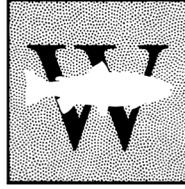


Appendix G:

Fish Trap Creek Salmon Habitat Evaluation

W A S H I N G T O N T R O U T



Reconnaissance and Recommendations
for Fishtrap Creek, Orcas Island, San
Juan County, Washington.

Draft Final Report

November 23, 2004

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1.0 Background

Fishtrap Creek is a first order stream that drains a 736-acre watershed on the west side of Orcas Island in San Juan County, Washington. Unlike many watersheds in the San Juan archipelago, Fishtrap Creek drains into a well-defined estuary, Cayou Lagoon, before emptying into Deer Harbor. Given the life-history requirements of Pacific salmon, particularly their demonstrable use of estuarine environments, Fishtrap Creek is potentially an important watershed for salmonid use in the San Juan Islands. Regardless of current freshwater use by fish, the health and integrity of this watershed are critical components of the ecological processes that sustain Cayou Lagoon.

In March of 2004, Washington Trout was contracted by the People for Puget Sound to conduct a qualitative habitat reconnaissance and culvert assessments on Fishtrap Creek to support the Deer Harbor Bridge / Restoration Design project. The objective of these surveys were 1) to evaluate the existing condition of Fishtrap Creek with respect to salmonid spawning and rearing potential and 2) to identify activities or projects that would improve salmonid habitat in the Creek.

Surveys were only conducted where landowners had granted permission for Washington Trout field crews to access the stream on their property, and at public access points (public road crossings). Permission to access was requested by Ken Brown, Orcas Island project coordinator.

Fish passage concerns, existing stream habitat conditions, fish habitat, and salmonid spawning and rearing potential were of particular interest to help determine future recommendations for Fishtrap Creek, and also to aid in the development of appropriate design plans for the Deer Harbor Bridge/Restoration Project. San Juan County and the People for Puget Sound will use the results of Washington Trout's assessments to help identify and prioritize the most ecologically and economically appropriate salmon restoration and protection projects.

2.0 Methodology

2.1 Habitat Reconnaissance Methods

During the spring of 2004 Washington Trout conducted a qualitative instream habitat reconnaissance to characterize current salmonid habitat conditions in Fishtrap Creek. Surveys were only conducted on those properties where landowners had granted Washington Trout field crews permission to access. Ultimately, all landowners in the watershed granted access to Washington Trout crews.

For data management purposes, we divided the mainstem of Fishtrap Creek into three distinct segments, identified as reaches A, B, and C. (Appendix A, Map 1). The lowest reach extending from the mouth upstream to approximately 300 meters was designated as Reach A, the middle segment extending from 300 meters to approximately 1400 meters was designated as Reach B, and the uppermost segment extending from approximately 1400 meters to the man-made headwater pond (hereafter called Helso's pond) was designated as Reach C.

On March 24th and 25th Washington Trout surveyed from the creek's mouth to approximately 300 meters upstream (Reach A) and from approximately 1400 meters to the upstream end of Helso's Pond, approximately 2700 meters from the mouth (Reach C) (Appendix A, Map 1). The owner of the stream reach between 300 meters and 1400 meters had not granted permission for Washington Trout crews to access the property at the time of the March surveys; thus, the stream reach between 300 m -1400 m (Reach B) was surveyed later on May 18. A significant right bank tributary (hereafter referred to as Treacy's Tributary) entering the mainstem channel at approximately 1500 meters was also surveyed from its mouth upstream to Treacy's pond.

Habitat reconnaissance surveys were conducted on each of the reaches while walking upstream. Within each reach, station numbers were assigned at 100 meter increments and documented on a geo-rectified Arial map. This map was then utilized in the field to estimate stream distance. Dominant habitat type, potential spawning gravel presence, large woody debris abundance, riparian composition, substrate composition, and valley bottom type were recorded for each 100 meter stream segment. In addition, bankfull width and stream gradient measurements were taken at the end of each 100 meter segment.

2.11 Dominant Habitat Type

Habitat types within each 100 meter stream segment were assigned an estimated percentage and placed in one of the following habitat unit classifications:

1. **Riffle** – a shallow, low gradient area with surface turbulence.
2. **Pool** – impounded waters within a closed topographical depression with a residual depth greater than or equal to 0.33 ft. To be classified as a pool these units also needed to meet the Timber / Fish / Wildlife pool size criterion for a channel with an average bankfull width of 0-8.2 ft.
3. **Deep Glide** – an area with a uniform channel bottom and water depth 0.6 ft or greater without surface turbulence.
4. **Shallow Glide** – an area with a uniform channel bottom and water depth less than 0.6 ft.
5. **Pond** – impounded water, either natural or anthropogenic.
6. **Dry channel** – an area with no surface water.

Channel gradients were estimated using handheld clinometers.

2.12 Potential spawning gravel presence

During the course of the instream habitat surveys, potential salmonid spawning gravel locations within each 100 m segment were documented and comments relative to spawning gravel size, quantity and quality were made from visual observations and noted.

2.13 Woody Debris Abundance

Large woody debris (LWD) throughout each reach was categorized as logs or rootwads, tallied, and recorded on wood survey forms in one of the following stem diameter size

categories: (1) 4-8 in.; (2) 18-20 in.; or (3) greater than 20 in., unless wood was so sparse within the reach that individual logs could easily be documented in waterproof DuraRite field notebooks. Current abundance and distribution of instream LWD in each reach was assigned a quantity rating of (N) none, (S) sparse, (M) moderate or (A) abundant based on the total number of logs tallied within the reach. The Timber / Fish / Wildlife criterion of 4-in. minimum diameter and at least 10 ft in length was utilized to identify LWD and only LWD within the active channel was considered. Each log was only counted once; logs that crossed reference points were counted in the nearest station downstream of the mid-point of the log.

2.14 Riparian Composition

At the end of each 100 meter segment, prevailing tree or brush type (conifer, deciduous, or mixed) was noted and a visual estimate of canopy cover was recorded.

2.15 Substrate Composition

Visual estimates of the stream channel substrate for each 100 meter stream segment were placed in one or more of the following substrate material categories:

Category:

1. Mud
2. Sand (< 0.25 in. particle size)
3. Gravel (0.25 in.-6.0 in. particle size)
4. Cobble (6.0 in.-36.0 in. particle size)
5. Boulder (36.0+in. particle size)
6. Bedrock

2.16 Valley Shape

Valley shape for each 100 meter segment was categorized as confined, moderately confined or unconfined.

The habitat field reconnaissance survey was utilized to characterize parameters (habitat type, spawning gravel potential, woody debris abundance etc.) which may potentially limit salmonid populations in Fishtrap Creek. Habitat parameter results were considered when determining potential limiting factors and in considering recommendations for habitat improvement.

2.2 Photo Documentation Methods

Channel habitat, unique channel features, channel barriers, culvert structures, and wildlife-use were photographed to help document existing channel conditions and channel use. A global position system (GPS) point obtained with a Magellan Model 315 GPS unit was collected at each photo point to tie current channel and culvert conditions into specific stream locations. These photographs and an accompanying map that shows the photo point locations have been included in Appendix A of this report to provide a visual illustration of the Fishtrap Creek watershed from its mouth to its headwaters. Photo point locations are labeled on the map in alphabetical order and have been classified into one of the following four types:

1. **Fish passage impediment (non-culvert)** - photo point shows man-made or natural channel features which may impede fish passage, but which are not culvert related. Information relative to barrier status is provided on the photo point page;
2. **Fish passage impediment (culvert)** - photos show culvert conditions and may also show habitat conditions near or at the culvert. Culvert assessment data and barrier status have been included with the photo
3. **Channel Feature** - photo shows typical habitat or unique channel features of interest;
4. **Wildlife** - photo shows some type of animal documented during the course of the surveys.

