

Appendix 13

Millard and Piercy Creeks Mapping and Inventory Project

Sensitive Habitat Inventory and Mapping (SHIM) Surveys

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For:

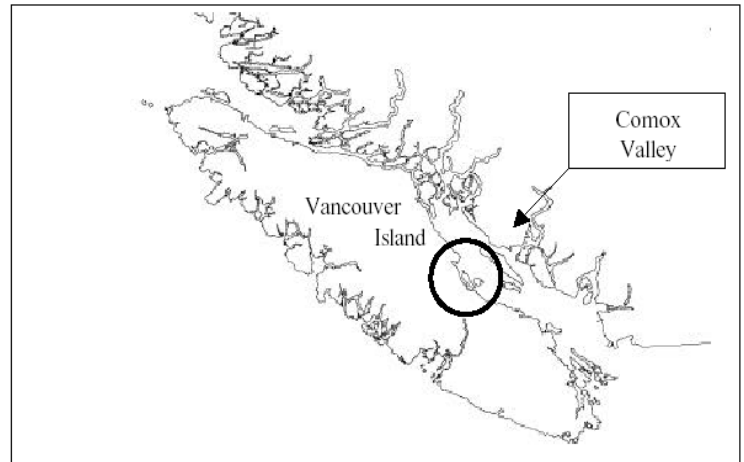
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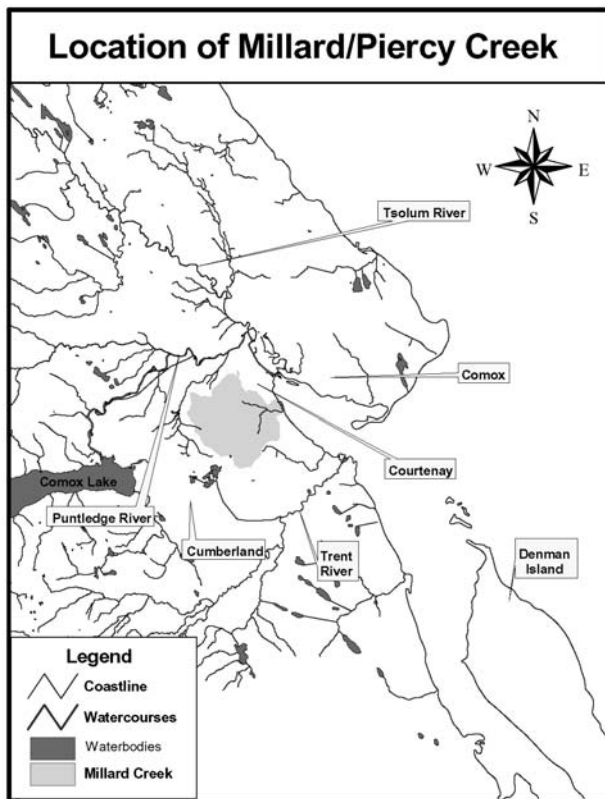
OVERVIEW

“Millard/Piercy Creek is located within the southern portion of the City of Courtenay, in the Comox Valley, extending into the Comox Strathcona Regional District. Millard Creek is a second order stream with one major tributary referred to as Piercy Creek” (V. Komori 98 USHP report). The main water source for Millard/Piercy Creek consists of three separate springs feeding three separate main tributaries. Two of the springs are in the vicinity of upper Minto road towards the intersection with Cumberland Road and the third is at the “Kiwanis” Hatchery /LaFarge site. Millard/Piercy Creek mainstem has consistent flows throughout the summer with the lowest flows being approximately 62% (98 USHP report) of wetted area.

Many landowners along the creek have historically used Millard/Piercy Creek for domestic and drinking water. Much of the creek runs through agricultural land, where it has been ditched to accommodate farm fields or property lines.



Vancouver Island Map showing location of Comox Valley



A bedrock cascade at Lockwell road (“The Lockwell Falls”) has traditionally been a barrier to the upstream migration of anadromous salmonids. The Kiwanis Club in conjunction with the Department of Fisheries and Oceans have an ongoing program of outplanting (the depositing of hatchery-raised fish into the watershed) coho juveniles into the upper watershed of Millard (beyond the cascade). Its spring fed headwaters would appear to provide superior summer rearing capabilities due to the potential for water temperatures within necessary parameters and consistent flows. We could identify no anadromous spawning gravel above the cascade barrier.

A very complex beaver dammed/ wetland exists along and under the power lines from the vicinity of the Bartosh property some 1.2 Km towards the NW to approximately 250 meters short of Cumberland Rd. (See digitized ortho photo) Juvenile salmonids have good passage into this wetland and it appears to have sensitive wetland

MILLARD CREEK SEGMENT DESCRIPTIONS

Millard Creek Mainstem

For the purposes of the survey we considered Millard Mainstem to be the waterbody that contained the most flow. We chose the most southerly of the streams as being the mainstem as it contained about 60% of the flow at the time of the survey. The Millard mainstem originates from two spring fed ponds on the Gotmann property in the vicinity of Minto Rd. and Cumberland Rd. The mainstem is fed by flow from Trib 208 and Happy Creek. Piercy Creek enters just SE of the City of Courtenay.

Land Use

Land use in the upper and mid reaches consists mostly of active agricultural/ dormant agricultural and private forest land. Land uses in the lower reaches, consists of agricultural and park land. Purely residential land constitutes a very small percentage. Much of the upper reaches of Millard Creek tributaries have been historically ditched to accommodate property lines or farm fields.

Habitat Issues

Millard Creek has very high fisheries value because it is spring fed and has year-round flows. Many streams in the Comox Valley tend to dry up in the heat of the summer and as such have limited values in rearing coho, steelhead and trout through the summer stages of their lifecycles. The watershed inventory technicians on this project felt that there may be many opportunities to increase salmonid production in Millard Creek by focusing on its spawning capabilities and the quality of its rearing habitat.

As there has been incomplete salmonid capacity studies done on the Millard Piercy Watershed one of the habitat issues that needs to be addressed is the current level of outplanting done each year by DFO. A complete and thorough capacity study needs to be undertaken, (particularly as these streams are rehabilitated and made more friendly for natural spawning), to determine the level of outplanting of coho fry that should occur. It would seem prudent to limit the outplanted numbers as naturally spawned fish increase.

Features of Interest and Rehabilitation/Protection Opportunities for Millard

Mainstem and Tributaries *The "TP" code that appears as identifiers on the tributaries are a part of the methodology and represent Tributary Points. The methodology dictates the tributaries be surveyed as they are encountered and that is how this information is presented. Significant tributaries have been placed in a box. Other tributaries that have not been placed in a box are small or insignificant. The features in between are in order up the mainstem and represent the features along Millard Creek. The accompanying photographs are displayed in the same order.*

F14 - Pilings

Old instream bridge pilings- may serve as useful anchors for large woody debris placement site.

F33 - Side Channel

Historic side channel, which is presently closed off to the main flow of Millard. This site could increase the amount of coho rearing habitat if it were opened up and complexed.

F53 - Flood Channel

This site could be modified to increase spawning values, but further assessment would be recommended

**F65 – Side Channel (TP65)
Locally known as “The Rearing Channel”**

SEGMENT DESCRIPTION

The landowners initiated, in partnership with DFO, the creation of this Rearing Channel so the level of landowner involvement is high and ongoing. Two of the three owners are on the executive of the MPWS.

Water is diverted from the mainstem of Millard Creek into a small channel, through a pond with a debris fence, through a series of enhanced pool/riffles, through a sinuous channel and back into Millard Creek some 20 meters below the confluence of Millard and Piercy Creeks. (pt#65)

F 11 – Erosion

Active bank erosion at 125m. The bank at this location is about 3m high and on a slope that encourages this erosion. Thirteen meters of bank material along the left bank has sloughed into the creek with large clumps of dirt and vegetation laying in the creek.

F 27,28,29 – Culvert/pools

This is culvert under a property access road at 364 m. Enhanced pools both upstream and down.

F 48,49,50 – Culvert/pools

Also a culvert with upstream and downstream pools at 583 m.

F 52 – Pool

A dug (enhanced) pool at 604 m. 10m long by 5.2m wide, depth at time of survey was .5m.

F 54 – Pool

Larger pool also dug with several nooks and crannies dug out at 620 m. (23m long by 10.5m wide with a depth of .8m.)

F64,65,66 – Fishway/culvert

This is a series of pool/riffles created with the use of wooden beams. A fishway has been notched into these wooden beams. This is followed by a culvert through to the entry pond of this created channel.

CONCLUSION

The upper third of this channel with its enhancements serves as an excellent rearing opportunity. The lower portion of the channel however suffers from deep sedimentation and unstable banks causing erosion.

RECOMMENDATIONS

Suggest ongoing monitoring of the lower portion to ensure fish passage into the deeper and more effective rearing opportunities in the upper portion. A discussion with the landowners has raised the problem of silting and filling of the diversion channel at the top end. Suggest the creation of a pond in the mainstem that has to fill before spilling water into this channel.

F66 - Piercy Creek Confluence (TP66)

See Piercy Creek SHIM Report, *Features of Interest, Enhancement, Restoration & Protection*

F76 – Beaver dam

At 1668 an old beaver dam is forming pooling up to approx. 2150 meters. This dam is about a meter thick instream and 9m wide by 2m high.

F87 – Erosion

Surface run –off over this deactivated culvert site needs to be diverted upstream to minimize erodable soils entering Millard Creek.

F88 - Riparian Planting

These open farm fields which had previously had poor riparian cover, have recently been re-planted

F87 - Off Channel Pond

This off-channel / water intake pond dug and used for irrigation for the River Meadow Farm nursery has been in-filled with sediment over time. Digging it out would increase rearing habitat and its ability to work as a sediment pond.

F102 - Agricultural ditching (TP102, TP102_TP8)

Locally known as The Southern Ditches on River Meadow Farm

SEGMENT DESCRIPTION

River Meadows ditching

These ditches are around the central and Southern edges of River Meadows, a tree farm and nursery providing materials for the landscaping trade in the Comox Valley. The landowner, Dave Samson, maintains a high level of contact with the MPWS and is considered to be one of the key players in the watershed planning process being undertaken over the next year. During the survey this crew had the opportunity of talking at length with Dave Samson. He has expressed his concern that his water needs will expand as his business grows and is not convinced that he is going to be able to go ahead with such plans as he has not observed a credible planning process in his dealings with the DFO to date. Mr. Samson remains actively involved with the planning process.

TP102

This ditch collects run-off from the eastern portion of the agricultural fields mentioned above and returns water through an old and small cement culvert under a decommissioned access road at point # 102 of Millard Creek.

TP102_TP8

This ditch joins the above ditch at point #8 which collects water from the eastern and southern sections of these fields as well as run-off from the forested slopes above the end of the fields.

CONCLUSION

There is no anecdotal information supporting the migration of adult salmonids into these ditches. There have been observations however of fry and juveniles in them. The entry point into TP102 is severely constricted due to the size and flows of the cement culvert. These are basically featureless ditches that do not appear to be good habitat other than in peak flow times. Fry entering these ditches are likely trapped as water recedes and are lost. Further, as these are drainage ditches accommodating an agricultural operation they are not conducive to rehabilitation or enhancement.

RECOMMENDATION

Suggest screening these ditches off from the migration of juvenile salmonids with the cooperation of the property owner.

