

Cowlitz Wildlife Area Fish Retrofit

Habitat Program
Salmonid Screening, Habitat Enhancement
and Restoration (SSHEAR) Section

Submitted by

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INTRODUCTION

During the past 62 years, the Washington Department of Fish and Wildlife (WDFW) has acquired

approximately 808,000 acres of land to benefit fish and wildlife and provide recreational opportunities, throughout nearly every county in the state. Due to the agency's and the public's increasing interest in factors affecting fish resources, in October 1997, the Habitat Program initiated an inventory of fish passage and water diversion features on all agency owned and/or managed lands. WDFW's Salmonid Screening, Habitat Enhancement and Restoration (SSHEAR) Section was assigned this task. The purpose of the inventory is to document and prioritize for correction, all agency owned fish passage problems including culverts, dams, fishways, lake screens and unscreened or inadequately screened water diversions to ensure compliance with Washington State laws. According to RCW 77.55.060, "All dams or obstructions across or in a stream shall be fitted with a durable and efficient fishway" and RCW 77.55.040 requires that water diversions be fitted with a screen to prevent fish from entering the diversion.

Salmonids of the Pacific Northwest have long been impacted by structures installed in streams incorrectly or with no regard to the salmonid life cycle. Thousands of juvenile salmonids are killed every year when they enter inadequately screened or unscreened water diversions, by mutilation from a pump or being stranded in irrigation canals as the irrigation season comes to a conclusion. Screened water diversions that are not properly maintained can also impinge salmonids, either killing them directly or carrying them into the diversion system.

Culverts, dams, non-functioning fishways and lake outlet screens also have a very detrimental impact on salmonid populations. When these facilities result in a barrier to fish passage, spawning and rearing habitats become inaccessible. Each year, more of these structures become barriers to fish passage. Watersheds are continually being altered (e.g., development, logging, new roads, etc.), which substantially influences the hydrological dynamics of the watershed. Culverts, fishways, lake outlet screens, and water diversions that were once designed for a defined flow regime, are now incapable of handling the increased flow. Culverts become velocity barriers and contribute to scouring of huge plunge pools that in most circumstances result in large outfall drops. Even hydraulic drops less than 0.30 meter (one foot) in height are a potential barrier to adult chum salmon, juvenile salmonids and other fish species. Recent studies have shown that these small hydraulic drops can limit juvenile production by rendering valuable rearing habitat inaccessible.

In cooperation with the Lands Division of the Wildlife Program, SSHEAR staff designed a sampling protocol, database format, and Wildlife Area Scheduling Index for the inventory. To create the scheduling index of Wildlife Areas, a prioritization questionnaire was distributed to Regional Lands Coordinators, Regional Fish Biologists and Wildlife Area Managers. This enabled SSHEAR staff to take advantage of the many years of experience and data accumulated from local Wildlife Area Managers.

The questionnaire was designed to prioritize wildlife areas based on four main factors:

- ▼ number of known fish passage problems,
- ▼ stock status,
- ▼ stock mobility, and
- ▼ high profile fish passage and water diversion screening issues of public interest.

This prioritized list was then used to guide, along with other management considerations, the sequence that the wildlife areas would be inventoried. After the index was calculated for each area, they were stratified according to the time of year in which the inventory could be accomplished. Eastern areas will be scheduled in the spring and summer months and the western areas will be inventoried in the fall and winter months. The Cowlitz Wildlife Area (CWA) is the third inventory of the western areas.

WILDLIFE AREA OVERVIEW

The numerous units of the CWA are all located in Lewis County of western Washington. A total of eight different units (Cowlitz Trout Hatchery, Davis Lake, Kosmos, Mossyrock, Peterman Ridge, Spears, Kiona Creek and Swofford), as well as the buffer zones around Mayfield and Riffe lakes, comprise the 13,940 acre wildlife area. All of the units are within the Cowlitz River watershed (Figure 1). During the preparation of this report the name of the Smathers unit was changed to Kiona Creek; this report will reflect that change.

The CWA consists of lands owned by Tacoma Public Utilities (TPU) and managed by the WDFW as wildlife mitigation for Mayfield and Mossyrock dams. Almost all mitigation lands (approximately 13,940 acres) are adjacent to the reservoirs created by Mayfield and Mossyrock dams (Figure 1). The only exceptions are four small parcels, which include 243 acres located at Davis Lake east of Morton, 280 acres adjacent to the Cowlitz Trout Hatchery, 293 acres south of Randle, and 415 acres off of Savio Road west of Randle.

The CWA is surrounded primarily by commercial timber land, private farms, residential areas, and developed recreational parks. The economy of the surrounding communities is based heavily on the timber industry. The majority of the forested lands on the CWA was logged prior to dam construction. Most of these lands were reforested or allowed to re-vegetate naturally and now support hardwood and coniferous forests.

Mitigation History

The Cowlitz River Project was licensed by the Federal Energy Regulatory Commission (FERC) on November 28, 1951. In December 1999, TPU filed an application for re-licensing the project. Initially, the project consisted of Mossyrock Dam and Mayfield Dam, at river miles 65 and 52 respectively, on the Cowlitz River, Lewis County, Washington. The two reservoirs formed as a result of this project inundated approximately 14,080 acres (WDFW 2000).

On November 17, 1964, the FERC issued an Order Further Amending License (Major) for the Cowlitz Project, at which time Article 37 was incorporated into the project license.

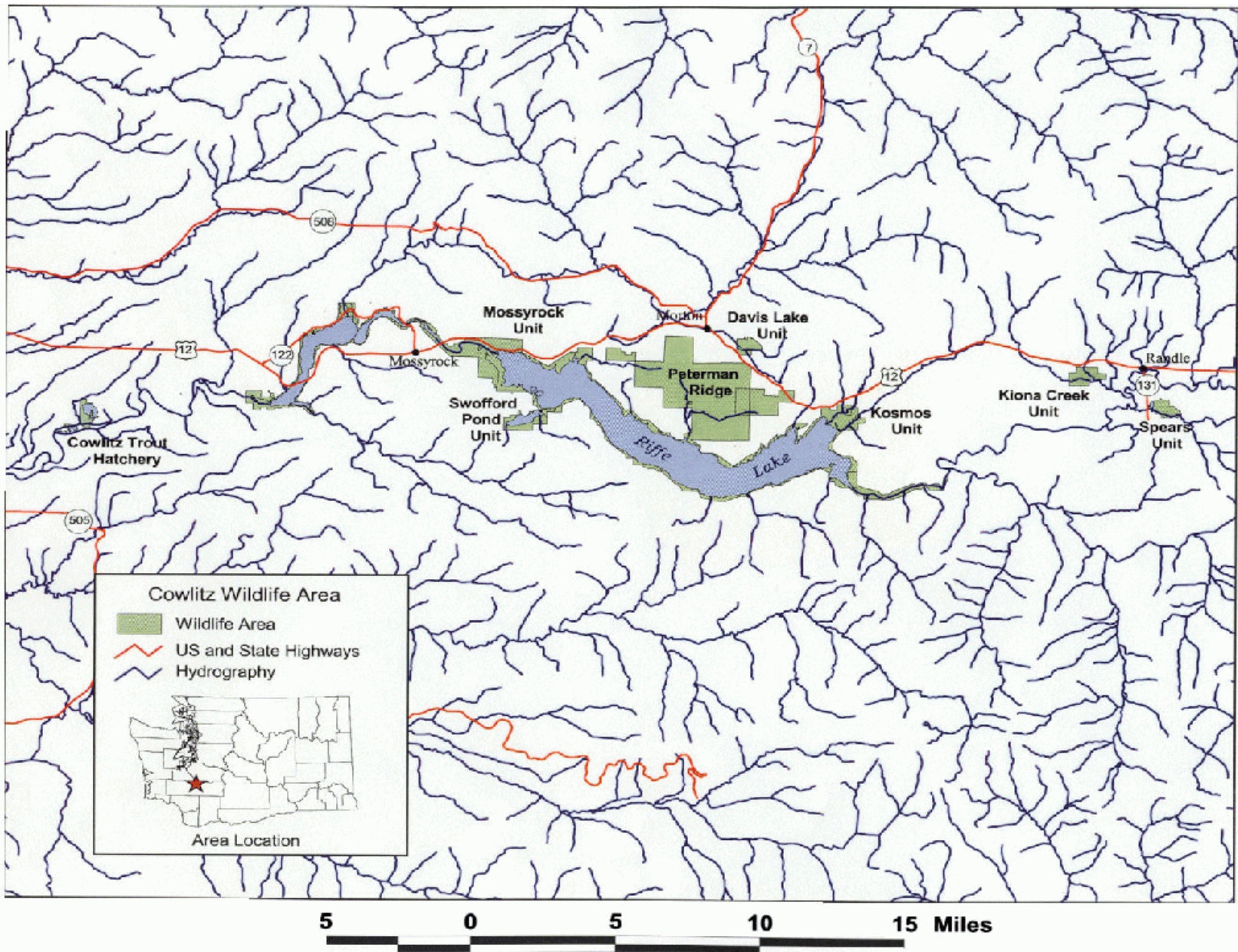


Figure 1

Since that time, license Article 37 has been regarded by the state and federal wildlife resource agencies as a mandate for TPU to mitigate for projected related wildlife impacts.

Beginning as early as 1966, the WDFW and the United States Fish and Wildlife Service (USFWS), in conjunction with TPU, studied the project's impact to wildlife habitat. Over the years, a number of wildlife enhancement measures were mutually implemented on project lands under the direction of the resource agencies.

In the early 1980's, TPU began funding full-time WDFW employees to help plan additional and more intensive habitat enhancement programs. Eventually, a significant series of intensively managed project sites were developed on approximately 1,475 acres (described in detail below). These sites, in conjunction with other, less intensively managed, project lands set aside for wildlife, totaled approximately 4,555 acres. TPU funded the personnel, equipment, and supplies necessary to operate and maintain this program.

In 1985, TPU, at the request of the WDFW and the USFWS, conducted a Habitat Evaluation Procedure (HEP) study on the project lands, to further assess the impact of the Cowlitz Project on wildlife. When Phase I of the HEP study was completed in 1986, a ledger of losses and gains in habitat units attributable to the Cowlitz Project was developed.

During subsequent years, alternative wildlife mitigation packages were discussed. Recently, a mutual agreement was reached on a package of activities TPU would undertake to mitigate for wildlife impacts. The resulting Settlement Agreement identifies and credits existing wildlife mitigation undertaken by TPU and identifies new and additional projects TPU shall undertake in satisfaction of the settlement (WDFW 2000).

The Cowlitz Falls Project was licensed by the FERC in 1986. Owned by Lewis County PUD, the project consists of the upper-most dam on the mainstem Cowlitz River, Cowlitz Falls. It was completed at river mile 88.5 in the early 1990's, creating a 610-acre reservoir and an additional barrier to migratory fish. The license agreement requires Lewis County PUD to implement a mitigation plan based on project impacts and enhancement of the fishery and wildlife resources of the project area (WDFW 1998).

Anadromous Fish Use / Existing Fish Passage Facilities

Due to the anadromous fish reintroduction program in the upper Cowlitz River, WDFW is currently managing for Chinook, Coho, Steelhead, and Searun Cutthroat throughout the Cowlitz River drainage, except in Riffe Lake and associated sub-basins.

Returning adult anadromous fish are trapped at the Cowlitz Salmon Hatchery separator, transported upstream of Mayfield and Cowlitz Falls dams, and released in the upper river to spawn naturally. No upstream volitional fish passage facilities exist at this time. As for out-migrating juveniles, Cowlitz Falls Dam is equipped with a collection facility. Fish collected here are transported to stress relief ponds at the Salmon Hatchery, then released to continue their seaward migration. Mayfield Dam has a louver system that passes downstream migrating fish through the dam itself. The Mossyrock dam, which impounds Riffe Lake, is not equipped with

downstream passage or collection facilities (E,I,S, Cowlitz River Hydroelectric Project [FERC 2016] 2001), hence the non-anadromous management of Riffe Lake and associated sub-basins.

Unit Description

Cowlitz Trout Hatchery Unit

This unit is located on approximately 280 acres adjacent to the Cowlitz Trout Hatchery. Management on this area includes agriculture, including planting and maintaining big game food patches, and construction and maintenance of wood duck, kestrel, and goose nesting structures. Douglas fir planting's for visual buffers and weed control are also a part of the unit's management. California quail and turkey introductions have taken place here with some success although sightings have been down recently.

Also included in this unit is a large portion of the wetland area known as Oxbow Lake. At one time there was a large heron rookery adjacent to the lake. Although recent observations have not confirmed current nesting, the area is still used heavily by herons and other wetland wildlife. Oxbow Lake. is managed for waterfowl habitat and has the highest success rate for wood ducks on the Wildlife Area (WDFW 2000).

Davis Lake Unit

The Davis Lake Unit contains 243 acres and acquisition of additional property is a priority. Initially, TPU acquired 61 acres adjacent to Davis Lake near Morton in 1991 and an additional 20 acres was purchased by Lewis County Public Utility District then transferred to TPU as compensation for impacts of a new power line built across the Kosmos unit. This area has not received any development activity due to its recent acquisition. Lewis County maintains a road easement to the lake which is used for fishing access. The lake is reported to support brown bullhead and cutthroat trout and is planted annually by WDFW with rainbow trout. Most fishing is from boats as the shoreline is mostly inaccessible (WDFW 2000).

Kosmos Unit

The 520 acre Kosmos Unit received most of the initial attention when WDFW management began. As a result, relatively tall shrub and coniferous planting's intersect the area following field boundaries. Habitat developments here include farming corn and small grains for waterfowl, big game food patch management, Douglas fir and hydrophytic tree plantings, timber thinning, creation of 28 dugout ponds, wood duck and Kestrel nest boxes, and maintenance of an upland bird feeder program.

The Kosmos Unit has a high level of non-wildlife oriented recreational use, particularly in the summer and fall. These uses include hang gliding and wind surfing, which appear to have little impact on wildlife and habitat in the area. Other activities which appear to have a more significant impact are random camping and ORV travel on the mud flat areas. Past efforts to limit these destructive uses were largely ineffective but, recent posting of signs and enforcement patrols has dramatically reduced the occurrence of those destructive uses (WDFW 2000).

Mossyrock Unit

This unit is about 640 acres of wetland, upland and forested habitat. Management activities have included wetland enhancement and creation, farming, tree planting, putting up nest boxes, and big game forage production. Corn, small grains, and millet have been farmed for waterfowl use. Douglas fir and hydrophytic trees have been planted for cover and visual buffers. The forested portion of the unit has approximately 39 acres of forage clearings along with numerous attempts at girdling trees for snag creation. Previous problems of wildlife harassment and poaching in this unit have been largely corrected by gating field accesses and ditching where necessary. (WDFW 2000).

Peterman Ridge Unit

This 6,855 acre unit supports a mixed hardwood, conifer forest varying from 1 to 55 years old. This unit was purchased in 1992 with a few stipulations concerning timber harvest. The major factor affecting the management of this unit is the fact that approximately 2,212 acres land with standing timber is owned by TPU, while the remaining 4,643 acres of timber is controlled by the Hancock Timber Resource Group. Hancock is allowed one cutting until the year 2026. Upon completion of the cutting, ownership reverts to TPU. Tacoma Public Utilities is then responsible for replanting. Between 1992 and 1999 approximately 2,147 acres of land have reverted to TPU. This acreage has been replanted and is managed as part of the CWA.

Wildlife management on the unit is the responsibility of the WDFW. No wildlife or habitat management has taken place in this unit since it became part of the CWA in December, 1992. With commercial timber harvest being the factor dictating where habitat management will occur, adaptive management will be necessary (WDFW 2000).

Kiona Creek Unit

Purchased as part of the wetland mitigation agreement in 1995 and 1996, this unit consists of approximately 415 acres. The majority of the unit consists of wetland habitat and a small portion of upland pasture. The management of this unit will consist of establishing riparian zones, wetland enhancement projects, and a small portion of the unit will be managed to benefit big-game and non-game species (WDFW 2000). Since the completion of this report, the name of this unit has been changed from Smathers to Kiona Creek.

Spears Unit

As part of a wetland mitigation agreement, approximately 293 acres was purchased for the Spears Unit in 1994 and 1995. The majority of the management for this unit will focus on replanting riparian zones and wetland enhancement projects. The upland portion will be managed to benefit a variety of wildlife species. Visual screens will be planted along the roadways. In addition, trees and shrubs will be planted to improve wildlife habitat (WDFW 2000).

Swofford Unit

The 520 acre Swofford Unit consists of Swofford Pond and the surrounding upland areas. Swofford Pond was a steelhead/cutthroat rearing pond until 1983. Due to poor water quality, this program was abandoned and the area was developed as wildlife habitat. In addition, a warm water fish program was started with the introduction of bluegill, black crappie, largemouth bass, channel catfish, brown bullhead, rainbow and brown trout. The fishery, which opened in 1985, has become very popular.

Wildlife habitat developments here include farming corn, elk pastures, big game food patches, and goose pastures. Snag creation, hydrophytic tree and wetland planting's have also increased the value of the unit's habitat. Wood duck and kestrel nest boxes, and goose nesting platforms have also been placed in various locations around the pond.

The biggest problem plaguing Swofford Pond is an infestation of Eurasian milfoil. The weed once thought to be eradicated is now present at high levels. Weed density exploded in the summer of 1992, to where approximately 25-30 percent of the water areas less than three feet deep were covered with milfoil. Winter draw-downs were implemented in an attempt to slow the spread of this weed, but were unsuccessful. In 1996, 22 infested acres were treated with Endothall, but plants were again detected in 1998 and 1999. Native wetland plants have been planted by WDFW and TPU launched an Integrated Aquatic Vegetation Management Plan in 1999, which will guide future control efforts (WDFW 2000).

Buffer Zones

Much of the acreage designated as wildlife land exists in the form of a narrow band surrounding both Riffe and Mayfield Reservoirs and are referred to as "buffer zones". Much of the buffer zone surrounding Mayfield Lake has been impacted through recreational parks, docks and privatization. The recreational lands are part of the TPU responsibility to mitigate for recreational losses. Very limited private development has occurred on Riffe Lake.