2.3 Culvert/ Fish Passage Assessment Methods

Washington Trout performed a comprehensive culvert inventory and assessment to identify the most egregious culvert barriers within the Fishtrap Creek watershed. These data, coupled with the habitat assessments, provide a scientific foundation for identifying and prioritizing culvert removal, repair, and replacement projects within the watershed. The data also provide a useful baseline against which to compare future field measurements to track changes in culvert condition and passability over time.

The culvert inventory and assessment was conducted using the protocol provided in the Washington Department of Fish and Wildlife (WDFW) *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* as presented at: <http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm>, unless the culvert was identified in the inaccessible portion of reach B following the initial culvert assessment or categorized as a low priority. Culvert field measurements included culvert material, gradient, length, and width, stream width, outfall drop, water velocity, and plunge pool characteristics. The location of the culvert, the presence or absence of substrate within the culvert, debris blocking the culvert, and other maintenance issues were noted. If warranted, surveyors drew a schematic plan-view to document unique site features. Upstream- and downstream-facing photographs of each culvert surveyed were also taken. In instances in which the culvert was identified after the culvert assessments were completed or in which the culvert was categorized as a low priority culvert, general information was collected at the culvert site, however, a comprehensive culvert assessment was not performed.

Washington Trout determined the barrier status of each assessed culvert (i.e. 'barrier' or 'non-barrier') using the WDFW assessment protocol. When culverts could not be unequivocally designated as 'barrier' or 'non-barrier' using the WDFW protocol, barrier status was recorded as 'unknown'. Such culverts must be reassessed by WDFW technical staff for a final barrier status determination. As part of the WDFW protocol Washington Trout crews also provided their own assessment of fish passability at each culvert, based on years of professional experience, to document any passage issues that may not have been identified by the WDFW protocol.

3.0 Results

3.1 Habitat Reconnaissance Summary

Instream Habitat Observations

- Two distinct habitat unit types dominated Fishtrap Creek: riffles (including shallow glides) and ponds. Although all the reaches were dominated by riffles, shallow glides (a sub-category of riffle) is found throughout Fishtrap Creek and could provide limited rearing habitat. The two man-made ponds in Reach B, Helso's Pond, and Treacy's Pond could provide additional rearing habitat if fish were able to access them.
- The ponds likely contribute to elevated summer water temperatures because of their surface area and lack of shading; temperatures measured in the small pond at 450 m and at the outlet of the large pond at 1250 m were 21° C on 5/18/04. The three ponds also provide a large water surface where evaporation could be detrimental to the flow which has already been severely limited by the redirection of Helso's pond.
- Reach C downstream from Helso's Pond is dominated by wetland characteristics that are important to Fishtrap Creek as they provide water retention and aid in ground water recharge, ecological diversity, protect water quality, and provide flood control.
- Large woody debris, pools, and spawning gravels are sparse in all reaches.

Riparian Observations

- Reach A is dominated by brush and grasses with varying degrees of cover: 90-100% in the dense stand of roses and blackberry, 0-50% where the riparian is dominated by grass. Non-native blackberry is intermittent.
- Riparian in Reach B is composed of native brush and young Douglas-fir and alder with a combined canopy of 85-95%.
- Reach C is composed of a mixed salmonberry under story and a mature alder, bigleaf maple and western red cedar overstory. Cover to the creek is 90-95%.
- Helso's Pond and both ponds in Reach B lack canopy cover.

Spawning Observations

- Only three intermittent areas of spawning gravel can be found:
 1. One stream segment with potential spawning gravels in Reach A beginning at approximately 77 m and extending intermittently for approximately 100 m upstream.
 2. One stream segment in Reach B beginning at 633 m upstream of the mouth, extending approximately 10 m.
 3. One stream segment in Reach C beginning at 1820 m, extending approximately 5 m.
 4. No spawnable gravels were observed in Treacy's Tributary

Where present, spawning gravels were poor in quality, small and sparse, more suitable for resident trout than anadromous species.

3.2 Reach Level Habitat Descriptions

REACH A

Channel Characteristics: The downstream-most reach of the watershed, extending from the mouth upstream to 300 meters, lies in an unconfined valley. The stream in this reach has been ditched and straightened. Although adjacent land-use appears to have been historically agricultural, the fields adjacent to the stream are presently lying fallow. Channel incision, significant near the creek's mouth, decreases with distance from the mouth until at approximately 150 meters there is little remaining evidence of incision. Bankfull widths varied ranging from 3.5-6.0 ft depending on the degree of incision. Wetted widths were also dependent on the degree of incision and varied from 3.3-4.3 ft.

Very little in stream wood exists to provide or create habitat complexity. Instream woody debris throughout the reach was nonexistent or, where present in the first 100 meters, sparse in quantity¹. As a result, the channel is homogenous, lacking habitat diversity. Habitat in the first 100 meters of Fishtrap Creek consisted of a deep glide (40%) and riffle habitat (60%). Shallow glides (20%) and riffle habitat (80%) encompass the remaining portion of the reach extending from 300-1400 m. Excepting a potential fish migration barrier at 60 m (Appendix A, Photo Pt A), stream gradients throughout this reach consistently range from 2-2.5%. Substrate is composed almost entirely of either clay or silt with small patches of potential spawning gravels appearing within the riffle at approximately 77 m. Where present, spawning gravels were poor in quality, small and sparse, more suitable for resident trout than anadromous species.

Riparian: The riparian corridor is dominated by a thick and impenetrable barrier of densely tangled wild rose, snowberry, and Himalayan blackberry thickets that have totally engulfed the channel. Canopy cover approaches 100% in the first 150 meters, provided predominately by wild rose and blackberry shrubs. Shrub density decreases incrementally with distance from the mouth, until the riparian zone is eventually dominated by grasses, shrubs (hawthorn and rose), and a sparse stand of fruit trees (< 4 in. in diameter) which offer limited amounts of canopy cover ranging from (15-50%). Set back approximately 70 ft and paralleling the channel on the right (west) bank is a stand of young Douglas-fir (approximately 8-12 in. in diameter). Because of their distance away from the channel the Douglas-fir trees provide minimal shade at present, but will be beneficial in future years eventually providing both shade and woody debris recruitment.

¹ Only five pieces of woody debris were observed in Reach A. All pieces were observed within the first 100 meters and all were less than 20 inches in diameter.

Fish Passage Impediments:

The channel from the mouth to a point approximately 60 meters upstream is deeply incised in a resistant clay hardpan that has headcut to create a potential fish migration barrier at approximately the 60 meter mark (Figure 1; Appendix A, Photo Point A). A V-notch plank weir immediately upstream from the headcut, installed by project partners to evaluate the watershed's hydrograph, further exasperates fish passage by increasing the overall drop to the channel below. The drop from the water surface upstream of the weir to the water surface in the channel below the clay plunge (located at the upstream end of the headcut) was 4.8 ft over a distance of 14.7 ft. Thus, the gradient for this short stream segment is 32.6%. The drop from the water surface just below the weir to the water surface below the clay plunge is 3.93 ft. Part of the distance from the weir to the final vertical plunge of 2.05 ft at the clay drop off is a short steep cascade. Water depth at the base of the clay plunge was 0.29 ft. The complete lack of plunge pool depth makes upstream fish migration very unlikely, except possibly during extremely high tides.

