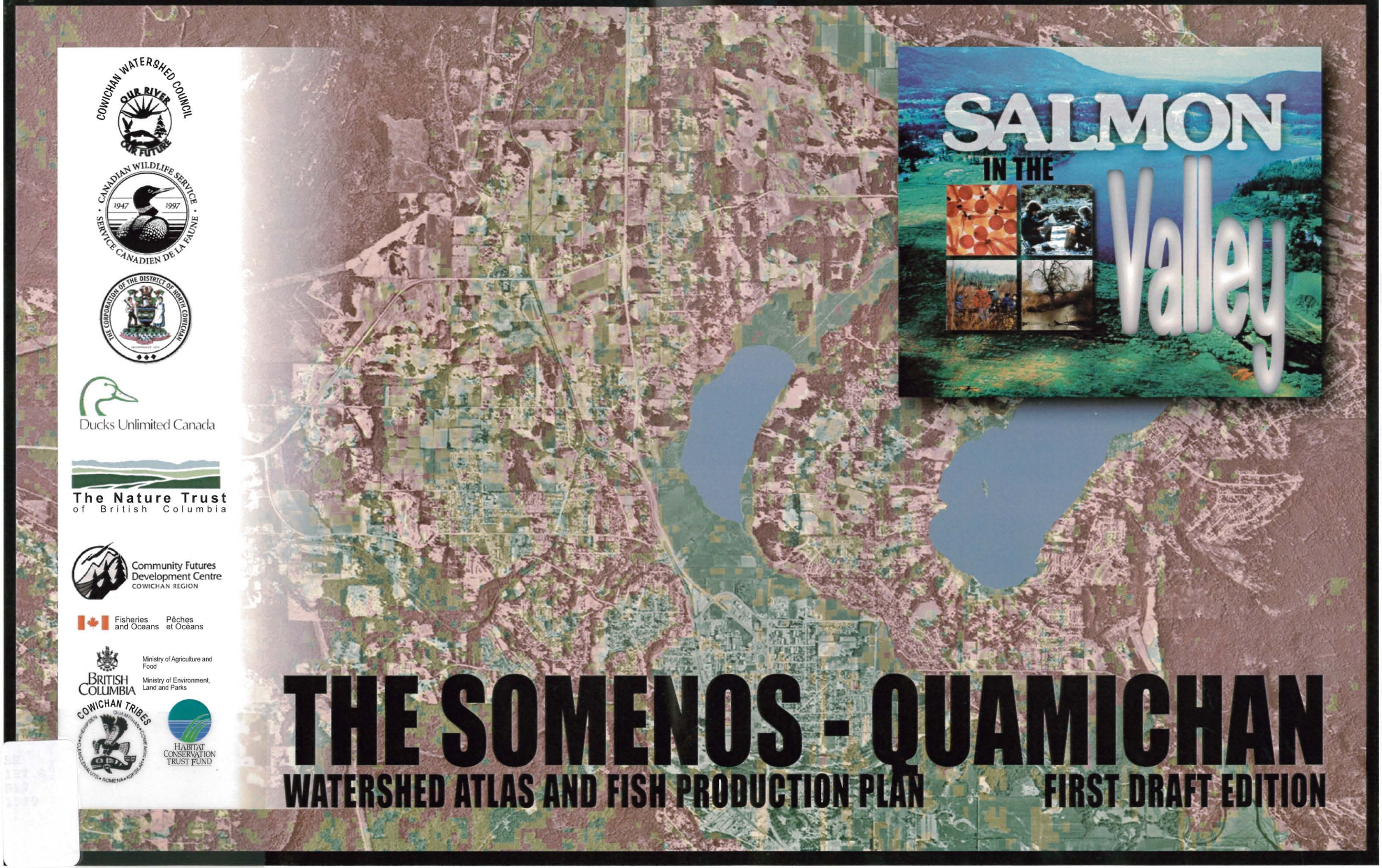


COWICHAN WATERSHED COUNCIL
OUR RIVER OUR FUTURE

CANADIAN WILDLIFE SERVICE
1947 1997
SERVICE CANADIEN DE LA FAUNE

THE CORPORATION OF THE DISTRICT OF NORTH COWICHAN

Ducks Unlimited Canada

The Nature Trust of British Columbia

Community Futures Development Centre COWICHAN REGION

Fisheries and Oceans Pêches et Océans

BRITISH COLUMBIA
Ministry of Agriculture and Food
Ministry of Environment, Land and Parks

COWICHAN TRIBES
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HABITAT CONSERVATION TRUST FUND

# THE SOMENOS - QUAMICHAN

## WATERSHED ATLAS AND FISH PRODUCTION PLAN

## FIRST DRAFT EDITION

## Acknowledgements

This Watershed Atlas and Fish Production Plan is prepared with the tremendous effort and assistance of many interested and dedicated individuals. The constraints on agriculture and fish production in these two watershed basins have required ongoing attention and cooperation among a wide variety of individuals and agencies.

Much of the information presented in the watershed atlas is developed from the local experience and observations of biologist, Ted Burns. In addition to Ted's direct and substantial input the report benefits from the direction of several key steering committee members. Cheri Ayers, through information compiled for the phase 1 report has provided a great deal of background information presented in this document. Tim Clermont has provided advice and direction for the report overall, and for the areas of the basin covered by Nature Trust properties in particular. These ideas are illustrated with photographs collected during a helicopter flight generously donated by TimberWest. Thanks to Steve Lorimer, Mike Hayhoe, and David Groves for arranging this trip.

The form and content of this document is enriched by the wisdom and vision of Brian Tutty. The concept of the 'production planning' grows out of Fisheries and Oceans Canada's quest for effective ways to manage watersheds for the benefit of fish in cooperation with other stakeholder interests.

Finally, to the extent that the Watershed Atlas and Fish Production Plan is a 'blueprint' for fish production initiatives, we acknowledge the central role that the Cowichan Watershed Council will play in actually 'building' this vision. It is only through the ongoing efforts of community agencies such as the Watershed Council that the full potential of the watershed can be realized.

# THE SOMENOS - QUAMICHAN BASIN

## WATERSHED ATLAS AND FISH PRODUCTION PLAN

Draft First Edition

April 26, 1999

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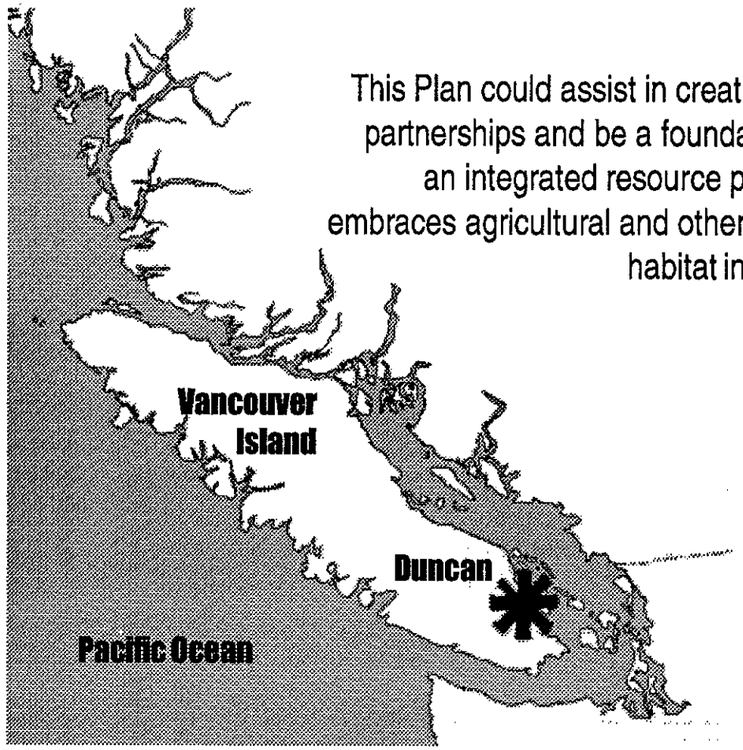
## Table of Contents

## 1.0 Summary: "Salmon in the Valley"

The Somenos - Quamichan Basin Atlas and Fish Production Plan has been prepared to highlight the watershed production opportunities for salmonids in the Somenos - Quamichan watershed, a lower tributary of the Cowichan River located on Vancouver Island near Duncan, British Columbia.

Using existing information and local knowledge, this Draft Somenos - Quamichan Watershed Atlas and Fish Production Plan identifies, summarizes, and graphically illustrates a variety of fish habitat problems and opportunities that are available, or could become available, through a program of habitat conservation and stewardship, restoration and enhancement.




This Plan could assist in creating new partnerships and be a foundation for an integrated resource plan that embraces agricultural and other wildlife habitat interests.

The goal of the Somenos - Quamichan Watershed Atlas and Fish Production Plan is to provide the ad hoc Somenos - Quamichan Management Committee, and the interested Community with some helpful tools to stimulate discussion. This Plan could assist in creating new partnerships and could be a foundation for an integrated resource plan that embraces agricultural and other wildlife habitat interests. Through the action items outlined in the Somenos - Quamichan Watershed plan, it may be possible to increase the population of salmonids living in, and returning to spawn in this basin in the coming years.

The Somenos sub basin area (see attached map) is comprised of Somenos Lake and Quamichan Lake, and a reservoir, (Crofton Lake), and significant marsh wetlands and associated riparian habitats. Crofton Lake, in the headwaters of the Somenos flows towards Crofton and also has a controlled outlet that discharges into Upper Richards Creek, one of three major inlet streams to Somenos Lake. Somenos Lake has one outlet stream that discharges to the Cowichan River via Lower Somenos Creek. The lowlands surrounding these lakes are important agricultural lands. The Somenos Lake and tributary streams are important rearing areas for salmonids, especially coho salmon, trout, and other fish.

Resource extraction, land development and stormwater drainage, and agricultural within the watershed have led to concerns about: seasonal flooding problems, increased nutrient levels and algae blooms, and stream sedimentation and reduced salmon productivity.

The flooding of the agricultural land stems from an overwhelming backwatering influence of the Cowichan River during high discharge periods. This situation has diminished the wildlife and agricultural land capability in the Somenos Basin. These flooded wetlands have attracted waterfowl populations into submerged and saturated farm fields. This increased waterfowl presence has added to field and crop depredation complaints. The problem extends to the agricultural lands upstream of Somenos Lake along lower Richards Creek.

During summer months, fish kills have occurred due to elevated water temperatures, stagnation, anoxic (low dissolved oxygen) conditions, and water stagnation. These conditions lead to heavy predation when juvenile fish seek colder water as refuge and concentrate in small areas. Inadequate, or inaccessible cool water refuge options exist during summer periods for young fish due to flat design of the lower reaches of the existing tributary streams and their ditched channels, aggravated by beaver dam obstructions. Low summer stream flows have also contributed to these problems.

The Quamichan system is similar to the Somenos system in many respects. The lake is eutrophic and suffers from poor water quality during the summer months. Agricultural flooding is also a problem on the Quamichan system.

Quamichan Lake is unique in that it currently supports a resident, year round trout population. The lake is also at a slightly higher elevation than Somenos Lake that makes drainage and flooding problems potentially easier to address.

For agricultural producers, problems arise during seasonal high water events of the Cowichan River. As the river rises, water flows back into Somenos Creek and causes Somenos Lake and Lower Richards Creek to fill and then flood surrounding lowlands. When the Cowichan River recedes, the Somenos Lake and surrounding lowlands gradually drain. The timing of this drainage is important to agricultural producers as it can determine whether or not lowland areas will be dried out and available for planting and crop production.

This situation is complicated when late spring runoff or storms trigger a rise in the Cowichan River later in the spring. Flooding in the Somenos Basin shortens the growing season and restricts the range of crops that can be produced. Indeed late flooding in early fall can devastate the ability to harvest any crop. This backwatering situation persists to the present with the added complexity that the bed of the Cowichan River may be aggrading due to bedload depositions caused by the dyked channel built in the 1970s.

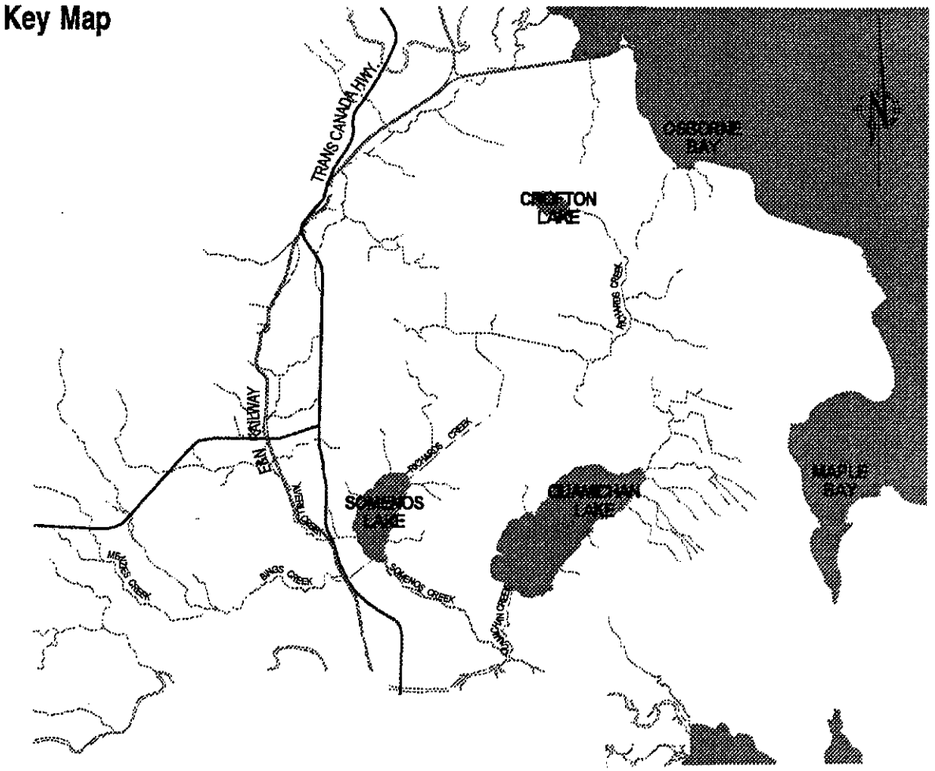
# 2.0 Description of the Somenos - Quamichan Watershed

## Overview

The geomorphology of the Somenos - Quamichan Basin can be described as low relief with extensive riparian lowlands and two lowland lakes: Somenos and Quamichan. It consists of five sub-basins: Quamichan, Somenos, Richards, Bings-Menzies and Averill.

A substantial portion of the basin - approximately 10 percent – is in high density urban use while another approximately 20 percent is in agricultural use of relatively high intensity. In fact, nearly all of the basin below the 100 m contour is utilized to some degree for urban or agricultural uses. Despite some very compromised fish habitat in parts of the basin, a great deal of capability and potential remain – some of the highest in the region.

## Key Map




**The Somenos - Quamichan Watersheds**

*The watersheds described in this document are made up primarily of extensive riparian lowlands and two lowland lakes. The area includes five sub-basins: Quamichan, Somenos, Richards, Bings-Menzies and Averill.*

## A History of Seasonal Flooding

Problems from flooding of residential and agricultural lands in these basins have been recorded for nearly one hundred years. Early European landowners along Somenos Lake attributed annual flooding impacts to beaver activity on Somenos Creek.

Since that time, ditching and drainage efforts have continued over the years. During the late 1970's, the lower Cowichan River, downstream of the Island Highway Bridge was channelized to:

1. reduce flooding of Cowichan Reserve lands
2. reduce flood risk of urban areas in Duncan
3. partially reduce the effect of backwatering of the Somenos basin lowlands by the Cowichan River.

