Mc Gregor

STEELHEAD STOCK ASSESSMENT

Since its inception, a major objective of S.E.P. has been to vastly improve the data base on the status of steelhead stocks throughout the province. On Vancouver Island, a partial list of methods employed in this exercise includes analysis of commercial fishery catch data, creel and questionnaire surveys, snorkel surveys, electrofishing surveys, habitat capability analysis, smolt abundance monitoring, and coded wire tag analysis. Evidence for overexploitation of steelhead, most commonly by sport fishing, was sufficient to warrant the imposition of heavy restrictions on wild steelhead harvest in the late 1970's. In 1983, the evaluation of management by regulation continued.

Development of a steelhead smolt production model by research staff of Fish and Wildlife provided the mechanism for estimating theoretical smolt and adult production in all major streams on Vancouver Island. The focus recently has been to relate steelhead catch data to production and compare actual to theoretical production to aid in evaluating restrictive harvest regulations.

Initial interpretations indicated that wild steelhead stocks in streams whose habitat was relatively stable responded quickly to increased escapements. Catches rose sharply four and five years after implementation of kill reductions. However, in streams seriously impacted by forest harvesting, the responses were not significant. In yet another category of streams, it appeared that illegal harvest of steelhead by gillnets has served to maintain steelhead production well below its estimated potential.

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Management prescriptions for specific waters have been identified. In most situations, these have or will be incorporated into the production program. The immediate future of the stock assessment program should include fine tuning of the production model, especially as it relates to larger streams and curtailing the incidence and impact of illegal netting.

Program cost $185,800.00 x 1/3 = $61,800.00

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STEELHEAD PRODUCTION

Steelhead production is one of two major S.E.P. funded steelhead projects on Vancouver Island. The program includes both hatchery and wild steelhead components. While the former tends to attract the most attention in the budgeting and evaluation process, it must be recognized that the latter is the backbone of the regional production.

In 1983, five federal, two provincial, and one community development facility were involved in the culture of 18 different steelhead stocks from 16 watersheds. Green egg production for the 1983 brood totaled 1.6 m from which 656,000 fry and 440,000 smots were liberated. Approximately half of the fry originated from incubation experiments conducted at Robertson Creek and Big Qualicum hatcheries. These fry were liberated in landlocked lakes and will not contribute to adult steelhead production. The expected returns from the remaining fry and smolt liberations total 1,600 and 13,000, respectively.

The hatchery steelhead program has been well received by the majority of anglers. Fishing effort on four major streams in which hatchery fish are now available grew from 20% of the regional total in the pre-hatchery period to almost 50% in 1983. Hatchery fish comprised 58% of the estimated 3255 steelhead caught and retained on Vancouver Island in 1983 and 23% of the total catch (hatchery plus wild) of 29,569.

The wild steelhead production program on Vancouver Island has focused on management by regulation. Evaluation of the regulations imposed in 1979 to reduce wild steelhead harvest and increase escapement continued in 1983. On many streams, the impact of harvest restrictions has been dramatic. Catches in 1983 were the highest ever recorded as the first generation response to the regulations materialized. The total regional catch of wild steelhead was also the highest ever recorded.

Streams and stocks which appear not to have responded to the restrictive harvest approach were categorized as those which suffer serious impairment of habitat and smolt carrying capacity and/or those which are subject to illegal harvesting by gillnets. The latter problem appears to be growing in magnitude and must be addressed if clients are to receive a reasonable return on their management investment.

Program cost: $185,800.00 x 2/3 = $124,000.00

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1983 PROVINCIAL S.E.P. ANNUAL REPORT

REGION II

Period Covered: January 1, 1983 to December 31, 1983.

Steelhead and searun cutthroat enhancement activities continue with a number of highlights occurring this year.

1. South Coast (Mainland):

Tenderfoot Creek Hatchery initiated its steelhead function by holding wild Cheakamus and Squamish origin brood stock. Fry from these fish were outplanted to the Cheakamus River and Ashlu Creek in August. The provincial Fraser Valley Trout Hatchery at Abbotsford, using Squamish River brood stock, provided additional fry for release into Ashlu and Shovelnose Creeks on the Upper Squamish River. Organized steelhead anglers helped provincial fisheries staff considerably during the capture of steelhead brood stock for these hatchery programs.

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Angling on the Squamish River system was under its first full season of a wild steelhead release harvest regulation. Angler effort during this (82/83) season on the Squamish watershed (Cheakamus River, Squamish River, Mamquam River) was down by 38% over the previous year. Total catch and catch success was also decreased considerably. These changes were due to the new harvest regulations and poor returns of steelhead. Regulations and the hatchery fry stocking program will result in much improved fish numbers and angling over the next few years.

2. Fraser River:

Alouette River is in its sixth year of a hatchery smolt stocking program. Hatchery operations are co-operatively done between Fraser Valley Trout Hatchery and the Corrections Branch facility on the river. During the 82/83 steelhead run, wild and particularly hatchery returns to the river were strong. Compared to the anglng during 81/82: angler effort was increased by

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200%; catch was up by 450% and the catch success had almost doubled. The hatchery portion of the catch is now up to 68%. The South Alouette was the Region's third most heavily fished stream and ranked second for total catch.

Vedder River winter steelhead angling now ranks first in the Region for catch and angler effort (provincially, it is the second most heavily fished river for steelhead behind the Thompson and it ranks third for total steelhead catch behind the Gold and Dean Rivers. Compared to the previous season, angler effort is up by 30% and catch has increased by 18%. Improved angling on this river is directly related to a greater abundance of steelhead. This increase in numbers of fish is due to restrictive harvest regulation for wild steelhead and a prominent hatchery stocking program using Chilliwack River Hatchery. Using broodstock captured this year, this hatchery will reach its full steelhead smolt production by next spring (1984).

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Provincial staff collected the first winter steelhead and searun cutthroat brood stock for the Chehalis River Hatchery. Offspring from these fish will be reared to smolt stage and stocked into Chehalis River, Weaver Creek, Big Silver Creek, Cogburn Creek and Harrison River in Spring of 1984.

Summer run steelhead hatchery and assessment programs continued on the Coquihalla River and Silverhope Creek. Special angling fisheries occurred on the Coquihalla for the seventh year, and on the Silverhope for the first time in many years. First adult returns from summer steelhead fry stocking into upper Silverhope were expected to show up in this fishery and in the subsequent capture of brood stock. Results were very poor and hope now rests on the 1984 run showing a large proportion of fry program returnees.

Stocking of Fraser River Hatchery cutthroat smolts, produced at Fraser Valley provincial and Inch Creek

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federal hatcheries, continues. Hope Camp Slough near Chilliwack has been stocked since 1978 while Stave River, Nicomen Slough, and Brunette River have had hatchery input since 1981. Results of these stockings are very encouraging. Hatchery fish are showing up strongly in angler catches in a variety of Fraser River locations. Angler effort, directed at cutthroat, increasing rapidly.

S.E.P. REPORT

PROJECT: Chilcotin River Fry Stocking 1983

LOCATION: Chilcotin River near Alexis Creek, B.C.

BACKGROUND: Declining steelhead stocks in the Chilcotin River system have been noted during the past decade. Interception of return runs of adult steelhead by mixed stock commercial fisheries and over harvest by sports anglers have been contributing factors. Currently very restrictive angling regulations are in place.

In 1981 and in 1982 pilot steelhead fry production projects were undertaken at a makeshift hatchery facility located on the T-H Ranch near Hanceville. 14,000 and 34,000 (approximately) steelhead fry were liberated in those respective years in the system. Initially fry were released in the Chilko River. In 1982,fry were released in the Little Chilcotin River.

WORK DONE IN 1983: The fry stocking program was continued in 1983 and the stated release goal was 100,000 fry. This is a substantial increase over previous efforts. Adult steelhead were collected from the Chilcotin River by angling during April and were held in isolation boxes until ripe. Spawning was done between May 10th and May 27th.

Fry were released on July 14 by helicopter;the Fish Habitat Improvement Section surveyed fry densities and growth at the liberation site (1 of 3) during September .

Steelhead escapement to the Chilcotin system were assessed by aerial count of spawners in the Chilko River during May. A creel census was also undertaken to provide data on run size and angling effort/success.

FISHERIES RESULTS: A total of 136,555 eggs were obtained from 17 female Chilcotin steelhead. Approximately 87,500 fry averaging .34 gr., were released into the Little Chilcotin River in three reaches totalling 24 km of habitat.

The May 13th aerial count of steelhead in the Chilko River was 319. This is substantially higher than the 1982 count of 195. Total escapement to the system in 1983 is not calculable. The higher count is not necessarily indicative of larger overall returns. Between October 9, 1983 and December 3, 1983, 353 angler days were expended in the Chilcotin system and 121 steelhead were landed of which 81 (67%) were released.

WORK TO BE DONE IN 1984: Unacceptable losses of eggs during incubation were occasioned in 1983. These losses were incurred by contamination of the water source by livestock. Heavy silt loads were carried to and deposited on the eggs resulting in suffocation and subsequent fungus growth. The present hatchery site is in a small woodshed and is neither large enough or convenient. A suitable building and "safe" water intake system will be constructed. Approximate costs including additional hatchery equipment would be $25,000 - $30,000.

Approximately 100,000 steelhead fry to be raised and released into Chilcotin River.
Survival and growth assessment in Sept - Oct.

A creel survey to be undertaken October - December.

Spawning escapement to Chilko River to be determined by aerial counts in May.

Approximate Costs - $50,000.

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PROJECT: Atnarko/Bella Coola Steelhead Enhancement - Salloomt River Fry Stocking

LOCATION: Bella Coola River system near Bella Coola, B.C.

BACKGROUND: During the 1970's, returns of steelhead to the Bella Coola system declined considerably, mainly due to overharvesting by the sport and native fisheries as well as habitat degradation. Starting in 1981, several enhancement projects were undertaken on the system to increase steelhead production and thereby restore angling activity to former levels.

The primary enhancement project on the Bella Coola system involves a six year headwater stocking program on the Salloomt River. The objective of the program is to establish steelhead in previously unused rearing habitat above a set of impassable falls. The barrier will eventually be removed thus allowing the population to become self perpetuating. In 1981, 79,000 fry were released and in 1982, 49,000 fry were liberated to the Salloomt River.

Other enhancement projects which have been undertaken on the Bella Coola system include rehabilitation of a well used spawning area on a Camera side channel (Atnarko River). Six spawning platforms (approximately 400m^2 of gravel) were installed for steelhead as well as pink and coho salmon. Also, a steelhead fry stocking program on Hotnarko Lake (upper Atnarko watershed) was started in 1982. The objective of the program is to use this previously barren lake as a rearing area for juvenile steelhead. It is expected that not all the released steelhead will migrate to the ocean, however, fish that residualize will provide a trophy trout fishery in the lake. Approximately 24,000 fry were released in 1982.

WORK DONE IN 1983: In 1983, the third steelhead fry release of a six year program was undertaken on the Salloomt River. Broodstock was obtained from the Bella Coola River, November to March. Adult holding, incubation and rearing were carried out at Snootli Creek Hatchery (Fisheries and Oceans). In addition to the fry release, steelhead smolts from 1981 broodyear were liberated into the lower Salloomt River in May 1983.

Fry releases were also undertaken on four other tributaries of the Bella Coola system as well as Hotnarko Lake.

In early September, Fisheries Habitat Improvement Section and Region 5 staff assessed the survival and growth of fry released in the Salloomt. Camera Channel was surveyed to enumerate spawning steelhead and to determine the extent of spawning platform use.

FISHERIES RESULTS: During March - May, 1983 a total of 145,000 eggs were taken from Bella Coola River broodstock. Approximately 132,000 unfed steelhead fry were released into Bella Coola tributaries (Salloomt R. 61,500; Atnarko 37,000; Hotnarko Lake 15,000; Noosgulch R. 9,500; Nusatsum 6,000; Burnt Bridge Cr. 3,000). The expected return of adults (1988-89) is 1,000 - 1,200 adults.

Approximately 7,500 smolts were released to the lower Salloomt in May. The expected return, in spring 1985, is 200-250 adults.

On May 30, 1983 67 adult steelhead were observed using the spawning platforms in Camera Channel (other areas of the channel were not surveyed due to turbid water conditions). In mid August, 211 redds were counted in the channel of which 115 were on introduced gravel.

WORK TO BE DONE IN 1984:

Fry Stocking:

Salloomt River	60,000
Atnarko River	35,000
Noosgulch River	20,000
Hotnarko Lake	10,000
	125,000 fry.

Possible removal of Salloomt River falls

Continued assessment of growth and survival of Salloomt River fry.

Camera Channel spawning platform assessment

Steelhead reconnaissance on South Bentnick tributaries.

COST: Approximately $40,000

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

The life history characteristics, population estimate and enhancement options of Pallant Creek steelhead, a co-operative project between the Queen Charlotte Island Chapter of the B.C. Steelhead Society, Federal Dept. of Fisheries and Oceans and the Fish and Wildlife Branch.

LOCATION

The Pallant Creek drainage is located on the East Coast of Moresby Island, part of the Queen Charlotte Islands.

BACKGROUND

The construction of a Federal hatchery and a proposal to blast a barrier on Pallant Creek prompted an indepth study of steelhead trout in this actively fished stream-lake system. Steelhead brood stock were captured from Pallant Creek and eggs incubated at the hatchery. Fry (1.6 gms) were subsequently released (5128 in 1982, 7200 in 1983) upstream of the barrier in tributaries to Mosquito Lake in an attempt to colonize this area prior to falls removal.

1983 PROGRAM

In 1983, unmarked fry were released in both pond and stream habitats while in the previous year (82), 4174 marked fry were distributed in lake tributary streams only. During the mid-summer low flow period of 1983 extensive sampling was conducted throughout fry release sites in an attempt to ascertain fry survival and thus determine the most successful stocking strategy. Gee minnow traps, electrofishing and nets were used to locate: (1) parr from the 1982 fry release, and (2) fry of the spring 1983 release.

Multiple catch and recapture data of adult steelhead angled during the 1980-81 winter season was compared to a steelhead smolt model based on habitat. The latter was measured in 1983.

RESULTS

Although extensive areas were sampled, only one steelhead parr of the 1982 fry release project was collected. Stocked steelhead fry to parr survival was considered minimal, and was attributed to unstable over-wintering conditions in lake tributary streams and possible interactions with juvenile Dolly Varder char, cutthroat and coho populations. Mid-summer sampling indicated a redistribution of 1983 fry from point release sites to riffles and pools at varying densities. Average fry density in pools was .99/m^2 while in riffles it was .89/m^2. Data is inconclusive however due to few samples. Monitoring of released ad natural steelhead and other salmonid juveniles of the Pallant system is scheduled to continue in 1984 to clearly identify the limitations and possible conflicts of proposed enhancement options.

The smolt model based on the quantity and quality of anadromous habitat in Pallant Creek calculated an average run of 267 adult steelhead. Comparable results were obtained from the 1980-81 mark and recapture project where a population range of 364, 263, 328 adult steelhead were estimated to be in the system during the sampling period. Life history characteristics derived from scale interpretations have not been finalized.

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

Mosquito Lake cutthroat - coho interaction study, a co-operative project between the Queen Charlotte Islands Chapter of the B.C. Steelhead Society, Federal Dept. of Fisheries and Oceans and the B.C. Fish and Wildlife Branch, funded by the New Economic Expansion Program.

LOCATION

Mosquito Lake is part of the Pallant Creek drainage on the east coast of Moresby Island, Queen Charlotte Islands.

BACKGROUND

In an effort to increase salmonid production of Pallant Creek, 32387, II4597, and 349222 coho fry were distributed during 1981, 1982 and 1983 respectively throughout Mosquito lake and its tributaries. Lesser numbers of steelhead fry (5128 in 1982, 7200 in 1983) were also released in this area. The lake is physically isolated from these anadromous species by a large falls on Pallant Creek. Prior to fry introductions this habitat was utilized primarily by resident populations of cutthroat trout and lesser numbers of dolly varden char and kokanee.

The stocking enhancement program was implemented to establish adult runs prior to falls removal, thus allowing for natural colonization of anadromous species into the previously inaccessible area.

1983 PROGRAM

The 1983 study program was initiated to assess possible impacts of coho and steelhead fry releases on resident cutthroat juveniles.

Juvenile fish distributions and densities in lake tributaries were obtained by electrofishing, fry traps, and angling throughout the year. Study streams were stocked with varying coho fry densities and their effects on the existing cutthroats assessed.

RESULTS

Preliminary results indicate that cutthroat young of the year inhabit primarily shallow riffle areas of small tributary streams. These riffle habitats lacked coho fry. Cutthroat fry parr (1, 2, 3 year olds) however co-inhabited pools with coho. Positive correlations were found between the size and densities of cutthroat parr and pool depth, as was the case with coho fry. In pools of tributary streams where coho fry had been released for three consecutive years, cutthroat parr densities were less than 30% of those areas not stocked with coho fry. Coho fry densities in streams which were naturally seeded (ie. below falls), extensively stocked for 3 years, or selectively stocked at 1 and 5 per m^2, all equilibrated to an average density of about 1 fry per m^2 measured during low summer flows. It appears that interactions between cutthroat and coho juveniles in Mosquito Lake tributaries takes place in pools between cutthroat parr and coho fry, resulting in the displacement of cutthroat parr.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

The distribution and biology of juvenile salmonids in the mainstem and tributaries of the Mamin River, a joint project between the Port Clements Rod and Gun Club and the Fish and Wildlife Branch, funded by the New Economic Expansion Program.

LOCATION

The Mamin River is a small stream (10-20 m. width) flowing north into Juskatla Inlet on Graham Island, Queen Charlotte Islands.

BACKGROUND

A number of Queen Charlotte Island streams have received considerable coho fry introduction through the Public Participation Projects Sector of the Salmonid Enhancement Program. An egg incubation facility was constructed by the Port Clements Rod and Gun Club in an effort to increase coho stocks. Resultant fry were released at specific densities into several ponds and tributaries of the Mamin River. Since the fate of fry once released is frequently not assessed, a sampling program was initiated on the Mamin River to document the distribution, growth rates and possible interactions of juvenile salmonid species in this stream system.

