CHIMACUM DRAINAGE DISTRICT ANALYSIS

[Document subtitle]

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Prepared by Jefferson County Conservation District

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Executive Summary

This document outlines the major drainage and flooding challenges impacting agriculture, infrastructure, and salmonid habitat within Jefferson County Drainage District #1, also known as the Chimacum Drainage District. To facilitate this analysis of current conditions and issues, the drainage district area is divided into reaches. Seven reaches comprise the main branch of Chimacum Creek and five comprise the East Chimacum Creek branch. Data for a variety of environmental parameters were gathered for each reach. Parameters, both quantitative and qualitative, that influence the dual goals of maintenance and improvement of farmland and aquatic habitat improvement were selected. These parameters address flooding propensity, farmland viability, water quality, fish utilization, riparian forest establishment potential, as well as general landscape and waterway data. The primary source of information was existing data from previous studies and plans. Some additional orthophotograph imagery interpretation and geographic information systems analysis was done to augment existing data. Very limited field verification was performed. Draft stream reach analyses were presented to the community during two focus group meetings where input and feedback was solicited. In addition, the reach analyses were posted on a Jefferson County Conservation District webpage dedicated to drainage district planning.

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SECTION 1: INTRODUCTION AND BACKGROUND

The Chimacum Creek valleys with their rich peat soils were once the agricultural life blood of Jefferson County. The agricultural development of these valleys was made possible by major alterations in the natural drainage system, including channelization of Chimacum Creek, excavation of many miles of drainage ditches, and installation of miles of subsurface drainage. These dramatic alterations to the landscape enabled agriculture to thrive, albeit for only a couple generations in much of the watershed. The vast majority of the drainage improvements were undertaken by Jefferson County Drainage District #1, also known as the Chimacum Drainage District (DD1).

Not surprisingly, these remarkable drainage accomplishments and the resulting agricultural achievements came with significant environmental impacts. Chimacum Creek once supported thriving runs of coho and chum salmon, steelhead, and trout. Coho and chum populations were extirpated from Chimacum Creek in the 1980s but were reintroduced with stock from neighboring streams. Chimacum Creek has long suffered from water quality problems, including bacterial contamination, high water temperature, and low dissolved oxygen. Portions of Chimacum Creek are listed as impaired by the Washington Department of Ecology for each of these water quality parameters. Many factors have contributed to degraded water quality and declines in salmonid population, but we now have a much better appreciation for the detrimental effects of natural drainage system manipulations and the endless care and maintenance that dramatically altered landscapes demand.

Today, much of the once-thriving agriculture land in the Chimacum Creek valleys is highly impaired by long periods of saturated soils and inundation. The creek, its tributaries and drainage ditches are clogged with introduced and highly invasive reed canarygrass (RCG), which obstructs stream flow and sediment transport, exacerbating flooding and hindering fish passage. It also contributes to low dissolved oxygen as it decomposes. The planting of trees and shrubs for riparian habitat improvement and to shade out RCG has attracted beaver, further contributing to farmland flooding and creating new challenges for riparian habitat restoration.

Current conditions are far from ideal, both for agriculture and for aquatic and wetland habitat. Strategically planned and implemented drainage system rehabilitation and stream and wetland restoration projects, combined with comprehensive and regular management of RCG and beaver dams can produce watershed-scale win-win results.

This plan presents such a strategy. The causes of flooding and inundation throughout DD1, and the associated impacts on agriculture, infrastructure, and salmonid habitat are assessed and described. Best management practices for regular drainage system maintenance are presented, and special large-scale projects for drainage system improvement and ecological restoration are identified and described. The goal is to maintain and restore viable farmlands of long-term importance with minimal environmental impacts, while also improving water quality and aquatic and wetland habitat in the Chimacum Creek watershed.

Following a general overview of watershed conditions and issues common throughout the drainage district area, the drainage district is broken down into reaches for a more detailed inventory and analysis of conditions. A review of annual maintenance costs, large-scale project costs and potential revenue sources follows the reach-scale analyses. Included in the annual maintenance cost review are

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potential drainage district assessment schemes. Links to relevant drainage district laws are presented in the appendix.

What entity or entities will play a role in plan implementation is yet to be determined. DD1, created in 1919, and responsible for most of the modifications to the watershed drainage system, as well as its maintenance, is presently inactive but under consideration for reactivation. However, a variety of potential plan implementation organizations and mechanisms are presented and evaluated.

Chimacum Creek (CHI) refers to the west fork stream channel and the channel downstream of the confluence with the east fork. East Chimacum Creek (ECH) is the east fork stream channel.

The *Drainage Management Guide for Whatcom County Drainage Improvement Districts* prepared by Whatcom Conservation District in 2009 served as a template for this analysis. The *Geomorphic Assessment of Chimacum Creek* prepared for the North Olympic Salmon Coalition by Natural Systems Design in 2016 is the source of a substantial amount of inventory and evaluation data. Jefferson Land Trust and Jefferson County also provided GIS data.

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SECTION 2: WATERSHED AND DRAINAGE DISTRICT CHARACTERIZATION

2.1 General Watershed Characterization and Historical Conditions

The Chimacum watershed totals approximately 37 square miles (~23,680 acres) (Bahls and Rubin 1996; SCS 1955). The watershed is pear-shaped, draining from south to north with West Chimacum Creek (CHI) and East Chimacum Creek (ECH) comprising the primary waterways. The two spring- and lake-fed channels flow through two parallel valleys (CHI, commonly referred to as Center or Chimacum Valley, and ECH, referred to as Beaver Valley) in the form of an inverted Y. These two valleys comprise the vast majority of DD1 or about one-third of the total watershed. The two stream branches join approximately 2.3 miles upstream of the outlet at Port Townsend Bay. There are approximately 29.5 miles of main channels between the two branches. CHI comprises a little less than 80 percent of the average combined flows of the two tributaries.

