TENDERFOOT CREEK HATCHERY

Technical Field Report

By

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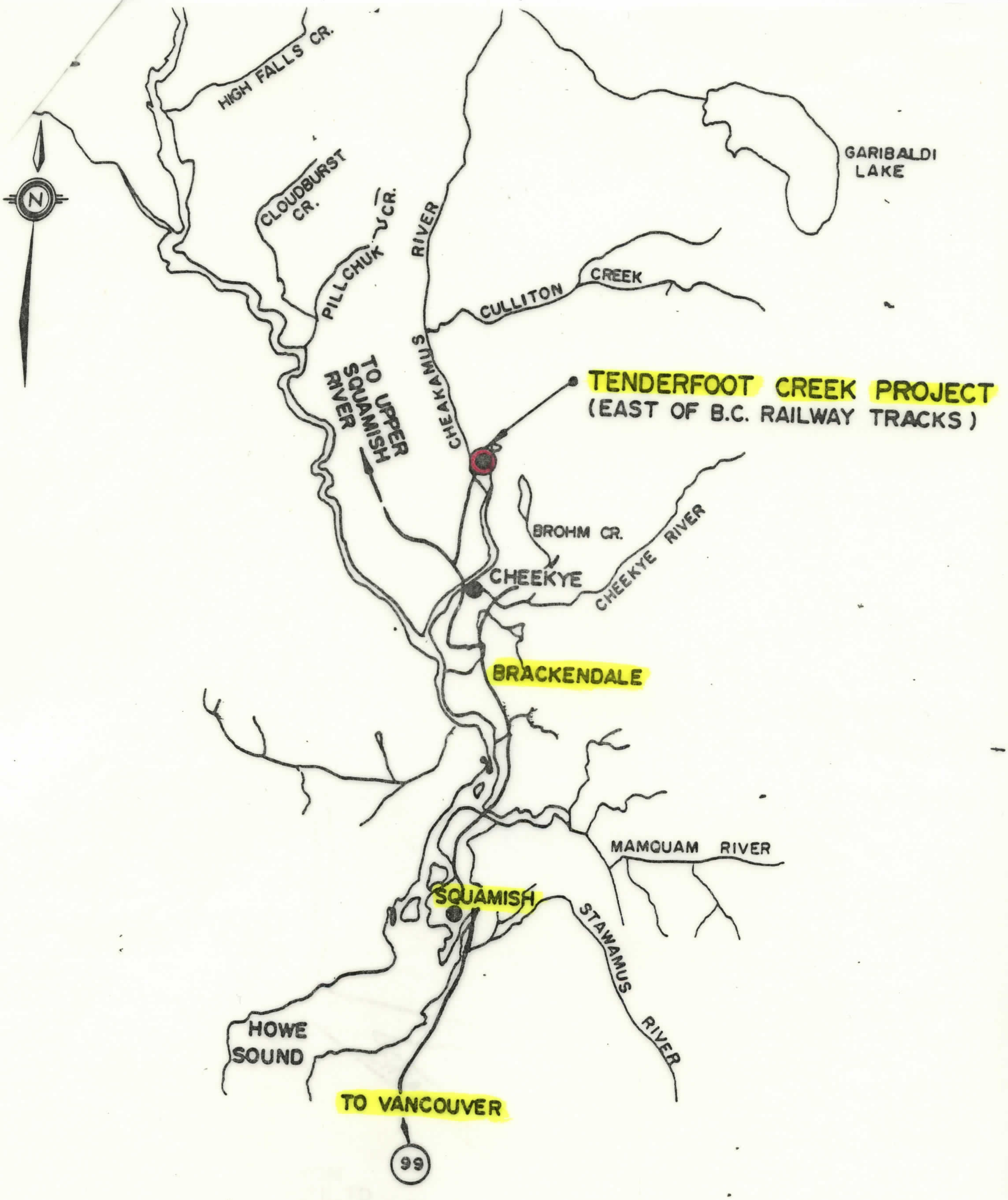
Distributed to Len Dunsford & Bob Dooley in partial fulfillment of the requirements of W.R. 280 - Field Practicum

SUMMARY

Tenderfoot Creek Hatchery, located in Brackendale, B.C., has 16 cap troughs, 8 concrete raceways, and 2 concrete rearing channels for producing healthy chinook, coho, and steelhead stock. The hatchery is considered a Federal facility and is funded primarily through the Salmon Enhancement Program. The hatchery's carrying capacity is about 2 million fish per year. The fish culturists working at the hatchery are responsible for ensuring that all aspects of the hatchery process are carried out in an efficient manner. Fish culturist duties at the hatchery includes: acquiring brood stock, extracting eggs from brood stock, incubation, rearing, tagging and marking, transporting and releasing, collecting mortalities, feeding, and sampling of the hatchery fish stock.



LOCATION MAP

0 4 8
APPROXIMATE SCALE (MI.)

0 6.43 12.87
APPROXIMATE SCALE (km)

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INTRODUCTION

Tenderfoot Creek Hatchery has been in existence since 1981. The hatchery was originally constructed as an SEP (or REB) pilot project to help rehabilitate chinook and coho stocks in the Squamish and Cheakamus River systems. Today, the hatchery would be deemed a successful operation due to the increased number of chinook fry produced over the past seven years (chinook stocks increased from 100,000 eggs in 1981 to 1.4 million eggs in 1987).