1983 PROGRAM

Juvenile salmonids were captured throughout the watershed using baited "Gee" minnow traps, upstream downstream fyke traps and electrofishing. All coho enhanced sites were sampled prior to fry release, and 2000 fry were marked. Sampling started in early spring and continued throughout the summer and fall of 1983 and early spring of 1984. Fish were measured, weighed and identified to species. Habitat was also inventoried in association with fish capture sites.

RESULTS

In the mainstem Mamin River, the most common juvenile salmonid was steelhead, followed by lesser populations of coho salmon and dolly varden char. Densities of all three species was greatest in pools. Riffles generally contained few fish. No juvenile cutthroat trout were encountered in the mainstem, although the adults of this species were often found here.

The situation however was vastly different in the smaller tributaries. No juvenile steelhead were captured in any of the tributary sites, despite extensive sampling. The dominant species in these areas were juvenile coho salmon and dolly varden char, with lesser numbers of cutthroat trout. Cutthroat fry and parr abundance was greatest in small low gradient tributary stream sections with abundant cover.

Growth rates of released coho fry was greatest in pond habitats stocked at low densities.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

The life history characteristics and population estimate of Mamin River Steelhead, a cooperative project between the Port Clements Rod and Gun Club and the Fish and Wildlife Branch.

LOCATION

Draining central Graham Island, the Mamin River is a small steep gradient unstable stream flowing north into Juskatla Inlet on the Queen Charlotte Islands.

BACKGROUND

The Queen Charlotte Islands are considered by many anglers as having an abundance of wild steelhead in many of its streams. Due in part to high angler activity in other areas to the province, non-resident but also local sport fishering effort has increased dramatically on these islands during the past 2 decades. Although steelhead and angler use studies have been conducted on some of the north west, seldom has this information been obtained for a small less fished coastal stream. Since almost all Queen Charlotte Island streams are brown in colour, making snorkel observations impossible, a mark and recapture study was undertaken to determine life history characteristics and population abundance of Mamin River Steelhead.

1983 PROGRAM

Steelhead were angled and tagged with coloured spaghetti tags during the 1983-84 winter season. Scales were removed for age determination. Lengths and in some cases weight were also measured. In stream movements and population abundance were derived from repeat captures.

RESULTS

All data has not been collated, results are therefore inconclusive, but indications are that the steelhead population of the Mamin River is small, probably less that 200 fish. Steelhead enter the Mamin River from fall to late spring. Life history characteristics obtained from scale interpretations will become available in a forthcoming report.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

Life history characteristics and population abundance of Deena Creek Steelhead, a cooperative project of the Queen Charlotte Islands Chapter of the B.C. Steelhead Society and the Fish and Wildlife Branch.

LOCATION

Deena Creek flows north into Skidigate Inlet from the eastern slopes of Moresby Island, one of the Queen Charlotte Islands.

BACKGROUND

Central to the development of steelhead management strategies is a thorough knowledge of population abundance and life history characteristics of this species on a stream specific basis. A steelhead mark and recapture project was initiated through the local steelhead society in order to obtain some of this pertinent information.

1983 PROGRAM

Steelhead were captured by angling and seining, then marked with coloured spaghetti tags and released at the capture site. Scale samples were taken, sex noted and lengths measured. Casual observations and snorkel diving surveys by steelhead society members frequently accompanied angling excursions.

RESULTS

Generally clear water conditions during the angling season allowed for reasonably close observation of tagged versus untagged fish. Mark and recapture population estimate results were variable and ranged from 598 to 1311 adults (estimates include 1311, 983, 648 and 598 fish). It is likely the lower estimate more closely approximates reality since comparing observed tagged to untagged fish at the end of the season estimated 585 fish. Life history characteristics are as yet not known, but will become available after scales have been interpreted.

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

The life history characteristics and population estimate of Yakoun River Steelhead, a cooperative project of the Port Clements Rod and Gun Club and the Fish and Wildlife Branch.

LOCATION

The Yakoun River is the largest stream of the Queen Charlotte Islands, flowing north into Masset Inlet near Port Clements on Graham Island.

BACKGROUND

The Yakoun River is the largest and most intensely fished steelhead stream on the Queen Charlotte Islands. Annual angling effort has more than tripled (almost 2000 angler days in 1982) during the past decade and a half. This increased angler activity by both local and off Island anglers identified the necessity for better life history and population abundance information on Yakoun River Steelhead.

1983 PROGRAM

Steelhead were caught by angling and tagged with coloured spaghetti tags during the 1981-82 and 82-83 winter seasons. Scales were removed for age determination, lengths and in some cases weight were also recorded. Migration patterns and population abundance data were obtained through repeat captures.

RESULTS

Yakoun steelhead enter the river from late fall to early spring, and once in the river, migrate very little. Average migration rates of repeat captures was .11 km/day, with some fish spending from 1 to 5 months in the original capture area. Population abundance varied dramatically between the two project years. In the 1981-82 season an estimated 800 steelhead were present, while during the winter of 1982 to 1983 over 2000 fish were estimated in the Yakoun River. Scale interpretations indicated 90% of fish had spent 3 or more years in fresh water prior to a 3 year (73%) ocean residency.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

Kitsumkalum River Steelhead Investigations

LOCATION

The Kitsumkalum (Kalum) River flows south into the Skeena River near Terrace, B.C. from Kalum Lake. Kalum Lake is 12 km long and the river below the lake is 30 km in length.

BACKGROUND

The Kalum River provides a combination of scenery and year round angling that has made it a major recreation area for local as well as non-resident sportsmen. It supports major sport fisheries for salmon, steelhead and resident rainbow and cutthroat trout. Increased angling pressure combined with intensive logging in the upper watershed during recent years prompted the B.C. Fish and Wildlife Branch to conduct a preliminary investigation of Kalum River steelhead trout. The objective of the study were to better understand the sportfishery, and the run timing and movements of steelhead within the sportfishery as well as their wintering and spawning behavior. In addition, baseline briolgical data for Kalum steelhead was required as well as options for their management and enhancement.

1983 PROGRAM

Data from the 1981 study was analysed and reported in 1983. A total of 22 steelhead were radio-tagged and an additional 45 steelhead were spaghetti tagged so that their behavior could be better understood. Movements of radio tagged fish were monitored until spawning time in the spring, and records were kept of tagged fish recaptured in the fishery. Readable scales from 69 Kalum steelhead were analysed for age and growth

RESULTS

An examination of the sportfishery indicates that although total catch has increased in recent years, the kill has remained fairly stable due to an increasing incidence of catch and release.

Tagging data indicates that the Kalum has 3 main steelhead runs: late summer, late fall, and spring; all of which spawn during May. The lakes of the Kalum system were heavily utilized by wintering steelhead. Several tributary streams and side channels were identified as valuable spawning and rearing areas.

Aspects of life history are described from the data derived for analysis of scales. Most juveniles spent 3 years in freshwater and the remainder spent 4 years before smolting. Returning steelhead spent 1 to 3 years in the ocean before spawning.

Some of the management and enhancement options include angling restrictions in areas of high summer steelhead density, and headwater fry stocking above barriers, and rehabilitation of side channels that were closed years ago to aid in log drives.

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

Skeena Fry Stocking and Assessment.

LOCATION

Most work is focused on tributaries of the Skeena that are major producers of summer run steelhead. To date, systems that have been examined include the Bulkley River and its tributaries, and the Kispiox, Kitsumkalum, Morice, Suskwa and Zymoetz (Copper) Rivers.

BACKGROUND

The primary focus of the provincial Salmonid Enhancement Program in the Skeena Region has been Skeena River summer steelhead. Production of more steelhead in the Skeena River is presently based almost solely upon fry stocking above barriers or in underutilized habitat.

In conjunction with the Fish and Wildlife habitat improvement section, Skeena tributaries have been surveyed to determine baseline biological data on juvenile steelhead densities and survival rates. Barren habitat has been located in Harold-Price Creek (Suskwa River) and in the Morice and Zymoetz Rivers which are presently stocked annually or bi-annually with summer steelhead fry.

An intergral part of the fry stocking project is the annual assessment of stocked systems to determine the survival of fry and parr. This assessment procedure determines the success of the fry plants and refines the target for fry stocking in following years.

1983 PROGRAM

The juvenile assessment phase of the 1983 program was divided into 2 parts; the first of which was the annual monitoring of index sites throughout the Skeena drainage. These sites are sampled every year during specified times so that annual comparisons of juvenile densities and survivals can be made. The second part of the juvenile assessment was the sampling of new systems in the Skeena to investigate feasibility of fry stocking in the future.

Based on data of similar work in previous years, the Morice River and Harold-Price Creek (Suskwa River) were stocked with steelhead fry. All planted fry were progeny of wild brood stock from the stocked systems.

RESULTS

Approximately 100,000 fry were liberated in underutilized ares of the upper Zymoetz in 1981 and again in 1983. Post-stocking assessment indicated that the stocked juveniles (clipped) were doing well and should begin to return as adults in 1985.

A similar project in the Morice river system began in 1983 with 70,000 summer steelhead fry stocked above barriers and in underutilized areas.

The eventual target for the Harold-Price is 200,000 fry which should produce approximately 1,000 adults. The stocking of fry above the falls began with a pilot project in 1979 and was subsequently stocked in 1980 and 1982. In 1984, 90,000 fry are slated for stocking as this project approaches it's target. Once again, post-stocking assessment of juveniles above the barrier indicated that planted fry were doing well.

This year for the first time, data from the annual assessment of the index sites was used as a basis for management purposes as seen in regulation changes. Poor smolt production resulting from floods was detected by the juvenile sampling, and reduced limits will be imposed in the Suskwa River this year.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

Lakelse Steelhead.

LOCATION

The Lakelse River flows north into the Skeena River near Terrace, B.C., from Lakelse Lake. Lakelse Lake is 10 km in length and the Lakelse River is 20 km long.

BACKGROUND

The Lakelse River is one of the most productive systems in the Skeena drainage. Ideal habitat combined with warm, clear water give this river the capacity to be one of the most productive systems in the Skeena. It supports major sport fisheries for salmon, steelhead and resident cutthroat trout. The main part of the fishery is steelheading, but management has been difficult because there are 3 separate steelhead stocks within the Lakelse; summer, fall and spring runs. Lack of hard data on run timing and behavior of the various stocks in relation to the sport fishery has hampered regulation design and management.

In a joint project with the Terrace Chapter of the Steelhead Society of B.C., the Fish and Wildlife Branch carried out a 2 year study of steelhead movements within the Lakelse Lake drainage.

1983 PROGRAM

The work done in 1983 was basically a repeat of the 1982 program. Various portions of the steelhead run were tagged with radio transmitters to monitor their behavior up to and including spawning. In addition, steelhead were tagged with spaghetti tags; a different color for each

part of the run so that they could be identified on snorkel surveys in the spring. Scale samples were collected from all fish tagged to bolster age and growth data for Lakelse steelhead.

RESULTS

Preliminary analysis of the results indicate that the 3 runs behave differently, and exhibit a spatial segregation within the Lakelse. The Lake was heavily used by summer runs as overwintering habitat during the icing conditions in the river. Some of these fish spawned above the lake and some dropped back down into the upper Lakelse River to spawn. The spring run fish, on the other hand, stay almost entirely in the lower half of the river, and do not utilize the upper half of the river or the lake.

Management implications of these results are fairly straight forward. In order to protect the heavily exploited summer and fall run fish, the upper part of the river is only catch and release in the spring. A kill fishery is permitted on the lower river, where most fish are spring run steelhead and subject to only light harvesting. Enhancement and regulations in the future will utilize this information to ensure that the summer and fall steelhead are not overharvested in the sportfishery, and that the fish have priority in any production projects.

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

Bulkley River Steelhead.

LOCATION

Bulkley River near Smithers; a tributary of the Skeena.

BACKGROUND

The Bulkley River is one of the major steelhead fisheries in B.C. Recent radio tagging studies throughout the Skeena river drainage indicate that the Bulkley steelhead are heavily harvested in the salmon gillnet fishery at the mouth of the Skeena near Prince Rupert. It is anticipated that these commercial interceptions of steelhead may increase in future years as major salmon enhancement projects reach full production and the gillnet pressure increases.

In order to compensate with future steelhead enhancement, a detailed survey of steelhead in the Bulkley river was initiated in 1982.

1983 PROGRAM

The project in 1983 was sequel to the 1982 creel survey and was implemented to provide a second year of results upon which to base fisheries management decisions.

The objectives in 1983:

1) Conduct survey of steelhead anglers in the area between Smithers and Houston.
2) Refine run timing by tagging as many steelhead as possible.
3) Further refine life history data.

RESULTS

Angler Origin and Effort

A total of 2,676 angler-days were reported in the area between Smithers and Houston. Locat fishermen accounted for the majority of the angling effort inthe portion of the Bulkley-Morice system censused during the 1983 steelhead fishery (49.2% of the total anglers, 64.6% of the total reported angler-days). The 234 locals checked angled an average of 7.4 days for a total of 1,730 angler-days.

B.C. residents, other than locals, were responsible for 22.3% of the angler-days reported and accounted for 33.8% of the total number of anglers checked. These "residents" spent a total of 597 angler-days in the study area (an average of 3.7 days for each of the 161 anglers checked).

Anglers from outside of B.C. made up 17.0% of the total number of anglers; 13.4% (64 anglers) were non-residents of Canada, 3.6% (17 anglers) were Canadian residents not living in B.C. These anglers accounted for 10.6% and 2.5% respectively of the total reported angler-days.

Distribution of Effort

The area between Chicken Creek and Telkwa (Zone 3) accounted for 34.9% (933 angler-dasy) of the 2,676 angler-days reported. The area of second-most popularity was between Barrett and 3 Mile on the Morice (Zone 6)

where 31.7% of the angler effort was directed. Zone 4 (Telkwa to Quick) and Zone 5 (Walcott to Barrett) attracted smaller percentages of the total angler effort (20.4% and 13.0% respectively).

Locals represented the vast majority of anglers checked in Zone 3 (56.2%) and Zone 4 (56.1%). In zones 5 and 6 residents accounted for most of the anglers encountered (43.6% and 45.9% respectively) followed by locals (33.6% and 38.0% respectively). Non B.C. Canadian and non-Canadian anglers showed lower representation throughout all four zones of the study area.

The month of September accounted for 55.7% (1490 angler-days) of the total effort during the creel census. October attracted 34.5% and November 9.8% of the total angler effort (the steelhead fishery ended on November 20 due to inclement weather).

Catch and Success

Anglers caught a total of 877 steelhead in 2,676 angler-days for an overall success rate of 0.33 fish-per-day. Local anglers landed 466 steelhead (50.9%) but had the lowest rate of success at 0.25. Non-Canadian anglers accounted for only 21.0% of the catch but showed the highest success rate (0.65 fish-per-day). Resident anglers landed 223 steelhead (25.4%) while non-resident Canadians caught 24 (2.7%). Success rates for these two groups were 0.37 and 0.36 respectively.

Zones 5 and 6 had the highest success rates in the study area at 0.44 and 0.42 fish-per-day respectively. Zone 4 had a success rate of 0.34 while the lowest rate of success occurred in Zone 3 where anglers landed only 0.20 fish-per-angler-day. Zone 6 also accounted for 40.2% of the total catch (353 steelhead) while the other three zones shared the remainder of the catch fairly evenly.

Overall, anglers killed only 19% of their catch. Non-resident Canadians killed 38% of the fish they landed while non-Canadian anglers killed only 4%. Locals and residents killed 20% and 28% of their catch respectively. Anglers killed a smaller percentage of their catch in Zones 4 (14%) and 6 (18%) than they did in Zones 5 (20%) and 3 (25%).

Steelhead Tagging

During 1982 and 1983 715 steelhead were tagged on the Bulkley-Morice system. To date 67 recaptures have been reported.

Of the 317 steelhead tagged in 1982 there have been 29 recaptures to date. Of the 398 steelhead tagged in 1983 there have been 38 recaputres to date.

Life History of Bulkley River Steelhead

Scale samples were collected from 245 steehead during the 1983 creel census, of which only 10 were unsuitable for use in total age determination. Eight age groups were identified with the most common being 3.1+ (57.9%). The second-most common age group was 3.2+ (23.8%)

followed by 4.1+ (10.6%). The 3.1+ fish were male dominant (60.3%) while the 3.2+ steelhead were mostly female (73.2%). Only 2 different fresh water age classes were identified with the vast majority being 3. (85.6%). Repeat spawners, most of which were females, accounted for only 3.4% of the steelhead sampled in 1983.

Preliminary data gathered in 1982 representing 268 readable samples, also showed 8 age groups present. The most frequently observed age groups were 3.2+ (56.0%), 3.1+ (34.2%), 4.1^{+} (3.0%) and 4.2+ (3.0%). All age groups were dominated by female fish with 3.2+ showing the largest proportion of females (64.0%). As in 1983, only 2 different freshwater age classes were represented with the vast majority being 3. (94.0%). Repeat spawners, the majority being females, accounted for only 3.4% of the total sample in 1982.

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S.E.P. ANNUAL REPORT 1983-1984

PROJECT

Sustut River Reconnaissance.

LOCATION

The Sustut River is located about 160 km north of Smithers, B.C., and is a major tributary of the Skeena River. Tributaries of the Sustut include the Bear River, Asitka River and Johanson Creek.

BACKGROUND

The Sustut has long been known for it's run of large steelhead trout. Angling pressure has been relatively light due to the remoteness of the system, although in the 1970's, construction of the British Columbia Railway (B.C.R.) and the associated airstrips created new access and hence increased angling pressure. Because of the new access, regulations banning angling in waters above the Bear-Sustut confluence were instituted to protect this vulnerable stock.

There has been an angling guide operating on the river for 17 years with 2 others starting operations in 1984.

Due to recent management and enforcement concerns, a reconnaissance survey was carried out to gather biological data for Sustut steelhead as well as create a higher enforcement profile in the area.

1983 PROGRAM

Fish and Wildlife personnel made four trips to the Sustut during the peak of the steelhead fishery in September and October.

Overview flights were made to locate anglers, check guide camps and find concentrations of fish. Juveniles were sampled from the mainstem to obtain data on age, growth and densities. Scale samples were taken from 61 adult steelhead which were also tagged before their release.

RESULTS

A higher profile for the Fish and Wildlife Branch was achieved through the checks of fifty-four anglers and hunters.