CHI originates in Delanty Lake at river mile (RM) 13.1 with another small tributary flowing out of nearby Peterson Lake. This area is upstream of the DD1 boundaries, thus outside the scope of this plan. Two additional small tributaries flow out of forested wetlands about 1.5 miles downstream and join, becoming what is presently known as Barnhouse Creek. Barnhouse Creek joins CHI at RM 9.6. Another major tributary to CHI is Naylors Creek, which joins CHI at about RM 5.4. Naylors Creek originates in Gibbs Lake, located to the west. Putaansuu Creek, also flowing from the west, joins CHI at about RM 4.3. Several other small tributaries and ditches flow into CHI. Much of the CHI stream channel in the lower eight miles is about 20 feet wide with vertical or near-vertical banks.

ECH originates in forested wetlands approximately 5.5 miles upstream of the confluence with CHI. Swansonville Creek, formerly a tributary to Ludlow Creek, was diverted to ECH as part of the early drainage modifications and stream channelization. There are many other small and relatively minor tributaries and ditches that flow into ECH. Average stream channel width on ECH is less than ten feet with vertical or near-vertical banks.

Both streams are low to very low gradient, particularly through the reaches where farming is most prevalent (CHI RM 9.4 to confluence with ECH, and nearly the entire length of ECH). Total elevation change for these stream reaches are about 122 feet and 81 feet respectively resulting in gradients less than 0.4 percent. Most of the CHI fall occurs in the upper 3-4 miles, upstream of the DD1 boundaries. The gradient levels out below about RM 9, maintaining a fairly consistent gradient from there to the confluence; however, from RM 5.8 to 3.4 the gradient is particularly low at less than 0.06 percent. ECH has a consistently low gradient throughout.

Climate

The climate is mild with cool, dry summers and wet and cloudy but mild winters. Annual precipitation ranges from about 20 inches at the north end to about 30 inches at the south end of the watershed. About two-thirds of the annual precipitation falls during the six-month period from October to the end of March, mostly as rain. Climate change modeling predicts a wetter rainy season with more intense storm events and drier summers.

Geology and Soils

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Ancient tectonic forces and the advance and retreat of glacial ice sheets formed the relatively broad, flat Chimacum valleys and adjacent ridges and terraces. Valley floors are up to 3,000 feet wide. Valley bottom soils are hydric and mostly organic peats and mucks that developed from decaying vegetation under the saturated conditions of the glacial basins and ponded areas.

The soils of the stream valleys are predominantly poorly drained and relatively deep organic soils – mostly Semiahmoo mucks. These soils are comprised of partially decomposed organic matter that formed mainly from herbaceous plant material, such as rushes and sedges. The water table is at or near the surface, and these soils remain stable under saturated conditions. However, once drained, these soils shrink and the exposure to oxygen can result in rapid organic matter decomposition. Through decomposition, the organic carbon tied up in the soil organic material converts to carbon dioxide and water through a process called oxidation. Therefore, the main challenge with the cultivation of organic soils is water control.

Careful and complex water management, including both drainage and management of the water table is critical to create suitably dry conditions for agricultural production but not so much that the soil disappears. Initial drainage of organic soils often results in substantial settling and subsidence. Continued cultivation can result in settling and subsidence of up to one inch per year or more, depending on the depth to the water table, and the surface soil becomes increasingly dense. This phenomenon explains why ground immediately adjacent to ditches and streams where the water table remains relatively high is higher than the drained land farther away from the waterway.

Pre-Colonial Settlement Conditions

Colonial settlement of Chimacum watershed began in the 1850s. Very few of the original inhabitants of the area, the Chemakum Tribe, were still alive at the time (Bahls and Rubin 1996). According to General Land Office surveys conducted between 1858 and 1873 and personal accounts from old timers, the watershed was historically mostly coniferous forest with western redcedar and spruce swamps, meandering stream channels, beaver ponds, and thickets of Pacific crabapple and Douglas spirea in the broad stream valleys (Bahls and Rubin 1996). Reference is made to the “Chimacum Prairie” in some literature, and recent work by the US Forest Service Pacific Northwest Research Station has identified several small prairies in the Chimacum and Port Hadlock/Irondale area. The largest of these prairies was centered at the intersection of Beaver Valley and Center roads. Bahls and Rubin also recorded homesteader accounts of large wood in the streams and large wood rising to the surface of the land out of the peat during cultivation.

Beavers were common in the lower watershed until major forest clearing and drainage work began near the end of the 19th century. Trapping occurred during the first half of the 20th century, significantly reducing beaver populations. Beaver reintroduction started around 1960 (Bahls and Rubin 1996).

Fish Presence

The Chimacum watershed once included native runs of anadromous coho salmon, summer and fall chum, steelhead, and resident cutthroat and rainbow trout (NOSC 2018; Bahls and Rubin 1996). The native coho and chum runs are greatly reduced from their historic levels (Bahls and Rubin 1996; Lichatowich 1994). The coho were considered a unique run because of their geographic isolation and late run timing; however, this may have changed because of the introduction of coho from other streams, most notably the Quilcene River. The coho, steelhead, and trout likely spawned primarily upstream of RM 8.5 of CHI, in Naylors Creek, and in upper ECH, but reared throughout the system. Summer chum spawned in the lower mile or two of Chimacum Creek. Chum were extirpated from Chimacum Creek by the late 1980s following a heavy storm that caused the Irondale Road fill to fail during chum spawning time. The road failure sent an estimated 20,000 cubic yards of fill downstream, burying the chum redds. Summer chum salmon were reintroduced beginning in 1996 with stock from Salmon Creek, which flows into Discovery Bay (Johnson and Weller 2003).

Historical data regarding natural habitat conditions for coho salmon are not available. However, there were old timer accounts from the early 20th century of abundant coho salmon and cutthroat trout, particularly in the headwaters reaches (Bahls, P. and J. Rubin 1996). The Washington Department of Fish & Wildlife rates coho runs as healthy, but this rating is relative to habitat conditions in the 1950s when data collection began, and by that time the watershed had been significantly altered for decades.

