

Bridge-Coastal
Fish and Wildlife Restoration Program

Gates Creek
Fish Habitat Restoration Project
Feasibility and Fencing

Final Report

April 2004

Prepared for:
N'Quatqua

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With financial contribution from:
BC Hydro Bridge Coastal
Fish and Wildlife Restoration Program
&
Department of Fisheries and Oceans Canada

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Executive Summary

The Gates Creek Fish Habitat Restoration Project Feasibility and Fencing was a project in the Bridge-Coastal Fish and Wildlife Restoration Program. The purpose of the project was to address the human development impacts on the fisheries resource of the Gates Creek Watershed. The first objective of the project was to install one kilometer of fencing with watering points for bison at the Gates Creek Bison Ranch near D'Arcy, B.C. The second objective of the project included assessing in-stream obstructions, evaluation of off-channel juvenile fish rearing habitat sites and making prescriptions for the future. The third objective was to do juvenile fish trapping in the Gates Creek Watershed. The project is located in Southwestern BC in the Seton River Watershed. Fencing was installed at the Gates Creek Bison Ranch. A topological survey was completed on Gates Creek to assess an in-stream boulder obstruction. Juvenile fish trapping was completed in the Gates Creek Watershed using Gee-Traps. To inform the public about the project signs were made and the project was included in a newsletter. The fence installed allows access for the bison to the creek at certain watering points and the rest of the creek is now protected. The topographical survey indicated that there is a three-meter difference in height from the bottom of the in stream obstruction to the top. Juvenile fish were in all creeks sampled with a total of five different species, which included bull trout (*Salvelinus confluentus*), Dolly Varden (*Salvelinus malma*), rainbow trout (*Oncorhynchus mykiss*), Coho (*Oncorhynchus kisutch*) and sculpins (*Cottus sp.*). From the project the following recommendations are suggested.

- A public awareness program would help to educate people on fish/wildlife habitat and stream morphology and hydrology.
- Continue to fence off the riparian zone from livestock.
- Undertake stream bank stabilization.
- Plant native riparian vegetation along areas with little streamside cover (e.g. between the Gates Creek Bison Ranch fence and Gates Creek).
- Continue to liaise with landowners to develop and protect off-channel rearing habitat.
- Continue to monitor, assess and protect the fish populations.
- Commence additional work on the habitat and life history of bull trout and Dolly Varden as well as the interactions between the two.

1.0 Introduction

The BC Hydro Bridge-Coastal Fish and Wildlife Restoration Program (BCRP) is a collaborative program consisting of the Government of B.C., the Government of Canada, First Nations and the Public, to address the historical effects of hydroelectric development on the fish and wildlife resources of the watersheds in the Bridge-Coastal Generation Area (Conlin et al. 2000). The Seton River Watershed, which is part of the Bridge-Coastal Generation Area, has been severely impacted over time due to human developments. In the upper reaches of the Seton River Watershed is Gates Creek. Throughout the Gates Creek Watershed there is limited off-channel rearing habitat, numerous in-stream obstructions that hinder fish passage and heavily impacted riparian habitat. These impacts are the rationale for the necessity of the BCRP project in the Gates Creek Watershed.

The project is located in Southwestern BC in the Seton River Watershed. The system that the project focused on is the Gates Creek Watershed, which forms the headwaters of the Seton River. Gates Creek flows from Gates Lake into Anderson Lake at the town of D'Arcy. Seton River flows from Anderson Lake into Seton Lake and then into the Fraser River (see Figure 1). Gates Creek is positioned in the Interior Douglas-fir Wet Warm Biogeoclimatic Subzone within the Coast/Interior Transition Vegetation Zone.

The Gates Creek Assessment Project (Creekside Resources, Inc., 2001) provided the following recommendations:

- fencing off the riparian zone from livestock,
- assessing options for providing additional off-channel rearing habitat during high water,
- building off-channel rearing habitat and
- monitoring and assessing fish populations for future protection

There were three different objectives of the BCRP project that expanded on the ideas from the original study:

1. Installation of one kilometer of livestock exclusion fencing with watering points for bison at the Gates Creek Bison Ranch.
2. Assessment of fish passage concerns, evaluation of off-channel juvenile fish rearing habitat sites and making prescriptions for the future.
3. Presence/absence juvenile fish trapping in the Gates Creek Watershed to indicate the different types of juvenile fish species present in the areas of interest and the potential for future project feasibility.

Gates Creek Fish Habitat Restoration Project Fencing and Feasibility

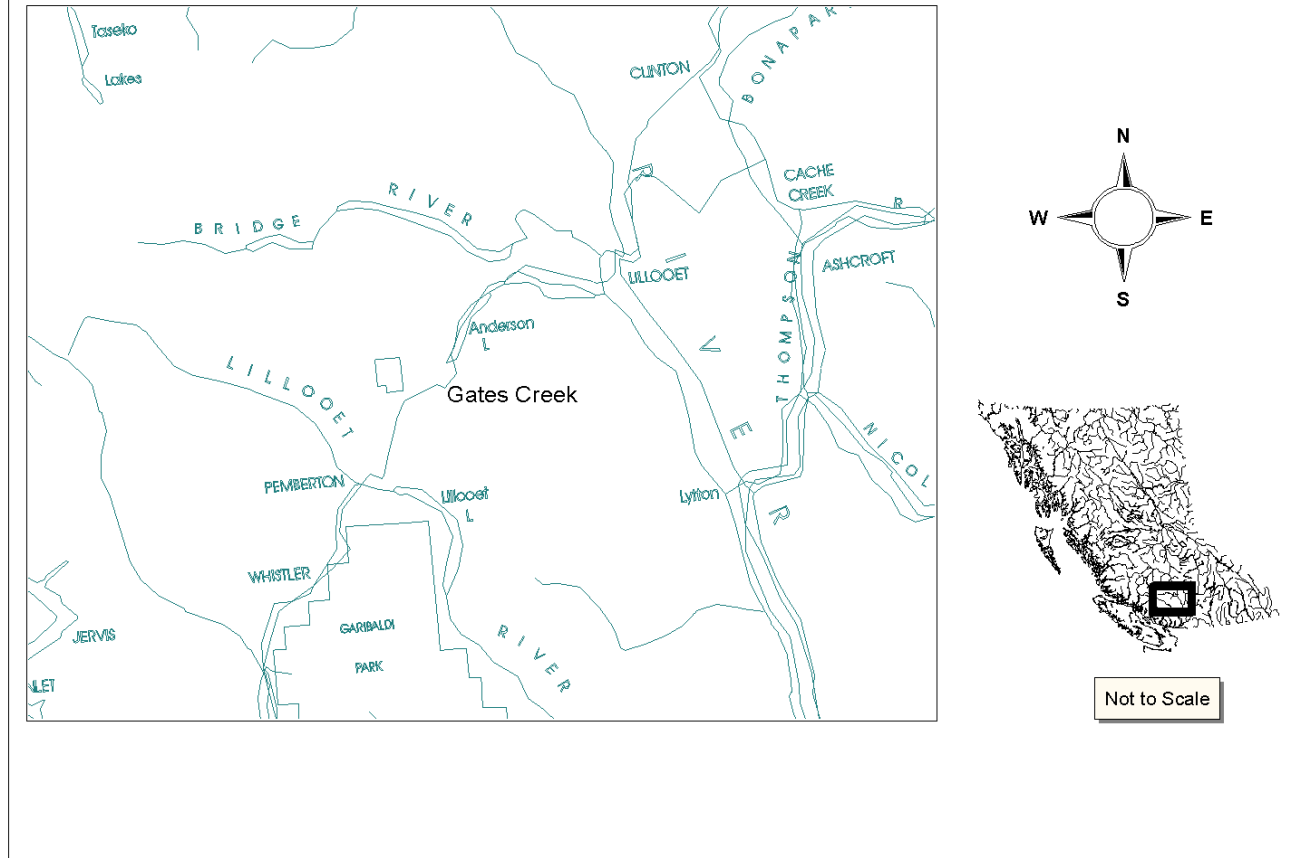


Figure 1: Location of the Gates Creek Fish Habitat Restoration Project, Fencing and Feasibility 2003/2004.

