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KILLUTSAL CREEK REARING POND ENHANCEMENT

Kitsumkalum Band Council

BC hydro

BRITISH COLUMBIA

Skeena

FOREST RENEWAL BC

FISHERIES RENEWAL BC

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Killutsal Creek Rearing Pond Enhancement

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EXECUTIVE SUMMARY

With funding provided by Fisheries Renewal BC, and with the assistance of many organizations and individuals, the Kitsumkalum Watershed Restoration Program successfully performed instream channel and rearing pond habitat in Killutsal Creek, a highly productive stream located within the 100-year flood plain of the Lakelse River system. Killutsal Creek has been heavily impacted by forest harvesting, road build, utility corridor construction, and heavy beaver activities leading to seasonal flooding of White Creek Road and often stranding juvenile salmonids.

To divert Killutsal Creek high stream flows away from White Creek Road and eliminate negative conflicts with fish and motor vehicle traffic on the road, two low-lying berms were constructed. As well, the construction of an alcove-channel and complexing of and upper and lower pond provide 4180 m^2 of new rearing habitat for salmonids. Riparian planting of grass and trees between the upper and lower ponds adjacent to the road will provide bank stability and future cover for shade. This amount of rearing habitat is expected to provide considerable benefit to coho and other salmonids. It is estimated that the increase in rearing habitat will result in 4222 more fry and 284 more adults annually.

Monitoring of these works is planned between 2001 and 2005. Monitoring will include water quality, water levels, observing negative beaver activity and enumeration of adult escapement and juvenile rearing fish populations.

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Background

The Lakelse is a prized recreational area both locally and regionally. Many small and large creeks enter the river along its 14-km length and fish values in these creeks are exceptionally high. As a result of forest harvesting, road build, and utility corridor construction, fish habitat in Killutsal Creek has been compromised in this highly productive small fish-stream.

The White Creek Road, constructed within the 100-year flood plain of Lakelse River, was also built over the Killutsal Creek alluvial fan. The road location has restricted the creeks' natural tendency to migrate over the fan. Due to logging, and brushing practices associated with the utility corridor maintenance, the area has become heavily populated by beaver colonies.

As a consequence, reduced levels of fish access, increased channel instability, and seasonal flooding of the White Creek Road have occurred (Figure 1). More over, as the seasonal floods receded they isolated large numbers of juvenile fish on the far side (southwestern) of the White Creek Road where they became stranded resulting in high rates of juvenile mortality (Heibein, 2000). Additionally, adults have been observed spawning, and juvenile fish holding, on the road. During high water events, industrial and recreational traffic conflicts further exacerbated negative fish impacts and DFO has been forced to close the road for extended periods.

Figure 1. Killutsal Creek flows flooding White Creek Road.

Location and Description

Killutsal Creek rearing ponds are located 200 m southwest of the Lakelse River left bank approximately 2 km upstream from the rivers' confluence with the Skeena River. The UTM coordinates are 9.50515496.6032361. The Killutsal Creek drainage encompasses a 4 km^2 area and is a low elevation watershed. The project area is located within a section of low-lying fluvial flood plain (100-year) of the Lakelse River.

The project is located on private TFL scheduled 'A' property, and BC Hydro/Pacific Northern Gas utility corridors. Access to the site is via two forest roads. The site can be easily reached by traveling west on the White Bottom Main FSR and turning left onto the White Creek Road a short distance after crossing the Lakelse River Bridge. The project is located one-half kilometer along this road. Figure 2 shows the location of Killutsal Creek in relation to the Lakelse watershed and the Province.

Figure 2. Location of Killutsal Creek Rearing Pond Enhancement Project

OBJECTIVES

Although there are a range of benefits resulting from the construction of the Killutsal Creek Rearing Ponds, the two main objectives (Bolton and Reese-Hansen, 2000) of the project were to:

1) Divert Killutsal Creek high stream flows away from White Creek Road by constructing a series of berms and thereby eliminating or reducing associated negative conflicts between fish, the road, and motor vehicle traffic on the road, and

2) Increase fish rearing habitat by developing approximately 3200 m^2 of pond area and constructing a series of low berms and beaver -control structures designed to allow anadromous salmonids and resident fish migration while deterring beaver activity that would direct water and fish species onto the road.

