

## Taking Ownership through Stewardship

The overall success of the Windermere Creek restoration depended on positive working partnerships that provided support from early in the process. These positive results demonstrate that successful watershed restoration and management is primarily the result of stakeholder "buy-in" and support, whereas the resolution of technical issues is a secondary, although still important, consideration.

Opportunities have been identified and prescriptions developed for additional high priority Windermere Creek restoration sites, with continued financial and project support through multiple partners dedicated for 1999-2000. With potential funding limitations pending, strong stakeholder support and partnership arrangements can provide an avenue to ensure that some restoration initiatives and management processes are able to continue. The Windermere Creek Watershed management process will remain one that incorporates public participation and addresses the concerns identified by the public and stakeholders. Proposed local programs that promote local stewardship, such as Streamkeepers, Greenways and Pathways, and community-based water sampling and monitoring programs, will ensure the successful management of the watershed. Ongoing monitoring is key to evaluating the

progress and success of the project, so that future restoration strategies can be adapted accordingly.

As demonstrated for Windermere Creek, encouraging and maintaining diversified partnerships is critical to the continued success of watershed management.

**Acknowledgments:** The Ministry of Environment acknowledges with appreciation the dedication, and personal and professional commitment, of the following partners during the scope of restoration activities for Windermere Creek: Vivian Jablanczy, Slocan Forest Products-Radium Division, and Jon Bisset & Liv Hundal, Agra Earth and Environmental Limited, Cranbrook/Calgary.

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# The San Juan Watershed Agreement

*Bud Iverson and Deb Epps*

## Introduction

The San Juan Watershed Agreement establishes a cooperative and jointly managed program with the objectives of protecting, improving and replacing fish habitat and fisheries-related recreational opportunities. This agreement concerns the 665 km<sup>2</sup> drainage of the San Juan River, located on the southwest coast of Vancouver Island, approximately 80 km west of Victoria (Figure 1). The main valley lies east-west and has been eroded along a major fault line with different terrain and geology to the north and south. The south side of the drainage is composed of easily erodible sedimentary rock while the north side is composed of more stable intrusive and volcanic rock. The length of the San Juan River is just over 50 km and is composed of two distinct types of stream channel morphology. Most of the streams, particularly the headwater reaches, are steep bedrock/boulder-controlled channels. The other channel morphology type is a 1-2 km wide floodplain found in the lower 10 km of the San Juan mainstem. The floodplain contains numerous

wetlands relic channels and small low gradient minor tributaries (Griffith, 1997).

The agreement for the San Juan Watershed recognizes both the economic and social values provided by forest management, and also that fulfillment of private property rights includes protection of publicly-owned environmental values such as fisheries, water quality and quantity. It was signed on August 1, 1995, and will terminate on December 31, 2001.

The agreement provides for the establishment of a Management Committee and a Steering Committee. The Management Committee consists of an Assistant Deputy Minister from the MELP, the MOF District Manager, the DFO Chief of Habitat Policy Unit and the Chief Forester from both MacMillan Bloedel Limited and TimberWest Forest Limited. The Steering Committee is composed of a representative and an alternate from each participating entity.

# Feature

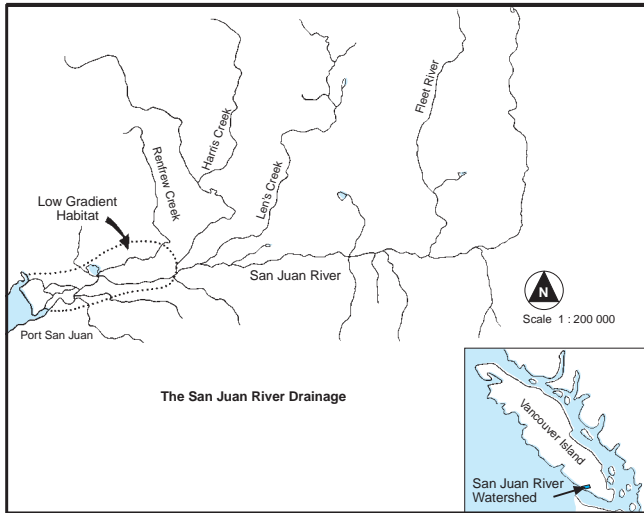


Figure 1. Locational map of the San Juan Watershed.