Tenderfoot Creek Hatchery is classified as a Federal establishment and is 95% funded through the Salmon Enhancement Program. The remaining 5% of the hatchery funds originates from the provincial level through the Fish and Wildlife. Fish and Wildlife funds are indirectly supplied to the hatchery in support of steelhead trout production. Tenderfoot Creek Hatchery's main objective is to increase the depleted chinook salmon stocks in the lower Georgia Strait. The chinook species have suffered noticeable population declines in the past five years due to its popularity with the sports fisherman.

1.0 DESCRIPTION OF STUDY AREA

Tenderfoot Creek Hatchery is located 18 km. north of Squamish, B.C. near Cheekye at the intersection of Paradise Valley Road and the B.C. Rail tracks. Access to the hatchery is by paved and gravel road off Hwy. # 99 at the Alice Lake junction via Cheekye and Cheakamus River Valley.

Tenderfoot Creek Hatchery monitors two spawning channel operations at Gates Creek and Seton Creek. Seton Creek spawning channel began producing pink salmon stocks in 1961. Seton Creek is one of the largest spawning channel operations in B.C.(Seton Creek is considered in the top five with Little Qualicum, Big Qualicum, Fulton and Babine Lake spawning channels). "The spawning channel at Gates Creek was constructed in 1967-68 to improve the production of sockeye in Gates Creek and Anderson and Seton Lakes" (Cooper 1977). Tenderfoot also works closely with Birkenhead Hatchery which is located on the Birkenhead River. Birkenhead Hatchery was constructed in 1977 as a pilot project for producing and enhancing chinook stocks in the upper Fraser River system. All three of these facilities report to Tenderfoot and are as equally committed to helping restore salmon populations in U.S. and Canadian convention waters.

The rearing facilities that are utilized by the hatchery include: 1 incubation room, 16 aluminum cap troughs for rearing chinook, coho and steelhead fry, 2 rearing channels, 8 concrete raceways, and 2 concrete rearing channels. The concrete raceways were constructed in 1987 as part of a expansion program to increase the hatchery's fish carrying capacity (Figure 1). The present carrying capacity of the hatchery is about 1.4 million chinook eggs, 300,000 coho eggs, and 100,000 steelhead eggs.

The most active season for the hatchery personnel is July to the end of September when the chinook run is on. April and May are also busy due to the tagging and releasing of chinook and steelhead fry as well as coho smolts. The water source for the hatchery originates from under ground aquifers and is supplied to the hatchery via a three pump water system.