Most of these buffer zone lands are steep or inaccessible, limiting their potential for habitat improvement. Management of these lands has focused on preserving them in their current state. Activities that have taken place include putting up wood duck, eagle, and osprey nest structures. (WDFW 2000).

For the purpose of this inventory and the report discussion, the buffer zones surrounding both lakes have been divided into north and south shorelines and named accordingly (i.e. Riffe North, Riffe South, Mayfield North, Mayfield South).

METHODS

Inventory / Feature Evaluation

The inventory encompassed the Cowlitz Wildlife Area and the Wildlife Access Areas directly associated with it. The Wildlife Area Manager identified each culvert, dam, fishway, and water diversion known to them. The SSHEAR field crew then drove all roads and walked each fish bearing drainage on the wildlife area to locate and evaluate any additional features.

All human-made features encountered in fish bearing waters were evaluated for fish passage (culvert, dams, fishways) or fish safety (water diversions). Evaluation methodologies for these features are described in the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000). Feature dimensions were measured using a metric stadia rod. Slope and elevations were measured using a laser from Laser Tech Inc. (Model Impulse 200) mounted on a Bogen Manfrotto monopod (Model 3218). Velocity was measured using the three chip method.

The latitude and longitude of each feature was recorded using a Trimble GeoExplorer II. These positional data were differentially corrected and exported to SSHEAR's Fish Passage and Screening database using Trimble's Pathfinder Office software. Streams were identified by name and/or Water Resource Inventory Area (WRIA) stream number, when possible, by using U.S.G.S. quadrangle maps (1:24000), Atlas of Washington (DeLorme Mapping 1992), or the Columbia River Basin River Mile Index (WA Dept. of Ecology 1972). Expected fish species presence was determined using the Washington State Salmon and Steelhead Stock Inventory (WDF et. al.1992), Washington State Salmonid Stock Inventory Bull Trout/Dolly Varden Appendix (WDFW 1997), the Wildlife Area Manager, Area Habitat Biologist, Area Fish Biologist, and by direct observation.

Barrier Prioritization

On streams where fish passage barriers were identified within the CWA, habitat assessments, data analysis and barrier prioritization were completed per the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000). Potential habitat gain was calculated utilizing the reduced sampling full physical survey methodology. Fish passage barriers identified during a physical survey, which have less than 200 meters of useable stream habitat are given a repair status of 'no gain'. Repairing these features for fish passage is not required at this time, but the eventual repair, modification or replacement of these

structures will need to meet fish passage requirements per the Hydraulic Project Approval (HPA) permit process.

In watersheds that can provide habitat for anadromous salmonids, potential habitat gain is always calculated from the human-made barrier upstream to the first natural barrier. The net gain is represented by the connection of the smaller (upstream) segment of habitat with the larger (ocean access downstream). In those portions of a watershed that only support resident salmonids, barrier removal may not result in a net gain of habitat upstream because resident fish populations can exist both up and downstream of a human-made barrier. Resident fish populations and habitat

become fragmented and isolated by the human-made barriers because downstream movement is possible but upstream is not. This reduces genetic interchange and makes the fish susceptible to extinction within isolated reaches. Overall habitat quality for fish is diminished when some habitat components are isolated from segments of the population. In addition, some reaches may not have all the habitat components necessary to sustain independent populations. What is gained by barrier removal is the reconnecting of fragmented fish populations and habitat by re-establishing the ability of fish to migrate upstream.

For the purposes of calculating a Priority Index (PI) value, the benefit to the resident fish population is represented by the habitat segment between the human-made barrier and the closest natural barrier, whether it be upstream or downstream. For example, if an impassable waterfall exists 500 linear meters downstream of a barrier and there is more than 500 linear meters of useable habitat upstream, the downstream habitat would be used to calculate habitat gain as it is the smallest. In this case, the real benefit is to the smaller population segment provided by the access to the larger population/habitat component. Conversely, if there is an impassable cascade eight kilometers downstream of a barrier and there is less than eight kilometers of habitat upstream, the upstream habitat would be used to prioritize for barrier resolution. In this case, the real benefit is to the larger population segment provided by the access to the smaller population/habitat component.

Screen Prioritization

The Screening Priority Index (SPI) model is a modification of the quadratic formula used in prioritizing fish passage barriers. The SPI was created to consolidate the many variables relevant to water diversions into a manageable framework for developing prioritized lists of projects. In the SPI, the habitat value (H) is replaced with flow (Q) as a surrogate to estimate the number of adult salmonids potentially killed by the unscreened or inadequately screened diversion. The SPI is described in the *Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (WDFW 2000).

RESULTS

Inventory

Within the CWA, a total of 158 fish bearing features were evaluated. There are 136 culvert crossings, ten dams, one lake outlet screen, two water diversions, nine 'other' features and no fishway features. Table 1 summarizes this information for each Wildlife Area Unit. One hundred and nine culverts, nine dams, three 'other' features and the lake outlet screen were identified as fish passage barriers. The two water diversions within the CWA are abandoned, adequately sealed off and pose no threat to fish health.

The inventory and physical habitat surveys for the 122 barrier features covered approximately 107 kilometers of fish bearing stream length. Habitat surveys revealed 68 of the 122 barrier features had a significant reach of useable habitat to warrant repair. The total potential gain in spawning and rearing habitat associated with the Cowlitz Wildlife Area inventory are 45,744.5 meters square and 279,849.2 meters square, respectively. Table 2 lists the site identification number,

unit, stream, tributary to, feature type, and repair status of each fish bearing feature associated with the CWA. Figures 2-8 show the location of fish bearing features within, or associated with, each Wildlife Area Unit or Buffer Zone.

Prioritization

Table 3 list the fish passage barriers requiring repair within the CWA. Barriers are sorted by unit and total PI. The table includes: stream/tributary to, barrier type, potential spawning and rearing habitat gain, estimated passability, number of additional human-made barriers within the drainage (including non- WDFW ownership/ management), and species specific and total PI values. Species benefitting from repair are indicated by a PI value. The two water diversions within the CWA are abandoned, adequately sealed off and pose no threat to fish health.

PI and SPI values are only intended to be used as a guide to prioritize projects. Other factors can and need to be considered. For example, the PI values do not reflect the possibility of additional human-made barriers. The true habitat gain can only be realized if all other human-made barriers within the drainage are repaired. PI and SPI values should be regarded as a dynamic index, since it can change as new information becomes available and inputs are refined.

Table 1. Number of fish passage (culverts, dams, lake outlet screens and ‘others’) and fish screening features (water diversions) within each Cowlitz Wildlife Area Unit.

Feature Type	Feature Status	Cowlitz Trout Hatchery	Davis Lake	Kosmos	Mayfield North	Mayfield South	Mossyrock	Peterman Ridge	Riffe North	Riffe South	Kiona Creek	Spears	Swofford	* Total
Culvert	<i>Fish Bearing</i>	4	5	8	3	3	4	66	14	9	9	6	5	136
	<i>Fish Barriers</i>	1	2	7	2	3	4	62	13	6	2	3	4	109
	<i>Repair Required</i>	1	2	4	1	1	3	33	5	3	2	1	1	57
Dam	<i>Fish Bearing</i>	2	0	1	0	0	4	0	0	1	0	1	1	10
	<i>Fish Barriers</i>	2	-	1	-	-	4	-	-	1	-	0	1	9
	<i>Repair Required</i>	2	-	1	-	-	4	-	-	0	-	0	1	8
Water Diversion	<i>Fish Bearing</i>	1	0	0	0	0	0	0	0	0	0	0	1	2
	<i>Screen Function</i>	OK	-	-	-	-	-	-	-	-	-	-	OK	-
Others	<i>Fish Bearing</i>	0	0	1	0	0	1	0	2	5	0	0	0	9
	<i>Fish Barriers</i>	-	-	0	-	-	1	-	1	1	-	-	-	3
	<i>Repair Required</i>	-	-	0	-	-	1	-	1	1	-	-	-	3
Lake Screen	<i>Fish Bearing</i>	0	0	0	0	0	0	0	0	0	0	0	1	1
	<i>Fish Barriers</i>	-	-	-	-	-	-	-	-	-	-	-	1	1
	<i>Repair Required</i>	-	-	-	-	-	-	-	-	-	-	-	1	1

* Table displays 69 repair required features. However, the repair required lake screen feature is associated with a dam feature requiring repair and both are considered one fish passage barrier site. Therefore, the actual number of fish passage barrier features requiring repair is 68.

Table 2. The location, type, repair status and ownership type of features in fish bearing waters within the Cowlitz Wildlife Area. Repair status indicates whether the site has no significant habitat gain (NG), the site requires repair (RR), or the site does not require repair (OK).

Site ID	WLA Unit	Stream	Tributary To	Feature Type	Repair Status	Owner
980911	Cowlitz Tr. Hatchery	Blue Cr	Cowlitz R	Dam	RR	City
980911	Cowlitz Tr. Hatchery	Blue Cr	Cowlitz R	Diversion	OK	City
980912	Cowlitz Tr. Hatchery	Unnamed	Blue Cr	Culvert	OK	County
980916	Cowlitz Tr. Hatchery	Unnamed	Blue Cr	Culvert	OK	City
980917	Cowlitz Tr. Hatchery	Unnamed	Blue Cr	Culvert	OK	City
980918	Cowlitz Tr. Hatchery	Alexander Cr	Blue Cr	Culverts	RR	City
981318	Cowlitz Tr. Hatchery	Blue Cr	Cowlitz R	Dam	RR	City
981280	Davis Lake	Unnamed	Minnie Cr	Culvert	RR	City
981281	Davis Lake	Unnamed	Unnamed	Culvert	OK	City
981284	Davis Lake	Unnamed	Davis Lake	Culvert	OK	City
981356	Davis Lake	Unnamed	Minnie Cr	Culverts	RR	City
981358	Davis Lake	Unnamed	Minnie Cr	Culvert	OK	City
980660	Kiona Creek	Spring Cr	Oliver Cr	Culvert	RR	City
980661	Kiona Creek	Unnamed	Squaw Cr	Culvert	OK	City
980663	Kiona Creek	Unnamed	Squaw Cr	Culvert	RR	City
980951	Kiona Creek	Squaw Cr	Kiona Cr	Culvert	OK	City
980952	Kiona Creek	Unnamed	Squaw Cr	Culvert	OK	City
980953	Kiona Creek	Squaw Cr	Kiona Cr	Culvert	OK	City
980954	Kiona Creek	Ditch	Squaw Cr	Culvert	OK	City
980956	Kiona Creek	Ditch	Squaw Cr	Culvert	OK	City
980957	Kiona Creek	Unnamed	Squaw Cr	Culvert	OK	City
980843	Kosmos	Unnamed	Rainey Cr	Culvert	RR	City
980849	Kosmos	Unnamed	Riffe Lk	Culvert	NG	City
980850	Kosmos	Unnamed	Unnamed	Culvert	NG	City
980852	Kosmos	Unnamed	Steffen Cr	Culvert	RR	City
980854	Kosmos	Unnamed	Rainey Cr	Dam	RR	City
981164	Kosmos	Unnamed	Rainey Cr	Culvert	NG	City
981165	Kosmos	Rainey Cr	Riffe Lk	Other	OK	City
981166	Kosmos	Unnamed	Rainey Cr	Culvert	RR	City
981177	Kosmos	Unnamed	Steffen Cr	Culvert	RR	City
981179	Kosmos	Frost Cr	Steffen Cr	Culvert	OK	County
981103	Mayfield N	Unnamed	Mayfield Lk	Culverts	RR	City
981278	Mayfield N	Unnamed	Mayfield Lk	Culvert	OK	City
981279	Mayfield N	Unnamed	Mayfield Lk	Culvert	NG	City
981097	Mayfield S	Unnamed	Cowlitz R	Culvert	NG	City
981099	Mayfield S	Unnamed	Mayfield Lk	Culvert	NG	City
981102	Mayfield S	Unnamed	Mayfield Lk	Culvert	RR	City
980929	Mossyrock	Unnamed	Cowlitz R	Dam	RR	City
980931	Mossyrock	Unnamed	Unnamed	Culvert	NG	City
980932	Mossyrock	Unnamed	Cowlitz R	Culvert	RR	County
980933	Mossyrock	Unnamed	Cowlitz R	Dam	RR	City
980934	Mossyrock	Unnamed	Cowlitz	Culvert	RR	County
980948	Mossyrock	Unnamed	Cowlitz R	Dam	RR	City
981159	Mossyrock	Unnamed	Cowlitz R	Culvert	RR	City
981160	Mossyrock	Unnamed	Cowlitz R	Other	RR	City
981172	Mossyrock	Unnamed	Cowlitz R	Dam	RR	City
980675	Peterman Ridge	Shelton Cr	Riffe Lk	Culvert	NG	City
980701	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
980723	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City

Table 2. The location, type, repair status and ownership type of features in fish bearing waters within the Cowlitz Wildlife Area. Repair status indicates whether the site has no significant habitat gain (NG), the site requires repair (RR), or the site does not require repair (OK).

Site ID	WLA Unit	Stream	Tributary To	Feature Type	Repair Status	Owner
980724	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980725	Peterman Ridge	Unnamed	Unnamed	Culvert	OK	City
980729	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980734	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980737	Peterman Ridge	Unnamed	Riffe Lk	Culvert	RR	City
980738	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980741	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980745	Peterman Ridge	Unnamed	Riffe Lk	Culvert	RR	City
980747	Peterman Ridge	Unnamed	Riffe Lk	Culvert	RR	City
980750	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980754	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980759	Peterman Ridge	Shelton Cr	Riffe Lk	Culverts	RR	City
980761	Peterman Ridge	Shelton Cr	Riffe Lk	Culverts	RR	City
980779	Peterman Ridge	Unnamed	Shelton Cr	Culverts	RR	City
980781	Peterman Ridge	Shelton Cr	Riffe Lk	Culvert	RR	City
980787	Peterman Ridge	Unnamed	Shelton Cr	Culvert	NG	City
980792	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980793	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980796	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980812	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
980813	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980814	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980817	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
980990	Peterman Ridge	Unnamed	Riffe Lk	Culvert	NG	City
980991	Peterman Ridge	Unnamed	Rife Lk	Culvert	NG	City
980992	Peterman Ridge	Unnamed	Riffe Lk	Culvert	NG	City
980997	Peterman Ridge	Unnamed	Riffe Lk	Culvert	NG	City
980998	Peterman Ridge	Unnamed	Riffe Lk	Culvert	NG	City
981007	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981027	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981029	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
981033	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981035	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981036	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981058	Peterman Ridge	Unnamed	Highland Cr	Culvert	NG	City
981077	Peterman Ridge	Simmons Cr	Riffe Lk	Culvert	RR	City
981087	Peterman Ridge	Unnamed	Simmons Cr	Culvert	OK	City
981136	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981199	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981207	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981224	Peterman Ridge	Unnamed	Sandy Cr	Culvert	NG	City
981225	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981226	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981227	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981236	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981253	Peterman Ridge	Unnamed	Riffe Lk	Culvert	NG	City
981254	Peterman Ridge	Unnamed	Unnamed	Culvert	OK	City
981263	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981264	Peterman Ridge	Unnamed	Unnamed	Culvert	OK	City

Table 2. The location, type, repair status and ownership type of features in fish bearing waters within the Cowlitz Wildlife Area. Repair status indicates whether the site has no significant habitat gain (NG), the site requires repair (RR), or the site does not require repair (OK).

Site ID	WLA Unit	Stream	Tributary To	Feature Type	Repair Status	Owner
981294	Peterman Ridge	Shelton Cr	Riffe Lk	Culvert	RR	City
981295	Peterman Ridge	Shelton Cr	Riffe Lk	Culvert	RR	Private
981296	Peterman Ridge	Shelton Cr	Riffe Lk	Culvert	RR	Private
981297	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
981298	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
981300	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981302	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
981303	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981304	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
981305	Peterman Ridge	Unnamed	Shelton Cr	Culvert	RR	City
981306	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981308	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981309	Peterman Ridge	Unnamed	Unnamed	Culvert	RR	City
981310	Peterman Ridge	Unnamed	Unnamed	Culvert	NG	City
980866	Riffe N	Unnamed	Riffe Lk	Culvert	NG	City
980908	Riffe N	Unnamed	Riffe Lk	Culvert	NG	City
980910	Riffe N	Unnamed	Riffe Lk	Culvert	NG	City
981174	Riffe N	Unnamed	Steffen Cr	Culvert	NG	City
981180	Riffe N	Unnamed	Riffe Lk	Other	OK	City
981181	Riffe N	Unnamed	Riffe Lk	Culvert	RR	City
981182	Riffe N	Unnamed	Riffe Lk	Other	RR	City
981184	Riffe N	Unnamed	Riffe Lk	Culvert	RR	City
981228	Riffe N	Sand Cr	Riffe Lk	Culvert	OK	City
981268	Riffe N	Unnamed	Unnamed	Culvert	RR	City
981269	Riffe N	Unnamed	Riffe Lk	Culvert	NG	City
981270	Riffe N	Unnamed	Riffe Lk	Culvert	NG	City
981272	Riffe N	Unnamed	Riffe Lk	Culvert	RR	City
981273	Riffe N	Unnamed	Riffe Lk	Culvert	RR	City
981275	Riffe N	Unnamed	Unnamed	Culvert	NG	City
981285	Riffe N	Unnamed	Riffe Lake	Culvert	NG	City
980871	Riffe S	Unnamed	Cowlitz R	Culvert	RR	City
980888	Riffe S	Unnamed	Cowlitz R	Culvert	RR	City
980962	Riffe S	Unnamed	Riffe Lk	Other	RR	City
980963	Riffe S	Steel Canyon Cr	Rife Lk	Culvert	OK	City
981161	Riffe S	Unnamed	Riffe Lk	Culvert	NG	Unk
981162	Riffe S	Peterson Cr	Riffe Lk	Other	OK	City
981209	Riffe S	Unnamed	Riffe Lk	Other	OK	City
981213	Riffe S	Unnamed	Riffe Lk	Culvert	OK	City
981214	Riffe S	Unnamed	Riffe Lk	Other	OK	City
981216	Riffe S	Unnamed	Riffe Lk	Other	OK	City
981217	Riffe S	Unnamed	Riffe Lk	Dam	NG	City
981222	Riffe S	Indian Cr	Riffe Lk	Culvert	OK	City
981231	Riffe S	Unnamed	Riffe Lk	Culvert	NG	City
981232	Riffe S	Unnamed	Riffe Lk	Culvert	NG	City
981233	Riffe S	Unnamed	Riffe Lk	Culvert	RR	City
980654	Spears	Unnamed	Siler Cr	Culvert	NG	City
980655	Spears	Siler Cr	Cowlitz R	Culvert	RR	City
980656	Spears	Unnamed	Siler Cr	Culvert	NG	City
980659	Spears	Siler Cr	Cowlitz R	Culvert	OK	City

Table 2. The location, type, repair status and ownership type of features in fish bearing waters within the Cowlitz Wildlife Area. Repair status indicates whether the site has no significant habitat gain (NG), the site requires repair (RR), or the site does not require repair (OK).

