	59°25'N	139°32'W
Italio River	59°16'N	139°14'W
Akwe River	59°15'N	138°55'W
Alsek River	59°10'N	138°35'W
East Alsek River	59°5'N	138°30'W
Doame River	59°5'N	138°20'W
Steelhead Creek	58°31'N	138°30'W
Bartlett River	58°28'N	135°50'W
Salmon River	58°25'N	135°42'W
Excursion River	58°31'N	135°30'W

TAKU

Stream	Location	
	Latitude	Longitude
Chilkat River	59°15'N	135°33'W
Berners River	58°51'N	134°56'W
Cowee Creek	58°38'N	134°54'W
Windfall Creek	58°31'N	134°45'W
Peterson Creek	58°27'N	134°45'W
Taku River		
Chuck River	57°34'N	133°21'W
Crystal Creek	56°53'N	132°42'W

STIKINE - UNUK

Stream	Location	
	Latitude	Longitude
Stikine River	56°30'N	132°20'W
Andrews Creek	56°39'N	132°15'W
Crittenden Creek	56°30'N	132°16'W
Aaron Creek	56°22'N	131°56'W
Oerns Creek	56°22'n	131°55'W
Marten Creek	56°14'N	131°50'W
Tom Creek	56°13'N	131°43'W
Eagle River	56°11'N	131°35'W

STIKINE - UNUK (cont.)

Stream	Location	
	Latitude	Longitude
Anan Creek	56°10'N	131°52'W
Black Bear Creek	55°42'N	132°10'W
Wolverine Creek	55°55'N	131°50'W
Hulakon River	56°8'N	131°5'W
Unuk River	56°8'N	131°6'W
Checats Creek	55°28'N	130°52'W
Rudyerd River	55°38'N	130°38'W
Wilson River	55°25'N	130°38'W
Blossom River	55°28'N	130°38'W
Bakewell Creek	55°18'N	130°37'W
Keta River	55°21'N	130°25'W
Humpback Creek	55°2'N	130°40'W
Marten River	55°10'N	130°30'W
Fillmore Creek	54°56'N	130°27'W

CHICHAGOF

Stream	Location	
	Latitude	Longitude
Sitkoh Creek	57°32'N	134°58'W
Kadashan Creek	57°44'N	135°12'W
Pavlof River	57°50'N	135°2'W

BARANOF

Stream	Location	
	Latitude	Longitude
Goulding River	57°48'N	136°15'W
Salmon Creek	56°58'N	135°10'W
Redoubt River	56°52'N	135°15'W
Plotnikof River	56°33'N	134°56'W
Sashin Creek	56°24'N	134°38'W
Eva Creek	57°24'N	135°6'W

ADMIRALTY

Stream	Location	
	Latitude	Longitude
Admiralty Creek	58°8'N	134°30'W
Mole River	57°40'N	134°5'W
Pleasant Bay Creek	57°38'N	134°00'W
Hasselborg River	57°35'N	134°20'W
Tyee Creek	57'4'N	134°28'W
Wilson Cove Creek	57°9'N	134°35'W
Little Pybus Bay Creek	57°18'N	134°8'W
North Arm Creek	57°23'N	134°20'W
Kanalku Creek	57°28'N	134°22'W

KUPREANOF

Stream	Location	
	Latitude	Longitude
Hamilton River	56°53'N	133°42'W
Kushneahin Creek	56°28'N	133°40'W
Castle River	56°38'N	133°18'W
Kah Sheets Creek	56°31'N	133°10'W
Mitchell Creek	56°44'N	133°12'W
Totem Bay Creeks (3)	56°31'N	133"25'W
Tunehean Creek	56°36'N	133°38'W
Duncan Salt Chuck Creek	56°55'N	133°19'W
Duncan Creek	56°45'N	133°12'W
Portage Creek	56°57'N	133°15'W
Petersburg Creek	56°46'N	133°6'W
"12 Mile" Creek	56°58'N	133°5'W
Big Creek	57°4'N	133°38'W
Five Mile Creek	56°52'N	132°58'W
Falls Creek	56°42'N	132°55'W
Blind Slough	56°36'N	132°50'W
Ohmer Creek	56°34'N	132°43'W
Sumner Creek	56°33'N	132°46'W
Big Creek (Bear Creek)	56°42'N	132°40'W

KUIU

Stream	Location	
	Latitude	Longitude
Kadake Creek	56°46'N	133°58'W
Rowan Bay Creek	56°44'N	134°15'W
Kutlaku Creek	56°38'N	134°9'W

KUIU (cont.)