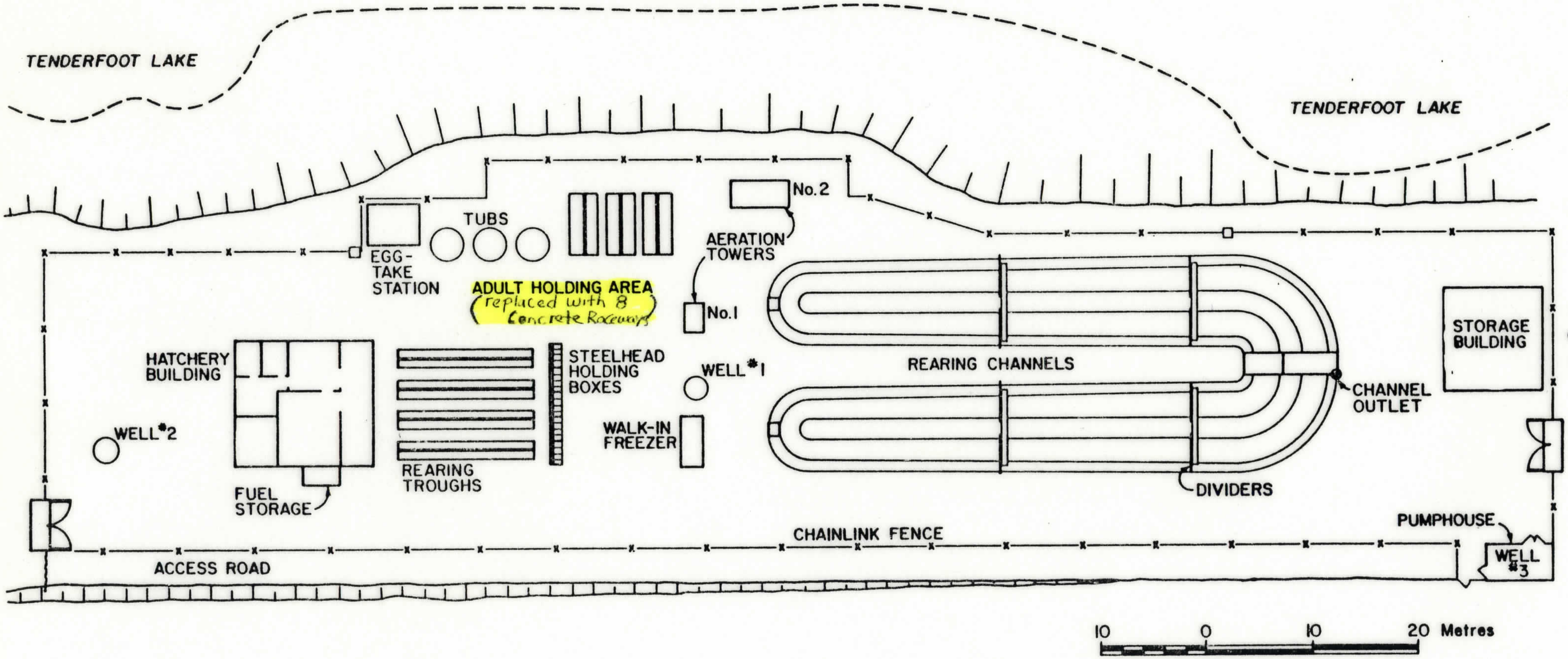


Figure 1 Tenderfoot Creek Facility Site Layout

1.1 Rearing Facilities Description

Tenderfoot Creek Hatchery utilizes 8 concrete raceways, 2 concrete rearing channels and 16 cap troughs for rearing healthy chinnok, coho, and steelhead stock. Each raceway is 15m x 2.5m x 1.8 deep with a maximum water capacity of 67,500 litres. The raceways are capable of supporting up to 200,000 fish/ raceway. Each rearing channel is 52.5m x 9.1m x 1.4m deep capable of handling a maximum water capacity of 668,850 litres. The rearing channels are also capable of supporting up to 150,000 fish/channel. Each cap trough is 6.4m x 0.8m x 0.6m capable of handling a water capacity of 307.2 litres. The cap troughs can support up to 35,000 coho, 50,000 chinook and steelhead fry.

Table # 1 is a breakdown of the total amount of water required by the hatchery's rearing facilities.

TABLE #1

	TT H20 Capacity (L)		# of units	Total
C.R.	67,500	x	8	540,000
C.C.	668,850	x	2	1,337,700
C.T	307.2	x	16	4,915.2

C.R. = Concrete Raceways

C.C. = Concrete Channels

C.T. = Cap Troughs

The hatchery water system is pumped to the aeration towers using a three well system. Well # 1 and #2 are equipped with submersible electric pumps capable of pumping out 2,890 LPM each. Well # 3 is equipped with an electric turbine pump which is capable of pumping 7,570 LPM; therefore, the total developed water capacity of the three Well system is 13,300 LPM.

The following table #2 indicates the flow rate into the hatchery's holding and rearing facilities relative to the three pumps water output.

TABLE #2

	Flow Rate (LPM)	#of units	total
C.R.	1000	8	8,000
C.C.	1500	2	3,000
C.T.	230	16	1,840
I.R.	275	1	275
I.B.	4	40	160
		Total output(LPM)	13,275

I.R.= Incubation Room

I.B.= Isolation Boxes

From Table 1 and 2 it is apparent that the hatchery's water supply system is operating at its total developed capacity.

1.2 Support Structures

Tenderfoot Creek Hatchery has 2 concrete aeration towers on the site. The smaller of the two towers supports water flow from Well #1 and #2. Thw water is entering the tower at about 5700 LPM. The second tower on the site has a larger water holding capacity to accomadate flow from Well #3. The water is entering this aeration tower at about 7600

LPM. "Both towers are equipped with plastic cylinders (bio-rings) designed to expose the maximum water surface area to the atmosphere" (MacKinlay 1985).

The tumbling effect of the water passing over the plastic cylinders helps decrease the nitrogen level in the water. Well water supplied to the hatchery must aerated because the water is supersaturated with dissolved nitrogen. It is recommended to maintain nitrogen levels under 100% and any levels of supersaturation over 105% must be rectified immediately. Recent nitrogen tests were conducted on the water at the hatchery. "The results of the tests indicated 101.3% dissolved nitrogen in the hatchery water which is within acceptable levels for culturing fish" (Celli 1988).

The food for the fish is stored in a walk-in cooler. The cooler is capable of holding up to 4000 kg OMP and Biodiet. The freezer unit is equipped with a small, adjacent room for storing daily rations and weighing out feed proportions for the following day.