As agreed to in the San Juan Agreement, a coordinator was hired by the Steering Committee at the outset of the project. Bud Iverson, a forest engineer, who had worked in this watershed during the earlier logging phases, was hired in the Fall of 1995 and has been acting in the capacity of coordinator since that time.

At a special meeting of the Management Committee, the Pacheedaht Band sent representation to request a role in the Steering Committee. The Management Committee agreed that the Pacheedaht Band had special status and were invited to attend as observers at Steering Committee meetings.

The parties to the agreement recognize there has been significant improvement in forest practices, especially during the last three years. The agreement builds on this positive change by developing a comprehensive fisheries restoration and enhancement plan for the entire San Juan Watershed. The plan has been adequately funded, professionally implemented and cooperatively managed by the parties.

The ownership in the San Juan Watershed is approximately 44% Crown (Figure 2). The remaining 56% is privately held, of which 11% is managed within a Tree Farm License (TFL) by TimberWest Forest Limited. TimberWest holds 86% ownership interest in the non-Crown watershed lands, and MacMillan Bloedel holds the remaining 14%.

The Agreement allowed for expenditures of \$830,000 of which 56% (\$464,000) would be private funds and 44% (\$366,000) Crown funds to be funded through Forest Renewal BC. The private funds are split according to the ownership ratio: 14% Macmillan Bloedel and 86% TimberWest. These funds were to be spent on fisheries restoration and enhancement projects.

## Forest Renewal BC Funding

Approximately 44% of the watershed is public land and TimberWest is the proponent seeking funding from Forest Renewal BC in support of projects on public lands. Delivery of the Forest Renewal BC funding is currently accomplished through the MOF and the MELP. Generally, the land and upslope activities are administered through the MOF, and the MELP administers those activities deemed “in-stream”.

To meet Forest Renewal BC objectives, it was necessary to obtain input and develop a cooperative planning process that included other interests in the San Juan Watershed. As a result, the Forest Renewal BC Steering Committee was created to advise and make recommendations regarding the projects to be carried out on the Crown land portions of the watershed.

Representatives on the committee include:

- Pacheedaht Band
- Sooke Renfrew Forestry Society
- San Juan Enhancement Society
- Cowichan Lake Forest Coop
- Renfrew Community Association
- IWA

## Activities and Projects associated with the San Juan Watershed Agreement:

### Hiring of a coordinator:

The coordinator position has been funded through the agreement since October 1995.

### Biologists:

The Steering Committee contracted Bob Griffith and Associates to carry out a detailed assessment of the watershed following up on the initial report for the lower San Juan completed by Ship Environmental Consultants. This report (Ship, 1996) provided early

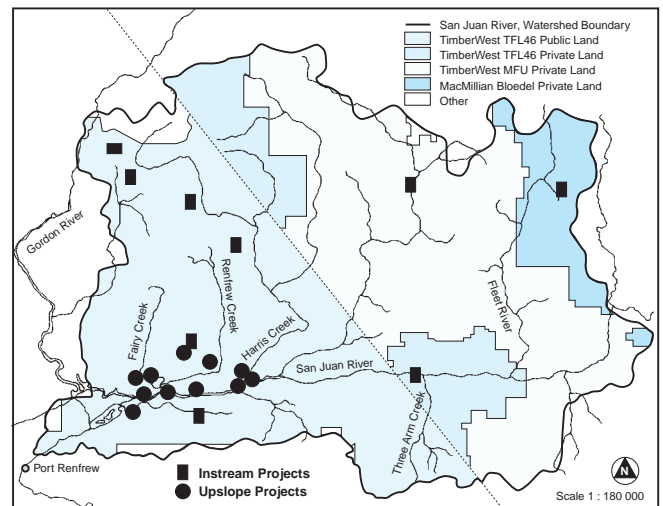


Figure 2. Land use map of the San Juan Watershed 1997-1999.

results to assist in the identification of restoration and enhancement opportunities in the lower San Juan River area, while the Griffith report included the entire watershed.

**Base Maps:**

In order to provide consistent mapping on a common basis, a mapping consultant was contracted to produce TRIM maps of the San Juan Watershed, over all tenures. These indicated sub-basins to be used as a reference during the completion of the project. In addition to the direct funding provided by Forest Renewal BC and the companies, the companies provided aerial photographic information, including "Ortho" photos, to assist in this project.