In 1982, flooding impacts culminated in the commission of a study through the Agricultural Rural Development Subsidiary Agreement (ARDSA), a Federal/Provincial program. This study proposed strategies to improve drainage of agricultural land during the growing season along with various costs and construction works to this effect. The option chosen involved dredging Lower Richards Creek (which drains into Somenos Lake) and the outlet stream, Lower Somenos Creek. It included a maintenance agreement (as a water license) for the District of North Cowichan (DNC) to maintain an open channel. Mitigation work, for salmonid habitat damage, was carried out on Upper Richards Creek above Richards Trail Road. A fish barrier culvert was replaced with a box culvert at Richards Trail to allow juvenile fish upstream access to Upper Richards Creek. It was noted in the 1980s that the Somenos watershed and lowlands were critical coho overwintering habitat serving coho populations that reared throughout the Cowichan watershed and sought safe winter refuge. An engineering firm, Delcan, was contracted to study and develop a detailed survey explaining the problem, and to prepare a report and plan. Delcan subsequently managed the plan implementation and drainage and stream dredging works.

Based on a trial "no net loss" concept, that predated current Fisheries and Oceans Canada policy, a strategy was developed by Fisheries and Oceans Canada local staff that included habitat compensation off-site in the higher fisheries value reach in the Upper Richards Creek above Richards Trail.

At the time Somenos Creek was an extremely warm and anoxic environment for fish, it was considered to be only a migratory route for spawners, and as an access route to overwintering habitat by coho. To improve the situation, the Delcan design, lowered the Somenos Creek channel by reshaping and dredging it deeper and wider to try to improve outflows from Somenos Lake.

From the agricultural and fisheries perspective, it is noteworthy that winter flood conditions remained unaffected, and that the high quality overwintering coho habitat was maintained. After the dredging was completed on Lower Somenos Creek, an unexpected observation was made and a beneficial net gain was also achieved in the Lower Somenos Creek. The Somenos Creek habitat conditions improved remarkably due to freshwater up-welling (springs) flowing from the newly disturbed gravel beds which were exposed by the dredging. The effect of this dredging of the channel was that the Somenos Creek was transformed from a lethally warm and anoxic condition in summer to one that sustained summer coho rearing. For several years, the drainage plan worked for most of the stakeholders and for the fish.

By the early 1990's, problems again resurfaced with beavers damming lower Somenos Creek on Cowichan Reserve Lands. The beaver dams caused significant backwatering. Changing land use patterns have also complicated and aggravated the flooding problem. At least one new subdivision stormwater outfall discharges directly into Somenos Creek. This new flow has created sand build-up in the channel and once again aggravated the drainage problem. Sediments from this outfall have also largely blanketed the exposed gravel areas. The District of North Cowichan arranged to trap several generations of the resident beaver and had the beaver dams periodically opened in cooperation with the

Cowichan Tribes. These maintenance practices have proved to be temporary and ineffective and the beavers persist to this day and are in fact expanding their range.

In the past five years, the complexity of the backwatering and drainage problems in the Somenos Basin has created more discord between property owners, local government, and agencies. Several coordinated efforts to bring stakeholders together to understand the situation and look for alternatives have been tried. In the fall of 1997, conservation groups involved in the management of Somenos Marsh and Lake developed a project that was designed to help bridge the impasse between citizens and government agencies. The objectives were to identify and facilitate workable solutions for flooding of agriculture land in the Somenos Basin and to restore fish and wildlife habitat in Somenos Marsh. The Nature Trust of BC began the process of hiring a project coordinator and assembling a Technical Review Committee. Concurrent with this effort, Mr. Reed Elley's (local Reform MP) March, 1998, stakeholders meeting in Duncan was also planned, to review and address agriculture drainage issues in the Somenos Basin. At that meeting the majority agreed that the Cowichan Watershed Council (CWC) would be the local coordinating group to help identify drainage issues and to implement solutions over the years to come.

The scope of the Nature Trust's project was broadened to include the entire Somenos Basin. With the help of the CWC, the first product was completed in January 1999, titled, *Somenos Basin Project, Phase I Restoration Feasibility.* The phase I report is a compilation of historical solutions/studies and new ideas proposed by the technical committee and is based on an engineering survey by Wright Focus Eng. & Surveying Ltd. during July and August of 1998 of the lower Somenos and Quamichan Creeks.

This Somenos – Quamichan Watershed Atlas and Fish Production Plan is the second product of this recent initiative. This Plan is designed to assist in creating new partnerships and to be a foundation for an integrated resource plan that embraces agricultural and other wildlife habitat interests.

## Management of Conservation Areas

The Somenos Basin study area contains 170 ha of conservation lands, owned by Ducks Unlimited Canada and The Nature Trust of BC. The lower elevation lands are zoned Agriculture 2 (A2) and Public Use (PU) and are under private tenure (including lands owned by the District of North Cowichan, Cowichan Tribes and other private landowners).

In 1976-77, The Nature Trust of BC acquired 22.1 ha of land around Somenos Lake within the District of North Cowichan. In 1989, a further 26.9 ha was acquired by the PECP, again with The Nature Trust holding title. This land consisted of wetland and hay fields that are significant habitats for a wide variety of wildlife. The Nature Trust lands are actively hayed by a local farmer to maintain winter forage quality for waterfowl.

Currently, the Ministry of Environment, Lands and Parks (MELP) manages all Nature Trust lands within the Somenos Basin under their Regional Wildlife Program. The Ministry's goals for the area are: the preservation and enhancement of waterfowl habitat, to increase public wildlife viewing opportunities, and the public knowledge of wildlife management (see MELP, Property Status Report, 1988). More recently this management goal has been expanded to restore the land's capability for agriculture, and fish and wildlife production.

Ducks Unlimited Canada (DUC) has completed habitat improvement/creation works on wetlands within the BC Forest Museum lands that contain nesting islands and Averill Creek, an important tributary to Somenos Lake. The BC Forest Museum is also working with Ducks Unlimited to develop an interpretive program using educational signage around the museum property.

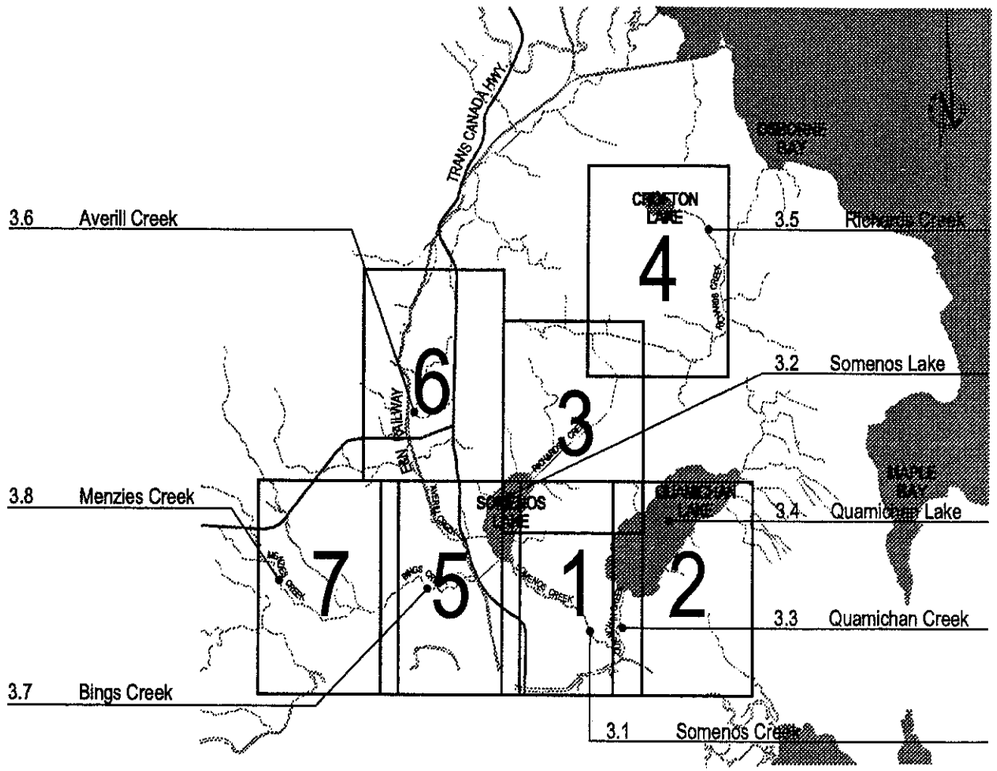
The Somenos Marsh Wildlife Society (SMWS) has undertaken a lead role of stewards of the Somenos Marsh and TNT property. These volunteers conduct annual bird census work, hold regular fund raising and public awareness events, and help focus attention on the importance of the Somenos Marsh.

# 3.0 Physical Description of the Somenos – Quamichan Watersheds

## Overview

Some of the primary factors limiting watershed production of fish are migratory access, and summer water quantity and quality. Waterfalls are present on Lower Quamichan, Richards, Bings and Averill Creeks. All of these streams become either dry intermitent, or dangerously low in the July-September critical stream discharge period. Water quality in the lakes, especially Somenos, becomes very poor along with elevated temperatures.

**Somenos Basin Production Options** **Key Map**




**Overview of Atlas Sheets**

*Production Opportunities described throughout this report are summarized on altas sheets illustrated above. The altas sheets are inserted following the discussion of each part of the watershed.*

## 3.1 Somenos Creek

### Overview

Somenos Creek 3 km long and carries water from Somenos Lake downstream to the Cowichan River. Just upstream of its confluence with the river, Quamicham Creek discharges into Somenos Creek. 'Fish Gut Alley', an important Cowichan River sidechannel enters Lower Somenos Creek just upstream of its confluence with the river.

Lower Somenos Creek is a virtually flat gradient stream that drains the Somenos Basin. When the water level in the Cowichan River is high, Lower Somenos Creek reverses flow direction and floods 'upstream' filling Somenos Lake and surrounding wetlands and floodplains. The Lower Somenos Creek floodplain/ riparian zone is at least 200 metres wide, and up to 900 metres wide in places. Noteably, the homes situated in the eastern portion of the Municipality of Duncan are situated within this Cowichan – Somenos floodplain and are protected by dykes.

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 20 | 17 | < 0.1 | 688 | 11,696 |
| Reach 2 | 19 | 17 | < 0.1 | 2332 | 39,644 |
| ***TOTAL*** | | | | ***3,020*** | ***51,340*** |

### Land Use Factors

#### Agriculture

Somenos Lake's surrounding lowlands have been intensively farmed for many years, but are now compromised by seasonal flooding. The stream was dredged and the cross-section was reshaped to fisheries specifications in 1983. The objective of this work was to increase the rate of runoff to hasten spring de-watering of the surrounding agricultural lands.

#### Residential

Upland areas east of Somenos Creek and lowlands west of Lakes Road are major residential areas. The Duncan sewage lagoons occupy approximately 12 ha of lowland west of Lower Somenos Creek and discharge into Cowichan River.

### Fish Utilization and Limiting Factors

Coho and chum salmon, brown trout, and sea-run cutthroat and steelhead pass through Lower Somenos Creek enroute to Bings, Averill and Richards Creek.

Production has been hindered by high summer temperatures in the 2800 metres of the creek down-stream of Somenos Lake. Channel dredging to improve agricultural drainage occurred in 1983 which created groundwater upwelling for several years and created near ideal summer rearing. Somenos Lake and Lower Somenos Creek supported a significant population of summer juvenile coho in 1986 and 1987.

Fish, particularly coho, become stranded in pockets of Somenos Marsh as water levels fall in the spring.

It was noted in 1983 that stranding of coho pre-smolts occurred in the spring if areas of standing water were not ditched and drained. Significant fish kills occurred as the stranded fish were subjected to rising lethal water temperatures in these shallow wetted areas.

## Recommendations

### 3.1.1 Lower Somenos Creek Cooling Strategy

Lower Somenos Creek is now largely uninhabitable for salmonids in the summer months due to elevated temperature and oxygen constraints. This is aggravated by low outflows and lack of flushing which is partly caused by large volumes of vegetation clogging the channel. A lack of shade vegetation allows the overabundant growth of grasses in-stream (reed canary grass, sedges, iris, smartweed, and other aggressive aquatic vegetation). Direct sunlight also contributes to high summer temperatures.

A more complete canopy of riparian shade vegetation could be established through the use of of taller trees. Under present conditions, less than 10% of the stream is shaded.

An experimental planting of native shade trees is recommended for a portion of the west side of lower Reach 2. A slight berm may have to be constructed to encourage growth.

These efforts should be planned and developed in cooperation with adjacent property owners.

### 3.1.2 Lower Somenos Creek Summer Refuge Improvement – Chesterfield Park

A wetland system that enters Somenos Creek via a ditch at the 362 m point of Reach 2 serves as a summer refuge for coho, cutthroats, sculpins and sticklebacks despite the fact that its temperature and oxygen levels become extremely marginal. It is reported that approximately 100 coho that spent the summer and early fall of 1998 in the small pool below Lakes road pumping station despite lethally high temperatures of 20.2 degrees and oxygen levels of less than 1 mg/L.(Lower Somenos Creek temperatures were plus 24 degrees with almost nil oxygen).

This pool could be enlarged and an upstream wetland pool that supports much heavier use could have its inflow increased by excavating finger channels into the aquifer that supports it.

A culvert could be placed under Lakes Road to connect it with an upstream wetland. This habitat unit is a high priority for additional study.

### 3.1.3 Lower Somenos Creek Summer Refuge Improvement – Fun Pacific Creek

A 160 metre long constructed stream inlet, and 123 square metres headwater pool are on the Fun Pacific property in the Beverly Street Area of Somenos Marsh. An adjacent stream 22 metres west is also present. These watercourses are fed by cool groundwater aquifers and could serve as summer refuge habitat for salmonids.

Refuge improvements could include diverting the west stream into the headwater pool of the 160 metre cosntructed stream. This stream could be deepened and improved by the addition of instream and riparian cover.

## 3.2 Somenos Lake

### Overview

### Fish Utilization and Limiting Factors

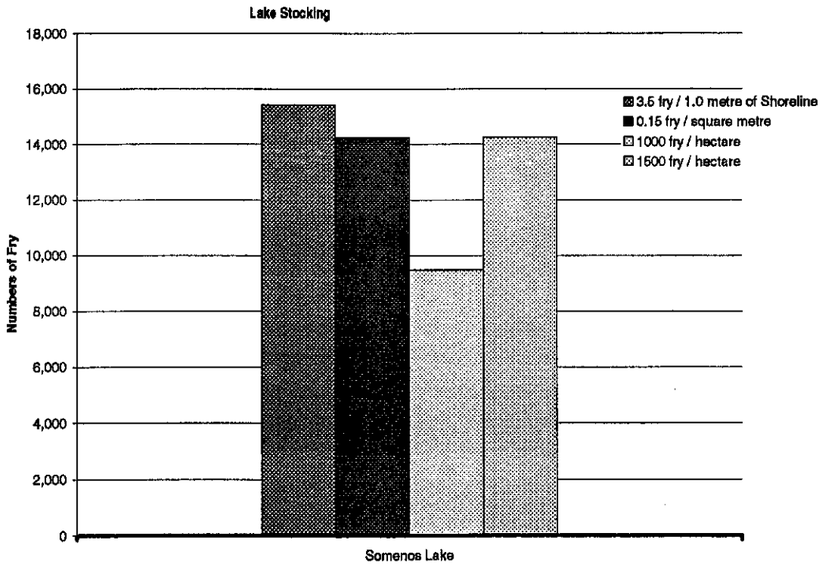
It is doubtful that Somenos Lake can support salmonids through the summer in most years due to high summer water temperatures. Summer water temperature surveys have revealed that epiliminion temperatures can be as high as 32.3° and that the warm surface (epilimnion) extends to the bottom in most areas of the lake. Where the thermocline (metalimnion) and lake bottom water (hypolimnion) are present, oxygen levels are in the lethal range.

There may be unknown summer refugia that harbour conditions that could support salmonids. Somenos Lake supports resident cutthroat, rainbow and brown bullhead; some brown trout may also be present. Sticklebacks are very abundant. Pumpkinseeds were reported in 1997.

Using existing models for calculating lake carrying capacity for salmonids it is apparent that much greater production potential may be available for this lake if the limits imposed by the extreme summer temperatures were removed.