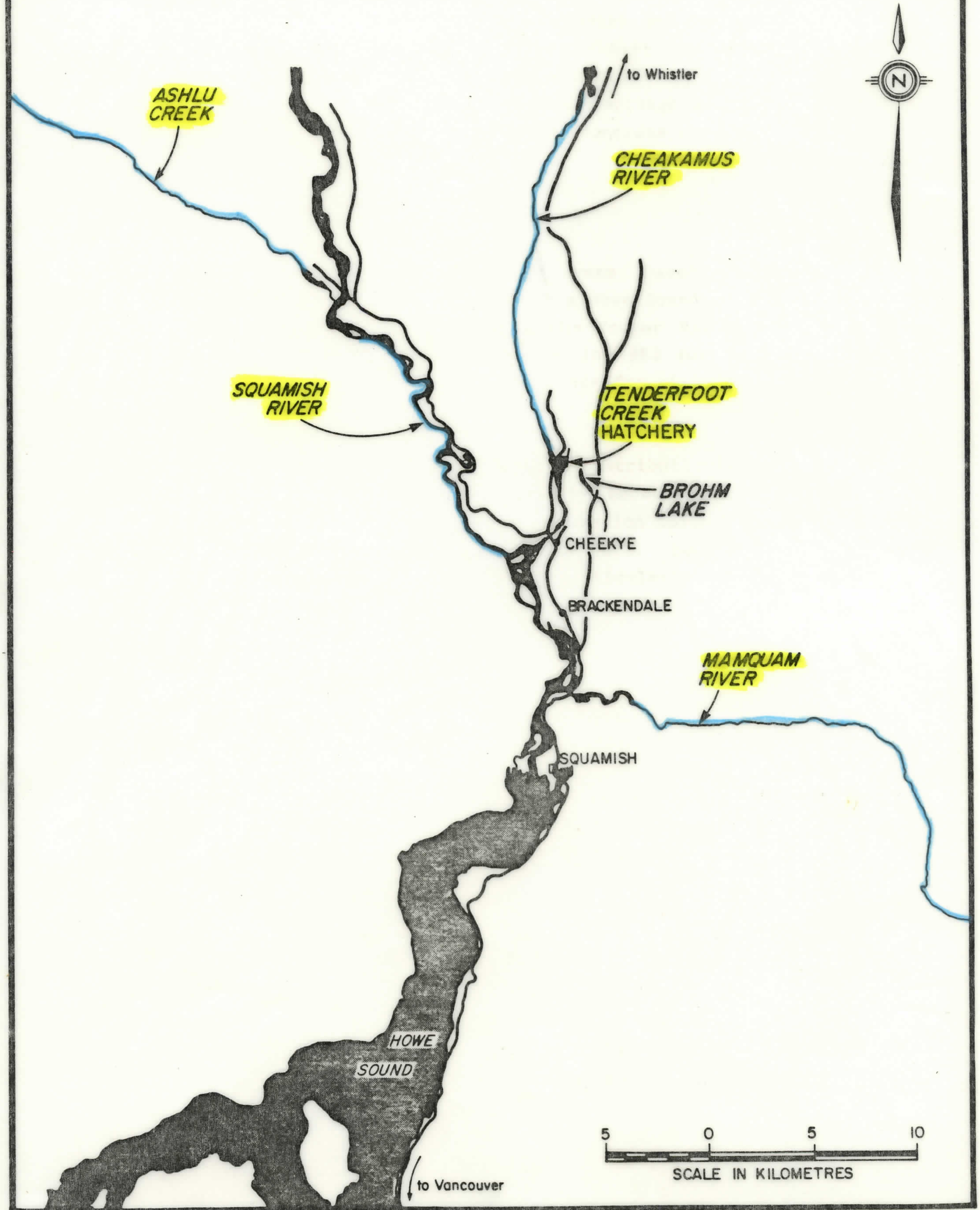
2.0 THE HATCHERY PROCESS

Tenderfoot Hatchery is now a more efficient fish rearing facility following the 1987 expansion of their rearing facilities. The expansion program increased the hatchery's carrying capacity and created more holding space for adult spawners. In the future, a fourth well may be installed to supply enough water to the hatchery that well #1 and #2 will become obsolete. The hatchery expansion program will result in a marked increase in production capabilities of the Tenderfoot facility.

2.1 Acquisition of Brood Stock

Tenderfoot relies heavily on the Squamish, Cheakamus, Ashlu and Mamquam River systems to obtain chinook, coho and steelhead brood stock donors (Figure 2). The hatchery has always experienced problems in obtaining chinook brood stock due to the low escapement numbers in recent years. "Low escapement numbers can be attributed to the unforgiving obstacles (both natural and man-made) and extensive river systems that the fish must overcome" (Johnson 1988).

Figure 2 Donor Stream Locations for the Tenderfoot Creek Project



The most successful method of obtaining the brood stock for the hatchery has been drift gill netting. This method is preffered over the use of stationary test netting mainly because stationary sets are susceptible to damage by suspended debris in our river systems. For example, the Fraser River system would not lend itself to a stationary set due to excessive debris loads often seen in this river system.

Other methods used by the hatchery to acquire brood stock are angling (highly successful for steelhead trout), beach seining, stationary traps, and occasionally a monsoon bucket attached to a helicopter. Electrofishing has proven insufficient in aquiring brood stock because of the large surface area of the river systems where the hatchery obtains its brood stock from. Once the brood stock has been obtained from the river system then the fish will be transported back to the hatchery where they will be held in concrete raceways until they reach sexual maturity. The brood stock is transported back to the hatchery immediately after capture to reduce handling stress on the fish.

2.2 Egg takes from Brood Stock

Tenderfoot Creek hatchery has always experienced problems acquiring brood stock, especially chinook salmon. For this reason, the hatchery will collect adults whenever feasible and they are easily accessible. Currently there are 8 concrete raceways and 40 isolation boxes available for holding adult salmon and steelhead at the Tenderfoot facility. Once the fish have been acquired, the male and female salmon are separated into 8 concrete raceways. The females that appear ripe are separated from the other females that have not yet reached sexual maturity. The male and female salmon are separated by species for convenience and to avoid confusion during the artificial spawning process.