Fifty-five steelhead were spaghetti tagged to aid in identification of run timing in the commercial fishery at the mouth of the Skeena. Scale sample analysis indicated that only 32% of the steelhead juveniles spent 3 years in freshwater while the remaining 68% spent 4 or 5 years in freshwater before smolting. Additional juvenile sampling will be continued next year to add to the preliminary data obtained in 1983.

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S.E.P ANNUAL REPORT 1983-1984

PROJECT

Kitimat River Steelhead.

LOCATION

The Kitimat River is located approximately 30 km. due south of Terrace, B.C., and flows roughly 30 km adjacent to Provincial Highway 25 then bisects the City of Kitimat near the head of Douglas Channel.

BACKGROUND

Historically the Kitimat River supported an above average winter steelhead run which over the years dwindled due to the combined effects of habitat degradation and overfishing. With construction of a new S.E.P. funded hatchery facility in Kitimat, the opportunity arose to bolster Kitimat steelhead stocks; basically to align them with angler demand and perhaps to reduce pressure on other nearby steelhead stocks. Beginning in 1983, 25,000 steelhead were to be reared to smolt size and then released in predetermined sites on the river. However it became necessary to review plans for Kitimat when it became apparent that the new hatchery facility would not be ready in time for the 1983 brood year. Therefore, the 1983 project was terminated. In 1984 the project will proceed as described above.

EVALUATION AND ASSESSMENT

Once the Kitimat Facility comes on line, creel surveys will be performed from time to time to determine what portion of the anglers catch are fish of hatchery origin. and regulations will be adjusted accordingly.

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ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Final assessment of 1980 and 1981 boulder placements to increase salmonid rearing habitat in Springer Creek (tributary to the Salmon River).

2. LOCATION

Sayward, Vancouver Island.

3. BACKGROUND

(i) in September 1980, 60 tonnes of boulders were placed in 450 m of Springer Creek to enhance rearing capacity for juvenile steelhead trout and coho salmon.

(ii) post-treatment assessment one year later (August, 1981) indicated increased salmonid densities, but also lack of durability in the placements: due to insufficient size, much of the rock had become scattered and/or buried.

(iii) consequently, in 1981 a portion of the treatment section was retreated with an additional 15 tonnes of larger rock (mostly >0.6 m) in order to improve both complexity and durability of the placements.

(iv) post-treatment assessment was again conducted in August 1982, and revealed further increases in salmonid densities, and vastly improved placement durability where larger rock had been added.

(v) a final assessment was conducted in August, 1983, two years after the last enhancement work was completed.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

(see above)

5. WHO WAS INVOLVED, AND COSTS

The 1983 assessment involved Fish Habitat Improvement staff only, as follows:

	No. of persons	Person Days	Cost
Office	1	4	560
Field	2	2	250
Travel	(travel included in field time above)		95
Other	N/A	N/A	-
Total			905

Staff involved:

J.C. Wightman	1 person-day
R.P. Griffith	5 person-days

6. RESULTS OF INVESTIGATIONS

(i) boulder placements appeared to significantly increase trout parr densities in all years, but progressively increased from 1981 (1.36 g/m^2 in treated areas) to 1983 (2.54 g/m^2 in treated areas): at control sites, parr were either non-existent, or at very low densities (max. 0.36 g/m^2) in all years.

(ii) there was little difference between trout fry densities in treated sites compared to controls (ca. 0.9-1.0 g/m^2, on average, in all years).

(iii) the mean density of coho fry in treated sites in 1982 and 1983 (1.30 g/m^2 and 1.07 g/m^2, respectively) was considerably higher than in the corresponding controls (0.33 g/m^2 and 0.65 g/m^2, respectively): such improvement was not shown in 1981, prior to the addition of the larger material.

(iv) total trout and salmon biomass in treated sites was 2.58 g/m^2, 3.87 g/m^2, and 4.59 g/m^2 in 1981, 1982, and 1983 respectively: at control sites, corresponding values were 1.59 g/m^2, 1.40 g/m^2, and 1.54 g/m^2.

(v) results indicate progressive improvement in coho fry and trout parr densities in treated sites 1981-1983, particularly after addition of larger material in 1981 (following 1981 assessment).

(vi) should funding become available, consideration should be given to "saturating" the Springer Creek project section with boulders, consisting of a variety of sizes, but with large materials (>0.6 m) predominating.

7. REPORT STATUS

Griffith, R.P. 1983. Final assessment (1983) of 1980 and 1981 boulder placements in Springer Creek (tributary to Salmon River). Unpublished Reconnaissance Report, B.C. Fish and Wildlife Branch. 8p.

- complete.
- available in regional offices, Nanaimo.

8. FURTHER WORK TO BE DONE

Regardless of whether or not additional enhancement work is completed in Springer Creek, 1980/1981 placement sites should again be assessed in August 1986, to test placement durability and fish biomass results 5 years after enhancement.

9. EVALUATION OF WORK DONE

As a pilot project over relatively short stream length, the ultimate value of the work is the indicated potential in terms of increasing rearing capacity for salmonid juveniles with boulder placements of adequate durability and complexity.

10. PHOTOGRAPH REFERENCE

(attached: other photographic reference 1980-1983 available).

11. OTHER PERTINENT INFORMATION

Similar results to those shown in Springer Creek were obtained in a simultaneous boulder placement/evaluation project in Scott Creek, tributary to the Coquitlam River, near Vancouver (Region 2).

12. CONTACT PERSON

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ANNUAL REPORT (1983-84 Fiscal)

1. NAME OF PROJECT

Coquihalla River (summer steelhead) rearing capacity assessment.

2. LOCATION

Coquihalla mainstem above Othello near Hope.

3. BACKGROUND

Design of field work is experimental in nature and attempts to answer whether the exceptionally low adult returns (<200) are in part, due to stream habitat limitations. Permanent closures or catch and release fisheries managed since 1965 have not manifested improved run size like streams on Vancouver Island. The present study is premised on outplanting fed fry at habitat saturation levels by trial. Hatchery fry (~1g each) have been planted since 1981. The specific goals of the study include:

(i) To test whether the late August biomass of juvenile steelhead can be consistently maintained at a significantly greater level given no recruitment limitations.

(ii) To monitor the year-to-year variation in juvenile abundance and growth as a function of density-dependent and independent factors.

(iii) To model the influence of habitat on fish abundance with the aid of Bovee (1978) probability-of-use curves.

(iv) To determine the present potential to produce more smolts and increase run size by examination of fish densities at index stations and

(v) To review the relative performance of fry and smolt releases into the study area and suggest best means for restoration of the wild stock to achieve a run size (historic?) of 1500 to 2000 adults.

4. WORK COMPLETED IN PREVIOUS YEAR(S)

a) Population estimates and habitat unit description have been completed for sixty-two index stations over seven years (1977-83). Results have been reported in all previous annual (S.E.P.) reports.

b) Earlier life-history and reconnaissance level sampling of various habitats have been reported by Ptolemy (1978) and related to pre-impact assessment of the highway construction.

Ptolemy, R.A. 1978. Habitat segregation and standing crop of steelhead trout juveniles (Salmo gairdneri Richardson) in the Coquihalla River mainstem above Othello, British Columbia, 1977. Unpubl. MS., B.C. Fish and Wildlife Branch, Victoria. 42p.

c) Snorkel census of parr in deeper, faster water (late August) and adult run size (by Region 2) have been conducted and recorded.

d) Work completed in previous years has been summarized and analysed in a current report. This includes data collected outside of the F.H.I.S. activities but necessary for data synthesis (eg. flow, temperature, freeze-core substrate analysis, creel census).

e) Stream gradient analysis and air-photo interpretation of macro habitat (necessary for application of Slaney's 1981 parr model).

5. WHO WAS INVOLVED (Does not include court litigation--Caroline Mines)

	F.H.I. Staff[1]			Region[2]			Other [3] (Drafting)		
	No. of Persons	Person Days	Cost ($)	No. of Persons	Person Days	Cost ($)	No. of Persons	Person Days	Cost ($)
Office	2	58.5	7,530				1	5	425
Field	3	45.8	5,268						
Travel	-	-	2,060						
Other	1	5	350						
Total		109.3	15,208					5	425

[1] R.A. Ptolemy* 42.0o + 17.2F = 59.2 days) includes fry release
J.L.R. Ptolemy 16.5o + 17.2F = 33.7 days) plus late August census.

[1a] S. Billings (on loan) 11.4F days.

Travel Cost = Travel voucher values + vehicle cost (gas, oil receipts).

* includes rough drafting of figures and A.F.S. presentation preparation.

6. RESULTS OF THE INVESTIGATIONS

(i) The standing crop of juveniles can be significantly increased for all pre-smolt age groups to a level which is relatively uniform from year-to-year. Results of sampling in 1983 demonstrated the same abundance of fry under similar habitat conditions compared to 1981 and 1982. Fry, yearling, and age (2+) parr densities were the highest observed compared to pre-stocking years.

(ii) Considerable year-to-year variation in juvenile abundance was observed prior to fry stocking. In most years the year class

strength of fry was directly proportional to the spawner escapement. Density dependent pressures caused by excessive numbers of fry in 1983 and residualized smolts, reduced the growth and biomass density of cohorts at some index stations.

(iii) Habitat quality expressed as an "use" index for mean depth, velocity and substrate explained within any given year. Formulation of habitat rating curves permitted direct comparison to other streams with similar measurements and transformations.

(iv) Experience gained in 1983 suggests that fry stocking density in combination with wild fry recruitment should be limited by a threshold of 24 fry/100m^2 total stream area or about 1 fry/m^2 useable fry habitat in the Coquihalla. The present potential (wild) smolt yield in thought to be about 21,000 fish and appears naturally limited by stream structure since only 25% of the 59 hectares is useable by fry at ~1.0 fry/m^2. Gross application of Slaney's (1981) parr-smolt model suggests a smolt yield near 36,000 smolts; there is a distinct possibility there is surplus, vacant parr habitat which might be made use of if appropriately stocked in the future.

(v) While it is premature to judge the relative performance of fry versus smolt releases to-date, neither technique will likely generate numbers of adult returns at historic levels. The maximum hatchery run size has been 200 adults in 1980 while the most optimistic projected adult return (at full fry saturation of the study area) should be 840 adults.

6. RESULTS OF INVESTIGATIONS

Coquihalla Field Investigation--1983 General Results and Effort

Dates Censused: August 21-28, 1983.
No. of Pop. Removal Sites = 14; 1 day snorkel census; 1 day spot shock (4 sites).
Sequence: Ladner (2a)----Othello (16)
Total stream-length censused = 378.6 m
Total stream area censused = 3763 m^2
Average Length shocked = 27 m
Average Area shocked = 268.4 m^2
Average Width shocked = 9.9 m
Date: Steelhead fry release = July 18, 1983

No. of Fish Captured (N)			Comments
Age (0+) RbT	1,100		Previous max. of 737 in 1982
(1+)	119	) 186	Previous max. of 124 in 1982
(2+)	67	) parr	Previous max. of 14 in 1979
>(2+) RbT	0		
Total Wild RbT	1,286		
Total DV	12		
Total RbT(Hatch Res)	20		Previous max. of 20 in 1979
Total Salmonids	1,318		
Total Salmonid Biomass (kg)	12.696		

N.B. number of scale samples (= no. fish sampled) = 114

Recommendations (1984 and on)

1. The annual August juvenile census should be continued at the present sampling density and with the same crew to:

   a) test the impact of the most extreme flood on record for the Coquialla (Jan. 4, 1984 event of 780 m^3/s) on fry to yearling survival and movement/accumulation of sand imbedding cobble/boulder habitat.

   b) establish for the first time the relationship between habitat quality and parr abundance without the usual influence/interference of residualized smolts.

and c) monitor the impact of accelerated highway construction.

2. A trial release of 15000 15 g (yearling equivalents) steelhead be planted into the study area during October 1984. This is to further test Slaney's parr model and to determine whether additional wild smolts can be produced to meet the management target of 1500-2000 returning adults. These fish should be censused in August 1985 for density, growth and survival estimation.

7. REPORT STATUS

2nd rough draft completed.

Ptolemy, R.A. 1983. Summer-run steelhead population of the Coquihalla River--1977-1983; data record and progress report investigating stream carrying capacity. Unpubl. MS., B.C. Fish and Wildlife Branch, Victoria. 80p.

8. FURTHER WORK TO BE DONE

(On-going as recommended).

9. EVALUATION OF WORK DONE

The B:C ratio on hatchery smolt releases to-date is low (<0.13:1) and the anticipated B:C ratio for fry outplanting should be near 7.6:1 if no serious overstocking is seen. The B:C ratio appears higher for other streams containing steelhead due to reduced age at smolting and/or lower C:E ratios applied before a sportfishery is applied.

10. PHOTOGRAPH REFERENCE

Colour slides for each year's activities are on file.

11. OTHER PERTINENT INFORMATION

Surplus hatchery fry (above the requirements for the study area) are to be released in July 1984 below Othello at 30 fry/100m^2 total stream area. The four lane highway between Hope and Merritt is to be completed by 1986 and will, no doubt, create environmental problems. These additional perturbations will be monitored. First major adult returns following the 1981 fry plant are due in summer 1986 (ca. 359 adults).

12. CONTACT PERSON

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ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Chilliwack River--lower Fraser River stock modelling assignment (steelhead trout).

2. LOCATION

Flows west for approximately 60 km entering the Fraser River 12 km west of Chilliwack.

3. BACKGROUND

In summer 1983 an investigation was initiated to provide the scientific basis for managing steelhead harvest in the Chilliwack-Vedder River. This initial emphasis on the highest priority stream in the Lower Mainland Region recognized a previous decision to release 60,000+ fry in 1983. The goal over several years was to define maximum habitat capability based on current models and total weighted useable area concept. First efforts were to define roughly the fry capacity of the study area (Sweltzer River upstream to Chilliwack Lake outlet; distance = 47.0 km; area = 182 hectares). Included in the field study was the location of suitable release sites and determination of optimal spawner escapement and harvest. No pre-release assessment of wild recruitment was completed due to time constraints.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Griffith (1982) completed some limited sampling in July 21-24 and November 16-19, 1981 in sidechannels to the Vedder River and one site on the mainstem. This represents the only previous F.H.I.S. sampling. Numerous studies including juvenile density estimates and life-history data that has been recorded (Hartman, 1965; Withler, 1966; Usher--file data, 1978; Clark--file data, 1983). Unfortunately, most of the fish abundance data cannot be readily paired with habitat quality indices since hydraulic conditions were not measured. Fry density ($n/100m^2$) ranged from 0 to 104 in selected tributaries (Clark, 1983; sample size = 9 sites) and ranged from 8 to 473 in selected tributaries and the mainstem (sample size = 20 sites; Usher, 1978).

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	2	52	6,040						
Field	2	28	3,360	2	8	840			
Travel			973						
Other[4]	1	1	70						
Total		81	10,443		8	840			

[1] R.A. Ptolemy: days = 21.0 (office*) + 14.0 (field) = 35 total days
J.R.L. Ptolemy: days = 31.0 (office) + 14.0 (field) = 45 total days
* includes 8 days preparation for Biologist's meeting (Nanaimo).

[2] Jim Scott: days = 0.5 (field)
Brian Clark: days = 4.0 (field)
Bruce Usher: days = 3.5 (field)

Travel cost = Travel voucher claims + vehicle cost (gas, oil)

6. RESULTS OF THE INVESTIGATIONS

(i) Chilliwack Field Investigation--1983

Date of fry release: August 12, 1983
No. of fry released: 65,478
Wt. of fry released: 111.9 kg (x weight per fish = 1.71 g)
Dates censused: September 14-22, 1983; No. of Pop. removal sites = 17
Sequence of Electroshocking: 400 m contour (SS1)→above Vedder Crossing (~ 40 m contour)
Stream length = 30500 m
x gradient = 1.2% Mean wetted width = 44m
Total stream length censused = 404.1 m
Total stream area censused = 3084.1 m^2
Average area shocked = 181.4 m^2
Average width shocked = 7.63 m

No. of Fish Captured (N)		Density Range (n/m^2)		
Age (0+) steelhead	1910	0.32	-	1.63
Age (1+) steelhead	114	0.004	-	0.17
Age > (2+) steelhead	17	0.00	-	0.05
Total steelhead (wild)	2041			
Total residual steelhead smolts	5			
Total chinook	2			
Total coho	228			
Total salmonids	2276			

(ii) Despite inaccurate but precise field measurements of stream velocity (due to a meter malfunction), habitat descriptors accounted for 60% of the fry density variability among 17 index stations. Further field work in 1984 should more conclusively define velocity limitation on useable habitat.

(iii) For each index station plus one whole river metering, transect depth and velocity suggest excessive depths/velocity for fry and smaller steelhead parr at points close to shore. Endurance or cruising speeds less than 4 fork lengths (fl) per second were generally measured within 3.6 m of shore for 55 mm fry (stream velocities <22 cm/s) and 5.2 m of shore for 120 mm yearlings (stream velocities <48 cm/s). Mean width of shocked areas was 7.6 m. Mid-stream velocities were metered as high as 143 cm/s.

(iv) Gradient profiles have been generated for the mainstem and all tributaries. Macro-habitat description has been completed for the mainstem between Sweltzer River and Chilliwack Lake outlet. Reach descriptors (averages) have been estimated at mean September flows from air photos (1:10,800). Gradient ranges from 0.7% (lowest reach) to 7.6% uppermost. Mean wetted width per reach ranges from 52.4 m to 20.0 m with an overall wetted width of 38.7 m.

(v) Using mainstem length and mean number of fry per lineal m, the mainstem capacity appears limited to 600,000 mid-September fry. This is equivalent to .13 fry per 100 m stream or 33 fry/100 m^2 total stream area. The 95% CL. on the linear estimate is ± 21.4% of the mean--a more accurate estimate would be possible with additional (typical) whole river transects with an accurate flow meter. At a maximum fry density of 144 fry/100m^2 under ideal conditions the approximate amount of useable habitat is near 20% of the total stream area. This is very similar to the Coquihalla River with the some gradient (~1.2%), channel characteristics, and flow characteristics.

