Gitsegukla Band Council 1998 Submission to

Annual compendium of WRP Aquatic Rehabilitation Projects

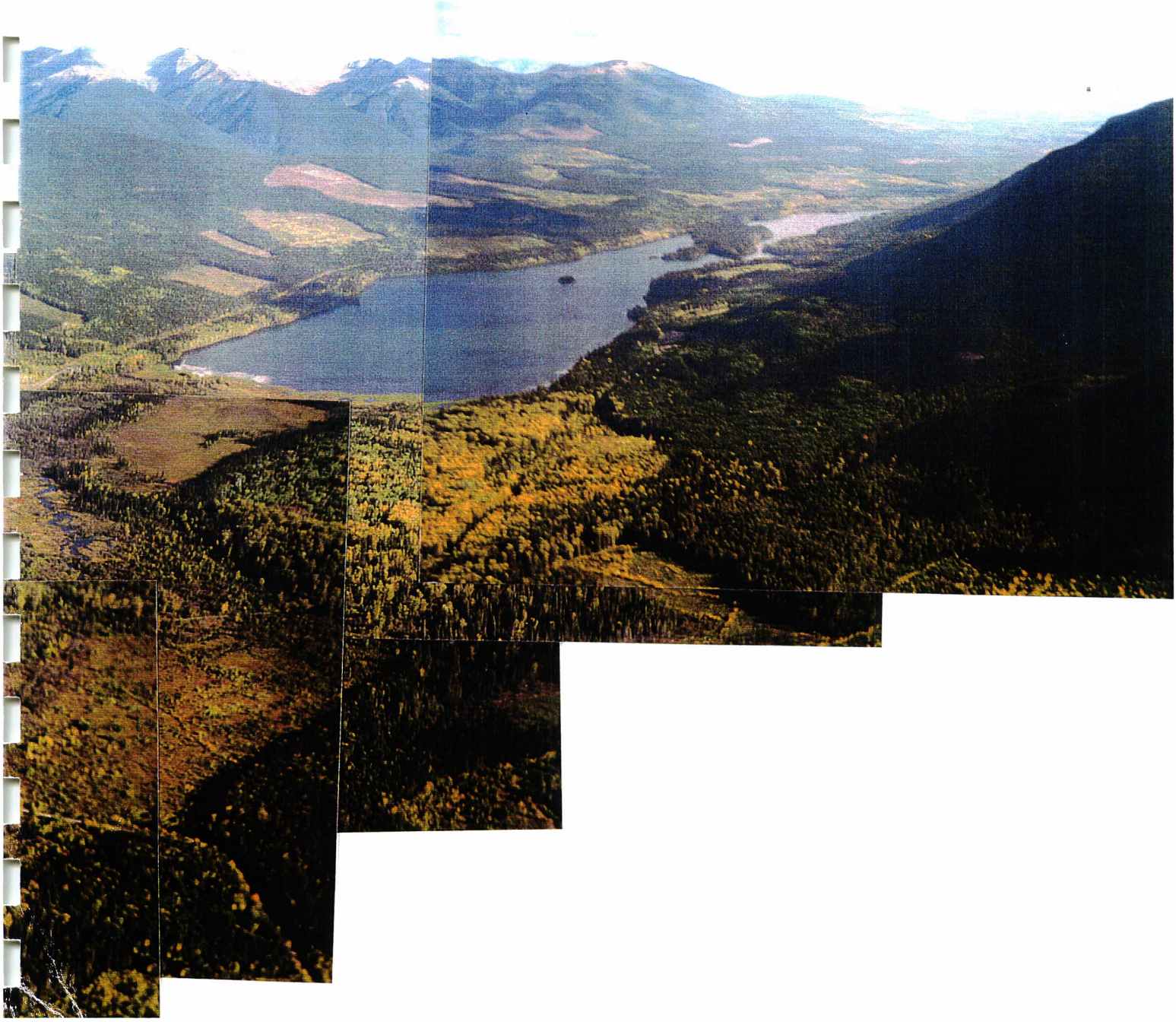

Table of Contents

Kitseguecla River WRP Project Tributary 1	Page 1
Photos	Page 3
Diagram	Page 4
Kitwanga River Tributary 15	Page 5
Photos	Page 7
Diagram	Page 8
Kitwanga River Tributary 18	Page 9
Photos	Page 11
Diagram	Page 12

Kitseguecla River WRP 1998 Site Works

Objectives
The Kitseguecla River South Tributary 1, Site 3 project is one of a series on that tributary to create and restore impacts to the fisheries resource through In-stream Restoration complexing to provide spawning, rearing, and high water refuge habitat for Rainbow Trout, Chinook, and Dolly Varden species.

FRBC **Skeena-Bulkley Region**/ MoELP
Skeena Region/ MoF Prince Rupert Region

Authors
Bill Fell

Proponent
Gitsegukla Band Council

Watershed
Kitseguecla River

Location
Tributary 1 is 15 kilometers upstream from the confluence of the Kitseguecla River with the Skeena River, accessed at 17 kilometer on the Kitseguecla FSR 200.

Introduction
The Kitseguecla River, ranked fourth in the Kispiox Forest District for timber and bio-diversity values, contains some rare ICH ecosystem variants and high fisheries values. Low present stocks are a result of both fishery impacts and logging related impacts. Tributary 1 had been extensively logged just prior to a 100-year rainfall event, which significantly altered natural recovery opportunities for fish stocks. The stream channel has a narrow wetted width for the channel width, a gradient less than 5%; cobble-dominated substrate and fair gravel quantities, with poor pool frequency and Large Woody Debris ratios.