The artificial process begins immediately after the hatchery fish culturist has assessed the brood stock as being ripe. All ripe female salmon will be killed humanely and their belly will be cut open to allow for easy extraction of the eggs. The eggs will be placed in sterilized containers so that the chance of infection by external or internal diseases is reduced. "The milt is squeezed from the male salmon and the eggs and milt are mixed together for fertilization purposes" (childerhose 1980).

Scale samples (10 per fish) are removed from the from the brood stock which was previously tagged. The scale samples are acquired so that the fish can be aged and to find out how long the fish has spent in salt water and freshwater environments. Furthermore, the fish's head will be removed so that the nose wire tag can be removed for inspection. The scale samples are sent to the Fisheries and Oceans head office in Vancouver, B.C. to be analyzed. In addition, the head samples collected are sent to the head lab in Vancouver where the nose wire will be extracted and analyzed. After the eggs and milt have been mixed together then they will be transferred into incubator heath trays

2.3 Incubation

Tenderfoot Creek Hatchery uses a vertical flow incubator system for developing the egg stock. The fertilized eggs are transferred directly from the plastic containers into the vertical flow incubator. The vertical flow incubator system is a successful method of producing young fry because the water temperature and water flow can be regulated whenever necessary. The eggs are washed prior to entering the tray because excess sperm matter may provide a medium for fungus growth.

In addition, the eggs will be sterilized for 10 minutes in a chemical called ovidine. Ovidine is a surface disinfectent designed to kill any fungus that may be attached to the eggs. "It must be remembered that ovidine is strictly a surface disinfectent and will not effect viral diseases occuring inside the egg" (Johnson). The eggs will be closely monitored during their time in the incubation trays. Shocking and egg picking is usually done at the eyed egg stage of the fish's life cycle. The eggs are shocked to help eliminate any weak eggs that may die in the near future. Egg picking is carried out to remove the dead eggs from the tray because fungus will develop on the dead eggs and may effect the entire tray. Fungus can move through a tray of eggs very easily due to the eggs being in contact with each other.

The eggs will remain in the incubation trays until they develop into swim-up fry. Furthermore, the fish will not be removed from the heath trays until they have absorbed their yolk sac and are ready for ponding. During the alevin stage of life, the fish will rely entirely on its yolk sac for a source of food. Coho and steelhead are intially ponded in the cap troughs compared to chinook which is ponded directly into the raceways. The cap troughs are used for initial rearing so that the fry will develop good initial feeding habits.

The eggs are constantly kept moist by clean, temperature- regulated water (a constant 7 degrees Celcius) which percolates through the incubator trays. A constant water flow through the trays provides a continual supply of oxygen to the developing eggs. "The number of eggs put into any incubator tray varies according to the egg size, conditions, and facilities available" (Thompson 1988).

The incubation room at Tenderfoot Creek Hatchery is completely utilized year-round due to the variation in spawning timing between chinook, coho, and steelhead. For example, chinook eggs will be incubated in the July to October period compared to coho eggs which are incubated between November and March. Accumulated Thermal Units (ATU's) for rearing coho is 720, chinook 920, and steelhead 600. An ATU is an average temperature of the hatchery water measured over a 24 hour period. The water supplied to the hatchery remains a constant 7 thermal units/day.

2.4 Rearing

The fry are transferred from the incubation room into either the aluminum cap troughs or concrete raceways. The chinook fry are generally transferred into the concrete raceways at 0.4 grams. However, coho and steelhead stock are released into the troughs at 0.4 grams and 0.25 grams respectively. Final rearing of the stock takes place in the concrete channels and raceways. The 2 rearing channels are divided into 3 sections per channel so that the fish can be separated according to the river system that their parental brood stock was obtained from. The same process is carried out on the raceways and troughs to further define where the stock originated from and where they will be returned to.

2.5 Tagging and Marking

Tenderfoot Creek Hatchery uses the coded wire tagging method for marking their fry chinook and yearling coho salmon. The fish are anaesthetized prior to being marked so that they do not wiggle during the marking process. The anaesthetic used to sedate the fish during marking process is CO2. "CO2 was used in production marking for the first time this year at the hatchery; however, the use of CO2 is still in question because their has been no returns to prove its success"

(Johnson 1988). The fish's snout is placed in a plastic head mould attached to the tagging machine. When the fish is in position he or she will insert the tag through a hollow needle in the mould into the nose cartilage of the fish.

"The nose wire is about 1.0mm long and 0.25 in diameter. Each tag is coded with information on the species, year the fish was hatched and where the stock was produced" (Federal Fisheries & Oceans 1986). The coded wire cannot be seen in live fish because the tag is embedded inside the fish's snout. To ensure that the tagged stock can be identified later, he or she will clip the adipose fin for an external indication that the fish has been tagged.