Site ID	WLA Unit	Stream	Tributary To	Feature Type	Repair Status	Owner
981156	Spears	Unnamed	Siler Cr	Culvert	OK	City
981157	Spears	Unnamed	Siler Cr	Culvert	OK	City
981499	Spears	Siler Cr	Cowlitz R	Dam	OK	City
980920	Swofford	Swofford Pond/ Sulphur Cr	Swofford Pond Outlet Cr	Dam	RR	County
980920	Swofford	Swofford Pond/ Sulphur Cr	Swofford Pond Outlet Cr	Lake Outlet Screen	RR	City
980921	Swofford	Swofford Pond Outlet Cr	Riffe Lk	Culverts	RR	City
980923	Swofford	Unnamed	Swofford Pond	Culvert	NG	County
980925	Swofford	Unnamed	Swofford Pond	Culvert	NG	City
980927	Swofford	Unnamed	Swofford Pond	Culvert	NG	City
980961	Swofford	Riffe Lk	Cowlitz R	Diversion	OK	City
981206	Swofford	Sulfur Cr	Riffe Lk	Culvert	OK	City

Table 3. Fish passage barriers requiring repair within the Cowlitz Wildlife Area. Barrier features are sorted by unit and total PI. Included are; stream/tributary to, feature type, estimated passability, additional human-made barriers within the drainage and potential spawning and rearing habitat gain.

Site ID	Stream/Tributary To	Feature Type	% Passable	Additional Barriers		Habitat Gain (m ²)		Priority Index (PI) Values					
				Downstream	Upstream	Spawning	Rearing	CK	CO	SH	SCT	RT	Total
Cowlitz Trout Hatchery													
981318	Blue Cr/Cowlitz R	Dam	0	0	14	9929.6	59841.5		12.1	5.46	11.2	8.33	37.09
980911	Blue Cr/Cowlitz R	Dam	33	1	12	7787.7	32482.5		9.37	4.24	8.69	6.47	28.77
980918	Alexander Cr/Blue Cr	Culverts	33	0	0	587.3	15186.3		7.75	3.51	7.18	6.36	24.80
Davis Lake													
981356	Unnamed/Minnie Cr	Culverts	33	0	5	238.9	120.2		2.61	1.23	2.52	1.90	8.26
981280	Unnamed/Minnie Cr	Culvert	33	1	4	179.4	97.3		2.10	1.04	2.13	1.59	6.86
Kosmos													
980854	Unnamed/Rainey Cr	Dam	0	0	0	0.0	19392.0					6.22	6.22
980843	Unnamed/Rainey Cr	Culvert	33	0	2	58.4	5616.2					4.17	4.17
981177	Unnamed/Steffen Cr	Culvert	33	0	2	591.9	3135.3					3.60	3.60
980852	Unnamed/Steffen Cr	Culvert	0	1	1	429.9	1358.2					3.23	3.23
981166	Unnamed/Rainey Cr	Culvert	33	0	1	50.0	1521.2					3.01	3.01
Mayfield N													
981103	Unnamed/Mayfield Lk	Culverts	0	0	4	898.9	1263.4	2.63	4.16	2.07	4.24	3.17	16.27
Mayfield S													
981102	Unnamed/Mayfield Lk	Culvert	0	0	0	48.8	362.0	1.97	3.12	1.51	3.09	2.32	12.01
Mossyrock													
981159	Unnamed/Cowlitz R	Culvert	0	0	5	917.1	10593.7	4.71	7.44	3.47	7.12	5.40	28.14
980948	Unnamed/Cowlitz R	Dam	0	3	2	0.0	6239.9	4.26	6.73	3.05	6.24	4.73	25.01
980933	Unnamed/Cowlitz R	Dam	0	5	0	0.0	2993.0	3.54	5.60	2.53	5.19	3.94	20.80
981160	Unnamed/Cowlitz R	Other	67	1	4	10.4	7368.7	3.36	5.32	2.41	4.93	3.74	19.76
980934	Unnamed/Cowlitz R	Culvert	67	2	3	0.0	6286.9	3.23	5.11	2.31	4.74	3.59	18.98
981172	Unnamed/Cowlitz R	Dam	0	0	2	0.0	1644.3	3.05	4.82	2.18	4.47	3.39	17.91
980932	Unnamed/Cowlitz R	Culvert	67	4	1	0.0	3000.6	2.69	4.25	1.92	3.94	2.99	15.79

Table 3. Fish passage barriers requiring repair within the Cowlitz Wildlife Area. Barrier features are sorted by unit and total PI. Included are; stream/tributary to, feature type, estimated passability, additional human-made barriers within the drainage and potential spawning and rearing habitat gain.

Site ID	Stream/Tributary To	Feature Type	% Passable	Additional Barriers		Habitat Gain (m ²)		Priority Index (PI) Values					
				Downstream	Upstream	Spawning	Rearing	CK	CO	SH	SCT	RT	Total
980929	Unnamed/Cowlitz R	Dam	0	1	1	0.0	223.9	2.05	3.24	1.47	3.01	2.28	12.05
Peterman Ridge													
980759	Shelton Cr/Riffe Lk	Culverts	67	2	4	3549.3	17111.3					5.51	5.51
980761	Shelton Cr/Riffe Lk	Culverts	67	1	5	3549.3	10698.1					4.90	4.90
981077	Simmons Cr/Riffe Lk	Culvert	0	0	0	0.0	6347.3					4.75	4.75
980779	Unnamed/Shelton Cr	Culverts	0	1	2	1361.6	4455.3					4.35	4.35
980737	Unnamed/Riffe Lk	Culvert	0	3	4	443.3	1875.6					3.47	3.47
981304	Unnamed/Shelton Cr	Culvert	67	0	3	1362.3	4580.1					3.32	3.32
981294	Shelton Cr/Riffe Lk	Culvert	0	3	3	128.2	1372.3					3.24	3.24
981305	Unnamed/Shelton Cr	Culvert	67	2	1	1348.0	4108.7					3.23	3.23
980781	Shelton Cr/Riffe Lk	Culvert	67	0	6	1642.8	3350.1					3.07	3.07
980817	Unnamed/Shelton Cr	Culvert	33	0	2	84.5	1595.1					3.04	3.04
980701	Unnamed/Shelton Cr	Culvert	0	3	0	427.7	1019.5					3.01	3.01
981236	Unnamed/Unnamed	Culvert	0	0	3	292.6	864.1					2.89	2.89
980796	Unnamed/Unnamed	Culvert	0	1	1	327.3	748.5					2.79	2.79
981297	Unnamed/Shelton Cr	Culvert	67	0	1	203.3	2180.4					2.76	2.76
981298	Unnamed/Shelton Cr	Culvert	67	1	0	157.2	1790.1					2.63	2.63
980793	Unnamed/Unnamed	Culvert	0	0	2	113.1	563.5					2.59	2.59
981225	Unnamed/Unnamed	Culvert	0	1	2	116.5	563.7					2.59	2.59
980750	Unnamed/Unnamed	Culvert	0	5	2	111.7	532.2					2.53	2.53
981136	Unnamed/Unnamed	Culvert	0	2	2	181.0	431.2					2.43	2.43
980729	Unnamed/Unnamed	Culvert	0	2	0	196.5	416.9					2.41	2.41
980745	Unnamed/Riffe Lk	Culvert	67	4	2	275.4	1322.8					2.41	2.41
981306	Unnamed/Unnamed	Culvert	33	0	0	226.8	609.6					2.39	2.39

Table 3. Fish passage barriers requiring repair within the Cowlitz Wildlife Area. Barrier features are sorted by unit and total PI. Included are; stream/tributary to, feature type, estimated passability, additional human-made barriers within the drainage and potential spawning and rearing habitat gain.

Site ID	Stream/Tributary To	Feature Type	% Passable	Additional Barriers		Habitat Gain (m ²)		Priority Index (PI) Values					
				Downstream	Upstream	Spawning	Rearing	CK	CO	SH	SCT	RT	Total
981309	Unnamed/Unnamed	Culvert	0	1	3	162.1	386.2					2.36	2.36
981029	Unnamed/Shelton Cr	Culvert	0	0	1	188.5	331.3					2.27	2.27
981295	Shelton Cr/ Riffe Lk.	Culvert	67	4	2	74.9	919.0					2.22	2.22
980812	Unnamed/Unnamed	Culvert	0	0	1	58.7	292.0					2.20	2.20
980747	Unnamed/Riffe Lk	Culvert	0	0	0	38.1	197.6					1.98	1.98
981296	Shelton Cr/ Riffe Lk	Culvert	67	5	1	3.9	494.9					1.90	1.90
981308	Unnamed/Unnamed	Culvert	33	3	1	9.8	235.7					1.89	1.89
981226	Unnamed/Unnamed	Culvert	33	2	1	68.7	231.8					1.88	1.88
981303	Unnamed/Unnamed	Culvert	67	1	0	48.9	243.3					1.59	1.59
981207	Unnamed/Unnamed	Culvert	67	4	0	8.5	203.4					1.52	1.52
980741	Unnamed/Unnamed	Culvert	67	0	1	12.8	187.9					1.48	1.48
Riffe N													
981184	Unnamed/Riffe Lk	Culvert	0	0	1	287.1	706.4					2.72	2.72
981273	Unnamed/Riffe Lk	Culvert	33	1	0	219.2	539.8					2.32	2.32
981181	Unnamed/Riffe Lk	Culvert	0	0	2	158.3	333.5					2.28	2.28
981272	Unnamed/Riffe Lk	Culvert	67	0	2	237.8	674.4					2.06	2.06
981182	Unnamed/Riffe Lk	Other	67	1	1	144.4	320.1					1.71	1.71
981268	Unnamed/Unnamed	Culvert	0		2	23.2	91.3					1.63	1.63
Riffe S													
980888	Unnamed/Cowlitz R	Culvert	0	0	0	1584.8	2347.4					3.71	3.71

Table 3. Fish passage barriers requiring repair within the Cowlitz Wildlife Area. Barrier features are sorted by unit and total PI. Included are; stream/tributary to, feature type, estimated passability, additional human-made barriers within the drainage and potential spawning and rearing habitat gain.

Site ID	Stream/Tributary To	Feature Type	% Passable	Additional Barriers		Habitat Gain (m ²)		Priority Index (PI) Values					
				Downstream	Upstream	Spawning	Rearing	CK	CO	SH	SCT	RT	Total
981233	Unnamed/Riffe Lk	Culvert	0	0	3	666.7	1631.2					3.38	3.38
980871	Unnamed/Cowlitz R	Culvert	0	0	1	66.7	179.9					1.95	1.95
980962	Unnamed/Riffe Lk	Other	0	0	0	133.2	276.7					1.81	1.81
Kiona Creek													
980663	Unnamed/Squaw Cr	Culvert	33	0	0	0.0	5035.5	4.04	6.38	2.89	5.92	4.49	23.72
980660	Spring Cr/Oliver Cr	Culvert	67	0	0	0.0	4734.8	3.01	4.76	2.15	4.41	3.35	17.68
Spears													
980655	Siler Cr/Cowlitz R	Culvert	0	0	20	22347.6	92765.1	8.37	13.20	6.12	12.70	9.20	49.59
Swofford													
980920	Swofford Pond/Riffe Lk	Dam/Lk Screen	0	1	0	2270.5	49984.0					7.96	7.96
980921	Swofford Pond Outlet Cr/Riffe Lk	Culverts	33	0	3	2686.0	50518.4					7.22	7.22

CK = chinook, CO = coho, SH = steelhead, SCT = sea run cutthroat, RT = resident trout

DISCUSSION

Much of the Cowlitz Wildlife Area was originally used for timber harvest and agricultural purposes during the late 1800's and early 1900's. These lands are now owned and/or managed by WDFW primarily to provide for fish and wildlife habitat and public recreation. The management for fish, wildlife, and recreation are sometimes conflicting. Therein, the prioritization and correction of fish passage barriers and screening issues can become complex. Before most of the barrier corrections on Cowlitz Wildlife Area can be initiated, the agency must establish what the wildlife area management priorities are with regard to fish, wildlife, and recreation. The ideal plan would be to protect and preserve fish and wildlife habitat while continuing to provide for the recreational needs of the public.

Currently, there is a multi-agency effort to re-introduce anadromous salmonids to certain portions of the upper Cowlitz River drainage which are block by human-made features (hydro-electric dams). With the exception of the Riffe Lake reservoir and associated sub-basin drainage's, WDFW presently manages the Cowlitz River drainage as anadromous waters. Information about the re-introduction efforts can be found in the "Draft Environmental Impact Statement - Cowlitz River Hydroelectric Project (No. 2016-044) Washington"(June 2000). Copies may be ordered from: Division of Public Information, Federal Energy Regulatory Commission, 888 First Street NE, Washington, DC 20426.

The following is a brief unit-by-unit discussion of fish passage structures and water diversions identified in fish bearing streams. All photos referenced in the text can be found in Appendix I.

Cowlitz Trout Hatchery

The only Wildlife Area unit with uninhibited anadromous access is the Cowlitz Trout Hatchery. Located approximately 8.2 river miles below the Cowlitz River barrier dam, at the Cowlitz Salmon Hatchery, is the confluence of Blue Creek. Blue Creek is the primary stream of the unit. Several, smaller tributary streams and a large, shallow, lowland body of water called Oxbow Lake add to the potential fish habitat blocked by a multitude of fish passage barriers (Figure 2). During the inventory and associated with this unit, 35 fish passage features and three diversions were identified. As shown in Table1, there are seven features in fish bearing waters located within the unit. One culvert (site 980918) on Alexander Cr and two dams (site 981318 and site 980911) on Blue Creek are barriers. These three fish passage barriers require repair. The additional features evaluated were encountered while assessing potential habitat gains for the barrier features within the unit.

Starting the inventory of Blue Creek at site 981318, there were no features inventoried during the 1,380 meter downstream check to the confluence. Barrier dam site 981318 is equipped with a hatchery rack and a fish ladder to divert fish into the nearby hatchery (Photo 1). With the right flow the right conditions of high flows, adult Steelhead have been occasionally observed passing successfully over this barrier.

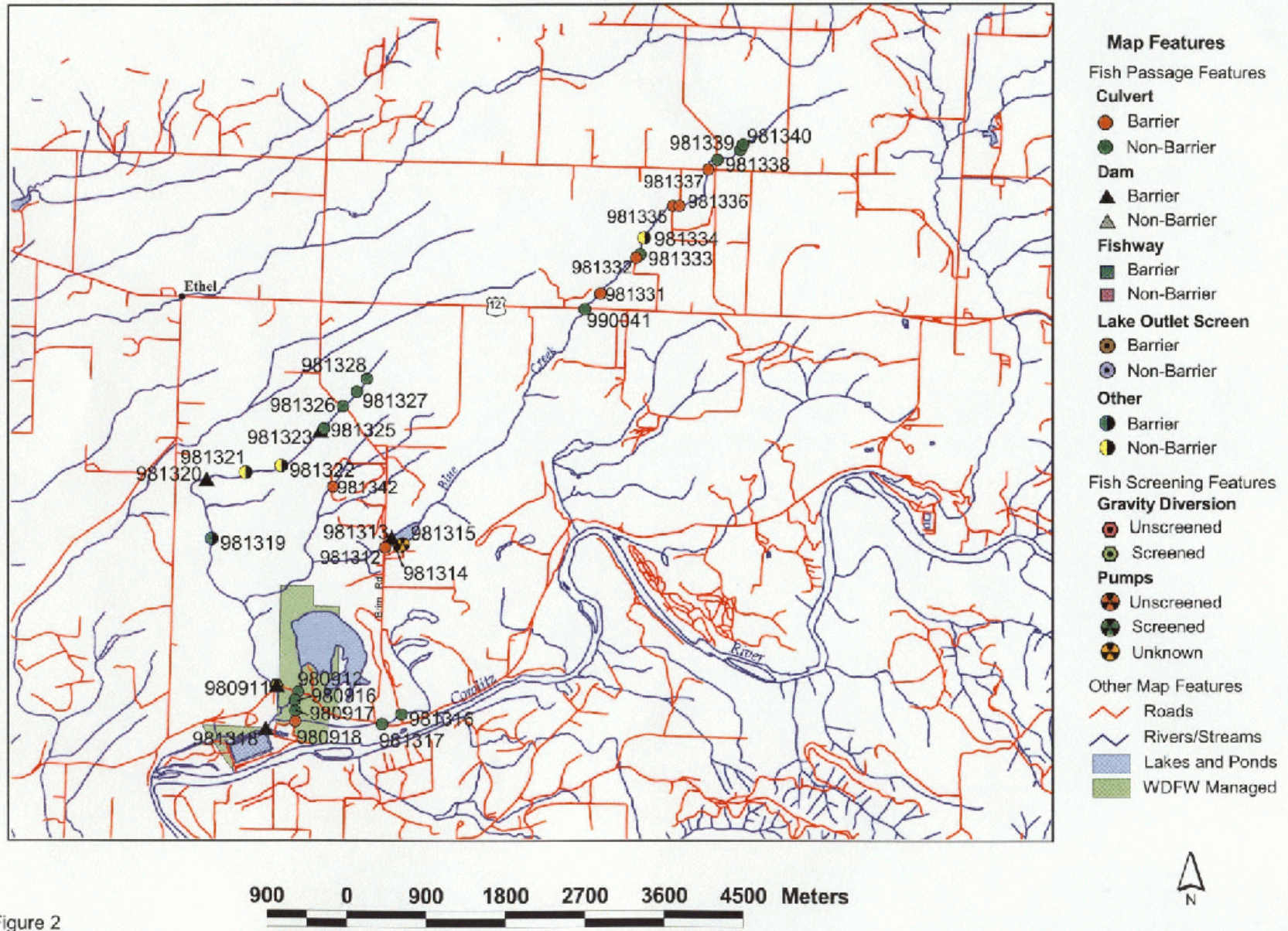


Figure 2

Approximately 760 meters upstream of the hatchery rack is a dam and gravity diversion (site 980911). The dam is a barrier. The diversion is adequately sealed off and is no longer in use. Since the hatchery no longer utilizes these structures, they should be removed. Shortly upstream of this site, the survey of Blue Creek continued beyond the unit boundary.