**Terrain Mapping:**

Chatterton Geoscience was contracted to provide terrain mapping for the San Juan Watershed, and to transfer information on gullies, slides and soil stability to the base maps of the watershed. This report is being used to determine areas of priority for action.

**Stream Restoration and Enhancement Activities:**

Projects either completed or planned for the San Juan Watershed program and intended to improve fish habitat recognize the need to reduce or slow down anthropogenically aggravated slope processes which contribute to the degradation of fish habitat as well as the restoration of habitat in streams that are not being negatively influenced by slope processes.

During 1996, two small creeks were identified and a preliminary assessment was carried out, to determine potential for restoration. The two creeks are at 5 Mile and a tributary of lower Harris Creek. Tremblay Creek, also a tributary to Harris Creek, was restored through the addition of large woody debris (LWD) in the form of tree stumps flown into the creek by helicopter. These were then tied into place using wire rope, as were some trees on the main stem of Harris Creek nearby. Funding for these activities came from the private sources as per the San Juan Agreement. Available groundwater supplies have not initially appeared sufficient to justify further off-channel works, unless further engineering assessments indicate otherwise.

In 1997/98, several instream projects were carried out based on studies that prioritized opportunities within the lower San Juan Watershed. Eleven project areas had assessment work conducted, and of those, nine had works carried out on a total of 63 sites (Figure 3). Expenditures of funds from the private allocation and Forest Renewal BC totaled some \$396,300, including assessment and planning. These projects created 654 days of employment.

Activity	Work Completed	Cost
5 Mile	34 sites stream complexing	\$98,625
Halliday	1 site - pool, riffles & wattling	33,967
Renfrew Upwelling	1 site - rearing habitat	39,881
Renfrew	10 sites - stream complexing	6,549
Mosquito	3 sites - stream complexing	5,719
Tremblay	1 site - stream complexing	8,415
George's Channel	1 site - rearing habitat	30,470
Dump Creek	assessment only	475
X-over	10 sites - mainstem complexing	7,621
Harris Camp	2 sites - complexing - rocks & wood	11,318
Pixie	assessment only	2,800
<b>Total</b>	<b>63 sites</b>	<b>\$245,840</b>

Figure 3. Location and costs of work carried out in eleven project areas of the San Juan Watershed.

**Hydrometric Stations:**

Data collection continued on the main station on the San Juan River and the three stations within the watershed; one at Granite Creek, one in Harris Creek and one at Garbage Creek. While this activity was proposed and coordinated by the Steering Committee, the funding was from Forest Renewal BC, outside of the San Juan Watershed Agreement.

**Slide Restoration Assessment:**

Using the information from the Terrain Mapping report, a more detailed assessment of areas at high risk for slides was undertaken during 1997/98. This provided recommendations for treatments, where feasible. Subsequently, the report was used to determine areas of priority for action, and a number of landslide rehabilitation projects were initiated.

**Crown Land Upslope Activities - Road Deactivation, Gully & Slide Stabilization:**

During 1997/98, a program including detailed assessments and prescriptions, hillside restoration and road deactivation was carried out (Figure 4).



Figure 4. An example of some of the areas chosen for road deactivation.

# Feature

Bioengineering has been an important component of the upslope activities. This section again draws heavily on the knowledge and ideas provided by Dave Polster (summarized in Polster, 1997) during the San Juan program. It included the following techniques:

**Wattle Fences:** Wattle fences (Figure 5) are short retaining walls built of living cuttings. These walls take up the vertical component of the slope, reducing the effective slope angle and allowing vegetation to become established. In addition, the living cuttings used to make the walls sprout and grow, thus further strengthening the structure. Wattle fences are used where site moisture conditions will allow the living cuttings on the face of the fence to sprout and grow. Sites where fine textured soils can provide ample summer moisture or where seepage of groundwater provides moisture are suitable for wattle fence installations.

Wattle fences provide breaks in the slope and can therefore reduce the impact of rolling materials on vegetation growing lower on the slopes. In many cases, vegetation will have difficulty in becoming established where materials from above are constantly bombarding it.