2.0 Discussion

2.1 Fencing

During the proposal stage of the project a letter was sent to the owner of the Gates Creek Bison Ranch. In the letter the owner was asked if he would be willing to allow a fence to be installed on his property along Gates Creek (see Appendix 1). Rob Menzel the owner of the Bison Ranch was willing to have the fence put on his property. Two N'Quatqua members installed the fencing on the Bison Ranch (see Figure 2). Four-inch mesh wire was nailed onto wooden posts that were spaced four meters apart. The Department of Fisheries and Oceans Canada (DFO) recommended that there be a fifteen-meter set back for the fence, which meant that the fence would be placed an average of fifteen meters away from the top of the stream bank. Through discussions with N'Quatqua and the landowner the end agreement was five meters from top of stream bank. The owner of the ranch and the N'quatqua field staff walked Gates Creek together and collectively decided where the watering points for the bison should be.



Figure 2: Two N'Quatqua members installing the fence at the Gates Creek Bison Ranch, 2003.

Ideally riparian exclusion fencing should be 15 meters or greater, this is the distance that literature suggests that there is a measurable benefit to the stream. As often is experienced when introducing a management approach to a watershed there is some reluctance at this distance due to landowner concerns with loss of grazing and the resultant financial impact.

The fencing portion of the project was located at the Gates Creek Bison Ranch, which is approximately six kilometers south of Anderson Lake (see Figure 3). Gates Creek meanders through the ranch.

Before the project, bison at the ranch had uncontrolled access to Gates Creek and trampled the limited vegetation along the banks. The benefits of riparian vegetation include:

- Some improvement in water quality because overland water runoff is filtered through the vegetation and helps prevent washing exposed soil and manure into the creek,
- Improved fish habitat due to the increased cover from overhanging branches, increased food supply from insect drop and shade, and
- Improved stream bank stability due to the developing root mass and therefore land loss is reduced.

N'Quatqua members put up a fence at the ranch with the owner's permission. Trees and shrubs now have a better chance to grow, which protects water quality, provides cover for fish and adds stability to stream banks. Although the fence reduces the total pasture available, the owner benefits from the project; during high water bison have fallen into the creek and are now restricted to accessible watering points where they can easily climb out of the creek. In addition there are the fish benefits and over time the vegetation will reduce the rate of erosion, which also benefits the owner.

2.2 Potential Project Sites

There are several potential project sites that this project has identified, which include riparian stabilization, fencing and planting sites, passage improvements at the bridge on N'Quatqua I.R. No. 1, Red Barn channel, and D'Arcy Creek passage improvements.

2.2.1 Riparian Stabilization, Fencing and Planting Sites

Several additional fencing sites have also been identified. These include addition fencing at the Gates Creek Bison Ranch and other ranches along Gates Creek.

There is concern of erosion at the Indian Beach site (see Figure 4). Planting would be of benefit to the stream banks as the area is highly mobile due to its proximity to the lake. Recommended species include willows due to their tolerance of high water table and their extensive and fast growing root system.

Large woody material could also be cabled to boulders in areas where the creeks erosive forces are higher. Budget costs for this type of prescription vary to material availability and related costs but should be approximately \$150 per meter not including technical services. See Appendix 2 for a drawing of the structure required to stabilize the stream bank.

Gates Creek Fish Habitat Restoration Project Location of Gates Creek Bison Ranch

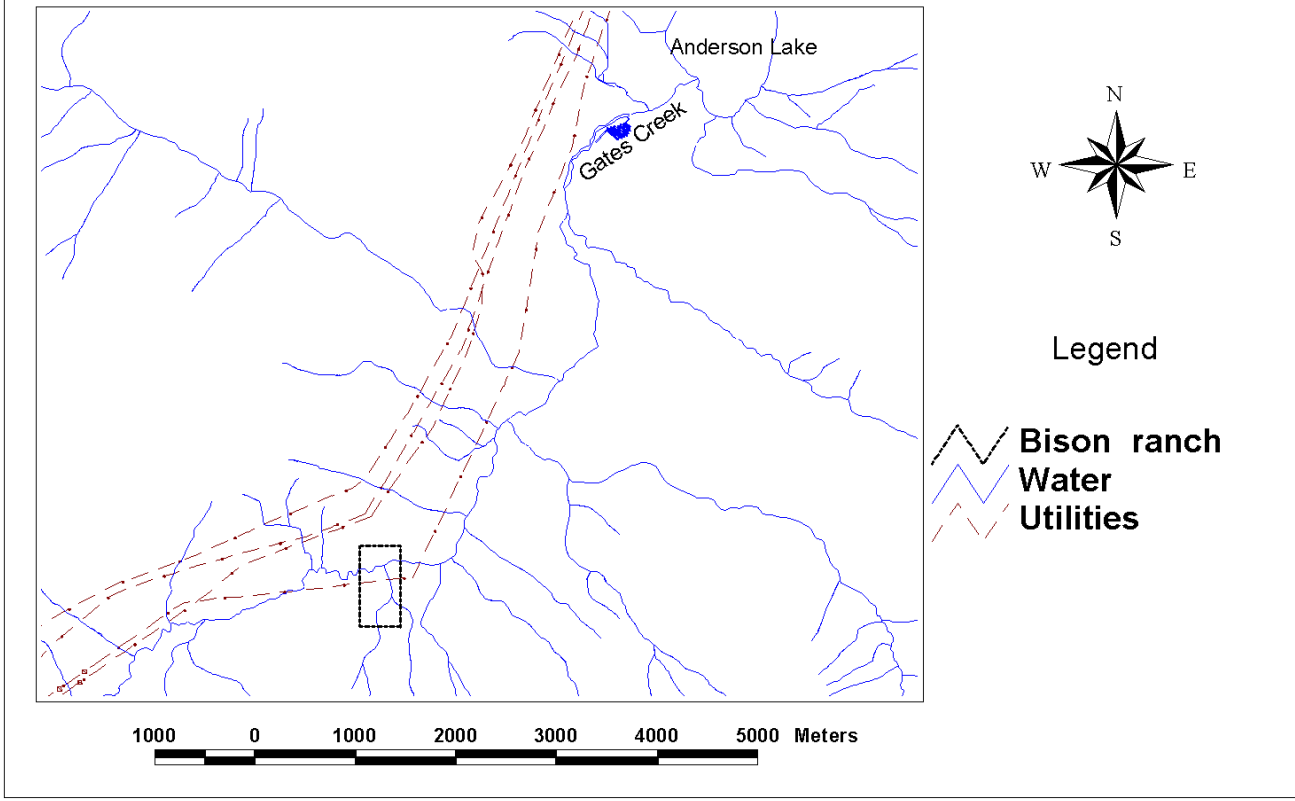


Figure 3: Location of the Gates Creek Bison Ranch, 2003.