Table 1. Current and Historic Stream and Wetland Conditions

Adapted from the 2018 *Chimacum Creek Restoration and Protection Plan.*

Stream Component	Historic	Current	Reduction
Wetlands	2,240 acres (1,650 inundated in winter, 590 year-round)	904 acres (mostly agricultural land)	>60%
Channel Length (entire watershed)	27.2 miles	21.7 miles	>20%
Channel Length (drainage district	Undetermined, but most channel straightening occurred within drainage district	13.2	
Riparian Forest	Unknown	36% of main channels in various stages of development	>60%
Agricultural Ditches within Valley Bottom	None prior to agricultural development	>44 miles of ditches, <10% with woody riparian vegetation	N/A

Farmland

The vast majority of the farmland in DD1 is in permanent cover with forage crops for pasture, hay, or silage. Most of the remaining farmland is under annual cultivation for vegetables and small grains, with a very small percentage of land planted to orchards and blueberries.

Approximately 3,081 acres of farmland were identified in DD1 through analysis of 2021 orthophoto imagery. County Assessor data from 2022 indicated that 60 property owners (127 parcels) were enrolled in the open space agriculture property tax program. The analysis of 2021 orthophoto imagery included an evaluation of farmland productivity, which was followed by limited field verification in February of 2024. An estimated 1,215 acres were rated to be in a fairly productive condition (a predominance of desirable forage species with estimated yields above 50 percent of potential, or currently under cultivation for annual crops or orchards or berries). This estimate totals just under 40 percent of the total estimated land currently in agricultural production, leaving over half of the farmland to be marginally productive.

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A total of the 1,201 acres of land in the drainage district is protected by conservation easements that severely restrict conversion to other uses. Approximately 730 of these acres (61%) are farmland; the balance is forestland or habitat. Most but not all of this land is farmland, but not all of it was rated as productive. Of the 730 protected farmland acres, approximately 267 acres (37%) were rated as productive during the analysis of productive farmland.

The vast majority of the land in agricultural production is in the valley bottoms where it is subject to flooding and/or excessive saturation. There are approximately 3,372 acres of valley bottom lands between the two valleys. Organic soils (Semiahmoo muck, Mukilteo peat, and McMurray peat) comprise approximately 30 percent of the total DD1 area but most of the valley bottom areas where most of the farmland is. All totaled, approximately 39 percent of the soils in DD1 are potentially prime farmland soils. If drained, these soils are considered prime farmland soils capable of producing six tons per acre of grass-legume hay. Undrained, these soils are expected to produce two tons per acre with good management.

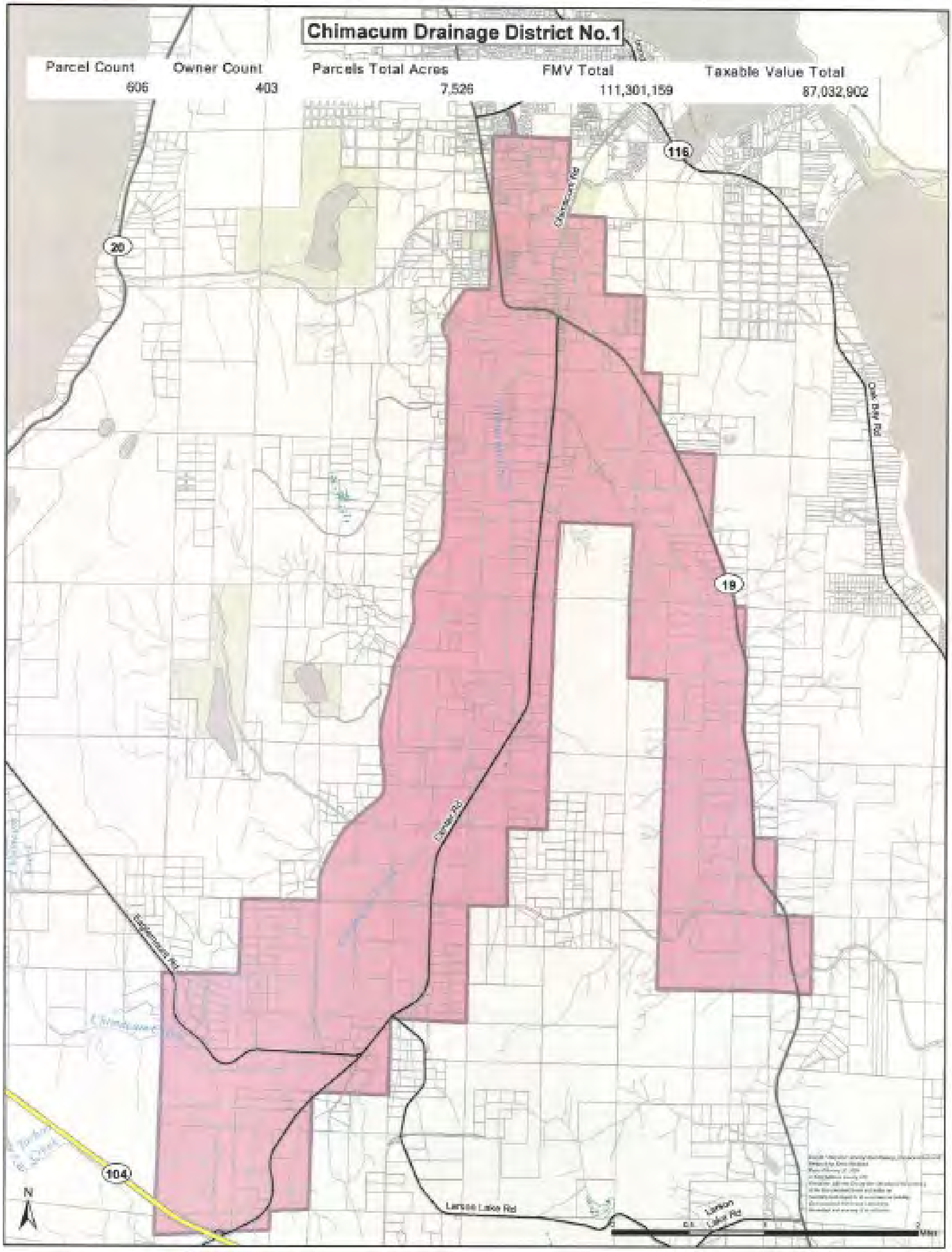
In order to assess the recent decline in productive farmland, an analysis of orthophotography comparing the years 2000 and 2021 was conducted. Based on this analysis, an estimated 400 acres of fairly productive and/or cultivated farmland in 2000 was in a highly degraded condition or no longer farmed in 2021. Therefore, over this 20-year span there was an estimated 25 percent decline in productive farmland. It is difficult to say with any certainty what contributed to this decline. However, prolonged inundation and/or excessively saturated soil appears to have been a major factor, as many of the less productive fields presently have an abundance of undesirable vegetation, such as common rush, that thrives in saturated conditions. Simple neglect may also be a contributing factor, as very few pasture/hay fields have been renovated over the past couple decades, and many fields do not appear to be harvested regularly.