METHODOLOGY

Construction of the project began in early September 2000 and was concluded by the end of the month. An experienced project supervisor was onsite at all times during construction. Project supervisors included: Rheal Finnigan (BCCF), Lars Reese-Hansen (KWRP), and Rob Hiebien (DFO).

Assessment and Prescriptions

The initial concept for the Killutsal Creek Rearing Pond Enhancement Project was developed by MELP and the BC Conservation Foundation (BCCF) in 1999. The following year the KWRP assumed responsibility for the watershed restoration program in the Lakelse Lake watershed and continued to develop the project along with MELP and DFO.

Prior to implementation of the works at Killutsal Creek, DFO and KBC staff conducted a 1:500 scale total-station survey. KBC staff also recorded soil overburden depths randomly throughout the site and at intervals along proposed dam locations using a calibrated 2 m long by 12 mm diameter stainless steel rod. Based on the soil depth data collected, it was concluded that a deep layer of clean granular (alluvial) soil was present below a shallow layer of organic overburden

Rheal Finnigan, a Professional Engineer with the BCCF, in concert with staff from the DFO, developed a project design suitable for regulatory approval. The initial design involved a series of three low-lying ponds with beaver-control outlet structures. The proposed ponds were to be located adjacent to the northeast side of the road in such a fashion that Killutsal Creek would flow through the ponds and northward away from the road and toward the Lakelse River. The land tenure where the project is located includes: private schedule “A” TFL property, an

electrical transmission line corridor, and a natural gas pipeline corridor. (Refer to Appendix I for a copy of the original design/plan)

KWRP staff developed an implementation work plan based on the design, procured BC Water Management and DFO regulatory approvals on behalf of the landowner, and completed all pre-project preparations required prior to initiation of construction.

Equipment

A 270 ELC John Deere was used in the construction of the berms, and ponds, and to load dump trucks. A Hitachi EX160LC-5 was used for finishing work. Four tandem axle dump trucks were used to import berm materials and a John Deere 450-Crawler tractor was used to spread and build the sections of berm adjacent to the road.

Fish Salvage

Silt fencing was used to minimize sediment releases into Killutsal Creek during construction. All wetted areas subject to construction activity were extensively fish salvaged using Gee traps and an electroshocker prior to disturbance.

Berm and Pond Construction

PNG monitoring personnel were on site during some minor channel modifications and roadway ditch line excavation over their gas pipeline. A requirement for BC Hydro personnel to monitor construction activities while under the transmission line was not necessary due to changes in project design during the construction phase.

Construction of the project commenced at the up stream end of the project area and proceeded down stream. The main channel of Killutsal Creek was diverted northward away from the road and into a historic channel. This isolated the upper pond construction area from the creek to facilitate construction in dry conditions. The berm along the road was then constructed using materials excavated from the upper pond area.

During this initial phase, based on the preliminary data recorded when the depths of overburden were obtained, it was assumed that a deep layer of clean granular (alluvial) soil was present below a shallow layer of organic overburden. However, a relatively thin layer (0.1 m to 1.0 m in depth) of granular mineral soil was encountered below the shallow organics. Beneath this layer of granular soil was a deep fine-textured glacio-lacustrine material (fine sand and silt with a high clay content). This condition existed throughout the project area. The soils encountered required ongoing site specific modifications to the project design during each step of the implementation.

Due to the soil conditions, two major modifications were made to the originally proposed design. The first was that one of the three proposed ponds (middle) was redesigned and constructed as a long alcove-pond rather than a pond with a small amount of headwater. The second modification was that the two remaining ponds (upper and lower) were constructed to a size less than originally proposed.