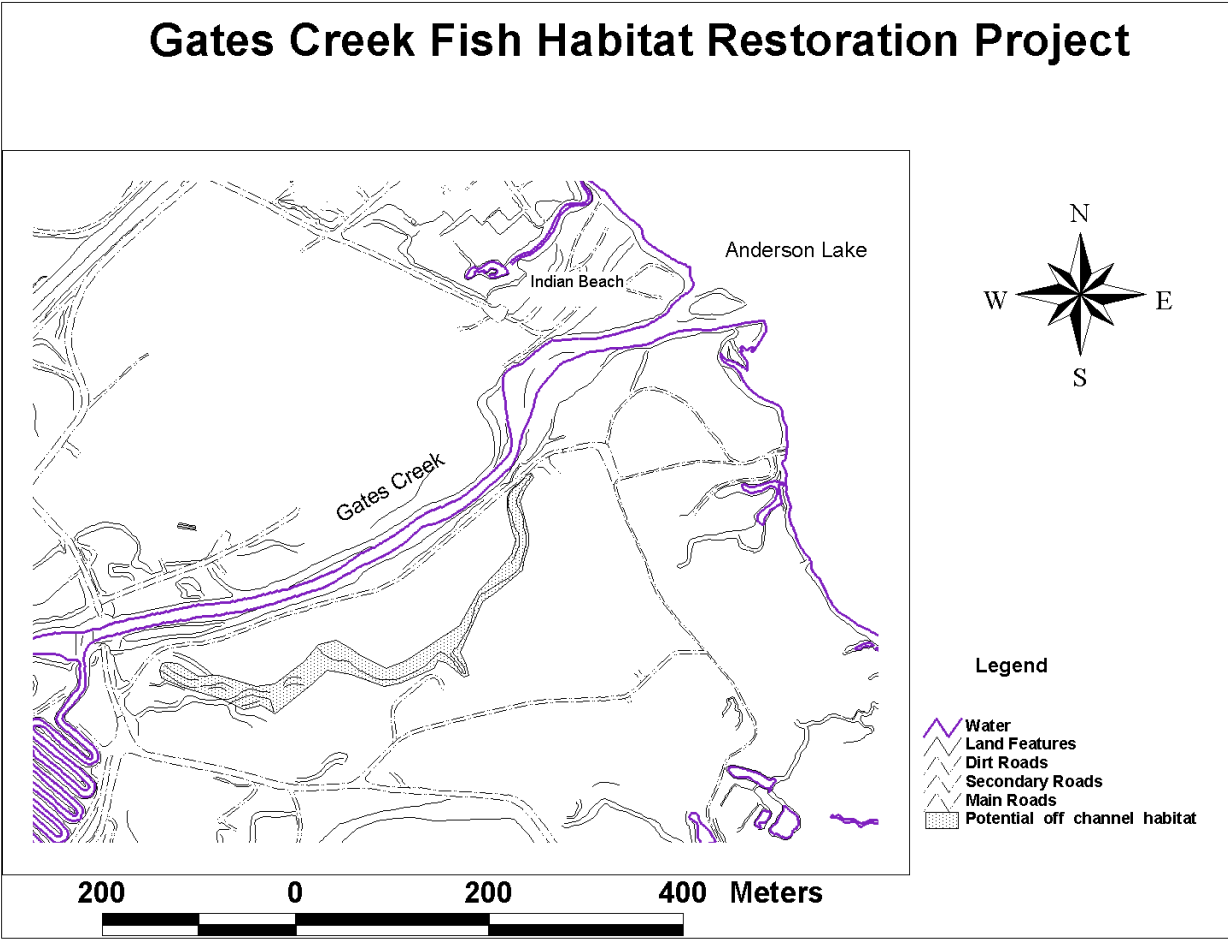


Figure 4: Location of the Indian Beach in N’Quatqua I.R. No. 1 and the potential off channel juvenile fish rearing habitat, 2003.

2.2.2 Passage Improvements at Bridge

The in-stream obstruction that was assessed is located approximately 800 meters south of Anderson Lake on Gates Creek. There were large boulders placed in Gates Creek between the Gates Creek Spawning Channel outlet and the bridge on N'Quatqua Indian Reserve (IR) No. 1 (see Figure 5). The structure is passable to most adult fish, though improvement can be made to reduce their energy expenditure to navigate it as well as improve conditions for determined juveniles.

The boulders between the Gates Creek Spawning Channel outlet and the bridge are on a steep slope. This creates torrent rapids that hinder fish passage up stream. A suggested prescription to address the passage concerns at the site is to construct a series of rock weirs (see Appendix 3). These weirs would be constructed approximately 60 meters apart and each would have an elevation change of approximately 1 meter across them. These weirs would backwater the existing boulder cascade. The size of rock required is 1 metre diameter minimum. Over 1200 cubic metres of rock would be required to construct the three structures. Estimated cost for this project is between \$50k and \$75k not including technical services.

Prior to construction of the weirs, an engineer should confirm the river information and design. Gathering information and creating designs would ensure that significant changes, (hydraulic changes, new adjacent structures, etc.) affecting the proposed design have not occurred. Also, it should be noted that N'Quatqua has planned for a new larger bridge crossing at this site.

2.2.3 Red Barn Channel

The potential off-channel fish rearing habitat site is located in N'Quatqua IR No. 1. (see Figure 4). The potential project would flow through three different properties that are not shown on the map.

A remnant flood channel of Gates Creek was observed at the Red Barn Campground. It is understood from anecdotal information from Maurice Thevarge, (pers. Com) that this channel flowed during higher water events prior to construction of the Gates Creek Spawning Channel. Since that time there is limited backwatering as well as some groundwater influence through the culvert under the campground access road.

Unfortunately the three landowners (Maurice Thevarge, Dwayne Thevarge and Sally Thevarge) on whose property the channel is evident are unwilling at this time to allow fish habitat restoration works to be undertaken.

As a concept based on the limited site observations, there is the potential to develop groundwater flow. This would require excavation of the channel approximately one meter into the water table. It is expected that flow should be able to be developed, as there is gravel and cobble exposed in the channel bottom where water is currently observed. Based on the limited ground truthing and aerial photos the channel length is estimated to be 400 m.

Gates Creek Fish Habitat Restoration Project In-Stream Obstruction

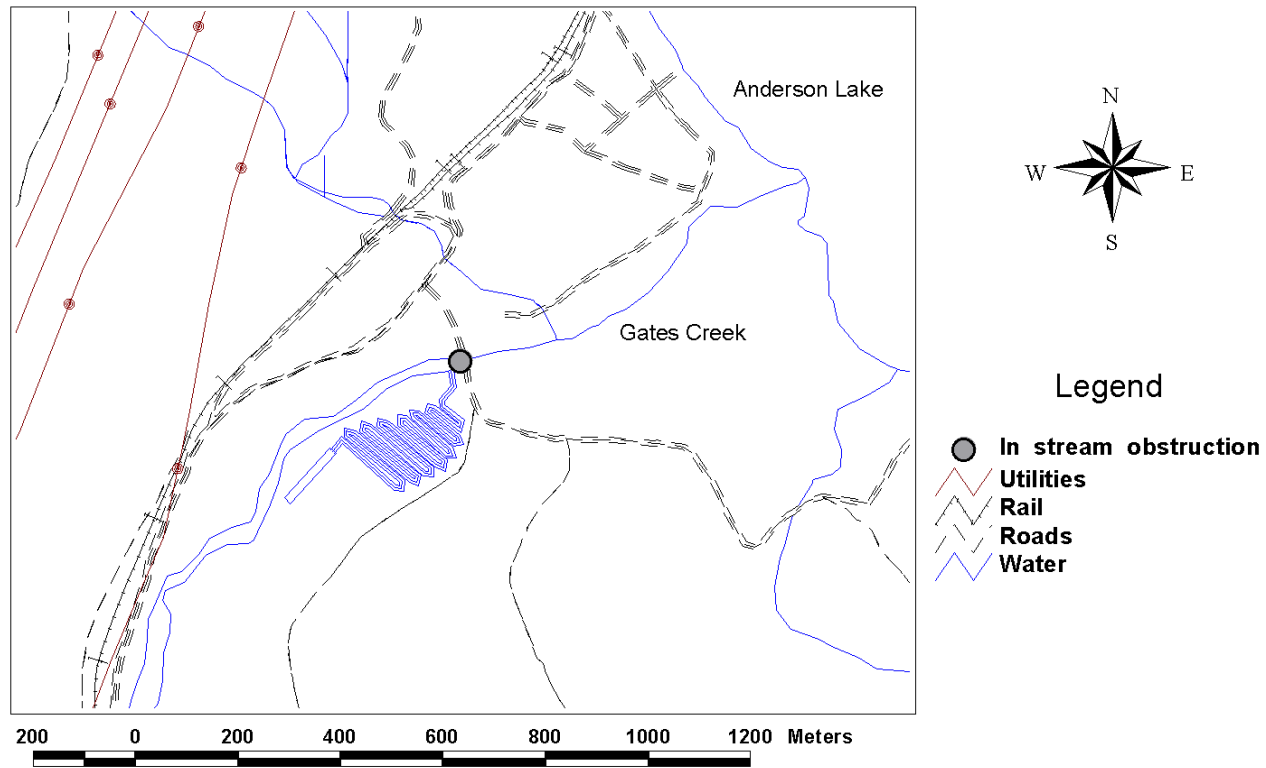


Figure 5: Location of the in-stream boulder obstruction in Gates Creek, 2003.