2.2 Jefferson County Drainage District #1

Drainage districts are local special purpose districts organized under chapters 85.06.010 and 85.38.180 of the Revised Code of Washington. Drainage districts are governed by a three-member board of commissioners elected by district property owners. Their enabling legislation was adopted in 1895, making drainage districts some of the oldest special purpose districts in the state. They have broad authority related to drainage improvement activities, including drainage system construction, alteration of natural waterways, and ongoing maintenance. They have the power of eminent domain and can hold title to real property and easements for maintenance purposes. Although the powers granted to drainage districts by statute are very broad, especially as they relate to modification of waterways, newer laws in place to protect the environment and wildlife prohibit many of the things that drainage districts commonly did a century ago.

Jefferson County Drainage District #1, also known as the Chimacum Drainage District (DD1) was formed in 1919 and became inactive in 1974, but it was never dissolved. DD1 still holds easements and title to land along portions of Chimacum Creek. According to state law (RCWs 36.96 and 85.38.220), if a special purpose district does not carry out its functions for five consecutive years or fails to hold an election for seven consecutive years, it should be dissolved, which is done by the county legislative authority after holding a public hearing. Alternatively, the county legislative authority can suspend the operations of a special purpose district, allowing it to be reactivated in the future. Reactivation typically requires appointment of new commissioners. As of December 2004, the Jefferson County treasurer reported a balance of $1,216.64 in the DD1 account.

Figure 1. Original Chimacum Drainage District with 2020 Tax Parcels



DD1 Facilities and Operations

The DD1 territory encompasses about one-third of the Chimacum watershed. Jefferson County reports a total of 6,730 acres in district (see Figure 1 above). It extends from near the Barnhouse Creek headwaters at present-day State Route 104 and the ECH headwaters just south of the Swansonville Road-Beaver Valley Road (State Route 19) intersection, downstream almost to Ness' Corner Road (approximately RM 2.3). The western boundary mostly follows West Valley Road, and the eastern boundary more or less follows Beaver Valley Road. Most of Chimacum Ridge, which separates the two valleys, was excluded from the district.

Sporadic ditching had been completed by individual landowners prior to the 1919 formation of the district, including numerous ditches in the ECH valley. However, the majority of the ditching work was done in the 1920s during the first decade following district formation (SCS 1955). This work included straightening and channelizing both CHI and ECH, and excavation of many miles of drainage ditches and installation of buried drain tile. Stream channel straightening reduced the total channel lengths of the two main channels and tributaries by approximately 25 percent (Bahls and Rubin 1996). The total channelized stream length of CHI is approximately 7 miles, and almost the entire 5.5 miles of ECH.

The drainage district was controversial from the beginning, mostly because of the tax imposed on landowners for expensive surveying, engineering, stream channel straightening, and ditch construction (Bahls and Rubin 1996; SCS 1955). The major works completed in the 1920s required many property owners to take out mortgages to pay their drainage district assessments. The Great Depression soon followed, contributing to the economic failure of many farms. In fact, the USDA Soil Conservation Service (SCS, which is the present-day Natural Resources Conservation Service or NRCS) reported in a 1955 field examination that there was a period of very limited activity until about 1946 that followed the major works of the 1920s. New drainage district commissioners had to be appointed by the court at that time because the district had become inactive. The East Jefferson County Soil Conservation District (present day Jefferson County Conservation District or JCCD) was established in 1946. At the time, federal technical and financial assistance from the SCS was only provided to communities through a local conservation district. Assistance from the SCS for the drainage district was a likely motivating factor for the conservation district formation.

1956 Drainage District Work Plan

A joint request from the conservation district and drainage district resulted in a 1955 field examination by the SCS and preliminary plans the following year for extensive drainage district improvements.

The report described three Chimacum watershed community problems:

1. *Flooding – Works of improvement measures are needed to eliminate erosion and control water runoff sufficient to eliminate inundation of farmlands and adjoining roadways and to alleviate siltation of perennial streams. 1953 winter flood water was particularly damaging with entire farms under water.*
2. *Drainage – Community ditches are needed to lower water table sufficient for crop production.*
3. *Additional Works – Any additional works which will control water and put it to use in crop production would be a desirable secondary need.* [This refers to irrigation.]

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Various species of forage grasses and clovers were noted as being commonly used, and others are identified that could be grown successfully if drainage were to be improved. There is no mention of reed canarygrass in the examination.

Work plan drawings identified problem areas (see Figure 2 below). Not surprisingly, these problem areas are very similar to areas identified as historic year-round wetlands (Bahls and Rubin 1996; NOSC 2018). These areas correlate with mapped organic soils. The drawings identified several existing dams recommended for removal and recommended installation of several adjustable water control structures. The existing dams were presumably simple structures installed to manage the water table. One dam located a short distance upstream of Rhody Drive was replaced with a concrete adjustable water control structure, which remains in place today.

Construction of a drainage grid to intercept upland flow and deepening of the stream channels were the two main recommendations; however, plans only show the recommended channel deepening. No record has been found documenting what was implemented; however, old-timer accounts suggest it was limited to the lower portion of the watershed (Bahls and Rubin 1996).

Post Drainage District Activities

In the 1960s and early 1970s, drainage district activities were again sporadic. Some stream vegetation removal occurred on CHI following drainage district reactivation in the early 1970s. Since 1974, individual landowners have assumed the responsibility of drainage system maintenance, which has been inconsistent, both spatially and temporally, due in part to the significant financial burden and onerous regulatory and permitting compliance requirements. The result is saturation and inundation of hundreds of acres of formerly productive farmland. Much of this land has been taken over by undesirable vegetation like reed canarygrass (RCG) and common rush.

