

Watershed Summaries
Sub-Area: N.E. Vancouver Island and Adjacent Mainland Inlets

Quatse River

Watershed Map Code: 920896200

4th Order

| | |
|--------------------------------|---|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Extreme Conservation Concern (for remnant wild stock) |
| Class: | Hatchery (Proposed, currently Augmented) (Quatse Winter Run broodstock; community hatchery) |
| Recent Escapements (H+W): | 100-200 Winter Run |
| Estimated Hatchery/Wild Ratio: | 5:1 (difficult to catch wild fish for hatchery brood program) |
| Angling Regulations: | Catch & release wild fish, retain 1 hatchery fish/day, extensive headwater seasonal closure. |
| Mean Annual Effort: | Long term ('68-'96) = 1,034 / recent ('97-'00) = 1,825 |
| Mean Annual Catch: | Long term ('68-'96) = 903 / recent ('97-'00) = 1,323 |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,923 smolts, 250 adults (SHA Model, Ptolemy 2002)

Existing Habitat:

| | |
|--|------|
| watershed area (km ²): | 86.2 |
| mean annual discharge (m ³ /s): | 3.7 |
| Summer baseflow (%mad) | ~7 |
| accessible length (km): | 11.9 |
| productivity: (natural) | low |

| Comments |
|---|
| Stream bank erosion (slumping clay banks), loss of stable woody debris, low summer flows, urban and industrial impacts, particularly downstream of Quatse Hatchery. Baseflow alkalinity very low at 10 mg/L and predicted biomass or capacity per steelhead size class is 115 g/Unit. |

HABITAT RESTORATION TO DATE

- Nil

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Minimize new and address current urban and industrial impacts downstream of the Quatse Hatchery.
- Improve logging practices to minimize impacts on the stream.

STEELHEAD OBJECTIVES AND STRATEGIES

- Enhance existing steelhead fishery through reinstating hatchery release of 15,000 smolts a year and reducing fry stocking (no change to egg-take target).
- Conduct a biophysical inventory/habitat capability assessment .
- Investigate feasibility of providing headwater storage on Quatse Lake to provide conservation flows in all mainstem reaches.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual stream enrichment (low cost -started in 2001, but temporarily discontinued in 2002 on account of unavailability of slow release product).
- Restore damaged habitats documented above.

NOTES: *Wightman 1998* suggests measures for trying to rebuild wild populations. Wild steelhead spawners have since dropped to such low levels that this may not be possible. It is recommended that habitat protection be improved, stream fertilization be done and fry stocking directed to vacant habitat. These measures would benefit wild production of all salmonid species present.

Draft: 19/08/02

Keogh River

Watershed Map Code: 920866900

4th Order

| | |
|-------------------------------|---|
| Wild Stock Trend: | Relatively Stable at Low level |
| Wild Stock Status: | Extreme / Conservation Concern |
| Class: | Augmented (Experimental - Keogh WR LGB Captive Brood- long-term classification contingent upon the results of LGB experiments) |
| Recent Steelhead Escapements: | 100-200 Winter Run, Observed Mean Peak Fish/km 1998-2001: 3.5 (Actual Fence Counts) Fence Count 2002: 140 |
| Angling Regulations: | Total fishing closure Dec 1 - May 31 |
| Mean annual effort: | Long term 1968- 1996: 512 / Recent 1997-2001: CLOSED |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 7000 smolts / 910 adults (based on Ward 1996, SHA Model (Ptolemy 2002) & Tredger 1986 (low))
- Conservation Concern Level @ 30% of capacity is 273 adults

Existing Habitat:

| | |
|--|--------|
| watershed area (km ²): | 130.2 |
| mean annual discharge (m ³ /s): | 5.6 |
| Summer Base Flow (%mad) | 7.3 |
| accessible length (km): | 32 |
| productivity: (with fertilization) | medium |

| Comments |
|---|
| Heavily logged in past to pre-FPC standards, but now largely restored at a cost of about \$70K per km. Steelhead capacity prior to fertilization = 145 g/Unit |

HABITAT RESTORATION TO DATE

- Extensive restoration undertaken by placement of rocks and ballasted large woody debris - serves as a WRP demonstration site.
- Full stream enrichment done annually.
- Headwater storage, side channels and over-wintering alcoves also built in last five years.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Careful (Helicopter Only) logging on any steep slopes that have the potential for instability.
- Careful control of any net pen operations in O'Connor Lake to prevent accidental escapes.

STEELHEAD OBJECTIVES AND STRATEGIES

- Re-establish wild stock productive capacity through inorganic enrichment and habitat restoration.
- Maintain ongoing steelhead index stream capabilities.
- Operate stream as a research and demonstration watershed - experiments in enrichment and stream enhancement must have full evaluation capability.
- Continue the LGB experimental smolt stocking started in 2001 until at least 2004.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual full stream enrichment (resumed in 2000).
- LGB smolt introduction should be continued (began in 2001 and to continue to at least 2004).

NOTES: This is the province's only long-term research watershed and provides vital applied research information for management and habitat rehabilitation of other coastal steelhead systems. It is imperative that this work be continued and the existing facilities maintained. The LGB program needs full scientific evaluation.

Draft 20/08/02

Wild Stock Trend:
 Wild Stock Status:
 Class:
 Recent Steelhead Escapements:

In Decline
Conservation Concern
Augmented (Medium Level - Cluxewe WR)
 100-200 Winter Run, H/W Ratio 2.3/1
 Observed Mean Peak Fish/km 1998-2001: 20.1 WR – but heavily biased by hatchery returns to the lower river.

Angling Regulations:

Steelhead Fishery - catch and release of wild fish, extensive headwater seasonal closure

Mean annual effort:
 Mean Annual catch:

Long term 1968-1996: 362 / Recent 1997-2000: 461
 Long term 1968- 1996: 307 / Recent 1997-2000: 336
 (Current regulations only allow for a 2-km fishery based on angler access and fish distribution patterns.)

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,731 smolts / 225 adults (based on SHA Model (Ptolemy 2002) and Tredger 1986 (low end))
- Conservation Concern Level @ 30% of capacity is 68 adults

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 96.3 |
| mean annual discharge (m ³ /s): | 4.1 |
| Summer Base Flow (%mad) | ~7 |
| accessible length (km): | 18.9 |
| productivity: | moderate |

| Comments |
|--|
| Main stem channel instability, bank erosion, and sediment transport. Has greater percentage of riffle/cascade habitat than Quatse in upper 8 km. Baseflow alkalinity low at 28 mg/L and predicted capacity per steelhead size class is 192 g/Unit. |

HABITAT RESTORATION TO DATE

- Inorganic enrichment began in 2001 but was discontinued in 2002 due to slow-release product unavailability.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Improve logging practices through strict application of good forest practices - particular emphasis should be placed on cut blocks on steep slopes in headwater reaches where current operations are now largely focused.
- Investigate need to isolate/remove or treat abandoned Port McNeill landfill above Highway 19.

STEELHEAD OBJECTIVES AND STRATEGIES

- Maintain a fishery for approximately 500 rod-days over 2 to 5-km fishable length through augmentation (winter steelhead smolts and fry raised by Quatse Hatchery) and conserve/rebuild wild stock if possible.
- Review present management strategy and undertake comprehensive biophysical inventory to identify steelhead recovery options and constraints.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual Inorganic nutrient enrichment - middle and upper reaches (done in 2001).
- Conduct stream restoration in the lower 6km. Detailed prescriptions should be developed by consultants - emphasis on bank stabilization using anchored large woody debris and boulders, development of stable side channels and over-wintering alcoves.

NOTES: The stream is now eroding into the abandoned landfill on Crown Land above Highway 19. This is a potential source of toxic leachates.

Draft 20/08/02

Nimkish River

Watershed Map Code: 920825900

6th Order

Wild Stock Trend: **Relatively stable at low levels**
 Wild Stock Status: **Winter Run: Extreme / Conservation Concern**
Summer Run: Extreme Conservation Concern
 Class: **Augmented** (Low Level - Nimkish WR fry releases, Woss Community Hatchery)
 Recent Steelhead Escapements: 200-500 Winter Run, Very Small Summer Run, likely <30 fish
 H/W Ratio: 1:20
 Observed Mean Peak Fish/km 1998-2001: 6.3 WR, Snorkel surveys for five years but with substantial limitations, summer run into Kaipit River poorly documented
 Angling Regulations: Limited Steelhead Fishery - catch and release of wild fish, extensive headwater seasonal closure
 Mean annual effort: Long term 1968-1996: 755 / Recent 1997-2000: 374
 2001 Similar
 Mean Annual catch: Long term 1968- 1996: 457 / Recent 1997-2000: 135

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- Current best estimate approx. 22,000 smolts/ 2,860 adults (based on extent and quality of parr habitat. A report done by Ptolemy in 1988 noted a low number of adults relative to the size of the system.)
- Conservation Concern Level @ 30% of capacity is 858 adults - mostly winter runs

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 2311 |
| mean annual discharge (m ³ /s): | 140 |
| Summer Base Flow (%mad) | 18 |
| accessible length (km): | 245 |
| productivity: | very low |

| Comments |
|---|
| Area: 1,761 sq. km plus 550.3 sq. km in major tributaries, large lake, extensive logging in the last century leaving no large woody debris in many reaches. System is nutrient poor - substantially reduced salmon escapements in recent years. Baseflow alkalinity is very low at 7.5 mg/L and predicted capacity per steelhead size class is 100 g/Unit. |

HABITAT RESTORATION TO DATE

- Several FRBC restoration projects undertaken in recent years primarily in smaller sub-basins with marginal steelhead productivity.
- Woss Lake currently being fertilized by Fisheries and Oceans Canada
- Side-channels constructed near Vernon Lake and downstream of Woss.

STEELHEAD OBJECTIVES AND STRATEGIES

- Recover wild stocks to take full advantage of this large system with 30 km of fishable water.
- Review current management strategy and maintain a catch and release fishery, if possible.
- Acquire resources to conduct a comprehensive assessment of habitat capability and evaluate the genetic uniqueness of Nimkish early versus late winter and summer steelhead.
- Upgrade enforcement to deal with chronic poaching concerns.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual liquid and slow release briquette stream enrichment (underway in 2001, slow release discontinued in 2002 due to unavailable product).
- Utilize high potential for more effective stream restoration - prescriptions to be developed by experienced consultants.