Should the landowners decide that they wish to proceed with this project at some time in the future, it is recommended that the following tasks be undertaken prior to design and construction:

- Juvenile presence/absence sampling
- Topographic survey
- Test holes and follow-up water level and quality monitoring
- Determine landowner requirements for incorporation into design if field information supports construction of a project

Typical costs for this type of off-channel project are in the range of \$15k per 100 meters for construction, which varies depending on the extent of habitat complexing, fencing, landowner considerations, spoil material disposal, etc. Using this estimate of construction, costs for this site would be in the order of \$60k not including technical services.

2.2.4 D’Arcy Creek Passage Improvements

In 1998, DFO in partnership with local area residents and BC Rail undertook passage improvements in D’Arcy Creek. This work was undertaken by hand placing rock at various obstructions in the small stream, which is known to support Coho. Some minor maintenance work is required on some of these structures to ensure continued passage. It is estimated that 2 loads of 1.5’ and smaller diameter rock, distributed between the various sites and a few days for a crew to hand place them, possibly assisted with a backhoe, would address the concerns. Approximate cost of this project is \$3k.

2.3 Juvenile Presence/Absence Sampling

A fish collection permit was issued from the Ministry of Water, Land and Air Protection for the period of August 11th, 2003 to March 31st, 2004 (see Appendix 4). The juvenile fish trapping took place over ten days (see Table 1). Two N’Quatqua members, one being a Certified Fisheries Technician and the other having worked at the Gates Creek Spawning Channel for several years, carried out the trapping portion of the project. The fisheries technicians set Gee-Traps with salmon eggs for bait and pulled out the traps after 24 hours and recorded the data and then released the fish (see Figure 6). The fisheries technicians recorded the date, time, site number, trap number, species, length (nose to fork), stage and any comments they had. The number of traps set in each creek can be seen in Table 2.

Gates Creek Tributary 1 trapping site was added at a later date to identify if there was any fish in the intermittent tributary that would help indicate whether or not the site was suitable for off-channel juvenile fish rearing habitat enhancement. Gates Creek Tributary 2 could only be reached by crossing an old broken bridge, but during a flood in October 2003 the bridge was washed out. So Tributary 2 could not be trapped for the rest of the study period.

Table 1: Days that trapping took place on each creek in the Gates Creek Watershed, 2003

Trap In	Trap Out	Young Creek	D'Arcy Creek	Gates Creek	Haylmore Creek	Blackwater Creek	Spruce Creek	Trib. 1	Trib. 2
09/03/03	09/04/03	X	X	X	X	X			X
09/19/03	09/20/03	X	X	X	X	X	X		X
10/01/03	10/02/03	X	X	X	X	X	X		X
10/15/03	10/16/03	X	X	X	X	X	X		X
11/13/03	11/14/03	X	X	X	X	X	X		
11/26/03	11/27/03	X	X	X	X	X	X		
11/27/03	11/28/03	X	X	X	X	X	X		
11/28/03	11/29/03	X	X	X	X	X	X		
11/29/03	11/30/03	X	X	X	X	X	X		
02/25/04	02/26/04							X	

Table 2: The number of Gee-Traps set at each creek.

Site	Number of Traps
Young Cr.	4
D'Arcy Cr.	3
Gates Cr.	4
Haylmore Cr.	3
Blackwater Cr.	4
Spruce Cr.	1
Gates Trib 2	1
Gates Trib 1	2



Figure 6: N'Quatqua Fisheries Technician setting Gee-Trap in Gates Creek, 2003.

The juvenile fish trapping sites are located throughout the Gates Creek Watershed (see Figure 7). Trapping took place on Gates Creek and creeks that feed into it, which include Blackwater Creek, Haylmore Creek, Spruce Creek, Tributary 1 (N'Quatqua IR No. 1) and Tributary 2 (N'Quatqua IR No. 4). Gates Creek Tributary 1 is an intermittent stream, with only pools of water during the time of trapping, that only flows during peak flows and is located on private property. Trapping also took place on creeks that feed directly into Anderson Lake, which include D'Arcy Creek and Young Creek.

The juvenile fish trapping portion of the project found that all of the creeks trapped had juvenile fish. There was a total of five different species trapped throughout the Gates Creek Watershed, which included bull trout (*Salvelinus confluentus*), Dolly Varden (*Salvelinus malma*), rainbow trout (*Oncorhynchus mykiss*), Coho (*Oncorhynchus kisutch*) and sculpins (*Cottus sp.*).

The graphs in Figure 8 and Figure 9 show all the fish caught for the ten days of trapping. The traps on both D'Arcy Creek and Gates Creek caught all five fish species. Young Creek, Gates Creek Tributary 1 and 2 had no rainbow trout caught in the traps at the time of trapping. Haylmore Creek, Blackwater Creek, Spruce Creek and Gates Creek Tributary 2 had no Dolly Varden or sculpins trapped at the time of the trapping. Gates Creek Tributary 1 had no bull trout at the time of trapping. Coho were not present at the time of trapping on Blackwater Creek and Spruce Creek.

The highest number of juvenile fish trapped for each species in one day at each creek can be seen in Figure 10. Of the creeks that had Coho present, Haylmore Creek had the lowest with three and Gates Creek had the highest number caught in a day with 71. For the rest of the fish species the range of juvenile fish trapped in one trapping day was from zero to eight with different species groupings in each creek.

During the high water in October of 2003 the juvenile Coho and Dolly Varden must have entered into Gates Creek Tributary 1. Some of the juvenile fish did not leave the stream before the water level lowered and were trapped in the remaining pools. Even though trapping only took place on one day for the Gates Creek Tributary 1, there was a relatively high amount of Coho caught compared to the other creeks when looking at Figure 10. This indicates that off-channel rearing habitat enhancements to Gates Creek Tributary 1 would be beneficial for juvenile Coho and Dolly Varden.