In 1987 the SCS conducted a geologic assessment following upper CHI landslides that occurred in 1982 and 1985, contributing substantial amounts of sediment to the stream channel. In 1986 a relatively large sediment/debris basin was constructed near RM 10 with design assistance from the SCS and the Washington Department of Fisheries. This debris basin was originally proposed by the SCS in their 1956 plans, along with two small debris basins near RM 8.8 and 7.6 (Eaglemount and Egg & I roads, respectively). Recommendations were made for annual dredging of the large debris basin and monitoring of the small basins. Alternatives for reed canarygrass sediment removal from the stream channel were made in the 1987 SCS assessment, as well as stream fencing to eliminate livestock access and tree planting along stream banks. A few landowners removed RCG and some sediment from the channel (roughly RM 7.0 to 9.0) during the summer of 1987. The large debris basin was last cleaned out over 20 years ago, and today it is completely filled in with sand and gravel and overgrown with willows and Himalayan blackberry; however, the stream flows freely through the former basin.

RCG removal has occurred sporadically over the past three decades, but removal of sediment has not occurred because of permitting challenges. Most RCG removal has been limited to a handful of properties, as it has been largely paid for by individual landowners. However, in 2020, JCCD received grant funding from the Washington State Conservation Commission (WSCC) to provide cost-share assistance for RCG removal. JCCD served as the authorized agent for the Washington Department of Fish & Wildlife Hydraulic Project Approval (HPA) permit and contributed 75 percent of the cost of mechanical RCG removal. Five miles of stream channel across 14 properties were cleared of RCG with an excavator attachment specially designed for removing RCG. The total cost, not including project

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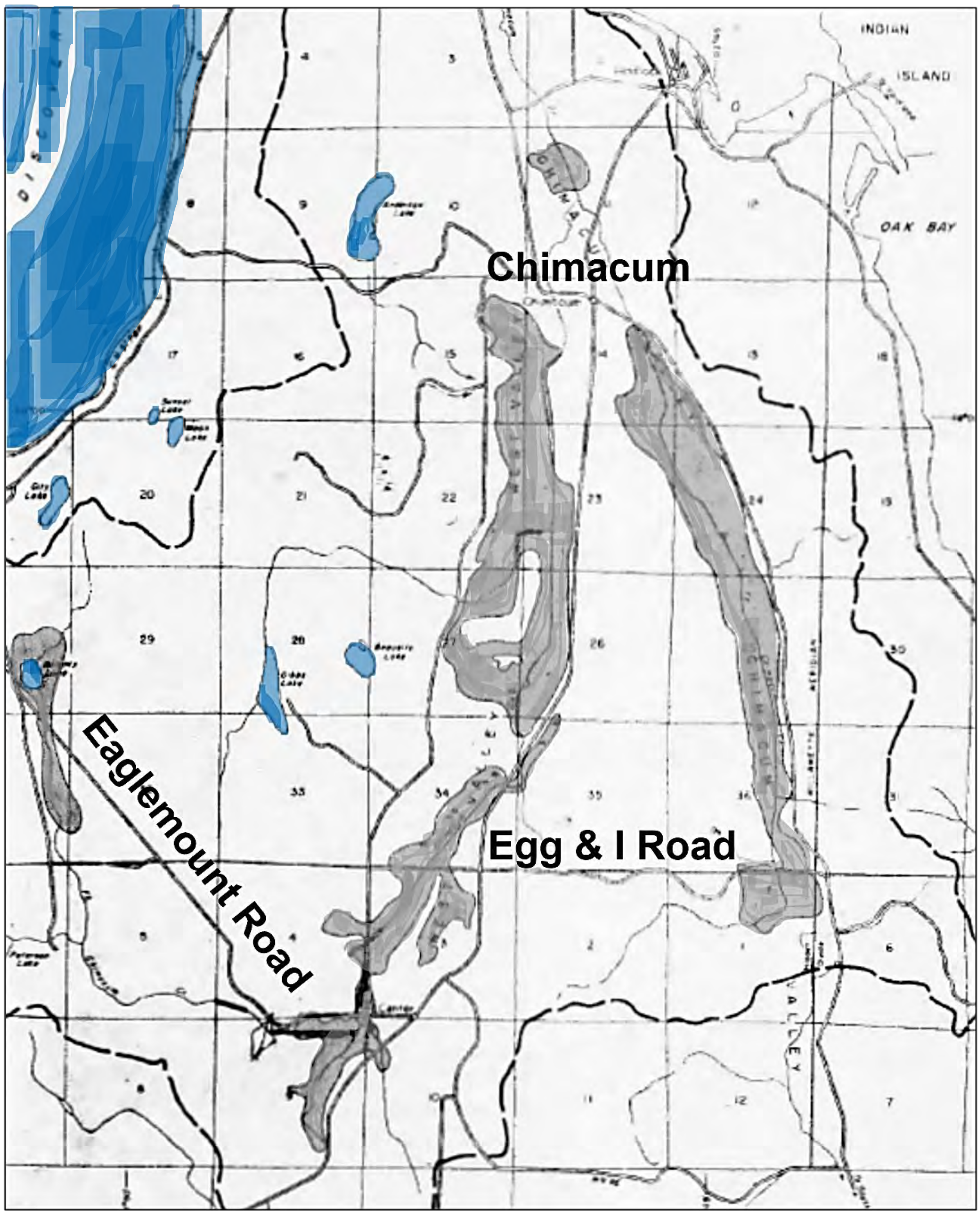
management, was $62,500. The project successfully improved stream flow and reduced flooding; however, one year after the treatment, RCG was growing back into the stream channel.

Figure 2. Chimacum Drainage District Problem Areas, 1955

1955 Soil Conservation Service map showing watershed drainage and flooding problem areas (shaded).



2.3 Persistent and Widespread Drainage Issues

Chimacum watershed has hundreds of acres of once highly productive farmland that is adversely impacted by excess soil moisture and inundation. In many areas seasonal flooding now extends well into the growing season. The degraded farmland is of limited habitat value, providing little more than overwintering habitat for migratory waterfowl. In fact, swans, geese, and some other waterfowl forage on new fall pasture growth, which has decreased in acreage due to increased inundation. In addition, stream habitat conditions are poor, suffering from high water temperatures, low dissolved oxygen, and a general lack of habitat diversity. Farmland inundation and many of these habitat limiting factors result both directly and indirectly from RCG and beaver.