Stream	Location	
	Latitude	Longitude
Kwatahein Creek	56°36'N	134°15'W
Alecks Creek	56°31'N	134°4'W
Saginaw Creek	56°50'N	134°10'W

WRANGELL

Stream	Location	
	Latitude	Longitude
Thoms Creek	56°12'N	132°10'W
Olive Creek	56°11'N	132°18'W
Hatchery Creek	56°3'N	132°24'W
Navy Creek	56°4'N	132°26'W
Mosman Creek	56°10'N	132°35'W
Streets Creek	56°6'N	132°36'W
Kunk Creek	56°17'N	132°25'W

PRINCE OF WALES

Stream	Location	
	Latitude	Longitude
Sutter Creek	56°8'N	133°26'W
Shipley Creek	56°6'N	133°30'W
Trout Creek	56°4'N	133°42'W
Red Bay Creek	56°16'N	133°19'W
Salmon Bay Creek	56°18'N	133°10'W
Calder Creek	56°12'N	133°31'W
Sarkar System	55°58'N	133°18'W
Staney Creek	55°46'N	133°10'W
Exchange Creek	56°11'N	133°6'W
"108" Creek	56°8'N	133°8'W
Eagle Creek	55°56'N	132°46'W
Thorne River	55°42'N	132°36'W
Karta River	55°33'N	132°36'W
Hatchery Creek	55°55'N	132°55'W
Log Jam Creek	55°55'N	132°58'W
Klawak River	55°33'N	133°4'W
Harris River	55°28'N	132°41'W
Maybeso Creek	55°28'N	132°41'W
Bear Creek	55°36'N	132°55'W
Trocadero Creek	55°22'N	132°54'W

PRINCE OF WALES (cont.)

Stream	Location	
	Latitude	Longitude
Steelhead Creek	55°38'N	132°56'W
Hydaburg River	55°14'N	132°50'W
Klakas Creek	55°4'N	132°23'W
Dolomi Creek	55°9'N	132°4'W
Miller Creek	55°7'N	132°14'W
Kegan Creek	55°3'N	132°10'W
Hunter River	54°52'N	132°15'W

REVILLAGIGEDO

Stream	Location	
	Latitude	Longitude
Naha River	55°35'N	131°35'W
Carroll Creek	55°41'N	131°21'W
Mahoney Creek		
Ketchikan Creek	55°21'N	131°38'W
Ward Creek	55°25'N	131°45'W
Fish Creek	55°24'N	131°12'W
White River	55°26'N	131°34'W
Grace Creek	55°39'N	130°58'W
Gokachin (Sea Level) Creek	55°21'N	131°10'W
Spit Creek	55°22'N	131°21'W

APPENDIX C

QUALITY WATERSHEDS

QUALITY WATERSHEDS - STEELHEAD

SOUTHEAST ALASKA

First Quality Watersheds

Stream	Location
Situk River	Yakutat
Plotnikof River	Baranof Island
Castle River	Kupreanof Island
Duncan Salt Chuck Creek	Kupreanof Island
Petersburg Creek	Kupreanof Island
Kadake Creek	Kuiu Island
Sweetwater System	Prince of Wales Island
Thorne River	Prince of Wales Island
Karta River	Prince of Wales Island
Naha River	Revillagigedo Island

Second Quality Watersheds

Stream	Location
Akwe River	Yakutat
Pleasant Bay Creek	Admiralty Island
Sitkoh Creek	Chichagof Island
Alecks Creek	Kuiu Island
Kunk Creek	Etolin Island
Olive Cove Creek	Etolin Island
Thoms Creek	Wrangell Island
Martin Creek	Mainland-Wrangell

Second Quality Watersheds (con't.)

Stream	Location
Eagle River	Mainland-Bradfield Canal
Red Creek	Prince of Wales Island
Salmon Bay Creek	Prince of Wales Island
Staney Creek	Prince of Wales Island
Klawak Creek	Prince of Wales Island
Black Bear Creek	Prince of Wales Island
Klakas Creek	Prince of Wales Island
Kegan Creek	Prince of Wales Island
Niblack Creek	Prince of Wales Island
Wolverine Creek	Ketchikan-Mainland
Unuk River	Ketchikan-Mainland
Fish Creek	Revillagigedo Island
Bakewell Creek	Ketchikan-Mainland
Humpback Creek	Ketchikan-Mainland

Other Quality Watersheds

Stream	Location
Hamilton River	Kupreanof Island
Tunaheen Creek	Kupreanof Island
Kushneahin Creek	Kupreanof Island
Tom Creek	Wrangell-Mainland
Streets Lake	Etolin Island
Hatchery Creek	Etolin Island
White River	Revillagigedo Island
Eagle Creek	Prince of Wales Island

Other Quality Watersheds (cont.)

Stream	Location
Trocadero System	Prince of Wales Island
Exchange Creek	Prince of Wales Island
Shipley Creek	Kosciusko Island
Trout Creek	Kosciusko Island