F107 - Spawning Gravel

Good quality anadromous sized spawning gravel begins here and extends through to the Porter, McCabe fence line.

F110 - Agricultural ditching

This is a ditch along the southern edge of an adjacent field which collects water from the forested slope to the east and run-off from the field itself. The water is returned to Millard Creek at point #110 of Millard Creek. **(See recommendation above re screening this ditch off from migrating fry.)**

F140 - Erosion

At up stream end of culvert, road bed material is slumping and inputting fines into Millard.

F148 - Barrier

This bedrock cascade is suspected to be an absolute barrier to the upstream migration of salmonids. The cascade is approximately 4m high over a 6.5m horizontal length at a 20 degree gradient.

F153 - Potential Erosion

The log cribbing that was constructed to support the bridge that has been decommissioned at this location may eventually fail and permit bank erosion. This cribbing consists of several large logs stacked up to a height of approximately 10m. There is some evidence of erosion beginning at this time.

F166 - Barrier/Tributary (TP166)

The confluence to Happy Creek appears to be a barrier to the upstream migration of salmonids.

The out-fall plunges approximately 4m onto boulder substrate with no plunge pool. A series of step pools or a fish ladder could easily solve this problem.

F166 - Tributary (TP166)
Locally known as "Happy Creek"
SEGMENT DESCRIPTION

The source of this creek is the spring at the "Kiwanis" hatchery. After running through the hatchery this creek passes through the Wyman property a large piece of private undeveloped land which contains the beaver dam/wetland complex area under the Hydro cut. Happy Creek then makes its way through agricultural land (Tobacca Farm) and then through fairly large parcels of residential/hobby farm land.

The general health of this tributary suffers from the typical sediments associated with the large pools created by the activity of beavers over the years. A distinct lack of riparian cover exists through the farm land, but instream cover is well established. Fry were observed at this location during the USHP survey conducted in August 98. Although the stream is ditch like over its entire length some meandering is occurring and apart from the barrier falls at the confluence and the beaver dams themselves there are no barriers.

F2 - Confluence of Happy Creek

At 6m from the confluence of Millard and Happy Creeks there is a sharp little barrier falls 6 meters long and 3 meters wide. At the time of this survey water was flowing heavily. A young second growth forest is providing excellent cover.

F11 - Domestic water supply

There is a water intake pipe 83 m from the confluence that runs to an adjacent property. The assumption is that this is a domestic water supply.

F18,20 - Culvert, footbridge

At around the 160 meter mark the grade has flattened considerably as the creek opens out of the young brush into an agricultural/residence with a culvert under an access road and is crossed by a substantial footbridge.

F22 - Wetland

A flat wetland, 120*50 meters. A well-defined channel with some depth meanders slightly through this wetland.

F30,31 - Pool and agricultural ditching

After a bit of slope and brush the creek flattens again into a low-lying corner of three properties. Here there is quite a large pooling of water. A ditch on the right bank at 464 meters collects water into this flooded area from adjacent fields

F34 37 - Bridge/culvert and diversion

The creek joins the "Tobacca diversion" at 704 meters after crossing the farm. There is one non-obstructive bridge/culvert for vehicle access. The creek is well fenced off from livestock. Fry were observed in this portion of the creek during a survey conducted in Aug 98. They were not trapped for species ID.

F41 - Decaying bridge/culvert

At 870 meters there is an old unused bridge/culvert. This should be monitored for collapse.

F51 – Tributary (TP166_TP51)

This is the first of many inflows, old semi-wet channels and wet spongy ground. The riparian area is struggling to survive. Profuse rotting vegetation and 5 to 15 cm deep sediment in the creek bed.

TP166_TP51_TP12 AND TP166_TP51_TP15 Are the more pronounced of the many braided channels in this area.

F62 - Beaver dam/wetland

An extensive older beaver dam(s) hold water back to flood a large area (291,536 sq m) under the hydro cut. See digitized ortho photo.

Tributary 166_2 (after the wetland)

F10,11,13,14- Culverts and outflow pipes

These are the culverts under the access roads to and from the hatchery and three outflow pipes from the hatchery. Two are immediately adjacent to the hatchery buildings and the third pipe is about 20 meters downstream.

F16,17,18 - Burm/dam, pond and overflow pipe

These are the Lafarge burm/dam the associated pond behind and the outflow/overflow pipe in the pond.

F19 - Plastic piping from spring to hatchery

Two three inch PVC type hoses run water directly from the spring through the Lafarge pond and into the hatchery.

CONCLUSION

This creek runs year-round with water first out of the "Kiwanis" hatchery and Lafarge settling ponds through a swamp where debris from these operations would be filtered out. A thorough study of this swamp and beaver dam complex would classify and identify this extensive wetland and determine if fry are moving freely through it. There is anecdotal information that supports the existence of beavers at the south end towards the Bartosh property.

Once the creek has found its way out of the many braids on the downstream side of the beaver dam it has some real potential for the development of habitat. There is very little spawning opportunity though as the majority of substrate is comprised of small gravel and fines. The only obstruction is the falls at the confluence. The "Lockwell Falls" that obstruct salmon however, are downstream from the confluence with Millard.

RECOMMENDATIONS

Recommend doing extensive trapping of fish in the beaver ponds to determine species. If Coho are found some study should be undertaken to discover how they are getting there and how best to utilize the habitat. The Lafarge Cement operation site has a history of leeching some pollutants into the aquifer. Suggest some form of testing for these pollutants and determining if there is a significant problem. As mentioned above the old bridge/culvert at the SE corner of H. Tobbaca's property be monitored for collapse.

F172 - Barrier

These twin culverts have marginal passage for adults and poor or no passage for juveniles. Passage could be created, by building up the downstream end to create a plunge pool.

F178 - Barrier

These dual culverts under a residential driveway pose a migration barrier for juveniles and adults.

The out-fall plunges onto boulder substrate.

F180 - Sediment Filled Pond

This historic pond, over time, has been filled with 2m of sediment. Digging it out would increase rearing habitat volume and increase its ability to work as a settling pond to settle out fines and protect downstream spawning gravel.

F185 - Instream concrete well rings

These are cement rings approximately 1m in diameter that are standard well rings. During the duration of the survey approximately five landowners were identified as using Millard Creek for drinking and/ or domestic water.

F197 - Blocked culvert

These twin culverts provide good fish passage but one is presently blocked with debris.

F202 – Ditch

Ditch is grown-in with grass and drains active farm fields. Landowner says shallow pond at confluence with Millard was intended to enhance rearing/resting opportunities for fish, but its' effectiveness is probably minimal as it is infilling with sediments and grass – to be effective, the pond would require re-excavation/deepening and a buffer of riparian vegetation.

F208 - Tributary (TP208 Millard Creek) No locally known name.

SEGMENT DESCRIPTION

Major tributary of Millard Creek that contributes approximately 40 % of the total flow in the upper watershed. It commences just south of the dairy Barns on Roy Creek Farm.

X8 - Lack of Riparian

Creek runs through a private landowners front property, "landscaped" and lacks sufficient riparian cover for 42 m.

F14 - Juvenile Barrier

This log and rock weir may block U/S migration of juveniles.

F16 - Pond

Fenced on left bank with some shrub cover (alders, cedars, and reeds); open lawn on right bank. No cover for approximately 25m on the right bank. The landowner, Graeme Wright, says there are many cutthroat, and there is probably outplanted coho rearing in this pond. Mr. Wright has expressed interest in creating a second pond. This potential initiative may deserve follow-up with the MPWS.

F19 - Ditch

This is the top end of an unmapped ditch line that runs behind the landowner's property and connects to the Fraser road ditch line. This ditch line would be considered an overflow ditch for TP208.

F22 - Pond

This pond towards the top end of the farm fields is connected to TP208. It has unknown fish use and has very poor riparian cover. Suspected watering usage by livestock (sheep in field at time of survey).

X36 - Spawning Gravel

Intermittent resident size spawning gravel-begins here.

F40 - Erosion

Recently reworked road has created sediment input to stream; photo looking upstream at eroding bank and culvert. Intermittent anadromous and resident spawning gravel in this section.

F46 - Tributary (TP208_TP46)

This unmapped waterbody begins at the Bartosh property fence line. It appears to be historically ditched in the lower section.. It has a separate mapping card associated with it. It extends to the Hydro line right of way where it contributes to draining a wetland, beaver dam complexed area.

F54 - Water Withdrawal

Four inch big-o water withdrawal line gravity-feeds flow from TP208_TP46 into a 20 by 20m pond on the bottom corner of the Bartosh property. The outflow of the pond returns to TP208. Landowner says the pond is 6m deep and contains cutthroat.

F57 - Tributary (TP208_TP57)

This unmapped waterbody begins just upstream of the Bartosh driveway along the Fence line. This tributary has a separate mapping card associated with it. The tributary contributes to draining a complex wetland beaver dam area upstream of the power line right of way.

F63 – Tributary (TP208_TP63)

No known local name

This tributary on the right bank was contributing about 30%- 40% of the flow to TP208 in the upper watershed. TP63 drains inactive/ grown over farm fields and a wet area just below Minto Road. It passes u/s through a Minto culvert crossing and originates a very short distance beyond that from a ditch line on the Minchin property. This ditch line is old and filled in with sediments and carries very little water as the historic drainage has been modified (more closely associated with the mainstem of Millard).

F65 - Side Channel

This side channel on the Calnan property carries approximately 20% of the flow of TP208 and extends 171m upstream to eventually reconnect with TP208. At the upper end connection, the water flows subsurface for 8m under root masses and woody debris.

At a location approximately 85m up from the confluence, there exists a wide floodplain area that presently has standing water. This would make a great location to dig large juvenile rearing ponds, considering the year-round spring -fed flow.

F87 - Rearing Ponds

A series of 5 manmade pools beginning 8m from left bank of TP208. The "Ross property" pools constructed in 1998 under DFO guidance (Bryan Allen) for juvenile salmonid outplanting. Upper pool is fed by spring water. See separate diagram and UTM coordinates for pool dimensions.

F93 - Juvenile Barrier

Subsurface flow under forest floor, could obstruct juvenile movement under most flow conditions.

Two juvenile coho were found landlocked and it is unclear as to whether they were stranded or deposited by a predator

F96 - Juvenile rearing ponds

The first pond begins 8m upstream of this location. Second pond is separated by a culvert and is fed by a spring. There are three more ponds attached at this location and two more ponds exist farther upstream. Chip Ross rears an approximate 30,000 coho juveniles in his seven ponds, in co-operation with D.F.O.(Bryan Allen) and Kinsmen Club. (see diagram for dimensions)

CONCLUSION

This portion of Millard offers excellent opportunities for rearing habitat, but does not have much to offer in terms of spawning as the "Lockwell Falls" are a barrier to migrating adults. As juveniles are being outplanted in this section of the creek effort needs to be made to identify the best rearing habitat restorations and work with the stewards to make them happen. Some trapping could identify for species and may serve to establish whether it is only hatchery coho in this portion of the creek.

F219 - Barrier Culverts

These triple culverts may be a barrier to the upstream migration of juveniles.

F223 - Livestock Access

This small, creek-side, livestock watering hole could use armoring and riparian planting.

F256 - Barrier

This old road/ railway grade creates a small 1.1m falls with a boulder out-fall. Possible barrier to adults, and an absolute barrier to juveniles.