Assessment and Prescription
Overview assessment in 1995 named the Kitseguecla River South sub-basin the highest priority watershed for stream assessments. Impacts included collapsed bridges, perched culverts, sediment wedges upstream of these structures with no stumps showing, lost stream complexity and cover, and logged riparian area. The site works in this report pertain to one of the bridge sites where the complexity is addressed one year after removal of the structure and abutments through WRP Upslopes remedial works. The channel and cross section surveys were completed for site design, approvals were issued and works were initiated in September 1998. Streambank sill logs, thalweg flow-direction/angled partial span logs, and channel spanning logs were to be installed to complete a minor component of the required works and to demonstrate technical expertise of the Gitxsan Nation/ Gitsegukla Watershed Restoration Crew.

Rehabilitation Work
Pre-work visits produced recommendations to be incorporated into works. Specifically, debris catchers were added as upstream facing 1.5 meter posts, inserted at a <30% angle into the stream bank, at 3 to 5 meter intervals along areas with stumps or low root holding power. A determination not to cable logs was based on the soils and materials on site, esthetics, and in order to minimize the risk of impact to downstream resources in the event that cabled materials were to increase the likelihood of a larger failure during peak event situations. Logs with root wads attached were supplied by a Ministry of Highways field crew clearing a gravel pit, under permit from Ministry of Forests, and hauled by a self-loading logging truck. Pre-trimming the roots and tops for highway safety is much easier before the logs are loaded! Although cedar logs appeared to be a good choice for longevity of works in an area with low recruitment for the next 100 years, few branches survived the loading and skidding process of staging materials. The tops of stems were used for debris catchers as shown in figure 3 because stems over 15 meter log length require a pilot vehicle. Access requirements were minimal as streamside logging created access to the

creek, and low complexity provided streambed access outside the wetted width for placement of the stems. Stems were placed to provide complexity, and to direct stream-flow towards the thalweg. The stems generally face downstream and are full length trees of .4 meter DBH or bigger. Monitoring and evaluation of the works will be facilitated by markers placed at surveyed sites during the as-built survey with a total station. Stream bank, substrate, and channel morphology changes will be measured from these permanent markers annually and after events.

Equipment
A 1997 EX200 Hitachi excavator with biodegradable hydraulic fluid was towed to the site with a tandem axle dump truck (4WD). Cable and winches tensioned geotextile sediment traps in stream. Clean-up tools, seeding tools, and positioning winches were also used.

Cost Summary
Prescription and drawings $4200,
Equipment and materials (20pcs w/ roots) $8300,
Project Management/reports $1650

Production Estimates
One 80 m. site, a road crossing a stream, was rehabilitated, including stream complex work for rainbow, chinook, and dolly varden char. Production estimates from LWD placement are 9.3fold for Chinook, 2.3fold for Steelhead, and 1.3fold for Dolly Varden char.

Proposed Work
Further complexing includes LRD and LWD for the above species and channel stability on 800meters of channel in this tributary sub-basin.

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References
Kitseguecla River South Level 1 Detailed Assessment, BioLith Ltd., 1997; Kitseguecla River WRP Report 1998 (in progress).

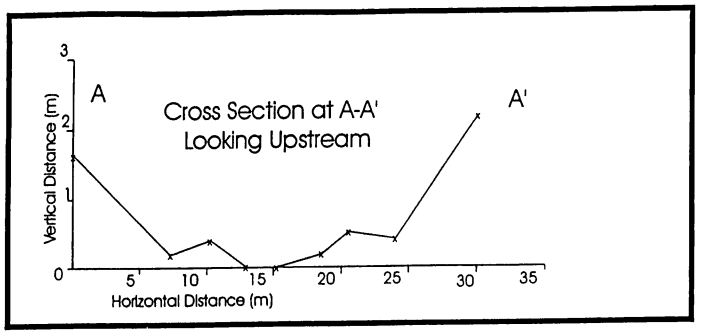
Kitseguecla River 1998 WRP
Compendium Photo Captions

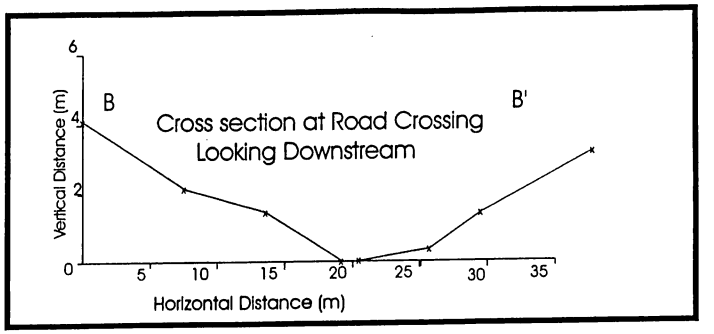
Photo 1. Kitseguecla trib 1 looking downstream before pullback.