A total of 13 additional fish passage features and two pump diversions were identified while surveying the rest of Blue Creek. Twelve of the 13 fish passage features are either partial or total barriers. The next fish passage feature (culvert site 981312) is located 3,532 meters upstream of 980911 (Figure 2). This county owned culvert passes under Brim Road and is barrier. Another 128 meters upstream is barrier dam site 981313. This dam is privately owned and impounds a large pond (approximately 40,000 square meters). Near the downstream end and along the left bank of the pond are two pump diversions (sites 981314 and 981315). These pumps were active during the survey however, screening function is unknown due to offshore intakes.

The next fish passage feature (site 990041) inventoried is a non-barrier culvert crossing under State Route 12. From this point upstream, ten more fish passage feature sites were identified. The stream gradient is low within this reach and summer drying is common. Six of the ten features are barrier culverts, which will require repair in order to realize the full, potential habitat gain. They are: sites 981331, 981332, 981333, and 981335 (privately owned) and sites 981336 and 981337 (county owned).

The first tributary encountered during the upstream survey of Blue Creek was Alexander Creek. Located 305 meters upstream of the confluence, within the unit, barrier culvert site 980918 was identified (Figure 2). This site blocks access to an estimated 587.3 square meters of spawning habitat and 15,186.3 square meters of rearing habitat. Two non-barrier culverts (county owned) were identified upstream.

The second Blue Creek tributary, a small unnamed stream originating from Oxbow Lake, is entirely within the unit, as well as the majority of the lake (Figure 2). Although no human-made features impede fish passage on this stream, a large beaver dam was encountered 31 meters upstream of the confluence. This natural structure is currently a partial barrier to fish. However, the beaver dam is not deemed a permanent barrier and will likely change over time, unlike culverts which are fixed structures. There is approximately 9,566 square meters of winter rearing habitat upstream of the beaver dam.

The third tributary enters Blue Creek well beyond the unit boundary, at 2,135 meters upstream of the Cowlitz River. Associated with this intermittent stream are 12 fish passage features. The first barrier feature (site 981319) is located approximately 1,014 meters upstream of the confluence (Figure 2). Site 981319, causing a vertical falls, was created by an old ford crossing that has been replaced with a bridge.

The next barrier feature inventoried (site 981320), located approximately 269 meters upstream, is a recently constructed earthen dam. This site was investigated by the Area Habitat Biologist and the landowner was asked to return the stream channel back to its free flowing state. Continuing upstream, beyond two non-barrier stream fords, a barrier dam (site 981323) was encountered.

Upstream of the impoundment, the stream has been straightened and flows intermittently through a cow pasture.

Correcting all human-made barrier features associated with this tributary would result in the potential habitat gain of 908.1 square meters and 4,387.8 square meters of spawning and rearing habitat, respectively.

The fourth and last tributary surveyed enters Blue Creek from the right bank. This confluence is 4,718 meters upstream of the Cowlitz River. The only barrier encountered while surveying this stream was a culvert (site 981342). This total barrier is approximately 1,064 meters upstream of the confluence. The correction of site 981342 would increase the potential habitat by approximately 556.6 square meters for spawning and 1,328.5 square meters for rearing.

Should all the fish passage problems within the Blue Creek Watershed be resolved, approximately 9,929.6 square meters of spawning and 59,841.5 square meters of rearing habitat would be made accessible to anadromous and resident fishes. The benefit of correcting the fish passage features located on the unit alone would allow fish access to approximately 90% and 60% of the total available spawning and rearing habitat, respectively.

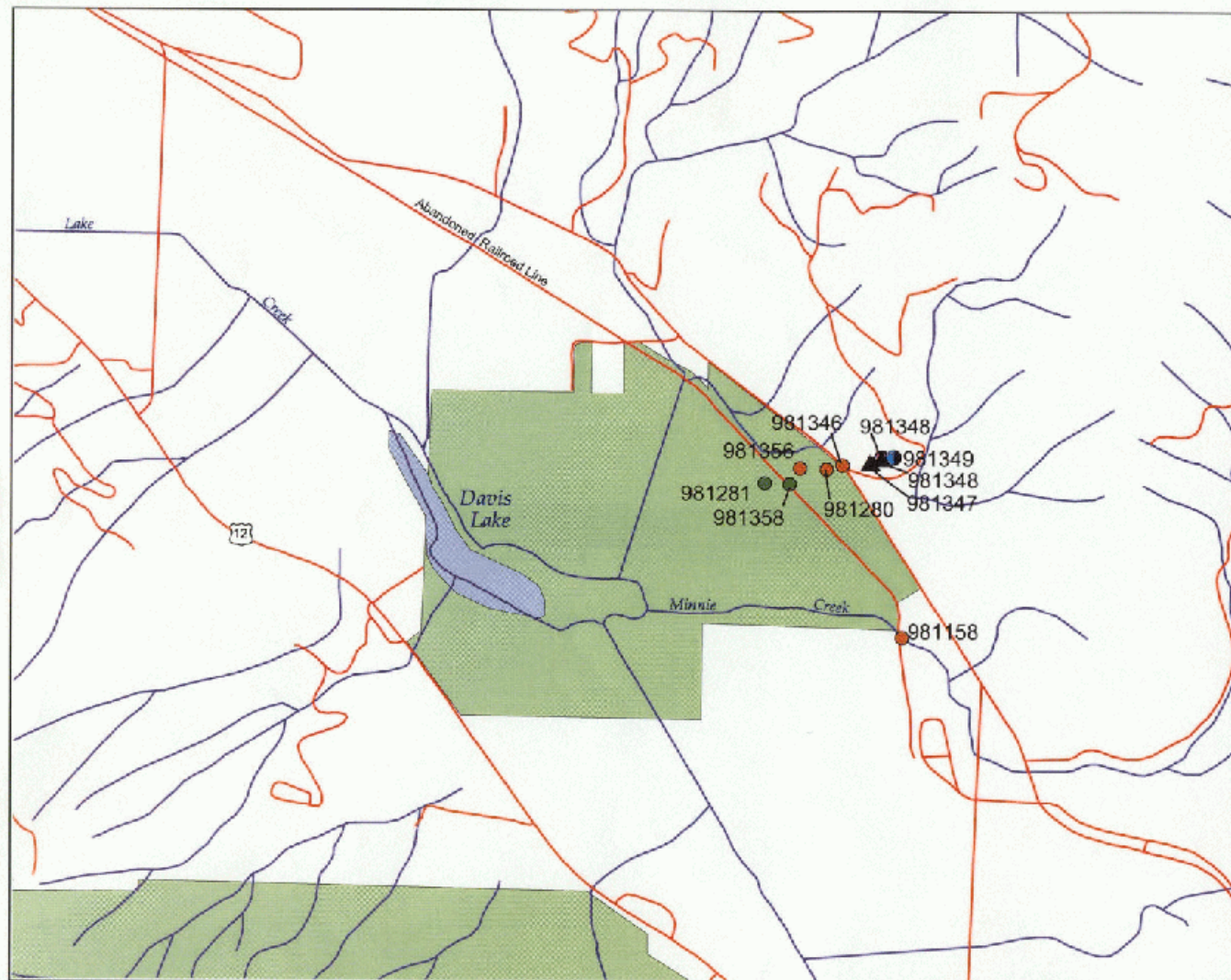
Davis Lake

Only two fish passage barriers were encountered within the Davis Lake Unit. Both barriers are culverts and are associated with a small unnamed tributary to Minnie Creek, which flows through the NW portion of the unit (Figure 3). This tributary is unstable, has several sections of aggraded channel (within the unit) and typically dries up during the summer.

The two barrier culverts on the unit (sites 981356 and 981280) are approximately 450 meters and 582 meters upstream of the confluence, respectively. A short 37 meters further upstream is a county owned barrier culvert (site 981346) under Davis Lake road, which requires repair. The Wildlife Area boundary borders this road. The stream continues on private property and becomes heavily impacted by the adjacent land use activities. Four additional problem features were identified before a natural point barrier was encountered, ending the survey. Of these four features, only the unscreened gravity diversion associated with barrier dam site 981348 requires correction. As for the three fish passage features, each one lacks enough fish habitat to warrant correction, but are included in the overall habitat gain amounts.

Correcting the fish passage barriers described above would increase the available spawning and rearing habitat by 120.2 square meters and 238.9 square meters, respectively.

While surveying Minnie Creek, a barrier culvert (site 981158) was identified within the vicinity of the unit boundary. Due to this close proximity, a Threshold Determination (TD) survey was conducted and 200 lineal meters of habitat exists both upstream and downstream of the barrier. Minnie Creek is the largest stream system that flows through the unit and into Davis Lake.



- Map Features**
- Fish Passage Features**
- Culvert**
- Barrier
 - Non-Barrier
- Dam**
- ▲ Barrier
 - ▲ Non-Barrier
- Fishway**
- Barrier
 - Non-Barrier
- Lake Outlet Screen**
- Barrier
 - Non-Barrier
- Other**
- Barrier
 - Non-Barrier
- Fish Screening Features**
- Gravity Diversion**
- Unscreened
 - Screened
- Pumps**
- Unscreened
 - Screened
 - Unknown
- Other Map Features**
- Roads
 - Rivers/Streams
 - Lakes and Ponds
 - WDFW Managed

300 0 300 600 900 1200 1500 Meters



Figure 3

Requiring repair, the correction of this barrier (981158) would be beneficial to resident and anadromous fishes.

Kosmos

This unit is located in a valley bottom adjacent to the east end of Riffe Lake (Figure 4). Rainey Creek, Steffen Creek, Frost Creek, and three unnamed streams are associated with this unit. The inventory of this unit was conducted during the time when Riffe Lake was lowered, exposing the lake bed stream channels. The inventory identified 18 features (13 culverts, two dams, one dam with a gravity diversion, and one 'other' feature). The repair required features, along with additional sites associated with habitat gains will be discussed.

Beginning with the Rainey Creek drainage and on the unit, a dam (site 980854) at the mouth of a unnamed tributary to Rainey Creek was encountered immediately east of the Champion Haul road (Figure 4). This total barrier structure creates a wildlife enhancement pond (Photos 2 & 3). Located on the flood plain, the pond is fed by groundwater and is influenced by the fluctuating water levels of Riffe Lake and Rainey Creek. Should the dam be redesigned to allow for fish passage, a potential habitat gain of 19,392 square meters of rearing habitat could be realized.

Two barrier culverts were located on an unnamed, unmapped tributary to Rainey Creek. Within the unit and requiring repair, site 981166 (Figure 4) has a potential habitat gain of 50 square meters and 1,521.2 square meters of spawning and rearing habitat, respectively. Identified outside the unit, a privately owned barrier culvert (site 981167) does not require repair due to a lack of significant habitat upstream.

The survey of another unnamed, unmapped tributary to Rainey Creek identified three fish passage features. Barrier culvert 980843 is located 176 meters upstream of the confluence and within the unit. Beyond the unit boundary, private barrier culverts 981168 and 981169 were identified during the upstream physical survey (Figure 4). The overall potential habitat gain, upon correction of these barriers amounts to 58.4 square meters and 5616.2 square meters of spawning and rearing habitat, respectively. Correcting the barrier at site 980843 alone would allow fish passage to approximately 83% and 89% of the total spawning and rearing habitat, respectively.

Several barriers were documented on an unnamed tributary to Riffe Lake, which flows through the northwest portion of the unit near the Kosmos boat launch (Figure 4). During the winter months when Riffe Lake is lowered, this stream actually enters the lake bed channel of Steffen Creek.

Starting the survey from the confluence with Steffen Creek and within the unit, culverts 981177 and 980852 were evaluated. Washington State Department of Transportation culvert 992113 and private culvert 981204 were identified beyond the unit. All features just described are barriers, which require repair. The potential habitat gain associated with this unnamed stream drainage amounts to 591.9 square meters and 3,135.3 square meters of spawning and rearing habitat, respectively.

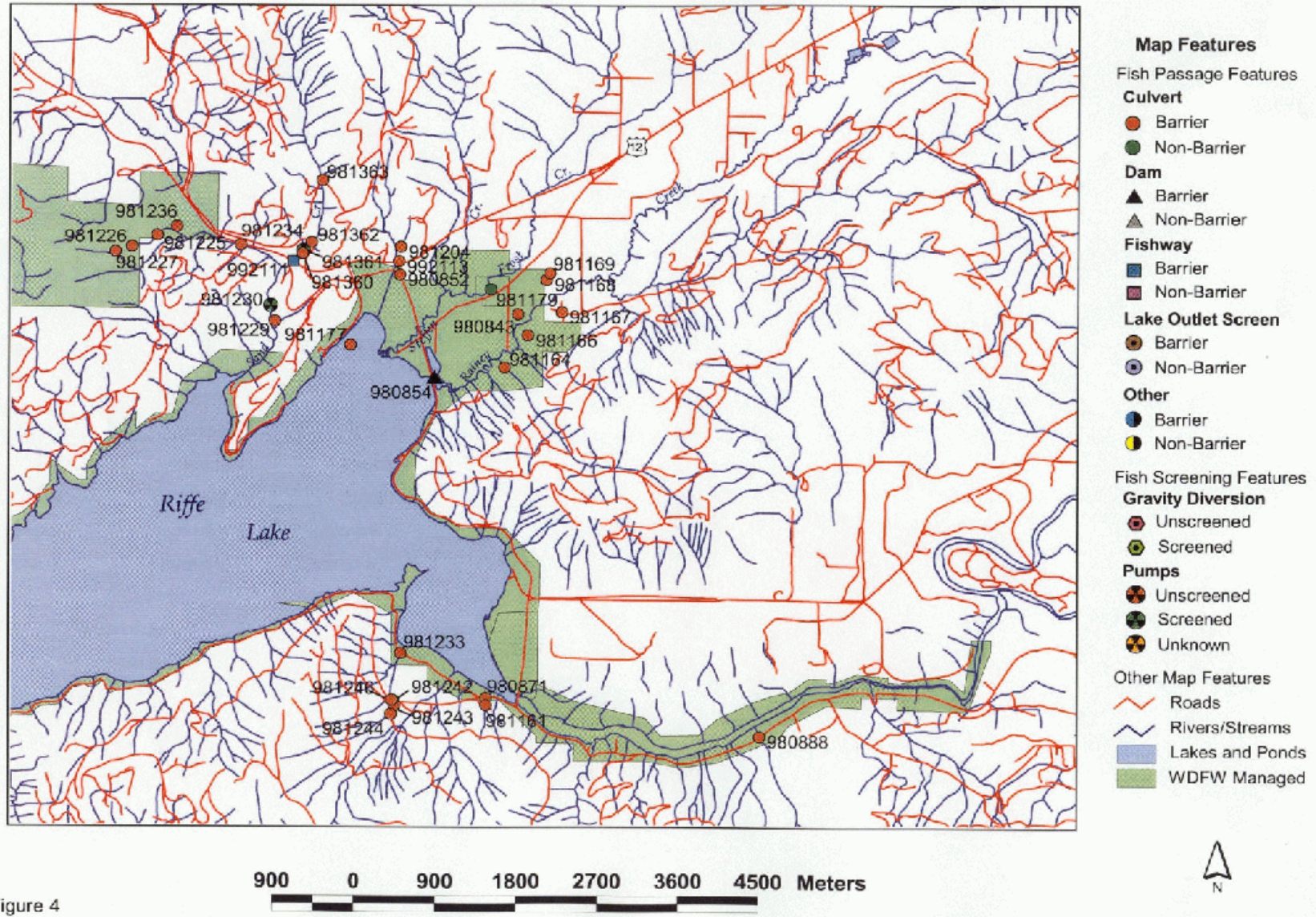


Figure 4

Mossyrock

There is one unnamed stream that flows through the unit and enters the Cowlitz River a short distance downstream of the Mossyrock dam (Figure 5).