F288 - Manure Contamination

A short ditch drains water from a dairy barn area and manure pile storage area. This ditch may input manure effluent into Millard during rain events.

F296 - Springs

A spring flows out of two big-o pipes, at this proximity.

- Horses have access to unconsolidated water which flows over grass to the creek.
- This could be a potential location for juvenile rearing ponds.

F310 - Potential Salmonid Rearing

These two ponds on the Gotmann property would make an ideal location for juvenile salmonid rearing. They are presently in-active and were previously used to raise trout on a semi-commercial basis.

F460 - Potential Pond Development

This area of significant groundwater upwelling is in the vicinity of the Minchin property at the headwaters of a newly dug ditch upstream of Minto Road would be an ideal site to develop ponds for juvenile rearing.

CONCLUSIONS

Millard Main

The stream length below the bedrock cascade barrier is the area that could benefit from intensive restoration work, as this area will naturally recruit wild salmon returns without the ongoing Human intervention.

The stream length above the barrier could benefit from rearing habitat restoration but is presently dependent on outplanting of juveniles on an ongoing basis. If the barrier were removed, juveniles from the lower reaches could access habitats. Of course, spawners would then access the upper reaches as well and there has been no anadromous spawning gravel identified in the upper portion of Millard Creek.

The creek below the "Lockwell Falls" generally suffers from a lack of pools and general diversity. The riparian area consists of a mostly second growth mature forest. Left to its own devices it is now slowly beginning to contribute woody debris into the creek. Left untouched the creek may begin to model a natural/ old growth type water course with abundant diversity (rearing pools and spawning habitat in pool tail-outs) in another several generations. Jump-starting the process, by strategically planting large wood, may increase habitat in the short term.

PRIORITY ISSUES

1. HIGHWAY CONSTRUCTION

The construction of the new highway south connector creates a possibility that some draining of the Happy Creek wetland along and under the Hydro cut could occur. The construction plans call for a deep ditch to be dug that could lower the aquifer in the sensitive upper watershed of Millard Creek.

Recommendations:

- ◆ Research and communication with Highways hydrologist and designers to prevent damage and determine construction safeguards are in place to protect this sensitive area
- ◆ Review designs for habitat mitigation as it appears that habitat will be lost.
- ◆ Obtain all wildlife surveys and/or studies done to date in order to assess the total wildlife impact of the proposed construction.

2. OUTPLANTING OF HATCHERY FISH

There is some concern that the current levels of outplanting may be negatively impacting naturally spawned juveniles in lower reaches.

Recommendations:

- ◆ Research and confirm 1999 levels of outplanting by DFO.
- ◆ Complete USHP survey of system to determine fry capacities. Measure relative population densities and make appropriate comparisons. Determine levels of outplanting according to this research.
- ◆ Research numbers of smolts leaving the system and measure hatchery vs. natural subsets.
- ◆ Develop ongoing program of measuring escapement numbers by species.

3. FRY SALVAGE

Due to low flows in the summer months, portions of the streams dry up leaving pockets of water that can contain trapped fry. These fry are lost as the system continues to go dry.

Recommendations:

- ◆ Develop a fry salvage strategy and organize volunteer teams.
- ◆ Screen off agricultural ditches, where appropriate, to restrict the passage of fry.

4. WATER FLOW

Portions of the stream have low flows in the dry season. There is also some escapement of spring waters that are bypassing portions of the system.

Recommendations:

- ◆ Develop low flow strategy.
- ◆ Design and build water retention ponds that would double as habitat.
- ◆ Remove filled in sediments and substrates where water may be flowing subsurface.

- ◆ Reroute year-round flows that are escaping portions of the system by way of ditching back into more productive portions of the creek.

5. INSTREAM RESTORATIONS

Many restorations are suggested in the body of this report. All are significant and doable with the appropriate resources (see features map). With the guidance of the MPWS only the following recommendations are being made at this time.

Recommendations:

- ◆ If population and capacity studies determine that capacities are minimal, then the digging out of infilled ponds and the development of new ponds in the upper reaches becomes a priority.
- ◆ From the mouth of Millard Creek to the confluence at Piercy Creek a distinct lack of complexing exists. LWD placement, pool and riffle construction, and off-channel development is recommended.
- ◆ Monitor the lower end of the rearing channel for sedimentation and develop a sediment control at the top end to ensure maximum use of the rearing channel.

6. WATER QUALITY

Water quality studies are ongoing in the system.

Recommendations:

- ◆ Increase number of stations, number of samples per station, and prioritize locations.
- ◆ Increase parameters of test site at Lafarge Hatchery to industrial standard because of concerns regarding past Lafarge activities and the subsequent leeching from the sediment ponds.

7. SEDIMENTATION

Although it appears that this system is fairly stable, historic sediments have clogged portions of the system. Also, the overburden consists of fine topsoils throughout the system and these fines are naturally entering the watershed.

Recommendations:

- ◆ Locate and map the most profoundly effected areas of the watershed (primarily in the upper tributaries and the rearing channel) and monitor for a) infilled habitat and b) ongoing sedimentation problem areas.
- ◆ Perform bank stabilization strategies at portions of the system identified as benefiting from such actions.

8. SENSITIVE AREA PROTECTION

Recommendations:

- ◆ Have new areas mapped during this survey included in the Sensitive Ecosystem Inventory.
- ◆ Contact landowners that own these wetlands with information about their sensitive nature and negotiate a protection strategy.

- ◆ Continue to protect these areas from encroaching development in ways that are innovative. For example, the wetland West of Burgess Road is slated for development. Development designs could include a natural watercourse with enhanced habitat that becomes a significant tributary of Piercy Creek without compromising the development potential. In fact this concept could improve the saleability and value of the development by being both environmentally sound and extremely attractive.
- ◆ Create and develop ongoing educative programs and media releases about sensitive areas and their value.

9. STAKEHOLDER COOPERATION

The stakeholders would include landowners, Federal, Provincial, Regional and Municipal Government, the MPWS and other groups and individuals.

Recommendations:

- ◆ Develop and have included into the Official Community Plan a watershed management plan that is effective for both protection and development of habitat and assists development proceed without allowing a net loss of habitat.
- ◆ Purchase easements and/or develop regulation that ensures landowners are compensated and required to provide fish and wildlife corridors across their properties.
- ◆ Develop legislation that describes restoration and mitigation procedures and provides a funding base to assist landowners and developers enhance watercourses during and following construction.
- ◆ Develop a "Stewardship Centre" that promotes the principals of stewardship and is able to provide up to date information on techniques, assistance in terms of both funding and volunteer labour and serves as a "round table" to discuss solutions.
- ◆ Develop a strategy to involve landowners in the active stewardship of watercourses on their properties.

Piercy Creek SHIM Report

Report Prepared by: Jack Minard and Leslie Taylor, Comox Valley Project Watershed Society

Date of Report: March 15 1999

Date of Survey: November 09 1998 through March 01 1999

Background

The information presented in this report was gathered during the 1998/99 field season of Project Watershed's Watershed Mapping and Inventory Project sponsored by the Dept. of Fisheries and Oceans Habitat Restoration and Salmon Enhancement Program, Pacific Salmon Foundation, and Human Resources Development Canada.

Purpose of Survey

The streams inventoried were chosen because of a need to collect information for the following purposes:

- updates to the Regional District of Comox Strathcona's Sensitive Habitats Atlas
- initiation of, or additions to, a set of "Streamkeepers Data" for the watershed
- determining rehabilitation, restoration and protection opportunities for the watershed

Methods

The methodology used for this mapping/inventory project was *"Training Procedures for Urban Stream Mapping"*, revised August 98 by Department of Fisheries and Oceans, Ministry of Environment, Lands and Parks, Langley Environmental Partners Society, and Community Fisheries Development Center.

Survey Summary

Stream Gazette Name: *Piercy Creek*

Watershed Code: 920-553200-94100-33000-3840-0000-000-000-000-000-000

Map locations: 92FO65-2-4 92FO65-4-2 92FO66-3-1

Start Date of Survey: Nov 09 98 **End Date of Survey:** Mar 01 99

Stream Length Surveyed: 28125m

List of Accompanying Documents: maps with new line work, map with prioritized features, photos.

Overview

Piercy Creek is a tributary of Millard Creek however, because of its complexity, it is receiving a separate report (see Millard summary F point #66).

"The Piercy Creek basin has been altered by urban development by the City of Courtenay that extends into a significant portion of the watershed as well as a small industrial park (Cousins Rd.), several single industrial businesses and 2 commercial dairy farms". (V.Komori 98 USHP report). There is a definite ridge of higher land that separates this watershed from the NW and the neighboring Morrison Creek. Run-off is directed by way of this slope into the five branches that form the upper portion of Piercy Creek. It is this run-off that accounts for much of the water associated with this system, particularly during the rainy season. There is anecdotal evidence that snow pack melts have little effect on Piercy Creek and this would seem to make

sense due to the ridge of higher ground mentioned. The Vancouver Island Inland Highway will be built along this ridge.

During the dry spell of August 98 large portions of Piercy Creek were dry, but long time landowners who live on the creek claim it was the first time in approximately fifty years that the creek actually dried up. Normally the water levels drop significantly during the summer months, but there are well-identified springs and others, more ephemeral, identified during this survey that provide year-round water. One of the most significant of these has found its way permanently into the ditch running down Cumberland Rd. and is bypassing entirely much of the upper portion of the system.

This water, currently running down Cumberland Rd., is, in effect, the mainstem of Piercy Creek in that the flow is consistent year round. The discussion as to which branch is the mainstem would have to include this water as well as the portion running through the Clifford property and the portion flowing through Knopp's Farm. Although there is some anecdotal information that suggests there is year-round flow through Knopp's and into the new culvert on Marsden Rd. the flow is insignificant compared to that on Cumberland Rd. The water running through Clifford's is run-off and the water running through McKay's goes dry by mid-June. In order of their flows starting with the lowest flow the branches are as follows: Tp66_Tp174(Copperfeild Trib), Tp66_Tp216(Clifford's), Tp66_Tp63_Tp21(Trib 6 from ditching between Baird and Lanyon Rds.) and Tp66_Tp74(Trib 7 from Ethier's pond) have similar flows and Tp66_Tp63_Tp21_Tp87(Upper Trib 6 Tributary) has the most and is the most consistent. This highest flow is currently entering "Trib 6" at Cumberland Rd. In terms of flow, Trib 6 is the most significant. The portion mapped as the mainstem (Tp66 from the headwater wetland above Lanyon Rd. and through Knopp's Farm) would be second only to Trib 6.

The watercourses of Piercy Creek are dug ditches or watercourses that have formed along fence lines or old roadways. In some portions diversions that have been created to control water have been loosed to find their own way such as the water crossing the Hydro cut in several locations. There are very few natural creekbeds although over time, a somewhat natural substrate has been established in places and some meandering is occurring.

"Piercy Creek originates as springs at the base of the upland gravel deposits and flow through a substratum of unconsolidated gravels and glacial till that is characteristic to the Eastern Vancouver Island Alluvial Plain". (V.Komori 98 USHP report) These springs emanate from a seep line created along the edge of the industrial fill that begins at Cumberland Rd. and continues into the headwater wetland above Lanyon Rd.. There are springs on the Ethier property as well. A portion of the water entering Piercy Creek comes from Happy Creek (see Millard Summary F #166) by way of the "Tobacca Diversion"(Tp66_Tp16).