**Coho Colonization Potential - Somenos Lake**

| Lakes | Area sq. m. Total | Area sq. m. less than 3m depth | Perimeter lin. m. | Tom Brown 3.5 fry / lin. m. shoreline | Ted Burns .15 fry/sq. m. | Barns Tech Report #1933 1000 fry/hectare | Brien Anderson 1500 fry/hectare |
|---|---|---|---|---|---|---|---|
| Somenos Lake | 94,952 | n/a | 4,402 | 15,407 | 14,243 | 9,495 | 14,243 |
| *Total Lake Stocking* | | | | 15,407 | 14,243 | 9,495 | 14,243 |



## Recommendations

### 3.2.4 Somenos Lake Aeration

This recommendation is aimed at exploring the potential of bubble type aeration to restore some of the habitat potential of Somenos Lake. It is anticipated that a test of this technique could be established and monitored to provide additional information about the use of bubble aeration in this context.

Although single point or air lift pump-type aeration would have marginal effect, bubble line or grid type aeration may provide an effective alternative. Bubble line aeration, with possible microbial augmentation is an effective mechanism for cooling, increasing dissolved oxygen levels, and for metabolizing and removing organic bottom deposits. Similar bubble line aeration systems may also be cost effective in enhancing the water quality on sluggish creek areas such as lower Bings, lower Richards and Somenos Creeks.

Grid aeration with fine bubble stream works downward through bottom deposits, deepening the lake and increasing contact with cool ground water. Although bottom mounted aeration becomes more effective as depth increases, water quality improvements will be significant in shallower areas where there is no thermocline.

Within Somenos Lake a number of locations are suitable as sites for pilot studies of grid aeration:

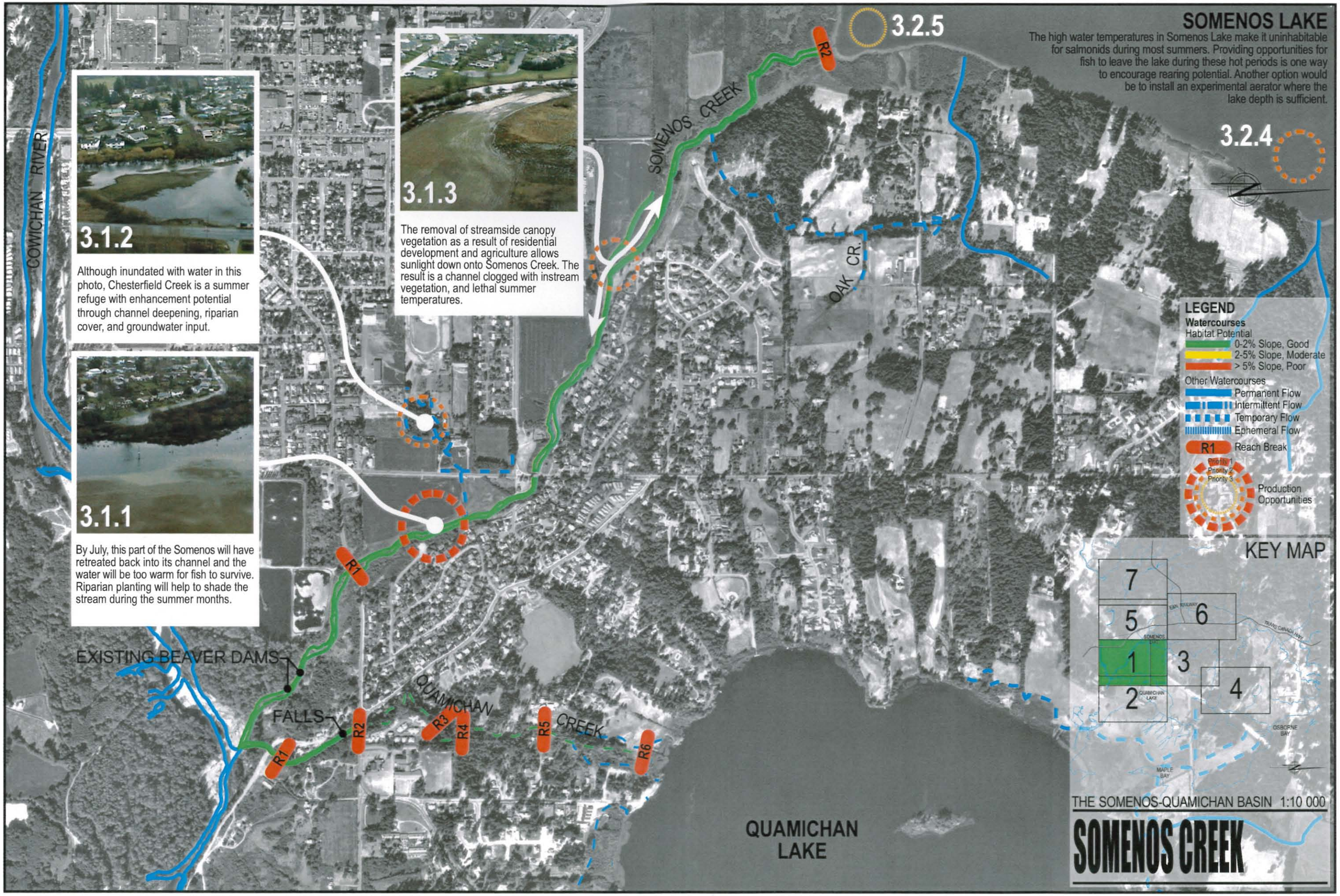
1. The area beside the railroad tressel at the Forest Museum,
2. The confluence of Bings Creek and the lake. Additional aeration could be considered as part of the habitat improvements developed for lower Bings Creek.
3. The lagoon at the foot of Roome Road.

### 3.2.5 Flow Augmentation

Explore the potential to improve spring and summer flows provided by:

1. A release of stored water from Crofton Reservoir. This may be more feasible in conjunction with flow control for storage in the Breen Lake/wetland.
2. Augmentation of Bings Creek with pumped groundwater from the CVRD Drinkwater site.
3. Groundwater from the North west head of the Richards Valley.

| Somenos Creek - Somenos Lake | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish Production Opportunities** | | | | | | | | | | | | | |
| Watercourses | | | Actions | | | | | | | | | | |
| Somenos | Reaches | Issues | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| | Lake | Somenos Lake becomes uninhabitable for salmonids by July of most years due to high temp. and | | | Access improvements to Bings and Averill Creek will allow fish opportunities for summer refuge | | | | | | Develop a nutrient input/output and nutrient sink calibration. Consideration for agriculture, residential land uses, etc. | | Landowner contact to develop management options for fish production |
| | 2 | Somenos Creek is also uninhabitable in the summer due to high temperatures and low oxygen, this is partly due to lack of canopy and low circulation | | | | Start experimental re-vegetation section on the west side of R2 @ 97 -147 m to rebuild canopy to cool water and retard instream growth | | | | | | | Landowner contact |
| | 2 | Increase cool water input to the creek or provide summer refuge for fish. | | | | | | | | | Chesterfield Creek @ 362 m of R2 is a summer refuge and has the potential to provide more with deepening and more groundwater input. Undertake in 1999. | | |
| | | | | | | | | | | Investigate opportunities to provide a pulse flow in May or June to encourage fish outmigration. | Improve water quality at Fun Pacific Creek for summer refuge | | |


3.1.2
Although inundated with water in this photo, Chesterfield Creek is a summer refuge with enhancement potential through channel deepening, riparian cover, and groundwater input.
3.1.3
The removal of streamside canopy vegetation as a result of residential development and agriculture allows sunlight down onto Somenos Creek. The result is a channel clogged with instream vegetation, and lethal summer temperatures.
3.1.1
By July, this part of the Somenos will have retreated back into its channel and the water will be too warm for fish to survive. Riparian planting will help to shade the stream during the summer months.
SOMENOS LAKE
The high water temperatures in Somenos Lake make it uninhabitable for salmonids during most summers. Providing opportunities for fish to leave the lake during these hot periods is one way to encourage rearing potential. Another option would be to install an experimental aerator where the lake depth is sufficient.
3.2.5
3.2.4
COWICHAN RIVER
SOMENOS CREEK
OAK CR.
EXISTING BEAVER DAMS
FALLS
QUAMICHAN CREEK
QUAMICHAN LAKE
R1
R2
R3
R4
R5
R6
LEGEND
Watercourses
Habitat Potential
0-2% Slope, Good
2-5% Slope, Moderate
> 5% Slope, Poor
Other Watercourses
Permanent Flow
Intermittent Flow
Temporary Flow
Ephemeral Flow
Reach Break
Priority 1
Priority 2
Priority 3
Production Opportunities
KEY MAP
7
5
6
1
3
4
2
THE SOMENOS-QUAMICHAN BASIN 1:10 000
SOMENOS CREEK

## 3.3 Quamichan Creek

### Overview

Quamichan Creek is 1.48 km long and flows intermittently. The creek drains and is buffered by Quamichan Lake and discharges into Somenos Creek. The Creek consists of six reaches. The lower 300 m reach (R1) is the only reach accessible to anadromous species. A 2.3 m. falls is situated immediately downstream of Lakes Road (R2).

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 5 | 1 | < 0.1 | 134 | 134 |
| Reach 2 | 6 | 2 | 0.5 | 234 | 468 |
| Reach 3 | 5 | 0 | 1.5 | 82 | 0 |
| Reach 4 | 15 | 0 | < 0.1 | 100 | 0 |
| Reach 5 | 5 | 0 | 1.0 | 980 | 300 |
| Reach 6 | 40 | 3 | < 0.1 | 100 | 300 |
| ***TOTAL*** | | | | ***1,730*** | ***1,202*** |

### Land Use Factors

#### Agriculture

In the area draining into Quamichan creek, extensive clearing and drainage has occurred. At least 40 percent of the surrounding lands have been modified for agricultural uses. The water quality of Quamichan Creek is impacted by manure runoff from adjacent farmland.

#### Residential

Residential development has occurred along the east side of Quamichan Lake and along Lakes Road on the west side.

### Fish Utilization and Limiting Factors

The outlet of Quamichan Lake is heavily overgrown and its channel is poorly defined. Downstream of the outlet, a small area of spawning gravel accommodates Quamichan Lake trout and is the only known area of trout spawning habitat. Eggs and progeny of Quamichan Lake trout once hatched are prone to desiccation or stranding in this reach as it dewaters in May. Resident trout spawners are limited by small areas of suitable gravel which could be augmented. The 2.3 m falls.on Quamichan Creek is an anadromous migration barrier, however there are no spawning habitats upstream that would support anadroumous fish.

During summer, the 300 m of Quamichan Creek (R2) downstream of the falls supports rainbow and cutthroat trout juveniles and coho fry rearing in spring fed pools. The summer discharge is less than 1 litre/sec. An occasional brown trout has been reported as were pumpkinseeds in the summer of 1998. Cutthroat and coho production is strongly limited by the low summer seepage discharge of Quamichan Creek, and the short 300m. accessible length of Quamichan Creek. Quamichan Creek dewaters and becomes intermittent as early as late May in most years.

Reach 1 (below the migration barrier) is a candidate for summer fry salvage. A Cowichan Tribes E-Team salvaged 300 coho and a some brown trout juveniles in the summer of 1998. Chum salmon also spawn in Reach 2 of Quamichan Creek; particularly in high escapement years. Also, an occasional spawning steelhead has been reported.

### Recommendations

#### 3.3.6 Improve Cutthroat Spawning/Quamichan Lake Recruitment

Gravel improvement to Quamichan Creek above the falls would increase cutthroat recruitment to Quamichan Lake. A gravel area within a backfilled berm area at 15805 Jaynes Rd. is a primary trout spawning area. A 70m$^2$ area supports at least 30% of Quamichan Lakes cutthroat spawners. Its gravel needs to be cleaned and would benefit by the addition of new gravel, and if possible a project design for this reach embracing other elements described below.

At least 3 m$^3$ of 2 – 5 cm washed drain rock was added in the summer 1996 on the noted Jaynes Rd. property. This small spawning platform was going to be mitigation for a land development proposal (Dennis James – Sutton) that was subsequently not approved by the District of North Cowichan. The property owner agreed in 1986 to some stream cleaning and the addition of new gravel material.

#### 3.3.7 Riparian and Water Quality Improvement

Cattle fencing is recommended on the Van Boven Farm lands to restrict livestock access and encourage riparian vegetation recovery along Quamichan Creek. It is noted that when stream flow begins in the fall after fall rains begin, the first runoff from this property is heavily contaminated with animal manure from the summer's accumulation in the channel.

Water quality problems in the upper Quamichan Creek in late summer occur as a result of wind concentrated algae blooms at the outlet of the lake.

## 3.4 Quamichan Lake

### Overview

Quamichan Lake is the largest lake in the Cowichan watershed that is inaccessible to anadromous fish. There are however, no significant areas for salmon to spawn in tributaries to Quamichan Lake or its outlet streams.

In spite of this lack of spawning area the lake has been shown to provide excellent rearing conditions. An experiment in 1987 showed that coho smolts grew so well that they outmigrated early in the spring before the normal May-June migration window. A key to taking advantage of this rearing potential will be to ensure that out-migration is not hindered by a drop in the lake level too early in the season. A second factor is the need to ensure that smolts find the lake outlet in spite of brush obstructions.

The water quality in the lake is also a concern. The lake is highly responsive to nutrient loading due to its small catchment area (11 km2), low flushing rate, large area and shallow depth. Algae blooms and rooted aquatic plants have increased markedly in recent years. Summer fish kills have been reported by residents in several locations on the Lake. Of Quamichan Lake's eleven small streams inflows, five are polluted by barnyard and manure run-off.

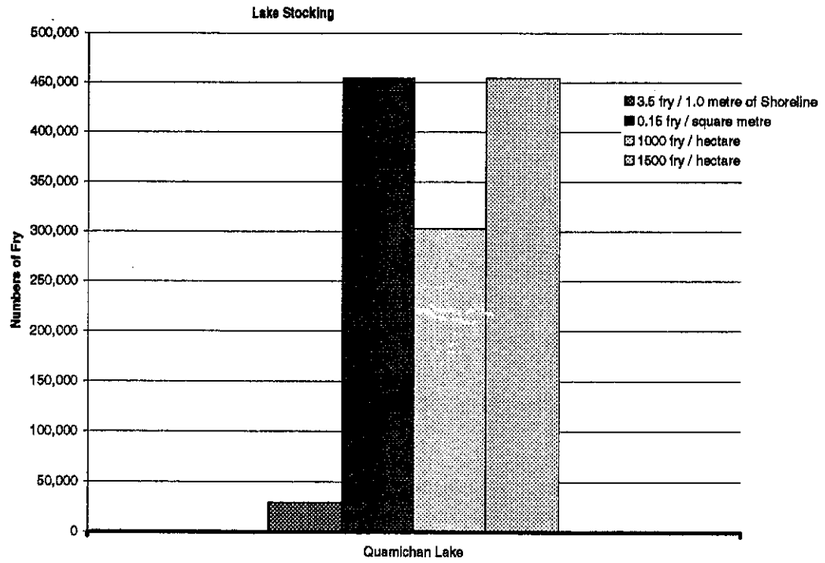
Protecting Quamichan Creek and improving water quality and increasing fish production potential in Quamichan Lake involves nearly all aspects of those living in this basin - much more is needed than protecting the stream corridor. Agricultural waste impacts need to be assessed because of elevated nutrient loading potential.

## Fish Utilization and Limiting Factors

Quamichan Lake cutthroats spawn in sections of Reaches 4 and 5. Lake resident rainbows may also spawn there. A backfilled reservoir in Reach 4 at 15805 Jaynes Road is the creek's primary spawning area. Trout from the lake have also been reported spawning in a seasonal inlet stream on the Peter Stone property (1437 Maple Bay Road) in very small numbers. However, no adults, redds or fry have been observed in three visits to the creek to look for fish or evidence of their utilization.