NOTES: Existing Nimkish Resource Management Board is very dedicated to rebuilding all salmon and steelhead stocks. Steelhead stock very small relative to theoretical watershed capacity.
 Draft 20/08/02

Kokish River

Watershed Map Code: 920810900

5th-6th Order

Wild Stock Trend:
Wild Stock Status:

In Decline
Winter Run: Special Concern
Summer Run: Conservation Concern

Class:
Recent Steelhead Escapements:

Augmented (10-20K Kokish WR fry - Port McNeill Chinook Club)
<50 Winter Run, 50-100 Summer Run,
H/W Ratio WR: 1:20; Summer runs hold in Ida and Bonanza Lakes making a run size estimate difficult.)
Observed Mean Peak Fish/km 1998-2001: 5.6 WR, 10.9 SR

Angling Regulations:

Steelhead Fishery - catch and release of wild fish, headwater closure from Nov. 1 to April 30.

Mean annual effort:
Mean Annual catch:

Long term 1968-1996: 271 / Recent 1997-2000: 146
Long term 1968- 1996: 220 / Recent 1997-2000: 66

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4000 smolts / 520 adults (based on Tredger 1986/Ptolemy 2002 (low end - combined runs)
- Conservation Concern Level @ 30% of capacity is 156 adults

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 370.5 |
| mean annual discharge (m ³ /s): | 18.1 |
| Summer Base Flow (%mad) | 16.3 |
| accessible length (km): | 18.5 |
| productivity: | moderate |

| Comments |
|---|
| Habitat above Bonanza Lake supports summer runs. Long history of logging in Kokish and Bonanza watersheds. Significant fish habitat impacts especially log storage in Beaver Cove estuary and abandoned booming site at outlet of Bonanza Lake. Concern over coho stocking into Bonanza R. between Bonanza and Ida Lakes relative to inter-specific fry competition with steelhead. Ideal summer flows, lake-headed. High quality parr habitat in boulder-cascades from Ida Lake downstream to tidewater. Good parr densities observed in snorkel surveys of 1995 and 1998 in canyon reach. Baseflow alkalinity moderate at 25 mg/L and predicted capacity per steelhead size class is 182 g/Unit |

HABITAT RESTORATION TO DATE

- Spawning gravel placement at outlet of Ida Lake (HCTF projects 1991/94).
- Failed attempt at creating an open channel through Bonanza Lake outlet log jam in 2000.
- Inorganic enrichment began by helicopter application in 2001 downstream of Ida Lake.

STEELHEAD OBJECTIVES AND STRATEGIES

- Maintain healthy wild stocks and a fishing opportunity over 5-km fishable length (with a low level of augmentation of winter runs by the community hatchery).
- Review management strategy and update the previous assessments to identify steelhead production and constraints - a better estimate of current summer and winter steelhead run sizes and habitat capacities is required.
- Upgrade local enforcement capability to deal with chronic poaching concerns - Summer Run stock in particular is vulnerable to poaching.

IDENTIFIED RECOVERY OPTIONS

- Ongoing slow release enrichment could be expanded.
- Limited potential for stream restoration - 1998 report suggested possibilities of further gravel placement at outlet of Ida Lake, selective woody debris removal and or repositioning in the outlet of Bonanza Lake.
- Improved protection against poaching - focus on steelhead holding and spawning in short section of Bonanza R. below Ida Lake (local capability in Port McNeill to complement conservation officer staff in Campbell River and Port Hardy would be very desirable - applies to Nimpkish as well).

NOTES: Non-mitigable impacts expected if independent power production was to proceed as has been proposed several times in the past.

Draft 20/08/02

Tsitika River

Watershed Map Code: 920782100

5th-6th Order

Wild Stock Trend: **Stable at low level**
 Wild Stock Status: **Winter Run: Special Concern**
Summer Run: Conservation Concern
 Class: **Wild** (Donor stream to Campbell River captive brood program)

Recent Steelhead Escapements: <50 Winter Run, 100-150 Summer Run
 Observed Mean Peak Fish/km 1998-2001: n/a WR, 11.9 SR

Angling Regulations: Steelhead Fishery - Catch and Release of wild fish, extensive headwater seasonal closure, fly-fishing only downstream of Catherine Creek

Mean annual effort: Long term 1968-1996: 24 / Recent 1997-2000: 25 / 2001 Similar
 Mean Annual catch: Long term 1968- 1996: 26 / Recent 1997-2000: 18

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4400 smolts / 572 adults (based on Tredger 1986/Ptolemy 2002 (low end - combined runs).
- Conservation Concern Level @ 30% of capacity is 172 adults.

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 360 |
| mean annual discharge (m ³ /s): | 22.5 |
| Summer Base Flow (%mad) | 14.5 |
| accessible length (km): | 36 |
| productivity: | Very Low |

| Comments |
|---|
| As this was one of the last significant unlogged watersheds on the east coast of Vancouver Island, it has received a high public profile. Extensive boulder habitat for parr. Baseflow alkalinity low at 5 mg/L and supports a low biomass of 82 g/unit. Good parr densities surveyed in early 1991-93 and 1998, but generally poor recently based on snorkel observations. |

HABITAT RESTORATION TO DATE

- Enrichment began with slow release briquettes added to mainstem plus Catherine/Claud Elliott Creeks in 2001, but was discontinued in 2002 due to product unavailability.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Maintain environmentally sensitive forest harvesting practices.
- Monitor/prevent establishment of feral Atlantic salmon run by regular escapes from nearby marine fish farms.

STEELHEAD OBJECTIVES AND STRATEGIES

- Recover wild stocks and maintain a catch and release fishery over 10-km fishable length.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual stream enrichment.
- Possible localized bank revetment using geo-textiles, botanical treatment.

NOTES: Tsitika summer steelhead were used as wild brood stock for hatchery smolt introductions to the Campbell River from 1981 - 1994 inclusive. Recent development (2001) of Tsitika captive brood for future stocking in Campbell River. Annual review required both in terms of hatchery program effectiveness and the health of the donor Tsitika wild steelhead population.

Draft 20/08/02

Adam and Eve Rivers

Watershed Map Codes: 920758000 (-11400 Eve),

6th Order

Wild Stock Trend:
Wild Stock Status:

Likely Declining
Winter Run: Conservation Concern
Summer Run: Special Concern
Wild

Class:

Recent Steelhead Escapements:

Unknown(but likely weak) Winter Run, Very Small Summer Run
(Stock status not being assessed regularly. Observed Mean Peak Fish/km 1998-2001: 7.4 WR, n/a SR)

Angling Regulations:
Mean annual effort:
Mean Annual catch:

Limited catch and release of wild steelhead, extensive seasonal headwater closure
Long term 1968-1996: 268 / Recent 1997-2000: 161 / 2001 (-)
Long term 1968- 1996: 147 / Recent 1997-2000: 124

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 6900 smolts / 897 adults (based on Tredger 1986/Ptolemy 2002 (low end - combined runs)
- Conservation Concern Level @ 30% of capacity is 269 adults

Existing Habitat:

| | |
|--|-------|
| watershed area (km ²): | 639.1 |
| mean annual discharge (m ³ /s): | 29.4 |
| Summer Base Flow (%mad) | ~14 |
| accessible length (km): | 35 |
| productivity: | low |

| Comments |
|--|
| Shortage of rearing habitat complexity (large woody debris) and over-wintering refugia following several decades of logging and stream channel instability. Approx. 30%+ of the watershed's old growth has been harvested. Sand is infilling channel. There is a barrier on the Adam about 1 km upstream from the confluence with the Eve. Channel widening and bedload instability are extensive processes. Baseflow alkalinity low at 17 mg/L and predicted capacity per steelhead size class is 150 g/Unit. |

HABITAT RESTORATION TO DATE

- Eve River was the focus of a small scale WRP habitat restoration project which started in 1997 - placement of LWD into side channels, ponds and tributaries to the Eve mainstem.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Improve logging practices and review rate of cut issue for this watershed
- Monitor/prevent establishment of feral Atlantic salmon runs by escapes from nearby marine fish farms.

STEELHEAD OBJECTIVES AND STRATEGIES

- Increase growth and survival of juvenile steelhead through to the smolt stage in order to maintain healthy returns capable of supporting a catch and release angling opportunity over 5-km fishable length.
- Undertake a comprehensive biophysical inventory/habitat capability assessment to identify potential smolt yields for summer and winter run stocks that focuses on the Eve River, upstream of the Adam confluence, as it is the key steelhead producer. Once completed, this will form the basis for a fisheries and habitat management plan to guide further restoration activities.
- Review and integrate past WRP inventories (1995) to derive capability estimates.

IDENTIFIED RECOVERY OPTIONS

- Conduct annual stream enrichment (started in 2001 - slow release briquette application in the early summer, expansion proposed for future years but no enrichment done in 2002 due to product unavailability).
- Conduct ongoing stream restoration with emphasis on the Eve (hill slope, riparian, in-stream).

NOTES: Rehabilitation work needs to be continued to provide stable juvenile cover in less flood-prone areas off the mainstem. Small anadromous brown trout population is present. All five salmon species present - likely among the most diverse fish communities on Vancouver Island.

Draft 20/08/02

Atwaykellesse River (Wakeman Watershed) Watershed Map Code:90069280015800

(4th Order)

| | |
|---------------------------|--|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Extreme Conservation Concern |
| Class: | Wild |
| Recent Escapements (H+W): | <50 Winter Run Observed Mean Peak Fish/Km – 2000-2002 (three swims) = 4.3 Observed Mean Peak Fish/Km – 1992-1998 (four swims) = 22.5 |
| Angling Regulations: | Catch & release of wild steelhead. |
| Mean Annual Effort: | Long term ('68-'96) = / recent ('97-'01) = <100 days/year (needs check) |
| Mean Annual Catch: | Long term ('68-'96) = / recent ('97-'01) = <50 fish/year (needs check) |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,700 smolts, 221 adults (Based on mad-low productivity model and short anadromous length; Ptolemy 2002)
- ECC level = 5 spawners/km; CC level = 9; Cap Level = 31.
- ECC level may be lower since adults are 3-ocean type with higher fecundity than the norm

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 177 |
| mean annual discharge (m ³ /s): | 17 |
| Summer baseflow (%mad) | 65 |
| accessible length (km): | 6.4 |
| productivity: (natural) | very low |

| Comments |
|---|
| Moderate to steep gradient with extensive riffle cascade sections. Extensive logging throughout the lower watershed. Baseflow alkalinity low at 4 mg/L and predicted biomass or capacity per steelhead size class is 70 g/Unit. |

HABITAT RESTORATION TO DATE

- No known habitat restoration efforts have been made to date

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Improve logging practices to minimize impacts on the stream.