Landowner awareness has been excellent throughout this survey thanks in large part to the ongoing efforts of the Millard/ Piercy Watershed Stewards (MPWS) who handled most of the landowner contact. The vast majority of landowners encountered by this survey crew were cooperative and friendly with only one notable exception. Jack Clifford on Marsden Road has repeatedly refused us permission to map on his property. There has been an ongoing conflict between Highways and Clifford and after many discussions with him his issue appears to be that highways caused the water to flow on his property and until highways purchases an easement from him he will remain uncooperative. There are two portions of data that are

missing due to this conflict. These include a portion of the mainstem of Piercy and its northernmost tributary (Copperfeild Trib).

The most significant issues along Piercy Creek are the lack of spawning opportunity, the lack of complexing and the lack of access for fish into the headwaters. We identified only four small stretches of spawning gravel and eyewitness reports of spawning activity during the 1998 spawn indicate that all of these were used by coho and chum in fairly good numbers compared to the last few years. Of great interest is the utilization of areas outside the normal spawning parameters such as ditches and small pockets of barely spawnable ground with more than ideal grade and less than ideal substrate. This would indicate that a priority for restorations on this system should start with consideration of spawning ground development and the appropriate complexing to support and encourage this aspect of fish needs. The second priority would include the barriers to upstream migration of juveniles. Inconsistent flows with typical urban run-off effects and a lack of "holding" would round out the more serious of the problems in this system.

SEGMENT DESCRIPTIONS

Piercy Mainstem

Land Use

At the confluence of Piercy and Millard mainstems the creek is moving through a relatively natural strip of mixed and broadleaf second growth forest. By chainage 161m the agricultural aspect of the lower reaches is beginning to be felt although a strip of forest is still offering canopy. There are some residences close to the creek along these lower reaches. An industrial park on the left bank begins at approximately 1550m and maintains a negative impact on Piercy Creek through to chainage 1969m. At this point the creek begins its way through residential areas mixed with some agricultural use (more the backyard horse field than crops or large-scale operations) until 3130m. Piercy Creek then travels through a stretch of undeveloped land until it emerges out onto the old Comox Logging Rd. at 11050m. From this point, again agricultural and residential land use is prevalent to the headwater wetland.

Habitat Issues

Piercy Creek is an example of a severely degraded urban stream. The entire system has been modified and channelized and as such the habitat provided is minimal. Critical overwintering habitat is subject to run-off effects that offer very few quiet areas for fish to rest and hide. Year-round habitat is subject to drying due to the effects of the lack of complex pool /riffle structure and natural meander. Lack of pool habitat, lack of instream cover and inadequate seasonal waterflow all contribute to the poor nature of this system. On a more positive note however it appears that salmonids are returning to Piercy Creek each year and the system has great potential. Given careful evaluation of solving some of the fundamental problems caused by unplanned alteration of the watershed could turn this creek into a successful producer of salmonids.

Features of Interest and Rehabilitation/Protection Opportunities for Piercy Mainstem and Tributaries *The "TP" code that appears as identifiers on the tributaries are a part of the methodology and represent Tributary Points. The methodology dictates that the tributaries are surveyed as they are encountered and that is how this information is presented. Significant tributaries have been placed in a box. Other tributaries that have not been placed in a box are small or insignificant. The features in between are in order up the mainstem and represent the features along Piercy Creek. The accompanying photographs are displayed in the same order.*

Piercy Mainstem (TP66) of Millard Creek

F3 – Erosion

At 25m a 10m length of the left bank is actively eroding. This is normal bank erosion and is not a concern at this time.

F16 – Tributary "Tobacco Diversion"(Tp66_Tp16) Locally known as Trib 1 or "The Tobacco Diversion".

SEGMENT DESCRIPTION

Approximately 40% of the water from Happy Creek is diverted into this tributary. This water then travels downstream through the Tobacco farm, by two residences, across Lockwell road and then begins its decent to the Comox Logging Road (CLR). The creek is channeled through a culvert with a slope of 5 degrees. And then makes its way to the NW corner of River Meadow Farm (RMF). At this corner the creek escapes its banks and floods a large area. The majority of the water from this diversion finds its way through several inflows into the ditch running along the northern edge of RMF. The rest of the water that escapes this tributary makes its way into Tp66_Tp43.

The ditch along RMF lacks riparian cover and is in need of complexing with LWD and boulder placements. As this tributary is being utilized by migrating adults, and has been spawned in by coho and chum, enhancements and restorations are badly needed. This ditch then re-enters Piercy after traveling through a pond, more ditching and a long culvert.

F6 – Culvert

This is a fish friendly culvert with a slope of .5 and a diameter of .8. The area leading up to this culvert from the mouth of this tributary is in need of some riparian planting.

F8&9 – Pond and water level control dam

This is a pond created as an enhancement for the protection of salmonids by the owners of RMF. 55m by 25m with an average depth of 1m it serves well as what it was designed for. The left bank offers some shelter, but the Right Bank is in need of some canopy.

F16 - Ditch

Over 100m long this ditch drains a good portion of the RMF fields.

F22 – Inflow

Several inflows find their way into this ditch line from the low-lying wet area to the north.

X24 – Change from ditch to relatively natural creekbed

This is the point where the ditchline ends and the creek turns into the forest. Coho and chum were observed spawning in this area. This wet low-lying area has been spawned quite heavily and is subject to washout. A thorough investigation into how to stabilize and improve this spawning area should be undertaken. (See F 22 through 37).

F37 – Side Channel

A short braid that diverts 11m above this point

F46 - Ditch

Small falls caused by woody debris build-up.

F52&53 – Plunge pool and culvert

At chainage 1271 the water coming out of the culvert under Comox Logging Rd (CLR) has formed a 4m pool. The culvert has a .8 m diameter and a slope in excess of 5degs. Amazingly enough there is eyewitness evidence that at least one chum salmon made it through this culvert to spawn in the adjacent ditching along the CLR. This culvert should be made to comply with the needs of fish by reducing its slope to around .5degs, as it appears that migrating adults are attempting to get through.

F54 – Tributary (Tp66_Tp54, Tp54_Tp17, Tp54_Tp17_Tp9 & Tp54_Tp29)

This is the series of tributaries that collect run-off in the ditches around the Maple Glen Subdivision. There was significant flows at the time of this survey but, this entire series of tributaries are subject to alteration due to the construction of the South Courtenay Connector (SCC).

F72 – Ditch

It is possible that fry move up into this ditch during high flows. This ditch should be monitored for fry salvage. This ditch interconnects with the Maple Glen subdivision ditching and is collecting water from as far up as the beaver dam/wetland complex on Happy Creek. Because the new South Courtenay connector is being constructed through this area and the entire flow arrangement is subject to change we feel that the new information will be more valuable than what we have at this point in time. The current watercourse information has been passed on to Highways for their planning purposes.

F74 – Culvert

Culvert under Lockwell Rd. Not a fish barrier, but should be monitored for sedimentation as the upper portion of the Tobacco Diversion suffers from heavy sediments.

F77, 78,82,83,88,91,95&96 – Low-lying wet area with braids and drainage ditches

From 1544m to 1824m the creek diffuses into a wet area. There are a series of braids, pools, and ditches draining adjacent fields into this wet area. The creek itself becomes diffuse, and very sluggish. Re-creating a definite creek bed through this area would be very beneficial. Livestock appear to have access at times to both sides of the creek.

F100 – Culvert

A .6 culvert at .5 slope is not an impediment to fish movement.

E103 – Diversion

This is the point where the diversion from Happy Creek occurs. Fry have been observed in Happy Creek and migrating adults have been observed in the lower reaches of the diversion.

CONCLUSION The "Tobbaca Diversion" is at present supporting spawning and rearing of salmonids. With many obstacles in their way fish are barely holding on to an existence in this tributary. With some assistance this creek could be quite actively producing salmonids. Riparian planting along the River Meadows ditchline with some complexing created for protection would be a minimal start. It is this writer's belief that the ownership of RMF is amenable to an enhancement plan and would actively steward any such action. Next, an evaluation of solving the flooding immediately above RMF involves protection and development of the spawning opportunity in this area and would serve to enhance the spawning already occurring. Evaluation of the reach between RMF and CLR for any further spawning opportunities and complexing for rearing opportunities should be undertaken. The reach between CLR and Lockwell Rd. is naturally steep and other than monitoring for debris jams no enhancements are recommended. The portion between Lockwell Rd. and the diversion suffers from deep sedimentation and a lack of defined channel. Some effort to develop sediment retention pond(s) could go a long way towards reducing the sedimentation problems and these ponds could be developed in the long term as rearing and overwintering habitats. Again the landowners in this area have all expressed a willingness to consider some enhancement planning.

F17 – Bridge

The main vehicle bridge to River Meadow Farms.

F18 – Bridge

An old unused bridge. Still in fairly good repair and not subject to collapse.

F19 – Water pipeline crossing

This pipe originates in the pond on TP63TP15 and supplies water to the section of RMF that is used to raise young plants on the other side of the creek.

F25 - Tributary (Tp66_Tp25)

Locally known as Trib 2.

At 477m a small tributary joins Piercy Creek. This Tributary is 155m in length and collects run-off from the adjacent fields on the right. Should be monitored for fry salvage.

F30 - Bridge

Footbridge in good repair used for crossing creek by people and horses. Almost 2m above water this bridge is no problem.

F31 - Beaver dam

This beaver dam is causing pooling to occur upstream past the ox-bow. Although the beavers have not been active here for some time the dam is still very solid and has reduced the flow to two small channels. These channels, however are not fish barriers and the pooling is providing much-needed rearing habitat.

F39 - Tributary (Tp66_Tp39)

Locally known as Trib 3 or "The Willemar Ditch".

The "Willemar Ditch" is 184m in length and features one tributary off it at PT#3. (Tp66_Tp39_Tp3), is 214m in length and features a wetland at its headwater. The Willemar Ditch ends into a storm drain that continues under Willemar Rd. and serves as the drainage for much of the Western portion of Courtenay.

F43 - Tributary (Tp66_Tp43)

Locally known as Trib 4.

This tributary joins Piercy Creek just above the ox-bow and is a series of ditches that interconnect to the wet area at the NW corner of RMF. Active spawning by Coho and Chum was observed in this wet area. It is suspected that the salmon spawning in the wet area at the top of this tributary are accessing this spawning opportunity by way of the ditch along the RMF. There are two reasons for this assumption; one, there is little access by way of this tributary due to lack of depth and two, no adults were observed in this tributary. There is one small tributary off this one (Tp66_Tp43_Tp7) which interconnects by way of crossing the adjacent field into Tp66_Tp49. Both of these tributaries are accessible to migrating juveniles and should be monitored for fry salvage.

F49 - Tributary (Tp66_Tp49)

Locally known as Trib 5.

This tributary crosses the adjacent fields to the west along a well-defined ditchline that is offering good cover and depth for juvenile salmonids. At the end of the fields the tributary heads uphill to the end of Arden Rd. (Winnig's property). From this point it has found its way along an old roadbed (Ayrton Rd. easement) and collects run-off from ditching along Comox Logging Rd. and then continues up the easement to Conrad Rd.