All disturbed areas were isolated during construction by erecting a coffer dam around the works area to prevent: a) silt laden water from mixing with the surrounding fish-supporting water, and b) fish from entering the works area during construction. Typically, construction involved stripping overburden to mineral soils from burrow areas and the foundation of the berm. The exposed mineral soils were then used to build the berm. Once construction was complete water in the burrow pond was left until clear. The coffer dams were then slowly removed to allow the construction area to refill with fish-supporting water.

The project design indicated a key to be constructed at the base of the berms. However, after the completion of the upper section of berm along the roadway, the requirement for a key was determined to be unnecessary due to the fine texture, and depositional history, of the soils. Additionally, the soils in the location of the key tended to be well below the water table and disturbing them made the completion of the berm very difficult. To maintain a high integrity to the berm sections along the roadway, most of the soils used to build this section were imported from local borrow pits.

Berm segments constructed beyond those adjacent to the road were built using the same isolation method as described above. While constructing the dams, several techniques were employed with varying success. Only soils available within reach of the excavator were used to build these segments. Often the excavator had to be 'floated' on a corduroy road using 0.6 m (or larger) diameter logs varying in length from 7 m to 10 m (Figure 3). The local forest licensee supplied logs used for this purpose. The logs were later used as LWD in the ponds.

Due to soil conditions the middle pond was constructed, in its original location, as a back-watered alcove-channel. Excavated soils were spoiled on the down stream side of the channel. To continue to provide moisture the wetland flora below the spoils, a 12 cm PVC pipe was placed between the alcove-channel and the wet land at the channels' north end.

The project, as constructed, was determined to be suitable to provide fish access between the ponds for all species, and migration through the system. No control structures were installed. The ponds were complexed with imported LWD, LWD sourced onsite during construction, and alders displaced at the site during construction.

Re-vegetation and Riparian Planting

Cedar (*Thuja plicata*), spruce (*Picea sp.*) and hemlock (*Tsuga heterophylla*) were planted on exposed banks adjacent to the upper pond and between the upper and lower ponds adjacent to the road (see as built drawing in Appendix II for precise locations). Conifers were protected from wildlife browse using metal "chicken" wire cages, supported with wooden stakes, in a similar fashion to Vexar tubes.

As well, a grass seed mixture containing a variety of species (45% Creeping Red Fescue, 15% Tetraploid Annual Ryegrass, 10% Orchardgrass and 30% Single Cut Red Clover-Pre Inoculated Legumes) was hand-seeded on all exposed or excavated soils.

Figure 3. Corduroy road used during the pond construction.

RESULTS AND DISCUSSION

A total habitat area of 4180 m^2 was created at Killutsal Creek. Two rearing ponds (lower and upper), an alcove-channel (connected to the creek), and two long berms were required to achieve this.

The lower pond has an area of 0.181 Ha (1810 m^2) (Figure 4 and 5). It is formed by a J-shaped berm that runs west, parallel to the White Creek Road (Figure 6) and then curls north, toward Killutsal Creek and connects to a beaver dam. The dam was constructed shortly after the

completion of the project and is approximately 0.5m high and runs perpendicular across the creek at that location. The lower pond contains two small islands.

The middle alcove-channel runs northward perpendicular to the Killutsal Creek main channel and is 0.147 Ha (1470 m^2) in area. A small PVC pipe has been placed at the north end of the channel to help provide moisture to the wetland flora below spoils piles.

The upper pond is 0.09 Ha (900m^2) in area (Figure 7). Killutsal Creek runs through the middle of this pond around a large island in the center. The upper pond is formed by a berm running parallel to the road and a historical beaver dam to the north.

The resulting berm and pond construction has: improved vehicular access due to reduced fish/road conflicts, and eliminated fish stranding (which resulted in a high incidence of juvenile salmonid mortality). Appendix II provides the Killutsal Creek Rearing Ponds As-Constructed Stream Enhancement Site Plan (pond depths were estimated).