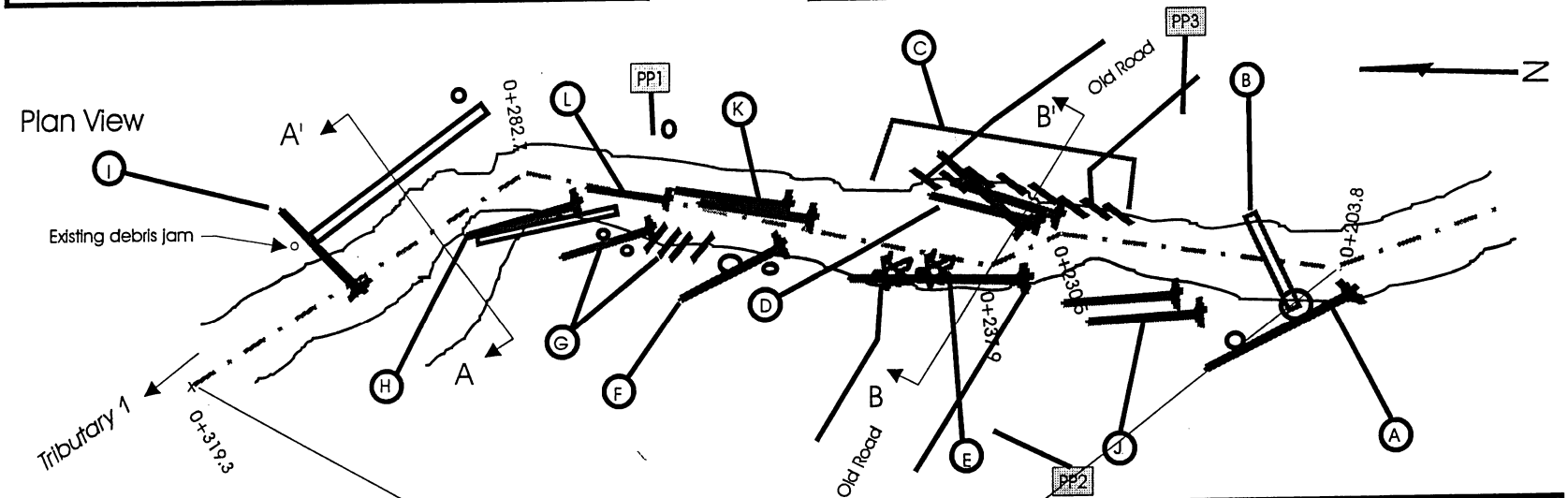
Photo 2 installing silt fence.

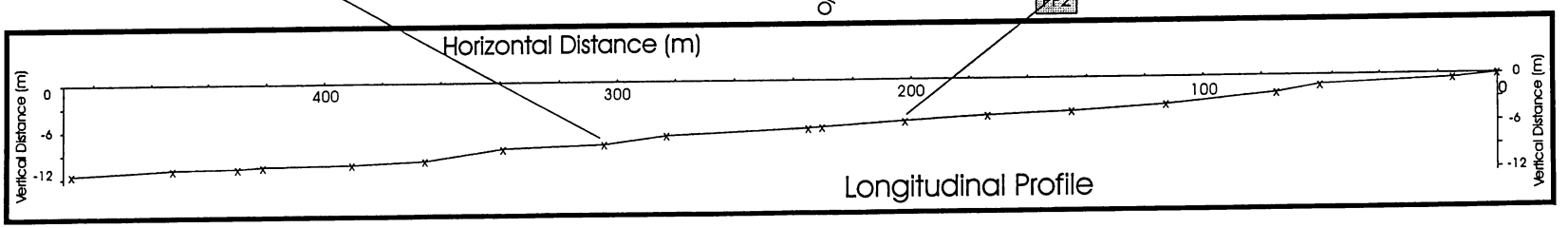
Photo 3 looking upstream after pullback of the collapsed bridge. The foreground shows a thalweg formed around a collapsed bridge structure removed during 1997. The sediment wedge in the upper right of the photo was deposited above the bridge in a 1 in 100 year event and is considered stable.

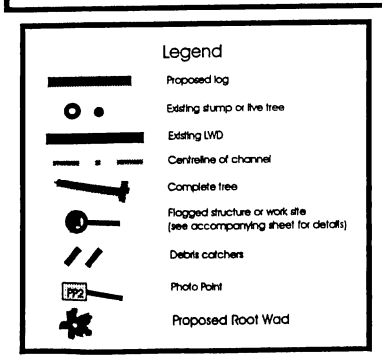
Photo 4 Aerial view of installed stems. Upstream is to right side of photo right.











Total Materials Required
- 14 complete trees (>40 cm diam. x >8 m long)
- 1 log (>40 cm diam. x >6 m long)
- 12 debris catchers (~0.2 m diam. x >2 m long)
- 2 root wads

In addition to these materials, it would be helpful to have an extra couple of trees and approximately 6 logs for additional complexing if desired.

Scale: 1:400	Gitsegukla River WRP
Drawn by: G.Grieve	Prescription Site 3
Source: Field Survey	Construction Drawing
Date: September 27, 1998	

Gitsegukla River - Prescription Site 3

List of Structures

General Instructions:
Where trees are specified, they should be >40 cm DBH and >8m long, with root wad intact.
Logs should be >40 cm diameter and >5 m long

Flagged Structure or Work Site Identifier	Distance from mouth (m)	Description	Objective/Expected Benefit
A	0+005	Place tree, with root wad u/s of debris jam and bole u/s of existing stump at 326 degrees. Anchor to stump.	Increase sinuosity; deflect water north (toward right bank) to protect north bank from further erosion and generate scour around root wad.
B	0+010	Place log across channel at 244 degrees. Jam under existing stump on south bank. Embed the other end into the north bank by hand. Log should be oriented horizontally.Remove some of the rocks in the channel by hand to embed the log to at least 1/2 its diameter.	To trap spawning gravels and create a scour pool below.
C	0+015.2 to 0.39.9	Pull bank back to <60% slope.	To remove finer granular road material, more closely approximate the natural angle of repose of this material and thereby reduce erosion.
		Drive a series of ~ eight 20 cm diameter x 2 m long debris catching posts into the north bank at 3 m intervals, protruding u/s at ~ 0.3 m above the current water level.	To catch debris to act as bank armour to prevent erosion.
D	0+025	Place two ~ parallel trees with root wads u/s and boles .at ~34 degrees. Place another tree on top of the other two, with root wad d/s of the others. Anchor together.	To deflect water toward south bank and to produce scour around root wads.
E	0+029	Place tree with root wad against south bank & u/s and bole at 20 degrees and d/s, resting in notch in existing log. Anchor both ends. Place two root wads into existing pool.	To protect the south bank from erosion and to provide cover habitat.
F	0+038.6	Place tree with root wad u/s in channel and bole against u/s side of existing stump on south bank and at 320 degrees. Anchor to stump.	To provide cover habitat.