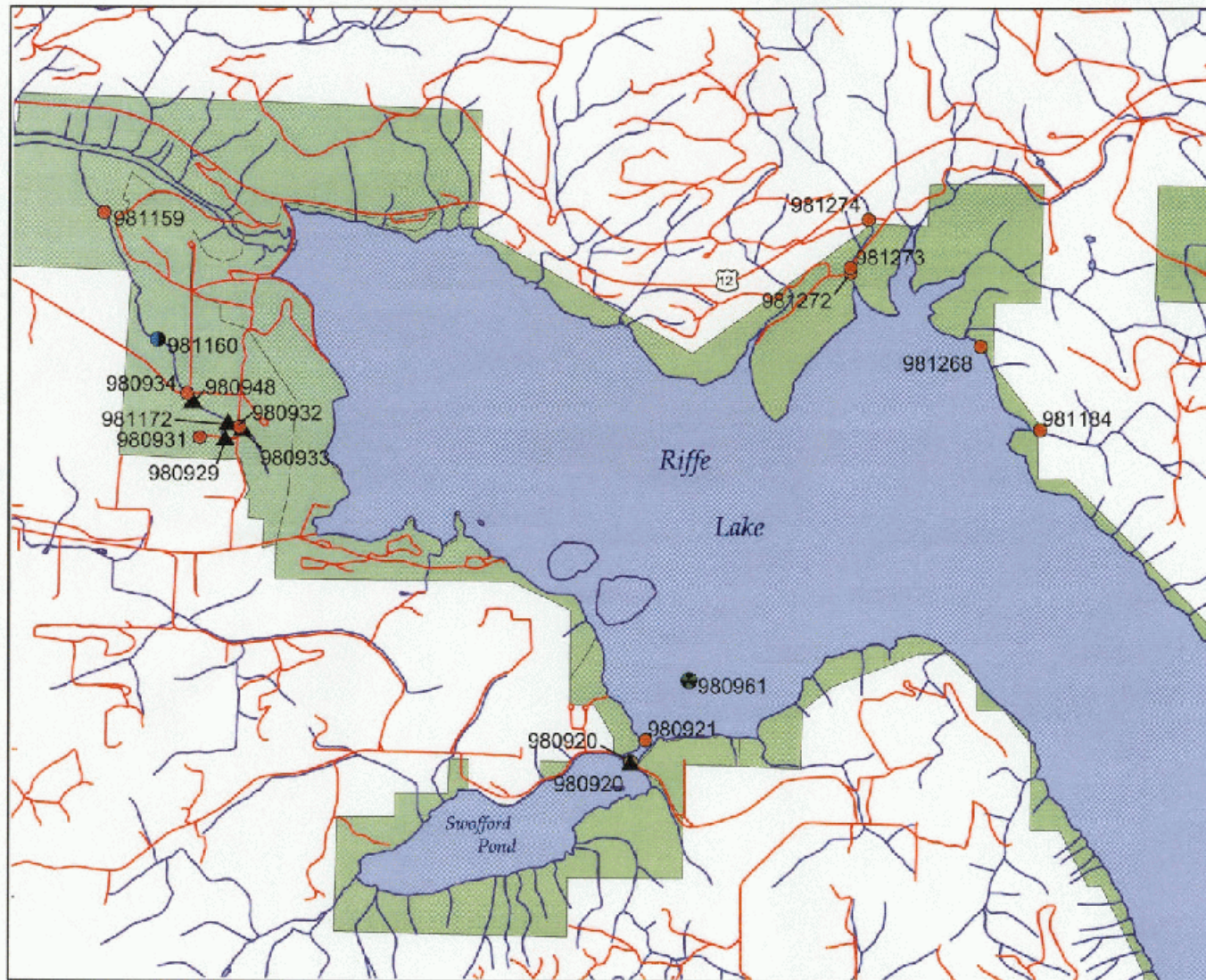
As the site description explains on page 6, this unit has enhanced wetland habitat. The inventory of this unit identified four dams (sites 980948, 980933, 981172, and 980929), four culverts (sites 981159, 980934, 980932, and 980931) and one 'other' feature (site 981160). All nine of these fish bearing features were located within the unit, however, two of the four culverts are county-owned. All of these features, except site 980931, require repair.

Beginning at the confluence with the Cowlitz River, the first feature inventoried, located 667 meters upstream, was barrier culvert site 981159 (Photo 4). With this feature being the lowest (downstream) fish barrier within the drainage, the potential habitat gain is dependent upon the correction of all other barrier sites. Should this occur, 917.1 square meters of spawning habitat and 10,593.7 square meters of rearing habitat could potentially be utilized by resident and anadromous fishes.

Located approximately 1,037 meters further upstream is the 'other' feature 981160. This site is an old culvert crossing. The structure has either been removed or washed out and the road is abandoned. However, this site is still a partial barrier due to a hydraulic drop created by a constricted channel and regrading. Ninety-nine percent of the potential spawning habitat described above exists between sites 981159 and 981160.

Continuing upstream, the gradient decreases and wetland-type habitat is dominant. The next site encountered was 980934. At this crossing, there are two county-owned culverts under Young Road, which create a partial fish passage barrier. Site 980948 is the first dam encountered during the upstream survey. A stand pipe and culvert are used to drain the impoundment and create a total barrier. The intent of this structure, as well as the other dams to be discussed, is to create waterfowl habitat. Proceeding upstream, the stream crosses under Young Road again through a partial barrier culvert at site 980932. The last barrier feature on this stream is a dam at site 980933.

Sites 981172, 980929, and 980931 are associated with a left bank tributary which enters the main stream approximately 2,453 meters upstream of the Cowlitz River (Figure 5). Dam site 981172 is located at the confluence. The impoundment of the dam extends 107 meters upstream to dam site 980929. Both sites are total barriers and block fish passage to approximately 1,644.3 square meters of rearing habitat. Culvert site 980931 will not require repair at this time, due to an insignificant habitat gain upstream.



- Map Features**
- Fish Passage Features**
- Culvert**
- Barrier
 - Non-Barrier
- Dam**
- ▲ Barrier
 - ▲ Non-Barrier
- Fishway**
- Barrier
 - Non-Barrier
- Lake Outlet Screen**
- ⊙ Barrier
 - ⊙ Non-Barrier
- Other**
- Barrier
 - Non-Barrier
- Fish Screening Features**
- Gravity Diversion**
- ⊗ Unscreened
 - ⊗ Screened
- Pumps**
- ⊗ Unscreened
 - ⊗ Screened
 - ⊗ Unknown
- Other Map Features**
- Roads
 - Rivers/Streams
 - Lakes and Ponds
 - WDFW Managed

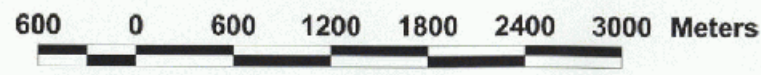


Figure 5

Peterman Ridge

Peterman Ridge is the largest unit within the Cowlitz Wildlife Area (Figure 6). Located on the north side of Riffe Lake, this unit can be characterized as mountainous, predominately forested, and overly abundant with fish passage barriers. The latter characteristic is likely due to the long history of logging in this area, the high number of stream crossing structures, and the high density of roads. Within the unit, 70 culverts on fish bearing streams were inventoried. Sixty-four of these culvert sites are either a partial or total fish passage barrier. An additional seven culverts were inventoried outside the unit, making a grand total of 77 fish bearing culvert features associated with the Peterman Ridge Unit. No other types of fish passage or water diversions features were encountered.

Besides the high number of human-made fish passage problems, many of the streams draining this mountainous area also possess natural barriers of high gradient reaches and/or impassable falls. With this in mind, the smaller amount of stream above or below a human-made barrier will be used to estimate the potential habitat gain for resident salmonids.

Most of this discussion will be of the Shelton Creek drainage, since it occupies the majority of the unit. Fish passage barriers were identified on three streams inventoried outside the Shelton Creek drainage, including: Simmons Creek, a tributary to Riffe Lake; Unnamed tributary to Riffe Lake; and Unnamed tributary to Sand Creek. Sand Creek is actually associated with the Riffe North inventory. So even though features of that drainage are located within the Peterman Ridge unit, they will be mentioned in the Riffe North discussion. This discussion will focus on each major barrier and mention additional barriers that add to the habitat gain of the major barrier.

The inventory of Shelton Creek began at the confluence with Riffe Lake. Upstream approximately 268 meters and 1,015 meters are natural barrier falls. The first falls has a ten meter vertical drop. The second falls consists of a series of large drops. Within this series of falls is a large right bank tributary (Figure 6). The first human-made fish passage barrier on Shelton Creek is located beyond this confluence. For the purpose of this report, the mainstem drainage above this tributary confluence shall be referred to as upper Shelton Creek.

As the survey of upper Shelton Creek continued, several more falls that either impede or block fish passage were encountered. The last falls located at 1,810 meters (m) is a total barrier. Beyond this point, a total of 16 culvert features were inventoried in fish bearing waters. All 16 culverts are within the unit, yet two are located on a privately owned parcel (NE ½, section 24, Township 12 North, Range 04 East).

The first human-made structure, a partial barrier culvert (site 980781), was located 2,948 m upstream of the confluence with Riffe Lake. Along with partial barrier culverts 980761 and 980759 located further upstream, these three repair required sites have an overall habitat gain of 3,549.3 square meters and 17,111.3 square meters of spawning and rearing habitat, respectively (downstream).



Figure 6

900 0 900 1800 2700 3600 4500 Meters



Associated with the private parcel of land described earlier in this discussion are barrier culvert sites 981295 and 981296. Along with barrier culvert 981294, these three barriers will require repair and have an overall habitat gain of 128.2 square meters and 1372.3 square meters of spawning and rearing habitat, respectively (upstream).

The first tributary (confluence) of upper Shelton Creek, having fish passage features, is located approximately 200 m upstream of site 980781 (Figure 6). Of the seven culverts that were inventoried while surveying this unnamed tributary, four are barriers requiring repair. All four culverts (sites 981304, 980779, 981305, and 980701) are located on the main tributary channel. Should all barriers be corrected, an estimated 1,362.3 square meters of spawning habitat and 4,580.1 square meters of rearing habitat would become accessible to resident salmonids and other fishes.

The second tributary of upper Shelton Creek, having inventoried fish passage features, is located 780 m upstream of 980759 (Figure 6). Located 63 m and 299 m upstream of the confluence are partial barrier culvert sites 981297 and 981298, respectively. Correcting these barriers will provide fish passage to 203.3 square meters and 2,180.4 square meters of spawning and rearing habitat, respectively.

The overall habitat quality of upper Shelton Creek is relatively good, but the attributes of logging (human-made fish barriers and clear cuts) have limited the surviving fish populations to segmented reaches. Ultimately, the correction of these human-made fish barriers will allow resident salmonids and other fishes contiguous access and utilization of approximately 5,243.1 square meters and 25,244.1 square meters of spawning and rearing habitat, respectively.

Twenty-five culvert features were identified during the inventory of the large unnamed tributary to lower Shelton Creek. The majority of the features associated with this drainage were located on secondary tributaries.

While surveying the mainstem tributary, a series of falls were observed at 238 m and 700 m upstream of the confluence. The first human-made barrier feature (culvert site 980817, Photo 5) was encountered 3,544 m upstream of the confluence. Upstream of here is a flat valley area with incised, slough-like channels. Shortly above site 980817 enter two small tributaries, which contribute to the upstream habitat gain. Both tributaries have barrier culverts (sites 981300 and 981302), that do not require repair resulting from a lack of significant upstream habitat. At 618 m above site 980817, the mainstem becomes non fish-bearing due to subsurface flows and lack of a defined channel. The potential habitat gain associated with site 980718 is approximately

84.5 square meters and 1,595.1 square meters of spawning and rearing habitat, respectively.

Beyond the non-fish bearing section and on the mainstem stream, barrier culvert site 981029 (within the unit) and 981311 (outside the unit) were surveyed. The habitat gain associated with the correction of both features amounts to approximately 188.5 square meters and 331.3 square meters of spawning and rearing habitat, respectively (upstream).

The first secondary tributary (with barrier features) to enter the mainstem tributary to Shelton Creek is located approximately 1,020 m upstream of the confluence. Barrier culvert 981136 was

located 450 m upstream of the confluence and requires repair (Figure 6). During the downstream survey, barrier culvert sites 981309 and 981310 were inventoried. Site 981309 has sufficient habitat gain to require repair. A natural barrier falls located a short distance below site 981310 results in a lack of significant habitat to warrant repair. The natural barrier falls blocks fish passage to and from the main tributary. Therefore, the habitat gain associated with the identified human made barriers will vary either upstream or downstream (whichever habitat segment is less).

During the upstream survey of 981136, barrier culvert sites 981308 and 981207 (Photo 6) were located and inventoried at 270 m and 313 m. Both culverts require repair. The course of this stream is depicted incorrectly on the DNR hydrology map (Figure 6). The actual course verified during the stream survey continues from the northwest direction beyond the culvert crossing at site 981207.

The potential habitat gain for site 981136 and 981309 consists of 181 square meters and 162.1 square meters of spawning habitat and 431.2 square meters and 386.2 square meters of rearing habitat, respectively (downstream). The potential habitat gain for sites 981308 and 981207 consists of 9.8 square meters and 8.5 square meters of spawning habitat and 235.7 square meters and 203.4 square meters of rearing habitat, respectively (upstream).

The next, secondary tributary enters the main stem approximately 25 m further upstream (Figure 6). The survey of this drainage identified 6 fish bearing culverts and two natural barriers. Starting at the confluence, 236 m upstream is barrier culvert site 981306. There are 391 linear m of fish bearing stream above this site before a natural barrier falls. Therefore, site 981306 will require repair and has the potential habitat gain of 226.8 square meters and 609.6 square meters of spawning and rearing habitat, respectively.

Three hundred and sixty meters upstream of the natural barrier falls is barrier culvert site 980793, which will require repair. The habitat gain for this site is an estimated 113.1 square meters and 563.5 square meters of spawning and rearing habitat, respectively, downstream.

Located 376 m and 578 m upstream of site 980793, are barrier culvert sites 980796 and 980729, both require repair. Due to a natural barrier falls located 350 m above site 980729, the habitat gain for these culverts is upstream. Should both culverts be repaired, the overall potential habitat gain is approximately 327.3 square meters and 748.5 square meters of spawning and rearing habitat, respectively.

The final, secondary tributary with barrier culverts enters the mainstem tributary approximately 2,265 m upstream of the Shelton Creek confluence. Two fish bearing culverts, both requiring repair, were identified while surveying this stream. Barrier culvert sites 980812 and 981303, located 610 m and 653 m upstream of the confluence, have a combined upstream habitat gain of 58.7 square meters and 292 square meters of spawning and rearing habitat, respectively.

Located in the northwest corner of the unit, Simmons Creek flows westerly from the only barrier feature (culvert site 981077) identified (Figure 6). During the downstream survey, a natural barrier, created by a bedrock cascade with sheetflow, was encountered 4,074 m below the barrier culvert. Located in the headwaters, culvert site 981077 (Photo 7) drains a series of ponds. After

an extensive investigation during the upstream survey, it was determined that there are no known fish bearing feeder streams to the ponds. Although no spawning habitat was identified, some gravel patches were observed. A population of resident trout are believed to be self-sustained in these headwaters (Shane Barstad, personal communication, 2001) .

The potential gain of fish habitat was calculated using the shorter, upstream, survey. Correcting barrier culvert site 981077 would allow resident trout and other fishes access to approximately 6,347.3 square meters of rearing habitat. Also, reconnecting the segmented habitat will allow the upstream fish population access to the downstream spawning habitat.

Twelve culverts were inventoried on an unnamed tributary to Riffe Lake. Eleven of these culverts are barriers with eight requiring repair. Several sections of steep gradient with cascades and falls were observed during the physical survey, but no natural barriers were found.

Starting at the confluence, the first three culverts surveyed are on DNR land, which is downstream of the unit boundary (Figure 6). These culvert sites (981255, 981256, and 981257) are barriers which require repair. The unit boundary is approximately 2,025 m upstream of the mouth. On the unit and requiring repair, barrier culvert sites 980737, 980745, and 980750 were surveyed 290 m, 567 m, and 1,085 m upstream of the unit boundary, respectively. Barrier culverts sites 980741 and 980747 were surveyed on secondary tributaries. Although these two sites require repair, the habitat gain is relatively small compared to the mainstem tributary. Even so, the overall potential habitat gain associated with this drainage is approximately 1,214.2 square meters and 5,314.9 square meters of spawning and rearing habitat, respectively. The habitat gain associated with correcting only the barrier features located on the unit would amount to approximately 443.3 square meters and 1,875.6 square meters of spawning and rearing habitat, respectively.

Kiona Creek (previously known as Smathers)

Nine culvert sites and one dam site were surveyed during the inventory of the Kiona Creek Unit, but only two fish bearing barrier culverts, sites 980660 and 980663, have sufficient habitat gains to require correction. Both sites are on the unit and are associated with Spring Creek, tributary to Oliver Creek (Figure 7). Dam site 981357 was identified beyond the unit boundary on a fish bearing tributary to Spring Creek. This privately owned dam lacks a significant amount of habitat upstream and does not require repair.

Located in the NE portion of the unit, Spring Creek has been entirely channelized to drain the springs to the east and the adjacent agriculture fields to the west and south. A short distance upstream of site 980660 is the beginning of a drainage ditch which connects Spring Creek to Squaw Creek (Figure 7). Site 980663 is located on this drainage ditch. Both Spring and Squaw creeks are managed as anadromous waters. No spawning habitat is associated with Spring Creek or the drainage canal. The correction of sites 980660 and 980663 would result in the potential rearing habitat gain of 4,734.77 square meters and 5035.49 square meters respectively.

Spears

Siler Creek, a tributary to the Cowlitz River, is the main stream flowing through the unit. The channelized outlet stream of Gibbs Lake is the only other fish bearing stream within the unit that connects to Siler Creek. Beyond the unit, the Siler Creek drainage includes Squire Creek and

several smaller unnamed tributaries (Figure 7).

Associated with the Siler Creek drainage are 41 fish passage features and two water diversions. Thirty-seven culverts, four dams, one gravity diversion (with a dam) and one pump diversion were inventoried while conducting the habitat surveys. Seven fish passage features are within the unit and three are barriers. The barriers include: two barrier culverts (sites 980654 and 980655) on Siler Creek and one barrier culvert (site 980656) on an unnamed tributary. Sites 980654 and 980656 do not require repair due to an insignificant habitat gain. Site 980655 requires repair and has a potential habitat gain of 22,347.6 square meters and 92,765.1 square meters of spawning and rearing habitat, respectively. To realize this potential habitat gain, 20 additional upstream barriers (18 culverts and two dams) need to be repaired.