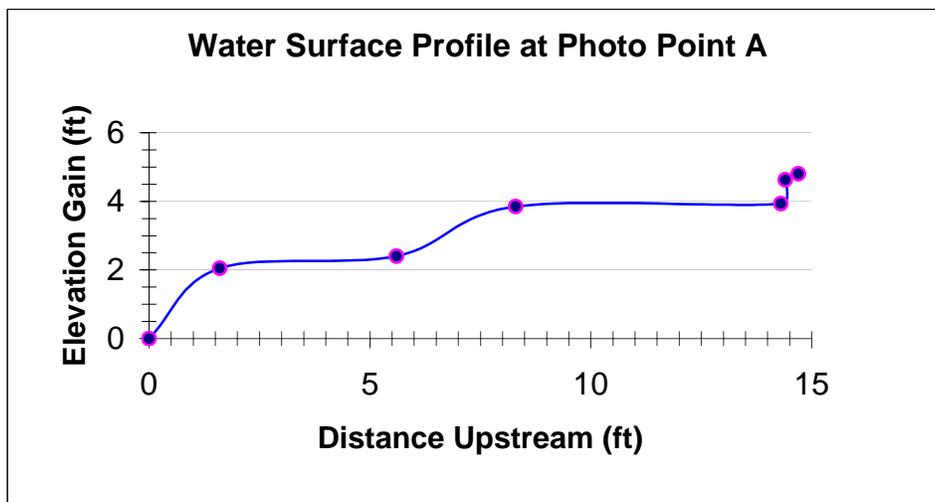


Figure 1: Water surface measurements at Photo Point A. The increase in water surface elevations is caused by headcutting and a plank weir located 60 m upstream of the mouth on Fishtrap Creek. The impediment extends for 14.7 ft upstream. Total elevation rise is 4.8 ft, resulting in a 32.6% gradient.

Reach B

Channel Characteristics: Reach B, extending from 300 to 1400 meters, was surveyed on May 18, 2004 (Appendix A, Map 1). This survey began in the upper portion of the unconfined valley where the gradient begins to increase. The creek appears to be ditched throughout the upper two thirds of this reach.

A small man-made pond, approximately 26.5 m by 25.3 m (80 ft by 76 ft) in size, is located approximately 50 m (150 ft) downstream of the Cormorant Bay Road crossing.

Pond depth was not measured. The pond's outlet structure is an anthropogenic barrier to fish migration. The spillway at the pond culvert outlet is undermined and water is percolating through the dam and under the spillway. The spillway is broken in the middle, and there is a 2 ft vertical drop to the 2nd half of the spillway. The bottom of the spillway drops 2 ft to the stream channel. The stream channel downstream of the spillway is diked and armored with riprap for approximately 10 m (30 ft) at >20% gradient (Appendix A, Photo Point B). The water temperature of the pond was 21.0° C on 5/18/04. Anecdotal reports suggest the pond had been stocked with trout in the past. While no fish were observed in the pond during the survey, fyke netting or another method of sampling would be necessary to confirm fish absence. There was very little water flowing downstream of the pond dam and spillway.

From the pond upstream to Cormorant Bay Road the channel is moderately confined in the valley bottom. Bankfull width is 4.7 ft and wetted width is 2 ft. Woody debris is completely absent. The channel is void of habitat diversity, composed of one long riffle. Channel gradient is 2%. Substrate is 90% mud, 8% sand and 2% gravel.

Upstream of the Cormorant Bay road, riffle habitat continues to dominate the channel, however, gravel and cobble abundance increases. Bankfull and wetted width remains the same at 4.7 ft and 2 ft respectively. Channel gradient increases slightly ranging from 2-2.5%. A short stream segment beginning at approximate 633 meters could support spawning by resident salmonid species and possibly small-bodied anadromous species including sea-run cutthroat trout and small coho. Substrate within this segment is composed of 10% mud, 30% sand, 30% gravel, 25% cobble and 5% organics.

At approximately 666 meters, a bedrock waterfall and cascade drops 5 ft over a linear distance of 10 ft (Appendix A, Photo Point D). There is a 2.4 ft vertical drop at the bottom into a plunge pool, the largest pool on the entire creek: 4 ft long, 2.7 ft wide and 0.52 ft deep. Despite the plunge pool, with the present-day low flows associated with Fishtrap Creek it is doubtful that fish could migrate upstream over the falls/cascade complex. The complex does not meet minimum WA Dept. of Natural Resources height/gradient requirements for a fish migration barrier, and it is possible that it is passable during some high flows.

An additional, fish-passable cascade with approximately 7% gradient exists within 200 ft upstream of the waterfall cascade complex. The stream appears to have been ditched from the upstream end of this second cascade to the large pond at 1250 meters. The upper end of the ditched channel from approximately 900-1250 m runs through a pasture where horses have several access points to the stream and to the large pond – the large pond is approximately 75 m by 33 m (225 by 100 ft) in size and extends from approximately 1250-1325 m (Appendix A, Photo Points E and F). Water temperature taken at the pond inlet was 13.9° on 5/18/04; water temperature taken at the pond outlet was 21°C on 5/18/04. Instream habitat upstream of the second cascade was dominated by riffles, with approximately 5% shallow glides from approximately 700-1000 m. A shallow glide with a substrate composed entirely of mud comprises the habitat from station 1000-1250 m. With exception to the large pond this shallow glide habitat continues upstream to the end

of Reach B at 1400 m. Usable gravels for spawning were not documented within the reach upstream of the falls/cascade complex.

Riparian: The tree canopy extending from 300 meters upstream to the small man-made pond south of Cormorant Bay Road is dominated by shrubs (snowberry, salmonberry and nootka rose), and various rushes, grasses, and horsetail. Intermixed within the shrubs are small stands of 4-7 in. diameter Douglas-fir, grand-fir 4-16 in. in diameter, and the occasional domestic plum. Overall, canopy cover in this stream segment is 90%.

The riparian corridor surrounding the small man-made pond is composed of 6-12 in. Douglas-fir, grand-fir, and Rocky Mnt. juniper on the north and south ends of the pond. At the north end of the pond, 12-20 in. diameter Douglas-fir and 3-6 in. diameter alder are mixed within the 6-12 in. conifers. Also present, and in denser thickets on the east and west sides of the pond are willow, snowberry, nootka rose, evergreen blackberry, Himalayan blackberry, bracken ferns, and cattail. Pond canopy cover is limited to approximately 15% coverage.

The stream corridor extending from the man-made pond upstream to the Cormorant Bay Road is composed of snowberry, nootka rose, Himalayan Blackberry, trailing blackberry, evergreen blackberry, oceanspray, and thimbleberry, with young alders, 6-30 in. diameter Douglas-fir, and the occasional big-leaf maple. Canopy cover is 95%.

Canopy cover remains high (85-95%) from the Cormorant Bay Road upstream to approximately 1100 meters composed predominantly of Douglas-fir ranging from 2-20 in. in diameter, western red cedar 4-15 in. in diameter, and young alder up to 10 in. in diameter with sporadic stands of crabapple or hawthorn. Undergrowth in this stream segment is composed of snowberry, ocean spray, rose, blackberry, and honeysuckle shrubs, intermixed with clusters of common ferns (sword, bracken etc.), nettles, wild parsley, rushes and sedges. Although riparian composition remains the same, canopy cover decreases through the pasture extending from 1100 meters to the large pond at 1250 meters.