**Coho Colonization Potential - Quamichan Lake**

| Lakes | Area sq. m. Total | Area sq. m. less than 3m depth | Perimeter lin. m. | Tom Brown 3.5 fry / lin. m. shoreline | Ted Burns .15 fry/sq. m. | Barns Tech Report #1933 1000 fry/hectare | Brian Anderson 1500 fry/hectare |
|---|---|---|---|---|---|---|---|
| Quamichan Lake | 3,029,142 | n/a | 8,358 | 29,254 | 454,371 | 302,914 | 454,371 |
| *Total Lake Stocking* | | | | 29,254 | 454,371 | 302,914 | 454,371 |




## Recommendations

### 3.4.8 Coho Colonization

Since Quamichan Lake is the largest lake in the Cowichan watershed inaccessible to anadromous fish, a cooperative experiment in 1987 with MELP and the Fisheries and Oceans Research Branch introduced 60,000 coho fry into the lake in June to determine if increased coho salmon production can be realized (contact R. Barns, Pacific Biological Station). Similar experiments in 1985 and 1986 in Grant Lake and Kelvin Creek (Koksilah drainage) and in Bings Creek in the Cowichan watershed have proven successful, (Burns et al, 1987). The experiment in Quamichan Lake was positive in that large coho smolts (30 cm) were caught and some successfully migrated to sea as smolts.

Estimates of coho rearing potential for Quamichan Lake range depending on the estimation formula. Some estimates suggests that as many as 454,000 fry may rear in Quamichan Lake. A more detailed review of the coho colonization potential will be required, including the effects on resident trout populations. Starting from the success of previous experiments it is recommended that additional colonization experiments be continued to develop a more complete understanding of the untapped potential of this waterbody.

### 3.4.9 Outlet Control

Successful coho colonization in Quamichan Lake will depend upon improved outlet control for the lake. Storing water in Quamichan Lake above present normal levels would be unpopular with lake area farm operators, and may cause additional problems of lake eutrophication as more agricultural land is taken out of production.

Lowering the present control point by one or two feet with a flow control structure located in Quamichan Creek channel would be supported by landowners and would provide augmented flow to assist smolt migration if needed. This control structure would be designed to pass spawning adult trout both down and up stream and hatched fry for their migration from the spawning area up into the lake.

A report to the MELP Regional Water Manager (Bill Hollingshead) by David Vincent, P. Eng. describes the potential for a small weir situated near the outlet of Quamichan Lake. Also, a compendium of materials was assembled by Dr. Stan Pollock, #203-300 Brae Rd., Duncan, V9T 3T8 entitled *Quamichan Lake Report.*

The design of the lake outlet should also respond to a problem with coho smolts finding the outlet due to its poorly defined channel.

### 3.4.10 Water Quality and Water Conservation

Given the relatively small size of the Quamichan lake watershed, and its high production potential, a survey of all agricultural properties and residential properties serviced by septic systems, could be undertaken to establish problem waste mangement areas. Based on this survey of priority areas, remedial strategies could be undertaken.

Another alternative to improve water quality is to encourage water conservation and a reduction in consumptive water use unless new storage is possible. Part of this initiative would be to investigate whether or not a combined agricultural/fish storage regime would be of benefit in the Quamichan watershed.

## Quamichan Creek - Quamichan Lake

## Fish Production Enhancements

| Watercourses | | | Actions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quam. | Reaches | Issues | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| | Lake | Quamichan Lake is a large, eutrophic lake that does not currently support coho. It is the largest unit of un-utilized coho habitat in the Cowichan Watershed. Initial trials found smolts had trouble exiting the lake. | Plan and implement a lake coho stocking feasibility progaram. 1987 trials produced inconclusive results. | 50,000 - 454,000 coho fry | See flow control | | | | | In order to insure coho smolt egress from the lake, a flow control weir and deeper channel will be required. | | Public access to the lake is encouraged in the Park and Open Space Plan. | Landowner contact to develop management options for fish production. Public information to illustrate the resource potential |
| | 2 | Reach 1 flow is permanent but very low. The Reach is very shallow and lacking riparian cover and channel complexity. Fish are at risk from predation at base flows. | | | | | Install cross log and windfall log at 135 m point near base of access path. Observe for one season then continue if appropriate. | | | | | | |
| | 3 | Quamichan Lake supports a rather unique population of large cutthroat trout. These fish provide a valuable winter-spring fishery but numbers are low. Lack of quality spawning habitat is a primary reason. | | | | | | upgrade existing spawning area by removal of fines and muck, scarification of existing gravel and addition of at least 3 cubic metres of 2-5 cm washed drain rock | | | | Define public access points. Develop access to minimize impacts from recreational use. | Use recreational sport fishery as a point of contact for public education |
| | 4 | Quamichan Creek is polluted and its channel and riparian zone are degraded by stock activity at Van Boven's Farm | | | | Install fencing and restore riparian vegetation to degraded sections of the stream. Remove overgrown instream vegetation | | | | | investigate ways to improve water quality by minimizing late summer algae blooms | | Landowner contact to develop management options for fish production. |

FALLS

QUAMICHAN CREEK

R1 R2 R3 R4 R5 R6

QUAMICHAN LAKE

The falls immediately downstream from the bridge is an upstream migration barrier; however there exists no spawnable areas.


Quamichan Lake is a large eutrophic lake that is inaccessible to salmon. It represents a significant coho production opportunity.

The riparian vegetation along Quamichan Creek is well established. The stewardship of this riparian corridor should be encouraged.


Enhancements to spawning areas will support the unique population of large cutthroat trout in Quamichan Lake.


Remove barrier to smolt egress and provide a control weir to control flow. Enhancement work in this area should also include fencing to control livestock access and riparian planting.

## LEGEND

**Watercourses**

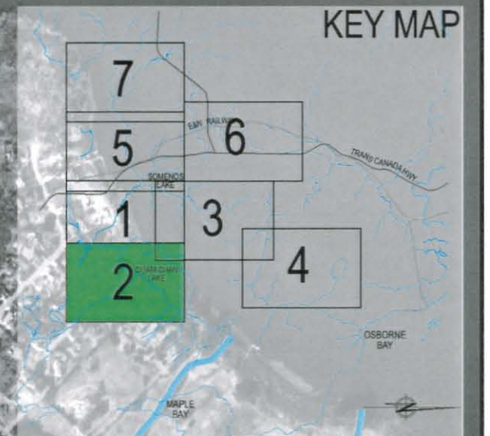
Habitat Potential
- 0-2% Slope, Good
- 2-5% Slope, Moderate
- > 5% Slope, Poor

Other Watercourses
- Permanent Flow
- Intermittent Flow
- Temporary Flow
- Ephemeral Flow

R1 Reach Break

Priority 1
Priority 2
Priority 3
Production Opportunities

## KEY MAP




THE SOMENOS-QUAMICHAN BASIN 1:10 000

# QUAMICHAN CREEK

## 3.5 Richards Creek

### Overview

Richards Creek begins at Crofton Reservoir and flows 10 km. into the northeast end of Somenos Lake. It drains Mount Richards and Maple Mountain and then flows through a broad lowland basin before entering Somenos Lake. Its primary flow source is Crofton Reservoir which is managed by the District of North Cowichan as a source of potable water. Numerous springs augment low summer flows and moderate high summer temperatures in Upper Richards Creek above Richards Trail. Flow from Crofton Lake is regulated by a 5 cm. Valve/pipe which discharges into Upper Richards Creek 60 m below the lake outlet. Water leaving the lake may be lethally warm at temperatures as high as +32 degrees in July and August. Cool groundwater springs feed the upper Richard Creek which help to moderate water temperatures There is a very extensive riparian area adjacent to Reach 1. In its natural state, it is largely a red osier – willow shrub forest, however much of the natural riparian zone has been cleared for agriculture and is now seasonally flooded vegetable or hay fields. In some areas in Reach 1B, the floodplain is over 600 m wide. There is no more than a fringe of native riparian vegetation along much of stream in this reach. Most of the channel throughout Reach 1 has been ditched as part of the agricultural drainage improvements done in 1983 under the ARDSA agreement. This reach is unlikely to support summer rearing of salmonids due to high water temperatures and low dissolved oxygen levels.

Reaches 2 and 3 also feature incised riparian landscape units, important springs and areas of steep adjacent slopes that are included in the FSZ (Fisheries Sensitive Zone). The FSZ narrows through Reaches 4 and 5 where it averages about 30m on either side of the stream. At this point the stream flows largely through upland landscape units with a narrow riparian zone which is only a fringe in many areas. In reach 6 the floodplain which is over 100m wide in places and much of it has been cleared. The FSZ narrows to about 20 – 40 m on either side of the creek through Reach 7 although there are broader areas where the riparian zone widens through this mainly upland reach. Reach 8 is an upland reach with narrow FZS but Reach 9 has a riparian band 15 to 30 metres wide on either side of the stream. The FSZ narrows again through Reaches 10 and 11 that traverse stable upland landscape units.

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 18 | 8 | < 0.1 | 4,827 | 38,616 |
| Reach 2 | 5 | 2 | 1.0 | 1,180 | 2,360 |
| Reach 3 | 4 | 2 | 2.3 | 82 | 164 |
| Reach 4 | 4 | 2 | 5.0 | 282 | 564 |
| Reach 5 | 3 | 2 | 2.5 | 310 | 620 |
| Reach 6 | 3 | 2 | 0.5 | 804 | 1,608 |
| Reach 7 | 2 | 1 | 3.0 | 151 | 151 |
| Reach 8 | 3 | 1 | 1.0 | 215 | 215 |
| Reach 9 | 3 | 2 | 2.5 | 460 | 920 |
| Reach 10 | 3 | 2 | 1.5 | 304 | 608 |
| Reach 11 | 3 | 2 | 2.0 | 85 | 170 |
| Reach 12 | 3 | 2 | 3.0 | 438 | 876 |
| Reach 13 | 3 | 1 | 2.0 | 585 | 585 |
| Reach 14 | 2 | 1 | 1.0 | 238 | 238 |
| Reach 15 | 3 | 0 | 5.0 | 131 | 0 |
| ***TOTAL*** | | | | ***10,092*** | ***47,696*** |

### Land Use Factors

#### Agriculture

The lowland portion of the basin has been transformed by agricultural activities.

Habitat compensation in Reach 2 for dredging the less productive Lower Somenos and Lower Richards Creek was undertaken in 1983 above Richards Trail on the Van Eeuwen farm property by farm fencing to restrain cattle from foraging in the riparian corridor, bank restoration, and off-stream cattle watering. (B.D. Tutty - DFO and G. Reid - MELP). Maintenance of cattle fencing by land owners in such situations is essential for such a mitigation/compensation plan to work and in this case it was not. The ditched length of Richards Creek extends from Somenos Lake upstream to a point 35m below Richards Trail. This flat gradient section has insufficient dissolved oxygen to support fish during the summer period. Water withdrawal immediately below Richards Trail for purposes of crop watering has been observed to suspend stream flow and dry up the stream (B. Tutty, pers. comm.)

#### Forestry

Uplands are covered by advanced second growth. There has been considerable second growth logging adjacent to the upper reaches of Richards Creek in the North Cowichan Municipal Forest.

#### Residential

Development of rural residential lots in the narrow upland valley should be planned to prevent future erosion and water quality problems.

#### Water licenses

Stream is fully recorded for consumptive water licenses.

## Fish Utilization and Limiting Factors

Richards Creek supports a large coho spawning population, more than 700 in 1997, as well as some cutthroat and rainbow trout. Some of these trout are anadromous. A few chum salmon are occasionally reported above Richards Trail. Steelhead and rainbow trout are also said to be present in small numbers.

Production is concentrated in Reach 2 within the small amount of reasonable spawning and rearing habitat (2,360 $m^2$) between the falls and the ditched zone downstream of Richards Trail. Coho fry densities are very high due to swim-ups from Somenos Lake in the spring to escape deteriorating water quality in the lake.

## Recommendations

### 3.5.11 Coho Colonization – Crofton Reservoir and Breen Lake

Crofton Reservoir is a potential site for coho colonization if the fish can get egress safely via the Lake outlet pipe. The Crofton Reservoir impoundment has a surface area of approximately 22.6 ha. Based on the models suggested in the lake colonization summary the potential for this reservoir ranges from 22,000 to 35,000 fry. If Breen Lake is impounded, an additional yield of 4,700 to 7,000 fry could be colonized. It is likely that Breen Lake would have to be colonized in the fall to avoid marginal summer rearing conditions.

This reservoir is the primary domestic water source for Crofton. Consideration of coho colonization opportunities, or headwater storage as described below must be review in the context of this primary use.

### 3.5.12 Headwater Storage

Breen Lake is a privately owned mature wetland at the headwaters of Crofton Reservoir's inlet. It has an existing 2.5m dam at its outlet. This dam is very old and its spillway is in disrepair. The wetland is capable of storing at least 168,000$m^3$ of water which could be used to provide 7.65 LPS (litres/second) for the 180 day critical discharge period if the dam were safe to hold back the additional storage. This would increase Crofton Reservoir's usable storage and allow additional spill from Crofton Reservoir into Richards Creek. It may be necessary to construct new spillway to act as a better flow control structure. Adding additional flow would improve summer rearing conditions in Reach 1 and make it more productive.

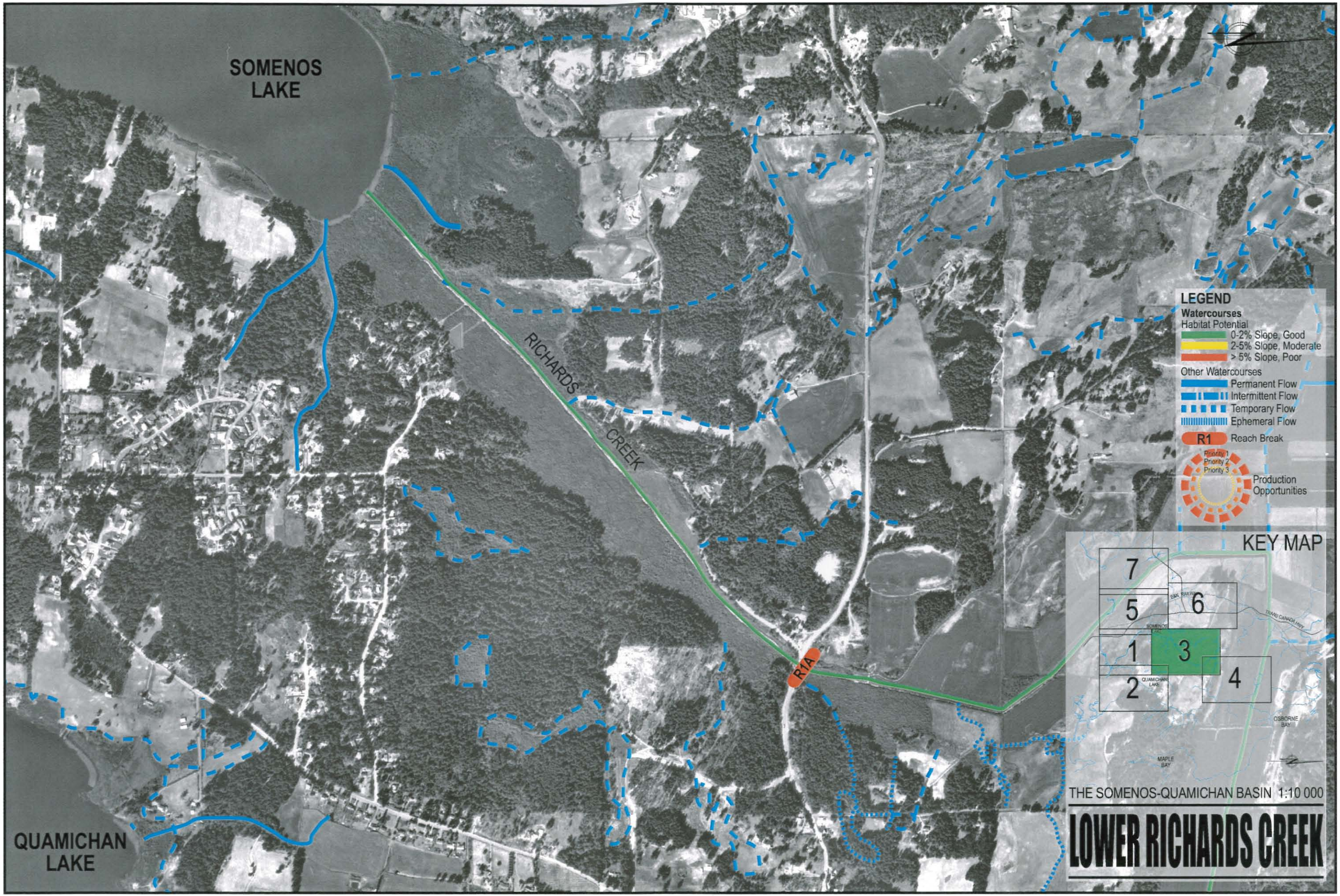
### 3.5.13 Riparian Maintenance and Improvement