F56 - Unmapped Tributary (Tp66_Tp56)

This is not really a tributary but for lack of any other way of describing this inflow of water caused by the movement of heavy machinery in preparation for the South Connector. The passage of this machinery has created an opportunity for the water sitting in the floodplain adjacent to the Beaver pond on Tp66_Tp63 to drain into Piercy Creek.

F58 - Log jam

This is a major jam instream at 1125m. Should be monitored for debris build up and fish passage. We recommend that it be dismantled completely because it is only a matter of time before it becomes a barrier. There are a number of log and debris jams along this reach. This is the largest and the most likely to become a major barrier.

F59 - Boulder/Rip-rap placement

At 1156m it appears that some boulders were placed in a line perpendicular to the creek. This crew could not discern what this placement was meant to accomplish, but is certainly not doing any harm.

F60 - Beaver dam

An old, solid and inactive beaver dam at 1174 is constricting the creek and creating a braid. The pooling upstream is excellent habitat and offers one of the few pools along this stretch of Piercy Creek.

F63 – Tributary (Tp66_Tp63, Tp66_Tp63_Tp8 & Tp66_Tp63_Tp8_Tp14)

Locally known as Trib 6 or “The Beaver Pond Trib”.

SEGMENT DESCRIPTION

This is a major tributary of Piercy Creek that extends all the way up the watershed to where it diverts from Tributary 7(Tp66_Tp74). The spring water that is currently running down the ditch on the North side of Cumberland Rd. finds its way into this tributary a few meters above the crossing at Conrad Rd.

Largely ditched and channelized this tributary offers little in the way of habitat although anecdotal information suggests that there are trout and salmon along its entire length. One of the major problems on this tributary is the almost one meter drop out of the culvert under Conrad Rd. Immediately below this culvert fish have been observed in good numbers. The ditching around Eagle Crest subdivision needs to be trapped for species identification.

The beaver pond at the lower reach of this tributary has the potential to be one of the major rearing habitats for the entire system as it is quite large and has good depth.

The point at which this tributary joins Piercy is quite constricted and sedimented in and the portion of Piercy that it empties into is also constricted and subject to high volume flows.

Land use is varied and follows much the same pattern as most of Piercy Creek. From the headwater in a combination of residential and undeveloped land the Tributary passes through residential properties to below Marsden Rd. At this point it travels through undeveloped, privately owned land approaching fairly close to a couple of residences until it crosses Conrad Rd. Upon crossing through this culvert it passes through densely populated subdivided land on the left bank and a residential type horse field on the right. This watercourse then makes its way through privately owned undeveloped land and floodplain until it joins the mainstem.

S1 - Confluence

The confluence of this tributary is quite sedimented in and constricted. There is a lot of water coming through a very narrow channel during high flows. This is also the time that fry will be attempting to access the habitat available in the beaver ponds upstream but will find it difficult due to the high flow.

F7 - Log jam

A solid log jam that should be monitored for debris build up or removed.

F8 - Beaver dam

This is the first of two beaver dams. About 2m deep instream with a width of over 25m and a height of 1.2m this dam has backed up a pool that measures approx. 25m by 55m.

Beaver pond data(Tp66_Tp63_Tp8) Traverse around two beaver ponds

F6 - Beaver dam

The second of the two beaver dams, this is by far the largest and most significant. Both of these dams are inactive. The best estimate of duration of inactivity by beavers in this area is approx. two years judging by the death rate of the most recently flooded riparian species. This pond should serve as a major rearing habitat but it is not known if fish have access or are utilizing this pond. Suggest extensive trapping be done in this pond as soon as possible. If no fish are trapped then an evaluation of the barriers to this pond should be undertaken. This crew has not had contact with the landowner, but has heard that that this owner is considering

draining and filling this area in order to develop the land. Suggest timely contact with this owner to determine if this is true.

F14 - Continuation of this tributary (See Tp66_Tp63_Tp8_Tp14)

In order to get an accurate picture of the beaver pond this crew completed a closed traverse around the pond. This point represents the continuation of this tributary.

F17 – Tributary (Tp66_Tp63_Tp8_Tp17)

Locally known as Trib 6A.

An inflow that travels up to the area above the beaver pond where the creek escapes its banks and extensive flooding is occurring. Basically this is a braid that returns by way of the pond.

F29 – Tributary (Tp66_Tp63_Tp8_Tp17)

This is inflow to the pond from the next tributary upstream on Piercy Creek. Known as Tributary 7, a beaver dam on that tributary is forming pooling that has found its way across.

Continuation data (Tp66_Tp63_Tp8_Tp14) Trib 6

F3 – Inflow

A short stream draining the floodplain to the South.

X12 through X15 - Water escaping banks

The gradient in this area begins to rise. The creek has infilled with gravel off the slope above causing the creek to diffuse through this area.

F28, 30 - Falls

Both are one-meter falls over built-up substrate. This is indicative of this area with the substrate material that has moved down the slope.

F32 - Culvert

This is a culvert under Arden Rd. It suffers from lack of a plunge pool and has about a half-meter drop into the creek.

F35 - Inflow

Small inflow from run-off collected above subdivision. Water collects from undeveloped land above the residences on Arden and behind the residences on the north side of Falconcrest.

F36 - Culvert

Culvert under Arden Rd. Not a fish barrier but could be an obstruction at peak flows.

F37 - Ditch

This ditch is currently featured as fish bearing in the Sensitive Habitat Atlas (SHA), but this ditch, even at high flow, is little more than a damp grassy swale. This should be removed as having fish presence from the SHA.

F40 - Livestock access

The Winnig's have one horse in the field adjacent to this ditchline that forms the creek. This horse has access to the creek from this point for 115m. Significant numbers of fish have been observed by this crew in this ditch during the USHP survey conducted in Aug. 98. ID has not been established.

F45 – Tributary (Tp66_Tp63_Tp8_Tp14_Tp45)

Tp66_Tp49 passes very close here and due to some pooling occurring in this area an overflow into this tributary has formed.

F53 – Tributary (Tp66_Tp63_Tp8_Tp14_Tp53)

A small tributary collecting run-off from the side hill above the CLR. There are a series of quite large pools just off the road and as these fill they run into the creek through a culvert under the CLR.

F55 - Ditch

Actually an extension on the same bearing as the creek which rises to a shallow ditch dug by the adjacent property owner to drain water away from their driveway. There is a strong septic smell in this area. This portion of the creek is fish bearing. Suggest trapping for species ID along this portion of the creek. Investigation into the odour and water quality should be undertaken.

F56 - Culvert

There is almost a one-meter drop into the creek out of this culvert. Fish presence has been firmly established in the plunge pool of this drop but the drop acts as a complete barrier to the passage of fish. Suggest that this plunge pool be enhanced to include a fishway of some description. A ladder or series of stepped pools could allow fish passage.

F58 - Tributary/Ditch (Tp66_Tp63_Tp8_Tp14_Tp58)

This is an inflowing tributary that collects water from below Conrad Rd. on the north side of Cumberland Rd. which flows through a culvert under Cumberland Rd. and connects into Trib 6 at this point.

F59 - Side Channel (Creek escaping banks)

The first 30m beyond the culvert on the west side of the CLR has formed into several braids. Some of the water is moving into the pooling that forms Tp66_Tp63_Tp21_Tp53.

F77 - Spawning gravel

Some 75m of gravels and grade suitable for coho spawning.

F84, 85&86 - Culvert, channelization, culvert.

The two culverts at this location are fairly well placed at this location. The real problem here is the rip- rap section in between the culverts. At a slope of 11.5degs this would present an obstacle to the migration of fry. Suggest creating a series of stepped pools through this channelization to assist the passage of fish.

F87 - Ditch/Tributary (Tp66_Tp63_Tp8_Tp14_Tp87)

This is the ditch carrying the spring water year-round down Cumberland Rd. This water then connects at this point into Trib 6 and supplies year-round spring water into the Eagle Crest ditching where so many fish have been observed. Again this points to the importance of repairing the culvert in some way at the CLR.

F97 - Falls

Eroded soils have created this little falls. Under the Hydro lines there is an old culvert that has grown in after having been filled to provide historical access to the Hydro cut. This work is failing and is causing the soils to move downstream.

F99 - Culvert

This culvert is carrying only about 50% of the water moving past this point. The culvert is blocked with water flowing around it. It is assumed this location is an old access road along the Hydro cut. Suggest this culvert be removed and a new channel dug.

F104 - Culvert

A culvert under deteriorating Hydro access road.

F105 - Former site of two ponds (fish obstruction)

The landowner here showed this crew where the two ponds used to be. There are the remnants of one of the ponds, much infilled with sediments and vegetation. Recommend the restoration of these ponds as habitat for overwintering and perhaps rearing as well. This entire area should be looked at in terms of a mitigation by BC Hydro, as it is their work that has caused these problems.

F109 - Back flooded ditch

This is due to the constricted flows through the Hydro cut. This flooding is causing problems for the adjacent landowners and, again is due to the past activities in this area by BC Hydro.

F118 - Culvert

The portion of the creek below this culvert is a straight ditchline down to the Hydro cut. Upstream of this culvert there is a low-lying pool and wetted area with heavy sedimentation.

F122 - Diversion

Tributary "7" and Tributary "6" interconnect at this point. There is a large swampy, wet area here with deep sediments and very sluggish flows. Flows here are difficult to determine. Water that enters this wet area is coming from the seep line along the Tayco lands fill by way of Trib 7 and by way of Tp66_Tp74_Tp169.

CONCLUSION

It is not known at this time how utilized this tributary is by salmonids. Trout are known to inhabit the upper reaches and fish have been observed at the Eaglecrest Subdivision. Extensive trapping will determine over time where, when and what species are using this segment.

Like all of this system this tributary suffers from channelization and is in need of complexing. As spring water runs year-round in this segment, priority to enhancement projects should be considered along this tributary.

F74 – Tributary (Tp66_Tp74)

Locally known as Trib 7.

SEGMENT DESCRIPTION

Another of the major tributaries, this one is known as Tributary 7. Basically a straight ditchline from its confluence with Piercy Creek up to Arden Rd. there are few features and very few, if any, spawning or habitat complexes. Because of this the USHP survey conducted during August 98 identifies this lower reach of this tributary as the area most in need of remediation. After this tributary crosses Arden Rd. some opportunities for enhancements exist as well. Good substrates and some meandering are inherent up to the crossings at Cumberland RD. and the CLR. A fine opportunity for habitat development begins just off the CLR behind Thompson's sawmill. A wetland in this area could be developed into rearing habitat. Beyond this wetland the stream flows up 3 to 5 degrees of grade through one of the few more natural appearing portions of this system. As it moves across the Hydro cut and into the residential area off Marsden Rd. trout are regularly observed. The landowners (Brown and Zajac) are actively involved in fry salvage each year from the portions of the creek in their yards.

Above Marsden Rd. the stream passes through two holding ponds regularly stocked with the trout salvaged from lower down. Long time residents of this neighborhood own these ponds and have developed them with the assistance of DFO in order to protect the trout in this area during times of low flows.

This tributary interconnects with Tributary 6 ("The Beaver Pond Tributary") between these ponds. From here the creek moves through heavy canopy and out onto Baird Rd. where it turns up to the NE and ends up at Louis Ethier's pond. This property owner has piped some 15 springs found over the years on his property into this pond that in fact forms part of the headwater of Piercy Creek.. This pond would appear to have great habitat potential but, it is not known if fish are using it at present. Due to the shallow nature of the downstream access it may be that fish cannot move into this pond.