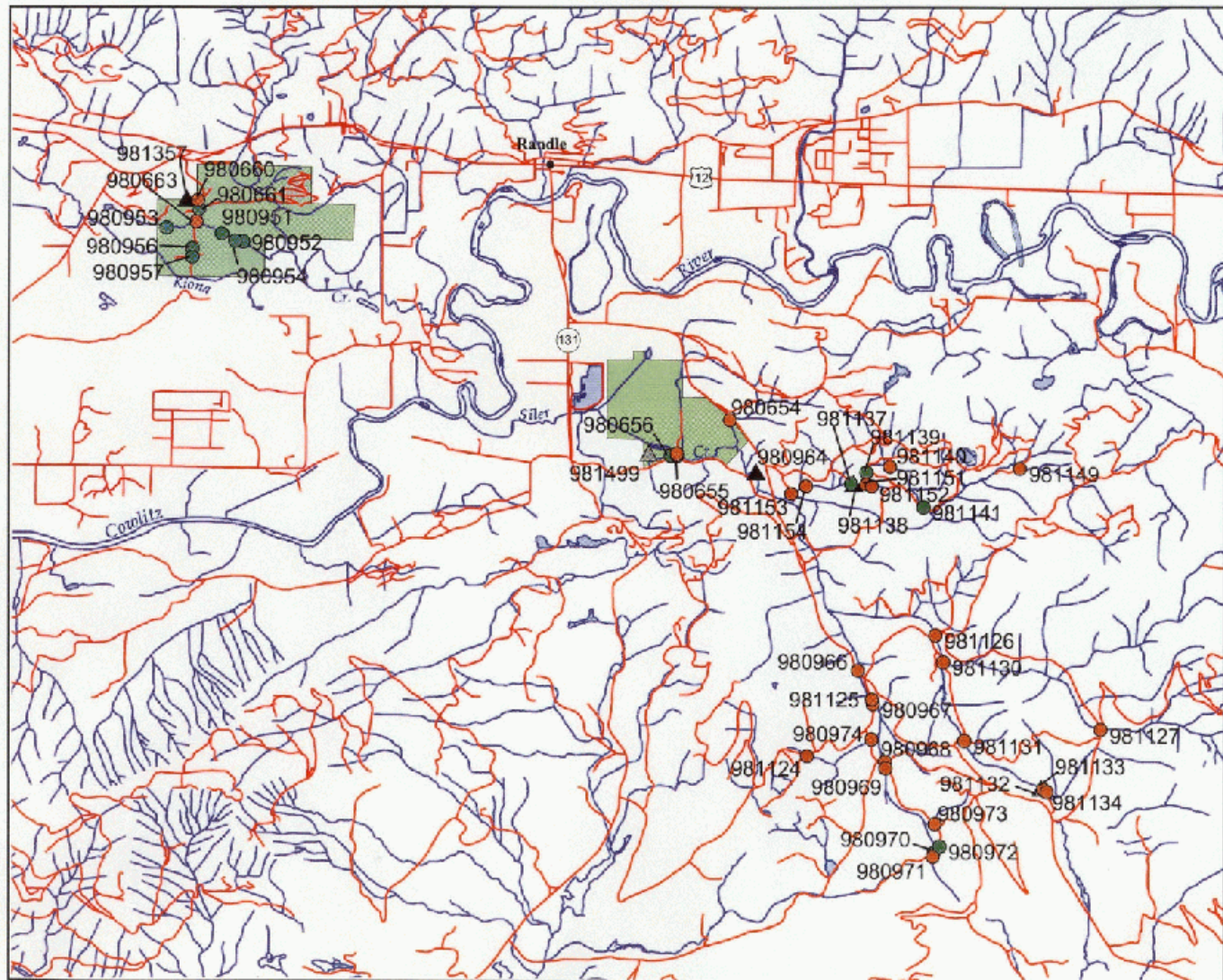
At the upstream (east) end of a human-made pond structure is barrier culvert site 980655. This undersized culvert, along with the earthen dam, allows only a portion of Siler Creek to flow into the pond. This flow exits the west end of the pond through several breaches in the earthen dam (non-barrier site 981499). The other portion of diverted Siler Creek flow enters the field to the north. Correcting site 980655 alone would allow anadromous and resident fishes upstream access to approximately 1,206 linear meters of stream; 1,311.55 square meters and 3,313.16 square meters of spawning and rearing habitat, respectively.

Three additional fish passage barriers were surveyed on the mainstem. They include a privately owned dam, site 980964, and two barrier culverts, site 981126 and site 981127, owned by the U.S. Forest Service (USFS). All three barrier features require repair.

Eleven USFS-owned culverts were identified while surveying Squire Creek and its tributaries. Located on Squire Creek are five barrier culverts (sites 980966, 980967, 980968, 980969, and 980971) requiring repair. Located on small unnamed tributaries to Squire Creek are two barrier culverts (sites 980974 and 981124) requiring repair. Should all the fish passage barriers be resolved, the potential habitat gain for the Squire Creek drainage would amount to 1,771.74 square meters and 25,582.27 square meters of spawning and rearing habitat, respectively.

Located approximately 1,780 m upstream of site 980655, is a large unnamed tributary to Siler Creek. The survey of this stream identified eight privately owned culverts, two privately owned dams (one w/ a gravity diversion), and one USFS-owned culvert. Of these 11 features, four culverts and one dam require repair and will be discussed below.

The first two features, located approximately 50 m and 300 m upstream of the confluence, are partial barrier culvert sites 981153 and 981154, respectively. These culverts are privately-owned and because the field crew was denied landowner's permission to survey them, a visual determination of fish passage was made. The location of these culverts was also estimated using



- Map Features**
- Fish Passage Features**
- Culvert**
- Barrier
 - Non-Barrier
- Dam**
- ▲ Barrier
 - ▲ Non-Barrier
- Fishway**
- Barrier
 - Non-Barrier
- Lake Outlet Screen**
- Barrier
 - Non-Barrier
- Other**
- Barrier
 - Non-Barrier
- Fish Screening Features**
- Gravity Diversion**
- Unscreened
 - Screened
- Pumps**
- Unscreened
 - Screened
 - Unknown
- Other Map Features**
- Roads
 - Rivers/Streams
 - Lakes and Ponds
 - WDFW Managed

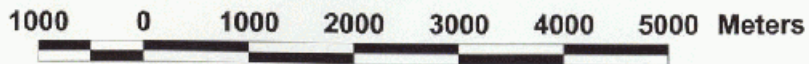


Figure 7

a map and property boundaries. Located on the grounds of a country motel, barrier dam site 981138 was identified. The dam was apparently constructed for landscape design and waterfowl habitat. Approximately 576 m upstream of site 981138, under an overgrown road, is the location of partial barrier culvert site 981140. Continuing upstream, the last barrier feature inventoried was culvert site 981149. This crossing is under a private road that appears to be rarely used. The potential habitat gain associated with the correction of these five barrier features amounts to 3542.9 square meters and 16422.1 square meters of spawning and rearing habitat, respectively.

Located 5,206 m upstream of site 980655 is an unnamed tributary to Siler Creek. During the survey of this stream, six fish passage features were inventoried. Figure 7 shows the location of these features, which include five barrier culverts and one non-barrier dam.

The first two barrier culverts (sites 981130 and 981131) are owned by the USFS and require repair. The other four features are all located on a private landowner's property. Of these four features, only barrier culvert site 981133 requires repair. With the correction of these three barrier culverts, a potential gain of 1,256.4 square meters of spawning habitat and 11,349.8 square meters of rearing habitat would become accessible to both resident and anadromous fishes.

Swofford

The Swofford Unit was inventoried in January, 2000. The winter draw-down of Riffe Lake exposes the outlet creek of Swofford Pond and the large box culvert (site 980921) under an old road once used to access an abandoned pump station, site 980961 (Figure 5). The culvert at site 980921 is a partial barrier to fish passage during the low lake elevation periods, but is back-watered and 100% passable during the periods of higher lake elevations.

The next fish passage feature is the Swofford Pond dam and lake outlet screen (site 980920, photo 8). The features of site 980920 are owned by TPU and block fish passage completely. Lewis County maintains a two lane road atop the 30-foot-high embankment dam, while minor maintenance of the lake outlet screen is performed by WDFW personnel.

The primary inlet stream feeding the pond is Sulphur Creek, which has 850 linear meters of habitat and no human-made fish passage problems before a natural barrier falls. A few smaller streams feed the pond, but the steep topography creates natural fish passage barriers.

The overall gain of existing habitat upstream of site 980921 is 2,686 square meters for spawning and 50,518.4 square meters for rearing. Resolution of barriers 980920 and 980921 should consider past accounts of poor salmonid habitat and the currently popular warm water fishery.

Buffer Zones

The inventory of the Mayfield Lake and Riffe Lake buffer zones were divided by north and south shorelines. Mayfield Lake and its tributaries are managed for anadromous salmonids, while Riffe Lake and its tributaries are currently managed as resident-only waters because there are no downstream fish passage facilities associated with Mossyrock Dam.

Mayfield North

While surveying the north shoreline of Mayfield Lake, three unnamed streams, with fish passage structures within the management boundaries, were inventoried. Only one of these streams has fish passage barriers requiring repair and will be discussed below.

Located on an unnamed tributary, which enters the lake less than 100 m from the dam itself, is barrier culvert site 981103 (Figure 8, photo 9). This quadruple culvert crossing is under a private drive for TPU employee housing and is approximately 20 meters upstream of the confluence and within the buffer zone. During the physical survey upstream, three privately-owned barrier culverts (sites 981351, 981352, and 981353) and one county-owned barrier culvert (site 981350) were inventoried. The three private culverts are associated with small field crossings. Site 981350 is a double culvert under Gershick Road. All five culverts described require repair and

the potential habitat gain amounts to 898.9 square meters and 1263.4 square meters of spawning and rearing habitat, respectively. Correcting barrier culvert site 981103 alone would allow salmonids and other fishes access to all of the available spawning habitat and nearly 80% of the available rearing habitat within the watershed..

Mayfield South

While surveying the south shoreline of Mayfield Lake, a total of eight culvert features were inventoried. Two of the eight culvert features require repair and are discussed below.

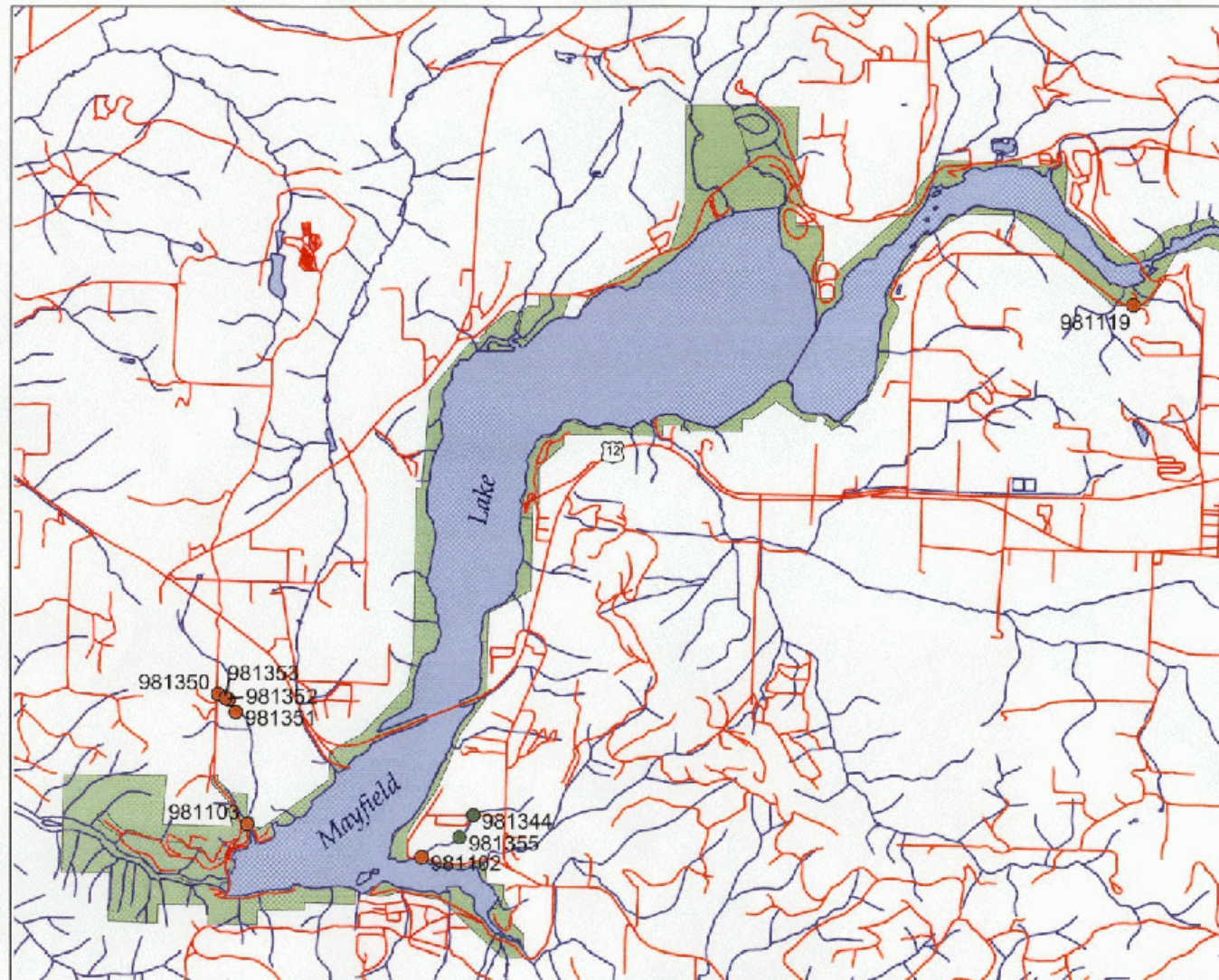
Located near the entrance of the Winston Creek arm of Mayfield Lake and within the buffer zone boundary, is Site 981102, a large concrete box culvert (Figure 8). Due to sheet flow and slope, this culvert is a total barrier to fish passage. Correcting this barrier would allow fish passage to 48.83 square meters and 361 square meters of spawning and rearing habitat, respectively.

Located within the Cowlitz River arm (eastern portion of the lake) is barrier culvert site 981119 (Figure 8). This site is under Birley Road and owned by the county. Due to the close proximity to the buffer zone boundary, this culvert was evaluated. There is a significant amount of habitat both upstream and downstream to warrant correction.

Riffe North

Twenty-three culverts, two pump diversions, three 'others', and one fishway were evaluated on fish bearing streams during the inventory of the north shoreline buffer zone of Riffe Lake. Associated with this discussion are five culvert features from the Peterman Ridge unit.

Starting with the largest stream surveyed, Sand Creek is located near the eastern end of Riffe Lake just west of the Kosmos boat ramp (Figure 4). A total of 15 features (12 culverts, two pump diversions and one fishway) are associated with this drainage. Included are the five



- Map Features**
- Fish Passage Features**
- Culvert**
- Barrier
 - Non-Barrier
- Dam**
- ▲ Barrier
 - ▲ Non-Barrier
- Fishway**
- Barrier
 - Non-Barrier
- Lake Outlet Screen**
- Barrier
 - Non-Barrier
- Other**
- Barrier
 - Non-Barrier
- Fish Screening Features**
- Gravity Diversion**
- ⊗ Unscreened
 - ⊗ Screened
- Pumps**
- ⊗ Unscreened
 - ⊗ Screened
 - ⊗ Unknown
- Other Map Features**
- Roads
 - Rivers/Streams
 - Lakes and Ponds
 - WDFW Managed

800 0 800 1600 2400 3200 4000 Meters



Figure 8

features that are within the Peterman Ridge Unit. The barrier culverts on the Peterman Ridge Unit are what initiated the physical survey of this stream drainage.

From the mouth of Sand Creek, the first fish passage barrier (site 981229) identified during the upstream survey is a double culvert crossing under a private drive. Requiring repair, the correction of this barrier and eight other barriers (to be described) would increase the available fish habitat by 3,813.7 square meters for spawning and 10,732.8 square meters for rearing. A short distance upstream, is an inadequately screened portable pump diversion (site 981230 and privately owned), used primarily for landscape beautification.

Continuing on Sand Creek, the next feature upstream is fishway site 992111 under State Route 12. This culvert was retrofitted with steel baffles and is passable. Located on private property and requiring repair, barrier culvert site 981360 and inadequately screened pump diversion site

981361 are 104 m and 150 m upstream of the State Route crossing, respectively. The last two features identified are barrier culvert sites 981362 and 981363. Located 257 m and 863 m upstream of site 992111, these crossings are under logging roads owned by a local timber company and require repair.

The survey of the unnamed tributary to Sand Creek identified seven barrier culvert sites. Of these, five are located within the Peterman Ridge Unit and two are privately owned. Four of the seven barrier culvert sites require repair, including: sites 981225, 9981226, 981234 and 981236. The overall habitat gain numbers are estimated at 884.6 square meters and 1,915.8 square meters of spawning and rearing habitat, respectively. As for 981236 and the other barrier culverts on the Peterman Ridge Unit, the correction of these barrier features would result in an estimated habitat gain of 292.6 square meters and 864.1 square meters of spawning and rearing habitat, respectively.

A short distance west of Swigert Creek is an unnamed stream with three associated fish passage features (Figure 6). The survey of this stream was conducted during lowered lake elevation. Beginning at the existing confluence, the gradient exceeded 20% up to the high (summer) water line, approximately 28 m upstream. Barrier culvert sites 981181 and 981182 were identified within the buffer zone. Barrier culvert site 981183 was identified beyond the buffer zone. All three sites are timber made culverts. All three barriers require correction and have a potential habitat gain of 158.2 square meters and 333.5 square meters of spawning and rearing habitat, respectively.

Further west along the shoreline, barrier culvert site 981184 was identified on another small, unnamed stream (Figure 5). Located approximately 80 m upstream of the lakes' ordinary high water elevation, and requiring repair, this culvert blocks fish passage to approximately 287.1 square meters and 706.4 square meters of potential spawning and rearing habitat, respectively.

Three barrier culverts are associated with the next stream continuing west along the shoreline. This small stream has a minimal amount of habitat, but has the physical characteristics to be considered fish bearing. The only culvert requiring repair is site 981268, having approximately 23.2 square meters and 91.3 square meters of spawning and rearing habitat gain, respectively.

Associated with the third stream drainage west of Simmons Creek are barrier culvert sites

981272, 981273, and 981274 (Figure 5). Upstream 250 m and 325 m from the confluence, beyond a steep section of bedrock cascades with chutes, are barrier culvert sites 981272 and 981273 (photo 12). Both sites require repair. Although barrier culvert site 981274 does not require repair (due to a gradient barrier upstream), the culvert is clogged at the upstream end and the majority of the flow is diverted away from the natural channel and down an old logging road. The maintenance of this site should be addressed.