The riparian area surrounding the large pond is composed of deciduous trees, young alder and willow less than 14 in. in diameter. These trees provide some shade near the banks (~10%); but pond cover remains inadequate. Canary reed grass, rushes, sedges, rose and snowberry line the banks and outer-margins of the pond. Canary reed grass and what appears to be milfoil have encroached on the ponds inlet choking the channel coming into the pond. Douglas-fir (4-8 in. in diameter) and Alder (2-14 in.) dominate the riparian corridor upstream of the pond to the end of Reach B providing ample amounts of canopy cover (90%). Interspersed among the trees are salmonberry, trailing blackberry, rose, nettles, and an occasional skunk cabbage.

Fish Passage Impediments: (See **Reach B** -paragraphs two and five above)

Reach C

Channel characteristics: Reach C, extending from Sta. 1400-2700 meters, was surveyed on March 25, 2004 (Appendix A, Map 1). This upper reach of Fishtrap Creek extends from approximately 100 ft downstream of Penny Lane upstream to the headwater pond, commonly known as Helso's pond.

From 1400-1800 m the channel wanders through an unconfined valley bottom approximately 85ft broad with forested wetland characteristics (Appendix A, Photo Point J). Bankfull widths through the forested wetland varied considerably and were difficult to measure accurately, however, active channel widths generally ranged from 2-12 ft. Wetted widths range from 0.6-12 ft. Water temperature throughout the wetland ranged from 8.0-8.75°C on 3/15/04. Habitat is dominated by a very shallow slow moving glide which flows through the meandering and often indeterminate channel or channels. Instream woody debris abundance increases through the wetland², but substrate composition and low flows prohibit pool formation. Consequently, no pools were observed. Substrate is composed of 100% muck or silt. There are no gravels suitable for spawning.

At approximately 1800 m the valley sides close in and stream gradients increase from 2-3% to 8-9%, reaching 13% just below the pond's dam. Potential spawning gravels were observed for a short distance (~5.0 m) beginning at approximately 1820 m. Although small in size these gravels were the best in quality observed in the system (Appendix A, Photo Point K). The gravel source appears to be an old road-bed which parallels the channel on the east slope. Surface water flows diminish and become intermittent from approximately 1700-2200 m (Appendix A, Photo Points L and M). Much of stream channel in this stream segment has been selectively logged and cleared leaving prominent openings in the canopy. Streamflow goes totally subsurface for approximately 75 ft downstream of the pond outlet where much of the channel has been destroyed during dam construction (Appendix A, Photo Point N). Because Helo's Pond and Fishtrap Creek are only connected by a stem-pipe/culvert structure with a valve that is currently shut-off, the pond outlet prohibits water from entering the Fishtrap Creek channel. As a result, at the time of the survey, the pond's overflow was directed in the opposite direction away from Fishtrap Creek and into Skull Creek, an adjacent watershed.

Riparian: A lower canopy of shrubs and emergents dominated by salmonberry and skunk cabbage cover the valley floor throughout the forested wetland. Mixed within the salmonberry and skunk cabbage are salal, gooseberry, Himalayan blackberries, devils club, horsetail and various ferns. A mixed deciduous/conifer overstory of big leaf maple, alder and large western red cedar up to 5.5 ft in diameter is interspersed throughout the forested wetland and covers the surrounding slopes. Collectively the overstory and understory provides 60-80% canopy cover to shade the stream.

² Fifteen pieces of LWD was observed between 1400m and 1800m. Eight of the fifteen pieces of wood were greater than 20 in. in diameter.

Reach C right-bank tributary: Treacy's Tributary

Channel Characteristics: Treacy's Tributary was surveyed from its mouth located at approximately 1500 meters on Reach C, upstream to Treacy's pond. While the lower reach of this tributary flows through an unconfined valley, the valley floor closes rapidly upstream of the sediment deposition/wetland located at Photo Pt Q (Appendix A, Map 1) and the channel becomes quite confined. Bankfull and wetted width vary from 2.4-13.0 ft and 2.4-12.3 ft respectively, with broader widths in the moderately confined segment immediately upstream of the deposition and at the mouth. Except for a single high gradient (20%) bedrock chute, identified at Photo Pt R (Appendix A, Map 1), gradients through the reach were low ranging from 2.5-4%. Likewise, habitat through the reach is dominated by low gradient riffles and shallow glides excepting to two dam pools which were observed within the reach immediately upstream of the bedrock chute at Photo Pt R. The larger of the two pools was 13.0 ft long by 5.0 ft wide. Residual pool depth was 0.9 ft. With an average large woody debris abundance of 5 pieces/100 m, large woody debris is sparse, but more abundant than wood found in the mainstem Fishtrap³. Other than the bedrock chute, the substrate was composed of mud and fine sediments with only trace amounts of gravel. No spawnable gravels were observed within this tributary.

Riparian: From its mouth upstream to Deep Meadow Lane, Treacy's Tributary flows through a forested riparian corridor composed of young alder intermixed with smaller stands of mature big-leaf maple, and cedar. The riparian corridor immediately upstream of Deep Meadow Lane is void of trees as the channel meanders through the wetland and depositional material west of the road. A diverse forest composed largely of conifers, Douglas fir, 8-20+ in. in diameter, grand-fir 8-20+ in. and young western red cedar <8 in. in diameter, dominate the hillslopes upstream of the deposition where the valley walls come together. Intermixed within the conifers are deciduous alder, 8-20+ in. in diameter, and big-leaf maple 8-20+. Adjacent to the stream are dense stands of native salmonberry mixed with individual and smaller clusters of elderberry, snowberry, and various ferns. Also present are stinging nettle, horsetail, and the infrequent holly shrub. Stream canopy cover averages 50-90% with 90% of the cover being provided by trees and 10% of the canopy cover provided by shrubs.

Fish Passage Impediments: Fish passage in Reach C is impeded by five culverts - four on the mainstem and one on Treacy's Tributary (Appendix A, Photo Points G, H, N, O, and P), by intermittent flows and channel destruction attributable to dam construction and outlet pipe closure at Helso's Pond (Appendix A, Photo Point N), and by two non-culvert impediments, both on Treacy's Tributary (Appendix A, Photo Points Q and R). Details with regard to culvert impediments are presented in Appendix A. A summary of the non-culvert impediments at Photo Points Q and R follows:

Treacy's Tributary Photo Point Q - sediment deposition west of Deep Meadow Lane has resulted in an unconsolidated and undefined channel through this segment of Treacy's

³ Fifteen pieces of LWD were observed in the reach from Photo Pt Q upstream to Treacy's Pond (approximately 300 meters); three pieces were >20" in diameter, eleven pieces ranged from 8-20" in diameter, and one piece was <8.0" in diameter.

Tributary. Consequently, although some of the stream flow remains in Treacy's Tributary substantial amounts of water are absorbed into the depositional soils and resulting wetland west of Deep Meadow Lane. As a result, fish passage upstream is thwarted by inadequate water depths.

Treacy's Tributary Photo Point R - a high gradient (20%) bedrock chute and constricted channel 21 ft in length could impede fish passage.

3.3 Fish Passage Assessment Results

In total, 12 culverts were identified in the watershed. Of the twelve culverts identified, eight were formally inventoried and assessed during the culvert assessment surveys conducted in March 2004 (Appendix A, Photo Points C, G, H, N and P). Two culverts, the pond outlet culvert at 450 m (Appendix A, Photo Point B) and overflow culvert at 2700 m (Appendix A, Photo Point O) were informally assessed and photographed, but not officially surveyed. Access to survey the pond outlet culvert at 450 m was secured only after the culvert assessments had been completed and the overflow culvert at 2700 m was classified as a low priority culvert because it drains into the Skull Creek drainage. Two additional small ABS and/or steel pipes, 0.65 ft in diameter, which drain the ditch paralleling Deep Meadow Lane, were also classified as low priority. The location and size of these pipes was documented, however, the pipes were not photographed or assessed (Appendix A-Map 1). The most northerly of the two road drainage pipes is 90% plugged with sediment.