Gitsegukla River - Prescription Site 3			
List of Structures			
General Instructions: Where trees are specified, they should be >40 cm DBH and >8m long, with root wad intact. Logs should be >40 cm diameter and >5 m long			
Flagged Structure or Work Site Identifier	Distance from mouth (m)	Description	Objective/Expected Benefit
G	0+052.7	Drive a series of ~ eight 20 cm diameter x 2 m long debris catching posts into the north bank at 3 m intervals, protruding u/s at ~ 0.3 m above the current water level.	To catch debris to act as bank armour to prevent erosion.
•		Place tree with root wad u/s and against west bank and bole against u/s side of 20 cm DBH live hemlock (the hemlock furthest d/s of the two trees). Anchor to the hemlock.	Deflect water to east and produce scour around root wad.
H	0+062	Place tree with root wad in existing small pool and bole at ~340 degrees and resting on the floodplain that starts at 0+065.	To deflect water to east and produce scour around root wad.
I	0+093	Place tree with root wad in stream and tight against east bank and bole on east bank at 44 degrees and u/s of existing debris jam. Anchor to existing ~0.75 m diameter log.	Create scour pool and provide cover habitat.
J	0+012	Place two trees on western bar at 352 degrees with root wads u/s. Tie together.	Stabilize existing bar and encourage regeneration of trees.
K	0+034	Place two trees on island with root wads u/s and boles at 26 degrees. Tie together.	Stabilize existing bar and encourage regeneration of trees.
L	0+054	Place 1 tree on island, root wad u/s and bole at 360 degrees.	Stabilize existing bar and encourage regeneration of trees.
Seed disturbed areas with grass. Plant alder and cottonwood cuttings.			

Kitwanga River WRP 1998 Site Works

Objectives
The Kitwanga River South Tributary 15, Site 14 objective is to create habitat and restore the fisheries resource through In-stream Restoration complexing which will provide spawning, rearing, access and habitat.

FRBC **Skeena-Bulkley Region/** MoELP
Skeena Region/ MoF Prince Rupert Region

Authors
Bill Fell

Proponent
Gitsegukla Band Council

Watershed
Kitwanga River

Location
Tributary 15 is 22 kilometers upstream of the confluence of the Kitwanga River with the Skeena River, accessed at 22 kilometers north of Kitwanga on Highway 37 North.

Introduction
The Kitwanga River South sub-basin is a broad valley with glacial lacustrine deposits on mid and upper benches in the U-shaped valley. Fine soils give way to rocky sedimentary outcrops at higher elevations in the rounded Bulkley Ranges. Logging, settlement, highway 37, and fire impacted the CWH and ICH forests of the sub-basin during the last 80 years. Fisheries values are very high with resident and salmon species occupying Kitwanga Lake and River. Kitwanga South is 22 kilometers of low gradient mainstem, including 5 reaches in the portion of the watershed below the lake to the mouth at the Skeena River. Tributary 15 portion treated in this report is the 20 meters below a culvert at Highway 37 North. Lower and mid benches on the Kitwanga River were burned early in the century, and upper benches were logged just prior to a 100-year flood event, which significantly altered natural recovery opportunities for fish stocks by removing LWD and destablising stream channels. The stream channel has steep sides, a gradient of <3%; gravel-dominated substrate with poor pool frequency and poor Large Woody Debris ratios.

Assessment and Prescription
Detailed Assessment of Streams in this sub-basin was completed in 1997, revealing significant access barriers to fish migration at the Highway 37 culverts throughout the sub-basin. A committee including Ministry of Highways, Ministry of Environment, Lands and Parks, and Department of fisheries and Oceans was struck to deal with this problem. The tributary 15 was prescription for back-watering the culvert and complexing the stream channel. The mouth of the tributary is at the surface height of the Kitwanga River at moderate flows. Flow direction through placement of a full span log without root wad was prescribed to increase sinuosity and to define the channel development pattern. Pullback of over-steep stream-banks was prescribed. LWD was prescribed to increase the step pool frequency and improve complexity for coho, steelhead, cutthroat and Dolly Varden. A hydrologist assessed the stability of the stream to assure retention of stream works.

Rehabilitation Work
The excavator hired to perform pullback did not require access below the upper bench. Permission to carry out works was acquired from MoF, DFO, MoELP, Ministry of Highways, BC Hydro and BC Tel. The pullback was prescribed to create stability on the oversteep banks and let in light without disturbing the riparian vegetation. The single stem placed in the stream was anchored with rock and dug into the bank at an angle. Pullback was spoiled at the site, all disturbed areas were seeded, and a silt fence was installed. Photo points and monitoring peg locations were established in as-built drawings.

Equipment
A 1997 EX200 Hitachi excavator with biodegradable hydraulic fluid was towed to the site with a tandem axle dump truck (4WD). Polaskis and shovels were used to dig in the LWD. Rock was placed by hand using a dolly. Clean-up tools and seeding equipment were used.

Cost Summary
Prescription and drawings $1200,
Equipment and materials $2400,
Project Management/reports $700

Production Estimates
Twenty meters of stable, habitat complexity produced 2.6fold coho, 2.3fold steelhead, 1.4fold cutthroat and 1.3fold Dolly Varden increases.

Proposed Work
Further complexing includes LRD and LWD for the above species and channel stability on 200meters of channel in this tributary sub-basin.