The habitat gain for sites 981272 and 981273 is approximately 237.8 square meters and 674.4 square meters of spawning and rearing habitat, respectively.

Riffe South

Fourteen culverts, one dam, and five 'other' features were evaluated on fish bearing streams during the inventory of the south shoreline buffer zone. Of these 20 features, five are barriers that require repair, seven are non-barriers, and eight lack enough habitat to warrant repair

Starting the with the repair required feature furthest east and working west, is barrier culvert site 980888 (Photo 13). This feature, located on an unnamed stream, blocks fish passage to an estimated 1,583 square meters of spawning habitat and 2,347.4 square meters of rearing habitat and requires repair (Figure 4). No other features were located on this stream before a natural gradient barrier was encountered.

Barrier culvert site 980871 is located on an unnamed stream, 140 m above the confluence, under the Chapman Haul Road (Figure 4). Approximately 107 m further upstream is barrier culvert site 981161. This culvert is clogged at the upper end, which causes the stream to flow over the road grade. Fifty-six meters upstream of 981161, the stream gradient exceeds 40% and another 30 m upstream, the stream flows out of a landside scarp, ending possible fish use and the survey.

Site 980871 blocks fish passage to an estimated 66.7 square meters of spawning habitat and 179.9 square meters of rearing habitat and requires repair. Although there is an insignificant amount of habitat upstream of 981161, the estimated amount of available habitat for 980871 can only be realized if both barrier sites be corrected.

Six fish passage features were identified on an unnamed stream that enters Riffe Lake just west of Peterson Creek (Figure 4). Approximately 45 m upstream of the lakes' ordinary high water elevation is barrier culvert site 981233. At this site, the culvert is embedded in the right bank, but the crossing has a barrier hydraulic drop and requires repair. Of the five other barrier culverts, which all have insufficient habitat to warrant repairs individually, four of them (sites 981242, 981243, 9981244, and 981246) contribute to the overall habitat gain of 666.7 square meters and 1,631.2 square meters of spawning and rearing habitat.

The last repair required fish passage feature to be discussed is site 980962. Located within the buffer zone and on an unnamed stream west of Steel Canyon Creek (Figure 6), this 'other' site is a barrier ford crossing, created by several huge logs placed across the channel and backfilled with boulder and gravel. The structure creates a 1.9 meter drop and blocks fish passage to an estimated 133.2 square meters and 276.7 square meters of spawning and rearing habitat, respectively

(upstream).

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APPENDIX I

Photographs of Barriers on the Cowlitz Wildlife Area.

Cowlitz Wildlife Area / Trout Hatchery Unit / Barrier Features



Photo 1. Site 981318, Blue Creek (26.0527) tributary to Cowlitz River. View of dam is obscured by the hatchery rack. The Fish ladder entrance is at the left bank. This site is a total barrier.



Photo 2. Site 980911, Blue Creek (26.0527) tributary to Cowlitz River. This dam is also equipped with a hatchery rack and is a total barrier to fish passage.



Photo 3. Site 980911 continued. Side view of this site shows the hatchery rack and the gravity diversion intake on the left bank. Because the diversion is no longer in use, the features should be removed.



Photo 4. Site 980918, Alexander Creek (26.0528) tributary to Blue Creek. Both culverts at this site have a 3% slope and lack streambed material throughout the inside of the culverts. This site is considered a partial barrier to fish passage due to velocity.

Cowlitz Wildlife Area / Kosmos Unit / Barrier Features



Photo 5. Site 980854, Unnamed pond to Rainey Creek. Developed to enhance waterfowl habitat, this site is influenced by the fluctuating stage of Riffe Lake and the floodplain of Rainey Creek.



Photo 6. Site 980854 continued. Outlet of pond drains directly into Rainey Creek. No streams feed the pond and only rearing habitat exists upstream. This site is considered a total barrier to fish passage.



Photo 7. Site 981177, Unnamed tributary to Steffen Creek. Having greater than 1% slope and no streambed material throughout the culvert, this culvert is considered a partial barrier to fish passage due to velocity. This site becomes inundated by Riffe Lake during the summer recreation season.



Photo 8. Site 980852, Unnamed tributary to Steffen Creek. Because this culvert is undersized and has 5 % slope, high velocities create a total barrier to fish passage.

Cowlitz Wildlife Area / Mossyrock Unit / Barrier Features



Photo 9. Site 981159, Unnamed tributary to Cowlitz River. This culvert is undersized and set at greater than 1 % slope, creating high velocity flows and a total barrier to fish passage.



Photo 10. Site 981160, Unnamed tributary to Cowlitz River. This ford crossing creates a partial fish passage barrier due to constricted channel with a hydraulic drop of 0.30 meter at the upstream end.



Photo 11. Site 980932, Unnamed tributary to Unnamed tributary to Cowlitz River. Having 1% slope with no streambed material throughout the inside of the culvert, this site is considered a partial barrier to fish passage.



Photo 12. Site 980933, Unnamed tributary to Cowlitz River. Created for waterfowl enhancement, this dam site is a total fish passage barrier.

Cowlitz Wildlife Area / Mossyrock Unit / Barrier Features



Photo 13. Site 981172, Unnamed tributary to Unnamed tributary to Cowlitz River. Created for waterfowl enhancement, this dam with a water control structure is a complete barrier to fish passage.



Photo 14. Site 980929, Unnamed tributary to Unnamed tributary to Cowlitz River. This barrier dam (with a water control structure) is located 107 meters upstream of site 981172.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 15. Site 980781, Shelton Creek (26.0640) tributary to Riffe Lake. This timber-made culvert is considered a partial barrier and may fail over time. Several timber-made culverts within this unit have failed, resulting in flow and passage obstructions.



Photo 16. Site 980761, Shelton Creek (26.0640) tributary to Riffe Lake. This double culvert crossing is undersized and a partial barrier to fish passage. The right bank pipe is impassible due to velocity. The left bank pipe becomes a velocity barrier during high flows.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 17. Site 981294, Shelton Creek (26.0640) tributary to Riffe Lake. This culvert is a total barrier due to the outfall drop and no plunge pool. Because the culvert is perched and undersize, streambed material passes through rather than settling out.



Photo 18. Site 981296, Shelton Creek (26.0640) tributary to Riffe Lake. This timber-made culvert has failed. The outfall drop impedes fish passage during low flow periods.



Photo 19. Site 981304, Unnamed tributary to Shelton Creek. The obstructed stream flow caused by this timber made culvert is cutting at the right bank. This is a good view of the large timbers placed parallel within the channel. This site is a partial barrier to fish passage.



Photo 20. Site 980779, Unnamed tributary to Shelton Creek. Although this site has an overflow pipe, the culvert is undersized and has a 5% slope. This culvert is a total barrier to fish passage.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 21. Site 980701, Unnamed tributary to Shelton Creek. This photo depicts two reasons why this culvert is a total fish passage barrier: (1) excessive velocity created by an undersized pipe with a 3% slope, and (2) outfall drop greater than 0.30 meter.



Photo 22. Site 981297, Unnamed tributary to Shelton Creek. Several sections of this timber made culvert have failed. Flow through this structure is obstructed, which partially blocks fish passage.



Photo 23. Site 980817, Unnamed tributary (26.0641) to Shelton Creek. This culvert is undersized with greater than 1% slope, posing a velocity barrier to adult and juvenile fish passage, depending on flow conditions.



Photo 24. Site 981136, Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. A 0.46 meter corrugated steel pipe was added to this clogged timber made culvert crossing. The road prism atop this crossing has failed and is no longer drivable. This site is a total barrier to fish passage.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 25. Site 981207. Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. This timber-made crossing appears to be mostly clogged and the flow constricted. This site was evaluated as a partial barrier at the time of the survey.



Photo 26. Site 980793, Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. This photo illustrates how the installation of an undersized culvert can create obstacles that inhibit fish passage. The velocity and outfall drop impedes fish passage and this culvert is a total barrier.



Photo 27. Site 980796, Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. With a 1.5 meter outfall drop and a 3% slope, this culvert is a total barrier to fish passage.



Photo 28. Site 980729, Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. Because this culvert is undersized and has a 1.6 meter outfall drop and a 5% slope, it is a total barrier to fish passage.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 29. Site 980812. Unnamed tributary to Unnamed tributary (26.0641) to Shelton Creek. Flow and fish passage are completely obstructed through this timber made culvert.



Photo 30. Site 981077, Simmons Creek (26.0631) tributary to Riffe Lake. With large headwater ponds directly upstream, this total barrier culvert blocks fish access to more than 6,300 square meters of quality rearing habitat.



Photo 31. Site 980737, Unnamed tributary to Riffe Lake. While this high gradient stream possesses difficult obstacles for fish movement, the culvert is considered a fish passage barrier due to inadequate size and a 6% slope. There are three additional barrier culverts downstream on DNR property.



Photo 32. Site 980750, Unnamed tributary to Unnamed tributary to Riffe Lake. Several reasons why this culvert is a total barrier to fish passage include: 2% slope, 0.30 meter outfall drop, and inadequate pipe size constricting the flow causing high velocities.

Cowlitz Wildlife Area / Peterman Ridge Unit / Barrier Features



Photo 33. Site 980741. Unnamed tributary to Unnamed tributary to Riffe Lake. This timber-made culvert obstructs the flow and partially blocks fish passage.



Photo 34. Site 980747, Unnamed tributary to Unnamed tributary to Riffe Lake. This photo illustrates an undersized culvert with slope greater than 1% and severe outfall drop creating a barrier to juvenile and adult salmonids.

Cowlitz Wildlife Area / Swofford Unit / Barrier Features



Photo 35. Site 980921, Swofford Pond outlet to Riffe Lake. This partial barrier culvert becomes backwatered and passable when the stage of Riffe Lake is raised.



Photo 36. Site 980920, Swofford Pond (Sulphur Creek, 26.0628). Distant view of dam and lake outlet structure. Although this barrier would require repair to pass salmonids, the upstream habitat is more suitable for warm water fish. The current warm water fishery is popular and likely the best choice for this small sub-basin watershed.

Cowlitz Wildlife Area / Buffer Zones / Barrier Features



Photo 37. Site 981103, Mayfield North, Unnamed tributary to Mayfield Lake. This culvert crossing is less than 25 meters upstream of the lake. Correcting fish passage of this total barrier will allow anadromous and resident fishes upstream access to approximately 1,046 linear meters of stream.



Photo 38. Site 981273, Riffe North, Unnamed tributary to Riffe Lake. Located under an abandoned black top road, this partial barrier culvert is undersized and has a 2% slope.



Photo 39. Site 980888, Riffe South, Unnamed tributary to Cowlitz River. This total barrier culvert is the only feature on this fish bearing stream and blocks access to approximately 736 linear meters of stream.

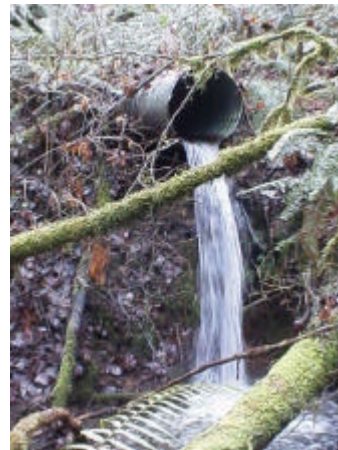


Photo 40. Site 980871, Riffe Lake South, Unnamed tributary to Cowlitz River. This site is a total barrier to fish passage.



Photo 41. Site 981233, Riffe South, Unnamed tributary to Riffe Lake. This barrier outfall drop is likely the result of the undersized culvert that washed out sometime in the past.

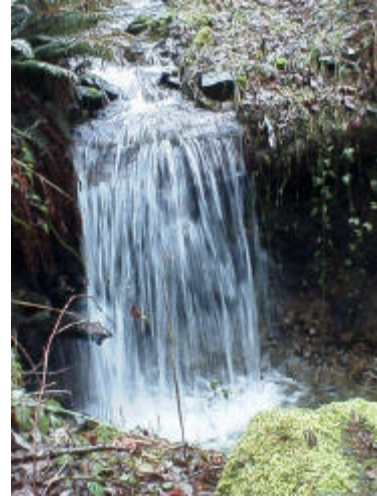


Photo 42. Site 980962, Riffe South, Unnamed tributary to Riffe Lake. This 'Other' site is on an abandoned logging road. Logs were placed across the stream and backfilled with crushed rock to create ford crossing. This is a total barrier due to a 1.9 meter drop.

APPENDIX II

Features Evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
980654	46.5113487	-121.9317856	Spears	Unnamed	Siler Cr	26	Culvert	city
980655	46.5079231	-121.9389954	Spears	Siler Cr	Cowlitz R	26.1018	Culvert	city
980656	46.5081024	-121.9389954	Spears	Unnamed	Siler Cr	26	Culvert	city
980659	46.5079002	-121.9398804	Spears	Siler Cr	Cowlitz R	26	Culvert	city
980660	46.5312500	-122.0055299	Kiona Creek	Spring Cr	Oliver Cr	26	Culvert	city
980661	46.5304199	-122.0053800	Kiona Creek	Unnamed	Squaw Cr	26	Culvert	city
980663	46.5292244	-122.005661	Kiona Creek	Unnamed	Squaw Cr	26	Culvert	city
980675	46.5103111	-122.2377625	Peterman Ridge	Shelton Cr	Riffe Lk	26	Culvert	city
980701	46.5136909	-122.265274	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
980723	46.5105896	-122.2649689	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980724	46.5094566	-122.2627563	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980725	46.5081711	-122.2615356	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980729	46.5157204	-122.2773285	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980734	46.5170593	-122.2731934	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980737	46.491703	-122.2487411	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980738	46.4916191	-122.2515182	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980741	46.4912376	-122.2491531	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980745	46.4939003	-122.2491302	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980747	46.4953156	-122.2500076	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980750	46.4976845	-122.2490463	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980754	46.5015221	-122.2446823	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980759	46.5001335	-122.2619934	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	city
980761	46.5005074	-122.2643738	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	city
980779	46.5026283	-122.2678757	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
980781	46.5032082	-122.2709961	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	city
980787	46.5065613	-122.2713394	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
980792	46.5115738	-122.2758713	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980793	46.5113029	-122.2797318	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980796	46.5141449	-122.2779846	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980812	46.5211601	-122.2863007	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980813	46.5212402	-122.287384	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980814	46.5212822	-122.2882004	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
980817	46.5248718	-122.2948685	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
980843	46.504158	-122.16642	Kosmos	Unnamed	Rainey Cr	26	Culvert	city
980849	46.5079041	-122.189064	Kosmos	Unnamed	Riffe Lk	26	Culvert	city
980850	46.5078278	-122.1885071	Kosmos	Unnamed	Unnamed	26	Culvert	city
980852	46.507988	-122.1836548	Kosmos	Unnamed	Steffen Cr	26	Culvert	city
980854	46.4974327	-122.1783371	Kosmos	Unnamed	Rainey Cr	26	Dam	city
980866	46.4795341	-122.1661072	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
980871	46.4642067	-122.1697159	Riffe S	Unnamed	Cowlitz R	26	Culvert	city
980888	46.4608231	-122.1299515	Riffe S	Unnamed	Cowlitz R	26.0666	Culvert	city
980908	46.501152	-122.1921463	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
980910	46.4998779	-122.1939163	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
980911	46.4927406	-122.7249832	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Dam/ Gravity Diversion	city
980912	46.492157	-122.7217941	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	county