(vi) The population of fry captured during census was comprised of 31% wild origin and 69% hatchery origin by length-frequency separation (Peterson method). If the sample sites are representative of the entire river (not likely since most of the sampling was conducted in Reach 4 and it represents 32% of the total stream length), some 166,000 wild fry were to be found in 1983. This number of fry at 1.8% fry to adult survival yields a run size of near 3000 fish or at 0.6% survival (Biostandard) it yields a run size of near 1000 fish. Recent run size has been judged to be 3,000-4,000 adults and relates to smolts yielded from both mainstem and tributary production areas.

(vii) There is evidence of reduced growth for hatchery fry introduced at sites already operating near capacity. Hatchery fry were released at a mean weight of 1.3 g. and length of 49 mm at Site 1 (below Middle Creek). After 39 days these fish had achieved a mean weight of only 1.7 g and length of 55 mm. The growth slope of 2.9 is considerably less than the expected (10). Better resolution of growth performance can be attained in 1984 with continuous temperature recordings over the growth period and length/weight sampling of background wild fry at release time.

Results suggest better efforts are required to disperse fry at lower effective stocking density (<10,000 fry per release site).

(viii) Application of Binn's (1981) habitat quality index which models catchable sized trout given flow, food and shelter indices, suggests a high score of 11.5 g/m^2 total stream area. The upper Chilliwack scores a high rating for late summer stream flow (59% mad), annual stream flow variation (ASFV = 14), and maximum summer stream temperature (<18.5°C). However, the unusually high flows (September) compared to other coastal streams combined with high gradient restricts the amount of useable habitat for pre-smolt steelhead.

(ix) Size at age was described by the formula Y = 42.39 + 52.70 (x), r = 1.000 where Y is the mean fork length (mm) at x (age 0 to 2+). The slope is similar to the Coquihalla (b = 51.4) although the Y - intercept (age 0+) was smaller by 10 mm.

7. REPORT STATUS

Preliminary estimates of fry capacity have been computed but parr capacity analysis awaits further field work in 1984 with more reliable hydraulic measures. Data records are on file and the first draft reconnaissance report will be available in June, 1984.

8. FURTHER WORK TO BE DONE (in 1984)

(i) this is an ongoing project with likely expansion into tributary habitat assessment.

(ii) some 175,000 unfed fry are to be released in late July-early August.

(iii) failure of hatchery fry released in 1983 to reach full growth potential necessitates reduced stocking density by greater dispersal (eg. 5000 per site).

(iv) creel census and harvest statistics will be reviewed for historic perspectives re: stock-recruitment.

9. EVALUATION OF WORK DONE

Preliminary estimates of fry capacity (most limiting stage) suggest a maximum fry population under full seeding of 60 km (historic useable length?) mainstem near 780,000 fry. The smolt yield was probably near 117,000 while the adult run size was 14,000. If current biostandards are applicable then near 4,700 adults would be manifest before any fishery (eg. 5% fry to smolt, 12% smolt to adult).

10. PHOTOGRAPH REFERENCE

A slide record of the study is available from Section files.

11. OTHER PERTINENT INFORMATION

Annual plants of up to 85,000 hatchery smolts have been made within the study area. If significant proportions residualize in the stream they may render the parr capacity lower due to density-dependent competition. The 1982-83 steelhead harvest analysis estimated 10,953 days fished by 1,548 anglers; some 66 wild steelhead were kept while 4,201 were released. Hatchery smolt releases have generated increasing hatchery adult catches with 322 heads recovered to-date from the 1983-84 fishery. In 1982-83, the Chilliwack fishing effort (days fished) represented 7.3% of the provincial total and 30.9% of the lower mainland coast total.

12. CONTACT PERSON

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ANNUAL REPORT (1983-84 Fiscal)

1. NAME OF PROJECT

Evaluation of chinook and coho outplanting opportunities in the Middle Shuswap River above and below Shuswap Falls.

2. LOCATION

Middle Shuswap River from Sugar Lake to Mabel Lake northeast of Lumby, B.C. Tributaries included in the assessment were Bessette, Duteau, Harris, Creighton, Cherry and Rieter creeks.

3. BACKGROUND

A small hydro electric plant (Wilsey Dam) at Shuswap Falls presents anadromous fish from gaining access to 31 km of the Middle Shuswap River. In 1977, a S.E.P. program was undertaken by the Department of Fisheries and Oceans (D.F.O.) involving the transplant of adult chinook to above the falls to assess suitability for spawning. Transplanting of adults was rejected as a viable enhancement technique due to difficulty in capturing adults and mortalities due to handling. The Fish Habitat Improvement Section (F.H.I.S.) first became involved with the Middle Shuswap River in 1978, to investigate potential impacts of chinook introduction on existing resident trout populations. In 1983-84, F.H.I.S. assumed a technical advisory role with Alpha-BioResource Environmental consultants who undertook a project to evaluate outplanting opportunities for chinook and coho in the Middle Shuswap River and tributaries (S.E.P.--D.S.S. Contract No. 04SB.FP576-3-2462). F.H.I.S. provided field support, technical expertise in sampling and data analysis and initial editing of manuscripts. Objectives were to ensure that complete habitat and fish information (all species) was collected which would enable a habitat capability assessment for salmonids, in particular, for juvenile chinook and coho, but also for rainbow. The primary interest of F.H.I.S. was to collect data which could be used to further assess the potential impacts of chinook and coho outplanting on resident gamefish populations in the Middle Shuswap River and tributaries.

4. WORK COMPLETED IN PREVIOUS YEARS: refer to:

Griffith, R.P. 1979. Enhancement opportunities for resident rainbow trout in the Middle Shuswap River above Shuswap Falls and potential impact of chinook reintroduction. MS., B.C. Fish and Wildlife Br., Victoria. 84pp.

5. WHO WAS INVOLVED

	F.H.I.S. Staff[1]			ALPHA BIORESOURCE ENVIRONMENTAL CONSULTANTS[2]		
	Number of Persons	Person Days	Cost	Number of Persons	Person Days	Cost
Office	1	20	2,800	2	(200)[4]	(20,000)[4]
Field	4	50	5,960	2	(80)	(8,000)
Travel	4	50	3,785	2	(80)	(6,200)
Other[3]	0	0	0			(2,800)
TOTAL		70	$12,545		(280)	$37,000

[1] F.H.I.S. Staff and involvement:

D. Sebastian	BIO2 @ $140/day	20 days-Consultation, Proofing & Editing	$ 2,800
R. Griffith	BIO2 @ $140/day	23 days-field	3,220
J.C. Wightman	CO3 @ $110/day	4 days-initial field	440
B. Yaworski	CO1 @ $100/day	23 days-field	2,300

[2] J. Fee, G. Jong.

[3] Business expenses, office supplies, photographic expenses, truck rental.

[4] Bracketed values are estimates only.

6. RESULTS OF INVESTIGATIONS

This project involved two field assessments; at moderate flow during July and at low flow during September. The purpose was to quantify usable habitat area at different flows and to investigate summer migration behaviour in juvenile chinook. Results suggested that:

(i) Significant numbers of juvenile chinook remained until mid-summer before outmigrating. Early stream rearing appears to be important for chinook survival.

(ii) Populations of juvenile chinook below Shuswap Falls were significantly reduced by late summer suggesting a major outmigration occurred prior to September. Low densities of chinook in September suggest outmigration are behavioural and not necessarily habitat related (i.e. not necessarily density dependent).

(iii) Because of outmigrations, high flow habitat areas of approximately 30 ha below Shuswap Falls and 13.5 ha above, appear to be more limiting to potential chinook production than late summer habitat areas of only 1.3 and 0.4 ha below and above the falls, respectively.

(iv) Both velocity and cover become more limiting to juvenile chinook and coho production, moving upstream from Shuswap Falls. Habitats are more favourable for trout than for chinook production in Cherry and Reiter creeks, and in the Middle Shuswap River upstream of Cherry Creek confluence.

(v) Opportunities exist for outplanting approximately 190,000 chinook fry at 2 g size above Shuswap Falls. If successful, outplanting below Shuswap Falls should not be necesary with increased escapements to the lower river.

(vi) Potential for enhancing coho production exists primarily in Bessette Creek, and secondarily in the Middle Shuswap River below Shuswap Falls. An outplant of 100,000 unfed fry to Bessette Creek was recommended as a best enhancement strategy for coho. Follow-up assessments were recommended for all outplanting.

7. REPORT STATUS

- completed - available in limited supply from D.F.O., New Projects Unit (Appendices only available for photocopying).

Fee J. and J. Jong. 1984. Evaluation of chinook and coho outplanting opportunities in the Middle Shuswap River above and below Shuswap Falls. DSS Contract No. 04SB-FP576-3-2462. MS., Dept. of Fisheries and Oceans, Vancouver, B.C. Vol. 1, 76pp.; Vol. 2 (Appendices), 107pp.

8. FURTHER WORK TO BE DONE

F.H.I.S. plans further analysis of 1983 data, primarily as it relates to potential impacts of chinook/coho introductions on resident gamefish populations.

9. EVALUATION OF WORK DONE

N/A.

10. PHOTOGRAPH REFERENCE

Original photographs available in F.H.I.S. slide files.

11. OTHER PERTINENT INFORMATION

N/A.

12. CONTACT PERSONS

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John Fee, Biologist
Alpha-BioResource Environmental Consultants
Phone: 430-3786 (Vancouver)

ANNUAL REPORT (1983-84 Fiscal)

1. NAME OF PROJECT

Nicola Fisheries Assessment--enhancement opportunities and recommendations based on 4-consecutive years of habitat and fisheries investigation, 1980-83.

2. LOCATION

The Nicola River from Nicola Lake, near Merritt, to the Thompson River, near Spences Bridge. Investigations in 1983 included two major tributaries; Spius Creek and the Coldwater River.

3. BACKGROUND

This project was intended to last 3 consecutive years (1980-82) focussing on the role and relative importance of various components of the watershed for anadromous fish production. Specific objectives were:

(i) to identy the distribution and relative importance of salmonid spawning and rearing areas in the mainstem Nicola and major tributaries through censusing of juvenile fish, and

(ii) to relate existing production to habitat capabilities and constraints, while identifying enhancement opportunities for salmonids.

A third year of investigation (1982) uncovered a number of uncertainties and apparent inconsistencies in data not evident from the first two years (1980 and 1981). In addition, some questions raised by 1980-81 investigations could not be addressed in 1982 as a result of lower funding levels, particularly questions regarding chinook outmigration. Investigations were extended to a fourth consecutive year to help clarify apparent inconsistencies, and to gain a broader perspective in relation to natural variability.

4. WORK COMPLETED IN PREVIOUS YEAR(S)

Assessment work completed on the Nicola River during 1980 and 1981 is written up in:

Sebastian (1981). Nicola Fisheries Enhancement Assessment--A summary of 1980 results and preliminary Enhancement Opportunities, with recommendations for future assessment activities.

Sebastian (1982a). Nicola Fisheries Assessment--Preliminary enhancement opportunities and recommendations based on 1980 investigations.

Sebastian (1982b). Nicola Fisheries Assessment--Interim enhancement opportunities and recommendations based on 1980 and 1981 investigations.

A third year of investigation was undertaken in 1982 at a reduced level of effort (60%). A total of 31 fish sample sites were completed, of which 27 sites were index sites from previous years of investigation. Included in the field program was a first post-stocking assessment of steelhead fry liberations in Spius Creek. A number of questions regarding original interpretations arose from analysis of a third year of data. Final reporting on 1982 data was postponed until further information was collected in 1983 (a fourth year of investigation was deemed necessary). Analysis of 4 consecutive years of data was completed in 1983-84 and reporting is in progress.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other [3] (Designate)		
	No. of Persons	Person Days	Est. Cost	No. of Persons	Person Days	Est. Cost	No. of Persons	Person Days	Est. Cost
Office	2	51(DS) ?120(BY)	7,140 12,000est	0	0	0	0	0	0
Field	2	12	1,440	3	20	2,200	0	0	0
Travel	2	12	930		15	1,200			
Other[4]	0	0	0	0	0	0			
Total			21,500			3,400			

[1] F.H.I.S. staff--Field

D. Sebastian	BIO2	@ $140/day:	6 days =	$ 840
B. Yaworski	CO1	@ $100/day:	6 days =	600
				$ 1,440

Office

D. Sebastian	BIO2	@ $140/day:	51 days =	7,140
B. Yaworski	CO1	@ $100/day:	120 days =	12,000
			Σ office	19,140
			ΣΣ	20,580

[2] Region 3 staff--

A. Caverly	CO2	@ $105/day:	8 days =	$ 840
D. Moore	CO1	@ $100/day:	8 days =	800
I. McGregor	BIO2	@ $140/day:	4 days =	560
			20	$ 2,200

6. RESULTS OF INVESTIGATIONS

(i) Ratios of steelhead parr to fry in the Nicola mainstem over a 4-year period suggest that parr habitats may be limiting and near capacity for direct smolt production. Estimates of potential for steelhead smolt production in the Nicola River have been revised downward from earlier assessment.

(ii) Recent sampling results and smolt prediction models together suggest that the Spius/Make system is much closer to its production potential for steelhead than originally estimated. Initial results of post-fry stocking assessment indicates that Maka Creek may receive adequate natural recruitment during most years. Fry densities appear to have increased in upper reaches of Spius Creek since fry releases in 1982 and 1983, but not in Maka Creek.

(iii) The greatest potential for increased steelhead production in the Nicola system may be realized by improved recruitment of fry to the upper Coldwater River. Potential for increased steelhead production has been realized in tributaries such as Guichon, Clapperton and Skukun Creeks, however, alternative irrigation practises and flow regulation required prior to fry stocking are extremely prohibitive in terms of cost.

(iv) Extreme variability in pre-fall outmigration of juvenile chinook has been documented for 1980-83 populations (0-100% outmigration). There appears to be a strong relationship between size and outmigration, not evident from earlier data. The assessment of habitat capability for chinook requires an earlier assessment of habitat quantity. High flow refuge habitat may ultimately limit juvenile chinook production.

(v) Coho populations in the Nicola River appear to have been virtually elimninated, while remmant populations were found in Maka Creek and the upper Coldwater River. Limited recruitment is suspected to be the major problem for juvenile coho production.

7. REPORT STATUS

"Nicola Fisheries Assessment--Enhancement Opportunities and Recommendations based on 4-consecutive Years of Investigation".

Data analysis complete; report in preparation--'anticipate completion in mid-1984.

8. FURTHER WORK TO BE DONE

No further assessment is planned--regions are encouraged to continue followup assessments of fry stocking. F.H.I.S. involvement will be upon Regional request.

9. EVALUATION OF WORK DONE

A fourth year of habitat capability assessment and followup assessments of fry stocking has indicated these should be changes in present enhancement strategies, in particular, the fry stocking program on Spius Creek.

10. PHOTOGRAPHIC REFERENCE

Available in F.H.I. Section slide files.

11. OTHER PERTINENT INFORMATION: N/A

12. CONTACT PERSONS

Dale Sebastian, Project Biologist (SEP)
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ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF REPORT

Bonaparte River juvenile steelhead and chinook release assessment.

2. LOCATION

The Bonaparte River, tributary to the Thompson River at Ashcroft.

3. BACKGROUND

Stocking of anadromous salmonids (chinook and steelhead) above the barrier falls in the Bonaparte River was initiated in 1979. Steelhead fry and parr, and chinook fry have been released at various sites since that time. With the initial (1979) assessment of fish production potential as a base, the F.H.I.S. has been involved in planning release strategy and in post-release assessment. Objectives of the assessment programs were to evalute success of releases in terms of juvenile rearing and growth and to form a basis for future stocking programs.

In 1983 the F.H.I.S. continued its involvement in Bonaparte River chinook and steelhead release assessment.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

F.H.I.S. involvement in the Bonaparte River has included an initial assessment of anadromous fish production potential, and assessment of 1979, 1981 and 1982 fish release programs.

Tredger, C.D. 1980a. Assessment of the Bonaparte River relevant to anadromous fish production potential. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

_____. 1980b. Evaluation of a steelhead fry release to the Bonaparte River in 1979. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

_____. 1981. Bonaparte River chinook/steelhead assessment. Memo to G. McIntyre, D.F.O., File 0140-3 Bonaparte River, Fish and Wildlife Branch, Victoria. Nov. 20, 1981.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	25.5	3,570						
Field	1	5	700	2	6	750	3	11	1,100
Travel		5	500		6	450		11	605
Other[4]									
Total			4,770			1,200			1,705
83/84 Total			1,970			1,200			1,705
84/85 Total			2,800						
Project Total = 7,675									

[1] D. Tredger 83/84 5.5 office days, 5 field days, 84/85 20 office days.
[2] I. McGregor 83/84 3 field days, A. Caverly 83/84 3 field days
[3] J. Jong (consultant) 5 field days
D. Moore (consultant) 3 field days
P. Matthew (Control Interior Tribal Council) 3 field days

6. RESULTS OF THE INVESTIGATION(s)

The 1983 fish release to the Bonaparte River included 34,000 chinook fry, 68,000 steelhead fry and 11,700 steelhead parr (yearlings). Assessment of the various releases was conducted by late summer fish population estimates. Preliminary data only is available as results have not yet been analyzed.

7. REPORT STATUS

Report in preparation at this time.

8. FURTHER WORK TO BE DONE

Further F.H.I.S. involvement will be limited to preparation of a comprehensive report outlining 4 years of hatchery release assessment programs.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional contact person is Ian McGregor (374-9717)

12. CONTACT PERSON

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ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Salloomt River steelhead fry stocking assessment: progress to 1983.

2. LOCATION

22 km upstream of Bella Coola estuary, east of Hagensborg.

3. BACKGROUND

The lower 4.5 km of stream is accessible to anadromous fish and an impassable barrier prevents upstream migration to a further 17 km. Prior to 1981 the area above the barrier was occupied only by resident Dolly Varden char. At the request of Regional Fisheries Management, the Fish Habitat Improvement Section carried out a study to determine feasibility of stocking steelhead fry above the barrier followed by assessment of carrying capacity to maximize benefits from released fry. Four consecutive years of study have now been completed. Work in 1983 was concerned with obtaining clarification of steelhead fry carrying capacity in the absence of flood conditions and an estimation of survival to parr.

An estimated 60,500 steelhead fry were released July 29, 1983 at 10 sites in the mainstem Salloomt above the barrier. An additional 1,000 were liberated below the barrier as in previous years. Releases consisted of two size groups; 31,900 at 29.7 mm f.l. and 0.20 g and 29,600 at 30.6 mm and 0.27 g. Reach 5 received an average 0.25 fry/m^2 mostly from the smaller size group. Approximately 6,700 grade-down chinook juveniles were liberated in Reach 3 on or about July 5 by Snootli Hatchery staff.