STEELHEAD OBJECTIVES AND STRATEGIES

- Conduct a biophysical inventory/habitat capability assessment including Kippan Creek.

NOTES: Inorganic nutrient addition may be considered, although watershed size/base flows may make this option impractical for the mainstem below Kippan Creek (too expensive). A biophysical assessment of Kippan Creek may show this major tributary to be an excellent candidate for nutrient addition.

The mainland coast streams appeared to fair better than east coast Vancouver Island streams in the period 1997 through 2000 possibly due to a higher proportion of maiden ocean age 3 spawners and geographic location on the east side of Johnstone Strait. Assessments in 2000, 2001 and 2002 showed precipitous declines in adult returns placing many stocks in the Conservation / special concern zones.

Draft: 13/09/02

| | |
|---------------------------|--|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Conservation Concern |
| Class: | Wild |
| Recent Escapements (H+W): | <50 Winter Run Observed Mean Peak Fish/Km – 2000-2002 (three swims) = 4.8 Observed Mean Peak Fish/Km – 1992-1998 (four swims) = 35.9 |
| Angling Regulations: | Catch & release of wild steelhead. |
| Mean Annual Effort: | Long term ('68-'96) = / recent ('97-'01) = <200 days/year (needs check) |
| Mean Annual Catch: | Long term ('68-'96) = / recent ('97-'01) = <100 fish/year (needs check) |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,000 smolts, 130 adults (Based on mad-low productivity model and short anadromous length; Ptolemy 2002)
- ECC level = 5 spawners/km; CC level = 10; Cap Level = 32.
- ECC level may be lower since adults are 3-ocean type with higher fecundity than the norm

Existing Habitat:

| | | |
|--|-----|--|
| watershed area (km ²): | 65 | <p style="text-align: center;">Comments</p> Extensive logging throughout river corridor in lower watershed. Short steep watershed, likely subject to moderate to severe flooding. Unconfined channel in lower 2 km and moderately confined in upper 2 km. Baseflow alkalinity low at 4 mg/L and predicted biomass or capacity per steelhead size class is 70 g/Unit. |
| mean annual discharge (m ³ /s): | 6.2 | |
| Summer baseflow (%mad) | 65 | |
| accessible length (km): | 4 | |
| productivity: (natural) | low | |

HABITAT RESTORATION TO DATE

- No known restoration activities in sub-basin.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Improve logging practices to minimize impacts on the Watershed.

STEELHEAD OBJECTIVES AND STRATEGIES

- Conduct a biophysical inventory/habitat capability assessment. (The short anadromous length likely has two reaches both with significant steelhead value.)
- Investigate whether inorganic nutrient addition to increase primary production may be a viable recovery option.
- Determine feasibility of side-channels or over-wintering alcoves for improving juvenile steelhead and coho survivals.

NOTES: Recent interest in guided angling on this stream has waned with the collapse of these stocks although a sportfishing closure may be considered due to the accessible nature of the lower river.

The mainland coast streams appeared to fair better than east coast Vancouver Island streams in the period 1997 through 2000 possibly due to a greater proportion of ocean age 3 maiden spawners and geographic location on the east side of Johnstone Strait. Assessments in 2000, 2001 and 2002 showed precipitous declines in adult returns placing many stocks in the Conservation / special concern zones.

Draft: 10/09/02

Kakweiken River

Watershed Map Code:900632100

5th Order

| | |
|---------------------------|--|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Special Concern (possibly Extreme Conservation Concern) |
| Class: | Wild |
| Recent Escapements (H+W): | 100-200 Winter Run Observed Mean Peak Fish/Km – 2000-2002 (three swims) = 3.3 Observed Mean Peak Fish/Km – 1992-1998 (four swims) = 35.9 |
| Angling Regulations: | Catch & release of wild steelhead. |
| Mean Annual Effort: | Long term ('68-'96) = / recent ('97-'01) = est. <200 days/year (check) |
| Mean Annual Catch: | Long term ('68-'96) = / recent ('97-'01) = est. <100 fish/year (check) |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 7, 000 smolts, 910 adults (Based on mad-low model productivity; Ptolemy 2002)
- ECC level = 4 spawners/km; CC level =12; Cap Level = 41.
- ECC level may be lower since adults are 3-ocean type with higher fecundity than the norm.

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 317 |
| mean annual discharge (m ³ /s): | 30.4 |
| Summer baseflow (%mad) | 65 |
| accessible length (km): | 22 |
| productivity: (natural) | very low |

| Comments |
|--|
| Historic barrier at 2.7 km was made passable in 1979. Significant instability downstream of the Elbow Creek confluence due to input of bedload and fines. Extensive logging throughout river corridor in lower watershed. Baseflow alkalinity low at 4 mg/L and predicted biomass or capacity per steelhead size class is 70 g/Unit. |

HABITAT RESTORATION TO DATE

- An extensive semi-natural side channel is located downstream of the Elbow Creek confluence on the rivers west bank. This unmanned spawning channel annually produces several hundred thousand pink salmon but has produced as many as 800,000 pink salmon in recent years.
- The Twin Falls barrier was bypassed successfully in 1979 with a concrete fishway increasing anadromous length from 2.7 to 22.0 km.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Improve logging practices throughout watershed to minimize fish habitat impacts.

STEELHEAD OBJECTIVES AND STRATEGIES

- Monitor encroachment of Atlantic salmon into this watershed from nearby fish farms.
- Conduct a biophysical inventory/habitat capability assessment.
- Consider as potential candidate for inorganic stream enrichment following water chemistry monitoring
- Monitor steelhead catch and effort, consider partial or complete sportfishing closure of stream.

NOTES: Mainstem lakes, overall anadromous length and the large population of pink salmon should provide some measure of resiliency for this stock although it appears to have suffered the most dramatic decline of all of the mainland coast index streams.

The mainland coast streams appeared to fair better than east coast Vancouver Island streams in the period 1997 through 2000 possibly due to maiden spawner age structure (i.e., greater proportion of ocean age 3 adults) and geographic location on the east side of Johnstone Strait. However, spring snorkel surveys in 2000, 2001 and 2002 showed precipitous declines in adult returns placing many stocks in the Conservation / special concern zones.

Draft: 13/09/02

| | |
|---------------------------|--|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Conservation Concern |
| Class: | Wild |
| Recent Escapements (H+W): | <50 Winter Run Observed Mean Peak Fish/Km – 2000-2002 (three swims) = 4.2 Observed Mean Peak Fish/Km – 1992-1998 (four swims) = 26.5 |
| Angling Regulations: | Catch & release of wild steelhead |
| Mean Annual Effort: | Long term ('68-'96) = / recent ('97-'01) = <100 days/year (needs check) |
| Mean Annual Catch: | Long term ('68-'96) = / recent ('97-'01) = <50 fish/year (needs check) |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,100 smolts, 143 adults (Based on mad-low productivity model and short anadromous length; Ptolemy 2002)
- ECC level = 4 spawners/km; CC level = 6; Cap Level = 20.
- ECC level may be lower since adults are 3-ocean type with higher fecundity than the norm

Existing Habitat:

| | |
|--|-----|
| watershed area (km ²): | 100 |
| mean annual discharge (m ³ /s): | 6.2 |
| Summer baseflow (%mad) | 20 |
| accessible length (km): | 7.5 |
| productivity: (natural) | low |

| Comments |
|--|
| Extensive channel braiding and large frequency of LWD in the lower 2 km. create excellent conditions for juvenile steelhead, cutthroat and Dolly Varden rearing. Large lakes on mainstem and tributary (Tom Browne Creek) promote stability and likely increase productivity. Baseflow alkalinity low at 8 mg/L and predicted biomass or capacity per steelhead size class is 100 g/Unit. |

HABITAT RESTORATION TO DATE

- Extensive FOC spawning channel complex is located near the Tom Browne Creek confluence (water is drawn from Tom Browne Lake via intake structure).

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Limit headwater logging activities to minimize deleterious impacts on the stream.
- Preservation of existing habitat is of paramount importance.

STEELHEAD OBJECTIVES AND STRATEGIES

- Consider protection of adult steelhead with seasonal sportfishing closures.
- Review operation of weirs at the outlet of Tom Browne and Glendale lakes to ensure minimum flow releases are met in lowest reaches. All reaches above Tom Browne confluence are sustained by Glendale Lake.
- .A specific anadromous trout/char survey should be undertaken.

NOTES: Very large abundances of searun cutthroat trout are identified annually in steelhead escapement surveys. A biophysical inventory/habitat capability assessment was completed by FOC before development of the pink salmon spawning channels in the 1980s but the focus was primarily on pink salmon and how they were impacted by severe winter storms. Addition of inorganic nutrients is likely not needed due to presence of large pink salmon runs, enhanced with FOC spawning channel development.

The mainland coast streams appeared to fair better than east coast Vancouver Island streams in the period 1997 through 2000. This was possibly due to the greater proportion of ocean age 3 maiden spawners and geographic location on the east side of Johnstone Strait. Assessments in 2000, 2001 and 2002 showed precipitous declines in adult returns placing many stocks in the Conservation / special concern zones.