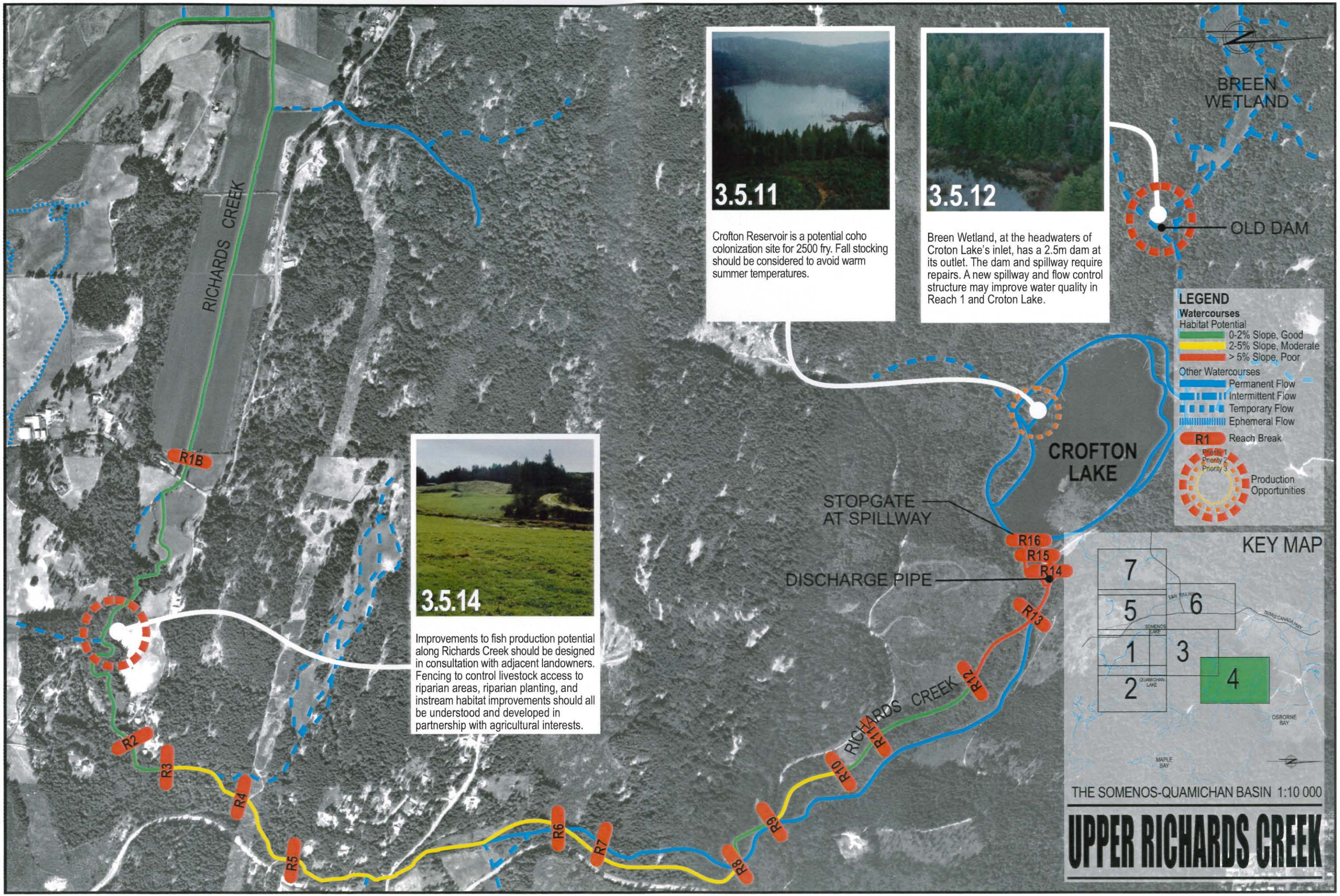
As noted previously, in-stream enhancement, in 1983, above Richards Trail on the Valley View Farm property was undertaken as an ARDSA habitat mitigation project in this highly productive reach. Maintenance of these mitigation works and fencing was not been kept up. (DFO memo-Tutty to Field 01/09/87). As of July, 1998, most of the structural work was still in place but in need of repair. The riparian setback also needs to be increased somewhat because it is generally too narrow to allow for healthy riparian vegetation.

### 3.5.14 Coho Colonization – Upper Richards Creek

Richards Creek could be colonized with coho above the barrier and would yield about 400-500 smolts. This reach could be colonized with about 6,000 coho fry.

| Richards Creek | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish Production Enhancements** | | | | | | | | | | | | | |
| Watercourses | | | Actions | | | | | | | | | | |
| Richards | Reaches | Issues | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| | 2 | Reach 2 is the only accessible quality spawning and rearing habitat in the system. There is considerable riparian degradation in Lower Reach 2. | | | | Upgrade 1983 works by repairing and setting back fencing. Plant in areas between fence and creek. | | | | | | | Landowner contact to develop management options for fish production |
| | all | Richards Creek production is limited by low summer flows and Crofton Lake suffers from summer water quality problems. | | | | | | | | Impound Breen Lake, a headwater wetland that can yield 7.65 LPS for 180 days with control. Improvements would compound below. | | | |
| | Breen Lake, Crofton Lake and Reaches 4 through 14 | 6161 square meters of upper system stream habitat is inaccessible to coho along with 160,000 in Crofton L. and another 60,000 in Breen L. | Colonize with coho fry. The two lakes should receive fall plants only. | Upper Richards: 6000, Crofton L: 24,000, Breen L: 9000. | | | | | | | | | |


SOMENOS LAKE
RICHARDS CREEK
R1A
QUAMICHAN LAKE
LEGEND
Watercourses
Habitat Potential
0-2% Slope, Good
2-5% Slope, Moderate
> 5% Slope, Poor
Other Watercourses
Permanent Flow
Intermittent Flow
Temporary Flow
Ephemeral Flow
R1
Reach Break
Priority 1
Priority 2
Priority 3
Production Opportunities
KEY MAP
7
5
6
1
3
4
2
TRANS CANADA HWY
QUAMICHAN LAKE
OSBORNE BAY
MAPLE BAY
THE SOMENOS-QUAMICHAN BASIN 1:10 000
LOWER RICHARDS CREEK


RICHARDS CREEK
R1B
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
3.5.11
Crofton Reservoir is a potential coho colonization site for 2500 fry. Fall stocking should be considered to avoid warm summer temperatures.
3.5.12
Breen Wetland, at the headwaters of Croton Lake's inlet, has a 2.5m dam at its outlet. The dam and spillway require repairs. A new spillway and flow control structure may improve water quality in Reach 1 and Croton Lake.
BREEN WETLAND
OLD DAM
CROFTON LAKE
STOPGATE AT SPILLWAY
DISCHARGE PIPE
3.5.14
Improvements to fish production potential along Richards Creek should be designed in consultation with adjacent landowners. Fencing to control livestock access to riparian areas, riparian planting, and instream habitat improvements should all be understood and developed in partnership with agricultural interests.
LEGEND
Watercourses
Habitat Potential
0-2% Slope, Good
2-5% Slope, Moderate
> 5% Slope, Poor
Other Watercourses
Permanent Flow
Intermittent Flow
Temporary Flow
Ephemeral Flow
R1 Reach Break
Priority 1
Priority 2
Priority 3
Production Opportunities
KEY MAP
7
5
6
1
3
4
2
SOMENOS LAKE
QUAMICHAN LAKE
TRANS CANADA HWY
OSBORNE BAY
MAPLE BAY
THE SOMENOS-QUAMICHAN BASIN 1:10 000
UPPER RICHARDS CREEK

## 3.6 Averill Creek

### Overview

Averill Creek is 5.3 km long and drains the southeast slope of Mt. Prevost and enters Somenos Lake along the west side. It is a complex system consisting of two major tributaries.

The mainstem of Averill Creek has its primary origins in several wetland basins near the Island Highway in the vicinity of North Cowichan's Municipal offices. The West Averill Creek tributary originates on the southwest shoulder of Mt. Prevost and drains southeast through Duncan Lakes Golf Course to join the mainstem of Averill Creek 2.55 km above Somenos Lake. Important tributaries are Fairview and Herd Creeks, which supply Averill's flow from May to October (Critical Discharge Period – CDP), the East Averill Creek tributary and Prevost Creek.

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 6 | 3 | 0.1 | 570 | 1,710 |
| Reach 2 | 10 | 4 | 0.5 | 180 | 720 |
| Reach 3 | 8 | 7 | 2.0 | 300 | 2,100 |
| Reach 4 | 5 | 3 | 1.0 | 1,600 | 4,800 |
| Reach 5 | 3 | 0.5 | 0.5 | 800 | 400 |
| Reach 6 | 3 | 1.5 | 0.5 | 500 | 750 |
| Reach 7 | 3 | 0 | 3.5 | 1,200 | 0 |
| ***TOTAL*** | | | | ***5,150*** | ***10,510*** |

### Land Use Factors

#### Agriculture

Intensive use of most of the Averill Watershed below the 100 m contour has caused chronic stream degradation: sedimentation, bank damage, cover removal and pollution from barnyard and manure runoff.

#### Residential

The area below the 100 m contour is about 10 percent urbanized and residential expansion is increasing. Duncan Lakes Golf Course was constructed in 1990. It covers a major portion of the West Averill Creek watershed.

### Fish Utilization and Limiting Factors

Cutthroat trout, coho and chum salmon utilize the lower 750 m. However, only 150 m of this section has quality spawning and rearing habitat.

Unlike Bings and Richards Creeks, Averill Creek does not appear to receive a large population of coho fry emmigrating from Somenos Lake which may be due to migration barriers downstream. It is thought that the E&N culvert is a velocity barrier to upstream fry migration. Base flow velocity in the 41 m. concrete box structure with a "V" centre grove is 1.55 metres per second and appears to be a barrier.

Production is further limited by very low summer flow. Averill Creek dries early above an elevation of 2,000 metres where only isolated pools persist from July through September each year.

### Issues

Much of the Fisheries Sensitive Zone (FSZ) around Averill Creek has been altered by agriculture and other adjacent land uses. The largest riparian component is Somenos Lake wetland reach which has a significant inland extension on Averill Creek above the Island Highway – E and N right of way. After this wetland segment, Averill Creek enters a moderately incised ravine with steep silt-clay walls There has been some residential intrusion into the FSZ in this area and in the adjacent Fairview Creek tributary. The ravine becomes increasingly shallow until it gives way to lower gradient riparian area above Drinkwater Road that extends to the Fry Swamp - Powerline area. Above this point, the stream descends from a ravine that connects to its headwater wetland basins.

### Recommendations

#### 3.6.15 Substrate Improvement

It should be possible to improve a 100 m section between the barrier falls and E & N culvert by gravel restoration. Streamside cattle fencing would also be beneficial in some areas. The objective is to provide at least one section of high quality spawning habitat in an accessible location so it can be maintained on an annual basis. There would be reasonable coho and chum egg survival in this reach. Averill Creek spawning gravels have been seriously degraded from upstream development and agricultural activities. This project would involve the additon of at least 5 cu. M. of washed 2-5 cm gravel (drain rock).

#### 3.6.16 Barrier Improvement - Adult Passage

The falls could be made passable, but few coho or trout rearing benefits would result due to lack of quality upstream summer habitat. Headwater storage and flow augementation as described in 3.6.21, could alleviate this problem.

There is a small 35 m long overflow channel on the south side of the falls that only carries water in peak freshet flows, at discharge levels of 0.6 – 1.0 cubic metres per second the channel only flows at about 1LPS and only attains this discharge several times per year.

This channel needs to be deepened at least 20 cm at its inlet along with widening and deepening at selected spots. Two resting pools would need to be constructed near its lower end. It is also possible that a small deflector will be necessary above the falls to guarantee sustained flow during the migration period. Note, if these falls are made passable, and summer flow increases, it wouidbe advisable to replace the Somenos Road culvert on the West Averill Creek which is also migration barrier.

#### 3.6.17 Coho Colonization without Headwater Storage

Nine ponds with a total surface area of 22,500 square metres are situated on the West Averill Creek on Duncan Lake's Golf Course. With minor modifications in outlet controls, storage regime and channel structure in outlet streams, these could produce +/-500 coho smolts from fall stocked fry.

#### 3.6.18 Barrier Improvement – Fry Passage

Baffles or small weirs in the E & N Railway culvert would allow for summer season fish passage from Somenos Lake to the most habitable refuge portion of Averill Creek. It may also be advisable to do the same in the Island Highway culvert. Baffles should be placed 2 – 3m. apart. The purpose of the baffles is to deepen and slow the water to allow fry passage while not speeding flow near the baffles.

### 3.6.19 Headwater Storage

Nearly 80% of the mainstem channel of Averill Creek is dry or highly intermittant during summer periods but is otherwise habitable for salmonids. Provision of CDP (Critical Discharge Period) flow is a primary objective. Five wetland basins (Muni, Fry, Alligator, Deer Heaven and Deer City) might afford a combined storage area of 19.29 ha and with 1 m of storage, a 180 day discharge yield of 8.723 LPS.

### 3.6.20 Coho Colonization with Storage

Above-barrier coho habitat: is 7,900 sq. m. of +/-600. Coho colonization should not be necessary if the falls are made passable but will probably need to be kept up for at least one generation because coho escapement below barrier is presently very low. If the headwater wetlands could support fall fry, +/-2300 smolts could br produced.

### 3.6.21 Additional Flow Augmentation

The Crofton Pulp Mill water pipeline from the Cowichan R. passes adjacent the Averill headwater wetlands (Deer, Heaven, and Deer City Cr.). The possibility of withdrawing some water from this source to augment storage should be investigated.

### 3.6.22 Riparian Restoration

An area of upper Reach 5 extending from from 1210 – 1335 m on both banks requires riparian protection as do other tributary in the area of the Municipal Wetland. East Averill Creek is a 600 m long stream that flows largely through pasture with denuded banks which are eroding in many places. Its channel is becoming clogged with spike rush and canary grass due to lack of a shading stream canopy.

### 3.6.23 Groundwater Development – Herd Creek, East Fork, Snowberry Creek

Sloped riparian wetlands and springs near the heads of Herd and Snowberry Creeks on upper Drinkwater Road are the headwaters of Averill Creek. These springs provide summer flows that are very low (base flow 1-2 LPS). A headwater aquifer below North Road as well as springs along Upper Drinkwater may support wells that could provide additonal high quality water. Existing well logs should be examined and a test drill should be conducted.

East Averill Creek flows from Municipal Wetland to join Averill Creek in Reach 5 . There are at least 3 springs on the adjacent Hayhoe property that appear capable of yielding additional summer flow. Winter flow in the main spring was measured on 1/14/98 at 1.615 LPS @ 8.9°C. This permanent spring flows all summer and is largely responsible for the retention of intermittent pools in Averill Creek between Herd Creek confluence and the East Averill Creek confluence. Test wells could be completed. If these tests prove productive, wells could be constructed to augment summer base flows.