The tagging machine is equipped with a Quality Control Device (QCD) for separating out the fish which obtained their tag versus the fish that did not get tagged. The fish that were not tagged initially will be put through the tagging process again. During the tagging process, a sample of tagged fish will be held for a 24 hour period and then will be run through the tagging machine to check to see if the fish have retained their tags after this time period. The hatchery fish culturist will tag a statistically valid percentage of the pond population.

The tagged fish will be released at the same time as the general pond population to ensure there is no bias introduced into the marking process. Marking the fish stock provides information on fish migration patterns and survival rates in their natural environment. Furthermore, information obtained from the tags can be used to predict the impact of commercial and sport fishing on our salmon stocks.

2.6 Transport and Release

Tenderfoot Creek Hatchery primarily uses flatbed trucks equipped with insulated transport boxes for transporting the hatchery raised fry and smolts. The fry are transplanted into their stream of parental origin and will help maintain future spawning runs. The transport boxes are insulated so that the water temperature remains constant at all times during transport. The water used in the tanker transport boxes is obtained from the hatchery water supply. This ensures that the fish are not exposed to any foreign diseases that may be in other water sources. The fish are generally starved 1 or 2 days prior to loading to reduce amonia emmissions during transport.

The transport tank is equipped with oxygen and air supply lines which are essential for the survival of fish during transport. The oxygen level in the water is usually maintained at 11-13 PPM during transport. "The air injection into the water is used to reduce the amonia nitrate build-up (NH_3) which occurs when fish release excretion into the water. In addition, the air helps control the amount of Carbon Dioxide in the water" (Celli 1988). It is recommended to maintain dissolved CO_2 levels below 10 PPM.

Oxygen is monitored on a constant basis during transport to ensure the fish are not exposed to D.O. concentrations of less than 5 PPM. The chinook stock is transported directly to net holding pens to allow the fish an opportunity to adapt to the saltwater environment and to improve their chances of survival after release. It is hoped that by placing the chinook stock directlly into the Georgia Strait that these fish will maintain population levels to support the commercial and sports fishing demand.

2.7 Disease & Mortalities

Tenderfoot Creek Hatchery has experienced very few disease problems. The most common problem that occurs at the hatchery is fungus which develops on the exposed flesh of the fish. Fungus becomes established on adult fish when their scales are removed as a result of being netted during the capturing process. Furthermore, fungus can develop on young fry which are subjected to external clipping during the tagging process.

Preventive measures used by the hatchery to inhibit fungus growth includes the use of a chemical called Malachite Green. This chemical is an external disinfectent used for treating fungus or external parasites. The majority of the hatchery's mortalities occur in the first stages of ponding when the weaker fish fail to adapt to their new environment. In addititon, a portion of the fish will not survive the incubation process because of biological deformities.

Other mortalities in the raceways can be attributed to cannabilism which is common in situations where fish are crowded into high densities. Myxobacterium has been discovered in small traces on the gills of chinook and coho fry. So far this bacteria has not been directly linked to any of the hatchery mortalities.

The mortalities are collected and recorded in the raceways, troughs and channels on a daily basis. This practice is carried out daily to ensure the dead fish are accounted for before they are consumed by the surviving pond population. If there is any signs of a disesaes occuring within the pond population then the mortalities will be collected and a Case Reporter form will be completed (Figure 3). Samples of the diseased fish and the form would be sent to Victoria, B.C. for diagnostic analysis. The hatchery has

Figure 3

CASE REPORTER

DATE : ______________________
SAMPLE SITE : ________________
CONTRIBUTOR : ________________
SPECIES : *_________________
AGE : *_____________________
LENGTH (MM) : ________________
WEIGHT (GM) : ________________
SEX : *_____________________

REASON FOR SUBMISSION: *____________
DATE COLLECTED : ____________________
STOCK ORIGIN : *_____________________

		LOSSES	WATER TEMP 'C
TODAY'S	(7)	__________	__________
PAST WEEK	(6)	__________	__________
	(5)	__________	__________
	(4)	__________	__________
	(3)	__________	__________
	(2)	__________	__________
	(1)	__________	__________

SPECIES OPTIONS	AGE OPTIONS	SEX OPTIONS
COHO	EGGS	FEMALES
CHINOOK	SAC FRY	MALES
SUMMER CHINOOK	FRY (BUTTONED)	MIXED
FALL CHINOOK	ADVANCED FRY	UNKNOWN
SOCKEYE	YEARLING	
CHUM	2 YEAR	
PINK	3 YEAR	
SUMMER STEELHEAD	4 YEAR	
WINTER STEELHEAD	IMMATURE ADULT	
DOLLY	RIPE ADULT	
RAINBOW	SPENT ADULT	
CUTTHROAT	JACK	
OTHER	OTHER	

SUBMISSION REASONS	STOCK ORIGIN
HATCHERY LOSS	WILD
FISH KILL IN WILD	CULTURED
RESEARCH	SEMI-WILD
HEALTH CHECK	UNKNOWN
CERTIFICATION	
OTHER	

COMMENTS

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suffered less than a 1% mortality rate due to disease outbreaks.

"The egg to release survival rate for the hatchery in 1987 is about 82% for coho and 85% for chinook and steelhead stock. The egg to fry survival rate is about 92% for coho, 93% for chinook, and a 90% survival rate for steelhead. In 1987, coho returns were 5%, chinook were 0.8%, and steelhead was 0.5%" (Johnson & Thompson 1988).