4. WORK

In 1980 a preliminary biophysical assessment of the Salloomt River and an estimate of the benefit/cost of barrier removal was carried out. These activities are reported in:

Stuart, K.M. 1981. Habitat characteristics and fish production of Salloomt River near Bella Coola, with reference to enhancement opportunities. Unpubl. MS., B.C. Fish and Wildlife Branch, Victoria, B.C. 67pp.

On the basis of this investigation a steelhead fry stocking program was initiated in the summer of 1981. Objectives of 1981 releases and follow-up population assessment were: 1) to determine relative survival rates of early (unfed) vs. late (fed) fry and 2) to ascertain whether predicted carrying capacity could be attained. Unpredictable delays in release timing and subsequent assessment led to unreliable results brought about by confounding effects from cold water temperatures and resultant overwintering behaviour. Further details are contained in:

Ptolemy, R.A. and J.R.L. Russell. 1982. Fry stocking assessment of the upper Salloomt River. Unpubl. Reconnaissance Report, B.C. Fish and Wildlife Branch, Victoria, B.C. 14pp.

Both stocking and assessment programs were continued in 1982 and discussed in:

Russell, J.R.L. and R.A. Ptolemy. 1983. Assessment of fry stocking in the Salloomt River: Progress to 1982. Unpubl. MS., B.C. Fish and Wildlife Branch, Victoria, B.C. 14pp.

Statistical comparisons of 1982 recaptures indicated no benefits had been derived from hatchery rearing to fall fry stage in 1981. Late fry releases were discontinued with future liberations scheduled during the period of normal wild fry emergence for this system. Due to the unknown influence of post-release flooding in 1982 some uncertainty existed over whether fry saturation had been achieved at all sample sites. Results implied a maximum capacity of less than half the 0.22 fry/m^2 originally predicted. A large portion of the discrepancy between predicted and sampled densities was related to presence of high water velocities and depths which would limit total rearing habitat for fry, even under normal flow conditions.

5. WHO WAS INVOLVED AND COSTS

Fish Habitat Improvement Section with support from Regional staff.

	F.H.I. Staff			Region		
	No. of Persons	Person Days	Cost ($)	No. of Persons	Person Days	Cost ($)
Office	1	28	2,800	-	-	-
Field	2	18	2,160	1	10	1,050
Helicopter	-	-	313*	-	-	258*
Travel	-	-	-	-	-	-
			5,273			1,308

* Assessment only--helicopter cost for liberations was an additional $414 to Region.

6. RESULTS OF THE INVESTIGATIONS

(i) Seven electroshocking sites were completed September 9 and 10 in the mainstem; four sites were located in Reach 5, two in Reach 3 and one in Reach 1. In addition to the shocking sites, a snorkel survey for parr was carried out over a 2.5 km section in Reach 5.

(ii) Steelhead fry densities ranged from 0.07-0.32 fish/m^2 or 0.08-0.44 g/m^2 in stocked sites. Fry densities in two out three repeat Reach 5 sites were lower than in the previous fall.

(iii) F.H.I.S. modified Bovee (1978) curves for depth, velocity and substrate were used to determine probability-of-use at sampled sites. A regression on 1985 fry data, and calculated probability-of-use, showed no relationship similar to that observed in 1982. The relationship did hold for parr. It is possible that 1983 fry densities were influenced by factors other than those measured at time of sampling and that saturation was not achieved at all sites.

(iv) Fry quality as indicated by a difference in condition factor between the two groups of fry released (0.94×10^{-5} compared to 0.76×10^{-5}) may be a prime factor as low condition fry were used to seed the Reach 5 index sites.

(v) Highest parr densities were sampled in Reach 3 at 0.14 fish/m^2. High parr densities were associated with depth >0.30 m, surface velocities >40 cm/s, and boulder cobble substrate.

(vi) A total of 795 parr were observed during the 2.5 km snorkel survey for an average of 318/km. Based on snorkel observations fall fry to parr survival is estimated at 20-30%. Smolt production for Reach 5 is now estimated to be 35-42% of the original prediction based on Slaney's preliminary model (Stuart, 1981).

(vii) Continuous temperature recordings were made over the growth period from time of release to recapture with a Ryan Thermograph. Mean temperature recorded was 11.0°C. Growth slope calculated for the same period was 11.5, slightly higher than predicted by the growth model used. Higher than expected growth slope may reflect disproportionately greater mortality among the smaller fry liberated.

7. REPORT STATUS

Reconnaissance Report completed January 1984 entitled Salloomt River Steelhead Fry Stocking Assessment: Progress to 1983. (J.R.L. Russell and R.A. Ptolemy)

8. FURTHER WORK TO BE DONE

(i) Failure to obtain uniform densities between 1982 and 1983 is not believed to be due to a reduction in carrying capacity. Uncertainty still exists over whether fry saturation has been achieved at all sites. The assessment program should continue, if possible, in order to fine-tune the stocking rate to provide optimum production.

(ii) A Marsh-McBirney (Model 201M) flow meter and top levelling rod should used to collect more accurate measurements of depth and velocity across the entire wetted width of specific hydraulic units. This information would be useful in developing a system specific habitat rating curve to clarify understanding of maximum sustainable fry population for this system.

9. EVALUATION OF WORK DONE

(i) In light of restraint further assessment work may be limited, however, the Salloomt data has become valuable in fish abundance/habitat quality modelling for the province as a whole.

(ii) Smolt yield and subsequent adult returns will likely be less than half of the original estimate (680 at 8% smolt to adult survival or 1,020 at 12% survival). First major adult steelhead returns are expected in 1986. Based on snorkel survey estimates of survival to parr (35-42% of the original prediction) and 8-12% smolt to adult between 240-430 adults would be anticipated. Since the original estimate of benefits appears to be high, barrier removal has yet to be justified.

10. PHOTOGRAPH REFERENCE

A slide record of the study is available from Section files.

11. OTHER PERTINENT INFORMATION

Grade-down chinooks released above the barrier appeared to do very well. Mean fork length and estimated weight at recapture was 76.3 mm and 5.0 g respectively (n = 80). Growth slope was calculated at 10.5 compared to a mean recorded temperature of 11.0°C (which indicates good growth). Survival cannot be estimated from the data.

12. CONTACT PERSONS

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Regional Fisheries Technician
Regional Operations
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ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Assessment of a steelhead fry release to the Little Chilcotin River, 1983.

2. LOCATION

The Chilcotin River, upstream of the Chilko-Chilcotin confluence at Redstone, 110 km west of Williams Lake.

3. BACKGROUND

Enhancement of Chilcotin River steelhead through fry stocking in the Little Chilcotin River was initiated in 1982 with a release of 34,000 marked steelhead fry. Post-stocking assessment (Tredger, 1983) indicated a saturation fry density of 3.24 fry/linear m (0.12 fry/m^2). Release density sufficient to saturate the stream was estimated at 4 to 4.7 fry/linear m (0.15 to 0.17 fry/m^2). Total fry requirement for the Little Chilcotin was estimated at 110,000. Poor growth of hatchery fry suggested that future releases be conducted earlier in the summer to take advantage of better instream growth conditions.

Results of the 1982 assessment program provided the basis for 1983 fry release planning. A total of 87,500 Chilcotin River steelhead fry were released to the Little Chilcotin River on July 14, 1983 in accordance with suggested densities. Objectives of the 1983 assessment program were to determine fall fry density, growth and survival rates, and to discuss results in terms of optimum stocking strategy through comparison with 1982 results.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Tredger, C.D. 1983. Assessment of a steelhead fry release to the Little Chilcotin River. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	14.5	2,030				1	1	100
Field	1	6	840	1	6	660	2	10	1,000
Travel			600			600			550
Other[4]			140						
Total			3,610			1,260			1,650
83/84 Total			3,400			1,260			1,650
84/85 Total			210						
Project Total = $6,520									

[1] D. Tredger 14 office, 6 field days in 83/84, 0.5 office days in 84/85.
[2] T. Wilkinson.
[3] M. Van Dyke (consultant) 6 field days.
J. Jong (consultant) 6 field days, 1 office day.
[4] Typing approx. 2 days (84/85).

6. RESULTS OF THE INVESTIGATIONS

Assessment of a steelhead fry release to the Little Chilcotin River was conducted September 14 to 16, 1983. Of the 87,000 fry released, 43,000 (0.37 g) fry were released to a study area on July 14, 1983, at a density of 4.7/m of stream (0.17 fry/m^2). Survival of hatchery released fry to fall fry was estimated at 30%. Mean density was 1.75 fry/m of stream (0.06 fry/m^2). Growth slope (Gs x 1000) from release to assessment was 12.5, for a final size of 3.48 g.

Comparison of the 1983 release was made with the August 27, 1982 release of 37,000 fed (0.86 g) fry at 27 fry/m (1.0 fry/m^2). Results indicated better growth for 1983 releases as evidenced by higher growth slope values 12.5 vs 3.4 in 1982). Mean fry density was significantly lower in 1983, while total fry biomass was higher (though not significant statistically) in 1983. Growth and survival data is presented for fall 1982 fry to fall 1983 yearlings which indicates survival in the order of 3 times greater for larger hatchery and wild fry. The 1983 release was viewed as "more successful" by providing a larger fall fry, which is suspected of translating to greater smolt yield through increased overwinter survival and younger average smolt age.

7. REPORT STATUS

Complete, limited copies available through Region:

Tredger, C.D. 1984. Assessment of a steelhead fry release to the Little Chilcotin River, 1983. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

Steelhead fry stocking in the Little Chilcotin River will continue as a Regional program. Assessment of fry stocking programs to "fine-tune" fry stocking strategy will be conducted only as opportunities present.

9. EVALUATION OF WORK DONE

Results of 1982 and 1983 fry stocking assessment programs in the Little Chilcotin River have essentially determined the optimum stocking requirements. Knowledge of this optimum will aid in generation of a benefit/cost for the project.

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional Contact person: T. Wilkinson, Williams Lake.

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Chilko River steelhead fry recruitment monitoring.

2. LOCATION

The Chilko River, from Chilko Lake to the Chilcotin River confluence near Redstone, 90 km west of Williams Lake.

3. BACKGROUND

The Chilko River is the major spawning area for Chilcotin River steelhead. Assessment of steelhead fry recruitment in the Chilko relative to potential carrying capacity was initiated in 1981, and continued as annual monitoring in 1982. Estimates of fall steelhead fry population have ranged from 600,000 in 1981 to 304,000 in 1982. In September 1983 a third consecutive year of fry population monitoring was conducted. Objectives of the program were to estimate the steelhead fry population, and to discuss annual population trends in terms of indicators of adult escapement.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Previous F.H.I.S. assessments of Chilko River fry population include:

Tredger, C.D. 1982a. Assessment of steelhead fry carrying capacity in the Chilko River with reference to Chilcotin River steelhead enhancement opportunities. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

Tredger, C.D. 1982b. Annual monitoring of the steelhead fry population in the Chilko River, 1982. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	2	13.5	1,490						
Field	1	3	420	1	3	330	2	6	600
Travel			300			300			330
Other[4]			140						
Total			2,350			660			930
Project Total = 3,940									

[1] B. Yaworski 10 days office
D. Tredger 3 days field, 3 1/2 days office
[2] T. Wilkinson
[3] M. Van Dyke (consultant) 3 days field
J. Jong (consultant) d says field
[4] Typing approx. 2 days

6. RESULTS OF INVESTIGATION(s)

Sampling at 8 index sites in the Chilko River produced a population estimate of 598,000 steelhead fry in September 1983. This estimates was approximately equal to the 1981 fry population estimate of 601,000, and roughly double the 1982 estimate of 304,000.

No pattern was found in relating fry population trends to indicators of adult escapement (eg. Steelhead Harvest Analysis, Regional creek census and aerial spawner counts) in the three years of study.

7. REPORT STATUS

Complete, limited copies available through Region.

Yaworski, B.A. and C.D. Tredger. 1983. The third year of steelhead fry monitoring in the Chilko River, 1983. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

Additional work is requried in calibration of adult escapement indicators to fall fry populations. Adult census (S.H.A., creel census, aerial counts) is an ongoing regional program.

8. EVALUATION OF WORK DONE

Initial assessment of the Chilko River steelhead fry population (Tredger 1982a) indicated a population very near to suspected saturation levels. The need for hatchery steelhead fry introductions to the Chilko River was questioned, and the hatchery program was shifted to colonize known under-recruited areas in the Chilcotin River system.

10. PHOTOGRAPHIC REFERENCE

Photographs available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional contact person is T. Wilkinson (392-6261).

12. CONTACT PERSONS

B.A. Yaworski, Fisheries Technician
C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 382-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

To assess 1982 steelhead fry stocking and wild steelhead recruitment in the Harold Price Creek system.

2. LOCATION

Harold Price Creek, tributary to the Suskwa River 16 km east of New Hazelton.

3. BACKGROUND

The Suskwa River steelhead enhancement project was initiated in 1977 by Region 6 (Skeena) fisheries staff. The project has involved modification of the Harold Price Creek barrier (falls) by blasting (1977 to 1979), and outplanting of steelhead fry into the upper Harold Price Creek system. In August 1982 the F.H.I.S. conducted an assessment of upper Harold Price Creek to determine potential steelhead smolt production (estimated at 0.0087 smolts/m^2 or 6000 smolts) and steelhead fry stocking requirements (estimated at 0.25 fry/m^2 or 170,000 fry). In September 1982 a release of 48,300 hatchery steelhead fry (0.41 fry/m^2) was conducted in portions of the upper Harold Price Creek system. An August 25, 1983 assessment was conducted to evaluate the 1982 fry release program in terms of translation to 1+ parr, and monitor wild steelhead recruitment above the Harold Price Creek falls.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Details of project planning, barrier modification and initial fry release activities are available in:

Chudyk, W.E. 1978. Suskwa River steelhead trout: The 1977 inventory, creel survey and life history characteristics study leading to the removal of a barrier on Harold Price Creek. Unpubl. MS., Fish and Wildlife Branch, Smithers, B.C.

_____. 1979. Suskwa River steelhead trout: The colonization of Harold Price Creek with hatchery reared steelhead. Unpubl. MS., Fish and Wildlife Branch, Smithers, B.C.

F.H.I.S. assessment reports include:

Yaworski, B.A. and C.D. Tredger. 1982. Steelhead fry stocking requirements for the upper Harold Price Creek system near Hazelton. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

Tredger, C.D. 1982. Steelhead fry stocking requirements for the upper Harold Price Creek system--1982 revisions. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	6	840						
Field				4	4	480	2	2	200
Travel						100			55
Other[4]			70			1,000			
Total			910			1,580			255
Total 1983/84						1,580			255
Total 1984/85			910						
Project Total = 2,745									

[1] D. Tredger
[2] M. Lough, D. de Leeuw, R. Tetreau, G. Schultze
[3] M. O'Neill (consultant), S. Cox-Rogers (U.B.C. Graduate Student)
[4] Typing approx. 1 day (F.H.I.S.)
Helicopter Rental (Region)

6. RESULTS OF THE INVESTIGATION(s)

Sampling of the Harold Price Creek system on August 25, 1983 revealed:

(i) A total of 27 yearling (1+) rainbow, resulting from 1982 fry stocking were captured in the sampling program. These fish had moved up to 8 km from release sites. Average sampled density was 0.064/m^2, slightly greater than the predicted average density of 0.0435/m^2. Suspected positive sampling bias suggests the average density would approach the 0.0435/m^2 expected. Estimated survival from September 8, 1982 release to August 25, 1983 capture was 11 to 32%, with the most likely estimate being 22%. The fry release density of 0.41 fry/m^2 was suggested as greater than required to meet parr saturation goals.

(ii) No wild steelhead fry were captured above the falls, indicating a continued problem with fish access at the Harold Price Creek falls.

(iii)Recommendations to reduce the stocking rate to 0.25 fry/m^2, and to review the fish passage problem were made.

7. REPORT STATUS

Complete--limited copies available through Region 6 (Skeena).

Tredger, C.D. 1984. Harold Price Creek. Reconnaissance Report, Fish Habitat Improvement Section, Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

Fry colonization and assessment will continue as a regional program.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

N/A

11. OTHER PERTINENT INFORMATION

Regional contact persons: M. Lough 847-4411
B. Chudyk 847-4411

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 382-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Juvenile steelhead assessment in the Kispiox River, 1980 to 1982.

2. LOCATION

The Kispiox River, tributary to the Skeena River approximately 15 km north of Hazelton.

3. BACKGROUND

Assessment of the juvenile steelhead population of the Kispiox River system has been conducted for three consecutive years (1980 to 1982) by the F.H.I.S. Goals of the assessment program were to outline "carrying capacity" of the Kispiox system in terms of steelhead smolt yield, and to recommend methods of steelhead enhancement applicable to the Kispiox. Objectives of the annual sampling program were to conduct a biophysical assessment of the Kispiox system, to monitor steelhead fry recruitment levels, and to define optimum fry recruitment relative to fry to parr survival, and subsequent smolt yield. In 1983/84 a summary of the three years of assessment was prepared to meet the goals of the program.

4. WORK COMPLETED IN PREVIOUS YEARS

The 1980 and 1981 assessment programs were reported on separately, while 1982 data was included in the 1983/84 reporting. References include:

Stuart, K.M. 1981. Juvenile steelhead carrying capacity in the Kispiox River system in 1980, with reference to enhancement opportunities. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

Tredger, C.D. 1982. Juvenile steelhead population monitoring in the Kispiox River system, 1981. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	20	2,800						
Field									
Travel									
Other[4]			490						
Total			3,290						

[1] D. Tredger
[4] Typing approx. 7 days

6. RESULTS OF THE INVESTIGATION(s)

(i) Steelhead Fry Population Monitoring

At index sampling sites, mean steelhead fry density was greater in 1981 than 1980 (+ 0.88 fry/m) or 1982 (+ 1.29 fry/m). Weighted population estimates based on index site results indicate total fry populations of 526,000 in 1980, 646,000 in 1981 and 408,000 in 1982.