Reed Canarygrass

Reed canarygrass was introduced to the Pacific Northwest as a forage species during the last century. It is particularly well adapted to saturated soil conditions and thrives in the wet peat and muck soils of the Chimacum watershed. Although it produces high yields of forage, its palatability rapidly declines as it matures. Saturated or inundated soil conditions in spring commonly make it difficult, if not impossible to harvest RCG before it becomes unpalatable to most livestock. An exception are goats, which are known to graze on mature RCG.

RCG is a non-native, vigorous, perennial grass that aggressively spreads by rhizomes, often outcompeting other vegetation, including native vegetation in wetlands and shallow, low-velocity waterways, like Chimacum Creek and the many drainage ditches in the watershed. It can reach heights of over six feet and form mats of rhizomes, stems and leaves across streams and ditches, choking the flow of water and creating challenges for adult and juvenile fish migration.

RCG growth can in shallow, low-gradient waterways inhibits flow and sediment transport, contributing to waterway siltation. It also contributes to low dissolved oxygen (DO), particularly during decomposition. When plant matter dies and decomposes in the water, available oxygen is consumed, leading to low DO. In late summer Chimacum Creek DO commonly reaches levels that are lethal to fish.

For decades, grazing kept RCG relatively in check. However, grazing along the banks of waterways contributed to poor water quality in Chimacum Creek, mostly bacterial contamination from livestock. Water quality improvements began in the 1990s when significant efforts were made to fence cattle out of waterways. Where grazing on streambanks was curtailed, the highly invasive RCG flourished.

Elodea and bittersweet nightshade (*Solanum dulcamara*) are two other invasives species that grow in and along waterways and can adversely impact habitat. *Elodea* is a perennial submersed aquatic plant that grows entirely under water. Bittersweet nightshade is a perennial vine that grows over other vegetation. RCG commonly outcompetes both species except where *Elodea* has established in deeper stream channels.

Beaver

In response to the invasion of RCG following stream fencing, as well as an emphasis on improving stream and riparian habitat, substantial effort and funding was invested in the establishment of woody riparian vegetation along Chimacum Creek. RCG is intolerant of shade; therefore, long-term control is best achieved by shading it out with trees and shrubs. Willows and cottonwoods, two species that are adapted to saturated soil conditions and easily propagated with hardwood cuttings, were commonly

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planted during the early years of riparian restoration work. Unfortunately, both these species are preferred by beavers, and many acres of reforested riparian buffers have suffered high mortality, either directly by beaver or from inundation that resulted from beaver dams. Willows can also topple over into waterways and continue growing, sometimes obstructing flow. Plantings that included conifers have been less likely to suffer direct damage or mortality from beavers, they many have succumbed to excess water.

Small, slow-flowing waterways provide ideal habitat for beavers, and although beaver have been particularly problematic over the past couple of decades, their impacts are not a new phenomenon. According to landowner accounts, even when the drainage district was active, beaver dam maintenance was commonly left up to individual landowners. Not all landowners performed the necessary maintenance work, resulting in some landowners being impacted by a lack of downstream maintenance.

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SECTION 3: REACH ANALYSES

This section includes a detailed analysis of the drainage district on a reach-by-reach basis. The drainage district was divided into reaches with relatively homogeneous characteristics to facilitate the inventory and analysis exercise. There is one reach downstream of the confluence of Chimacum Creek (CHI) and East Chimacum Creek (ECH), seven reaches for CHI, and five for ECH. The inventory and analyses are based on data from previous watershed analyses and an analysis of 2021 orthophoto imagery and elevation hillshade maps. Very limited field verification and landowner consultation was performed. However, draft analyses, including maps, were presented to the community during two focus group meetings – one for each stream. Meeting participants were asked to review the data and provide input and feedback. The tables and maps were also posted on a JCCD webpage created specifically for the Chimacum Creek planning effort.

Waterways include streams and ditches. The vast majority of stream miles have been modified (i.e., straightened and deepened), and it is difficult to distinguish between a modified stream or a ditch. In most cases, only the named streams, and forested stream reaches upstream of farmland are identified as streams. The modified reaches of these unnamed streams in the valley bottoms are identified as ditches, even though many of the ditches are likely modifications of natural drainage patterns. Ditches were digitized onto orthophotos based on aerial and hillshade imagery analysis. Stream gradient is provided for each reach, as gradient can impact other parameters, such as water temperature, dissolved oxygen, reed canarygrass growth, and flooding.

The characterizations of riparian conditions primarily depict the presence or absence of trees and shrubs cover, and the general width of the riparian forest buffer. The potential for tree and shrub establishment is noted for each reach, although conditions favoring or inhibiting woody plant establishment, such as inundation, a high water table, or severe competition from RCG can vary throughout the reach. These conditions can be transient, too, depending mainly on the presence or absence of beaver dams. However, some areas that are chronically prone to inundation without being impacted by downstream dams are likely not suitable for establishment of riparian forest buffers unless hummocks of higher ground are created.

Impacts from aquatic vegetation include inhibiting flow and adversely impacting aquatic habitat. Reed canarygrass (RCG) has by far the most serious impacts, but *Elodea* and bittersweet nightshade can also impact waterways. Potential for tree and shrub establishment is mainly influenced by RCG and the water table and inundation.

Culvert and fish passage barrier data come from Washington Department of Fish & Wildlife GIS data that were obtained from Jefferson County. Barriers listed include full and partial barriers. Some additional culverts not included in these data were added based on analysis of orthophotograph imagery. Culverts and bridges on public roads are not included in the inventory.

The assessment of fish utilization is limited to salmonids, specifically coho and chum salmon and steelhead. Resident trout are widespread throughout the watershed and their presence depends on a variety of factors.