Wattle fences are used to reduce the effective slope of over-steepened areas. In the San Juan they were found most effective where moisture is plentiful and where the cuttings used to construct the fences did not dry out. In this regard, backfilling the fences with fine texture materials will assist in providing moisture during dry summer periods.

Wattle fences can provide support for oversteepened cut and fill slopes and for small soil slumps where excess soil moisture results in small rotational failures of surface materials. In the case of slumping sites, the wattle fences allow moisture to drain through the face of the fence while the soils are retained behind the fence. Where slumps are particularly “soupy”, the branches and twigs may be retained on the cuttings to provide additional support of the wet soils. Wattle fences can be used in combination with live pole

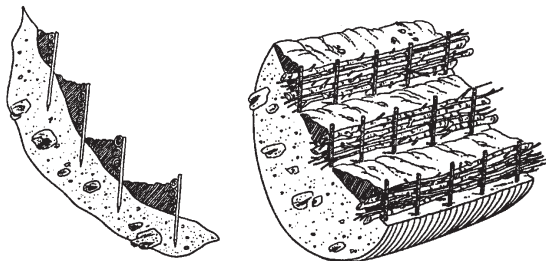


Figure 5. Wattle fences are used to allow oversteepened slopes to support plant growth. The section shows the effects of steeper slopes on wattle fence spacing (after: Polster, 1997).

drains (see above) to support the slumps while the live pole drains provide drainage of the excess moisture.

Wattle fences are constructed by establishing the supporting rebar or cuttings in a row in the ground and placing the cuttings behind these supports. Soil materials are then backfilled behind the cuttings and additional cuttings are added to increase the height of the fence. Resloping behind the fence should be conducted to create a slope of about 2 : 1 or less between the top of the fence and the bottom of the fence above. Wattle fences are constructed from the bottom of the slope up the slope so that workers may have a place to stand while additional fences are constructed.

**Modified Brush Layers:** The process described here was particularly used for revegetating road side casts in drier sites in the San Juan.

Modified brush layers (Figures 6 and 7) are supported on a short, small log or board. The use of a log for support of the brush layer provides the advantage of a small terrace which can serve to “catch” rolling rocks rather than allowing them to roll down the slope, gathering speed and damaging vegetation or entering stream channels. Although the log will eventually rot, the cuttings will, by that time, have grown to the point where they are stabilizing the slope. As the cuttings that are used in the brush layer grow, the wall of plants will also serve to trap rocks and soil and prevent movement of materials down the slope, thus further protecting vegetation on the slopes. Modified brush layers can be used on sites that would be too dry for effective wattle fence growth but where some form of additional support is needed for stabilization of the slopes.

Logs or boards approximately 2 m in length are used for the modified brush layers. This allows a large number of modified brush layers to be established on

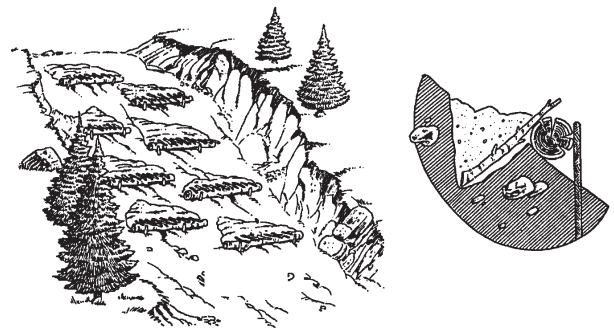


Figure 6. Modified brush layers can be built with either a log or a board for support. They should be staggered across a slope so that material rolling down the slope does not have a chance to accelerate before it is caught. The section shows the normal backfill which creates a small bench (after: Polster, 1997).



Figure 7. Modified brush layers used to stabilize the slope.

the slope. This has the advantage of providing separate, independent structures so that if a very large rock comes down and destroys one of the modified brush layers, there are still others to do the work. Many bioengineering systems use this “strength in numbers” concept.