### 3.6.24 Coho Colonization – Duncan Lake Golf Course Ponds

At least nine ponds with a total surface area of 22,500 square metres are present on the west fork on Duncan Lakes Golf Course. With minor modifications in outlet controls, storage regime and channel structure in the outlet stream, these could produce coho smolts from stocked fall fry. These ponds have enough marginal vegetation to allow survival of summer salvaged coho fry. Water temperature and dissolved oxygen should be assessed for this purpose.

## Averill Creek

## Fish Production Opportunities

| Watercourses | | Priority | Actions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reaches | Issues | | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| 1 | Poor channel definition during periods of high flow results in fish stranded outside of the channel as water levels recede. | | | | See Riparian Enhancements | Develop a new channel for Averill Creek from Somenos Lake to the Highway. | | | | | | Develop a self contained public information kiosk, walkway that allows access without impacting habitat | This highway location is excellent for sign, access, etc. |
| 1 | Fry access into summer refuge habitat in Reach 2 due to summer anoxia in Reach 1 | 1 | | | Ensure upstream fry passage at Island Highway and E + N culverts | | | | | | | | Install stream name signage at each crossing |
| 2 | No access for adults into the upper basin | 1 | | | Provide adult access over Averill Falls via bypass channel on south side | | | | | | | | |
| 2 | Reduced spawning capability. | 2 | | | | | | Provide an area of enhanced gravel in and adjacent to a sidechannel, maintain annually | | | | | |
| All | Chronic very low, or no summer flows above the confluence of Herd Creek, located at the top of Reach 3 | 1 | | | | | | | | Headwater storage in five wetland basins can provide 8.7 LPS for CDP. | | | Landowner contact to develop management options for fish production |
| | Chronic very low, or no summer flows above the confluence of Herd Creek, located at the top of Reach 3 | 2 | | | | | | | | Supplement water storage with water from the Crofton Mill waterline | | | |
| All | Habitat potential of the upper basin is not used for Coho rearing (80% of watershed) | 2 | Stock coho fry for three years following summer flow augmentation to jump start upstream population that will come when falls improved | 7900 in stream (late spring) ;3375 in Duncan Lakes Golf Course Ponds (fall) | | | | | | | | | |
| 5 mainstem and 1 on East Fork | Bank erosion and reduced streamside canopy contributes to downstream sedimentation and reduces habitat quality on site | 2 | | | | An area of 125 m on either side of the stream in upper Reach 5 and an area of Reach 2 of the East Fork near Hall Rd. require treatment | | | | | | | |
| Herd Creek, East Fork | Chronic very low, or no summer flows are a limiting factor to production | 2 | | | | | | | | Investigate well potential on Mayer and Hayhoe properties and at head of West Fork trib. near Upper Drinkwater Rd. | | | |

## 3.1.27

A series of falls limit anadromous fish migration. Improving the falls, and removing the dam and CN culvert would allow coho, steelhead, and migrant brown trout to use additional habitat in Bings and Menzies Creek.

3.7.25

Similar to this stream restoration project, substrate improvement and replacement in reach 2 should provide a quality spawning site.

## 3.6.17

Pond improvements are possible with minor modifications. The nine ponds on Duncan Lake Golf Course could produce coho smolts from stocked fall fry. Pond improvements required include outlet controls, storage regime and channel structures in outlet streams.

COWICHAN RIVER

FALLS

DAM

R5

R4

R3

R2

3.7.28

R1B

R1A

R1

BINGS CREEK

HERD CREEK

BARRIER

FAIRVIEW CREEK

R4

R3

R2

R1A

R1

AVERILL CREEK

Refer to detail view - 1B

Refer to detail view - 1A

SOMENOS LAKE

LEGEND

Watercourses

Habitat Potential

- 0-2% Slope, Good
- 2-5% Slope, Moderate
- > 5% Slope, Poor

Other Watercourses

- Permanent Flow
- Intermittent Flow
- Temporary Flow
- Ephemeral Flow

R1 Reach Break

Priority 1
Priority 2
Priority 3

Production Opportunities

KEY MAP

7
5
6
1
3
2
4

SAN RAFAEL

SOMENOS

QUAMICHAN LAKE

OSBORNE BAY

MAPLE BAY

THE SOMENOS-QUAMICHAN BASIN 1:10 000

# AVERILL & BINGS CREEK

## 3.6.16

The falls prevent fish migration. Constructing resting pools and a deflector above the falls would make the falls passable for adult fish. Upstream summer habitat is poor due to low summer flow. Headwater storage could enhance summer habitat.

3.6.18

The surface temperature of Somenos Lake measured 32.3 °, and the temperature of Averill Creek just below the culvert measured 26 °. The Island Highway culvert is also a problem for migration of fry. This 24 m concrete box structure provides a shallow 1 - 2 cm lens of water at base summer flows which impede juvenile and adult fish from migrating upstream.

SOMENOS LAKE

FALLS

R3

AVERILL CREEK

R2

R1A

R1

AVERILL CREEK

## 3.6.15

Averill Creek substrate quality has been degraded by upstream development. The substrate between the falls and the E and N culvert could be restored by adding 5 cu.m of washed 2-5 cm gravel (drainrock).

**LEGEND**

**Watercourses**

Habitat Potential

- 0-2% Slope, Good
- 2-5% Slope, Moderate
- > 5% Slope, Poor

Other Watercourses

- Permanent Flow
- Intermittent Flow
- Temporary Flow
- Ephemeral Flow

R1 Reach Break

Priority 1
Priority 2
Priority 3
Production Opportunities

KEY MAP

5

THE SOMENOS-QUAMICHAN BASIN 1:2500

# AVERILL CREEK - VIEW 1A

WATERLINE

COWICHAN VALLEY HIGHWAY

AVRILL CREEK

E&N RAILWAY

ALLIGATOR WETLAND

ALLIGATOR CREEK

DEER HEAVEN WETLAND

DEER HEAVEN WETLAND

WATERLINE

MUNICIPAL WETLAND

TRANS CANADA HIGHWAY

FRY SWAMP

## 3.6.21

The Crofton Pulp Mill water pipeline passes close to the Averill headwater wetlands. Drawing water from this source to augment storage may be possible and should be investigated.

## 3.6.19

In the summer, 80% of the mainstem of Averill creek is dry or highly intermittent. Increasing CDP (Critical Discharge Period) flow would make the creek habitable during the summer.

**LEGEND**

**Watercourses**

Habitat Potential

- 0-2% Slope, Good
- 2-5% Slope, Moderate
- > 5% Slope, Poor

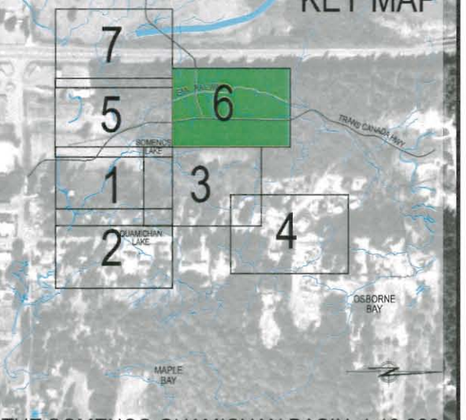
Other Watercourses

- Permanent Flow
- Intermittent Flow
- Temporary Flow
- Ephemeral Flow

R1 Reach Break

Priority 1
Priority 2
Priority 3
Production Opportunities

KEY MAP




## 3.6.22

Averill Creek flows largely through pasture lands and lacks riparian vegetation. The riparian zone should be restored to prevent bank erosion and inhibit the growth of Spike Rush and Canary Grass that are clogging the channel.

## 3.6.24

With minor modifications, at least nine ponds on Duncan Lakes Golf Course could produce coho smolts from stocked fall fry. Changes to outlet controls, storage regime and channel structure in outlet streams are required to make the ponds productive.

## 3.6.20

Downstream from these headwater wetlands, falls are a barrier to fish passage . Colonization should be kept up for at least one generation after the falls have been made passable because escapement is presently low. Headwater wetlands may support fall fry.

THE SOMENOS-QUAMICHAN BASIN 1:10 000

# AVERILL, UPPER REACHES

## 3.7 Bings Creek

### Overview

Bing's Creek enters Somenos Lake from the west side and drains the southeast shoulder of Mt. Prevost. The watershed of this creek covers and area of about 15.5 km². A 3.2 m falls about 1.5 km upstream limits upstream migration.

The Bings Creek Fisheries Sensitive Zone is a combination of riparian areas and small ravines upstream to the headwaters on Mt. Prevost. This stream corridor is in reasonable health, but there are significant intrusions in the form of buildings and encroaching residential areas occurring along Mary Rd. The first 520 metres of Bings Creek (below the Trans-Canada Highway) flows through a low elevation winter flooded farm field and Somenos Marsh before entering the Lake. Shade giving riparian vegetation is sparse and consists mostly of flood tolerant willow species. The creek was diverted and channelized when the railway and highway corridor were built. In high water periods the Lake extends up to the highway flooding the adjacent fields and back watering the creek channel and wetland area around the RCMP station.

Further upstream at Old Lake Cowichan Road (Reach 10), there is a small sewage discharge pipe. Agricultural encroachment occurs along Reaches 7 (Knight) and Reach 11 (Judge). Much of Reaches 6 – 9 is paralleled by the old railroad grade which serves as highly utilized walking trail in a very attractive landscape setting. There is an excellent opportunity to establish a Recreational Greenway Corridor here and formalize the trail system adjacent this productive stream.

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 6 | 4 | 0.01 | 540 | 2,160 |
| Reach 1A | 11 | 4 | 0.1 | 39 | 156 |
| Reach 1B | 6 | 4 | 0.5 | 859 | 3,436 |
| Reach 2 | 10 | 5 | 1.5 | 303 | 1,515 |
| Reach 3 | 9 | 4 | 4.0 | 327 | 1,308 |
| Reach 4 | 10 | 5 | 1.5 | 94 | 470 |
| Reach 5 | 7 | 5 | 2.0 | 72 | 360 |
| Reach 6 | 6 | 4 | 2.0 | 1,836 | 7,344 |
| Reach 7 | 5 | 2 | 1.3 | 692 | 1,384 |
| Reach 8 | 4 | 2 | 3.0 | 157 | 314 |
| Reach 9 | 5 | 3 | 1.0 | 589 | 1,767 |
| Reach 10 | 4 | 2 | 1.5 | 267 | 534 |
| Reach 11 | 4 | 2 | 0.7 | 1,158 | 2,316 |
| Reach 12 | 4 | 0 | 2.5 | Unknown | 0 |
| ***TOTAL*** | | | | ***6,933*** | ***23,064*** |

### Land Use Factors

#### Agriculture

A significant portion of the basin below the 100 m contour is utilized for animal grazing and forage production. Intensity is generally low but a 500 m section that passes through the Judge Dairy Farm suffers from erosion and sedimentation from unrestricted access of cattle into the stream channel.

#### Residential

There is currently not a lot of residential development in this area, except that higher density multi-family is adjacent to the creek from reach 2 to reach 5.

#### Forestry

The forested parts of the watershed are mainly advanced second growth with some recent logging on the lower slopes of Mt. Prevost. Minimal impact will result from logging this basin because of low relief and careful management by the District of North Cowichan.

### Fish Utilization and Limiting Factors

Bings Creek supports coho and chum salmon and cutthroat trout (resident, sea-run, and Somenos Lake spawners). Brown trout have been introduced above the falls. Steelhead have also been reported spawning below the falls. Some steelhead occasionally ascend the barriers and spawn in Upper Bings or Menzies Creeks. Steelhead smolts were trapped in May 1989 from this reach.

Lower Bings Creek is noted for its large population of coho juveniles. Densities of 10 fry/m² have been observed. It is suspected that coho fry rear in Somenos Lake in the spring months. Then they seek the cooler refuge waters of the creek in mid-summer when the lake warms and becomes anoxic. A major fish kill occurred in early Sept. of 1989. As a result, significant numbers of young coho and trout migrated into Bings Creek to avoid high temperatures (24+ degrees C.) and low oxygen concentrations (1 ppm).

Beavers sometimes dam Lower Bings and this can prevent upstream access by fish seeking refuge in critical periods. A beaver dam first noted in 1994 is located in Reach 1 immediately downstream of the Island Highway and should be removed or made passable. Another beaver dam exists near the top of Reach 1B and its removal is also recommended.

Introduced brown trout have established as a resident population above the falls. Migrant browns from Somenos Lake or the Lower Cowichan are also present below the falls . Many of the larger browns (60 cm plus) are anadromous and represent a unique subspecies and are likely spawning in this reach.

Anadromous salmonids are restricted to the lower 1438 m. Only 898 m of this section are good quality habitat.

Production of coho and resident trout is limited by summer flow. The system dries in the summer above the 100 m contour.

## Recommendations

### 3.7.25 Substrate Improvement

Spawning substrate improvement and/or replacement in Reach 2 would serve to increase recruitment of fry into the Somenos watershed. Bings, Richards and Averill Creeks contain less than 5,000 sq. m. of quality spawning habitat.

### 3.7.26 Coho Colonization

Above the existing fish barrier 15,797 sq. m. rearing habitat is available. With 15797 @ 1 fry/sq. m. and a smolt survival rate of 15% there is the potential to produce +/-2300 smolts.

If the fish passage barriers were removed, upstream colonization of coho would not be required.

### 3.7.27 Barrier Improvement (Adult)

A series of falls occur at 1438m and confines anadromous fish to only 22% of the habitat of Bing's Creek. Improvement of the barrier falls at 1438 m, combined with removal/improvements to the CN culvert and apron at 1683 m would allow coho, steelhead and migrant brown trout to utilize 5138 sq. m. of additional habitat in Bings Creek and 3756 sq. m. of habitat in Menzies Creek.

### 3.7.28 Refuge Access – Juvenile migration Improvement (Juvenile)

Coho from Somenos Lake must be able to move into Bings, Averill and Richards Creeks to seek cool refuge and escape lethal temperature and oxygen conditions. Two beaver dams are present and pose risks to fry migration into Lower Bings Creek. The first is located just below the highway at 458m in (R1) and the other just below Mary Road at 1200 m. The lower beaver dam should be assessed and removed if required. The upper beaver dam is more recent and much larger. A local resident lowers it from time to time but beavers rebuild it consistently. This dam is also responsible for considerable flooding in the area and the dam and its beavers need to be completely removed.

### 3.7.29 Riparian Vegetation – Reach 1

Reach 1 is choked with reed canary grass and other aggressive aquatic vegetation. This restricts drainage, prolongs flooding, and enhances pressure to dredge the creek channel and/or Somenos Creek. Stream cross sections that encourage the establishment of a higher canopy to shade the stream and dicourage heavy growth of instream or noxious vegetation is required. It is recommended that a test section should be started in the spring of 1999 using taller native species.