Figure 4. Excavation of the lower pond.

Figure 5. Lower rearing pond after construction. Note LWD.

Figure 6. Berm construction parallel to White Creek Road.

Figure 7. Upper pond construction adjacent to the road.

Habitat Complexing in Ponds and Channels

The upper pond/channel has been complexed with rootwads and LWD that were displaced during construction. Six LWD structures, ranging in length between 3.4 m and 13 m, and nine rootwads of various sizes were placed in the stream channel to provide cover in rearing and spawning habitat. As well, a large number of whole alder trees were placed randomly in the lower pond.

Modifications to Original Plan

Modifications were made to the original design under the direction of the design engineer present during construction. Construction of the rearing ponds at Killutsal Creek revealed unanticipated-soil conditions, which required deviations from aspects of the original design. Project objectives would have been more easily achieved if a better understanding of soils were established in advance of the start of construction. Because the soils were less than adequate for berm construction, material was end hauled to construct the berm adjacent to the road. Since the high cost of end hauling was not considered feasible, the middle pond was redesigned and constructed as a long alcove-channel rather than a pond with a small amount of headwater. Also, the upper and lower ponds were constructed to a size less than originally proposed. These modifications did not hinder the end result of the project and all objectives were successfully met.

Production Estimates

The total Killutsal Creek rearing pond area is 0.418 Ha (4180 m^2). Production estimates for coho, based on the amount of rearing habitat produced and the salmonid biostandards for production estimates, are 4222 fry, with 2884 smolts surviving and an escapement result of 284 adults per year (Koning and Keeley, 1997). Biostandards are not available for other species in side channels and off-channel ponds.

RECOMMENDATIONS

- During this project, some problems were encountered with equipment stability in unstable soils. While using a probe is an efficient means to measure soil depths, it was found that using only a probe provided misleading results. Therefore, it is recommended that a small number of machine excavated test pits be dug to confirm probing information and obtain the best possible soil information before beginning similar projects.
- Beaver activity at Killutsal Creek is extensive and will require ongoing monitoring
- The outlet to the wetland complex near Lakelse River (north end of alcove channel) requires further assessment to determine if fish access is an issue and recommend a mitigation method if necessary.
- Staff gauges should be placed in each pond to determine the fluctuation in water. Staff gauges can be simple "home-made" instruments and should be calibrated from one of the survey hubs used to survey the site and as a reference point during construction.
- The newly planted conifer species require continued monitoring to ensure that grazing does not occur. The wire cages should be checked periodically and repairs made when required. The revegetation of grass should be checked in the spring of 2001, and repeated if necessary, to ensure that the late season seeding took place.
- Dissolved O_2, conductivity, pH and temperature should be taken at several points throughout the project site to determine if suitable rearing conditions exist in the newly constructed ponds, channels and to compare the conditions of channel rearing and pond rearing. A proper methodology and specific locations should be determined with clear objectives prior to the start of measurements.
- Escapement counts of spawning anadromous salmonids, and juvenile coho population density counts, should continue over the next 5 years to establish a clear understanding of production increases over time.
- During spring high flows and flood periods (summer and fall) the road, berms, and ponds should be monitored to ensure that water is no longer running across the road.
- Logs should be placed perpendicularly on the berms to deter motorized vehicle traffic riding on the berms.

- A historic channel on the southwest side of road was identified as a good candidate for potential pond creation to create additional rearing habitat. This project should receive further consideration and assessment.
- Ensure that equipment operators are highly experienced, understand the objective(s) of project and "buy-into" (support) the project and its' objectives.
- Establish permanent photo points and take photographs from these photo points to serve as a visual aid gauge and measure changes in habitat over time.
- Use monitoring plan and schedule (see Appendix III) as a guide to complete recommended monitoring activities.