Land use is again, typical, but in the case of this tributary there is very little actual agricultural activity. Largely this segment moves through undeveloped private land and some residential use. The only exception is the land immediately downstream of Ethier's, which is an agricultural parcel with several horses and associated barns etc. This livestock is fenced out of the creek.

S1 – Confluence

The confluence of Tributary 7 appears quite accessible with good flow. The canopy is excellent and the instream cover is good. Surprisingly there is no evidence to support the presence of fish. This crew was in this creek at the peak of the 1999 coho spawn and observed no spawning activity. We believe this is due to the lack of complex structure and the resulting velocities down this lower reach.

F5 – Beaver dam

A fairly small, inactive beaver dam that is causing pooling for some distance upstream. This pooling has a tendency to intermingle with the pooling associated with the large beaver dam pools on the adjacent Tributary (Tributary 6). Trout have been observed in this pond.

F7 – Side channel

For 72m a channel runs alongside the main ditchline approximately 2m away. It reconnects into the main stream at the pooling above the beaver dam.

F10– Diversion

Some 20% of the water is diverted at this point, heading off at 269 degrees heading back into Piercy mainstem. This would flow only at bank full condition.

F17 – Falls

Small falls created by a log jam caught up between trees.

L27 – Creek undermining building

44m below the culvert on Arden Rd. a building has been constructed very close to the creek. This building's foundation has become exposed by the movement of water and is beginning to become undermined.

F29 – Culvert?

Although this feature appears to be a short section of culvert material it is just sitting in the creek for no apparent reason. Anecdotal information from an adjacent landowner suggests that this was some form of water wheel designed as an enhancement some years back. It is serving no purpose at present and should be removed to prevent possible obstruction over time.

F30 – Culvert

The culvert under Arden Rd. Built out of wood with a fishway built into the bottom. This culvert is excellent and should be considered as an example of how culverts can be made fish friendly.

F31 – Ditch

These are the ditchlines on the North side of Arden Rd. and empty into the creek at this point.

F33 – Enhancement

A cement weir has been built 21m up from the culvert crossing on Arden Rd. This weir has created a pool and a riffle. F29, F30 and F33 all suggest that efforts to do some enhancement on this portion of the creek were completed in the past.

F34 – Bridge

This is a well-constructed footbridge, but its footings are channelizing the creek. As this rip-rap is on a bend in the creek it is serving the purpose of bank stabilization quite well.

F38 – Waste dumped

The property owner or resident has been dumping used kitty litter at this location for some time. There is quite a build up of the material. As kitty litter is made of clay as this material washes down stream some silting would occur.

F43 – Lack of riparian vegetation

The creek here in the backyard of 2600 Mabley has begun the process of a meander because of the lack of riparian plants. This is one of those mixed issues where although meandering is good for the complexing of the stream the property owner is beginning to lose backyard. This situation should be monitored with the cooperation of the landowner and planted with some thought to stabilizing the meander as well as the lawn. A Mr. Brady, the landowner was present at the time of the survey and informed this crew that he had lived in this house for 14 years and has observed fry in the creek every year. He could not ID for species however.

F45 – Ditch/Inflow

This is an inflow from a wet area across Cumberland Rd from Tru-line Cement Products. Tru-Line is currently reclaiming some property in the rear of their existing commercial yard. Trees have been felled and removed and the ground cleared. There is a flowing ditch across this dug up area that has been dug by machine. Rick Green, the owner has provided straw bales at the confluence of the creek and this ditch and is planning to add a silt fence. This is a work in progress as the end result is to move the ditch along the new fenceline accommodating the commercial use of property that was unused before. This owner is aware of the sensitive nature of the work he is doing and will continue to provide silt controls and ongoing monitoring. He also is planning to revegetate the banks of the ditch upon completion.

F56 – Ditch/Inflow

Inflow from low-lying area approx. 30 meters from the creek. This has wetland characteristics and is about 30 by 30 meters.

F61 – Culvert

Culvert under Cumberland Rd. which is not a barrier to fish passage.

F62 – Rock/boulder placement

Both banks have had boulders placed to prevent erosion. Looks well done and is holding well. This is the property on the corner of Cumberland Rd. and the CLR. This may be a good example of an enhancement that can be accomplished by landowners concerned with property erosion. Suggest, with the cooperation of the owner, that this be included in any ongoing stream stewardship programming by the MPWS.

F70 – Inflow

A 20m ditch on the left bank draining an approximately 20 by 60m wetland. This wetland is a part of a large wet area that runs both sides of the CLR behind the Thompson Sawmill. The area on this side however is not as extensive as that on the North side.

F72 & 73 – Culvert and ditch

Culvert under the CLR and the ditchline along the north side of the CLR. The culvert is not a barrier and the ditching is not carrying a lot of water.

F76 – Wetland

This is an area that has standing water most of the year. 56m by 95m with an average depth of .05m this wetland offers a potential for habitat development. There is a tributary off the traverse that collects water from a wet area just North of Cumberland Rd. (See Tp66_Tp74_Tp76_Tp10) There is a second area upstream of this that is 44m by 70m as well. This entire area should be studied over the next few years to see if habitat could be developed here.

F82 – Side channel

This side channel diverts at point #90 is approx. 60m long and is carrying about 30% of the flow

F99 - Culvert

Culvert under Conrad Rd. is an obstruction at most flows.

F110 – Bridge

An old bridge built for access along the Hydro cut. Appearing to be unused and in poor repair, this wooden structure is in an imminent state of collapse and poses a blockage problem within a very few years.

F111 – Ditch

Ditch collecting water from a low-lying area, under the Hydro lines, on the right of the creek some 106m away.

F118 – Ditch

Ditch collecting run-off from adjacent property. Ditch ends 20m short of Marsden Rd.

F122 – Culvert

Culvert under access road to horse field behind property.

F127 – Dam

A dam built and maintained by the property owners in the area along Marsden Rd. to aid the resident trout survive during low flow periods. Approximately 20m of creek upstream from here has been widened and deepened to accommodate as many of these trout as possible. The dam however is serving as an impediment, if not an obstruction, to the upstream migration of fish.

F129 through F136 – Series of culverts, bridge and channelizations

This series of crossings and channelizations are all through the front yards of two properties on Marsden Rd. There is a lack of riparian cover along this stretch. The residents here recently had a small backhoe dig out sloughed in parts of the banks and generally open the creek bed up a bit. This was all done in the fall of 98 and included the deepening and widening at the lower dam/pool.

F171 – Culvert

Culvert under Marsden Rd. Not a fish barrier.

F153 & F154 – Culvert and ditch

Culvert under Lanyon Rd. and the ditchline on the left bank that is picking up run-off from along the North side of Lanyon Rd.

F159 & F160 - Footbridge and pond

The first of two ponds dug by the property owners here to assist the survival of the resident trout during low flows. These ponds suffer from some infilling of sedimentation and years of leaf litter. To be more effective in their purpose some thought should be given to deepening them.

F169 – Tributary (Tp66_Tp74_Tp169 & Tp66_Tp74_Tp169EXT Williams)

This tributary is a series of ditches all collecting both ground and surface waters from the ditches that begin where the end of the mainstem changes direction. See Tp66_Mainstem. There are also ditches collecting water from the properties between Lanyon and Baird Roads. One of these is the spring water coming from the Tayco lagoon at the top of Baird Rd. and down through the Williams property. The missing data between Williams property and the interconnection to trib 6 is due to not gaining permission from the landowners to access their properties.

This is the point where Tributary 6 and Tributary 7 interconnect. As mentioned in the Tributary 6 portion of this report the grade here is next to zero, the creek is extremely sluggish and there are deep sediments making flows difficult to determine.

F172 – Inflow

This is the point where the original channel re-joins the creek from the diversion at point #176

F173 - Pond

The second of the ponds on this tributary (see the polygons created by the traverse of these ponds).

F175 & F176 – Footbridge and side channel

This footbridge is at the upstream end of the pond and again, the original creekbed is now a side channel.

F179 – Culvert

Culvert under access road behind Mel Stewart's property.

F188 – Culvert

This is the culvert under Baird Rd. The stream is channelized for the next several hundred meters as it travels up Baird Rd. and turns into an agricultural field. On the left bank of the upstream side of this culvert there is a significant inflow of water. A ditchline carrying water from a swampy area along the right bank is draining into this ditch. There is enough water in this ditch to warrant some monitoring for fry salvage.

F192 – Culvert

Culvert under access road to horse barns. Livestock fencing protects the creek.

F197 & F198 – Culvert and pond

This is the headwater of this stream/tributary. The landowner here has dug a pond 36 by 16m and has piped the 15 or more springs on the property into this pond. The water level in this pond was the same at the time of this survey (during the highest flows) as it was in August 98 (during the lowest flows in many years).

CONCLUSION

The mouth and lower reach of this tributary appear to suffer from the problems connected with unchecked velocities. From the upstream end of the beaver pond that is only 26m from the mouth straight up to Arden Rd. this is an almost perfectly straight ditchline. If, with the cooperation of the property owners along this stretch, some meanders and complexing could be created the substrate, (which is the right size and composition for spawning) along this ditch, could become an excellent spawning opportunity. From the enhanced culvert under Arden Rd. right up to the headwater springs there are many enhancements done in the past. Unfortunately most of these are suffering from a lack of maintenance.

The ongoing trout salvage being done by residents should be supported and coordinated. When flows get low, for example, and the berm that holds back water into the ponds upstream is raised to increase depth the stream goes dry for some time while the pond fills. This process leaves trout stranded and dying downstream. With some coordination this effort could be quite successful.

F75 – Bank Erosion

15m of erosion on the left bank is depositing some of the sediments found downstream from here. (1538m)

F78 – Unmapped Tributary (Tp66_Tp78)

Short interconnect to Tp66_Tp74 at the beaver pond.

F80 – Tributary (Tp66_Tp80)

Locally known as Trib 8.

This tributary drains a wet area that begins some 23m above Piercy main. It then turns back to a diversion from Trib 7. There is an inflowing tributary at F point# 7 (Tp66_Tp80_Tp7) that collects water from the parkland to the North of Arden Rd. (Cates Park) and the accompanying ditches collecting water from the ditches along Arden.

F91 – Unmapped Tributary (Tp66_Tp91)

This tributary is 94 m in length and appears to drain a wet area just before the ditchline that is a feature on tributary Tp66_Tp96.

F96 – Tributary (Tp66_Tp96)

Locally known as Trib 9.

SEGMENT DESCRIPTION

This tributary appears to be an old portion of the original creekbed of Piercy Creek or one of its tributaries which now carries water from three areas to the north of the existing Piercy Creek. Ditching and storm drains from the Cherry Grove Estates on Morello Rd., run-off collecting in the ditches around the Japonica Trailer Park and the storm drain from subdivision construction currently underway to the East of Japonica all find their way into this tributary.

The portion of old creek bed has a minimal gradient and is quite infilled with sediments, but could be restored as habitat quite easily by hand digging the channel and adding some LWD.

Land use along here is primarily residential but the natural portion is on agricultural land that is in hay. The landowner, Mr. Rolloff seems amenable to considering restoration proposals.