Draft: 13/09/02

Ahnuhati River

Watershed Map Code:900603000

3rd Order

| | |
|---------------------------|---|
| Wild Stock Trend: | In Decline |
| Wild Stock Status: | Conservation Concern |
| Class: | Wild |
| Recent Escapements (H+W): | 50-100 Winter Run Observed Mean Peak Fish/Km – 2000-2002 (three swims) = 6.3 Observed Mean Peak Fish/Km – 1992-1998 (four swims) = 38.5 |
| Angling Regulations: | Catch & release of wild steelhead. |
| Mean Annual Effort: | Long term ('68-'96) = / recent ('97-'01) = <100 days/year (needs check) |
| Mean Annual Catch: | Long term ('68-'96) = / recent ('97-'01) = <50 fish/year (needs check) |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

Existing Habitat:

- 3,700smolts, 481adults (Based on mad-low productivity model and short anadromous length; Ptolemy 2002)
- ECC level = 4 spawners/km; CC level = 9; Cap Level = 30.
- ECC level may be lower since adults are 3-ocean type with higher fecundity than the norm

| | |
|--|------|
| watershed area (km ²): | 189 |
| mean annual discharge (m ³ /s): | 18.1 |
| Summer base flow (%mad) | 65 |
| accessible length (km): | 17.6 |
| productivity: (natural) | low |

| Comments |
|---|
| Some logging in lower 4 km of watershed with most of the headwater drainage intact. Extensive channel braiding and large frequency of LWD in the lower 8 km. Fish production comes almost entirely from mainstem due to consistently steep tributary streams. Base flow alkalinity low at 4 mg/L and predicted biomass or capacity per steelhead size class is 70 g/Unit. |

HABITAT RESTORATION TO DATE

- No known habitat restoration to date.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Preservation of existing habitat is of paramount importance.
- Limit headwater logging activities to minimize deleterious impacts on the stream.

STEELHEAD OBJECTIVES AND STRATEGIES

- Conduct a biophysical inventory/habitat capability assessment.
- Addition of inorganic nutrients may not be needed due to presence of large pink salmon runs, but conduct water chemistry (low level nutrient) sampling once monthly from May to October.

NOTES: Surveys in the fall of 2001, completed to identify potential encroachment by Atlantic salmon, showed very large numbers of cutthroat trout and Dolly Varden char in the lower 8km of this river.

The mainland coast streams appeared to fair better than east coast Vancouver Island stocks possibly due to the greater proportion of ocean age 3 maiden spawners and geographic location on the east side of Johnstone Strait. Assessments in 2000, 2001 and 2002 showed precipitous declines in adult returns placing many stocks in the Conservation / special concern zones.

Draft: 13/09/02

Salmon River Watershed Map Code: 920725300 6th Order

Wild Stock Trend: **Stable with some recovery** (particularly winter run)
 Wild Stock Status: **Winter Run: Routine Management**
Summer Run: Conservation Concern
 Class: **Wild**
 Recent Steelhead Escapements: 200-500+ Winter Run, 50-100 Summer Run,
 H/W Ratio: 1:20 – hatchery fry stocking ended in 1999
 Observed Mean Peak Fish/km 1998-2001: 13.6 WR, 4.3 SR

Angling Regulations: Limited Steelhead Fishery - catch and release of wild fish, extensive headwater closure year-round

Mean annual effort: Long term 1968-1996: 1,068 / Recent 1997-2000: 888 / 2001 (-)
 Mean Annual catch: Long term 1968- 1996: 588 / Recent 1997-2000: 276

Estimated Steelhead Habitat Capacity & Returning Adults (assuming 13% marine survival):

1,200 winter run and 300 summer run fish (based on Wightman and Craig estimate)
 Conservation Concern Level @ 30% of capacity is 360 adults (WR) and approx 100 adults (SR)

Salmon River Watershed Existing Habitat:

| | |
|--|--------|
| watershed area (km ²): | 1336.7 |
| mean annual discharge (m ³ /s): | 63.3 |
| Summer base Flow (%mad) | 17.4 |
| accessible length (km): | 80 |
| productivity: (natural) | low |

| Comments |
|---|
| BC Hydro diversion to Campbell system - canal capacity about 42 cms. High logging impacts, BC Hydro Diversion, river over-widened with loss of riparian zone, minimum flows may be inadequate in some years, estuary in very good condition. White River supports summer steelhead, some observed d/s of Island Hwy bridge. Over 80 km accessible length is increasing with improved passage. Memekay (major tributary) has 214.4 sq. km and MAD of 9.9 m ³ /s. Baseflow alkalinity low at 20 mg/L and predicted capacity per steelhead size class is 162 g/Unit |

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Determine and provide acceptable conservation flows below BC Hydro diversion.
- Ensure good logging practices are followed.

HABITAT RESTORATION TO DATE - Long-term history including:

- boulder obstruction removal from mainstem canyon and large increase in accessible length;
- habitat complexing with mixed results;
- diversion smolt screening and adult fishway;
- long-term enrichment project since 1990;
- LWD placements at 25 sites in Spirit and Big Tree Creeks (WRP);
- Grilse Creek side-channel/alcove and LWD placements (2000);
- Paterson Creek culvert removals (2001).

STEELHEAD OBJECTIVES AND STRATEGIES

- Return stocks to 800 - 1000 fish under average ocean survivals (13%) & maintain catch and release fishery.
- Review present management plan and update 23-year old habitat capability study.
- Conduct genetic stock identification on the White and Memekay systems in comparison with mainstem stocks.
- Install electronic fish counter in the fishway at the diversion dam (done in 2001, but damaged by floating debris).

IDENTIFIED RECOVERY OPTIONS

- Expand stream enrichment.
- Improve smolt diversion efficiency at BCH diversion canal.
- Excellent potential for more stream restoration on tributaries and upper reaches of mainstem.

NOTES: Salmon River is a success story for stream restoration/ enrichment. Steelhead stocks have fared much better during the downturn in marine survivals than in other north-east coast Island systems.

Draft 20/08/02

Amor de Cosmos Creek

Watershed Map Code: 920700700

4th Order

| | |
|-------------------------------|---|
| Wild Stock Trend: | Stable at Low level |
| Wild Stock Status: | Conservation Concern |
| Class: | Wild |
| Recent Steelhead Escapements: | <50 Winter Run (Observed Mean Peak Fish/km 1998-2001: 3.5 WR - only 2 swims in past five years - a few dozen fish observed.) |
| Angling Regulations: | Steelhead Seasonal Closure |
| Mean annual effort: | Long term 1968-1996: 198 Recent 1997-2001: Closed annually since 99/00 |
| Mean Annual catch: | Long term 1968- 1996: 162 Recent 1997-2001: Closed annually since 99/00 |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,080 smolts / 140 adults (based on Tredger 1986/Ptolemy 2002 (low end))
- Conservation Concern Level @ 30% of capacity is 43 adults

Existing Habitat:

| | |
|--|-------|
| watershed area (km ²): | 198.7 |
| mean annual discharge (m ³ /s): | 9.2 |
| accessible length (km): | 3.8 |
| productivity: | low |

| Comments |
|---|
| Large barrier falls at 3.8 km upstream from mouth. Observed parr densities appear healthy and consistent with biomass of 150 g/Unit and high quality rearing habitat. |

HABITAT RESTORATION TO DATE

- Fisheries and Oceans abandoned an experimental pink salmon hatchery in the early 1980s.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Ensure good logging practices are followed in this watershed both above and below the barrier falls.
- Monitor presence of Atlantic salmon adults/juveniles in the anadromous reach.

STEELHEAD OBJECTIVES AND STRATEGIES

- Rebuild small wild stock and protect habitats to support a limited catch and release angling opportunity over 2-km fishable water.
- Undertake a biophysical inventory to identify current steelhead production, habitat constraints and restoration opportunities.
- Monitor/prevent establishment of feral Atlantic salmon runs by escapes from nearby marine fish farms.
- Ensure regular enforcement checks are made during the steelhead-angling season.

NOTES: Check on persistent presence of juvenile Atlantic salmon first observed in 1999.

Draft 20/08/02

Sub-Area: S.E. Vancouver Island (Campbell River to Saanich Inlet)

Campbell River Watershed Map Code: 920627900 6th Order

Wild Stock Trend **In Decline**
 Wild Stock Status: **Extreme Conservation Concern (for remnant stocks)**
 Class: **Hatchery** (Proposed , Currently Augmented)
 (Tsitika Summer Run smolt stocking, surplus LGB fry from Quinsam stocked in Campbell R sidechannels)
 Recent Steelhead Escapements: <50 Winter Run, <20 Summer Run
 Observed Mean Peak Fish/km 1998-2001: n/a WR, 0.6 SR
 Angling Regulations: Limited catch and release fishery (targeting resident trout), gear restriction (artificial fly only)
 Mean annual effort: Long term 1968-1996: 3,395 / Recent 1997-2001: Limited
 Mean Annual catch: Long term 1968- 1996: 1,300 / Recent 1997-2001:Limited

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 1,080 smolts / 140 adults (based on a review of current available information.)
- Conservation Concern Level @ 30% of capacity is 42 adults

Existing Habitat:

| | |
|--|-------------------|
| watershed area (km ²): | 1755 |
| mean annual discharge (m ³ /s): | 98.9 |
| Summer Base Flows (%mad) | Nat 30; Reg 60 |
| accessible length (km): | 3.7 |
| productivity: | moderate |

| Comments |
|--|
| Watershed Area: 1,755 sq. km includes area above John Hart Dam. Major reservoir - summer flows have been too high for steelhead fry. Has 3.7 km accessible length, but informal agreement with BC Hydro now delivers water to canyon creating 2 km of additional habitat. Heavily impacted by BC Hydro power project flow regime, extreme ramping rates and loss of gravel recruitment leaving extremely coarse substrate. No enrichment requirement. Baseflow alkalinity moderate at 40 mg/L and predicted capacity per steelhead size class is 230 g/Unit. |

HABITAT RESTORATION TO DATE

- A large suite of restoration projects has been undertaken since 1990 including gravel placements, flow modifications, side channels highly complexed with improved steelhead rearing habitat, restoration of estuary (through land purchase and relocation of heavy industry).

STEELHEAD OBJECTIVES AND STRATEGIES

- Create a fishery through augmentation with Tsitika captive brood summer run steelhead smolts (target 20,000 smolts per year) supporting 1,500 angler-days per year - first returns expected 2005/06.
- Increase fishing opportunities for hatchery steelhead with surplus Quinsan winter run fry from the LGB experiment returning in future years.
- Continue Water Use Plan with BC Hydro to improve flow and habitat conditions for steelhead, salmon and resident trout.

IDENTIFIED RECOVERY OPTIONS

- Most potential restoration has already been done but ongoing gravel replacement should continue under BC Hydro's Bridge-Coastal Restoration Program.
- Restore fish flows plus gravel recruitment in 2-km Elk Falls Canyon section.
- Restore normal summer baseflows to 30% mad with Water Use Planning.
- Adopt more "fish-friendly" flow ramping rates downstream of JH power station.
- Optimize hatchery stocking to create sport fishery for summer and winter steelhead.