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References
Kitwanga River South Level 1 Detailed Assessment, BioLith Ltd., 1997; Kitwanga River WRP Report 1998 (in progress).

Kitwanga River 1998 WRP Photo/Caption Site 14, Tributary 15 Reach 1

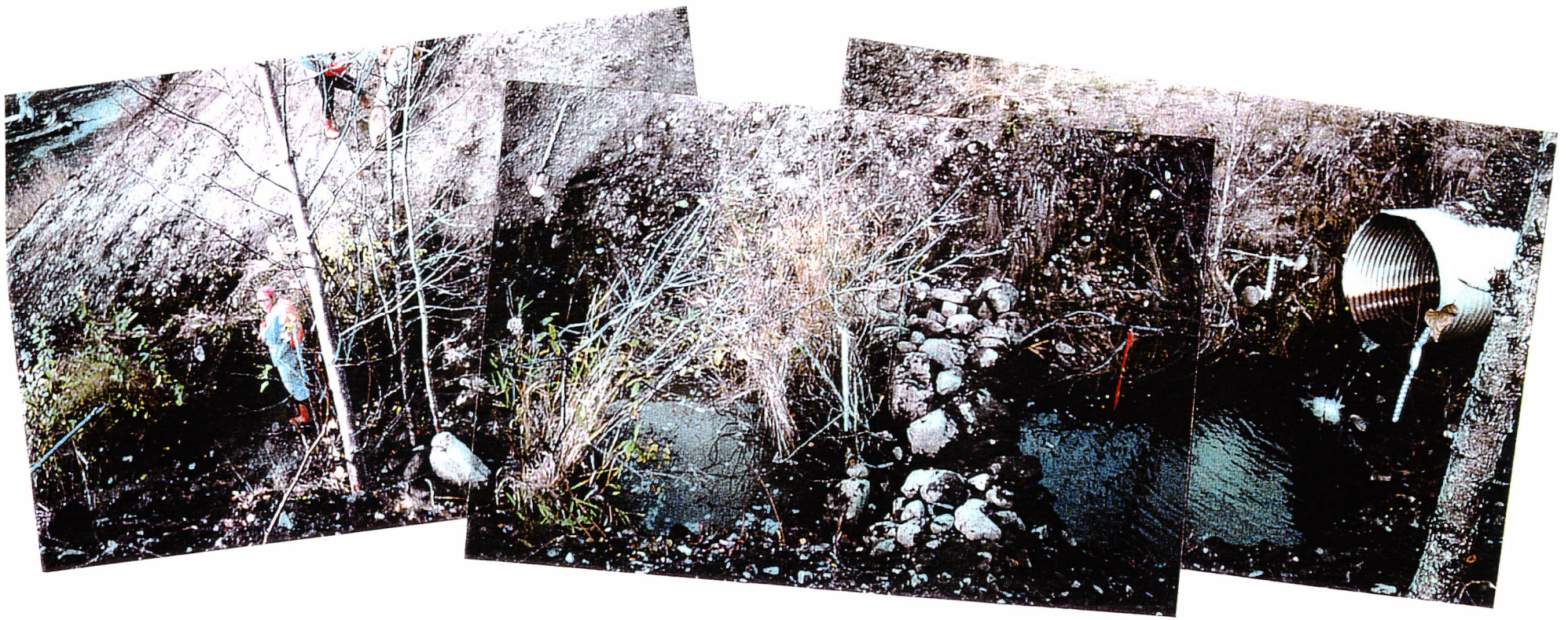
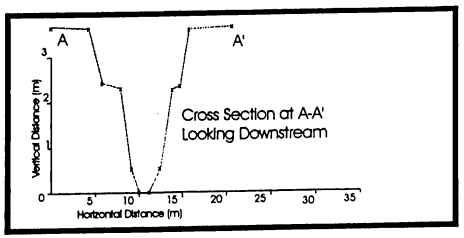
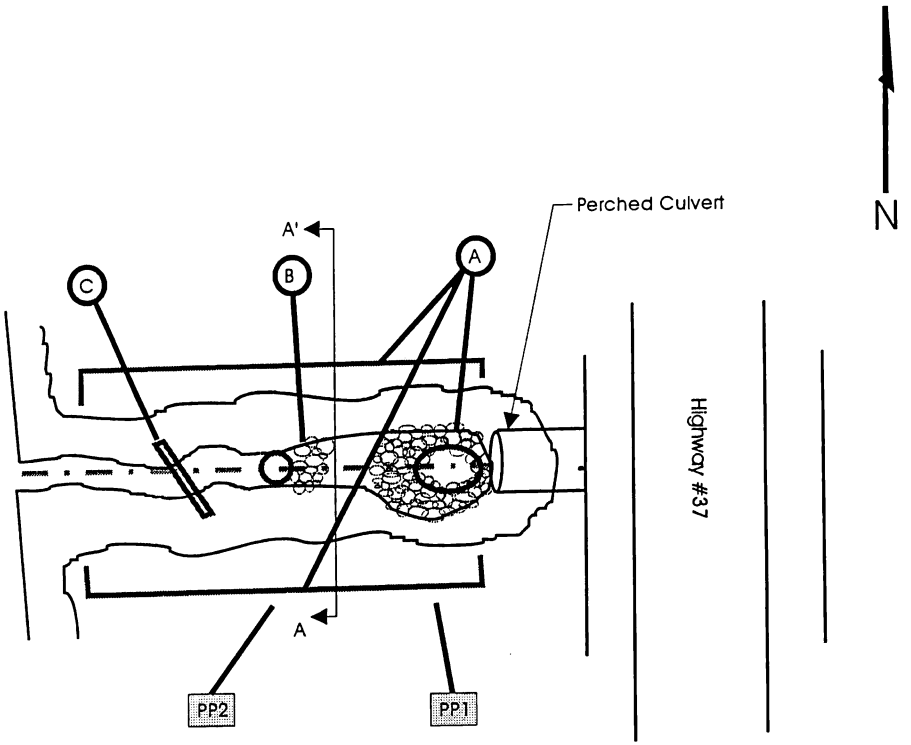


Photo caption of Site 14 shows the two jump pools constructed and the LWD being installed by hand below the pools. The pullback above the site was completed to open the area to light without removing the riparian vegetation or the stream bed. The area was seeded and a silt fence installed.