REFERENCES

Bolton, Lyle and Lars Reese-Hansen 2000 *Killutsal Creek – Rearing Pond Enhancement Project; Design, Planning, Construction, and As Built Reporting (Proposal).* Kitsumkalum Watershed restoration Program.

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APPENDIX I: ORIGINAL PRESCRIPTION FOR KILLUTSAL CREEK REARING POND ENHANCEMENT

APPENDIX II: KILLUTSAL CREEK REARING PONDS AS-CONSTRUCTED STREAM ENHANCEMENT SITE PLAN

APPENDIX III: MONITORING PLAN AND SCHEDULE

Killutsal Creek Rearing Pond Enhancement Monitoring Plan

Introduction

The purpose of this Killutsal Creek Rearing Pond Enhancement Monitoring Plan is to conduct specific routine monitoring activities necessary to: assess the present configuration and condition of restoration treatments; qualitatively assess key variables to determine whether or not the treatments have been effective in addressing the restoration objectives; determine if remedial work will be required; and identify specific areas that may require a more rigorous evaluation or investigation For more information on the KWRP monitoring program please see *Instream, Upslope and Riparian Monitoring Plan*.[3] . To review the project objectives of the Killutsal Creek Rearing Pond Enhancement Restoration Project please see the Objectives section located in this report.

Routine effectiveness monitoring of the Killutsal Creek project site will help determine whether or not these objectives were met and to what degree using qualitative and quantitative measurements and make further recommendations if required. Specifically,

- Are the berms successfully directing flows away from the White Creek Road?
- Is the risk to fish eliminated or reduced?
- Has fish rearing pond habitat area been increased to 3200 m^2?

Methodology

KWRP Technicians, with direction from a Biologist, will perform monitoring activities. To ensure that monitoring is performed consistently, a generic Routine Effectiveness Evaluation Form has been developed (attached). This will ensure that all required measurements are recorded during each visit.

[3] Sinkewicz, Kezia. 2001. *Instream, Upslope and Riparian Monitoring Plan*. Prepared by Gaia Environmental Consulting for Kitsumkalum Watershed Restoration Program.

Activities that will be used to evaluate the Killutsal Creek treatment site are as follows:

- As-built survey immediately after works are complete and in 5 years to determine if restoration treatments are still in place and if remedial work is required to repair failures that may have occurred.
- Juvenile population estimates to determine the success of fish rearing.
- Adult counts to determine the success of fish migration and escapement.
- Measure water levels using staff gauges at all flows to determine if the berms are successfully diverting flows away from the road.
- Establish permanent photo points and take photographs from each point periodically to use as a visual tracking tool over time.
- Monitor beaver activities frequently to determine mitigative procedures, if required.

Schedule

Monitoring activities at Killutsal Creek will continue from 2001 to 2005 involving frequent measurements of water levels, water quality and photographs. Periodic observations of adult and juvenile fish will be made.

Date	Task	Time Required
Early June 2001-2005	▪ Establish permanent photo points, water quality sites and install staff gauges in pools (2001 only) ▪ Take photographs from permanent photo points	1 day
Late June 2001-2005	▪ Measure water quality ▪ Check berm function and beaver activities	½ day
Late July 2001-2005	▪ Measure water quality ▪ Check berm function and beaver activities ▪ Juvenile population estimates	2 days

Late August 2001-2005	▪ Measure water quality ▪ Check berm function and beaver activities	½ day
Late October 2001-2005	▪ Adult coho counts ▪ Measure water quality ▪ Check berm function and beaver activities	1 day
Early November 2001-2005	▪ Adult coho counts	½ day
Late November 2001-2005	▪ Adult Coho counts	½ day
Mid December 2001-2005	▪ Adult Coho counts ▪ Measure water quality ▪ Check berm function and beaver activities	1 day
Late February 2002-2005	▪ Measure water quality ▪ Check berm function and beaver activities	½ day
Late April 2002-2005	▪ Measure water quality ▪ Check berm function and beaver activities	½ day