Attempts to relate fry population estimates to "reliable" escapement estimates (total run reconstruction) proved inconclusive. The highest fry population did correspond with highest estimate of escapement (646,000 fry from 1980 escapement (1981 brood) of 1,175), but the smallest fry population related to theoretically moderate escapement (408,j000 fry from 1981 escapement of 1,040). The moderate fry population related to the lowest estimated escapement (526,000 fry from 1979 escapement of 775).

(ii) Fry to Parr Translation and Survival Rates

Estimated steelhead parr population increased in the Kispiox system through all sampling years. Yearling population increased from 97,500 in 1980, to 123,000 in 1981, to 309,000 in 1982. The 2+ parr population increased from 25,000 in 1980 to 41,000 in 1981, to 81,000 in 1982.

Survival rates from fry to 1+ (for consecutive years) was 23% from 1980 to 1981, and 48% from 1981 to 1982 (average 35.5%). These values are considered high in terms of the 15% "standard" value. Yearling to 2+ survival rates were estimated at 43% and 66% (average 54.5%) for 1980 to 1981 and 1981 to 1982 respectively. These values are questionable due to difficulties in sampling older (i.e. 2+) parr.

(iii)Smolt Capacity

Theoretical smolt capacity was estimated by five methods, producing a variety of estimates. A reference value of 33,000 smolts was obtained by relating maximum historical adult run size (estimated) to expected smolt to adult survival. Other estimates are discussed.

Probable limiting stage in Kispiox smolt production was suggested as older (2+ - 3+) parr habitat. This was suggested by the size of actual yearling parr population in relation to the reference smolt yield.

Required escapement

An estimate of the adult escapement required to assure maximum smolt production was 1,100 fish. This estimate was based on average survival estimates for juvenile steelhead. Environmental conditions play a significant role in annual survival. Escapement of this magnitude, if properly distributed, should produce maximum smolt yield annually. At saturation a 12% smolt to adult returns a C/E of 2.6:1 (i.e. 2,860 catch).

7. REPORT STATUS

Completed, limited copies available through Region.

Tredger, C.D. 1983. Juvenile steelhead assessment in the Kispiox River (1980 to 1982). Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

F.H.I.S. involvement in the Kispiox River juvenile steelhead assessment program is complete. Fry recruitment monitoring will continue as a regional program with F.H.I.S. direction.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional contact person is M. Lough (847-4411).

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Investigtion of background fish density in three Kitsumkalum River tributaries relative to a proposed program of hatchery coho releases.

2. LOCATION

Kitsumkalum River tributaries (Deep, Spring and Lean-To Creeks), 10 km northwest of Terrace.

3. BACKGROUND

The Terrace-Kitsumkalum Salmonid Enhancement Society, under direction of the D.F.O. Public Involvement Program, is involved in a chinook and coho enhancement program. Currently a hatchery facility is in operation on Deep Creek, a Kitsumkalum tributary. Concern with potential impacts of hatchery releases on juvenile steelhead rearing was voiced by Regional Fish and Wildlife staff. In an effort to document these concerns, a brief reconnaissance was conducted.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

N/A

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	5	700						
Field				1	1	140	1	1	100
Travel						100			55
Other[4]			70						
Total			770			240			155

Project Total = 1,165

[1] D. Tredger
[2] M. Lough Region 6
[3] S. Cox-Rogers, U.B.C. Graduate Student
[4] Typing approx. 1 day

6. RESULTS OF THE INVESTIGATION(s)

A brief reconnaissance of Deep, Spring and Lean-To Creeks was conducted August 29, 1983. Impacts of hatchery introductions on current steelhead production in the study streams was discussed in terms of stream carrying capacity and present fish populations. Given current (1983) population levels, coho introductions were not recommended for Spring and Lean-To Creeks, while a limited release of 10,000 coho was suggested for Deep Creek. A recommendation to study all potential hatchery release streams in the Kitsumkalum River system in more detail was made.

7. REPORT STATUS

Completed--limited copies available through Region 6 (Smithers).

Tredger, C.D. 1983. Kitsumkalum River. Reconnaissance Report, Fish Habitat Improvement Section, Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

A more detailed assessment of Kitsumkalum River tributaries is being planned by Regional staff (M. Lough). The program may involve D.F.O. staff as well as F.H.I.S. staff.

9. EVALUATION OF WORK DONE

The Kistumkalum River reconnaissance has proven useful to Regional staff in negotiations with D.F.O. regarding salmonid fry release programs. Some D.F.O. staff see the requirement for conducting pre-stocking inventory of proposed hatchery release program areas.

10. PHOTOGRAPHIC REFERENCE

N/A

11. OTHER PERTINENT INFORMATION

Regional contact person is M. Lough, Smithers (847-4411).

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Assessment of a steelhead fry release to the Little Chilcotin River, 1983.

2. LOCATION

The Chilcotin River, upstream of the Chilko-Chilcotin confluence at Redstone, 110 km west of Williams Lake.

3. BACKGROUND

Enhancement of Chilcotin River steelhead through fry stocking in the Little Chilcotin River was initiated in 1982 with a release of 34,000 marked steelhead fry. Post-stocking assessment (Tredger, 1983) indicated a saturation fry density of 3.24 fry/linear m (0.12 fry/m^2). Release density sufficient to saturate the stream was estimated at 4 to 4.7 fry/linear m (0.15 to 0.17 fry/m^2). Total fry requirement for the Little Chilcotin was estimated at 110,000. Poor growth of hatchery fry suggested that future releases be conducted earlier in the summer to take advantage of better instream growth conditions.

Results of the 1982 assessment program provided the basis for 1983 fry release planning. A total of 87,500 Chilcotin River steelhead fry were released to the Little Chilcotin River on July 14, 1983 in accordance with suggested densities. Objectives of the 1983 assessment program were to determine fall fry density, growth and survival rates, and to discuss results in terms of optimum stocking strategy through comparison with 1982 results.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Tredger, C.D. 1983. Assessment of a steelhead fry release to the Little Chilcotin River. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	14.5	2,030				1	1	100
Field	1	6	840	1	6	660	2	10	1,000
Travel			600			600			550
Other[4]			140						
Total			3,610			1,260			1,650
83/84 Total			3,400			1,260			1,650
84/85 Total			210						
Project Total = $6,520									

[1] D. Tredger 14 office, 6 field days in 83/84, 0.5 office days in 84/85.
[2] T. Wilkinson.
[3] M. Van Dyke (consultant) 6 field days.
J. Jong (consultant) 6 field days, 1 office day.
[4] Typing approx. 2 days (84/85).

6. RESULTS OF THE INVESTIGATIONS

Assessment of a steelhead fry release to the Little Chilcotin River was conducted September 14 to 16, 1983. Of the 87,000 fry released, 43,000 (0.37 g) fry were released to a study area on July 14, 1983, at a density of 4.7/m of stream (0.17 fry/m^2). Survival of hatchery released fry to fall fry was estimated at 30%. Mean density was 1.75 fry/m of stream (0.06 fry/m^2). Growth slope (Gs x 1000) from release to assessment was 12.5, for a final size of 3.48 g.

Comparison of the 1983 release was made with the August 27, 1982 release of 37,000 fed (0.86 g) fry at 27 fry/m (1.0 fry/m^2). Results indicated better growth for 1983 releases as evidenced by higher growth slope values 12.5 vs 3.4 in 1982). Mean fry density was significantly lower in 1983, while total fry biomass was higher (though not significant statistically) in 1983. Growth and survival data is presented for fall 1982 fry to fall 1983 yearlings which indicates survival in the order of 3 times greater for larger hatchery and wild fry. The 1983 release was viewed as "more successful" by providing a larger fall fry, which is suspected of translating to greater smolt yield through increased overwinter survival and younger average smolt age.

7. REPORT STATUS

Complete, limited copies available through Region:

Tredger, C.D. 1984. Assessment of a steelhead fry release to the Little Chilcotin River, 1983. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

Steelhead fry stocking in the Little Chilcotin River will continue as a Regional program. Assessment of fry stocking programs to "fine-tune" fry stocking strategy will be conducted only as opportunities present.

9. EVALUATION OF WORK DONE

Results of 1982 and 1983 fry stocking assessment programs in the Little Chilcotin River have essentially determined the optimum stocking requirements. Knowledge of this optimum will aid in generation of a benefit/cost for the project.

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional Contact person: T. Wilkinson, Williams Lake.

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Assessment of juvenile steelhead populations in the Morice River, 1980 to 1982.

2. LOCATION

Morice River system, southwest of Houston, B.C.

3. BACKGROUND

Juvenile steelhead populations in the Morice River system have been studied by the Fish Habitat Improvement Section (F.H.I.S.) since 1980. Sampling has been conducted over three consecutive years (1980, 1981 and 1982), concentrating on late summer (August) population estimates. Original sampling in 1980 concentrated on Owen and Lamprey Creeks in an attempt to outline enhancement techniques applicable to these streams. Recommendations from the 1980 program included an expansion of sampling effort to include the entire Morice River system and to put specifically Owen and Lamprey Creek production into an overall system perspective. The sampling program was expanded to include the entire Morice system in 1981, and continued as index site sampling in 1982. In 1983/84 a summary of the three years of assessment results was prepared, with emphasis on annual variation in habitat parameters and fish populations.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Results of 1980 and 1981 assessment programs were reported separately, while 1982 results were included in the three year summary. References include:

Tredger, C.D. 1981. Assessment of steelhead enhancement opportunities in the Morice River system. Progress in 1980. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

_____. 1983. Assessment of steelhead enhancement opportunities in the Morice River system. Progress in 1981. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	35	4,900						
Field									
Travel									
Other[4]			560						
Total			5,460						

[1] D. Tredger
[4] Typing approx. 8 days

6. RESULTS OF THE INVESTIGATION(s)

Results of three consecutive years (1980 to 1982) of juvenile steelhead population monitoring in the Morice River system was summarized in 1983/84.

Emphasis was placed on Owen and Lamprey Creeks, with lesser effort on other tributaries and mainstem areas. Estimated steelhead fry populations in Lamprey Creek ranged from 45,000 to 70,000. The 1+ population ranged from 17,000 to 30,000 while the 2+ population ranged from 1,100 to 5,400. Three year old parr were only found in 1982. Estimated survival rates range from 25 to 68 percent fry to 1+, and 6.6 to 18 percent 1+ to 2+. Total steelhead biomass was relatively constant, ranging from 214 to 239 kg. Estimates of Owen Creek steelhead population ranged from 38,000 to 100,000 fry, 19,000 to 31,000 yearlings and 3,000 to 6,300 two year olds. No 3+ parr were found. Survival rates ranged from 29.6 to 81 percent fry to 1+, and 9.6 to 33.7 percent 1+ to 2+ parr. Total biomass ranged from 287 to 581 kg. More limited results are presented for other tributaries and the mainstem. Very rough steelhead parr capacity estimates using a preliminary steelhead smolt model are presented. Headwater fry stocking opportunities are briefly discussed.

7. REPORT STATUS

Complete, limited copies available through Region.

Tredger, C.D. 1983. Juvenile steelhead populations in the Morice River system, 1980 to 1982. Unpubl. MS., Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

No discussion of overall Morice River steelhead life history and smolt capacity was presented in 1983/84. Important data regarding steelhead parr densities in the mainstem Bulkley and Morice Rivers was collected during the 1983/84 Skeena boat shocking program. An overall perspective will be produced as time permits.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in the Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional contact person is M. Lough (847-4411).

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

To investigate carrying capacity and background fish density in Trout Creek relative to potential hatchery steelhead fry stocking.

2. LOCATION

Trout Creek, tributary to the Bulkley River, 21 km north of Smithers.

3. BACKGROUND

Trout Creek was considered as a potential site for headwater steelhead fry stocking. Currently an impassable falls 1 km from the Bulkley River blocks access to approximately 13 km of stream habitat. Cutthroat trout comprise the resident fish population above the falls. A brief reconnaissance was conducted August 22, 1983 to document resident cutthroat trout population status, habitat capability, steelhead production capacity and potential fry stocking requirements.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

N/A

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	2	12	1,280						
Field				2	2	240	2	2	200
Travel						90			
Other[4]			70						
Total			1,350			330			200
Project Total = 1,880									

[1] B. Yaworski - report preparation 10 days
D. Tredger - report preparation 2 days
[2] M. Lough, R. Tetreau
[3] M. O'Neill (consultant), S. Cox-Rogers (U.B.C. Graduate Student)
[4] Typing approx. 1 day

6. RESULTS OF INVESTIGATION(s)

Low sample density (due to limited access) produced major limitations in data, therefore reliable standing crop and carrying capacity estimates were not possible. Roughly estimated steelhead fry stocking requirements ranged from 9,500 to 21,000. More intensive ground reconnaissance to determine habitat characteristics and current cutthroat populations was recommended.

7. REPORT STATUS

Complete--limited copies available through Region 6 (Smithers).

Yaworski, B.A. 1983. Trout Creek. Reconnaissance Report, Fish Habitat Improvement Section, Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

More detailed reconnaissance will be conducted by Region 6 in 1984.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in F.H.I.S. Trout Creek file (prints).

11. OTHER PERTINENT INFORMATION

Region 6 (Smithers) contact person is M. Lough, Fisheries Biologist (847-4411).

12. CONTACT PERSON

B.A. Yaworski, Fisheries Technician
C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 387-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Skeena River steelhead fry recruitment monitoring--1983.

2. LOCATION

Skeena River tributary streams, including the Kispiox, Morice and upper Bulkley River systems.

3. BACKGROUND

Since 1980 the F.H.I.S. has conducted assessment of steelhead carrying capacity in selected Skeena River streams (Kispiox, Morice and upper Bulkley River systems). One task in these assessments was to monitor annual steelhead fry recruitment at "index" sampling stations. The goal of the fry monitoring program is to relate fry population levels to optimum levels as estimated in carrying capacity reports (available only for Kispiox at this time). Ultimately fry populations will be related to estimates of adult run size for harvest predictive purposes.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Fry recruitment monitoring has been reported in reports specific to individual system assessments (eg. Upper Bulkley, Morice and Kispiox).

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	1	6	840	-	-	-	1	10	1,000
Field	2	3	340	4	28	3,040	2	14	1,400
Travel			210			2,000			400
Other									
Total			1,390			5,040			2,800
83/84 total			970			5,040			2,800
84/85 total			420						
Project Total = 9,230									

[1] D. Tredger 83/84 3 days office, 1 day field
84/85 3 days office (so far)
B. Yaworski 83/84 2 days field

[2] M. Lough 2 days field
G. Schultze 10 days field
R. Tetreau 12 days field
D. de Leeuw 4 days field

[3] J. Fee (consultant) 10 days office
M. O'Neill (consultant) 11 days field
S. Cox-Rogers (U.B.C. Graduate Student) 3 days field

6. RESULTS OF THE INVESTIGATION(s)

Fry population monitoring in 1983/84 was conducted by Regional staff under F.H.I.S. direction. Sampling was conducted in the Kispiox, Morice and Upper Bulkley systems. Results from the Upper Bulkley indicate a larger fry population than either 1981 or 1982. Kispiox and Morice data has not been analyzed.

7. REPORT STATUS

Tredger, C.D. 1984. Upper Bulkley River steelhead fry population monitoring. Reconnaissance Report, Fish and Wildlife Branch, Victoria, B.C.

_____ in prep. Kispiox River steelhead fry population monitoring. Reconnaissance Report, Fish and Wildlife Branch, Victoria, B.C.

_____ in prep. Morice River steelhead fry population monitoring. Reconnaissance Report, Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

The annual fry monitoring program will be conducted by Region. F.H.I.S. will be involved in completion of carrying capacity reports for prediction of optimum fry population levels.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Regional contact person is M. Lough (847-4411).

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
Victoria, B.C.
Phone: 382-1961

ANNUAL REPORT (1983-84 FISCAL)

1. NAME OF PROJECT

Skeena River steelhead smolt capacity modelling.

2. LOCATION

Skeena River system, northwestern B.C.

3. BACKGROUND

In early 1982 fisheries management staff of the Fish and Wildlife Branch launched a program to "bring together" all information regarding the status of Skeena River summer run steelhead stocks. The overall objective was to relate, on a stock specific basis, present steelhead population size to historic population size, and to the streams productive (smolt) capacity. Three general tasks were set:

1. present steelhead population status
2. reconstruction of historic stock size, and
3. stream smolt production capacity.

F.H.I.S. involvement focussed on the third task.

Initial modelling of steelhead smolt yield was directed at application of the Keogh River smolt model to available habitat data. A "second attempt" at modelling incorporated the Keogh model with juvenile steelhead population density data collected by F.H.I.S. in streams throughout the Skeena. Smolt capacity estimates ranged from 282,000 to 517,000, and were considered to be in the "ballpark" when compared to present and historic adult population predictions.

Significant gaps in juvenile steelhead population data were identified in the course of the modelling exercise. These included 1) degree of utilization by juvenile steelhead of mainstem habitats (eg. Skeena, Bulkley, Morice), and 2) juvenile steelhead population density in a range of stream types and sizes throughout the Skeena.

The objectives of the Skeena steelhead modelling program in 1983/84 were therefore to collect data to 1) answer the question of mainstem utilization, and 2) to fill the gaps in the data base concerning stream type. Further modelling was not conducted, as major F.H.I.S. involvement in steelhead modelling was planned for 1984/85.

4. WORK COMPLETED IN PREVIOUS YEAR(s)

Results of 82/83 modelling were reported in memo form only, no reports were produced.

5. WHO WAS INVOLVED

	F.H.I. Staff[1]			Region[2]			Other[3]		
	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost	No. of Persons	Person Days	Cost
Office	3	34	4,520						
Field	2	33	4,300	4	20	2,640	2	11	1,100
Travel			2,900			1,500			405
Other[4]			810			300			
Total			12,530			4,440			1,505
Project Total = 18,475									

[1] D. Tredger 28 office days, 25 field days
B. Yaworski 8 field days
J. Ptolemy 6 office days

[2] M. Lough 11 field days
D. de Leeuw 5 field days
G. Schultze 3 field days
R. Tetreau 1 field day

[3] M. O'Neill (consultant) 2 field days
S. Cox-Rogers (U.B.C. Graduate Student) 9 days field

[4] Boat operation and maintenance--600 (FHIS), 300 (Region)
Typing approx. 3 days

6. RESULTS OF INVESTIGATION(s)

Fiscal year activities included collection of fish population and stream habitat data at selected sites throughout the Skeena system. Sampling was aimed at 1) large mainstem areas through boat shocking techniques, and 2) tributaries which were suspected to be operating at carrying capacity.