Reinforcing steel bar (rebar) is used to hold the modified brush layers in place. One hundred and twenty centimeter (120 cm) long rebar has been found to be best for support of the modified brush layers. The modified brush layers are constructed by initially establishing the rebar in the ground. The log or board is then placed above the rebar on the slope, and partially back filling behind the log or board creates an initial bench. The cuttings are then placed on the bench and 30 cm backfill is pulled down to cover the cuttings. The cuttings should protrude past the edge of the log or board about 5 cm. Like wattle fences, modified brush layers should be built from the bottom of the slopes to the tops thus providing places for the workers to stand as they construct additional structures. Modified brush layers can be very useful in the control of raveling from a road cut slope. The bench created initially serves to trap rolling materials while the growth of the cuttings eventually forms a wall of living plant materials. Modified brush layers can also be effective in the stabilization of sliver fills and raveling fill slopes (Polster, 1997).

Figure 8 lists the upslope accomplishments on Crown Lands.

Activity	Work Completed	Total Costs
detailed assessments & prescriptions	118 km	\$107,588
hillside restoration	81 km	374,347
road deactivation	27 km	534,822
<b>Total</b>		<b>\$1,016,757</b>

Figure 8. 1997/98 San Juan Road deactivation and hillslope rehabilitation (Crown Lands).

**Riparian Zone Enhancement:**

Reinhard Muller was hired in 1997/98 to carry out the assessment and make recommendations for riparian zone enhancement on the watershed to the west of the E&N Land Grant. The lower part of the San Juan Watershed is where most of the riparian zone restoration opportunities appear to exist. This project was funded by Forest Renewal BC. During the winter of 1997/98, some of the recommendations of the report were implemented and a report was submitted to the Steering Committee. Figure 9 indicates the activities undertaken from January to March, 1998.

Activity	Ha	# of Trees	Other Plant Species
conifer release / falling	7.0	6,264	-
sandbar planting	5.3	29,852	5,266
riverbank planting	-	3,000	-
girdling / planting	6.9	405	-
wattling	-	-	-
<b>Total days employment 557.25</b>		<b>Total Cost \$182,493</b>	

Figure 9. Riparian Zone Activities.

**Debris Removal, South Arm of the San Juan:**

During the summer of 1997, a project to remove a small jam formed by accumulated debris was undertaken for a second time. This project, which opened up the south arm of the San Juan, was entirely funded by Forest Renewal BC.

**Monitoring**

Effectiveness monitoring was conducted by Babakaiff and Henalt, in the winter of 1998, on the three main instream locations restored in 1997 through WRP. Both biological and geomorphic parameters were monitored and results were given a 1 to 4 class ranking. Class descriptions are as follows:

- Class 4: fully meeting or exceeding effectiveness standards
- Class 3: adequately meeting effectiveness standards
- Class 2: poorly meeting standards
- Class 1: is defined as not meeting effectiveness standards.

Figure 10 provides the draft report summary of the mean biological and geomorphic effectiveness ranking for the study reaches.

Overall, results are seen as being quite positive. The report stated that over time, fish production should see

Project	Reach/project Type	Mean Effectiveness Rating	
		Biological	Geomorphic
Halliday	1 / Pool Riffle	1.7	4.0
Five Mile	2 /	4.0	2.8
Renfrew	5 / LWD	3.3	3.0

Figure 10. San Juan effectiveness monitoring.

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further increases, as a result of natural improvements to habitat conditions (i.e. as residual pool depth increases with scour, and as LWD structures catch more woody debris).

At Halliday Creek, the report noted that low fish densities within the pool habitat may be the result of lack of LWD cover and fish may require more time for access. LWD and spawning gravel placement is scheduled as a phase 2 activity, planned for the 1999 work window.

At Five Mile Creek, all structures tested were given a class 4 biological ranking (Figure 11). Although the geomorphic ranking was not as high, the reach was said to provide good LWD cover and a good ratio of pools to riffles. This creek had the highest catch per unit effort of the Vancouver Island Watersheds monitored. Coho salmon accounted for 214 (96%) of the 223 fish sampled.

Renfrew Creek was reported to contain good LWD cover in the scour pools throughout, and good natural accumulations of LWD were evident.

### Opportunistic Fisheries Restoration, Enhancement and Maintenance Work

As described in the Addendum to the San Juan Fisheries



Figure 11. Typical installation in 5 Mile Creek.