Draft 20/08/02

Quinsam River

Watershed Map Code: 920462800 (Campbell tributary)

Wild Stock Trend

In Decline

Wild Stock Status:

Conservation Concern

Class:

Augmented (Experimental -Quinsam WR, LGB Captive Brood. Long term classification contingent upon results of LGB experiments.)

Recent Steelhead Escapements:

100-150 Winter Run (2002 may have been <100 returning adults)
Observed Mean Peak Fish/km 1998-2001: 5.8 WR

Angling Regulations:

Steelhead Seasonal Closure

Mean annual effort:

Long term 1968-1996: 3,255 / Recent 1997-2001: Closed

Mean Annual catch:

Long term 1968- 1996: 1,753 / Recent 1997-2001:Nil

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4800 smolts/ 624 adults (based on Lirette’s capability studies 1987 (low end))
- Conservation Concern Level @ 30% of capacity is 187 adults

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 280 |
| mean annual discharge (m ³ /s): | 9.6 |
| Summer Base Flow (%mad) | 21.7 ? |
| accessible length (km): | 36 |
| productivity: | moderate |

| Comments |
|--|
| Up to 5.7 cu m/s diverted to Lower Campbell Lake below Quinsam and Wokas Lakes. Some logging damage - forest lands held privately, urbanization in lower reaches, mine drainage issue - Quinsam Coal and abandoned mine. Recent strong pink returns should provide nutrients for improved juvenile steelhead growth and survival. Periodically very low summer flows. Parr habitat limited by scarce LWD in gravel-bed channel. Baseflow alkalinity moderate at 40 mg/L and predicted capacity per steelhead size class is 230 g/Unit. |

HABITAT RESTORATION TO DATE

- Very little done to date.

SPECIAL HABITAT PROTECTION REQUIREMENTS.

- Any mining developments must have no drainage impacts.
- Minimize urban and other impacts - improve public awareness of habitat protection requirements.
- Ensure good logging practices are followed on private land.
- Improve fish conservation flows (especially adult and smolt passage flows) through Water Use Plan process..
- Ensure water quality monitoring is on-going despite mine closures and government budget restraint.

STEELHEAD OBJECTIVES AND STRATEGIES

- Rebuild wild stocks (including returns from LGB smolt releases) into the Routine Management Zone capable of supporting a catch and release fishery based on 3,000 angler days a year.

IDENTIFIED RECOVERY OPTIONS

- LGB experimental smolt introduction (begun in 2001 to continue until at least 2004).
- Continue seasonal closure until stock shows considerable improvement.
- Implement flow regime improvements through Water Use Plan.
- Install LWD complexing and/or side channels in areas with suitable gradients for juvenile steelhead. (Gaboury 2002 recommends 42 LWD sites on the Quinsam and 15 sites on Cold Creek - total cost approx \$ 182K)
- Bank revetments using geo-textiles and botanical methods, where appropriate.

Draft 20/08/02

Oyster River

Watershed Map Code: 920600400

5th Order

Wild Stock Trend **In Decline** (Winter Run – also rumored to be small but persistent Summer Run)
 Wild Stock Status: **Extreme Conservation Concern**
 Class: **Wild**, Hatchery Augmentation cancelled 1984

Recent Steelhead Escapements: 50-100 Winter Run; <50? Summer Run (difficult to estimate)
 Observed Mean Peak Fish/km 1998-2001: 1.8 WR

Angling Regulations: Limited catch and release fishery (targeting sea-run cutthroat trout), gear restriction (artificial fly only), extensive seasonal headwater closure

Mean annual effort: Long term 1968-1996: 1,361 / Recent 1997-2001: Limited
 Mean Annual catch: Long term 1968- 1996: 495 / Recent 1997-2001: Limited

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 5800 smolts / 754 adults (based on Ptolemy 1998 estimate)
- Conservation Concern Level @ 30% of capacity is 226 adults.

Existing Habitat:

| | |
|--|-------|
| watershed area (km ²): | 366.3 |
| mean annual discharge (m ³ /s): | 14.2 |
| Summer Base Flow (%mad) | 15.8 |
| accessible length (km): | 46.3 |
| productivity: | low |

| Comments |
|--|
| High winter sediment loads, logging damage particularly from extensive past clear cuts on private lands. Summer flows good from high elevation snow pack and groundwater sources. Best parr habitat identified in riffle-cascade reaches above Highway 19. Channelized and dyked in lower reaches with associated loss of rearing habitat. Baseflow alkalinity low at 20 mg/L and predicted capacity per steelhead size class is 160 g/Unit. |

HABITAT RESTORATION TO DATE:

- None directed specifically to steelhead. Oyster River Enhancement Society's side channels are highly complexed for coho and may offer some over-wintering refugia for steelhead and cutthroat trout.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Provide adequate flood protection setbacks for urban development in lower reaches.
- Switch to alternate forms of forest harvesting and ensure harvesting on private land meets requirements comparable to the FPC.
- Fully implement Oyster River Water Management Plan recommendations(MELP 1984) with respect to flood control and water quality.
- Upgrade enforcement of land and water-use regulations.

STEELHEAD OBJECTIVES AND STRATEGIES

- Rebuild wild stocks to the Routine Management Zone capable of supporting a catch and release fishery of 1,400 angler days over 15-km fishable water.
- Establish if there is a unique summer run relevant to location of partial migration barriers.
- Refine habitat capability estimates and stock status; there are no detailed stream surveys for the mainstem including the extent and quality of steelhead parr habitat.
- More fully engage community volunteers in conservation and recovery of wild steelhead.

IDENTIFIED RECOVERY OPTIONS

- Side channels in areas of suitable gradients for steelhead.
- Well-anchored LWD complexing and over-wintering alcoves in middle and upper reaches and Little Oyster. (Gaboury 2002 recommends 77 sites - total cost estimate approx \$194K).
- Medium to high nutrient enrichment possibilities but requires consultation with community - distribute salmon carcasses upstream in side-channels in the interim period.

NOTES: Active community hatchery and side channel facility in watershed with many dedicated volunteers; has received annual support from DFO since its inception (early 1980s.)
 Draft 20/08/02

Black Creek

Watershed Map Code: 920595100

3rd-4th Order

Wild Stock Trend

In Decline

Wild Stock Status

Extreme Conservation Concern

Class:

Wild

Recent Steelhead Escapements:

<<50 Winter Run (No swim surveys - poor stream visibility)

Angling Regulations:

Steelhead Seasonal Closure

Mean annual effort:

Long term 1968-1996: 104 / Recent 1997-2001: Closed since 99/00

Mean Annual catch:

Long term 1968- 1996: 30 / Recent 1997-2001: Closed since 99/00

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 150 smolts / 20 adults (based on actual smolt counts)

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 80.8 |
| mean annual discharge (m ³ /s): | 1.8 |
| Summer Base Flow (%mad) | 0 |
| accessible length (km): | 5 |
| productivity: | moderate |

| Comments |
|---|
| Large marshy area above small lake provides excellent coho habitat, chronic low summer flows - conflict with local farmers over water withdrawals an ongoing problem. Present flows are regulated and efforts are being made to restore baseflows to 5% mad magnitude or 180 L/s (6 cfs). Habitat-flow surveys are being completed to better define conservation flow needs for steelhead and cutthroat trout. Baseflow alkalinity moderate at 43 mg/L and predicted capacity per steelhead size class is 240 g/Unit. Capacity may be higher with restored flows since SRP values are high at 12 µg/L due to agricultural inputs. |

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Conservation flow requirements a major issue - regulated base flows are zero for a minimum of 30 days in some years.

HABITAT RESTORATION TO DATE:

- Marsh 101 DFO storage development project in conjunction with Timber West Forest Ltd. and Ducks Unlimited (summer 2000) – appears to be successful based on 2002 coho smolt numbers at the counting fence.

STEELHEAD OBJECTIVES AND STRATEGIES

- Identify key steelhead habitats and any restoration opportunities - particular emphasis on restoring summer base flows

NOTES: DFO coho index stream. Historically very productive for coho. DFO may have reached a settlement with some farmers who have irrigation rights on the system, but tend to exceed their licensed withdrawals. System is considered over-subscribed with water licenses.

Draft 20/08/02

Wild Stock Trend
Wild Stock Status
Class:

In Decline
Extreme Conservation Concern (for remnant wild stocks)
Hatchery -FOC hatchery released 90,000 captive brood smolts last year

Recent Steelhead Escapements:

<50 Winter Run, <50 Summer Run, H/W Ratio: 3:1
Observed Mean Peak Fish/km 1998-2001: 7.9 WR, 2.7 SR

Angling Regulations:
Mean annual effort:
Mean Annual catch:

Steelhead Closure Year-round
Long term 1968-1996: 1,239 / Recent 1997-2001: CLOSED
Long term 1968- 1996: 346 / Recent 1997-2001: CLOSED

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 2500 smolts yielding 325 adults including tributaries (based on Ptolemy 2002)
- Conservation Concern Level @30% of capacity is 108 adults (combined wild stocks).

Existing Habitat:

| | |
|--|--------|
| watershed area (km ²): | 602.1 |
| mean annual discharge (m ³ /s): | 42 |
| Summer Base Flow (%mad) | Reg 20 |
| accessible length (km): | 14 |
| productivity: | Low |

| Comments |
|--|
| Long-standing BC Hydro project in watershed, chronic problems with low summer flows and high temperatures partially addressed by Interim Flow Order from Water Comptroller effectively doubling the base flow from 2.8 to 5.7 cms starting in 1998. It remains in effect until completion of current Water Use Plan. Seal predation in Courtenay and lower Puntledge Rivers is essentially resolved by cull program that started circa 1999. Baseflow alkalinity low at 16 mg/L and predicted capacity per steelhead size class is 145 g/Unit Cruickshank River 215.5 sq. km, Mean Annual Discharge 17.9 cu. m/s is the largest tributary to Comox Lake. |

HABITAT RESTORATION TO DATE

- Several restoration projects including two side-channels, small tributary complexing, salmon carcass distribution by federal hatchery staff and fishways at Stotan Falls, Nibs Falls, Browns River Falls and Comox Lake Dam.