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Beaver dam data are based on information collected by partner organizations over the past few years, supplemented by more recent observations by area residents and JCCD staff. Beaver activity can be highly transient; therefore, the presence or absence of beaver dams in a reach can change at any time.

Water quality data include the geometric mean and range for E. coli bacteria, the number of days water temperature exceeded state standards per year and the average daily high for the months of July and August, and the mean and range for dissolved oxygen. Water quality data have been collected for decades by JCCD at various stations throughout the watershed. The data presented are for the nearest downstream station for each reach. E coli data were collected in 2021-22, temperature data were collected in 2022, and dissolved oxygen data were collected in 2018-19.

Farmland and productive farmland estimates are based on analysis of 2021 orthophotograph imagery with very limited field verification performed in February 2024. Productive farmland was identified as land estimated to be producing above 50 percent of potential for forage or currently under cultivation for annual crops, berries, or orchard crops. The USDA Natural Resources Conservation Service (NRCS) yield data by soil type was the basis for evaluating forage land productivity. The organic soils (Semiahmoo muck, Mukilteo peat, and McMurray peat), which make up the majority of the farmed valley bottoms, are prime farmland soils if drained, and produce six tons per acre under good management. Therefore, if it was estimated that a field was producing fewer than three tons per acre, it was not identified as productive farmland. Factors influencing the production estimates included the percentage of desirable versus undesirable plant cover, overgrazing, and extent of inundation.

The productive farmland analysis is intended to inform decision-making regarding viable farmland of long-term significance. In other words, farmland identified as productive is a high priority for protection or reclamation. Whereas fields not identified as productive – marginal farmland – may be suitable candidates for wetland and stream restoration, assuming landowner willingness and funding for landowner compensation and restoration work. More detailed site analyses and consultations with landowners will be essential before any decisions are made on individual properties.

Organic soils data were taken from the USDA NRCS web soil survey online maps. Soils maps are not totally accurate but are generally considered sufficiently accurate for planning purposes. Design of specific projects requires site specific soils investigations. There is a strong correlation between organic soils and a high water table/inundation, thus marginal farmland.

This analysis is intended to provide a preliminary understanding of the issues and opportunities throughout the drainage district in order to inform future decisions. Additional site analyses, surveying and design will be necessary before performing significant work. Exceptions may include RCG removal and beaver dam management, both of which require permits.

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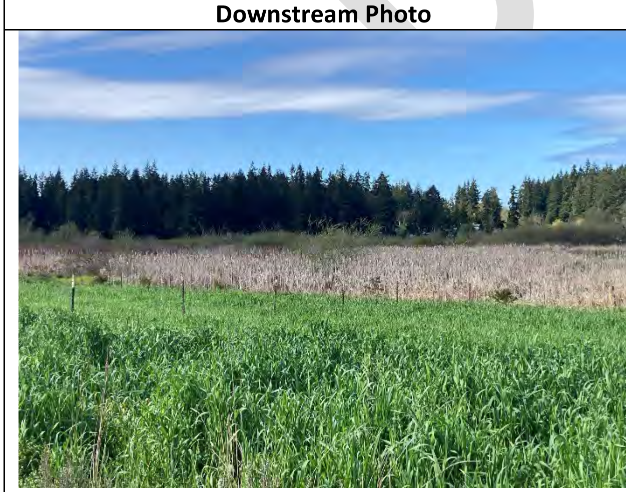
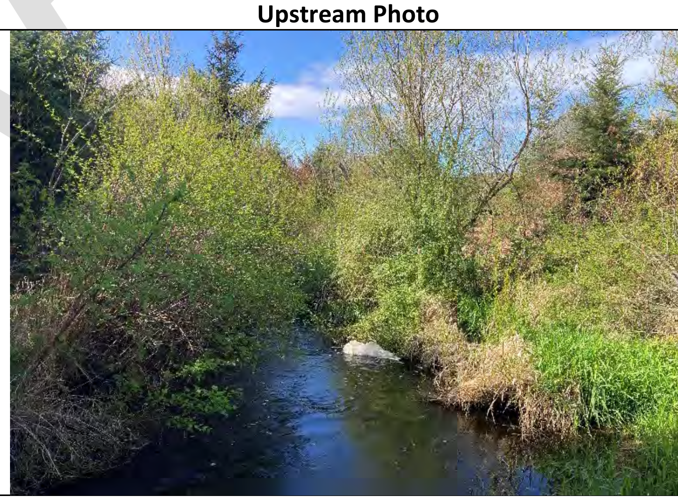
Reach 1

Most downstream reach of drainage district, approximately 0.2 miles upstream of SR 116 (Ness' Corner Road) upstream to confluence of main Chimacum Creek and East Chimacum Creek

Area, River Miles, Length	160 acres. RM 2.35 to 2.9 – 0.55 miles
Stream Gradient	0.6-1.0%
Channel Conditions	Highly modified. Channel is overgrown with reed canarygrass and barely discernible. No large woody debris.
Tributaries	None identified.
Riparian Characteristics and Tree/Shrub Establishment Potential	Channel flows through a large (~45-ac) wetland that is dominated by reed canarygrass with very little woody vegetation. Successful tree and shrub establishment unlikely due to high water table and competition from reed canarygrass.
Aquatic Vegetation Impact	Severe, mostly reed canarygrass
Ditches	None identified
Flooding	Seasonal flooding in wetland
Culverts, Fish Barriers	None identified
Beaver Dams	3 identified in 2020
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 58 MPN/100 mL; range = 8-361
Temperature Exceedances	79 days; July-August average daily high = 17.1ºC
Dissolved Oxygen	Mean = 7.7 mg/L; range = 5.3-10.0
Farmland Area	20 acres (12% of reach area)
Productive Farmland	10 acres (50% of all farmland), (50% marginal farmland)
Non-Agriculture Area	141 acres (88% of reach area)
Organic Soils	43 acres, approximately 25% of Farmland Area