S2 – Confluence

The mouth of this little tributary, like many of the tributaries along Piercy Creek, is quite constricted. Changes that have been made upstream have not been planned in their return to the creek so the water has found its own way over time with, perhaps, not the best results. With some planning this could be opened up to provide off-channel habitat in the old creek bed higher up the tributary.

F5 – Ditch

Ditchline which carries water from the designated parkland (formerly Rolloff's property) above Piercy Creek and the agricultural strip that runs West to short of Arden Rd.

F12 – Tributary (Tp66_Tp96_Tp12)

This is a tributary that carries water from the Rolloff property and the Cherry Grove Estates. There are a series of sediment controls along this tributary that were put in place due to the opening up of a spring during excavation for this project. This area should be monitored over the next year as construction of the second phase of the subdivision project is scheduled to begin soon. This should also be monitored during low flows to determine if there is year-round flow. The above mentioned habitat creation would of course be made feasible if this water could be utilized.

F38 – Culvert

A culvert under an unused access road. This culvert is now collecting water from the ditchline around Japonica Trailer Park and the new construction to the South. This area should be monitored for flows during low flows and water quality to determine if any of this water can be used for the habitat creation suggested above.

F40 & 46 – Sewer junctions

These are the pre-laid septic pipe heads for the new construction. They appear to be right in the ditchline. Water quality monitoring is the issue here.

CONCLUSION

Because of the near natural state of this little tributary we are suggesting that it be looked at for possible restoration. The inflowing tributaries may provide year-round water as anecdotal information suggests that at least some of this water is spring water.

The inflowing water may be an issue in terms of water quality as it is primarily run-off from construction sites and residential areas.

F102 & 104 – Enhancements

The property owner here has placed some rip-rap, created a small footbridge and planted some riparian plants along the bank

F110 - Culverts

A pair of culverts under an access road at the back of Marinus' property. These culverts have a negative slope, but this in effect creates a pool upstream.

F113 – Bank stabilization/channelization

15m of wooden wall constructed to shore up the banks above the culverts

F121 – Culvert

Culvert under 20th St. carries a lot of water at high flows. Not a barrier at average to low flows.

F124 – Ditch

Ditch along 20th St. collecting water from undeveloped land on the North side of 20th St.

F127 – Footbridge

This is a well-used little bridge giving access to the North bank of the creek. This access has caused some erosion and the damage to the riparian zone is noticeable.

F131 – Tributary (Tp66_Tp131)

Locally known as Trib 10.

This inflow is water collected from a wetland which is bordered by a new subdivision being constructed North of Burgess Rd, the backyards of the residences on the North side of Cumberland Rd., and storm drain run-off collecting from Arden Rd and running into a large parcel of undeveloped land.

Both migrating adults and more certainly, fry have access into this tributary. This entire tributary should be monitored for fry salvage. The wetland area that remains should be considered as a sensitive ecosystem and perhaps earmarked for protection.

F141 & 142 – Culvert and ditch

This is the culvert carrying the mainstem of Piercy Creek under Cumberland Rd. Heavily rip-rapped to prevent erosion this bend in the creek is subject to high velocities. The accompanying ditch that is on the North side of Cumberland Rd. was carrying a significant amount of water at the time of this survey.

F149 & 150 – Culvert and ditch

The ditch here is running along the west side of Arden Rd. and, at the time of this survey, was carrying a significant amount of water. The culvert under Arden is a large "flattened" style with a drop of about half a meter into a shallow plunge pool. Coho fry were observed in this pool during the USHP survey conducted during the dry spell of Aug. 98.

F157, 159 & 160 – Fences across creek and a collapsed footbridge

These three feature all present debris build-up potential and should be monitored to prevent obstructions.

F164 through 173 – Spawning gravel

Almost 200m of spawning opportunity. This crew observed spawning adults both above this location and below, but at the time of this survey no active spawning was observed here.

F174 – Tributary (Tp66_Tp174)

Locally known as Trib 11 or “The Copperfield Trib”.

SEGMENT DESCRIPTION

This segment, from its mouth at this location upstream to the CLR, has a real potential as a rearing and spawning opportunity. Gravel at the upstream end of this stream has been moving into the creek over time and has created a good mix of substrate. Gravel has built up at one location to the point where it has caused the creek to escape its banks and create a side channel.

A low-lying flat area along this segment has become inundated with water and, at the time of this survey, was laced with braids and standing water up to a meter deep. The ephemeral nature of the mapped side channel can be described as the outer extreme of this flooded area.

The data for this portion ends at the upstream side of the CLR as this is the border of the Clifford property and, as mentioned in the overview of this report, was not able to be accessed and appears as missing data. The continuation of this stream is described as ExtTp66_Tp174.

The main source of water into this tributary is from a 50 acre wetland owned by Knopp’s Farm and bordered by their fields to the South and Charter Rd. to the North. Between each of the four properties immediately to the North of the NE corner of Knopp’s fields that front onto the West of Marsden Rd. there are significant inflows along property line ditching into the ditching along Marsden Rd. This water is all collected through a culvert and ditch through Robin McKay’s property, which then travels through the Clifford property and joins again just above the CLR.

There is also water entering this tributary from the slope on the Linton property to the West of Knopp’s fields by way of the ditching along the West and North sides of Knopp’s fields. Anecdotal information from landowners along Marsden suggests that some of this water is spring water and does run year-round. Robin McKay has mentioned that a spring emerges from under her house. If this is the case then this tributary becomes extraordinarily valuable as year-round habitat.

The issues prevalent in the Clifford dispute become critical when considering this potential. The water currently crossing Clifford’s does not appear to travel in a defined creekbed.

As near as the eye can tell from observations made from Clifford’s fenceline, the water is broken up into many braids. This is a significant break in the continuity of this potentially very valuable stream.

F3 – Inflowing braid

This side channel should be monitored for flows through the summer to determine if this area is, or may be developing as habitat.

F5 – Culvert

Not an issue, this culvert is fine with rip-rapped banks at the downstream end.

F10 – Side Channel/Tributary (Tp66_Tp174_Tp10)

Braiding begins at this point and continues until Pt# F28.

F13 – Braid/side channel

Indicative of the braiding throughout this area.

F16 – Major braid

Some 30% of the water is diverted here.

F18 through F24 – Spawning gravel

There is decent gravel here and this crew suspects that salmon have spawned here this year.

F28 - Diversion

This is the point where the side channel diverts from the main creek. There is quite a build-up of gravel here that has caused the stream to escape its banks and create the side channel and flooded area.

F31 – Old road crossing

A culvert at this location has become dislodged and the cover that used to be the road is gone. The wooden cribbing which consists of two large logs are, along with the exposed culvert, simply lying in the streambed. This should be removed as already it is causing a partial barrier and with the gravel that appears to be moving down the creek will become a complete barrier soon

F41 – Inflow

Small inflows from both banks. Large wet forested area begins, providing excellent rearing opportunity for salmonids if made accessible.

F62 & 63 – Old road crossing

Decommissioned logging road crossing with a small footbridge that keeps the many joggers, bikers and hikers who use this road out of the creek. It is a make shift bridge and has begun to collapse.

F64 & 65 – Ditches

These are the ditches along the west side of the old CLR. These ditches carry a significant amount of water and do provide habitat. These ditches need to be monitored for flows during the summer and either developed as habitat or be monitored for fry salvage.

E66 – This is the beginning of the Clifford property and due to not being given access to the land the data ends here

Continuation of data (Mpiercy_EXTTp174)

S2 – Extension of TP66_Tp174

This data begins at Robin McKay's fenceline. The creek bed here has begun to create some meander as it crosses the Clifford property and the substrate is good. At this fenceline the stream becomes a straight ditchline with a bedrock substrate.

F11 – Culvert

The stream below this culvert has created a nice little bend with excellent substrate and depth, but is lacking cover. The culvert itself is not an issue.

F14 through 18 – Culverts, inflows and ditches

These are the series of culverts and inflows from the wetland off Charter Rd. that flow into the ditch along the west side of Marsden Rd.

F15 – Tributary (Tp66_Tp174_Tp15)

This is the main flow out of the NW end of Knopp's fields and the wetland off Charter Rd.

CONCLUSION

This tributary seems very significant in terms of habitat and year-round water flows. The situation at present is not conducive to the passage and rearing of salmonids, but with some monitoring and subsequent planning a real potential exists here for the creation of habitat. This crew is suggesting that if there is year-round water flowing into this tributary then a comprehensive re-routing of water along Marsden Rd. into this tributary could assist the development of habitat both up and downstream.

The residents along Marsden have expressed dismay at the changes that the Highways have made along here. Driveways that are being washed away, basement flooding, and changes without consultation seem to be the complaints. The recommendation here would solve these problems as well.

The obstacle to this creation of habitat and utilization of water flow is the landowner need to have easements for such a project purchased from them.

F184 through F194 – Spawning gravel and short side channel

Over 175m of spawning gravel in this location. This crew did not observe any actual spawning activity, but avoided walking on the gravel as looked as though it could have been spawned. If this area has been spawned some restoration work and development of the side channel here would be appropriate

F209 through 214 - Spawning gravel

51 m of spawning gravel, again likely spawned in this year.

F215 - Decommissioned logging road (CLR)

One of two locations where the removal of the logging road culverts has made the creekbed accessible to foot and bike travel (the second is on Tp66_Tp174 at the CLR). There is potential at this location for some habitat development and some riparian planting.

F216 – Tributary (Tp66_Tp216) (Clifford/Knopp)

Locally this trib was considered to be the mainstem of Piercy Creek.

This is the inflow into Piercy mainstem from the creek bed that is on the Clifford property just E of Marsden Rd. Again, this crew was not given permission to map on this land so the data is missing. The headwater of this tributary is the lower NE of the Knopp's Farm and primarily from the ditching that extends from the NE corner of these fields towards the centre of the field. We are suggesting that with the appropriate planning the water currently flowing across the Clifford property is re-routed into the ditch running northward down Marsden Rd. and into TP63TP330.

F217 & 218 – Ditches

These are ditches along the CLR and carry enough water to be a concern for fry. Should be monitored for fry salvage.

F220 – Evidence of filled in creek bed

The land owner here, Jack Clifford, claims that the creek bed seen by this crew filled in with dirt and woody debris is not and has never been a creek. In our opinion however this does not seem feasible. We can observe water entering this property off Marsden Rd. and we can see water joining the mainstem at Pt#410. In Aug. when this crew visited this site we clearly could see where the substrate of a creek bed had been filled in. After encountering and discussing the situation with this landowner subsequent visits showed more extensive filling of this site. There is water crossing the Clifford property and exiting into the mainstem.

The adjacent landowner Red Mclure has dug two major ditches along his property to handle some change in water flow that was creating a flooding problem on his farmland. This filled in area is 50m into this ditchline and is not at present exiting any water.

F224 – Sedimentation

This is where the ditches that form the creek bed downstream from here emerge from the alder cover and open out onto the end of Conrad Rd. There have been reports of coho spawning in these ditches that have become considerably shallower due to the amounts of sediments that are moving downstream. Highways work upstream has altered the flows here and much work has been done to mitigate the damage done in this area. We recommend digging and complexing these ditches and, working with Highways, to complete the best possible course of these increased flows.

225 & 227 - Culverts

Culverts under property access roads along Conrad Rd. Sedimentation has infilled this culvert significantly. If nothing is done about the sediments entering this area this culvert will become a barrier.