Kitwanga River



Legend

- Centreline of channel
- F — Flagged structure or work site (see accompanying sheet for details
- PP2 — Photo Point
- Proposed log weir
- Proposed rock structure

Scale: 1:200	Kitwanga River WRP
Drawn by: G.Grieve	Prescription Site 14
Source: Field Survey	Construction Drawing
Date: September 27, 1998	

Kitwanga River - Prescription Site 14			
List of Structures			
Flagged Structure or Work Site Identifier	Distance from d/s end of highway culvert (m)	Description	Objective/Expected Benefit
A	0+003 to 0+019	Pull back both banks to <60% slope. Plant with grass seed and cuttings from cottonwood, alder and willow.	To stabilize banks and prevent erosion of fines from old road bed into creek and river.
	0+003	Excavate scour pool under the culvert to deepen it by >0.75 m.	To deepen the plunge pool to allow easier jumps.
	0+003	Armour the banks of the scour pool with locally available rocks (20 cm intermediate diameter)	To reduce erosion of banks when this area is backwatered by a weir d/s.
B	0+005.3	Construct rock weir ~0.5 m higher than scour pool crest and at 240 degrees, using locally available rock. Leave a ~0.5 m deep x 0.4 m wide notch in the weir.	To raise the water level under the highway culvert to lower the effective jump height.
	0+005.8	Excavate existing scour pool below weir by >0.5 m.	To provide deeper jump pool.
C	0+011	Embed log weir into channel bottom and banks at 148 degrees. Orient horizontally.	To catch sediment for spawning DV or CT.

Kitwanga River WRP 1998 Site Works

Objectives
The Kitwanga River South Tributary 18, Site 15 project is one of a series on that tributary to create and restore the fisheries resource through In-stream Restoration complexing to provide spawning, rearing, and high water refuge habitat.

FRBC Skeena-Bulkley Region/ MoELP
Skeena Region/ MoF Prince Rupert Region

Authors
Bill Fell

Proponent
Gitsegukla Band Council

Watershed
Kitwanga River

Location
Tributary 18 is 24 kilometers upstream of the confluence of the Kitwanga River with the Skeena River, accessed at 24 kilometer north of Kitwanga on Highway 37 North.

Introduction
The Kitwanga River South sub-basin is a broad valley with glacial lacustrine deposits on mid and upper benches in the U-shaped valley. Fine soils give way to rocky sedimentary outcrops at higher elevations in the rounded Bulkley Ranges. Logging, settlement, highway 37, and fire impacted the CWH and ICH forests of the sub-basin during the last 80 years. Fisheries values are very high with resident and salmon species occupying Kitwanga Lake and River. Kitwanga South is 24 kilometers of low gradient mainstem, including 5 reaches, basically the portion of the watershed below the lake to the mouth at the Skeena River. A mill was located 4 kilometers upstream of Site 15 on Tributary 18 during the 1970s. The portion of Tributary 18 treated in this report is the 50 meters below a culvert at Highway 37. Lower and mid benches were burned early in the century, and upper benches were logged just prior to a 100-year flood event, which significantly altered natural recovery opportunities for fish stocks by removing LWD. The stream channel has a narrow wetted width for the channel width, a gradient less than 3%; gravel-dominated substrate with poor pool frequency and poor Large Woody Debris ratios.

Assessment and Prescription
Detailed Assessment of Streams in this sub-basin was completed in 1997, revealing significant access barriers to fish migration at the Highway 37 culverts throughout the sub-basin. A committee including Ministry of Highways, Ministry of Environment, Lands and Parks, and Department of fisheries and Oceans was struck to deal with this problem. The tributary 18 culvert is high on the list for remedial action. Although the committee was struck after prescription for back-watering the culvert and complexing the stream channel, only the stream complexing was allowed to proceed. The mouth of the tributary is at the surface height of the Kitwanga River at moderate flows. During Kitwanga high water flows the site is ideal refuge for all species of salmon found in the Kitwanga River. The Tributary 18 high water events have caused bank erosion on the north bank of the tributary at the mouth of the creek. Large stem placement with root wads upstream were prescribed to stabilize the bank, and debris catchers prescribed to: a) collect small woody debris, b) slow water flow, and c) enhance and protect the vegetation recovery already taking place at the base of the eroded bank. Flow direction through placement of partial and full span logs with root wads was prescribed to increase sinuosity and to define the channel development pattern. Pullback of over-steep stream-banks was prescribed. LWD was prescribed at 10-meter intervals to increase the step pool frequency and improve complexity for coho, steelhead, cutthroat and Dolly Varden. A hydrologist assessed the stability of the stream to assure retention of stream works.

Rehabilitation Work
A self-loading logging truck carried logs to the site along the Kitwancool access road below the Highway. The excavator hired to place the LWD did not require access below the lower bench. The access route to the pullback prescribed for a lower bench would have impacted the riparian vegetation on the opposite side of the creek. As the alternative was to cross the stream near the end of the window for works, and we were restricted from disturbing sediment during the pink spawning period, the pullback was determined to be detrimental for the site. The stems placed in the stream were anchored only where they were determined to be inherently unstable or where the stems were less than 1.25 times high-water channel width. LWD placed parallel to the stream were grouped together in two and three stem "rafts". The configuration of parallel stems was triangulated to a channel spanning stem and tied using Hemp Rope. Spacing blocks were used to fill the interstices created by root wads. All disturbed areas were seeded. Photo points and monitoring peg locations were established in as-built drawings.