Passage status and culvert data for each individually assessed culvert and/or fish passage impediment is presented along with its Photo Point picture in Appendix A. The assessment data and passage status for each impediment and/or assessed culvert is assembled in entirety in Appendix A-Table 1.

Fish Passage Impediments were identified at eleven locations in the watershed (Appendix A, Map 1):

- (a) the headcut falls near the mouth of the watershed (Photo Pt A);
 - (b) the spillway to the small man-made pond at 450m (Photo Pt B);
 - (c) Cormorant Bay Road culvert (Photo Pt C);
 - (d) a natural falls/cascade complex (Photo Pt D);
 - (e) a private driveway with three culverts on Fishtrap Creek (Photo Pt G);
 - (f) a second private driveway culvert on Fishtrap Creek (Photo Pt H);
 - (g) the outlet of Helso's Pond (Photo Pt N);
 - (h) the overflow of Helso's Pond (Photo Pt O);
 - (i) Deep Meadow Lane Culvert (Photo Pt P);
 - (j) sediment deposition on Treacy's Tributary (Photo Pt Q)
 - (k) a bedrock chute on Treacy's Tributary (Photo Pt R)
- The weir and vertical drop located approximately 60 m upstream of the mouth is a significant impediment and may be a complete barrier to fish migration: overall drop of 4.8 ft with a final plunge of 2.05ft. This needs to be observed at high tide and high flows to make a barrier status determination (Appendix A, Photo Point A).

- The pond outlet at approximately 450 m is a complete barrier to fish migration (Appendix A, Photo Point B).
- The (Fish-01) culvert at the Cormorant Bay Road crossing has a slope of 4.91%, which exceeds WDFW fish passage standards (Appendix A, Photo Point C).
- The 5ft waterfalls at 666 m is an impediment and potential barrier to upstream migration with so little water in the stream, but does not meet minimum DNR criteria for a fish barrier (Appendix A, Photo Point D).
- Lack of water and flow in the upper segments of Reach C inhibits fish use.
- The (Fish-02) culverts appear by Washington Trout Crews to be 100% passable, however, because these culverts do not have substrate throughout and because the maximum water depth does not meet WDFW recommended standards for salmonids, these culverts could not be unequivocally designated as ‘barrier’ or ‘non-barrier’ using the WDFW protocol. Consequently, barrier status was recorded as ‘unknown’ and further analysis is needed to determine passage status (Appendix A, Photo Point G). A level B survey has been conducted on this culvert, however, level B analysis was not part of this survey. Level B culvert information is available upon request.
- The (Fish-03) culvert appears by Washington Trout Crews to be 33% passable at the time of the survey. Water depth appears to be problematic, prohibiting some fish from passing the culvert. Because the culvert/toe ratio does not meet WDFW recommended standards this culvert could not be unequivocally designated as ‘barrier’ or ‘non-barrier’ using the WDFW protocol. Consequently, barrier status was recorded as ‘unknown’ and further analysis is needed to determine passage status (Appendix A, Photo Point H). A level B survey has been conducted on this culvert, however, level B analysis was not part of this survey. Level B culvert information is available upon request.
- The disconnection between Helso’s pond at the headwaters and the stream does not provide for fish passage. The earthen dam may also be at risk for failure during earthquakes or storm events. It currently leaks an estimated 2 gallons a minute according to the landowner (Appendix A, Photo Point N).
- The (Fish-04) culvert appears by Washington Trout Crews to be 33% passable, however, because the culvert/toe ratio and water depth inside the culvert does not meet WDFW recommended standards this culvert could not be unequivocally designated as ‘barrier’ or ‘non-barrier’ using the WDFW protocol. Consequently, barrier status was recorded as ‘unknown’ and further analysis is needed by WDFW staff to determine passage status (Appendix A, Photo Point P). A level B survey has been conducted on this culvert, however, level B analysis was not part of this survey. Level B culvert information is available upon request.

- Sediment deposition west of Deep Meadow Lane on Treacy's Tributary has resulted a large sediment plug 25-33 m (75-100 ft) in length which depletes flows into Fishtrap Creek and impedes fish passage (Appendix A, Photo Pt Q).
- A high gradient (20%) bedrock chute and constricted channel 21 ft in length could impede fish passage at Photo Point R on Treacy's Tributary (Appendix A, Photo R).

3.4 Provisional Fish Observations

A comprehensive fish presence survey was outside of the scope of this project. While minor fish sampling efforts performed during spring 2004 did not yield any fish, it is possible that fish are residing in some of the numerous ponds found within the watershed, or in stream reaches that were not surveyed for fish presence by Washington Trout.

No fish were observed during the habitat and fish passage surveys or while sampling with a Smith-Root backpack electrofishing unit at likely fish-holding habitats at road crossings and upstream of the Cormorant Bay Road.

Based on Washington Department of Natural Resource protocol, Fishtrap Creek meets the physical criteria for Type-3 waters from its mouth upstream to Helso's Pond and from the mouth of Treacy's Tributary upstream to Treacy's pond.

4.0 Restoration Recommendations

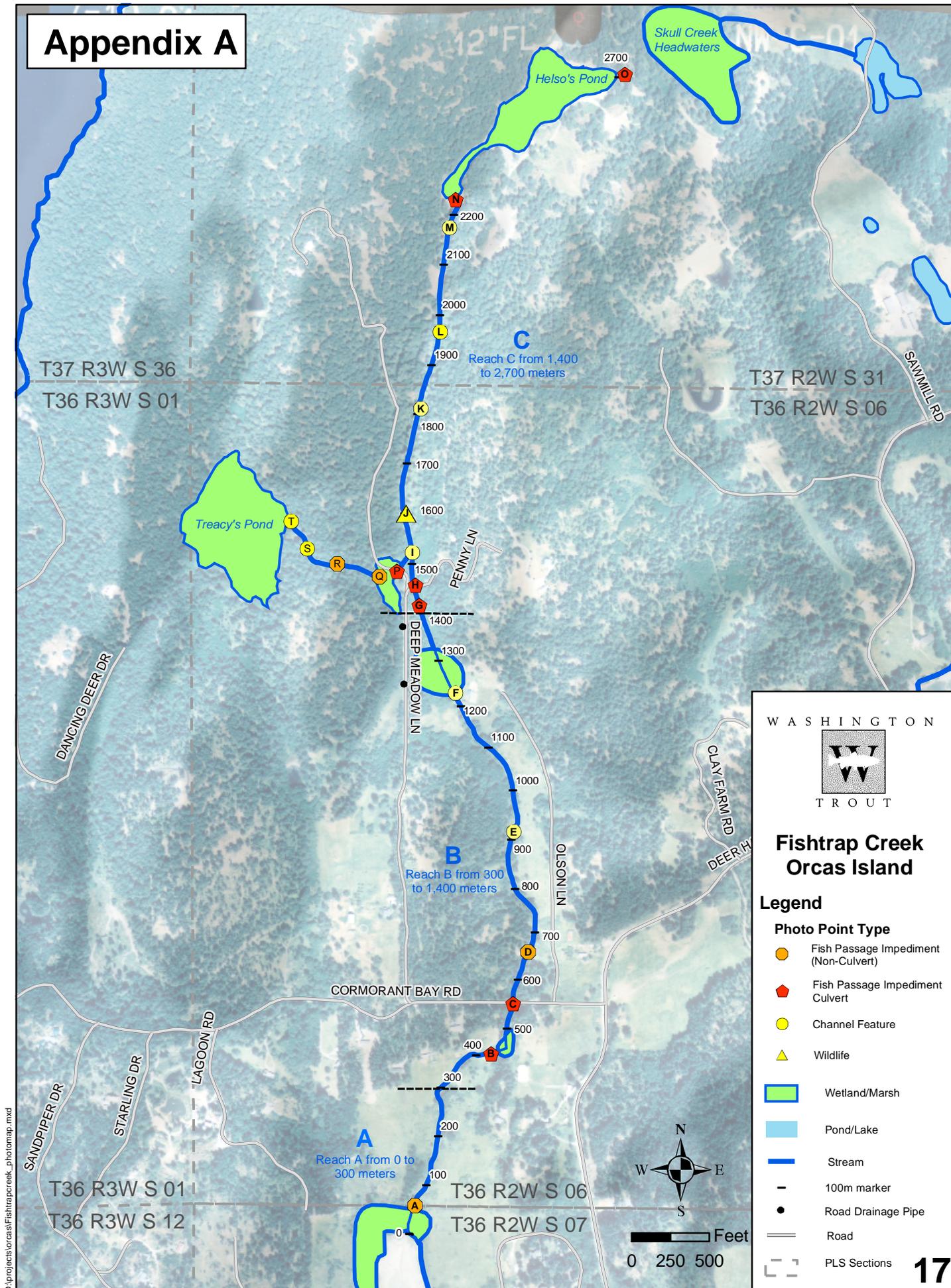
Anecdotal information suggests that Fishtrap Creek historically supported cutthroat trout and possibly coho salmon. To meet the goal of making Fishtrap Creek more suitable for salmonids given its current conditions, Washington Trout provides the following recommendations:

- At present, the hydrology of Fishtrap Creek has been significantly altered by the construction of Helso's Pond in 2001, and subsequent retention and redirection of water that used to flow down Fishtrap Creek. Because this significant anthropogenic modification occurred in the Creek's headwaters, it has altered the processes of sediment transport, wood recruitment, habitat formation, nutrient cycling, and fish passage, thereby compromising the ecological integrity of the entire watershed. An effort must be made to restore the Creek's hydrology by reconfiguring the outlets of Helso's Pond so that Fishtrap Creek receives its historical timing, magnitude and frequency of streamflows.
- Numerous anthropogenic impediments to fish passage exist throughout the watershed. These full and partial barriers restrict fish access throughout the watershed, blocking resident and anadromous fish from accessing important spawning and rearing habitats. A prioritized list includes:
 - The weir and vertical drop located 60m upstream of the mouth impedes anadromous fish access to the watershed. The notched weir (installed to

collect hydrological data) should be removed as soon as possible. The presence of the headcut step is likely the result of, or has been exacerbated by, hydromodification associated with the ditching and straightening of the lower reach of the creek. Passage at the headcut can be improved using several techniques, including placing weirs downstream from the headcut to reduce the water surface to water surface height of the feature by backwatering it; or installing grade control features upstream and downstream from the site and re-grading the step. Project designs should be undertaken only after additional monitoring is performed to evaluate the passability of the feature during high tides.

- Reconnect Treacy's Tributary, the right bank tributary to Fishtrap Creek. This creek currently provides an estimated 40-50% of the flow in Fishtrap. The tributary has a significant sediment plug for 25-33m (75-100 ft) with no channel formation upstream of its road crossing under Deep Meadow Lane that is upstream of its confluence with Fishtrap (approximately 23 m upstream of Penny Lane (private drive)).
 - Replace the outlet of the pond downstream of Cormorant Bay Road at 450 m with a fishway allowing fish passage into and above the pond.
 - Replace the Cormorant Bay Road culvert with one that meets WDFW fish passage criteria.
-
- Obtain conservation easements or other commitment from landowners to protect habitat conditions within those reaches with intact riparian zones.
 - Encourage landowners to plant native trees and shrubs, especially throughout Reach A, and around the ponds.
 - Increase habitat complexity in the lower 300 meters of the stream by naturalizing the stream channel - adding meanders and large wood and possibly rock to provide both cover and aid in pool formation. Design should be based on historical information for that reach of Fishtrap Creek, or based on an appropriately similar analog watershed. Design should address headcut located 60m upstream from the stream mouth.

Appendix A



D:\projects\orcas\Fishtrapcreek_photomap.mxd

Appendix B - Fish Passage Assessment Matrix

Photo Point Number (Map ID)	WT ID	Survey Date	Barrier per WDFW	Fishpass Barrier per WT	Ownership	Diameter	Length (ft)	BedMat	Outfall Drop (ft)	Culvert Slope (%)	Water depth in culvert (ft)	Velocity (ft/s)	FillDepth (ft)	Plunge Pool Length (ft)	Plunge Pool Max Depth (ft)	Notes
A	N/A	3/23/2004	Unknown	Impediment	Private	N/A	14.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This is a vertical drop of 2.05 ft caused by headcutting in resistant glacial hardpan further exasperated by a V-Notch plank weir (0.7 ft drop) upstream of the headcut. A short cascade exists between the weir and the final drop: total distance of 14.7 ft with a total drop of 4.8 ft for a slope of 32.6%. No plunge pool at the bottom of the final drop and shallow water makes this an extremely difficult obstacle for upstream fish passage. Extremely high tides may ease fish passage.
B	N/A	5/18/2004	Barrier	Barrier	Private	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	Broken spillway at outlet of pond: 2 ft drop from existing spillway to broken section then 2 ft drop from the broken section to a rip rap channel.
C	Fish-01	3/23/2003	Barrier	Barrier	County	1.5	45.21	None	0	4.91	0.65	1	8.7	N/A	N/A	Pool at outlet of culvert measuring 6.3 ft long x 5.7 ft wide with maximum depth of 0.65 ft. Pool at outlet of culvert is Not a plunge pool.
D	N/A	5/18/2004	N/A	Impediment	Private	N/A	10	Boulder	N/A	N/A	N/A	N/A	N/A	N/A	0.52	Waterfalls/cascade with a total drop of 5 ft in a distance of 10ft. Final drop of 2.4 ft is into a plunge pool 0.52 ft deep.
G-1.3	Fish-02	3/23/2004	Unknown	Passable	Private	1.0	20.75	None	0	0.43	0.41	*	0.93	N/A	N/A	WDFW barrier status is Unknown according to protocol; WT believes the culvert is 100% passable.
G-2.3	Fish-02	3/23/2004	Unknown	Passable	Private	1.0	20.75	None	0	0.14	0.43	*	0.93	N/A	N/A	WDFW barrier status is Unknown according to protocol; WT believes the culvert is 100% passable.
G-3.3	Fish-02	3/23/2004	Unknown	Passable	Private	1.0	20.75	None	0	0.14	0.42	*	0.92	N/A	N/A	WDFW barrier status is Unknown according to protocol; WT believes the culvert is 100% passable.
H	Fish-03	3/23/2004	Unknown	Barrier	Private	2.0 / 1.5	20	Yes	0	-0.3	0.2	0.98	1.29	N/A	N/A	WDFW barrier status is Unknown according to protocol; WT believes the culvert is 33% passable. Water depth appears to be a problem.
N	Fish-05	3/23/2004	Unknown	Barrier	Private	0.5	Unk	None	0.75	Unk	0	0	~12.31	N/A	N/A	Outlet culvert to Helso's pond. This pipe has a valve, which is closed at the present time with no fish passage provided. We could not measure slope, because we could not find the inlet, which is several feet below the water level.
O	N/A	3/23/2004	Unknown	Barrier	Private	1.0	Unk	None	Unk	Unk	0	0	Unk	N/A	N/A	Overflow culvert to Helso's pond. This culvert is not designed to pass fish.
P	Fish-04	3/23/2004	Unknown	Barrier	Private	1.0	30	Yes	0	0.2	0.21	1.78	2.12	N/A	N/A	WDFW barrier status is Unknown according to protocol because of the culvert/toe ratio (41.6%); WT believes the culvert is 33% passable. Water depth appears problematic in this culvert.
Q	N/A	3/23/2004	N/A	Impediment	Private	N/A	75-100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Sediment plug on Treacy's Tributary.
R	N/A	3/23/2004	N/A	Impediment	Private	N/A	21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This is a high gradient bedrock chute on Treacy's Tributary. The chute has a gradient of 20% and extends for 21.0 ft.