2.8 Feeding Practices

Tenderfoot uses two types of feed: Biodiet and OMP. Biodiet is a dry fish food and is easily stored in a dry, cool place. This food is generally used for chinook, coho and steelhead fingerlings weighing between 0 to 3 grams. Biodiet is a preferred food source because it has a long shelf life and has the ability to float on the surface of the water for several minutes. This is an advantage because it gives the young fry an opportunity to get used to looking to the surface for an additional food source as they would be required to do in their natural environment.

Oregon Mash Pellet (OMP) was originally fed to the fish weighing 0 to 3 grams before Biodiet; however, it was soon discovered that their was problems with OMP clumping up and sinking before the fish could consume it. OMP is a frozen food which is recieved in sacks and stored at temperatures of - 40 degrees Celsius. This brand of feed is administered to the hatchery fish when they weigh 4 to 20 grams. This type of feed has a long shelf life provided that it is not exposed to warm temperatures.

The fish are fed every 1/2 hour in the raceways and troughs and every 15 minutes in the channels where coho smolts are currently kept. The reason for feeding the fish at least 16 times a day is to allow the fish to ingest more food before it settles to the bottom of the rearing facility. The feed size given to the fish is monitored on a constant basis because oversized feed can cause gill irritations in the fish. Furthermore, incorrect feed size will significantly reduce growth rates in hatchery fish. "It is important to remember that fry should not be pushed to rapidly onto large feed that may be too large for them to consume. It is far better to feed a size that is too small too long than if to feed a larger size too soon" (Klontz et. al. 1979).

Some of the factors which determine how much the fish are fed at the hatchery include: water temperature, size and species of fish, metobolic rate of fish, and the intended the target size the hatchery wishes the fish stock to achieve. The fish stock at the hatchery is 100% hand fed with the exception of 3 automatic feeders used on the cap troughs.

2.9 Sampling

Tenderfoot samples their pond populations on a regular basis. The chinook in the raceways• are sampled once every 2 weeks compare to the coho in the channels which are sampled once a month. "The anaesthetic used to sedate the fish during the sampling process is 2- phenoxyethanol. This anaesthetic is adminstered at a concentration of 10 PPM" (Klassen 1988).

A sample size of 25 fish is used to represent the general pond population. All lengths and weights are recorded on a juvenile sampling record sheet (Figure 4). The results obtained from the sample is used by the fish culturist to either increase or decrease feeding proportions supplied to the fish.

3.0 HATCHERY MAINTENENCE

Maintenence and trained personnel are the key ingredients in ensuring that the hatchery fish stock have the best chance at survival. Maintainence can be described as the "backbone" of the Tenderfoot Creek Hatchery operations and its importence cannot be under estimated. All three wells are measured for the running level of the water or the static level of the water depending if the well is pumping or not. Inspections of the three wells is carried out once a week. The temperature of the freezer unit at the hatchery is monitored on a daily basis. Servicing of the freezer unit occurs on an annual basis. General maintenence is carried out on the compressor and refrigeration units of the freezer whenever required.

JUVENILE SAMPLING RECORD

Figure 4

BROOD: __________ SPECIES: __________

STOCK: __________ DATE: __________

NO.	WT.	LTH.	WT.	LTH.	WT.	LTH.	WT.	LTH.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

The back-up diesel generator is capable of supplying electricity to the hatchery for 12 hours following a power outage. The gen set is inspected once a week and is annuaslly inspected by a certified mechanic. The 16 aluminum cap troughs reqiure little maintenence except for cleaning. In addition, the 8 concrete raceways and the 2 rearing channels also require very little maintenence except for cleaning and painting. The bottom of the rearing channels are coated with anti-foulant paint to slow down the growth of algae. In the future, the concrete raceways may also be treated with anti-foulant paint for similiar reasons.

Cleaning the rearing facilities is essential to help reduce Biochemical Oxygen Demands (BOD) on the hatchery water system. BOD is caused by algae growth, which consumes oxygen while decomposing waste materials. All alarm systems are checked periodically to ensure that they are in good working order including the hi/low float level alarms in raceways and channels. The maintenence work shop operates on a user maintained policy to ensure that the shop remains clean and organized. The vehicles utilized by the hatchery are inspected every month by the employees and are completly serviced on a semi-annual basis.

4.0 PERSONNEL AND BUDGETING

The hatchery employs 5 full-time fish culturist, 1 clerk, and 1 part - time employee. Additional personnel are hired as required to carry out certain hatchery activities such as a chinook brood stock capture. The annual budget for the hatchery is $230,000 per year +/- $10,000 depending on the hatchery programs planned for the coming year. The projected budget must be submitted to the coordinator of SEP prior to March 31 each year. Employees wages are estimated to be about $50,000 per year and is considered a seperate budget from the original $230,000/year. Estimated costs for tagging the hatchery stock is about 10 cents/fish. Feed for the hatchery is purchased from Moore-Clark and Bioproducts. The feed generally costs the hatchery between $26,000 and $30,000 per year. The major cost incurred by the hatchery is electricity which costs the hatchery about $3,500 a month.