Equipment
A 1997 EX200 Hitachi excavator with biodegradable hydraulic fluid was towed to the site with a tandem axle dump truck (4WD). Cable and winches tensioned geotextile sediment traps in stream. Clean-up tools, seeding equipment, and positioning winches were used.

Cost Summary
Prescription and drawings $2850,
Equipment and materials (20pcs w/ roots) $7400,
Project Management/reports $1700

Production Estimates
Fifty meters of stable, high water refuge, complexity produced 2.6fold coho, 2.3fold steelhead, 1.4fold cutthroat and 1.3fold Dolly Varden increases.

Proposed Work
Further complexing includes LRD and LWD for the above species and channel stability on 200meters of channel in this tributary sub-basin.

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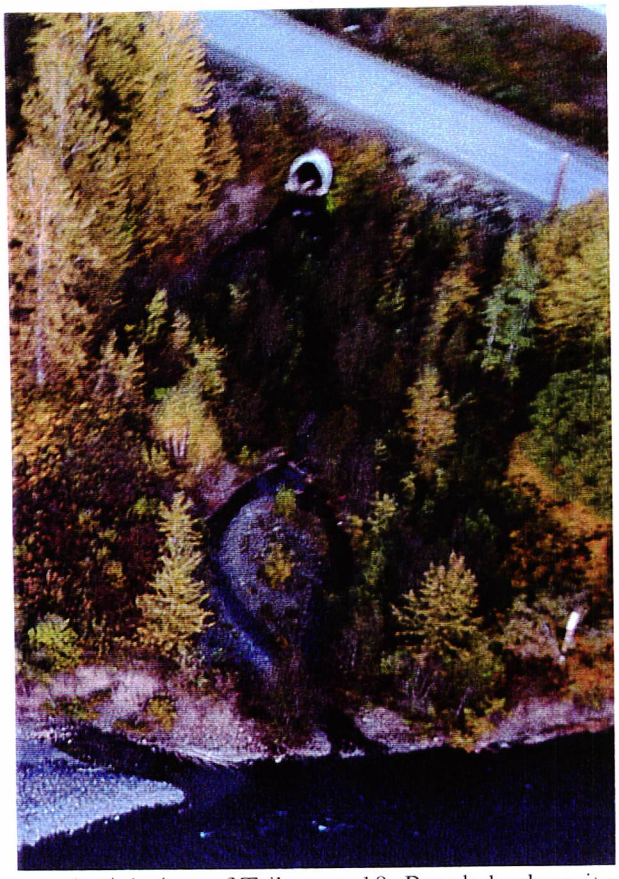
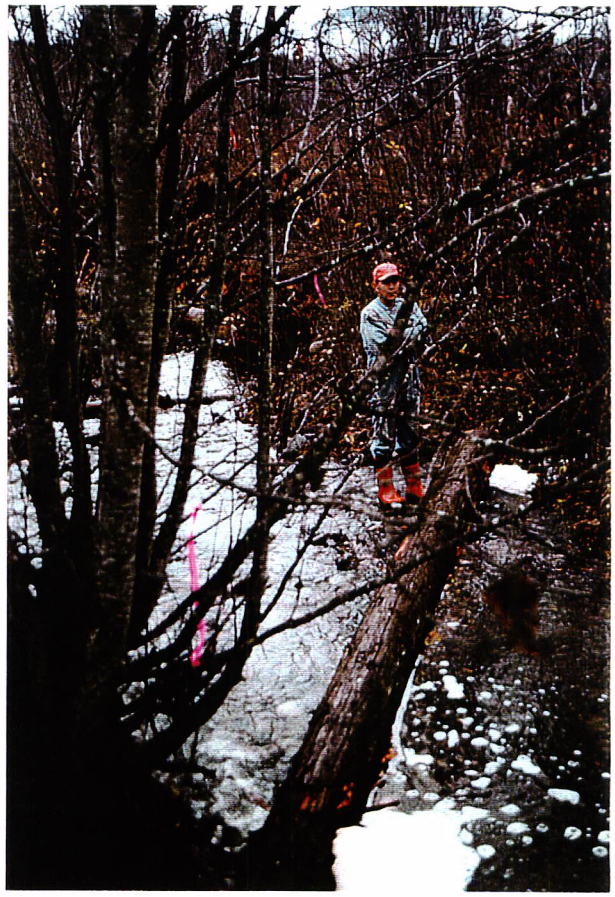
References
Kitwanga River South Level 1 Detailed Assessment, BioLith Ltd., 1997; Kitwanga River WRP Report 1998 (in progress).