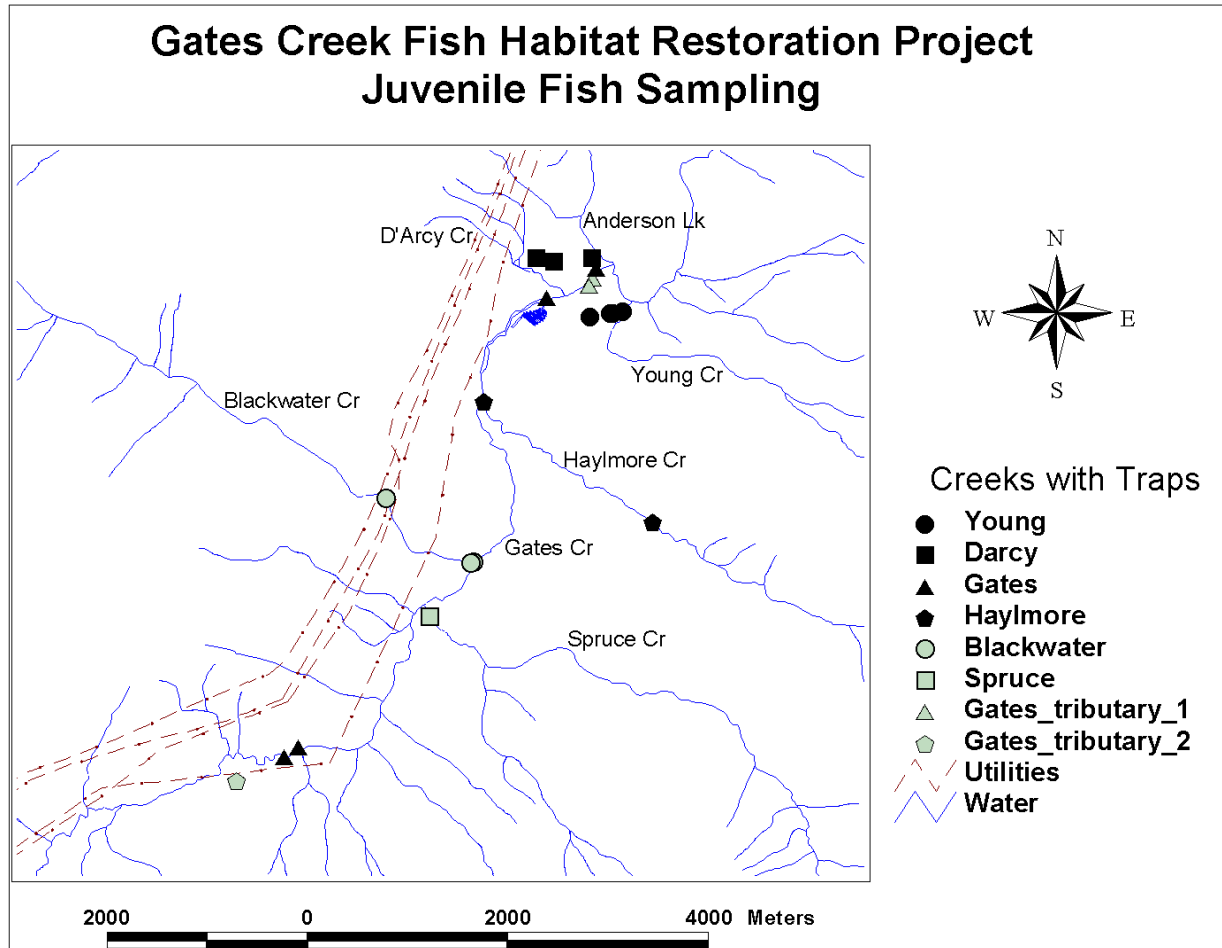


Figure 7: Location of the juvenile fish trapping sites in the Gates Creek Watershed, 2003.

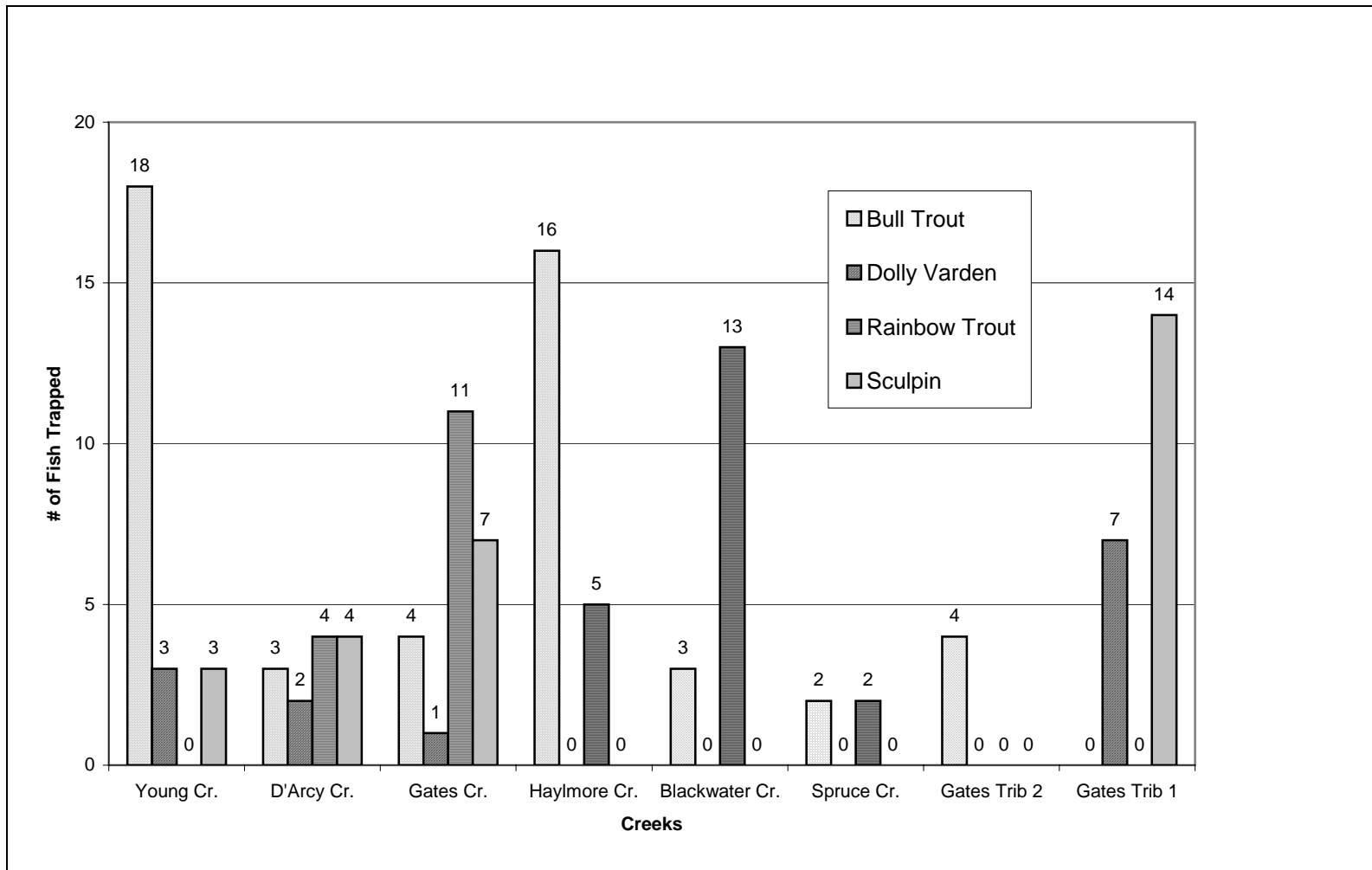


Figure 8: The total number of fish trapped for each species, except Coho, in the ten days of trapping in 2003/2004.