SPECIAL HABITAT PROTECTION REQUIREMENTS - Several issues around:

- BC Hydro's regulation of flows through the WUP process;
- Acid rock drainage from the headwaters of Tsolum River;
- Impacts from private forestry lands throughout the watershed; and
- Increasing urbanization of the lower Puntledge River basin including the estuary.

STEELHEAD OBJECTIVES AND STRATEGIES

- Return stocks to approx. 200 -300 adult return capable of supporting a catch and release fishery over 10-km fishable water.
- Continue to improve river hydrograph to reflect pre-regulation conditions as closely as possible.
- Investigate feasibility of cold-water siphon from Comox Lake and other projects in WUP process.

IDENTIFIED RECOVERY OPTIONS

- Continue the current suite of activities through the BC Hydro Water Use Plan
- Reduce poaching and continue control programs on "problem" seals
- Continue/expand selective fishing methods in approach commercial net fisheries
- Initiate gravel recruitment projects d/s of BCH diversion dam (starting in 2002 under BCRP)

NOTES: Quantify what part of the bedrock reach between the point-of-diversion and the power house is suitable parr habitat and what means are available to enhance parr cover. Quantify and restore steelhead rearing capacity below power-house since regulated summer base flows are much higher than compared to natural regime. Seek appropriate compensation for lost habitat resulting from the head pond. Summer steelhead production comes from Cruickshank River and main Puntledge between Nibs Falls and diversion. The significant amount of poaching in this watershed could potentially undermine extensive salmon and steelhead recovery efforts.

Trent and Tsable Rivers

Map Codes: 920545800 & 9205527600

4th Order

| | |
|-------------------------------|---|
| Wild Stock Trend | In Decline |
| Wild Stock Status: | Extreme Conservation Concern (Extirpated?) |
| Class: | Hatchery (Proposed), currently Wild |
| Recent Steelhead Escapements: | <<50 in both systems, Winter Run |
| Angling Regulations: | Steelhead Seasonal Closure |
| Mean annual effort: | Long term 1968-1996: 258 / CLOSED 99/01 |
| Mean Annual catch: | Long term 1968- 1996: 92 / CLOSED 99/01 |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- Trent: 1,650 smolts / 215 adults
- Tsable: 1,400 smolts / 182 adults (both based on actual smolt counts)
- Conservation Concern Level @30% of capacity: Trent 64 adults, Tsable 55 adults

Trent River Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 82 |
| mean annual discharge (m ³ /s): | 3 |
| Summer Base Flow (%mad) | 2 |
| accessible length (km): | 7.7 |
| productivity: | Moderate |

| Comments |
|---|
| Logging, urbanization. Loss of LWD and pool habitat is a concern. Baseflows are far below optimum and headwater storage is an option. Baseflow alkalinity moderate at 29 mg/L and predicted capacity per steelhead size class is 195 g/Unit. Artificially enriched by Cumberland STP. |

Tsable River Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 113 |
| mean annual discharge (m ³ /s): | 7.99 |
| Summer Base Flow (%mad) | 2 |
| accessible length (km): | 6.3 |
| productivity: | Moderate |

| Comments |
|---|
| Logging, historic coal mining, urbanization |
| Loss of LWD and pool habitat is a concern. Baseflows are below optimum and headwater storage is an option. Baseflow alkalinity moderate at 29 mg/L and predicted capacity per steelhead size class is 195 g/Unit. |

HABITAT RESTORATION TO DATE

- Small side channel in lower Tsable built by Fisheries and Oceans with community stewardship program.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Urban development requires adequate protection setbacks.
- Any potential for acid rock drainage on the Tsable needs to be reviewed.
- Any impacts from independent power proposal for the Tsable River need to be addressed.
- Private land logging is an ongoing concern that needs to be resolved.

STEELHEAD OBJECTIVES AND STRATEGIES

- Create fishing opportunities in these systems where native stocks appear to have been extirpated - first adult returns would be in 2004/05 if stocked with smolts in spring of 2003 using 10,000 Puntledge captive brood winter run per system. Give Trent preference if insufficient smolts are available to stock both systems.
- Address any serious habitat problems to ensure fish can successfully utilize these systems.

NOTES: Prior to any stocking, a basic bio-physical assessment should be made of these watersheds to determine habitat capabilities and whether any remnant wild stocks remain. Updated water quality information is particularly required if acid rock drainage is suspected. Perhaps a local community group or groups might be able to contribute assistance and local knowledge in this regard. Juvenile electrofishing was done in 2001 and one snorkel survey was also done in each system last winter.

Draft 20/08/02

Wild Stock Trend **Relatively Stable at Low level**
 Wild Stock Status: **Extreme / Conservation Concern**
 Class: **Augmented** (Suspended on account of lack of wild brood stock- 5 generations augmented from 1972 to 1998. Longer term classification contingent upon rebuilding success)
 Recent Steelhead Escapements: 50 -100 Winter Run
 Observed Mean Peak Fish/km 1998-2001: 5.1 WR
 Angling Regulations: Limited catch and release fishery (targeting resident rainbow and sea-run cutthroat trout), gear restriction (artificial fly only), seasonal area closure
 Mean annual effort: Long term 1968-1996: 2,625 / Recent 1997-2001: Limited
 Mean Annual catch: Long term 1968- 1996: 1,304 / Recent 1997-2001: Limited

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4,000 smolts / 520 adults (based on Lirette 1984 and Ptolemy 1998 (low end))
- Conservation Concern Level @ 30% of Habitat Capacity is 156 adults

Existing Habitat:

| | |
|--|----------------------|
| watershed area (km ²): | 147.5 |
| mean annual discharge (m ³ /s): | 7.3 |
| Summer Baseflows (%mad) | 12 (nat) 31 (reg) |
| accessible length (km): | 10 |
| productivity: | Moderate |

| Comments |
|---|
| This system is unique in that it is a long-standing flow regulation, hatchery and spawning channel project built by DFO (beginning circa 1958) solely for the purpose of salmon enhancement. The absence of winter freshets has, however, resulted in impacts in terms of natural stream flushing processes. DFO cleans part of the stream using heavy equipment in the summer months. Baseflow alkalinity moderate at 38 mg/L and predicted capacity per steelhead size class is 225 g/Unit. |

HABITAT RESTORATION TO DATE

- Numerous channel improvement projects
- Diversion of Hunt's Creek to reduce siltation.

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Urban development on the FN reserve and along watershed boundaries requires adequate protection buffers.

STEELHEAD OBJECTIVES AND STRATEGIES

- Rebuild naturally-spawning stocks into the Routine Management Zone capable of supporting a catch and release steelhead fishery in this system.
- Complete an updated biophysical inventory to reflect the extensive habitat restoration program over the last decade.

IDENTIFIED RECOVERY OPTIONS

- To increase the supply of marine-derived nutrients, distribute salmon carcasses upstream of hatchery rearing and spawning channels but below hatchery incubation facility near Horne Lake dam.

NOTES: System has received extensive habitat restoration but persistent infiltration by Quadra sands necessitates annual in-river scarification to clean spawning gravel. All possible bank armoring has been done according to Fisheries and Oceans. Horne Lake spillway being rebuilt 2002. New rule curve will increase peak winter flows, but not above bank-full levels unless a 200-year flood occurs when the spillway is overtopped.

Draft 20/08/02

Little Qualicum River

Watershed Map Code: 920481800

4th Order

Wild Stock Trend **Relatively Stable at a Low Level**
 Wild Stock Status: **Extreme / Conservation Concern**
 Class: **Augmented** (Experimental -Little Qualicum WR LGB Captive Brood -long term classification contingent upon results of LGB experiment)

Recent Steelhead Escapements: 50-100 Winter Run
 Observed Mean Peak Fish/km 1998-2001: 4.3 WR

Angling Regulations: Limited catch and release fishery, gear restriction (artificial fly only), extensive seasonal area closure

Mean annual effort: Long term 1968-1996: 3,000 / Recent 1997-2001: Limited
 Mean Annual catch: Long term 1968- 1996: 1,683 / Recent 1997-2001: Limited

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4,320 smolts / 560 adults (based on Lirette, Hooton, Lewensky 1987)
- Conservation Concern Level @ 30% of Habitat Capacity is 168 adults

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 248.9 |
| mean annual discharge (m ³ /s): | 11.8 |
| Summer Base Flow (%mad) | 14.7 |
| accessible length (km): | 9.5 |
| productivity: | moderate |

| Comments |
|---|
| Experiences low flow augmentation from storage on Cameron Lake, diversions, sediment problems, logging damage, urbanization, agricultural impacts. Baseflow alkalinity moderate at 31 mg/L and predicted capacity per steelhead size class is 202 g/Unit. |

HABITAT RESTORATION TO DATE

- Stabilization of large clay slide on lower Kinkadee Creek
- Dam breach on Whisky Creek

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Agricultural impacts need to be addressed.
- Urbanization impacts need to be minimized including flood protection impacts.
- Ensure good logging practices are followed - resolve chronic sedimentation from private lands.
- Avoid any further flow diversions and maintain/ restore frequency, quality of large woody debris.

STEELHEAD OBJECTIVES AND STRATEGIES

- Return wild stocks (including returns from LGB smolt releases) to levels well within the Routine Management Zone capable of supporting a catch and release fishery based on 3000 angler days per year.
- Increase enforcement of angling regulations, where/when applicable.
- Determine feasibility of slow release organic enrichment (water supply intakes are downstream).
- Investigate possible improvements to Cameron Lake weir and spawning channel cleaning operations.
- Investigate potential side channel work in areas of suitable gradients for steelhead.

IDENTIFIED RECOVERY OPTIONS

- Construct well-anchored LWD complexing and refuge alcoves on main stem. (Gaboury 2002 recommends 73 LWD sites for a total cost of \$193,073.)
- LGB experimental smolt introductions (underway 2001 to continue until at least 2004).
- Distribute salmon carcasses from federal spawning channel and hatchery upstream to increase marine-derived nutrients in upper mainstem.