Boat shocking was conducted at 17 sites, from the Skeena below Terrace upstream to the Morice River. Crude fish population estimates and useable area estimates were conducted. Rainbow parr density ranged from 4/km in the Morice River to 200/km in the lower Bulkley River. Throught the Bulkley/Morice system there was decreasing density with upstream distance. A similar pattern was found for chinook fry, ranging from 10/km in the Morice River to 522/km in the lower Skeena.

Tributary sampling was conducted at 9 sites in areas not previously sampled by F.H.I.S. Population estimates have been calculated and added to the data file.

7. REPORT STATUS

A report of boat shocking results has been completed, with limited copies available through Region.

Tredger, C.D. 1984. Skeena boat shocking program--1983. Reconnaissance Report, Fish and Wildlife Branch, Victoria, B.C.

8. FURTHER WORK TO BE DONE

Further steelhead smolt modelling will be conducted in 1984/85, with an expanded focus to cover steelhead throughout B.C. This program will be a F.H.I.S. priority. Data collected in 83/84 will provide important reference points.

In addition, analysis of Bulkley/Morice and Kispiox River steelhead dynamics will be enhanced by these new data. These projects will be undertaken when time permits.

9. EVALUATION OF WORK DONE

N/A

10. PHOTOGRAPHIC REFERENCE

Available in Fish Habitat Improvement Section slide files.

11. OTHER PERTINENT INFORMATION

Other aspects of the overall Skeena steelhead program were conducted by Region 6 (M. Whately, M. Lough, B. Chudyk--847-4411) and by Fisheries Research (U.B.C.; A. Tautz, A. Facchin--228-1158).

12. CONTACT PERSON

C.D. Tredger, Fisheries Biologist (SEP)
Fish Habitat Improvement Section
B.C. Fish and Wildlife Branch
Ministry of Environment
780 Blanshard Street
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Phone: 387-1961

SEP 1983 Annual Report:
Provincial Research and Development
May, 1984

1. Headwater Stocking

Hatchery-produced steelhead smolts are used to augment wild steelhead populations. However, because of the high cost of hatchery production and the various effects that hatchery fish may have on wild populations, alternate ways to enhance wild populations are being examined.

Utilizing rearing areas above obstructions is one potential method of enhancing wild steelhead stocks. The objectives of this research project were to assess the biological and economical feasibility of stocking steelhead fry in headwater areas.

In 1983 the final data collection on the Englishman River was conducted. The experiments on the Englishman River were designed to investigate the growth and survival of fry from stocking at different times and sizes. A smolt trap was operated on the Englishman in the spring of 1983 and afterwards a census was carried out in the stocking areas.

Data analysis is virtually completed and the final reports should be published in 1984. Final interpretation of the analysis has not be done yet but some results are apparent. Best survivals were achieved by release of large fry (4 to 6 g) in early October, after low summer flows but before winter floods and cold water temperatures. Increased stocking density also adversely affected fry survival but there appeared little effect at densities below 0.5 fry/m^2. The best utilization of habitat and the best survivals were achieved by scattering fry over the release section at the desired density. If due to staffing constraints or access problems the fish must be released in groups at relatively few points, then their subsequent dispersal determines the rearing density. From our dispersal data on .7 to 2.0 g fish in moderate sized streams (8 m to 20 m wide at low summer flows) we suggest stocking enough fry every 500 m to achieve the desired equivalent density if the fry were evenly dispersed.

Contact Jeremy Hume, U.B.C.

2. Keogh River Steelhead Investigations

Several years of research and development work has been conducted at an experimental river on northern Vancouver Island to 1) develop a biophysical model for prediction of steelhead smolts and adults, 2) assess the harvestable surplus of winter steelhead in a typical coastal river, 3) evaluate the feasibility, constraints and cost effectiveness of several enhancement techniques including instream enhancement, net-pen rearing in lakes, fry stocking above barriers, and stream enrichment. Some of these have been reported in earlier annual reports.

a) Wild Steelhead Survival and Production

Age specific survival data have been summarized for the wild steelhead trout population. Egg to fry survival has averaged 7.4% over seven years and ranged from 2% to 12%; survival was negatively correlated with rainfall in the spring. Fry to smolt survival from 1976 to 1979 has averaged 13% and ranged from 5% to 19%. Smolt to adult (wild steelhead) survival over 3 years has ranged from 8% to 14% and averaged 12% (excluding repeat spawners). Survival of kelt steelhead from tidewater exit to return the following year has averaged 26% (range 8 to 44%) and have comprised on average 10% (range 4 to 26%) of the total run of steelhead.

A preliminary model was completed that predicts parr density, smolt yield and adult numbers utilizing physical and chemical measurement of rearing habitat. Further refinement is continuing because the existing model is not applicable to streams with high late summer flows.

Minimum fry recruitment densities at summer flows (30-day mean low; e.g. July to September) have also been identified for these types of oligotrophic (TDS < 50) rivers. A critical threshold of 0.2 fry/m^2 of total 'wetted' area at summer flow conditions (30-day mean low) is necessary to utilize most of the parr habitat, but an optimum target density to approach saturation was about twice this level owing to high variation in juvenile survival, particularly during high winter freshets. High annual variations in egg to smolt survival rates suggest there would be considerable uncertainty in describing stock recruitment relationships even after several additional years of data collection. Restrictive harvest regulations that only permit a small harvest of wild fish in March and April, and now in place for most winter steelhead fisheries on Vancouver Island, are good alternatives to ensure stocks approach their habitat capacity.

b) Residualism Studies: Management Implications

Residualism (or failure to migrate) of hatchery steelhead smolts is finally considered a serious problem by fishery managers owing to both impacts on wild juvenile production and on return rates of hatchery adults. Four years of examination at Keogh has demonstrated migration success of ca. 50 to 93%. Fish 60 to 70 g stocked low in the river (e.g. 1.5 km upstream) had the highest out-migration success (93%). Small smolts (< 41 g mean), large smolts (105 g) stocking low in the river performed poorly (about 70% migration) but better than 65 g smolts stocked high (11 km) in the river (approx 50% migration). Residuals sampled in the river were highly biased to males (3:1, and up to 6:1 for the largest group, i.e. 105 g). Further migration after a second year of rearing has been negligible. Additional studies conducted at Little Campbell River, where large steelhead smolts (120 g) were stocked 10 to 14 km upstream also confirm poor migration success (57%) and high residualism which was also biased to males.

With the exception of restorative stocking, smolts should be only stocked in the lower reaches of small rivers that are managed as "Augmented Rivers" for both wild and hatchery steelhead. Also, smolts should be stocked at a size of 60 to 80 g to minimize undersized and oversized fish (particularly males) that fail to migrate. Adherence by fishery managers to these two guidelines should greatly improve return rates of hatchery steelhead (see below) to the river and sport fishery, plus reduce impacts on wild steelhead production.

c) Survival of Cultured Winter Steelhead Smolts

Two years of returns to Keogh River are now available for "hatchery" steelhead cultured in net-pens at O'Connor Lake, then counted as smolts and adults through a counting fence near tidewater. Preliminary analyses indicate an average rate of return of 13% for wild steelhead including repeat spawners. By comparison, two broods of net-pen reared smolts (60 - 65 g mean weight) released 1.5 km from the ocean returned at 5.2% (small pilot group) and 7.2% (larger production group) including repeat spawners, or 50% greater than the SEP biostandard of 4% for conventional hatchery steelhead.

A preliminary comparison of steelhead smolts released near the river mouth, compared to a group released 11 km upstream, suggests a slightly higher return rate for 2-ocean fish for the lower river stocking site (3-ocean fish return in 1984/85). Further annual evaluations of returns from these groups including early and late run groups and ocean release groups are required.

Contact Pat Slaney or Bruce Ward, U.B.C.

3. Experimental Net-Pen Rearing of Steelhead in O'Connor Lake

Until recently, there have been few attempts to develop net-pen culture of salmonids in lakes, although there are several advantages including low capital costs and higher smolt-to-adult survival. Research and development investigations at O'Connor Lake in the Keogh River watershed were designed to:

- determine if fish could be reared consistently to an average weight of 60 to 70 g at release
- resolve operational constraints including high temperature, ice formation, and predation
- determine effects of rearing density on fry to smolt growth, quality and adult return rates
- examine effects of feeder designs and frequency on growth and quality of smolts
- contribute to the assessment of survival of various smolt groups stocked at various locations
- contribute to steelhead production targets in Region 1.

During 1983, production of Keogh River and Quatse River winter steelhead smolts exceeded and met targets respectively. Tsitika River summer run steelhead, for stocking in Campbell River, were well below target owing to brood stock shortfalls:

Stock	Stocking Site	No. Smolts ('84 Stocking)	Comments
Keogh (WS)	Keogh River	37,500	early run, late run & early x late run
Quatse (WS)	Quatse River	12,000	early and late brood
Tsitika (SS)	Campbell River	5,500	designed to establish a summer run in Campbell River

Several subgroups were reared in 1983 to 1984 including early-run Keogh stock (17,600), late run Keogh stock (13,800) and early x late crosses (6100), the latter two groups primarily to compensate for the unexpected shortfall of Tsitika stock. Mean weights ranged from 67 to 88 g for all groups and stocks.

Several research experiments were conducted at the net-pen to compare feeding frequencies (0.5 hr vs 4 hr) and feeder type (demand vs conventional) in terms of growth and quality of smolts. The 0.5 hr interval produced better quality smolts and slightly better growth than the 4 hr interval. Demand feeders (4 per pen), started in September, performed better for growth but quality (fin erosion, scale loss) was not as good as the 0.5 hr conventional feeders. Approx 20,000 of the Keogh steelhead smolts were graded into "good quality" and poor quality groups that were similar in mean weight. Returns of these as adults will be compared to provide further insight into the effects of fin erosion-scale loss on post-release survival.

Total production of smolts in 1983/84 clearly demonstrated that a net-pen facility in an appropriate lake, similar to O'Connor, can be operated at a cost effective scale. In addition, returns of steelhead adults are 50% higher than conventional hatcheries.

Owing to the completion of research at the O'Connor facility, and the provincial government Restraint Program, further steelhead smolt production will cease at O'Connor Lake. Most of the facilities will be donated to the North Vancouver Island Salmonid Enhancement Society for coho rearing in 1984/85 and possibly further steelhead culture in 1985/86.

Contact Pat Slaney or Bill Harrower, U.B.C.

4. Stream Enrichment

Stream enrichment research has been conducted, provincially, since 1981. In 1981 it was demonstrated that growth of periphyton could be stimulated by additions of nitrate and phosphate, which stimulated the food chain, increasing growth of coho salmon and steelhead trout. After 2.5 months of enrichment both species reached the size that typically requires a complete year.

In 1982 research efforts were directed at use of trough experiments to examine at what levels phosphorus limitation occurs. No nitrate limitation occurred at background levels (80 to 180 ug/l), and phosphorus levels up to 10 ug/l stimulated periphyton growth substantially. Experiments were also conducted on release rates of Osmocote "slow release" fertilizer in preparation for a "whole-river" treatment planned for Keogh River for 1983.

In 1983, approx 70% of the Keogh River was treated with Osmocote fertilizer, applied by helicopter in three applications (2-month releases). However, stimulation of the periphyton-insect-salmonid food chain was marginal because release rates were twice as rapid as in laboratory tests and an unusual flood event in July scoured the substrate of colonized algae. Stimulation of the food chain and salmonid density and growth increments were not statistically detectable during summer.

Further Osmocote tests were repeated in 1983 in Keogh River water and within hatcheries troughs. However, owing to uncertainties in release rates in relation to flow, treatment of Keogh River in 1984 has incorporated one Osmocote section, one phosphorate only section using a dispenser and conventional fertilizer, and a longer nitrate plus phosphate treated section with 7 conventional fertilizer dispensers at 3 km intervals.

Contact Pat Slaney, U.B.C.

5. Chilliwack River Steelhead Production and Evaluations

During 1983 10,000 68 g steelhead smolts were reared at Salwein net-pens and released into the Chilliwack River. In addition 58,000 fingerlings (6 g) were reared at Abbotsford Research Hatchery from Chilliwack River egg collections. These fish were transported to the Federal Slesse Hatchery at the end of summer for smolt culture in the Slesse rearing channels. Twelve thousand grade down fingerlings were also stocked into barren sections of Slesse and Foley creeks.

Evaluations of coded wire nose tag recoveries in the 1983 Chilliwack River steelhead fishery were continued. Relative returns were compared for steelhead smolts raised in circular hatchery tubs and Salwein pond net-pens. The latter group was more evident in steelheader's catches.

Contact Bob Land, Abbotsford Research Hatchery

6. Sea-run Cutthroat Production and Evaluation

During 1983 and 1984 43000 and 9500 cutthroat smolts (60 g) respectively were reared at Abbotsford Research Hatchery and released into the Hope-Camp slough system. Further production of this stock will be carried by Abbotsford hatchery because research activities have been redirected to evaluations of fingerling and smolt stocking of cutthroat at Little Campbell River.

At Little Campbell River cooperative fence operations with the Semiahmoo Fish and Wildlife Club and the DFO Public Involvement Program have provided the opportunity to examine outmigration of success of stocked cutthroat and steelhead smolts and the survival to smolt stage of 5000 fingerlings planted in underutilized habitat upstream of the fence. Results have demonstrated serious residualism hatchery cutthroat smolts (40% migration).

Contact Bruce Ward, U.B.C.
or Bob Land, Abbotsford Research Hatchery

S.E.P. ENHANCEMENT OPERATIONS

1983

1. NAME OF PROJECT - Fraser Valley Trout Hatchery

2. LOCATION - Abbotsford

3. BACKGROUND

Fraser Valley Trout Hatchery is operated by the Provincial Ministry of the Environment and produces a variety of trout species, but mainly rainbow, cutthroat and steelhead. More than twenty different stocks are handled during a typical year. About one-half of the hatchery's production is for S.E.P. projects, while the other half consists of non-anadromous trout stocks for lake management programs.

In 1983, twelve stocks of steelhead and three stocks of anadromous cutthroat trout were incubated and reared at Fraser Valley Trout Hatchery. The majority of these fish were released as fry while the balance were retained for smolt production. Heated water can be used to accelerate growth during incubation and rearing to ensure suitable fish sizes are reached for both fry and smolts.

Audio visual presentations, technical displays and small aquaria attracted about 30,000 visitors to the public display area at the hatchery in 1983. Both guided and self-guided tours of the display area are available.

4. PROGRAM

Anadromous cutthroat and steelhead broodstocks required for fry and smolt stocking programs were collected in various ways. Electroshocking equipment has become the main method of collecting cutthroat from small Fraser River and Nickomekl River tributaries. Angling is the predominant method of capturing steelhead from large streams, although seining, trapping and electroshocking are all used in some instances. The Semiahmoo Fish and Game Club once gain provided steelhead broodstock from their trap on the Little Campbell River. The Coast Steelheaders played a major role in the capture of steelhead from the Squamish River. B.C. Corrections Branch 'residents' and staff provided assistance with seining the South Alouette River for steelhead. Kanaka Creek steelhead were obtained from the fence constructed by B.C. Corrections Branch and operated by S.E.P. Public Involvement Section. Green eggs from two northern steelhead stocks were flown from Smithers for incubation and rearing at F.V.T.H.

The number of anadromous fish produced in 1983 was up almost 40% over previous years, due mainly to the large number of northern steelhead reared. These northern fish were reared on elevated temperatures until late September at which time they were transported by truck back to the Smithers area. There they were scatter-released into the upper Zymoetz and Morice Rivers. Transport times exceeded 48 hours on this project with no ill effects to the fish.

Steelhead smolt production has remained fairly constant at the main hatchery over the past several years with about 60,000 being produced at the main facility. This year three different sized groups of steelhead smolts carrying different coded wire tags were released at the same time

into the Coquihalla River. It is hoped that returns from these releases will provide information about the ideal size of summer steelhead smolts at time of release.

Smolt production at the B.C. Correction Branch's Alouette River Correctional Centre was expanded with the construction of a large rearing pond. The number of smolts has increased to 30,000 this year from 5,000 last year. Contract smolt production by Bakerview Trout Farm in surrey came to an end this year after the release of smolts in May.

Anadromous cutthroat smolts produced at Fisheries and Ocean's Inch Creek Hatchery were once again used to stock Nicomen Slough, Stave River and Brunette River.

Don Peterson
Hatchery Supervisor
Fraser Valley Trout Hatchery
Fish and Wildlife Branch
34345 Vye Road
Abbotsford, B.C.
Telephone: 853-8394

TABLE A

Fraser River S.E.P. Facilities: Juvenile Releases, 1983

Species	Brood	Stock	Total Released	% Marked	% Survival[1]	Mean Size(g)
I. Smolts: Reared at Fraser Valley Trout Hatchery						
SH	82	Mud Bay	15,439	100 CWT	n/a[2]	100
SH	82	Marshall	5,680	100 CWT	n/a[2]	115
SH	82	Coquihalla	32,897[3]	100 CWT	n/a[2]	98
SH	82	Alouette	15,723	100 CWT	n/a[2]	108
Total steelhead smolts -			69,739			
ACT	82	Fraser	4,965	100 CWT	n/a[2]	125
Total anadromous cutthroat smolts -			4,965			
II. Fry: Reared at Fraser Valley Trout Hatchery						
SH	83	Marshall (H)	23,000	0	n/a[4]	3.8
SH	83	Marshall	3,900	0	n/a[4]	.7
SH	83	Whonnock	3,013	0	92	.3
SH	83	L. Campbell (H)	4,032	0	96	1.0
SH	83	L. Campbell	3,275	0	n/a[4]	1.0
SH	83	Murray (H)	6,880	0	82	1.0
SH	83	Murray	500	0	n/a[4]	.5
SH	83	Kanaka	14,345[5]	0	90	8.4
SH	83	Coquihalla	85,946	0	n/a[4]	1.4
SH	83	Coquihalla (H)	33,535	0	67	1.8
SH	83	Silverhope	32,384	0	52	2.8
SH	83	Zymoetz	140,278	0	90	1.1
SH	83	Morice	69,926	0	77	1.4
SH	83	Squamish	30,055	0	77	3.0
Total steelhead fry -			451,069			
ACT	83	Mud Bay (H)	20,420	0	84	1.4
ACT	83	Fraser (H)	1,100	0	30	.8
Total Anadromous cutthroat fry -			21,520			

[1] Survival from green egg to release.
[2] Survival figure not available as portion of brood year released in 1982.
[3] Three different sizes carried separate tag codes and released at same time.
[4] Survival figure not available as portion of brood still being reared for release in spring of 1984.
[5] Of these, 7,000 were transferred to Kanaka Hatchery for further rearing.