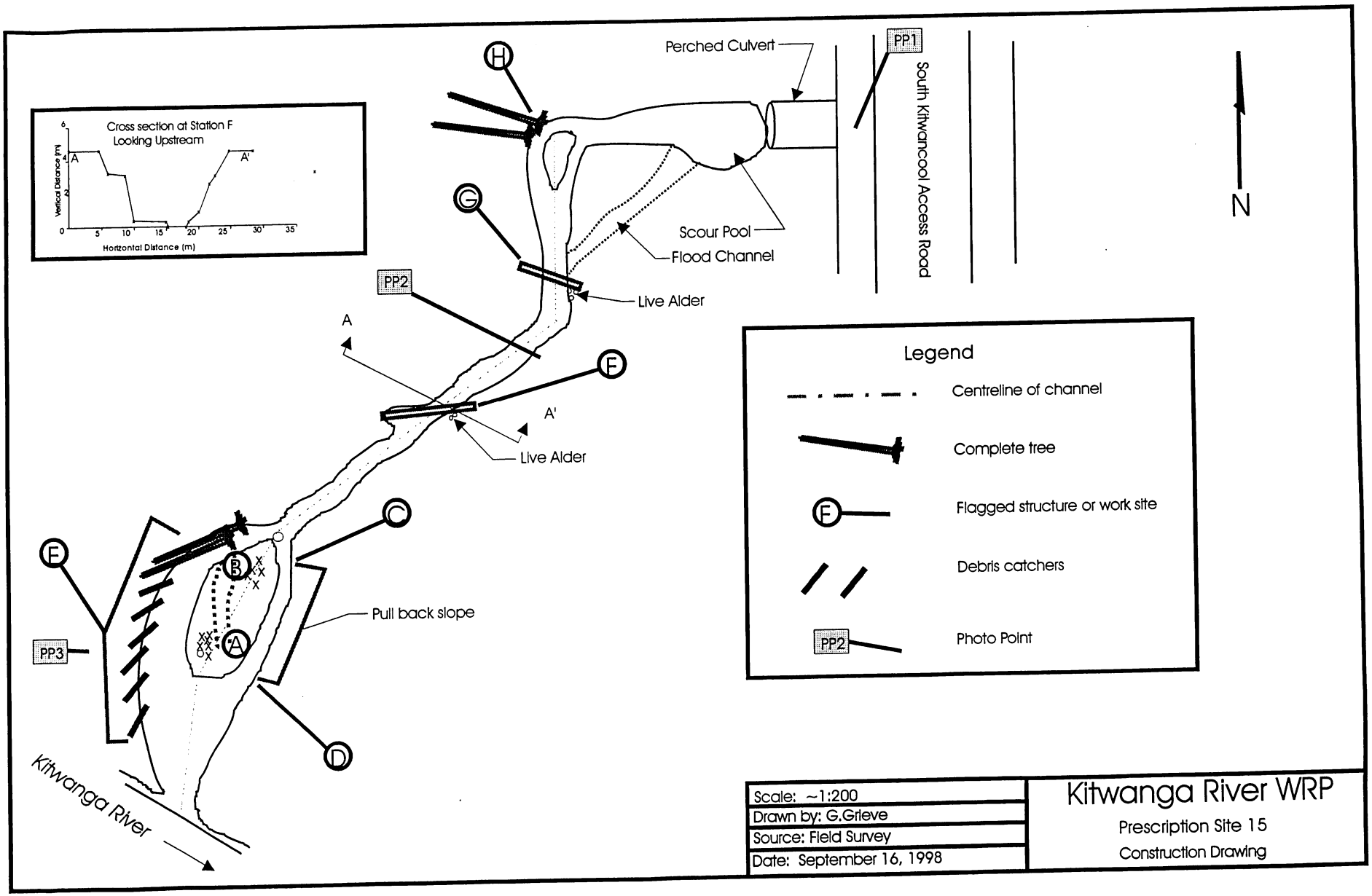


Aerial view of Tributary 18, Reach 1 where it enters the Kitwanga River. The Works were installed between the mouth and the culvert. Above

Site 15/Photo 2. Installed works from photo station 1. Workers are tying down the stems placed to control high water erosive forces. The log in the center of the photo is the log in Photo 3. Above

Below
Site 15/Photo 3. Installed channel span LWD provides cover, and backwater for sediment trap and step pool development. The log was placed with a winch and roller logs, and anchored with rock.




Cross section at Station F
Looking Upstream
Vertical Distance (m)
Horizontal Distance (m)
A
A'
Perched Culvert
PP1
South Kitwancool Access Road
N
Scour Pool
Flood Channel
Live Alder
PP2
A
A'
Live Alder
Pull back slope
PP3
Kitwanga River
Legend
Centreline of channel
Complete tree
Flagged structure or work site
Debris catchers
Photo Point
Scale: ~1:200
Drawn by: G.Grieve
Source: Field Survey
Date: September 16, 1998
Kitwanga River WRP
Prescription Site 15
Construction Drawing

Kitwanga River - Prescription Site 15			
List of Structures			
Flagged Structure or Work Site Identifier	Distance from mouth (m)	Description	Objective/Expected Benefit
A	12.9	Dig a channel 1.5 m wide and 0.5 m deep by hand from A to B to encourage water to flow through the sediment bar and away from the northern bank.	Increase sinuosity, protect north bank from further erosion.
B	19.1	Same as above	
C	18.5	Pull back bank from C to D to <60% slope using a small machine.	Reduce further erosion of bank and deposition of fines into stream.
D	11	Same as above	
E	5.0 to 23.7	Place two complete trees with root wads upstream to deflect water to the south. Also place debris catchers into bank from here downstream to end of the eroding bank on the north.	To protect the north bank from further erosion
F	34.4	Place a log (>40 cm diameter, > 5 m long) into channel bed. Embed the log into the substrate such that it is horizontally oriented and its d/s end is embedded into the existing small bay on the west.	To produce a scour pool below and catch spawning gravel above the log.
G	45.5	Place a log (>40 cm diameter, >5 m long) into channel. Embed it inot the stream bed with its end upstream of the live alder clump on the east and the other end descending slightly and u/s to the west bank.	To produce a scour pool below and catch spawning gravel above the log.
H	54.8	Place two complete trees with root wads to the east and on the west bank such that they deflect water to the south.	To dissipate energy directed into the flood channel to the west.
Plant disturbed areas with grass and cuttings from alder, cottonwood and willow.			