NOTES: Continue seasonal closure until stock shows more positive signs of recovery.
 LGB experiment underway - needs full evaluation. Fisheries and Oceans spawning channel, hatchery and low flow enhancement storage/regulation weir on Cameron Lake.
 Draft 20/08/02

French Creek

Watershed Map Code: 920470700

3rd Order

Wild Stock Trend **In Decline**
 Wild Stock Status: **Extreme Conservation Concern**
 Class: **Wild**
 Recent Steelhead Escapements: <<50 Winter Run

Angling Regulations: Steelhead Seasonal Closure
 Mean annual effort: Long term 1968-1996: 133 / Closed since 99/01
 Mean Annual catch: Long term 1968- 1996: 69 / Closed since 99/01

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 2,270 smolts / 295 adults (based on actual smolt counts from mid 1980s)
- Conservation Concern Level @ 30% of capacity is 89 adults

Existing Habitat:

| | |
|--|------|
| watershed area (km ²): | 86.6 |
| mean annual discharge (m ³ /s): | 2.58 |
| Summer base flow (%Mad) | 0.9% |
| accessible length (km): | 20.4 |
| productivity: | High |

| Comments |
|---|
| Major golf course development, logging on private lands, urban development and marina near mouth. Significant loss of LWD, summer base flows are totally inadequate, agricultural withdrawals from unlicensed shallow wells. This system is in very poor condition for steelhead although it does support some respectable levels of sea-run cutthroat trout in tributaries. Baseflow alkalinity moderate at 70 mg/L and predicted capacity per steelhead size class is 304 g/Unit. |

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Summer base flows must be improved through regulation of shallow wells.
- Urban and golf course development require adequate protection setbacks.
- Future rate of removal of forest canopy must be very low as stream has been heavily impacted by past logging.

STEELHEAD OBJECTIVES AND STRATEGIES

- Restore habitat and rebuild in order to create a sustainable steelhead stock.
- Develop a community - private landowner partnership to provide stewardship on this small system with emphasis on protecting remaining habitats and stocks.
- A list of opportunities needs to be developed for comprehensive habitat restoration.

NOTES: An environmental trend draft report is in preparation by MWLAP. Capable volunteer assistance should be available in the Parksville area.

Draft 20/08/02

Englishman River

Map Code: 920462800

4th Order

| | |
|-------------------------------|--|
| Wild Stock Trend | Relatively Stable at a Low Level |
| Wild Stock Status: | Extreme / Conservation Concern |
| Class: | Wild (Proposed change from Augmented) |
| Recent Steelhead Escapements: | 100-200 Winter Run Observed Mean Peak Fish/km 1998-2001: 5.6 Winter Run |
| Angling Regulations: | Steelhead Seasonal Closure |
| Mean annual effort: | Long term 1968-1996: 2,078 / Recent 1997-2001: Closed |
| Mean Annual catch: | Long term 1968- 1996: 1,052 / Recent 1997-2001: Closed |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4,600 smolts / 598 adults (based on SHA Model Ptolemy 2002, Ptolemy 1998)
- Conservation Concern Level @ 30% of capacity: 180 adults

Existing Habitat:

| watershed area (km ²): | 324 | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Comments</th> </tr> </thead> <tbody> <tr> <td>Extensive channel widening and chronic sedimentation related to past private land logging; reduced rearing habitat complexity aggravated by low summer flows; subject to winter rain-on-snow events that increase fish mortality; urbanization of lower/middle reaches (including tributaries) an increasing concern. Phosphorous limited. Baseflow alkalinity 31 mg/L and predicted capacity per steelhead size class is 202 g/Unit.</td> </tr> </tbody> </table> | Comments | Extensive channel widening and chronic sedimentation related to past private land logging; reduced rearing habitat complexity aggravated by low summer flows; subject to winter rain-on-snow events that increase fish mortality; urbanization of lower/middle reaches (including tributaries) an increasing concern. Phosphorous limited. Baseflow alkalinity 31 mg/L and predicted capacity per steelhead size class is 202 g/Unit. |
|---|----------|---|----------|---|
| Comments | | | | |
| Extensive channel widening and chronic sedimentation related to past private land logging; reduced rearing habitat complexity aggravated by low summer flows; subject to winter rain-on-snow events that increase fish mortality; urbanization of lower/middle reaches (including tributaries) an increasing concern. Phosphorous limited. Baseflow alkalinity 31 mg/L and predicted capacity per steelhead size class is 202 g/Unit. | | | | |
| mean annual discharge (m ³ /s): | 14 | | | |
| Summer Base Flow (%mad) | 4.6 | | | |
| accessible length (km): | 22.7 | | | |
| productivity: | Moderate | | | |

FISH HABITAT RESTORATION TO DATE:

- Two semi-natural side channels have been constructed by DFO. These are highly complexed with large woody debris but likely have low steelhead production. The Weyerhaeuser Canada Ltd. Channel is on the south side of the river above the Allsbrook canyon and the TimberWest Forest Ltd. Channel is on the north side, downstream of the Morison Creek confluence.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Reduce sedimentation from land development in Morison Creek watershed (a major tributary) and improve public awareness of habitat stewardship needs.
- Ensure private land logging practices meet or exceed standards required by provincial regulations.
- Arrest sediment loading from headwaters and eroding streambanks. Existing suitable parr habitat in boulder-cascades are highly embedded with sand and small gravel.
- Restrict further water licenses unless supported by off-channel storage.
- Develop operational "rule curve" for the new Arrowsmith Lake dam/reservoir that will provide flow augmentation between the dam and regional district's water intake in Parksville.

STEELHEAD OBJECTIVES AND STRATEGIES

- Recover wild stocks to an estimated 400-500 adult returns capable of supporting a catch and release fishery for approximately 2,100 angler days per year over 15 km fishable water.
- Make the Englishman a steelhead index stream as part of the PSEF watershed initiative.

IDENTIFIED RECOVERY OPTIONS

- Install anchored LWD structures and build off-channel refuge alcoves on mainstem and add habitat complexing to Center Creek (a south fork tributary) - Gaboury 2002 recommended 73 sites at a total cost of approximately \$193K.
- Conduct a revetment program using re-vegetation techniques for eroding mainstem clay banks.
- Extend the existing Timber West side-channel by 2.5 km at a cost of \$200K - DFO-designed project delayed indefinitely due to development approval problems with the landowner.

NOTES: Pacific Salmon Endowment Fund watershed - recovery plan completed that covers all salmonids. Steelhead hatchery program discontinued after operation for about 15 years. Could evaluate organic nutrient enrichment potential, but the regional district's water intake is within Parksville city limits and below the areas where nutrients would need to be added.

Draft 20/08/02

Wild Stock Trend: **Relatively Stable at a Low Level**
 Wild Stock Status: **Extreme / Conservation Concern**
 Class: **Augmented** (VI Hatchery Program suspended in 1998 due to lack of wild brood stock)
 Recent Steelhead Escapements: 100 - 200 Winter Run
 Observed Mean Peak Fish/km 1998-2001: Nanaimo River: 4.5 WR, Haslam Cr. 0.9/km
 (Very difficult to enumerate – large watershed and poor river visibility conditions)
 Angling Regulations: Steelhead Seasonal Closure
 Mean annual effort: Long term 1968-1996: 4,142 / Recent 1997-2001: Closed
 Mean Annual catch: Long term 1968- 1996: 1,364 / Recent 1997-2001: Closed

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- approx 10,000 / 1300 adults (based on Tredger 1986 (low end - difficult to estimate because of lakes in system and currently degraded habitat)
- Conservation Concern Level @ 30% of estimated capacity is 390 adults.

Existing Habitat:

| | |
|--|-------|
| watershed area (km ²): | 820.9 |
| mean annual discharge (m ³ /s): | 39.7 |
| Summer Base Flow (%mad) | 12.2 |
| accessible length (km): | 93.7 |
| productivity: | low |

| Comments |
|--|
| Sediment problems, logging damage, low summer flows and seriously degraded habitats in Chase and Haslam Creek tributaries, major flow diversions to Harmac Pacific mill, municipal supply from existing reservoirs, low summer temperatures below uppermost reservoir - steelhead utilization expected to be low above lakes on mainstem. Alder in riparian zones precludes LWD. Baseflow alkalinity low at 15 mg/L and predicted capacity per steelhead size class is 140 g/Unit. Haslam Cr. 96.0 sq. km / MAD 4.38 cms |

HABITAT RESTORATION TO DATE

- Fisheries and Oceans attempted to improve summer Chinook passage at “Bore Hole” cascade circa 1995 but results inconclusive.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Provide adequate protection from expanding urban development.
- Ensure sustainable logging practices are followed on private lands.
- Encourage stewardship groups to assist in habitat protection.

STEELHEAD OBJECTIVES AND STRATEGIES

- Return wild stocks to greater than 500 adult returns capable of supporting a catch and release fishery over 5-km fishable water based on 4,100 angler days a year.
- Review Implementation of MELP's Nanaimo River Water Management Plan (1993) re conservation flow requirements.
- Continue seasonal closure until stock recovers appreciably. Continue to encourage steelhead conservation with Nanaimo First Nation.
- Examine feasibility of water flow and temperature improvement opportunities below reservoirs.
- Consider an LGB program as originally planned if results elsewhere are clearly supportive.
- Consider fish passage improvements at the "Bore Hole" and "White Rapids" in Nanaimo River canyon.

IDENTIFIED RECOVERY OPTIONS

- Gravel placement in lake outlets, well-anchored LWD complexing and refuge alcoves. (Gaboury 2002 recommended spawning gravel in mainstem below First Lake and 111 LWD sites in Haslam and Deadwood Creek for a total cost of approx. \$329,000.)
- Good organic nutrient enrichment possibilities - needs full consultation with community.

NOTES: Community Development hatchery in watershed was established in early 1980s.

Draft 20/08/02

Chemainus River

Watershed Map Code: 920303500

4th –5th Order

| | |
|-------------------------------|--|
| Wild Stock Trend: | Relatively Stable at a Low Level |
| Wild Stock Status: | Extreme / Conservation Concern for both summer and winter runs |
| Class: | Wild |
| Recent Steelhead Escapements: | 50-100 Winter Run, <50 Summer Run Observed Mean Peak Fish/km 1998-2001: 11.8 WR, n/a SR |
| Angling Regulations: | Steelhead Seasonal Closure |
| Mean annual effort: | Long term 1968-1996: 493 / Recent 1997-2001: CLOSED |
| Mean Annual catch: | Long term 1968- 1996: 148 / Recent 1997-2001: CLOSED |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4,200 smolts / 546 adults (based on Tredger 1986/Ptolemy 2002 (low end))
- Conservation Concern Level @ 30% of capacity is 164 adults.