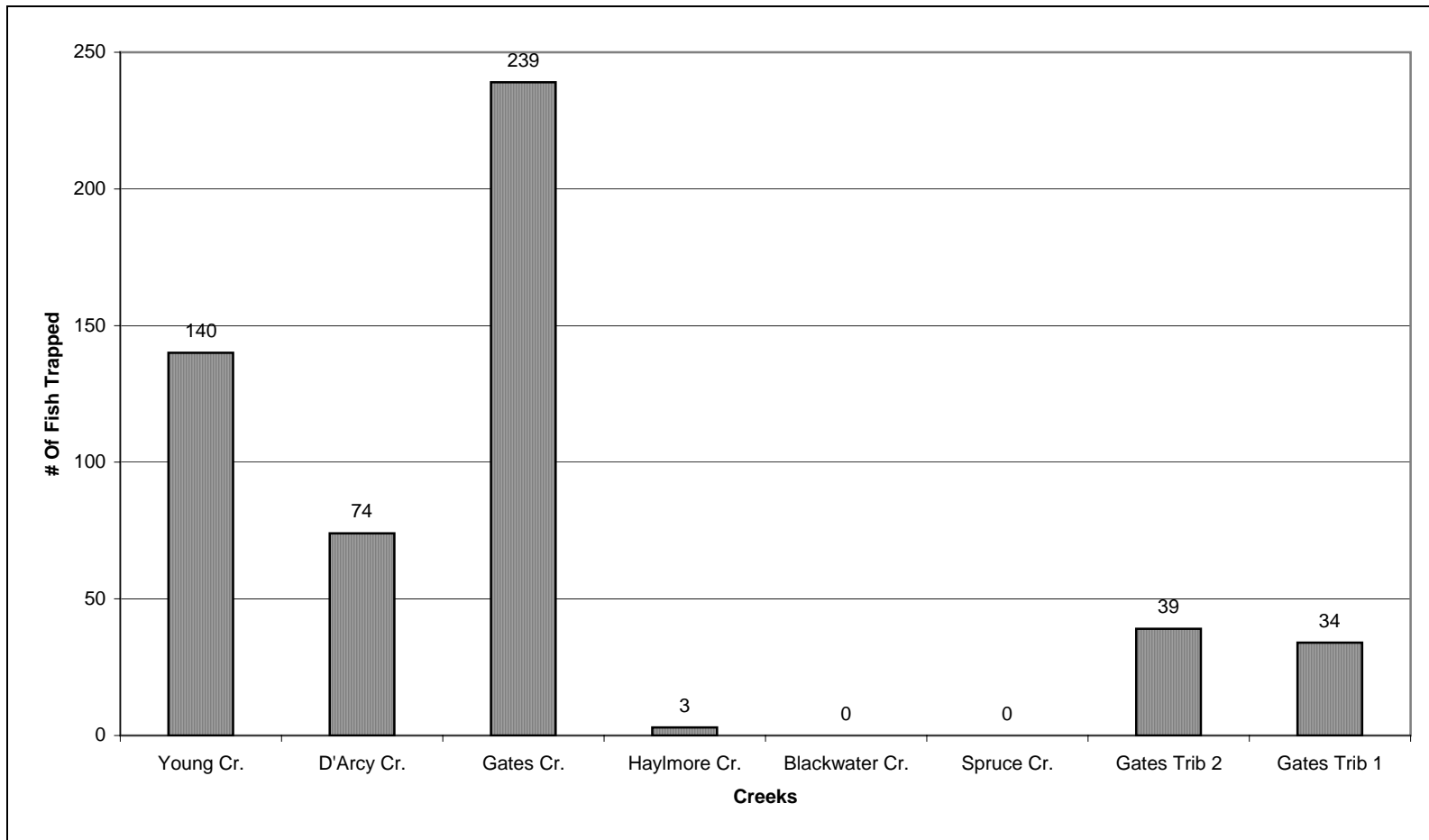


Figure 9: The total number of Coho trapped in the ten days of trapping in 2003/2004.

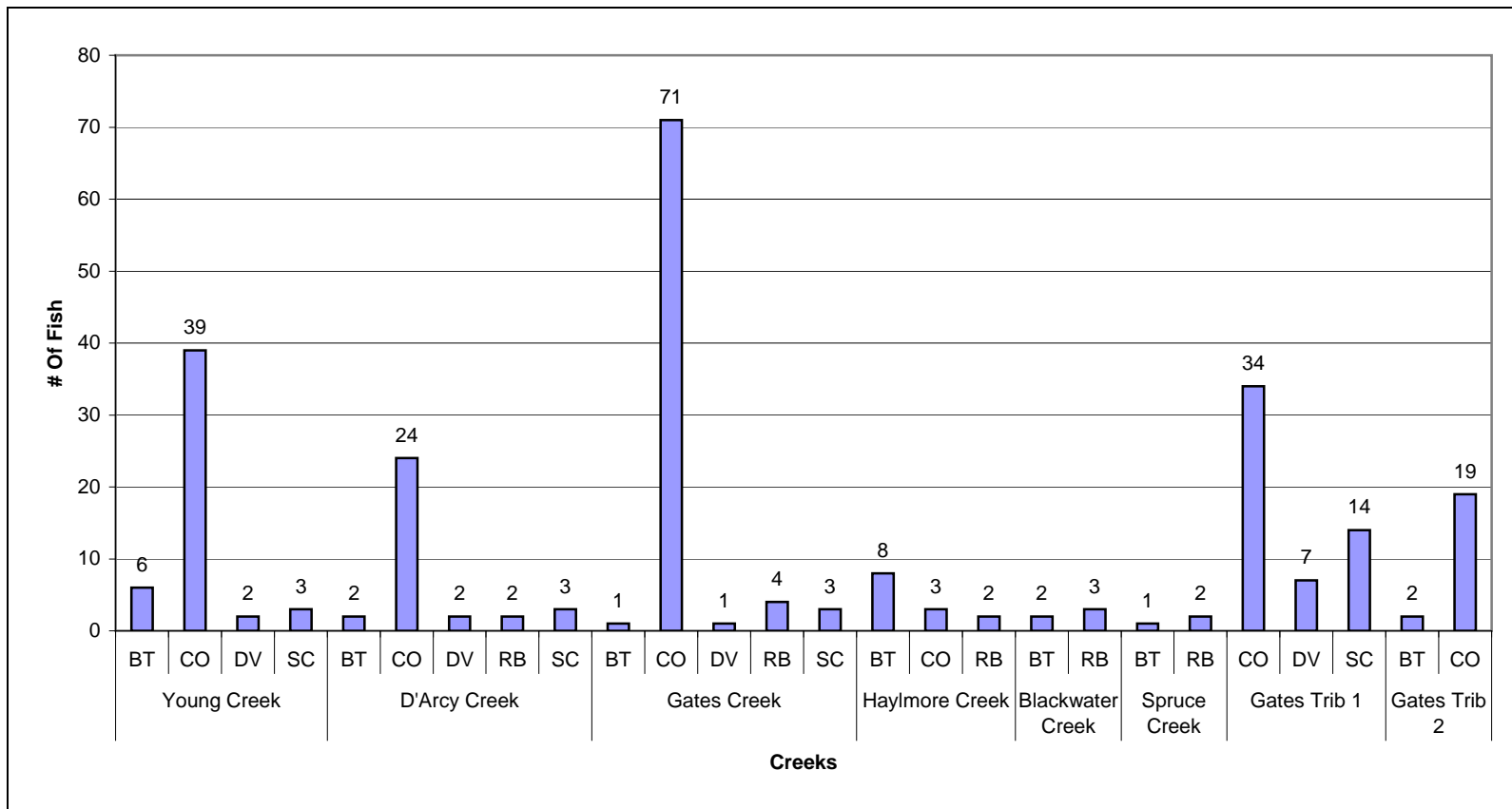


Figure 10: The highest number of juvenile fish trapped for each species in one day at each creek in 2003/2004.

Of the five fish species trapped in the project various creeks were missing some of the species. This may be due to the different habitat requirements of different fish species and competition between species. The Gates Creek Assessment Project, which took place in the fall of 2000, found the same juvenile fish species as this project did, with the addition of Chinook. The Gates Creek Assessment Project found Chinook in reaches one and seven. This project sampled from the mouth of Gates Creek at Anderson Lake up to the Bison Ranch, which is located in reach four. Chinook salmon tend to use larger rivers for spawning than do most other species (<http://www.fish.bc.ca>), which is probably why they were only found in the largest creek of the project. Bull Trout utilize small, very high gradient tributary streams and groundwater seepage channels for spawning and rearing (Cannings and Ptolemy 1998). Resident Dolly Varden can be found in very steep, small streams as well (with slopes well above 20%) (British Columbia Minist. of Fisheries). The habitat of stream-dwelling rainbow trout is usually small to moderately large, shallow rivers with moderate flow and gravel bottoms, of the pool-riffle type (British Columbia Minist. of Fisheries). Coho prefer to spawn and rear in diminutive and innocuous waterways, and these often include the smaller tributary streams of our larger watersheds (<http://www.fish.bc.ca>).

Bull trout and Dolly Varden are blue-listed, which means they are considered to be of Special Concern (formerly Vulnerable) in British Columbia (BC Species and Ecosystems Explorer 2003). Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

Rainbow trout and Coho are yellow-listed, which means they are apparently secure and not at risk of extinction (BC Species and Ecosystems Explorer 2003).

2.4 Communications

The communications part of the project was directed towards the public within the Bridge-Coastal Generation Area. Two signs were erected in the project area. One sign was installed at the Gates Creek Bison Ranch (see Figure 11) and the other at the Gates Creek Spawning Channel at N'Quatqua (see Figure 12). The project was included in the St'at'imc Hydro Fisheries Co-operative Group Newsletter as another form of communication to the public (see Appendix 5).



Figure 11: Gates Creek Fish Habitat Restoration, Feasibility and Fencing sign at the Gates Creek Bison Ranch, 2004.



Figure 12: Gates Creek Fish Habitat Restoration, Feasibility and Fencing sign at the Spawning Channel in N'Quatqua, 2004.