* Water velocity is too slow to measure.

Appendix C

Photo Points and Associated Data

PHOTO POINT A

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #s	Survey Date
A	N/A	N/A	N/A	Impediment	1, 2	3/24/04
Shape	Material	Coating	Span	Rise	Length	Bed Material
N/A	N/A	N/A	N/A	N/A	N/A	N/A
Outfall Drop	Culvert Slope	Water Depth	Velocity	Slope Break	Toe	Culv/Toe Ratio
N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comments:						
<p>This is an impediment attributable to a vertical drop of 2.05 ft caused by headcutting in resistant glacial hardpan, further exasperated by a V-notched plank weir (0.7ft drop) upstream of the headcut. A short cascade exists between the weir and the final drop: total distance of 14.7 ft with a total drop of 4.8ft for a slope of 32.6%. No plunge pool at the bottom of the final drop and shallow water makes this an extremely difficult obstacle for upstream fish passage. Extremely high tides may ease fish passage.</p>						



Photo Point A - Photo 1: Headcut channel and clay plunge located at the base of the V-notched weir.

PHOTO POINT A (CON'T)



Photo Point A - Photo 2: V-notched plank weir immediately upstream of the headcut in Photo 1. The weir, installed by project partners to evaluate the watershed's hydrograph, exasperates fish passage by increasing the overall drop to the channel below.

PHOTO POINT B

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
B	N/A	1.1	Barrier	Barrier	3, 4	5/18/2004
Location		Shape	Material	Span (ft)	Rise (ft)	Length
Pond Outlet (@ 450 m)		RND	CST	1.5	1.5	N/A
Culvert Slope	Slope Break	Bed Material	Culvert Water Depth	Velocity	Outfall Drop	Plunge Pool Max. Depth
N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plunge Pool Length x Width	Toe (ft)	Culv/Toe Ratio	Fill Depth (ft)	Ownership	Problem	
N/A	N/A	N/A	-8-9	Private	Outfall Drop	
Comments:						
Broken concrete spillway on pond culvert outlet: 2ft drop from existing spillway to broken spillway section then a 2ft drop from the broken section to a rip rapped channel.						



Photo Point B - Photo 3: Broken concrete spillway with 2 ft vertical drops between broken spillway slabs. The channel downstream of the spillway is completely rip rapped with a 20% gradient.

PHOTO POINT B (CON'T)



Photo Point B - Photo 4: Pond associated with Photo #3 culvert and spillway. This pond is located approximately 450 m upstream of the mouth and approximately 50 m downstream of Cormorant Bay Road.

PHOTO POINT C

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
C	FISH-01	1.1	Barrier	67% Passage	4,5,6,7	3/23/04
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Cormorant Bay Road (~550 m)		RND	PCC/CAL	1.5	1.5	45.21
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth
4.91	No	No	0.65	~1.0	No	N/A
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
N/A	4.7	31.9	8.7	County	Slope and Culv./Toe ratio	
<p>A pool exists at the culvert outlet, however, this is not a plunge pool. Max pool depth is 0.65 ft. Pool dimensions are 6.3 ft long x 5.7 ft wide. Backwatering within this culvert helps passage at this time, nevertheless, velocities could prohibit passage during high flows due to the high 4.9% gradient. This culvert exceeds WDFW slope recommendations and does not meet the WDFW culvert to toe ratio recommendations.</p>						



Photo Point C – Photo 5: Typical channel habitat immediately downstream of the Cormorant Bay Road culvert (Fish-01). Average bankfull width downstream equals 5.2 ft.

PHOTO POINT C (CON'T)



Photo Point C - Photo 6: Outlet of the Cormorant Bay Road Culvert (Fish-01).



Photo Point C - Photo 7: Inlet of the Comorant Bay Road culvert.

PHOTO POINT C (CON'T)



Photo Point C - Photo 8: Typical channel habitat upstream of the Comorant Bay Road culvert. Average bankfull width equals 2.9 ft.

PHOTO POINT D

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
D	N/A	N/A	N/A	Impediment	9	5/18/2004
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
~STA. 650 m		N/A	N/A	N/A	N/A	10
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
N/A	N/A	N/A	N/A	N/A	N/A	0.52
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
4.0 x 2.7	N/A	N/A	N/A	N/A	Cascade/Waterfall - slope	
Comments:						
This is a cascading waterfall with a 50% slope (total drop of 5 ft over 10 ft distance). The cascade has a final drop of 2.4 ft into a plunge pool which is 0.52 ft in depth.						



Photo Point D - Photo 9: A bedrock waterfall and cascade which drops 5ft over a linear distance of 10ft.

PHOTO POINT E



Photo Point E - Photo 10: Ditched channel between 900 m and 1,000 m.

PHOTO POINT F



Photo Point F - Photo 11: Ditched section of Fishtrap Creek accessible to livestock.



Photo Point F - Photo 12: Private pond located approximately 1250 m upstream of the mouth and immediately upstream of the ditched channel in Photo 11.

PHOTO POINT G

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
G	FISH-02	1.3	UNK	100% Passable	13,14,15,16	3/23/04
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Private Drive (~1410 m)		RND	Smooth - ABS	1.0	1.0	20.75
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
0.4	No	No	0.41	Stagnant	No	0.43
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
6.5 x 6.3	3.5	85.71*	0.93	Private	No material throughout culvert.	
Comments:						
This culvert is located on the left bank and is the first of three adjoining culverts at this site. WDFW barrier status is unknown according to protocol. WT crews believe this culvert is 100% passable, but velocity and water depth should be measured during high flows to confirm this. Velocity at the time of the survey was too slow to measure. * Culv./Toe Ratio (%) was based on the cumulative total span width of the three culverts. Level B survey data is available upon request.						

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
G	FISH-02	2.3	UNK	100% Passable	13,14,15,16	3/23/04
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Private Drive (~ 1410 m)		RND	Smooth - ABS	1.0	1.0	20.75
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
0.1	No	No	0.43	Stagnant	No	0.43
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
6.5 x 6.3	3.5	85.71*	0.93	Private	No material throughout culvert.	
Comments:						
This culvert is located mid-channel and is the second of three adjoining culverts at this site. WDFW barrier status is unknown according to protocol. WT crews believe this culvert is 100% passable, but velocity and water depth should be measured during high flows to confirm this. Velocity at the time of the survey was too slow to measure. * Culv./Toe Ratio (%) was based on the cumulative total span width of the three culverts. A level B survey is available upon request.						