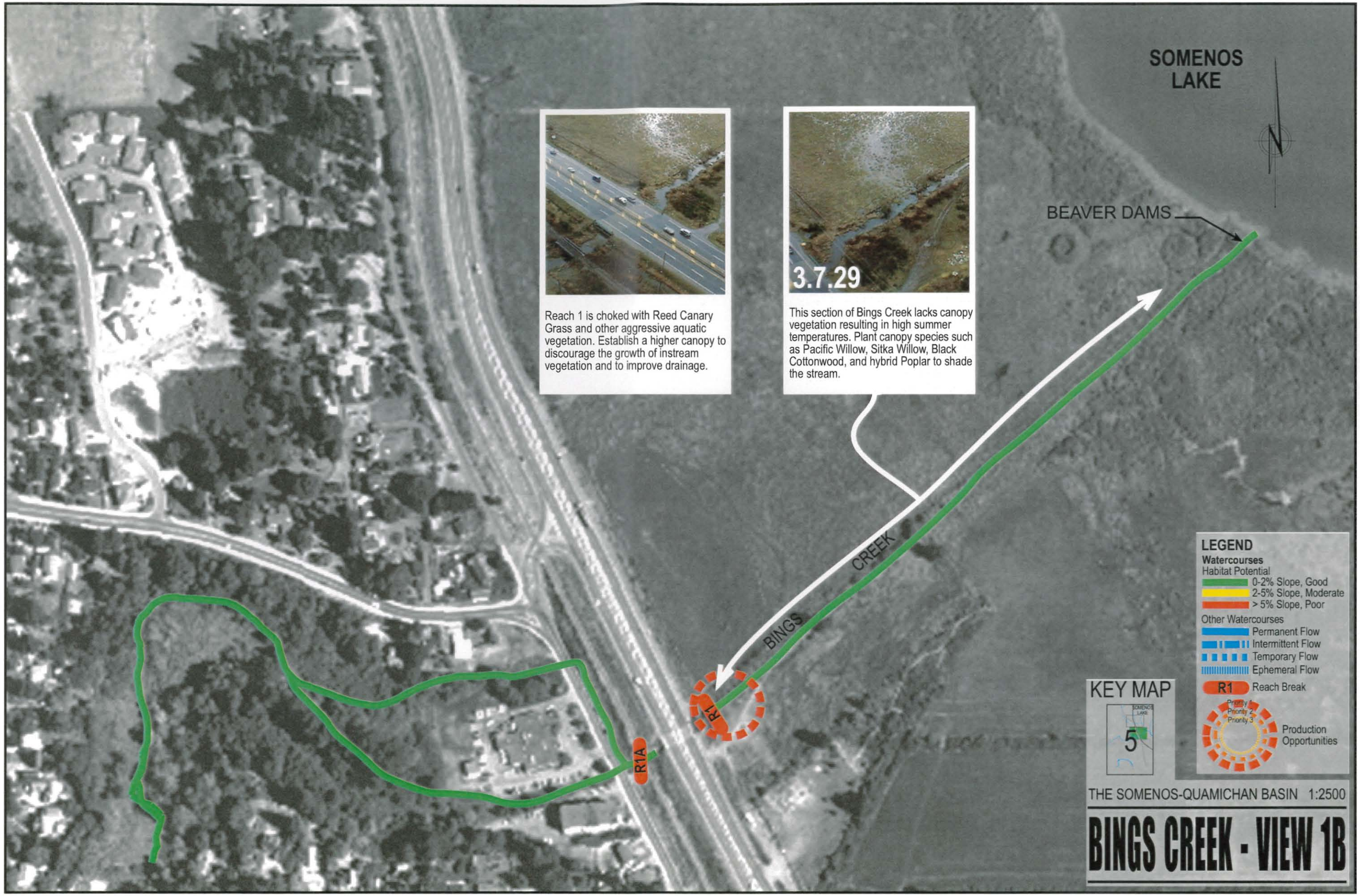
The section on the following page illustrates what this section of the creek might look like. This design development for this section should be undertaken as a demonstration for other sites within the watershed. The objective of the design would be to:

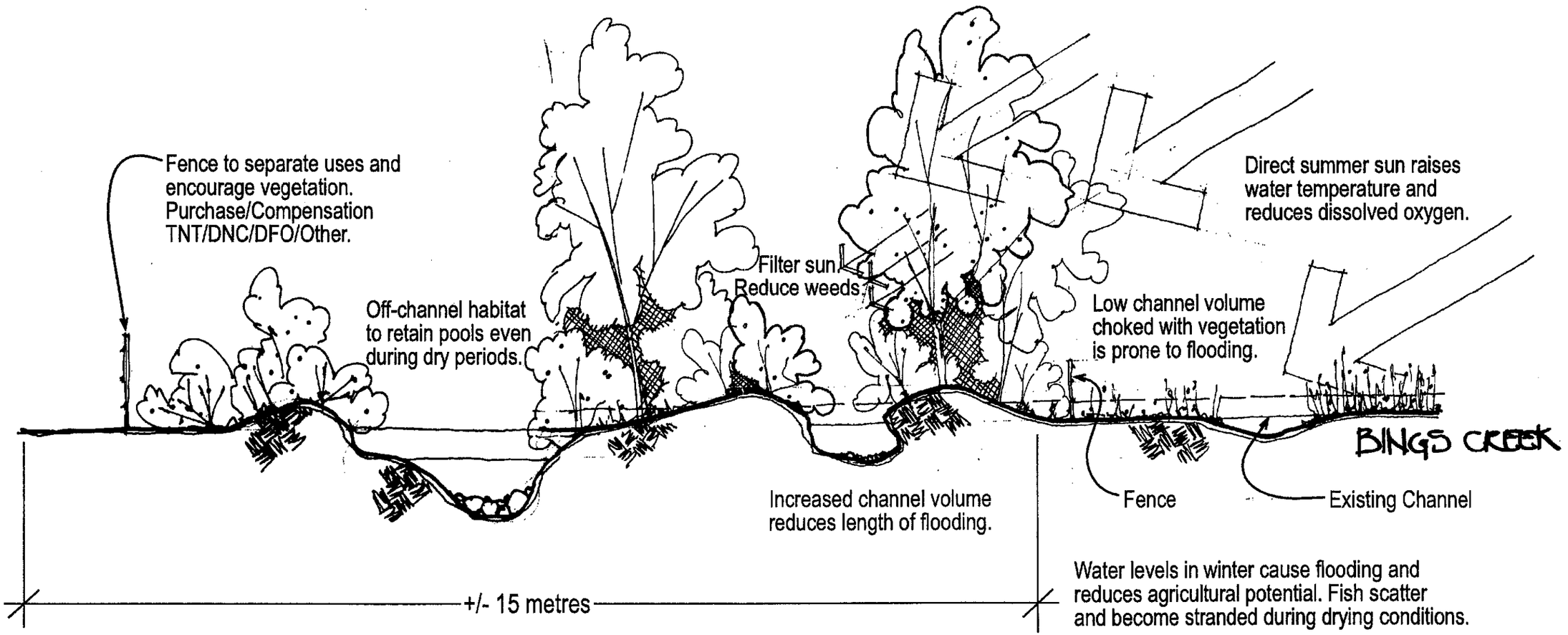
- Improve channel definition so that storm flows can be more easily contained.
- Provide canopy vegetation to discourage instream vegetation and reduce ongoing stream maintenance requirements.
- Provide cooler, summer refuge areas within the stream for coho migrating away from lethally warm water in Somenos lake.
- Suggest ways that stream channels and riparian vegetation can be incorporated into adjacent farm management practices.

### 3.7.30 Riparian Improvements: Reach 11

Portions of Reach 11 have been polluted and physically damaged by cattle access. Some attempts have been made to control the animals accessing the stream. Future riparian protection efforts should be designed to move fences further back from the streams and to provide opportunities for cattle crossings at bridges rather than through the creek channel. At the current agricultural densities, there are simply too many animals using the creek without creating significant stream impacts.

| **Bings Creek** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish Production Opportunities** | | | | | | | | | | | | | |
| Watercourses | | | Actions | | | | | | | | | | |
| Bings | Reaches | Issues | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| | 1 | Large numbers of juvenile salmonids use Lower Bings as summer refuge habitat. It is presently warm and exposed and fish must move further upstream to find quality habitat. | | | | Remove excess vegetation and detritus from channel and restore riparian vegetation including a higher canopy | | | Construct side channel at north end of playing fields adjacent to weir | Construct flow control in conjunction with side channel | Investigate potential for the installation of bubble line aeration to improve water quality in summer arefuge areas. | Develop a self contained public information kiosk, walkway that allows access without impacting habitat | This highway location is excellent for sign, access, etc. |
| | 1B | Juvenile access into Lower Bings is easily impeded. The Reach 1B beaver dam is a constant problem. | | | Remove beaver dam below Mary Rd. at top end of Misery Meadows and monitor Reach 1B for beaver activity. Trapping may be required | | | | | Consider opportunities to provide a pulse flow in May or June to encourage fish outmigration | | | |
| | 2 | Accessible spawning gravel in Bings Creek is degraded by high sediment levels | | | | | | Improve, monitor and maintain at least one high quality spawning site in Reach 2. Add new gravel and scarify as necessary. | | | | | |
| | 3 | Anadromous salmonids can only access 1754 m of Bings Creek's 6965 m habitable length: 25.18%. | | | Improve falls @ 1754 m, remove dam @ 1784 m and remove railroad culvert apron @ 1999 m | | | | | | | | |
| | 6,7 8, 9 10, 11 | anadromous salmonids, especially coho, cannot access suitable upstream habitat | If the falls and other barriers prove too difficult or expensive to improve, coho colonization may be employed | 15797 | | | | | | | | | |
| | 7, 11 | portions of the riparian zone in Reaches 7 and 11 have been degraded by stock | | | | establish set back fencing and start restoration process by riparian planting | | | | | | | |
| | | | | | | | | | Construct side channel at north end of playing fields adjacent to weir | Construct flow control in conjunction with side channel | | Trail development and access control | Signage and viewing facilities in conjunction with side channel construction |
| | | | | | | | | | | Consider opportunities to provide a pulse flow in May or June to encourage fish outmigration | | | |


SOMENOS LAKE
BEAVER DAMS
3.7.29
Reach 1 is choked with Reed Canary Grass and other aggressive aquatic vegetation. Establish a higher canopy to discourage the growth of instream vegetation and to improve drainage.
This section of Bings Creek lacks canopy vegetation resulting in high summer temperatures. Plant canopy species such as Pacific Willow, Sitka Willow, Black Cottonwood, and hybrid Poplar to shade the stream.
BINGS CREEK
R1
R1A
LEGEND
Watercourses
Habitat Potential
0-2% Slope, Good
2-5% Slope, Moderate
> 5% Slope, Poor
Other Watercourses
Permanent Flow
Intermittent Flow
Temporary Flow
Ephemeral Flow
R1 Reach Break
Priority 1
Priority 2
Priority 3
Production Opportunities
KEY MAP
5
THE SOMENOS-QUAMICHAN BASIN 1:2500
BINGS CREEK - VIEW 1B




THE SOMENOS-QUAMICHAN BASIN

# TYPICAL SECTION DETAIL

## 3.8 Menzies Creek

### Overview

Menzies Creek enters Bings Creek from the northwest at 4,388 m above Somenos Lake. Menzies Creek drains the southwest shoulder of Mt. Prevost and consists of a west and east fork.

### Summary Data

| | Channel width (m) | Wetted width (m) | Slope% | Length (m) | Wetted Area (m2) |
|---|---|---|---|---|---|
| Reach 1 | 5 | 2 | 1.0 | 47 | 94 |
| Reach 2 | 3 | 3 | 0.5 | 123 | 246 |
| Reach 3 | 5 | 2 | 1.2 | 1810 | 3,620 |
| Reach 4 | 4 | 2 | 2.7 | 65 | 130 |
| Reach 5 | 5 | 2 | 1.2 | 1096 | 2,192 |
| Reach 6 | 4 | 2 | 1.5 | 435 | 870 |
| Reach 7 | 4 | 0 | 2.0 | | |
| Reach 8 | | | | | |
| ***TOTAL*** | | | | ***3,756*** | ***7,152*** |

### Land Use Factors

#### Agriculture

Small hobby farms exist along Cowichan Lake and Sahtlam Roads. Riparian impacts have resulted from excessive clearing and lack of stock animal control.

#### Urban

Urban development in this area is moderate at this time. As these lands are on the urban fringe development pressure may increase over time.

#### Forestry

Much of the upper watershed is municipal forest. Advanced second growth is presnt, with some recent logging.

### Fish Utilization and Limiting Factors

Menzies Creek supports resident cutthroat and brown trout for 3756 metres above the confluence with Bings Creek. Above this point, the creek dries during the summer. Fish production is also limited by riparian zone degradation due to livestock access in Reach 3 and, in the Sahtlam Road area.

Fish utilization in Menzies Creek in limited as a result of access barriers downstream in Bings Creek.

### Recommendations

#### 3.8.31 Coho Colonization

The potential coho smolt yield for this stream is estimated to be +/-500 from a colonized population of +/-7000. Once the barriers at Bings Creek are removed, colonization will not be required.

#### 3.8.32 Headwater Storage

Additional headwater storage on West Menzies Creek could provide 0.008 CMS (cubic metres/second) to this stream during its summer dry period. This would also increase mainstem minimum flow below the West Menzies confluence.

#### 3.8.33 Coho Colonization – West Menzies

Coho colonization of West Menzies in the fall once fall rains begin. Possible yield: +/-200.

#### 3.8.34 Riparian Restoration

Fencing and streamside planting in the impacted zones of Reaches 3 and Reach 5 would increase productivity in the treated sections. Large woody debris (LWD) placement could accompany the treatment. Although Menzies Creek as a whole is not LWD deficient more could be placed to increase production and channel diversity.

#### 3.8.35 Groundwater Well

There is a small artesian spring just below the Dougan Gravel Pit near Tansor Junction that produces at least .032 LPS (litres/second) of 11 degree water that flows into a small tributary of Reach 5. The gravel pit is about to be utilized by Hayes Forest Services. There is a danger that the spring's source could be obliterated if the floor of the pit is paved. It may be possible to increase the spring's output by deepening the well. The spring is presently tapped by a standpipe. The water goes subsurface in the summer but emerges just as the small tributary it nourishes enters Menzies Creek at a point about 50 m above Sahtlam Road. In the winter and spring months, there is a constant flow between the well and Menzies Creek. The spring's mean winter flow is about .045 CMS. Much of it came from wetlands that had developed within the pit.

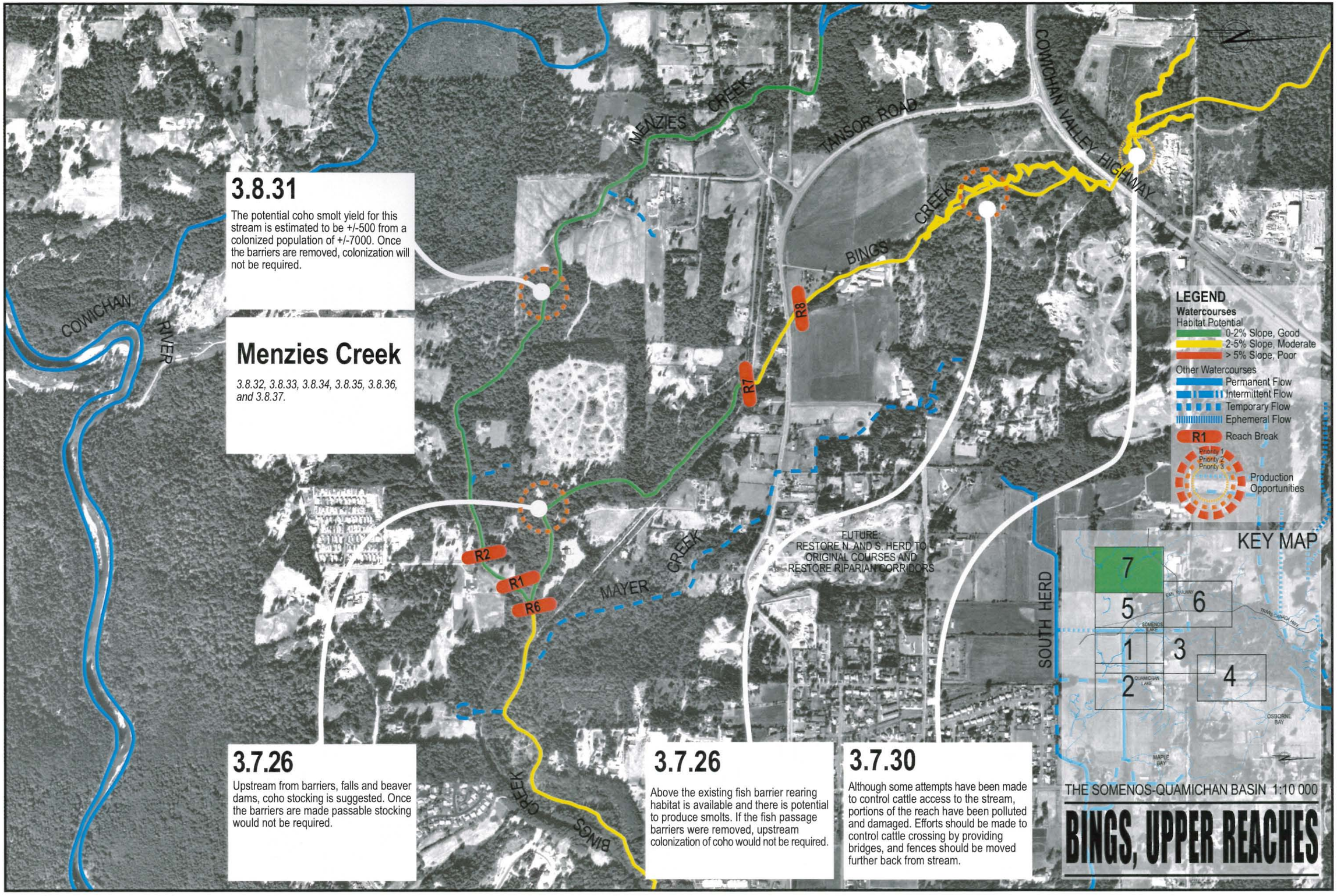
#### 3.8.36 Removing Adult

The main improvement measure for Menzies is to provide fish access above Bings Creek Falls. Access is limited on Bings Creek 1882 m. The barriers include a 1.2m dam at 2107 metres, and a CN culvert at 2347metres