3.0 Recommendations

From the project conducted on the Gates Creek Watershed the following recommendations are suggested. Detailed designs, prescriptions and plans will be required to carry out these projects along with continued relationships with DFO, consultation with the St'at'imc Nation and consultation with private landowners.

- A public awareness program would help to educate people on fish/wildlife habitat and stream morphology and hydrology.
- Continue to fence off the riparian zone from livestock.
- Undertake stream bank stabilization.
- Plant native riparian vegetation along areas with little streamside cover (e.g. between the Bison Ranch fence and Gates Creek).
- Continue to liaise with landowners to develop and protect off-channel rearing habitat.
- Continue to monitor, assess and protect the fish populations.
- Commence additional work on the habitat and life history of bull trout and Dolly Varden as well as the interactions between the two.

These recommendations could form the basis for a future application to BCRP or other funding program.

Acknowledgements

The technical support of the Department of Fisheries and Oceans Resource Restoration Unit staff is kindly acknowledged. The approval of the private landowners to work on their property is greatly appreciated. Without the support of N'Quatqua and the Ministry of Water, Land and Air Protection this project could not have been completed. The financial support of BC Hydro Bridge Coastal Fish and Wildlife Restoration Program is acknowledged.

References

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- Cannings, S.G., and J. Ptolemy. 1998. Rare and Endangered Fish of British Columbia. B.C. Minist. Environ., Lands and Parks, Victoria, BC. 214pp., pg 21 and 23.
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- Pacific Fisheries Resource Conservation Council. 2003. Chapter 3: Species of Salmon and Steelhead in British Columbia and their Individual Habitat Requirements. Vancouver, BC
Canada. Available: <http://www.fish.bc.ca/> or email: info@fish.bc.ca (March 5, 2004).
- Creekside Resources Inc., 2001, Gates Creek Assessment Project.
- Morris Thevarge, personal communication, February 2004.

Appendix 1

Letter to Rob Menzel from N'Quatqua

N'QUATQUA

21 Lakeshore Dr.
P.O. Box 88
D'Arcy, BC V0N 1L0
Phone (604) 452-3221
Fax (604) 452-3295



Rob Menzel

February 6, 2003

Dear Sir:

We are in the process of an application to do some Fish Habitat Restoration and Protection on Gates Creek. We would like to erect suitable fencing through your property on the creek as part of this project and we would need your 1. consent to first do so and 2. second have you agree to maintain the fence after it was constructed. The fence would help protect the creek from erosion from livestock and your animals from falling in.

If you agree all we would need is a letter from yourself agreeing to the above two items as soon as possible.

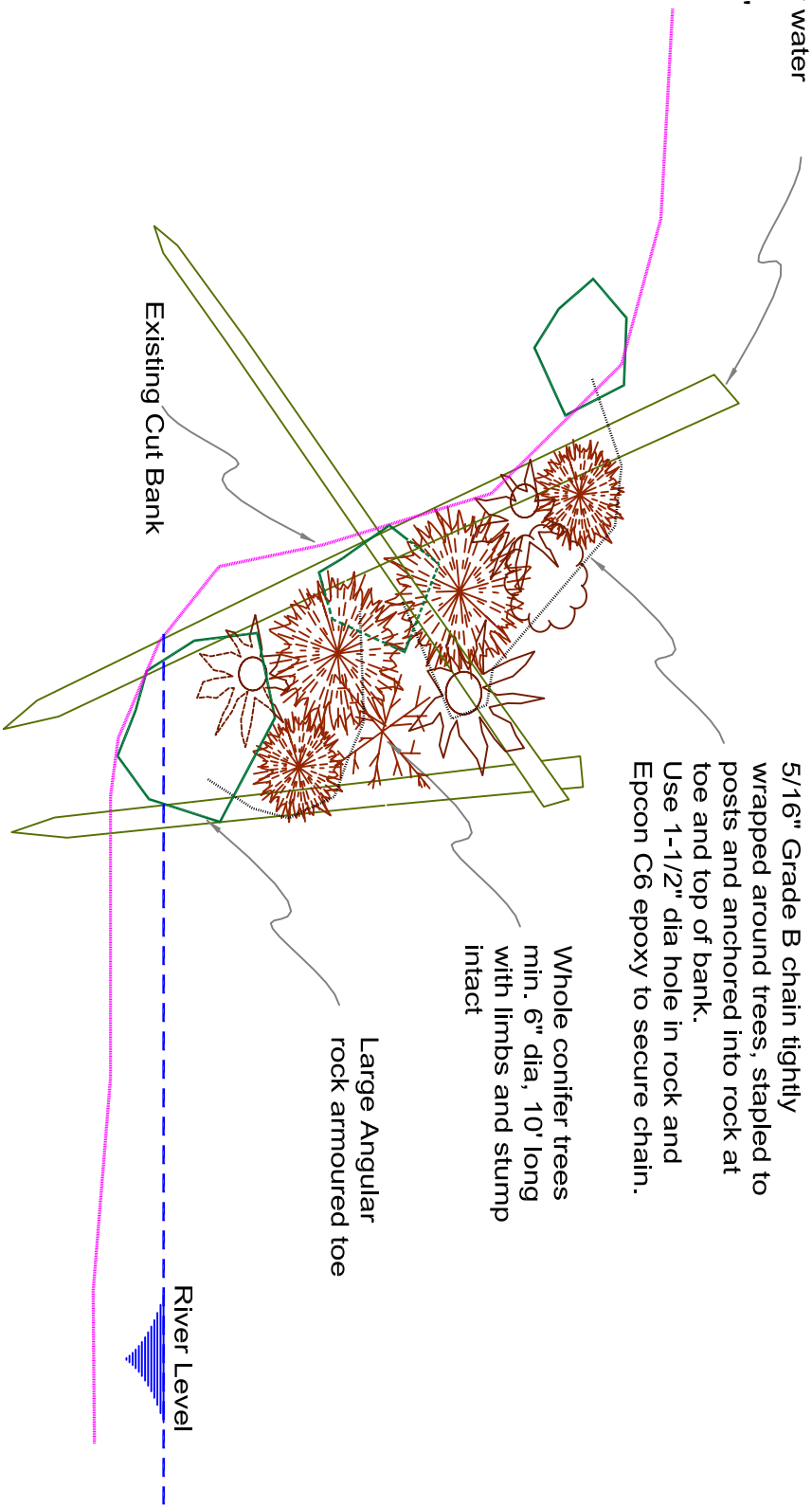
We would also be willing to work with you regarding issues with Gates Creek such as erosion protection that you may have and develop solutions to your concerns. If you have any questions regarding this matter please contact me.

Yours truly,

Chief Harry O'Donaghey

Appendix 2
Stream bank stabilization

Live cottonwood or willow posts sharpened on end and driven to below low water table (min. 6" dia)
Space posts 6' to 8'



5/16" Grade B chain tightly wrapped around trees, stapled to posts and anchored into rock at toe and top of bank.
Use 1-1/2" dia hole in rock and Epcon C6 epoxy to secure chain.