Enhancement and Watershed Agreements, the companies have committed to spending \$2,000,000 for restoration, enhancement and maintenance work on fisheries habitat located on their own private lands in watersheds on Vancouver Island. The Addendum indicates the formula for allocating the \$2,000,000 over 20 years, based on private land ownership on Vancouver Island, as follows:

- MacMillan Bloedel Limited 44% or \$880,000
- TimberWest Forest Limited 56% or \$1,120,000

The process to carry out works under this program involves Steering Committee approval of proposals, with the works to be carried out by the companies concurrent with their own operations. The small projects (under \$5000) are generally presented by the landowner, after planning and consultation with local agency staff, for approval by the Steering Committee. Larger projects may require further assessment and planning by the Steering Committee prior to approval, to ensure the viability of the project and to coordinate with other activities in the watershed. Such projects must be technically sound, with priority given to funding projects in the San Juan Watershed.

To March 31, 1998 the companies have spent approximately \$63,000.

### Uplands Restoration Expenditure on Private Lands to March 31, 1998

Under the San Juan Watershed Agreement the forecast expenditure was \$2,790,000 which represents the estimated expenditures to be made by the companies on their private lands. As in the Crown Land restoration projects, many of the new bioengineering techniques were used. To date, expenditures have been as shown in Figure 12.

Expenditures	MacMillan Bloedel Ltd	TimberWest
to March 31/97	\$270,000	\$1,921,177
April 1/97 to March 31/98	58,827	186,331
<b>Total</b>	<b>\$328,827</b>	<b>\$2,107,508</b>

Figure 12. Uplands Restoration Expenditures to March 31, 1998.

### Training

To ensure an excellent workforce, able to work on this and other projects in a safe and productive manner, a training proposal was developed by the Forest Renewal BC Steering Committee. The training, completed during the fall of 1997, involved native and non-native individuals from the Port Renfrew area. The course had 16 components, covering a variety of subjects such as first aid, basic forestry, vehicle and helicopter safety, power saw operation, basic mapping, fish habitat assessment, bioengineering techniques, river bar revegetating techniques, fire suppression, supervisory skills and other related topics. A total of 26 individuals took part in one or more of the individual

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course components for a total of approximately 1,832 hours of training. The individuals who participated in the training have been involved in a variety of projects in the San Juan Watershed as employees of the Pacheedaht Development Corporation.

In summary, the cooperative and jointly-managed program in the San Juan Watershed is and has been a successful program in protecting, improving and replacing fish habitat and fisheries-related recreation opportunities. The watershed restoration plan has been adequately funded, professionally implemented and cooperatively managed by the parties. The work-to-date has created employment, and the working partnership has resulted in increased stewardship for fisheries resources throughout the San Juan Watershed.

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## Bella Coola Watershed Restoration Partnership Project

Patricia McKim

The Bella Coola Watershed Restoration project was initiated, and is directed, by a group of community partners, all of whom have an equal voice. The partners are the Central Coast Regional District, the Central Coast Fisherman's Protective Association, MELP, DFO, MoF, private landowners, Interfor, and volunteers interested in the restoration of fish habitat.

Noted for its spectacular scenery, the Bella Coola watershed (Figure 1) is a magnificent and valuable watershed located on the west central coast of British Columbia. From the outlet of Little Charlotte Lake in the Chilcotin Plateau, the clear, warm water course flows due west as the Atnarko River, passing through Tweedsmuir Park. The Bella Coola River is formed where the Atnarko River meets the heavily glaciated

Talchako River, to then flow through the Coast Range Mountains. The area is extensively used by one of the largest concentrations of grizzly bears in the world.

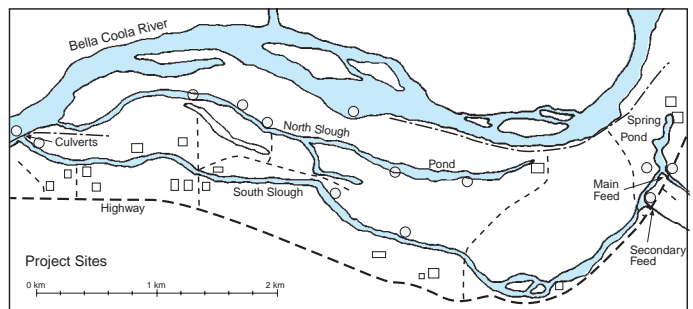


Figure 1. Map of the Bella Coola Watershed.