CONCLUSIONS

Tenderfoot Creek Hatchery, located in Brackendale, B.C., utilizes a variety of rearing facilities such as 8 raceways, 2 channels, and 16 cap troughs for producing healthy chinook, coho, and steelhead stock. The hatchery is primarily funded through the Salmon Enhancement Program. All SEP programs throughout the province of British Columbia are committed to rebuilding depleted salmon and trout stocks.

Tenderfoot's recent site expansion will increase the hatchery's fish rearing capabilities. Tenderfoot Creek Hatchery is contributing to the salmon stocks in the Lower Georgia Strait by transporting and releasing these fish into the river systems and oceans. SEP sponsored programs (such as Tenderfoot) are playing an important role fisheries management and will continue to do so both now and in the future. It is now up to the sport and commercial fishing industry to follow the acts and regulations so that our children of tomorrow can enjoy what fishing opportunities we enjoy today.

WORKS CITED

Celli, D. 1988. Personal interview on May 6, 1988. Tenderfoot Creek Hatchery, Brackendale, B.C.

Childerhose, R & M. Trim. 1980. Pacific Salmon. Vancouver, B.C. Published by Douglas & McIntyre Ltd.

Department of Fisheries & Oceans. 1986. Marking salmon and trout. Ottawa, Ontario: Fisheries and Oceans Publication.

Johnson, M. 1988. Personal interview on May 11 & 12, 1988. Tenderfoot Creek Hatchery, Brackendale, B.C.

Klassen, B. 1988. Personal interview on May 12, 1988. Tenderfoot Creek Hatchery, Brackendale, B.C.

Klontz, G. et al 1979. A manual for trout and salmon production. Murray, Utah: Published for Sterling H. Nelson & Sons, Inc.

Thompson, B. 1988. Personal interview on May 6 1988. Tenderfoot Creek Hatchery, Brackendale, B.C.

PHOTOGRAPHS

The Tenderfoot Creek Facility entrance sign.

Tenderfoot's hatchery and adminstration building.

Inside the tagging trailer.

Inside the tagging trailer with
the taggers and clippers

Information kiosk located at the centre of the Tenderfoot site.

Preparing the transport tanks for a chinook release into Indian Arm.

16 aluminum Cap troughs
with the freezer in the background

16 aluminum Cap troughs
with 40 isolation boxes

Feeding the Chinook fry in one of the 8 concrete raceways.

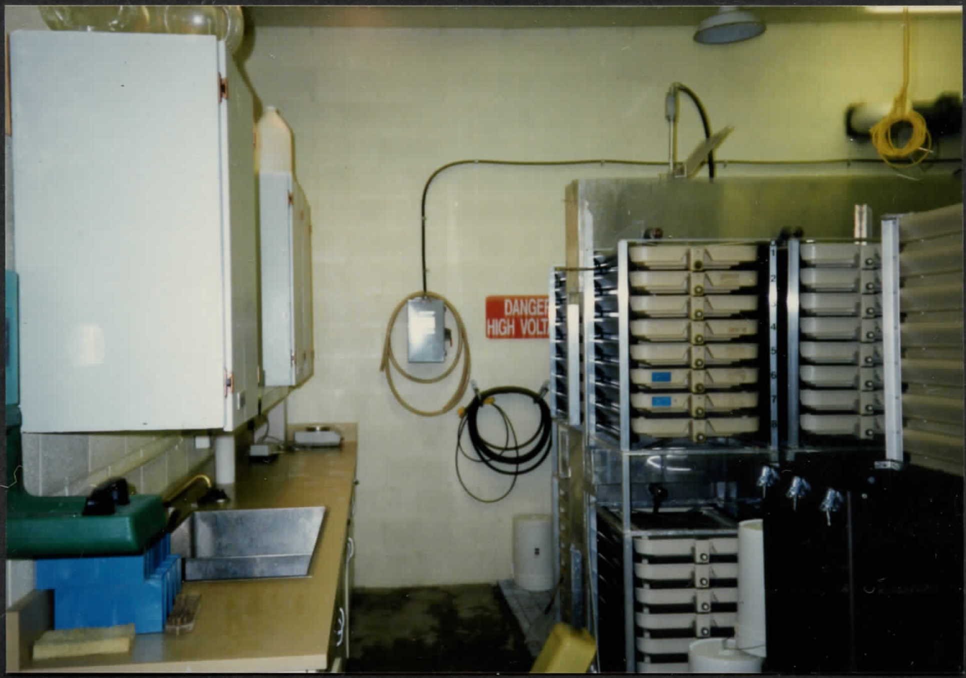
Stationary trap used on Tenderfoot Creek.

Tenderfoot's aeration towers

Feeding the coho smolts
in rearing Channel #1

8 concrete raceways with the feeding boxes in the foreground.

8 concrete raceways



Lab area used for sampling and preparing eggs for the heath trays.

Tenderfoot's incubation room.

Tenderfoot Creek Hatchery
Maintenence shop.

Inside the maintenence shop

Automatic feeder used on the cap troughs.

Inside the walk-in freezer. The average temperature is -40°C.