TABLE A. Fraser River S.E.P. Facilities: Juvenile Releases, 1983 (cont'd)

Species	Brood	Stock	Total Released	% Marked	% Survival[1]	Mean Size(g)
III.	Surrey Rearing Ponds (Contractor)					
ACT	82	Mud Bay	8,250[2]	100 LM	n/a[8]	130
ACT	82	Mud Bay	8,100[3]	100 LM	n/a[8]	118
ACT	82	Mud Bay	2,000[4]	100 LM-RM	n/a[8]	118
SH	82	L. Campbell	6,934[4]	100 CWT	n/a[8]	127
Total	-		25,284			
IV.	Inch Creek Hatchery (Fisheries & Oceans)					
ACT	82	Fraser	12,000[5]	100 RM	n/a[8]	68
ACT	82	Fraser	4,000[6]	100 RM	n/a[8]	48
ACT	82	Fraser	9,740[7]	100 RM	n/a[8]	42
Total	-		25,740			
V.	Alouette River Correctional Centre (B.C. Corrections Branch)					
SH	82	Alouette	5,937[9]	100 CWT	n/a[8]	67

1 Survival from green egg to release.
2 Released into Serpentine River.
3 Released into Nicomekl River.
4 Released into Little Campbell River.
5 Released into Nicomen Slough.
6 Released into Brunette River.
7 Released into Stave River.
8 Survival figure not available as a portion of this group was released as fry in 1982.
9 Released into S. Alouette River.

TABLE B

Status at December 31, 1983

Species	Brood	Stock	Stage	On Hand	Expected Release Date	Number	Site
I. Fraser Valley Trout Hatchery:							
SH	83	Mud Bay	Presmolt	16,000	May	16,000	Nicomekl R.
SH	83	L.Campbell	Presmolt	10,400	May	10,000	L.Campbell R.
SH	83	Coquihalla	Presmolt	31,500	May	31,000	Coquihalla R.
SH	83	Marshall	Presmolt	7,000	May	7,000	Marshall Cr.
ACT	83	Fraser	Presmolt	4,800	May	4,800	Marshall Cr.
ACT	83	Mud Bay	Presmolt	29,800	May	29,500	Nicomekl/ Serpentine
				99,500			
II. Inch Creek Hatchery:							
ACT	83	Fraser	Presmolt	30,000	May	30,000	Brunette R./ Nicomen Slough/ Stave R.
III. Alouette River Correctional Centre:							
SH	83	Alouette	Presmolt	30,900	May	30,500	Alouette R.

TABLE C

Escapement to S.E.P. Facilities, 1983

No escapement to any of the facilities. All stocks are outplanted to a variety of sites away from the rearing facilities.

TABLE D

Fraser River S.E.P. Facilities at Full Production

Rearing Site	Species	Year	Total Adults	Contribution to Fisheries
Fraser Valley Hatchery	SH	1983	7,500	3,750
Fraser Valley Hatchery	ACT	1983	1,640	820
Inch Creek Hatchery	ACT	1983	1,500	750
Alouette River Correctional Centre	SH	1983	1,000	500

S.E.P. ENHANCEMENT OPERATIONS

1983

1. NAME OF PROJECT - Vancouver Island Hatchery and Offsite Rearing

2. LOCATION - Duncan

3. BACKGROUND

Vancouver Island Hatchery is a new facility operated by the Fish and Wildlife Branch, Provincial Ministry of Environment, producing both steelhead and anadromous cutthroat. The hatchery is entirely funded by the Salmonid Enhancement Program and was built in 1982 as an adult holding, egg incubation and fry rearing facility to supply both anadromous fry and smolts for several streams throughout Vancouver Island. The fry are reared at Vancouver Island Hatchery while all smolt production is carried out at three offsite netpen rearing locations. The first full year of production for this hatchery was 1983, although smolt production has been ongoing at the offsite rearing locations since 1979.

Hatchery construction was carried out in 1982 with some minor revisions completed during 1983. The facility consists of:

1) a well supplying a water flow of approximately 4,500 litres per minute from three pumps;
2) an adult broodstock holding area consisting of:
   a) fourteen isolation boxes each having eight covered compartments for isolating adult fish. These boxes allow for easy access to fish as

well as an environment where the possibility of disease transfer between fish is kept to a minimum;

b) six wooden group holding tanks, each of 5,000 litre capacity and lined with smooth plastic swimming pool liners for the purpose of holding larger groups of steelhead or cutthroat adults for extended periods.

3) a 40 x 10 metre prefabricated "Quonset Hut" style portable fabric building with twenty-four 3,000 litre flat-bottomed aluminum troughs. These troughs were used for both egg incubation and fry rearing.

4. PROGRAM

Adult cutthroat were collected by four methods: angling, trapping, seining and elecro-shocking, depending on the stream conditions. Adult steelhead were collected primarily by angling although seining was used in a couple of instances in 1983. Oyster River cutthroat and steelhead adults were held and spawned at Black Creek Ponds and the eggs shipped to Vancouver Island Hatchery for incubation, while the Sandhill captive broodstock were held at North Saanich Ponds and the eggs also shipped to the hatchery. All other adults were held and spawned at Vancouver Island Hatchery.

A program of routinely injecting incoming adult fish with antibiotics was carried out during 1983 to assist in preventing adult holding losses due to furunculosis. This proved quite successful and will be continued in future years.

Eggs were incubated in wire baskets in troughs where the resulting fry were reared until release time. Fry were outplanted to twelve stream systems on Vancouver Island while the presmolts were transferred to the

offsite locations until smolting time. At release time, fry were either scatter-planted by hand or point-released from a new helicopter release mechanism designed and build in 1983. This device proved very successful in terms of load carried, versatility and worker safety.

Tsitika River steelhead fry were also reared at Vancouver Island Hatchery until early summer and transferred to netpens in O'Connor Lake near Port McNeill for summer steelhead smolt production. These smolts were once again to be released into Campbell River as part of the program to introduce a summer-run steelhead fishery to that river.

A total of 43,000 Englishman River steelhead eyed eggs were shipped from Vancouver Island Hatchery to Big Qualicum Hatchery for smolt production at that facility.

All anadromous cutthroat and steelhead smolt production was carried out at three separate netpen rearing locations. Some fry reared at Vancouver Island Hatchery were transferred to these locations in late summer where fish were fed by automatic feeders until smolting the following spring. They were then outplanted from these netpens to their respective streams.

In 1983, 45,701 steelhead smolts were released into the lower Cowichan River from the Cowichan Netpens. All fish were finclipped and nose-tagged. A total of 29,157 finclipped anadromous cutthroat smolts were also reared and released into four streams from two separate offsite rearing locations.

Growth was generally good at all offsite locations. In the previous two years, juvenile mortalities were high at the Cowichan Netpens but this problem has been rectified by holding the fry on cooler well water until the lake water temperatures have decreased in the fall.

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TABLE A

East Coast Vancouver Island S.E.P. Facilities: Juvenile Releases, 1983

Species	Brood	Stock	Total Released	% Marked	% Survival[1]	Mean Size(g)
I. Fry: Reared at Vancouver Island Hatchery						
ACT	83	Fulford	5,186	100	54	14.7
ACT	83	Sandhill	12,680[2] [3]	100	58	17.5
ACT	83	Sandhill	14,875[2] [4]	7	58	1.1
ACT	83	Oyster H.	15,325[5]	0	n/a[11]	2.0
Total anadromous cutthroat fry -			48,066			
SH	83	Tsitika	6,786[6]	0	n/a[11]	1.4
SH	83	Cowichan	3,078	0	n/a[11]	2.9
SH	83	San Juan	2,824	0	75	8.2
SH	83	San Juan	54,758[7]	0	75	1.4
SH	83	Oyster	23,849	0	40	0.7
SH	83	Gold	47,120[8]	0	77	0.8
SH	83	Heber	30,981[9]	0	64	2.7
SH	83	Salmon	52,576	0	90	0.8
Total steelhead fry -			221,972			
II. Smolts: Reared at Offsite Rearing Facilities						
SH	82	Cowichan	45,701	100	n/a	57.5
SH	82	Tsitika	14,706[10]	100	n/a	65.4
Total steelhead smolts -			60,407			
ACT	82	Colquitz	13,748	100	n/a[12]	63.8
ACT	82	Sandhill	2,724	100	55	83.3
ACT	82	DeMamiel	3,161	100	59	94.4
ACT	82	Oyster	9,524	100	n/a[12]	71.9
Total anadromous cutthroat smolts -			29,157			

[1] Survival from green egg to release.
[2] Progeny of captive broodstock from Sandhill Creek.
[3] Released into Colquitz River.
[4] 7,175 to Prior Lake, 2,472 to Noble Creek, 5,228 to Royal Roads Ponds.
[5] 4,325 to Little Oyster River, 11,000 to Woodhus Creek.
[6] Transferred to O'Connor netpens for further rearing.
[7] 21,102 to San Juan River, 17,880 to Fleet River, 18,600 to Lens Creek.
[8] Released into Ucona River.
[9] 15,000 to Heber River, 15,981 to Upana River.
[10] Reared at O'Connor netpens. Released into Campbell River.
[11] Figure not available as portion of brood year still being reared for release in spring of 1984.
[12] Figure not available as portion of brood year was released in 1982.

TABLE B

Status at December 31, 1983

Species	Brood	Stock	Stage	On Hand	Expected Release Date	Number	Site
Offsite Rearing Facilities:							
ACT	83	Oyster[1]	Presmolt	11,358	May	11,300	L.Oyster R.
ACT	83	Nanaimo[2]	Presmolt	10,528	May	10,500	Nanaimo R.
ACT	83	Colquitz[2]	Presmolt	25,983	April	25,800	Colquitz R.
SH	83	Cowichan[3]	Presmolt	52,761	May	50,000	Cowichan R.
				100,630			

[1] Reared at Black Creek Ponds.
[2] Reared at North Saanich Ponds.
[3] Reared at Cowichan Netpens.

TABLE C

Escapement to S.E.P. Facilities, 1983

No escapement to any of the facilities. All stocks are outplanted to a variety of sites away from the rearing facilities.

TABLE D

Adult Production
Vancouver Island Hatchery and Offsite Rearing Facilities

Species	Expected Production from 1983 Releases		At Full Production		
	Total Adult Production	Years of Return	Total Adult Production	Year	Contribution to Fisheries
ACT fry	500	1985-1987	500	1983	250
ACT smolts	2,400	1984-1986	3,700	1984	1,850
	2,900		4,200		2,100
SH fry	1,360	1986-1988	1,400	1984	700
SH smolts	1,840	1985-1987	4,000	1985	2,000
	3,200		5,400		2,700

S.E.P. ENHANCEMENT OPERATIONS

1983

1. NAME OF PROJECT - Loon Creek Hatchery

2. LOCATION - Cache Creek

3. BACKGROUND

Loon Creek Hatchery is operated by the Province of British Columbia, Ministry of Environment, and is involved in S.E.P. for the purpose of raising 150,000 chinook salmon fry and 40,000 steelhead smolts for the enhancement of the Bonaparte River.

4. PROGRAM

Adult steelhead were to be captured from the Bonaparte River using a broomstick fence. No fish were captured as high water conditions made it impossible to keep the fence operational. Adult donor stock (16 females and 8 males) from the Deadman River were substituted to attain the 40,000 smolt target with these fish being captured by regional personnel and held in isolation boxes at Loon Creek Hatchery. A loss of one adult was experienced during holding. About 160,000 eggs were collected with 65,000 being transfered to Fraser Valley Hatchery for incubation and initial fry rearing. These fish were returned to Loon Creek in October for over winter rearing and will be released as smolts into the Bonaparte

River in 1984. All fish will be identified by coded wire nose tags. In addition, 67,930 unmarked steelhead fry were released into the Bonaparte River in July of 1983.

Adult steelhead donor stock (10 females and 3 males) were captured from the Nicola River by regional personnel and held in isolation boxes at Loon Creek Hatchery. About 92,520 eggs were collected in May and the resulting 81,630 fry were released as unfed fry into the Maka, Spius, and Lower Prospect Creeks in the Nicola River system.

All adult steelhead are air spawned with most adults being released back to their natal river after spawning.

Chinook donor stock were angled at the obstruction in the Bonaparte River, with 21 females and 12 males being captured and held in earth ponds and isolation boxes at Loon Creek Hatchery. A loss of 4 adults was experienced during holding. About 50,300 eggs were taken, well short of the 150,000 fry target. All fry (2-4 g) will be identified by coded wire nose tags and released into the Bonaparte River in April 1984.

Chinook donor stock were captured from the Deadman River by region personnel and transported to Loon Creek Hatchery and held in earth ponds and isolation boxes. A loss of 4 adults was experienced during holding. About 45,147 eggs were taken and all fry will be identified by coded wire nose tags and released into the Deadman River in April 1984.

This hatchery will continue to be a major component in the provincial freshwater fisheries program, receiving and distributing some 2.5 million trout annually.

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TABLE A

Loon Creek Hatchery: Juvenile Releases, 1983

Species	Brood	Stock	Total Released	% Marked	% Survival	Mean Size(g)
SH	83	Nicola	81,630	0	88.0	0.36
SH	82	Deadman	51,409	100	64.0	57.0
SH	83	Deadman	67,930	0	72.0	.28
Chinook	82	Bonaparte	34,400	84	82.0	3.9

TABLE B

Status at December 31, 1983

Species	Brood	Stock	Stage	On Hand	Expected Release		
					Date	Number	Site
SH	83	Deadman	Presmolt	51,989	April	51,700	Bonaparte R.
ACT	83	Deadman	Alevin	39,075	April	38,000	Deadman R.
ACT	83	Bonaparte	Alevin	38,975	April	38,000	Bonaparte R.
				130,039			

TABLE C

Escapement of S.E.P. Facilities, 1983

No escapement to the facility as an obstruction in the Bonaparte R. stops the return of the adults.

TABLE D

Expected Production from 1983 Releases

Species	Year	Total Adults	Contribution to Fisheries
SH	1983	2,738	1,369
Chinook:			
Deadman	1983	2,090	1,672
Bonaparte	1983	2,090	1,672

SALMONID ENHANCEMENT PROGRAM

PROVINCIAL RESEARCH--DISEASE DIAGNOSTICS, 1983

Disease Background for Enhanced Populations

Steelhead and cutthroat trout enhancement often requires the transportation of adults and/or eggs from one water system to another. The health status of the wild adults from the various river systems must be determined in order to reduce the risks of transferring and disseminating disease agents and jeopardizing the health of progeny. In cases where hatcheries are involved with rearing the progeny, the importation of a disease agent into the hatchery water supply could result in disastrous losses. To provide a disease history on steelhead and/or cutthroat native to various rivers, spawned adults from eastern Vancouver Island, Lower Mainland, Cariboo and Skeena are examined for diseases.

A reduction of staff in the Fish Health Section, which works out of the Pacific Biological Station, required extensive priorization of the workload. Priority was given to those stocks having a history of disease and which were moved between river systems or were to be cultured in a hatchery recycle system. In 1983, 350 adult steelhead, cutthroat and chinook were examined from 32 river systems. The bacterium causing furunculosis was found in eight different stocks and was therefore the most prevalent disease organism.

Ceratomyxa shasta, a myxosporidian parasite, was again found in 4% of the cutthroat examined from the lower Fraser River and five of nine chinook salmon from the Bonaparte and Deadman rivers.

Disease Prevention and Treatment in Cultured Stocks

Steelhead and cutthroat juveniles are being reared at various sites, including net pens in lakes, satellite hatcheries and earthen fish ponds as well as large hatchery facilities. The diversity of physical and chemical water conditions represented by these rearing sites presents opportunities for disease outbreaks or stressful conditions to the health of the animals.

In October, losses in Colquitz cutthroat fingerlings held in earthen ponds in Saanich began to increase. Examination of fish revealed no disease agents but sectioning of the gills by Pacific Biological Station histologists revealed major damage to gill tissue. At the time of increasing fish mortality the pond water was murky with extensive algae present and chemical analysis revealed high ammonia levels as the probable cause of the fish health problem.

Approximately 1.5 months after capture, Oyster River cutthroat adults exhibited flashing and minor external hemorrhaging (petechiation) at the Vancouver Island Hatchery (Duncan). Salmincola sp, an external copepod parasite, which was picked up in the wild was multiplying rapidly in the warm (14 C) hatchery water and causing the fish some discomfort. Treatments with formalin killed the immature forms of parasite but adult forms had to be manually removed with forceps.

Parasites also presented a problem at the Fraser Valley Hatchery. Examination of fish in outside ponds in late September indicated almost all ponds had fish harbouring the protozoan parasite Costia in varying degrees. As well, one pond had fish severely infected with Gyrodactylus. Successful treatment was achieved using formalin (67 ppm) for 4.5 hours in the circular ponds containing parasitized fish.

Since furunculosis has been implicated as our most important cause of prespawning mortalities in steelhead, some stocks with a disease history are injected with oxytetracycline when the adults are brought into the hatchery. Usually only one injection is required but a second treatment may be needed if the fish are to be held many months before spawning. Most steelhead held at the Vancouver Island Hatchery and Loon Creek Hatchery received this treatment as did the Somass River stock held at Robertson Creek Hatchery and the Squamish stock at Fraser Valley Hatchery. Results of this type of treatment will be assessed in 1984.

About 124,000 cutthroat juveniles were vaccinated against vibriosis prior to release, using a commercially prepared vaccine.

In 1984 we will continue to monitor the disease agents in parent stocks of cutthroat and steelhead, as well as in juveniles, in an effort to have an accurate disease history for enhancement programs. Ideally, we want to avoid introduction of new diseases into fish culture facilities and natural streams which have no record of such diseases.

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