F231 – Channelization and boulder placement

control increased flows due to changes made upstream in the summer of 1998. The creek takes a 90deg bend here after coming down a steep grade. This work will need to be monitored for movement and failure during high flows.

F234 – Rock and boulder placement

A rock weir has been placed across the creek as a sediment and velocity control. We suggest that this is minimal and more should be done in this portion of the creek to control the movement of sediments and prevent the damage potential from high flows.

F237 – Unmapped Tributary (Tp66_Tp237)

This tributary collects water from the lower SE portion of Knopp's farmland. Water collects in the ditching along Marsden Rd. and makes its way through a culvert into a dug channel that winds its way through some residential backyards across the Hydro cut and joins the mainstem at this location by way of a recently dug channel. The channel was dug at the time Highways was working in this area (see two previous features) and has been dug up to the hydro cut and stopped. Water is finding its way through a series of braids that is picking up the water from the tributary here, but also from water diverging across the Hydro cut from the mainstem.

F239 – Channel ends

See the comment above. These have both been dug in the same manner and abruptly end at the edge of the Hydro cut. Again, the water is running over the ground and much of the water headed from the headwater of the mainstem is running over ground and into Tp66_Tp237.

F247 & 248 – Culverts

There is a significant drop into a shallow plunge pool at the downstream end of the larger of these two culverts. The smaller, older culvert is still carrying water but the upstream end is becoming plugged with debris.

The newer culvert was placed here to accommodate the higher flows anticipated after the digging of a major ditchline across Knopp's fields.

F252 – Discharge pipe

discharging chocolate milk appearing discharge that smelled strongly of manure at the time of this survey.

F258 through 271 – Culverts and ditches

These are the crossings and ditches flowing into the ditch through Knopp's Farm. See ortho photo. The concerns along this ditchline would include; lack of riparian cover, effluent levels from manure spraying and trapped fry at low flows.

F276 – Burn

This burn separates the water collecting from the Linton property from the water coming from the headwater wetland to the South.

F285, 286 & 289 – Inflows from wetland

Lanyon Rd.

E292 – Inflow

Inflow from wetland. The wetland on the left bank appears to be the headwaters of Piercy Creek. Anecdotal information confirms that water does flow year-round along the ditch through Knopp's farm. As this is the source of the water flowing in this ditch it can be assumed that there are springs in this wetland. The water flowing out of this last inflow does flow towards the ditching mentioned even though the grade is recorded as zero. Several tests with various floating objects confirm a divide at this point with water moving very slowly in the opposite direction beyond this point.

CONCLUSION

Piercy Creek has some portions in fine health, but the majority of this system suffers from channelization in the form of ditching with little or no complexing or rearing habitat.

PRIORITY ISSUES

1. HIGHWAY CONSTRUCTION

The construction of the new highway creates a possibility that some draining of the Piercy headwater wetland at the top of Lanyon Road could occur. The slash line currently in place divides the Morrison and Piercy watersheds quite well, however ongoing monitoring and contact with Highways design teams should be maintained to ensure damage is minimal and that appropriate mitigation takes place.

Recommendations:

- ◆ Research and communication with Highways hydrologist and designers to prevent damage and determine construction safeguards are in place to protect this sensitive area
- ◆ Review designs for habitat mitigation, as it appears that habitat will be altered and some loss of habitat will occur.
- ◆ Obtain all wildlife surveys and/or studies done to date in order to assess the total wildlife impact of the construction.

2. OUTPLANTING OF HATCHERY FISH

There is some concern that the current levels of outplanting may be negatively impacting naturally spawned juveniles.

Recommendations:

- ◆ Research and confirm 1999 levels of outplanting by DFO.
- ◆ Complete USHP survey of system to determine fry capacities. Measure relative population densities and make appropriate comparisons. Determine levels of outplanting according to this research.
- ◆ Research numbers of smolts leaving the system and measure hatchery vs. natural subsets.
- ◆ Develop ongoing program of measuring escapement numbers by species.

3. FRY SALVAGE

Due to low flows in the summer months, portions of the streams dry up leaving pockets of water that can contain trapped fry. These fry are lost as the system continues to go dry.

Recommendations:

- ◆ Develop a fry salvage strategy and organize volunteer teams.
- ◆ Screen off agricultural ditches, where appropriate, to restrict the passage of fry.

4. WATER FLOW

Portions of the stream have low flows in the dry season. There is also some escapement of spring waters that are bypassing portions of the system.

Recommendations:

- ◆ Develop low flow strategy.
- ◆ Design and build water retention ponds that would double as habitat.
- ◆ Capture and re-route spring water currently running out of the Tayco springs and down the ditch on Cumberland Road.
- ◆ Identify and remove filled in sediments and substrates where water may be flowing subsurface.
- ◆ Identify and re-route year-round flows that are escaping portions of the system by way of ditching back into more productive portions of the creek.

5. INSTREAM RESTORATIONS

Many restorations are suggested in the body of this report. All are significant and doable with the appropriate resources. With the guidance of the MPWS only the following recommendations are being made at this time.

Recommendations:

- ◆ If population and capacity studies determine that capacities are minimal, then the digging out of infilled ponds and the development of new ponds becomes a priority. There are several such opportunities in this system.
- ◆ The lower reach of tributary 7 (TP63TP130) appears in the USHP survey of 1998 as one of the areas most in need of remediation. As this is an absolutely straight ditch line from Arden Rd. to the small beaver pond and has excellent substrate for spawning we recommend that this portion be restored to a more natural stream by creating some meanders, complexing with LWD and pool/riffle structures and providing bank stabilization.
- ◆ Immediate remediation/mitigation is required at several locations along and under the Hydro cut. We recommend that approaches be made to BC Hydro to determine the level of funding for these projects they may be prepared to undertake. These locations all need the digging out or creation of a thalweg and the creation of or restoration of ponds to provide habitat and retain water at times of low flows.
- ◆ This survey has found that the tributary known as the Copperfield Trib (TP63TP330) has become a significant opportunity for spawning and rearing habitat. To ensure that this area becomes stabilized and has sufficient flows through the dry months we are recommending a major project be undertaken with the involvement of landowners, Jack Clifford and Robin McKay, BC Hydro, Ministry of Transportation and Highways, and the Regional and Municipal levels of Government.

This project would re-route the water currently running across the Clifford property from the ditch on Knopp's Farm into the ditch on Marsden Rd. From this point the water that is currently running in this ditch would be combined with this re-routed

water to form a significant flow down the ditch at the McKay property. Both the ditches above and below Marsden would be enhanced with the most modern techniques to provide not only a fish friendly environment but also a demonstration of what can be done to accommodate both fish and people. As the water crosses the Clifford property and back into this identified opportunity again, an enhanced streambed can be created. There is also water from the Charter Rd. ditches that currently runs out to Lake Trail Rd. and then back along the Comox Logging Road (CLR) to join this tributary as well. This water could be incorporated into this major project as well. This would be a long-term project but the feasibility studies and design work should begin immediately.

Both property owners have expressed their requirement of an easement purchase in order to complete this project.

- ◆ Several debris-collecting jams are in evidence along the mainstem of Piercy Creek. Volunteers could remove these with shovels and by hand. During the accomplishment of this work thought could be given to complexing opportunities along this portion of the creek.
- ◆ The portion of tributary 6 (Tp66_Tp63_Tp21) that runs around the Eaglecrest subdivision provides two opportunities for enhancement. 1) The ditch line that runs through the Winnig property from Arden Rd. to the point where the creek runs behind the residences off the CLR is in need of some riparian cover. The instream cover is excellent, but the lack of canopy allows water temperatures to rise unnecessarily and 2) the culvert under the CLR poses a complete barrier to the upstream migration of the fish in this portion of the creek. We recommend either replacing this culvert entirely or building a series of step pools that would allow fish passage.
- ◆ The portion of tributary 6 and 7 (Tp66_Tp63_Tp21 and Tp66_Tp74) that cross at the Gordon property and the dug pools located in this vicinity all suffer from deep sedimentation and sluggish flows. This is an excellent location for some remedial work to increase the rearing habitat and water retention potential. Some coordination at these ponds is required so that water retention decisions that are made upstream do not negatively impact the fish presence downstream. Generally throughout the system straight ditch lines, poor culverting and lack of complexing exists. Further recommendations would include a timetable over the next few years of instream enhancements to solve these problems. Also on a general note there are several naturally occurring side channels and off-channel habitats that could be identified for enhancement.

6. WATER QUALITY

Water quality studies are ongoing in the system.

Recommendations:

- ◆ Increase number of stations, number of samples per station, and prioritize locations.
- ◆ Water quality issues exist from the sporadic run-off of effluent emerging from the Knopp Farm manure retention pond. Spraying of manure onto the fields at this location may also present a water quality issue. We are recommending that water quality sampling be increased at the top and bottom of the fields for comparison

purposes and that an invertebrate study be undertaken downstream of the farm. If it is found that this effluent is a significant problem then some form of filtering pond is constructed below the farm and ongoing effort to clean this water is made.

- ◆ An issue may exist behind Cousins Rd. due to the industrial run-off that occurs and water quality testing should be increased. Given sufficient concern steps should be taken to contain this run-off.
- ◆ The "Willemar Ditch" is also a concern and research should begin as to how this might be dealt with.

7. SEDIMENTATION

Although it appears that this system is fairly stable, historic sediments have clogged portions of the system. Also, the overburden consists of fine topsoils throughout the system and these fines are naturally entering the watershed.

Recommendations:

- ◆ Locate and map the most profoundly effected areas of the watershed (primarily in the upper tributaries and the mainstem behind the Cousins Rd. area) and monitor for a) infilled habitat and b) ongoing sedimentation problem areas.
- ◆ Perform bank stabilization strategies at portions of the system identified as benefiting from such actions.

8. SENSITIVE AREA PROTECTION

Recommendations:

- ◆ Have new areas mapped during this survey included in the Sensitive Ecosystem Inventory.
- ◆ Contact landowners that own these wetlands with information about their sensitive nature and negotiate a protection strategy.
- ◆ Continue to protect these areas from encroaching development in ways that are innovative. For example, the wetland West of Burgess Road is slated for development. Development designs could include a natural watercourse with enhanced habitat that becomes a significant tributary of Piercy Creek without compromising the development potential. In fact this concept could improve the salability and value of the development by being both environmentally sound and extremely attractive.
- ◆ Create and develop ongoing educative programs and media releases about sensitive areas and their value.

9. STAKEHOLDER COOPERATION

The stakeholders would include landowners, Federal, Provincial, Regional and Municipal Government, the MPWS and other groups and individuals.

Recommendations:

- ◆ Develop and have included into the Official Community Plan a watershed management plan that is effective for both protection and development of habitat and assists development proceed without allowing a net loss of habitat.
- ◆ Purchase easements and/or develop regulation that ensures landowners are compensated and required to provide fish and wildlife corridors across their properties.

- ◆ Develop legislation that describes restoration and mitigation procedures and provides a funding base to assist landowners and developers enhance watercourses during and following construction.
- ◆ Develop a "Stewardship Centre" that promotes the principals of stewardship and is able to provide up to date information on techniques, assistance in terms of both funding and volunteer labour and serves as a "round table" to discuss solutions.
- ◆ Develop a strategy to involve landowners in the active stewardship of watercourses on their properties.