#### 3.8.37 Landowner Contact

Menzies Creek could be an important component of a larger Greenway Corridor that would start at Somenos Lake and extend up Bings and Menzies Creek to at least Highway 18. The corridor would protect sensitive wetland, riparian and ravine habitats that are part of the Fisheries Sensitive Zone. The Menzies Creek agricultural community should be consulted in the management of these fisheries resources at risk on their properties.

| **Menzies Creek** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish Production Enhancements** | | | | | | | | | | | | | |
| Watercourses | | | Actions | | | | | | | | | | |
| Menzies | Reaches | Issues | Coho Colonization | Stocking Numbers | Improving Fish Passage | Riparian Enhancements | Habitat Complexing | Spawning Platforms | Side Channel Development | Flow Controls | Water Quality | Public Access | Public Information/ Interpretation |
| | 1 through 7 | Anadromous salmonids do not have access into Menzies Creek due to barriers on Bings Creek | If Bings Creek barriers are not made passable, coho colonization could be employed | 7152 | | | | | | | | | |
| | all | The West Fork of Menzies Creek is summer dry. The creek is otherwise habitable for salmonids | | | | | | | | A 20 ha. wetland basin could provide .008 CMS for the 60 day CDP . This would also increase mainstem CPD below the confl. by 1.54 | | | Landowner contact to develop management options for fish production |
| | 3 and 5 | Portions of the riparian zones in these reaches have been degaded by excessive land clearing and free livestock access | | | | Fencing and streamside planting required in impacted zones. Total length is 570 m but only 350 m require fencing. | | | | | | | |
| | all | Low CDP flow limits production in both Menzies and Bings | | | | | | | | Small spring produces .032 LPS of 11 degree water. Can it be increased? | | | |


3.8.31
The potential coho smolt yield for this stream is estimated to be +/-500 from a colonized population of +/-7000. Once the barriers are removed, colonization will not be required.
Menzies Creek
3.8.32, 3.8.33, 3.8.34, 3.8.35, 3.8.36, and 3.8.37.
COWICHAN RIVER
MENZIES CREEK
TANSOR ROAD
COWICHAN VALLEY HIGHWAY
BINGS CREEK
R8
R7
R2
R1
R6
MAYER CREEK
FUTURE:
RESTORE N. AND S. HERD TO ORIGINAL COURSES AND RESTORE RIPARIAN CORRIDORS
SOUTH HERD
BINGS CREEK
3.7.26
Upstream from barriers, falls and beaver dams, coho stocking is suggested. Once the barriers are made passable stocking would not be required.
3.7.26
Above the existing fish barrier rearing habitat is available and there is potential to produce smolts. If the fish passage barriers were removed, upstream colonization of coho would not be required.
3.7.30
Although some attempts have been made to control cattle access to the stream, portions of the reach have been polluted and damaged. Efforts should be made to control cattle crossing by providing bridges, and fences should be moved further back from stream.
LEGEND
Watercourses
Habitat Potential
0-2% Slope, Good
2-5% Slope, Moderate
> 5% Slope, Poor
Other Watercourses
Permanent Flow
Intermittent Flow
Temporary Flow
Ephemeral Flow
R1 Reach Break
Priority 1
Priority 2
Priority 3
Production Opportunities
KEY MAP
7
5
6
1
3
2
4
SOMENOS LAKE
QUAMICHAN LAKE
OSBORNE BAY
MAPLE BAY
THE SOMENOS-QUAMICHAN BASIN 1:10 000
BINGS, UPPER REACHES

## 4.0 Summary of Fish Production Enhancement Opportunities

There are thirty seven (37) production options for habitat restoration or enhancement in the Somenos - Quamichan Basin. They are summarized in the table below. For more discussion, see the preceding subbasin summaries.

| | LOCATION | BRIEF DESCRIPTION | PRIORITY |
|---|---|---|---|
| 3.1 .01 | Somenos Creek | Somenos Creek Cooling Strategy | 1 |
| 3.1 .02 | Somenos Creek | Summer refuge improvement – Chesterfield Park | 2 |
| 3.1 .03 | Somenos Creek | Summer refuge improvement – Fun Pacific Park | 2 |
| 3.2 .04 | Somenos Lake | Lake aeration | 2 |
| 3.2 .05 | Somenos Lake | Provide summer pulse flow | 3 |
| 3.3 .06 | Quamichan Creek | Improve Cutthroat Trout Spawning | 1 |
| 3.3 .07 | Quamichan Creek | Riparian and Water Quality Improvement | 2 |
| 3.4 .08 | Quamichan Lake | Coho colonization | 1 |
| 3.4 .09 | Quamichan Lake | Lake level control at outlet | 1 |
| 3.4 .10 | Quamichan Lake | Water quality survey and conservation | 1 |
| 3.5 .11 | Richards Creek | Coho colonization (Crofton Reservoir) | 2 |
| 3.5 .12 | Richards Creek | Headwater storage | 1 |
| 3.5 .13 | Richards Creek | Riparian maintenance and improvement | 3 |
| 3.5 .14 | Richards Creek | Coho colonization (Upper Richards Creek) | 1 |
| 3.6 .15 | Averill Creek | Substrate improvement | 2 |
| 3.6 .16 | Averill Creek | Adult barrier bypass | 1 |
| 3.6 .17 | Averill Creek | Coho coloniztion without storage | 4 |
| 3.6 .18 | Averill Creek | Juvenile barrier improvement | 1 |
| 3.6 .19 | Averill Creek | Headwater storage | 1 |
| 3.6 .20 | Averill Creek | Coho colonization with storage | 2 |
| 3.6 .21 | Averill Creek | Additional flow augmentation (Crofton) | 1 |
| 3.6 .22 | Averill Creek | Riparian restoration | 2 |
| 3.6 .23 | Averill Creek | Groundwater development | 2 |
| 3.6 .24 | Averill Creek | Pond stocking coho fry | 2 |
| 3.7 .25 | Bings Creek | Spawning improvement | 3 |
| 3.7 .26 | Bings Creek | Coho colonization | 2 |
| 3.7 .27 | Bings Creek | Adult barrier improvement | 1 |
| 3.7 .28 | Bings Creek | Juvenile barrier removal | 1 |
| 3.7 .29 | Bings Creek | Riparian restoration/canopy development | 1 |
| 3.7 .30 | Bings Creek | Upper reaches riparian restoration | 3 |
| 3.8 .31 | Menzies Creek | Coho colonization | 2 |
| 3.8 .32 | Menzies Creek | Headwater storage on West Menzies | 2 |
| 3.8 .33 | Menzies Creek | Coho Colonization – West Menzies | 2 |
| 3.8 .34 | Menzies Creek | Riparian Restoration | 2 |
| 3.8 .35 | Menzies Creek | Groundwater well | 2 |
| 3.8 .36 | Menzies Creek | Removing Adult Barrier | 2 |
| 3.8 .37 | Menzies Creek | Landowner Contact | 2 |

## 5.0 Action Plan

The following action plan describes a series of recommendations based on the descriptions outlined above. The action plan identifies priority actions in each of the following categories throughout the watershed:

- Coho colonization
- Improvements to fish passage
- Riparian Enhancements
- Habitat Complexing
- Spawning Platforms
- Side Channel Development
- Flow Control
- Water Quality
- Public Access
- Public Information and Interpretation

### Coho Colonization

To establish the numbers of coho fry to be colonized above barrier in the Somenos - Quamichan watershed, estimates of habitat, and then conservative estimates the quantity of coho fry to colonize that the habitat have been prepared.

Some experimentation needs to be done with spring/summer introductions. Winter habitat is not a limiting factor in the Somenos - Quamichan watershed. Where feasible summer stocking should be investigated further.

| Location | Spring Coho Colonizing | Fall Coho Colonizing | Subject to |
|---|---|---|---|
| Quamichan Lake | 300,000 | 0 | Flow control at lake outlet |
| Somenos Lake | none | none | |
| Crofton Reservoir | 0 | 22,000 | |
| Breen Lake | 0 | 4,000 | Flow control |
| Duncan Lakes Golf Course Ponds | 0 | 3375 | As above |
| Richards Creek | 6,000 | 0 | Augmentation to summer flow |
| Menzies Creek | 7,152 | 0 | As above |
| Averill Creek | 7,900 | 0 | As above |
| Bings Creek | 0 | 15,797 | No improvements to fish access above falls |
| ***TOTALS*** | ***321,052*** | ***45,172*** | |

### Improving Fish Passage

Two different fish access situations are identified. The first access concern is to provide fish with upstream access to unused spawning and rearing habitat (above a barrier) in the upper reaches of several watersheds.

The second objective is to provide access to areas with cool water refuge. One of the key limitations to fish production in this watershed is the high summer water temperatures and low dissolved oxygen levels. Several of the enhancements described below are designed to provide access to areas with cooler water during these critical periods.

| LOCATION | ACCESS ENHANCEMENT |
|---|---|
| Quamichan Lake | Design and install a flow control weir/ fishway and deeper channel. |
| Somenos Lake | Provide pulse flow in May or June to encourage outmigration. This relies also on the drainage improvements for Somenos Creek. |
| Breen Lake | Assess possible flow control weir to impound water to augment base flow in Richards Creek during summer months. |
| Averill Creek | Ensure upstream fry passage at Island Highway and E + N Railway culverts.<br>Provide adult access over Averill Creek Falls via bypass channel on south side. |
| Bings Creek | 1. Improve fish access over the falls.<br>2. Remove dam above falls.<br>3. Remove/improve access via railroad culvert apron. |

## Riparian Enhancements

Many opportunities for riparian enhancement exist throughout the Somenos - Quamichan watershed. The action plan outlined below recommends developing the lower reaches of Bings Creek as a demonstration area of riparian enhancement that could be applied at other locations throughout the watershed.

The issue of riparian enhancements is a key component of the production plan for the Somenos - Quamichan watershed. Where streams do not have adequate riparian buffers, the channels are choked with in-stream and riparian noxious vegetation that restricts flow and exacerbates flooding and farming. The absence of canopy vegetation allows direct sunlight onto the streams and increases summer water temperatures. The riparian enhancement projects described in this production plan highlight opportunities to:

- Regrade stream channels to increase channel capacity and provide higher drier stream banks that support larger canopy vegetation.
- Provide off-channel refuge areas that maintain pools of water during dry summer months for fish refuge.
- Encourage fenced riparian areas that encourage natural revegetation and limit livestock access to streams.
- Identify compensation methods to encourage producers to remove riparian areas from production.

Pilot project constructed to illustrate methods of achieving these objectives will provide the confidence to other landowners in the watershed to undertake similar riparian enhancements.

## Habitat Complexing

The recommendations for in-stream work related to habitat complexing in this watershed are relatively minor. Several enhancement opportunities are identified and Lower Quamichan Creek.

## Spawning Platforms

Improvements to spawning areas are identified for along Quamichan Creek to improve the viability of cutthroat trout residence within Quamichan Lake.

## Side Channel Development

Side channel development/summer refuge will be a key component of the enhancements proposed for the lower reaches of Bings Creek.

## Flow Control

One of the most significant difficulties in improving the habitat quality of the Somenos - Quamichan system is the problem of low summer flows. Improving these summer base flows even marginally is a key component of this production plan. Improvements are made up of a variety of both substantial and minor enhancements described in the enhancement opportunities of this production plan.

## Water Quality

Water quality is a critical factor in the fisheries production of the watershed, especially during summer when there are low flows, high summer water temperatures, high nutrient/organic loading, and resulting low levels of dissolved oxygen. There is a need for nutrient balance assessment in both the Somenos and Quamichan basins that can lead to nutrient management and improved water quality.

Improved basin drainage can help to increase water exchange, surface to volume ratios, and contact with ground water. Improved drainage of low areas improves the potential for crop production and viable farm operations.

Carefully designed grid aeration with the possibility of bio-augmentation can be effective in removing organic bottom deposits and deepening profiles so that there is greater contact with cold groundwater for fish refuge.

With these actions, gradually the poor water quality trends in both lakes can be reversed, leading to a large increase in fish production and enhance recreational value.

## Public Access

Many of the streams in the watershed run through private land. Public access is NOT recommended in any of these locations.

Within the Somenos – Quamichan watershed, there are several excellent access points that will provide opportunities to let people have access to the lakes and streams in this system. A long-term plan for public access is identified within the District of North Cowichan's Park and Open Space Strategy.

Of particular interest in the context of this fish production plan is the opportunity to create a coordinated public access and information strategy related to Averill and Bings Creek, and Somenos Marsh. A concept design for public access in this location should be undertaken in coordination with the efforts of the Cowichan Watershed Council, the Somenos Marsh Society, and the Forestry Museum, and/or others. The design should build on the existing program infrastructure provided by the Forestry Museum. In addition to a trail and interpretive display beginning at the museum site, the public information and access elements of the production plan could include: interpretive signage and kiosks at key locations, highway signage, viewing platforms and blinds, etc.

### Public Information

The benefits and opportunities of the fish production planning process should be communicated with stakeholder and the general public. Communicating the stewardship message is always an important aspect of fish production planning and plays a key role in the development and maintenance of partnerships.

As illustrated by the success of the Millstone Watershed Fish Production Plan and Atlas, completed in 1998, it is evident that a coordinating agency with the interest and ability to assemble and encourage stewardship and enhancement activities is a key element of the ongoing success of the production planning process.

The coordinating agency would be responsible for communicating the overall objectives of the production plan and identifying resources to implement specific items in the plan. The specific activities of the coordinating agency would be to:

- Prepare news releases describing the objectives and achievements of the production plan process,
- Coordinate stakeholders and oversee restoration and enhancement projects
- Prepare newsletters, website, or other information distribution tools
- Develop/oversee landowner contact program
- Etc.,

## 6.0 Conclusion

It is far cheaper to protect and conserve streams and Fisheries Sensitive Zones than to restore them after the damage has been done. "Salmon in the Valley" is a community goal that all can share and everyone can participate. This work offers an example of collected knowledge that could help set a new direction. There are more basins to do and much work to be done.

A quotation from the Sand County Almanac describes the direction and intention of this production plan,

**"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect"**

From *A Sand County Almanac* by Aldo Leopold (1886-1948)

## Abbreviations

M.E.L.P.: Ministry of the Environment, Lands and Parks.
DFO: Fisheries and Oceans Canada
CDP flow: Critical Discharge Period, May to October in the Somenos - Quamichan watershed
LWD: large, woody debris.
Coho : Coho salmon *Oncorhynchus kisutch*.
Chum: Chum salmon: *Oncorhynchus keta*
Cutthroat: Cutthroat trout *Oncorhynchus clarki.*
Rainbow: rainbow trout *Oncorhynchus mykissi.*
Brown Trout : *Salmo tulta*
Pumpkinseed: *Lepomis gibbosus*