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
G	FISH-02	3.3	UNK	100% Passable	13,14,15,16	3/23/04
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Private Drive (1410 m)		RND	Smooth - ABS	1.0	1.0	20.75
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
0.1	No	No	0.42	Stagnant	No	0.43
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
6.5 x 6.3	3.5	85.71*	0.92	Private	No material throughout culvert.	
Comments:						
This culvert is located on the right bank and is the third of three adjoining culverts at this site. WDFW barrier status is unknown according to protocol. WT crews believe this culvert is 100% passable, but velocity and water depth should be measured during high flows to confirm this. Velocity at the time of the survey was too slow to measure. * Culv./Toe Ratio (%) was based on the cumulative total span width of the three culverts. A level B survey is available upon request.						

PHOTO POINT G (CON'T)



Photo Point G - Photo 13: Typical channel habitat downstream of the Fish-02 culverts.



Photo Point G - Photo 14: Outlet of the Fish-02 culverts crossing a private drive located at 1410 m.

PHOTO POINT G (CON'T)



Photo Point G - Photo 15: Inlet of the Fish-02 culverts.



Photo Point G - Photo 16: Typical channel habitat upstream of the Fish-02 culvert inlets.

PHOTO POINT H

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
H	FISH-03	1.1	UNK	33% Passable		3/23/2004
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Penny Lane		RND	Smooth - ABS	2.0 DS / 1.5 US*	2.0 / 1.5	20
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
-0.3	No	Yes	0.2	0.98	No	N/A
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
N/A	3.6	41.67	1.29	Private	Culv./Toe Ratio; Water depth	
Comments:						
WDFW barrier status is unknown according to protocol. WT crews believe this culvert is currently 33% passable; depth appears problematic and the culvert may be undersized, further analysis is needed during higher flows.* The culvert has a 2.0 ft diameter at the outlet and a 1.5 ft diameter at the inlet. The outlet pool has a max. depth of 0.66 ft (this is not a plunge pool).						



Photo Point H - Photo 17: Typical channel downstream of the Penny Lane culvert (Fish-03).

PHOTO POINT H (CON'T)



Photo Point H-Photo 18: Outlet of Fish-03 culvert.



Photo Point H - Photo 19: Inlet of Penny Lane culvert (Fish-03).

PHOTO POINT H (CON'T)



Photo Point H - Photo 20: Looking upstream from inlet of Penny Lane culvert (Fish-03).

PHOTO POINT I



Photo Point I – Photo 21: Photo taken from the mouth of Treacy's Tributary looking downstream at typical mainstem channel habitat at 1500 m.

PHOTO POINT J



Photo Point J - Photo 22: Skunk cabbage in forested wetland habitat.

PHOTO POINT J



Photo Point J - Photo 23: Roughskin Newt (*taricha granulosa*) observed adjacent to the channel in the forested wetland.

PHOTO POINT K



Photo Point K - Photo 24: Best potential spawning gravels observed in Fishtrap.

PHOTO POINT L



Photo Point L - Photo 25: Test pit for Helso's Pond.



Photo Point L - Photo 26: Dry channel upstream of test pit.

PHOTO POINT M



Photo Point M - Photo 27: Typical channel habitat.



Photo Point M - Photo 27: Looking upstream at the dry stream channel below Helso's Pond.

PHOTO POINT N

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
N	FISH-05	1.1	UNK	100% Barrier	29, 30-33	3/23/2004
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Helso's Pond Outlet		RND	Smooth - ABS	0.5	0.5	UNK
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
UNK	UNK	No	No	N/A	0.75	N/A
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
N/A	UNK	UNK	~12.31	Private	No fish passage provided.	
Comments:						
<p>This is a 0.5 ft pipe extending from the pond through the pond dam. The pipe has a valve which was closed during our survey preventing water from flowing from Helso's pond into Fishttrap Creek. When water in the pond rises, overflow is directed through the overflow culvert at the North end of the lake (photo point O). As a result, pond overflow is forced into the Skull Creek watershed rather than flowing into Fishttrap Creek.</p>						



Photo Point N - Photo 29: Looking upstream at Fish-05 pipe at Helso's Pond.

PHOTO POINT N (CON'T)



Photo Point N - Photo 30: Outlet of the Fish-05 pipe; a closed valve on this pipe prevents lake flow from entering Fishtrap Creek.

PHOTO POINT N (CON'T)



Photo Point N - Photo 31: Valve location on the Fish-05 pipe.



Photo Point N-Photo 32: Looking upstream at Helso Lake (Photo taken from the dam at the south end of the lake).

PHOTO POINT N (CON'T)



Photo Point N - Photo 33: Helso's Pond upstream of dam.



Photo Point N - Photo 34: Looking across Helso's Lake at Fish-05 overflow culvert (white dot in center of photo) which drains into Skull Creek watershed.

PHOTO POINT 0

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
0	N/A	1.1	UNK	100% Barrier	35	3/23/2004
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Helso's Pond Outlet		RND	SST	1.05	1.05	UNK
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft3/sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
UNK	UNK	No	No	N/A	UNK	N/A
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
N/A	Pond	UNK	UNK	Private	Unkown	
Comments:						
This culvert was not designed to pass fish.						



Photo Point O – Photo 35: Outlet of the overflow culvert at Helso's Lake.

PHOTO POINT P

Map ID	Culvert ID	Sequencer	Passage Status (WDFW)	Passage Status (WT)	Photo #'s	Survey Date
P	FISH-04	1.1	UNK	33% Passable	36,37,38,39	3/23/2004
Location		Shape	Material	Span/Dia (ft)	Rise (ft)	Length (ft.)
Deep Meadow Lane		RND	CST	1.00	1.00	30.0
Culvert Slope (%)	Slope Break	Bed Material	Water Depth (ft)	Velocity (ft ³ /sec)	Outfall Drop	Plunge Pool Max. Depth (ft)
0.2	No	Yes	0.21	1.78	No	N/A
Plunge Pool Length x Width	Toe (ft)	Culv. / Toe Ratio (%)	Fill Depth (ft)	Ownership	Problem	
N/A	2.4	41.6	2.12	Private	Culv./Toe Ratio; Water Depth	
Comments:						
WDFW barrier status is unknown according to protocol; WT believes the culvert is 33% passable. Water depth inside the culvert does not meet the minimum state design recommendations of 0.8 ft for adult trout.						



Photo Point P - Photo 36: Typical channel habitat downstream of the Fish-04 culvert.

PHOTO POINT P (CON'T)



Photo Point P - Photo 37: Outlet of the Deep Meadow Lane culvert (Fish-04).



Photo Point P - Photo 38: Inlet of the Deep Meadow Lane culvert (Fish-04).

PHOTO POINT P



Photo Point P - Photo 39: Ditched channel which flows into the Deep Meadow Lane culvert (Fish-04).

PHOTO POINT Q



Photo Point Q – Photo 40: Wetland and sediment deposition blocking Treacy's Tributary.

PHOTO POINT R



Photo Point R - Photo 41: High gradient chute on Treacy's Tributary. The chute has a gradient of 20% and extends for 21.0 ft.



Photo Point R - Photo 42: Looking downstream at the high gradient chute described in Photo 41.

PHOTO POINT S



Photo Point S - Photo 43: Typical channel and habitat on Treacy's Tributary upstream of the chute.

PHOTO POINT T



Photo Point T - Photo 44: Outlet to Treacy's Pond.



Photo Point T - Photo 45: Looking out over Treacy's Pond.