Existing Habitat:

| | |
|--|------|
| watershed area (km ²): | 359 |
| mean annual discharge (m ³ /s): | 19.2 |
| Summer Base Flow (%mad) | 3.5 |
| accessible length (km): | 63.6 |
| productivity: | low |

| Comments |
|---|
| Extensive bedload movement in mainstem. Sediment problems, historic logging damage and potential for more impacts, low summer flows with urbanization and agricultural impacts on the lower river. Base flow alkalinity low at 5 mg/L and predicted capacity per steelhead size class is 80 g/Unit. |

HABITAT RESTORATION TO DATE

- Westholme side channel for salmon in lower river downstream of Highway 1 bridge..

HABITAT PROTECTION REQUIREMENTS

- Provide adequate protection from urban development and agricultural activities.
- Ensure good logging practices are followed on private lands.
- Work closely with provincial mine inspectors regarding new mining development applications.

STEELHEAD OBJECTIVES AND STRATEGIES

- Recover wild stocks to well within the Routine Management Zone capable of supporting a catch and release fishery over 5 km fishable water based on 500 angler days per year.
- Upgrade basic stock composition and habitat capability information.
- Engage private forest companies in significantly improved logging practices that are comparable to FPC standards and in a habitat restoration program over the next five years.
- Consider as a candidate for a future LGB program if stock does not recover and results from elsewhere are positive.

RECOVERY OPTIONS

- Install well-anchored LWD complexing and refuge alcoves - Gaboury 2002 recommended 52 LWD sites - total cost \$131,142
- Conduct annual stream nutrient enrichment (-severely phosphorous limited).

NOTES: The forest holdings in this watershed are all private land. Migration bottleneck exists in Copper Canyon - extensive habitat above but recruitment very weak. Juvenile sampling completed in 1998. Continue seasonal total closure until stock recovers.

Draft 20/08/02

Cowichan River

Watershed Map Code: 920257700

5th Order

Wild Stock Trend: **Relatively Stable at Moderate Abundance**
 Wild Stock Status: **Conservation Concern**
 (Any stocks from Cowichan Lake tribs such as Robertson River are likely extinct or in the ECC zone.)
 Class: **Augmented** (50,000 smolts, Cowichan WR)
 Current Steelhead Escapement: 500-800 Winter Run, H/W Ratio 1:4
 Observed Mean Peak Fish/km 1998 -2001: 3.6 WR (but unreliable from snorkel surveys)
 Angling Regulations: Steelhead Fishery - Catch and release of wild fish and hatchery retention with daily/annual quotas.
 Mean annual effort: Long term 1968-1996: 8,072 / Recent 1997-2000: 5,818
 2001/02 (+)
 Mean Annual catch: Long term 1968- 1996: 3,507 / Recent 1997-2000: 2,726

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 26,576 smolts / 3400 adults (based on Tredger 1986/Ptolemy 2002 (high end)
- Conservation Concern Level @ 30% of capacity is 1,020 adults.

Existing Habitat:

| | |
|--|-----------|
| watershed area (km ²): | 1226.8 |
| mean annual discharge (m ³ /s): | 55 |
| Summer Base Flow (%mad) | 15.7 |
| accessible length (km): | 33.7 |
| productivity: | Very high |

| Comments |
|--|
| Sediment problems - active slides, logging damage, periodic low summer flows, high temperatures and BOD impacts on lower river. Floodplain at Duncan and Lake Cowichan communities subject to flooding - major encroachment on flood plain - stream channelization impacts mainly chum salmon and rearing areas for other salmonids. Degraded habitat in tributaries above Cowichan Lake. Biomass 800-1000g/Unit at estimated steelhead carrying capacity. |

HABITAT RESTORATION TO DATE

- Seven DFO side channels constructed primarily for chum and coho salmon.
- Rule Curve for Norske Canada operation of the Lake Cowichan weir provides for improved conservation flows.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Provide adequate protection from urban expansion - especially on the flood plain.
- Ensure good logging practices on private land.
- Ensure flood protection works and other developments do not impact the lower river and estuary.
- Avoid more flow diversions unless storage is provided.

STEELHEAD OBJECTIVES AND STRATEGIES

- Increase wild stocks and maintain catch and release fishery over 25-km of fishable water.
- Review habitat productivity and current stock abundance in Cowichan Lake tributaries.
- Investigate potential stream restoration in areas of suitable gradients for steelhead.
- Work with DFO to minimize any impact on steelhead from early winter commercial chum fisheries.

IDENTIFIED RECOVERY OPTIONS

- Address sediment loadings from failing clay banks (eg. Stoltz Slide 27 km upstream) with an innovative revetment and stabilization program.

NOTES: Largely private forest lands. Vancouver Island Trout Hatchery at Duncan raises Cowichan steelhead on groundwater. Community hatchery involved in salmon production. Draft 20/08/02

Koksilah River

Watershed Map Code: 920257700 - 02300

4th Order

| | |
|-------------------------------|---|
| Wild Stock Trend | Relatively Stable at a low level |
| Wild Stock Status: | Conservation Concern |
| Class: | Wild |
| Recent Steelhead Escapements: | 100-200 Winter Run Observed Mean Peak Fish/km 1998 -2001: 5.1 WR |
| Angling Regulations: | Steelhead Seasonal Closure |
| Mean annual effort: | Long term 1968-1996: 597 / Recent 1997-2001: Closed since 99/01 |
| Mean Annual catch: | Long term 1968- 1996: 155 / Recent 1997-2001: Closed since 99/01 |

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 4000 smolts / 520 adults (based on Ptolemy 2002 SHA analysis)
- Conservation Concern Level @ 30% of habitat capacity is 156 adults

Existing Habitat:

| | |
|--|----------|
| watershed area (km ²): | 209 |
| mean annual discharge (m ³ /s): | 9.77 |
| Summer Base Flow (%mad) | 4 |
| accessible length (km): | 36.8 |
| productivity: | Moderate |

| Comments |
|---|
| Sediment problems, logging damage, low summer flows – particularly in the lower reach. Baseflow alkalinity moderate at 45 mg/L and predicted capacity per steelhead size class is 245 g/Unit. Most of the productive parr habitat exists in the headwaters above Burnt Bridge. |

HABITAT RESTORATION TO DATE:

- Marble Falls fishway by Fisheries and Oceans Canada

SPECIAL HABITAT PROTECTION REQUIREMENTS:

- Ensure good logging practices on private lands and properly deactivate unused roads
- Ensure flood protection works and development activities do not impact on lower river

STEELHEAD OBJECTIVES AND STRATEGIES

- Recover wild stocks to well within the Routine Management Zone capable of supporting a catch and release fishery over 5-km fishable water at long-term average of 600 angler days per annum.
- Provide more focus on this largely neglected system to address chronic problems arising out poor habitat protection on private forest lands and poaching.
- Conduct a complete biophysical assessment to document current habitat conditions and steelhead limiting factors.
- Develop a co-operative fisheries and habitat protection plan with the Cowichan First Nation for the Cowichan and lower Koksilah Rivers.
- Develop a full suite of restoration prescriptions using qualified consultants.

IDENTIFIED RECOVERY OPTIONS

- Reduce poaching
- Stream enrichment in upper reaches above Marble Falls

NOTES: Recovery prescriptions need to be developed - largely First Nation and private forestry lands. Limited public access. A community partnership involving both First Nation and other citizens could provide an important watchdog role and foster improved stewardship.

Draft 20/08/02

Wild Stock Trend
Wild Stock Status:
Class:

In Decline
Extreme Conservation Concern, (Expired?)
Hatchery (Proposed - Currently Wild)
(10,000 pre-smolts Cowichan WR could be diverted from Vancouver Island Trout Hatchery and reared on site, if practical)
Remnant Winter Run?
Observed Mean Peak Fish/km 1998 -2001: 3.6 WR

Current Steelhead Escapements:

Angling Regulations:
Mean annual effort:
Mean Annual catch:

Steelhead Seasonal Closure
Long term 1968-1996: 343 / Closed since 99/01
Long term 1968- 1996: 74 / Closed since 99/01

Estimated Steelhead Habitat Smolt Capacity & Returning Adults (assuming 13% marine survival):

- 750 smolts / 98 adults (based on actual smolt counts)
- Conservation Concern Level is approximately 30 adults.

Existing Habitat:

| | |
|--|---------------|
| watershed area (km ²): | 48.5 |
| mean annual discharge (m ³ /s): | 2.2 |
| Summer Base Flow (%mad) | 10 |
| accessible length (km): | 4 |
| productivity: | Moderate-High |

| Comments |
|--|
| Major water diversion to Sooke reservoir is inactive and only used as backup. Limited watershed available to steelhead, low historic flows in summer. BC Park development below the Island highway has impacted steelhead rearing habitat. Most of the productive parr habitat exists upstream of Highway 1. Baseflow alkalinity moderate at 29 mg/L and predicted capacity per steelhead size class is 196 g/Unit. Capacity may be enhanced by thousands of chum carcasses. Due to short survey window to count adults, recent counts may be poor indicators of stock status. Adults move in and out of stream with short-term high flows that pose difficulties for standard snorkel counts. |

HABITAT RESTORATION TO DATE

- Side- channel improvements undertaken.
- Rule Curve on dam operation provides for improved conservation flows in most years.

SPECIAL HABITAT PROTECTION REQUIREMENTS

- Avoid more flow diversions unless storage is increased.
- Maintain wetlands associated with Langford Lake to ensure sustained summer baseflows in a key tributary.
- Prevent any more encroachment in riparian zone.
- Complete LWD placements in Reach 1 below Finlayson Rd. bridge. LWD was removed by DFO in mid-1970s.

STEELHEAD OBJECTIVES AND STRATEGIES

- If stock is expired, convert to hatchery status - 10,000 Cowichan smolts could be final-reared and released at Goldstream to create an angling opportunity.
- Clearly establish stock status to determine appropriate recovery strategy using all available techniques.

NOTES: Long-standing Amalgamated Conservation Society community hatchery involved in coho and chum enhancement. High visitor use park north of Victoria. Juvenile electrofishing done in 2001.

Draft 20/08/02