Whole conifer trees
min. 6" dia, 10' long
with limbs and stump
intact

Large Angular
rock armoured toe

Existing Cut Bank

River Level

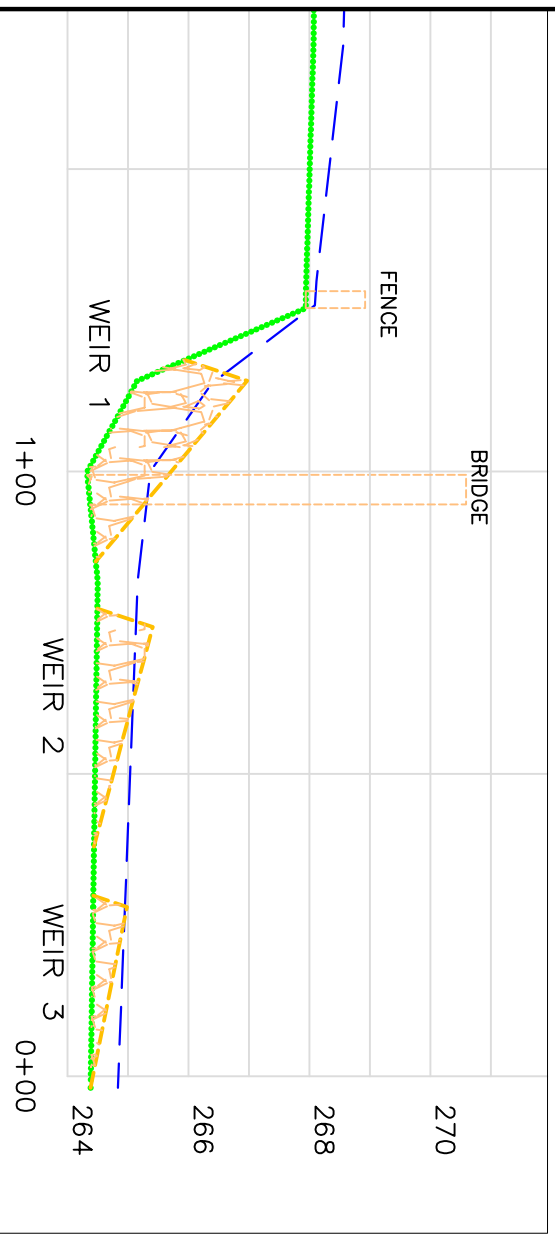
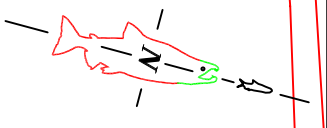
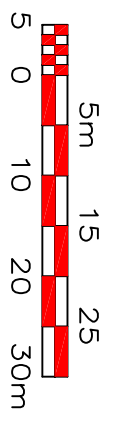
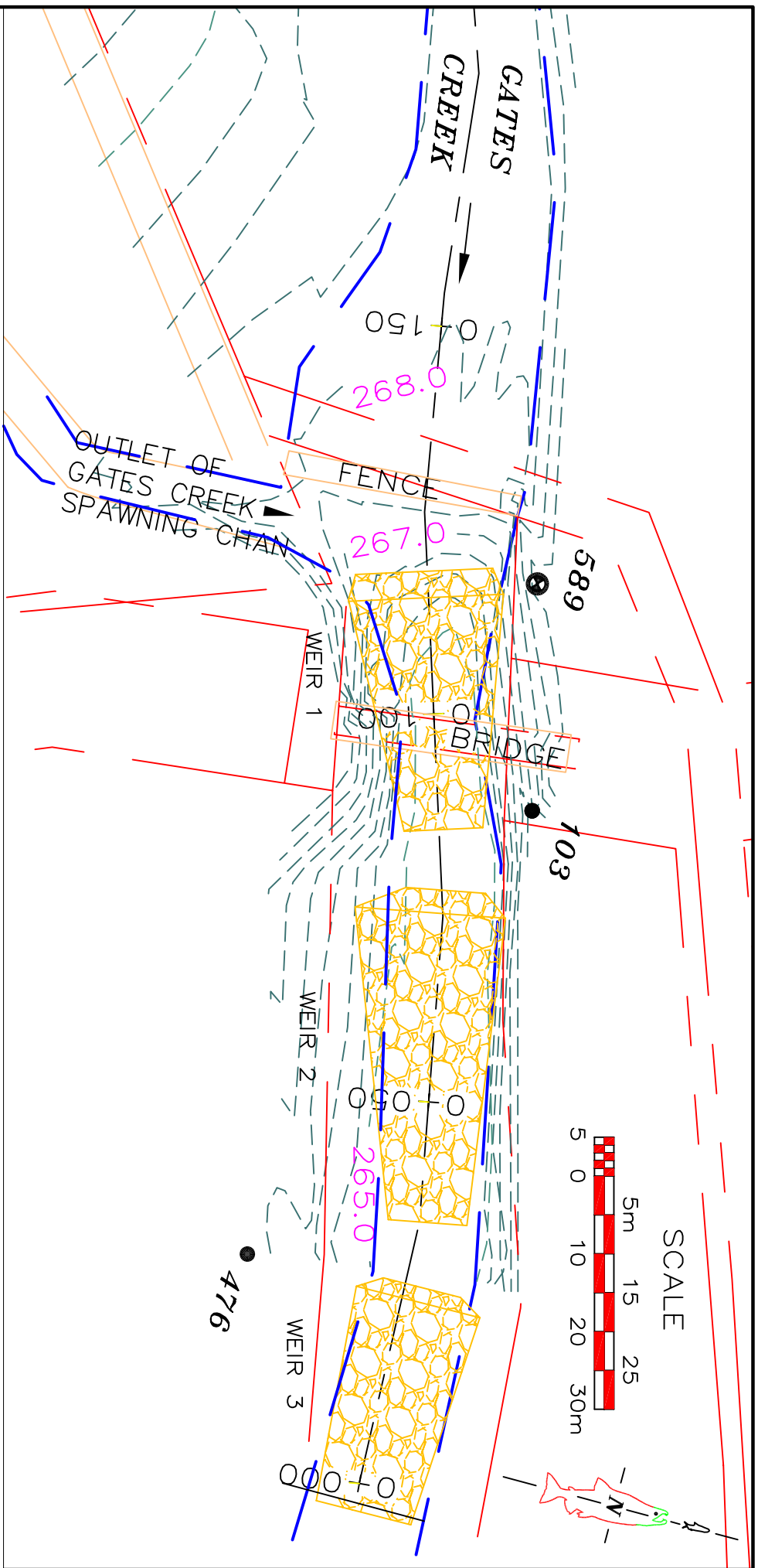
NOT TO SCALE


(FOR REFERENCE ONLY)

**FISHERIES & OCEANS
HABITAT & ENHANCEMENT BRANCH
POST & BRUSH REVETMENT
TYPICAL CROSS SECTION**

DESIGNED BY P. CARLSON
SKETCHED BY P. COCHRANE MARI04
POST & BRUSH REVETMENT 2.DWG

Appendix 3
Series of rock weirs



 **FISHERIES & OCEANS**
HABITAT & ENHANCEMENT BRANCH
GATES CREEK
FISH PASSAGE IMPROVEMENTS
CONCEPTUAL SKETCH

DESIGNED BY P. CARLSON
 SKETCHED BY P. COCHRANE APR/04
 GATES0903.DWG/WEIRS

Appendix 4
Fish collection permit



Province of
British Columbia

MINISTRY OF
WATER, LAND AND
AIR PROTECTION

1259 Dalhousie Drive
Kamloops BC
V2C 5Z5
Telephone: (604) 371-6200
Facsimile: (604) 828-4000

File: 34770-20

August 6, 2003

N'Quatqua Band
100 Lakeshore Drive
D'arcy BC
VON 1LO

Ag 11/03

Dear Chris Thevarge,

Re: Fish Collecting Permit

I have enclosed your Fish Collecting Permit issued from 11/08/2003 to 31/03/204 along with Receipt No. 246072K.

Please be advised that a summary report of collecting activities must be submitted to our office within 90 days of the expiry date of this permit. Interim reports may also be required and shall be submitted upon request of the permit issuer.

Please contact me if you have any questions regarding this permit.

Yours truly,

I.A. McGregor
Fish & Wildlife Section Head

Enclosure

cc:

Appendix 5

St'at'imc Hydro Fisheries Co-operative Group Newsletter Update

To: Bonnie Adolph
From: Chris Thevarge
Date: September 23, 2003

Up Date for Newsletter

The Gates Creek Fish Habitat Restoration Project Feasibility and Fencing is well under way. Within Anderson Lake, Gates Creek and their tributaries two N'Quatqua band members are conducting a presence/absence survey of fish with Gee-traps. As well, DFO surveyed a section of Gates Creek at N'Quatqua for the feasibility of adding fish habitat in future projects. N'Quatqua would like to thank Rob Menzel for allowing them to put up a fence to protect Gates Creek from his bison herd.