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
980916	46.4913216	-122.72229	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	city
980917	46.4902	-122.7221832	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	city
980918	46.4891129	-122.7221375	Trout Hatchery	Alexander Cr	Blue Cr	26.0528	Culvert	city
980920	46.5029373	-122.3931961	Swofford	Swofford Lk	Riffe Lk	26.0628	Dam/Lake Screen	county/city
980921	46.5043488	-122.3918991	Swofford	Swofford Lk Outlet Cr	Riffe Lk	26.0628	Culvert	city
980923	46.5019226	-122.3904343	Swofford	Unnamed	Swofford Lk	26	Culvert	county
980925	46.4988823	-122.3902054	Swofford	Unnamed	Swofford Lk	26	Culvert	city
980927	46.4991798	-122.3916855	Swofford	Unnamed	Swofford Pond	26	Culvert	city
980929	46.5223846	-122.4303741	Mossyrock	Unnamed	Cowlitz R	26	Dam	city
980931	46.5223656	-122.432579	Mossyrock	Unnamed	Unnamed	26	Culvert	city
980932	46.5230942	-122.4291	Mossyrock	Unnamed	Cowlitz R	26	Culvert	county
980933	46.523037	-122.4288254	Mossyrock	Unnamed	Cowlitz R	26	Dam	city
980934	46.5250664	-122.4338379	Mossyrock	Unnamed	Cowlitz	26	Culvert	city
980948	46.524662	-122.4333496	Mossyrock	Unnamed	Cowlitz R	26	Dam	city
980951	46.5281296	-122.002182	Smathers	Squaw Cr	Kiona Cr	26	Culvert	city
980952	46.5274239	-121.9992676	Kiona Creek	Unnamed	Squaw Cr	26	Culvert	city
980953	46.5285873	-122.0097275	Kiona Creek	Squaw Cr	Kiona Cr	26	Culvert	city
980954	46.5274887	-122.0003738	Kiona Creek	Ditch	Squaw Cr	26	Culvert	city
980956	46.5266685	-122.006134	Kiona Creek	Drainage Ditch	Squaw Cr	26	Culvert	city
980957	46.5258598	-122.0061035	Kiona Creek	Unnamed	Squaw Cr	26	Culvert	city
980961	46.5081635	-122.388092	Swofford	Riffe Lk	Cowlitz R	26.0002	Pump Diversion	city
980962	46.4641724	-122.2927704	Riffe S	Unnamed	Riffe Lk	26	Other	city
980963	46.4621048	-122.2865601	Riffe S	Steel Canyon Cr	Rife Lk	26	Culvert	city
980964	46.5064888	-121.9280472	Spears	Siler Cr	Cowlitz R	26.1018	Dam	private
980965	46.498455	-121.9194336	Spears	Siler Cr	Cowlitz R	26.1018	Culvert	federal
980966	46.4877853	-121.9133987	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980967	46.4845924	-121.9111862	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980968	46.4791489	-121.9093704	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980969	46.4785538	-121.909317	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980970	46.4705696	-121.9023972	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980971	46.470192	-121.9024887	Spears	Squire Cr	Siler Cr	26.1020	Culvert	federal
980972	46.4711723	-121.9015884	Spears	Unnamed	Squire Cr	26	Culvert	federal
980973	46.4732933	-121.9023285	Spears	Unnamed	Squire Cr	26	Culvert	federal
980974	46.4812546	-121.9113083	Spears	Unnamed	Squire Cr	26	Culvert	federal
980990	46.4896393	-122.276825	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980991	46.4895401	-122.2772751	Peterman Ridge	Unnamed	Rife Lk	26	Culvert	city
980992	46.490036	-122.2779846	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980997	46.4892082	-122.278183	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
980998	46.491127	-122.2831497	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
981007	46.4957275	-122.2774048	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981027	46.5292168	-122.277977	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
981029	46.5355034	-122.2840729	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
981033	46.5356941	-122.2876434	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981035	46.5335617	-122.2946167	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981036	46.5352707	-122.2952881	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981058	46.5401955	-122.3033371	Peterman Ridge	Unnamed	Highland Cr	26	Culvert	city
981077	46.52845	-122.3098145	Peterman Ridge	Simmons Cr	Riffe Lk	26.0631	Culvert	city
981087	46.5347061	-122.3442841	Peterman Ridge	Unnamed	Simmons Cr	26	Culvert	city
981097	46.5506058	-122.5005264	Mayfield S	Unnamed	Cowlitz R	26	Culvert	city
981099	46.5026398	-122.5774765	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	city
981102	46.5051117	-122.567894	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	city
981103	46.5072174	-122.5864487	Mossyrook	Unnamed	Mayfield Lk	26	Culvert	city
981119	46.5471802	-122.4933395	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	city
981121	46.5476265	-122.4955673	Mayfield S	Unnamed	Unnamed	26	Culvert	city
981122	46.5502892	-122.5009155	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	city
981123	46.4881401	-121.8844376	Spears	Unnamed	Siler Cr	26	Culvert	federal
981124	46.4795151	-121.9201736	Spears	Unnamed	Squire Cr	26	Culvert	federal
981125	46.4850388	-121.911377	Spears	Unnamed	Squire Cr	26	Culvert	federal
981126	46.4912872	-121.9026947	Spears	Siler Cr	Cowlitz R	26.1018	Culvert	federal
981127	46.4825821	-121.87957	Spears	Siler Cr	Cowlitz R	26.1018	Culvert	federal
981128	46.4852715	-121.882225	Spears	Unnamed	Siler Cr	26	Culvert	federal
981129	46.4891243	-121.8866577	Spears	Unnamed	Siler Cr	26	Culvert	federal
981130	46.4887085	-121.9015884	Spears	Unnamed	Siler Cr	26	Culvert	federal
981131	46.4813042	-121.8984299	Spears	Unnamed	Siler Cr	26	Culvert	federal
981132	46.4769135	-121.8877106	Spears	Unnamed	Siler Cr	26	Dam	private
981133	46.4768066	-121.8873749	Spears	Unnamed	Siler Cr	26	Culvert	private
981134	46.4765587	-121.886879	Spears	Unnamed	Siler Cr	26	Culvert	private
981135	46.4771042	-121.8852997	Spears	Unnamed	Siler Cr	26	Culvert	private
981136	46.5090446	-122.2934341	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981137	46.5055389	-121.9148407	Spears	Unnamed	Siler Cr	26	Culvert	private
981138	46.5055428	-121.9145432	Spears	Unnamed	Siler Cr	26	Dam	private
981139	46.5066566	-121.9126892	Spears	Unnamed	Siler Cr	26	Culvert	private
981140	46.5072365	-121.9094772	Spears	Unnamed	Siler Cr	26	Culvert	private
981141	46.503437	-121.904747	Spears	Unnamed	Siler Cr	26	Culvert	federal
981149	46.5072823	-121.8914261	Spears	Unnamed	Siler Cr	26	Culvert	private
981150	46.5075836	-121.8889771	Spears	Unnamed	Siler Cr	26	Gravity Diversion/ NFB dam	private
981151	46.5055275	-121.9126892	Spears	Unnamed	Unnamed	26	Culvert	private
981152	46.5053215	-121.9119644	Spears	Unnamed	Unnamed	26	Culvert	private
981153	46.5044556	-121.9230576	Spears	Unnamed	Siler Cr	26	Culvert	private
981154	46.5052452	-121.9210892	Spears	Unnamed	Siler Cr	26	Culvert	private
981155	46.5117722	-121.9537277	Spears	Siler Cr	Cowlitz	26	Pump	private
981156	46.5136681	-121.9477844	Spears	Unnamed	Siler Cr	26	Culvert	city
981157	46.5148926	-121.9462433	Spears	Unnamed	Siler Cr	26	Culvert	city
981158	46.5397682	-122.2341766	Davis Lake	Minnie Cr	Davis Lk	26.0592	Culvert	private
981159	46.5361252	-122.441658	Mossyrook	Unnamed	Cowlitz R	26	Culvert	city
981160	46.5283546	-122.4366074	Mossyrook	Unnamed	Cowlitz R	26	Other	city

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
981161	46.4634857	-122.1696625	Riffe S	Unnamed	Riffe Lk	26	Culvert	city
981162	46.4660912	-122.1751404	Riffe S	Peterson Cr	Riffe Lk	26.0655	Other	city
981164	46.4986038	-122.1682205	Kosmos	Unnamed	Rainey Cr	26	Culvert	city
981165	46.5003662	-122.167717	Kosmos	Rainey Cr	Riffe Lk	26.0651	Other	city
981166	46.5019951	-122.1649399	Kosmos	Unnamed	Rainey Cr	26	Culvert	city
981167	46.5044785	-122.16008	Kosmos	Unnamed	Rainey Cr	26	Culvert	private
981168	46.5078125	-122.1624374	Kosmos	Unnamed	Rainey Cr	26	Culvert	private
981169	46.5084991	-122.1619492	Kosmos	Unnamed	Rainey Cr	26	Culvert	private
981172	46.5233841	-122.4301147	Mossyrock	Unnamed	Cowlitz R	26	Dam	city
981174	46.4991684	-122.1943817	Riffe N	Unnamed	Steffen Cr	26	Culvert	city
981176	46.5011292	-122.1953506	Riffe N	Unnamed	Steffen Cr	26	Culvert	private
981177	46.5005989	-122.1905441	Kosmos	Unnamed	Steffen Cr	26	Culvert	city
981178	46.5075874	-122.1902924	Kosmos	Unnamed	Steffen Cr	26	Culvert	county
981179	46.5066986	-122.1704483	Kosmos	Frost Cr	Steffen Cr	26.0653	Culvert	county
981180	46.4948769	-122.3082047	Riffe N	Unnamed	Riffe Lk	26	Other	city
981181	46.5041542	-122.3287888	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
981182	46.5048409	-122.3292694	Riffe N	Unnamed	Riffe Lk	26	Other	city
981183	46.5052338	-122.3294907	Riffe N	Unnamed	Riffe Lk	26	Other	private
981184	46.5241852	-122.356926	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
981199	46.5306244	-122.2690506	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981204	46.5108643	-122.1836166	Kosmos	Unnamed	Unnamed	26	Culvert	private
981205	46.5136261	-122.1816406	Kosmos	Unnamed	Unnamed	26	Dam/ Gravity Diversion	private
981206	46.5034676	-122.3922806	Swofford	Sulfur Cr	Riffe Lk	26	Culvert	city
981207	46.5102539	-122.297081	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981209	46.4580917	-122.2727127	Riffe S	Unnamed	Riffe Lk	26	Other	city
981213	46.4580612	-122.2672501	Riffe S	Unnamed	Riffe Lk	26	Culvert	city
981214	46.4567375	-122.2672424	Riffe S	Unnamed	Riffe Lk	26	Other	city
981216	46.4566994	-122.2612839	Riffe S	Unnamed	Riffe Lk	26	Other	city
981217	46.456604	-122.2615585	Riffe S	Unnamed	Riffe Lk	26	Dam	city
981222	46.4591942	-122.2420197	Riffe S	Indian Cr	Riffe Lk	26.0644	Culvert	city
981223	46.5107117	-122.1781464	Kosmos	Unnamed	Steffen Cr	26.0652	Dam	private
981224	46.5109673	-122.2146301	Peterman Ridge	Unnamed	Sandy Cr	26	Culvert	city
981225	46.5115738	-122.2185669	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981226	46.5103302	-122.2221451	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981227	46.5097733	-122.2245102	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981228	46.4960136	-122.2082443	Riffe N	Sand Cr	Riffe Lk	26.0646	Culvert	city
981229	46.5029373	-122.2014542	Riffe N	Sand Cr	Riffe Lk	26.0646	Culvert	private
981230	46.5045433	-122.2020874	Riffe N	Sand Cr	Riffe Lk	26.0646	Pump	private
981231	46.4642143	-122.2236481	Riffe S	Unnamed	Riffe Lk	26	Culvert	city
981232	46.4640923	-122.2220764	Riffe S	Unnamed	Riffe Lk	26	Culvert	city
981233	46.468708	-122.1821899	Riffe S	Unnamed	Riffe Lk	26	Culvert	city
981234	46.510746	-122.2066116	Peterman Ridge	Unnamed	Sand Cr	26	Culvert	private
981236	46.5125122	-122.2158356	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981242	46.4637337	-122.1831131	Riffe S	Unnamed	Riffe Lk	26	Culvert	unk
981243	46.4632339	-122.1828995	Riffe S	Unnamed	Riffe Lk	26	Culvert	unk

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
981244	46.4623337	-122.1833878	Riffe S	Unnamed	Riffe Lk	26	Culvert	unk
981246	46.4637794	-122.1832733	Riffe S	Unnamed	Unnamed	26	Culvert	unk
981247	46.4636612	-122.1841202	Riffe S	Unnamed	Unnamed	26	Culvert	unk
981250	46.5104942	-122.2180176	Peterman Ridge	Unnamed	Sand Cr	26	Culvert	private
981253	46.5011139	-122.2453003	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	city
981254	46.4957275	-122.2518539	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981255	46.4846115	-122.2520905	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	state
981256	46.4856339	-122.251297	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	state
981257	46.4879837	-122.2482681	Peterman Ridge	Unnamed	Riffe Lk	26	Culvert	state
981263	46.4896698	-122.2788773	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981264	46.4894142	-122.2791748	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981265	46.4985313	-122.2868958	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	unk
981266	46.5011292	-122.2866898	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	unk
981268	46.529274	-122.3625183	Riffe N	Unnamed	Unnamed	26	Culvert	city
981269	46.5303841	-122.3614502	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
981270	46.5302925	-122.361145	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
981271	46.5402679	-122.3654556	Riffe N	Unnamed	Riffe Lk	26	Culvert	private
981272	46.533596	-122.3744812	Riffe N	Unnamed	Riffe Lk	26	Culvert	city
981273	46.5339165	-122.3744888	Riffe N	Unnamed	Riffe N	26	Culvert	city
981274	46.5367432	-122.3839569	Riffe N	Unnamed	Riffe Lk	26	Culvert	private
981275	46.534359	-122.3740845	Riffe N	Unnamed	Unnamed	26	Culvert	city
981278	46.5459976	-122.4710464	Mayfield N	Unnamed	Mayfield Lk	26	Culvert	city
981279	46.5523415	-122.4902496	Mayfield N	Unnamed	Mayfield Lk	26	Culvert	city
981280	46.5442467	-122.2371521	Davis Lake	Unnamed	Minnie Cr	26	Culvert	city
981281	46.5438309	-122.2395172	Davis Lake	Unnamed	Unnamed	26	Culvert	city
981284	46.5462379	-122.2428513	Davis Lake	Unnamed	Davis Lake	26	Culvert	city
981285	46.5380058	-122.3581161	Riffe N	Unnamed	Riffe Lake	26	Culvert	city
981294	46.5031738	-122.2536545	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	city
981295	46.5052948	-122.2460251	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	private
981296	46.505825	-122.2424622	Peterman Ridge	Shelton Cr	Riffe Lk	26.0640	Culvert	private
981297	46.5032692	-122.255928	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
981298	46.5056915	-122.257309	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
981299	46.5002937	-122.2874069	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	unk
981300	46.5264053	-122.2932892	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981302	46.5272827	-122.2993088	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981303	46.5216026	-122.2860184	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981304	46.502327	-122.2685013	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
981305	46.5043221	-122.26548	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	city
981306	46.5080338	-122.2844849	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981308	46.5097542	-122.2967377	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981309	46.508976	-122.2929382	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981310	46.507534	-122.2902222	Peterman Ridge	Unnamed	Unnamed	26	Culvert	city
981311	46.5363426	-122.2825623	Peterman Ridge	Unnamed	Shelton Cr	26	Culvert	unk
981312	46.5071487	-122.7096252	Trout Hatchery	Blue Cr	Cowlitz	26.0527	Culvert	county
981313	46.5081329	-122.7087173	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Dam	private
981314	46.5073318	-122.7073975	Trout Hatchery	Blue Cr	Cowlitz	26.0527	Pump	private
981315	46.5075455	-122.7070389	Trout Hatchery	Blue Cr	Cowlitz	26.0527	Pump	private

Features evaluated during the Cowlitz Wildlife Area Fish Passage Barrier and Surface Water Diversion Inventory. List sorted by Site ID. Latitude/ Longitude are in decimal degrees (WGS84).

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
981316	46.4901276	-122.7065506	Trout Hatchery	Alexander Cr	Blue Cr	26.0528	Culvert	county
981317	46.4890938	-122.7093811	Trout Hatchery	Alexander Cr	Blue Cr	26.0528	Culvert	county
981318	46.4882774	-122.7264099	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Dam	city
981319	46.5075493	-122.7350998	Trout Hatchery	Unnamed	Blue Cr	26	Other	private
981320	46.5135231	-122.7360687	Trout Hatchery	Unnamed	Blue Cr	26	Dam	private
981321	46.51437	-122.7303848	Trout Hatchery	Unnamed	Blue Cr	26	Other	private
981322	46.5151711	-122.7252426	Trout Hatchery	Unnamed	Blue Cr	26	Other	private
981323	46.5188255	-122.7196274	Trout Hatchery	Unnamed	Blue Cr	26	Dam	private
981324	46.5127296	-122.7381134	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981325	46.5190697	-122.7191315	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981326	46.5214272	-122.7164383	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	county
981327	46.5229301	-122.7144089	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981328	46.5242805	-122.7129974	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981329	46.5258446	-122.711525	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981330	46.5271606	-122.7101212	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981331	46.5335884	-122.6788406	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	private
981332	46.537323	-122.6737061	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	private
981333	46.5376968	-122.6731186	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	private
981334	46.53936	-122.6726151	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Other	private
981335	46.5427246	-122.6684494	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	private
981336	46.5427399	-122.6675186	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	county
981337	46.5464897	-122.6634293	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	county
981338	46.5475044	-122.6620712	Trout Hatchery	Blue Cr	Cowlitz	26.0527	Culvert	county
981339	46.5485992	-122.6587067	Trout Hatchery	Blue Cr	Cowlitz	26.0527	Culvert	private
981340	46.549118	-122.6583176	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	private
981341	46.5209389	-122.6905289	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Other	state
981342	46.5131493	-122.7175674	Trout Hatchery	Unnamed	Blue Cr	26	Culvert	private
981343	46.5135841	-122.7172699	Trout Hatchery	Unnamed	Unnamed	26	Other	private
981344	46.5081399	-122.5625299	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	private
981346	46.5443599	-122.2365599	Davis Lake	Unnamed	Minnie Cr	26	Culvert	county
981347	46.5444999	-122.2355100	Davis Lake	Unnamed	Minnie Cr	26	Dam	private
981348	46.5445599	-122.2350899	Davis Lake	Unnamed	Minnie Cr	26	Dam/ Gravity Diversion	private
981349	46.5445899	-122.2346100	Davis Lake	Unnamed	Minnie Cr	26	Other	private
981350	46.5167500	-122.5898600	Mayfield N	Unnamed	Mayfield Lk	26	Culvert	county
981351	46.5154399	-122.5879800	Mayfield N	Unnamed	Mayfield	26	Culvert	private
981352	46.5163599	-122.5887199	Mayfield N	Unnamed	Mayfield Lk	26	Culvert	private
981353	46.5164699	-122.5891100	Mayfield N	Unnamed	Mayfield Lk	26	Culvert	private
981355	46.5066500	-122.5639000	Mayfield S	Unnamed	Mayfield Lk	26	Culvert	private
981356	46.5442600	-122.2381900	Davis Lake	Unnamed	Minnie Cr	26	Culvert	city
981357	46.5313700	-122.0071200	Kiona Creek	Unnamed	Spring Cr	26	Dam	private
981358	46.5438199	-122.2385799	Davis Lake	Unnamed	Minnie Cr	26	Culvert	city
981360	46.5099799	-122.1977300	Riffe N	Sand Cr	Riffe Lk	26.0646	Culvert	private
981361	46.5103300	-122.1976300	Riffe N	Sand Cr	Riffe Lk	26.0646	Pump	private
981362	46.5111599	-122.1965000	Riffe N	Sand Cr	Riffe Lk	26.0646	Culvert	private
981363	46.5176099	-122.1951200	Riffe N	Sand Cr	Riffe Lk	26.0646	Culvert	private

Site ID	Geographic Coordinates		WLA Unit	Stream	Tributary To	WRIA	Feature Type	Owner Type
	Latitude	Longitude						
981499			Spears	Siler Cr	Cowlitz R	26.10.18	Dam	city
990041	46.5319824	-122.6811295	Trout Hatchery	Blue Cr	Cowlitz R	26.0527	Culvert	state
992111	46.5091591	-122.1990051	Riffe N	Sand Cr	Riffe Lake	26.0646	Fishway	state
992113	46.5093575	-122.1838531	Kosmos	Unnamed	Riffe Lake	26	Culvert	state