Downstream Photo	**Upstream Photo**
	

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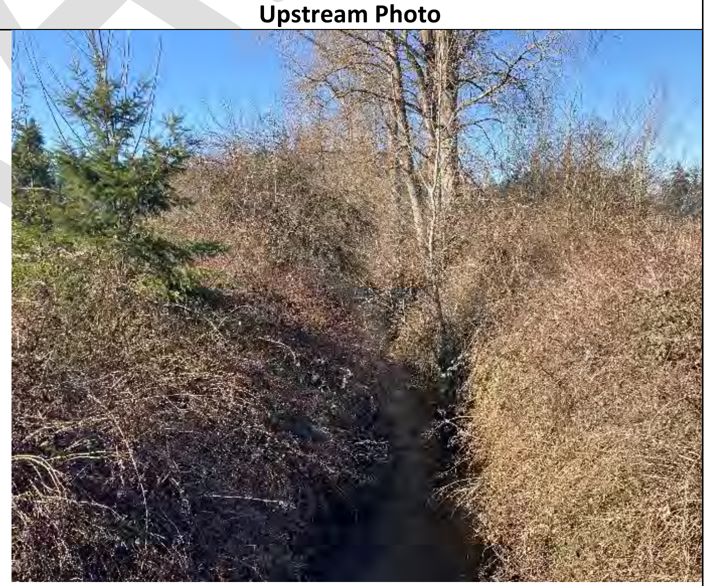
Reach W1

Main Chimacum Creek from East Chimacum Creek confluence upstream to SR 19 (Rhody Drive)

Area, River Miles, Length	150 acres. RM 2.9 to 3.65 – 0.75 miles
Stream Gradient	0.6-1% at upstream and downstream of reach, 1.1-2.0% in middle of reach
Channel Conditions	Relatively complex channel with some large woody debris from about RM 2.9 to 3.3. Modified with little complexity from about RM 3.3 to 3.65.
Tributaries	None identified
Riparian Characteristics and Tree/Shrub Establishment Potential	Well established forest buffer along downstream half of reach. Limited woody buffer along left bank on downstream half of reach. Good potential for tree and shrub establishment throughout reach.
Aquatic Vegetation Impact	Slight to moderate
Ditches	None identified
Flooding	Rare
Culverts, Fish Barriers	None identified
Beaver Dams	None identified
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	No data
Temperature Exceedances	85 days; July-August average daily high = 17.7°C
Dissolved Oxygen	No data
Farmland Area	59 acres (39% of reach area)
Productive Farmland	10 acres (17% of all farmland), (83% marginal farmland)
Non-Agriculture Area	91 acres (61% of reach area)
Organic Soils	0 acres mapped

Downstream Photo	**Upstream Photo**
	

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Reach W2

Chimacum Creek from SR 19 to downstream of Putaansuu Creek confluence

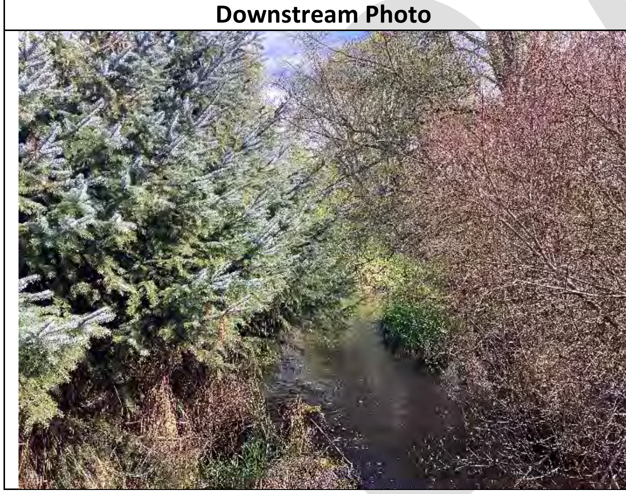
Area, River Miles, Length	277 acres. RM 3.45 to 4.3 ~ 0.9 miles
Stream Gradient	0.1-0.5%
Channel Conditions	Entire reach is highly modified with little complexity.
Tributaries	None identified
Riparian Characteristics and Tree/Shrub Establishment Potential	Narrow forest buffer along downstream and upstream quarters of reach. Good to fair tree and shrub establishment potential.
Aquatic Vegetation Impact	Severe except for forested buffer areas (~RM 4.0-4.1, 4.2-4.3)
Ditches	3.3 miles
Flooding	Rare except for upstream of RM 4.2 where flooding is common and prolonged.
Culverts, Fish Barriers	3 – no fish passage barriers identified
Beaver Dams	None identified
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 44 MPN/100 mL; range = 15-98
Temperature Exceedances	93 days; July-August average daily high = 19.1ºC
Dissolved Oxygen	Mean = 8.0 mg/L; range = 5.7-9.8
Farmland Area	202 acres (73% of reach area)
Productive Farmland	107 acres (53% of all farmland), (47% marginal farmland)
Non-Agriculture Area	75 acres (26% of reach area)
Organic Soils	87 acres, approximately 43% of farmland

Downstream Stream Corridor	**Upstream Stream Corridor**
	

Reach E1

Confluence with Chimacum Creek upstream to SR 19 crossing

Area, River Miles, Length	215 acres. RM 0.0 to 1.0 – 1.0 miles
Stream Gradient	0.1-2.0%, steepest at downstream end of reach.
Channel Conditions	Highly modified with little complexity throughout reach.
Tributaries	None identified.
Riparian Characteristics and Tree/Shrub Establishment Potential	Narrow healthy forest buffer along entire reach. Good tree and shrub establishment potential.
Aquatic Vegetation Impact	Moderate throughout reach.
Ditches	0.7 miles
Flooding	Occasional but not prolonged.
Culverts, Fish Barriers	3 (2 stream, 1 ditch) – no fish passage barriers identified
Beaver Dams	None identified.
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 32 MPN/100 mL; range = 2-153
Temperature Exceedances	48 days; July-August average daily high = 16.4ºC
Dissolved Oxygen	Mean = 9.1 mg/L; range = 7.5-11.1
Farmland Area	39 acres (18% of reach)
Productive Farmland	18 acres (46% of all farmland), (54% marginal farmland)
Non-Agriculture Area	163 acres, 82% of reach
Organic Soils	0 acres

Downstream Photo	**Upstream Field & Riparian Buffer**
	

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	Upstream Stream Corridor
	

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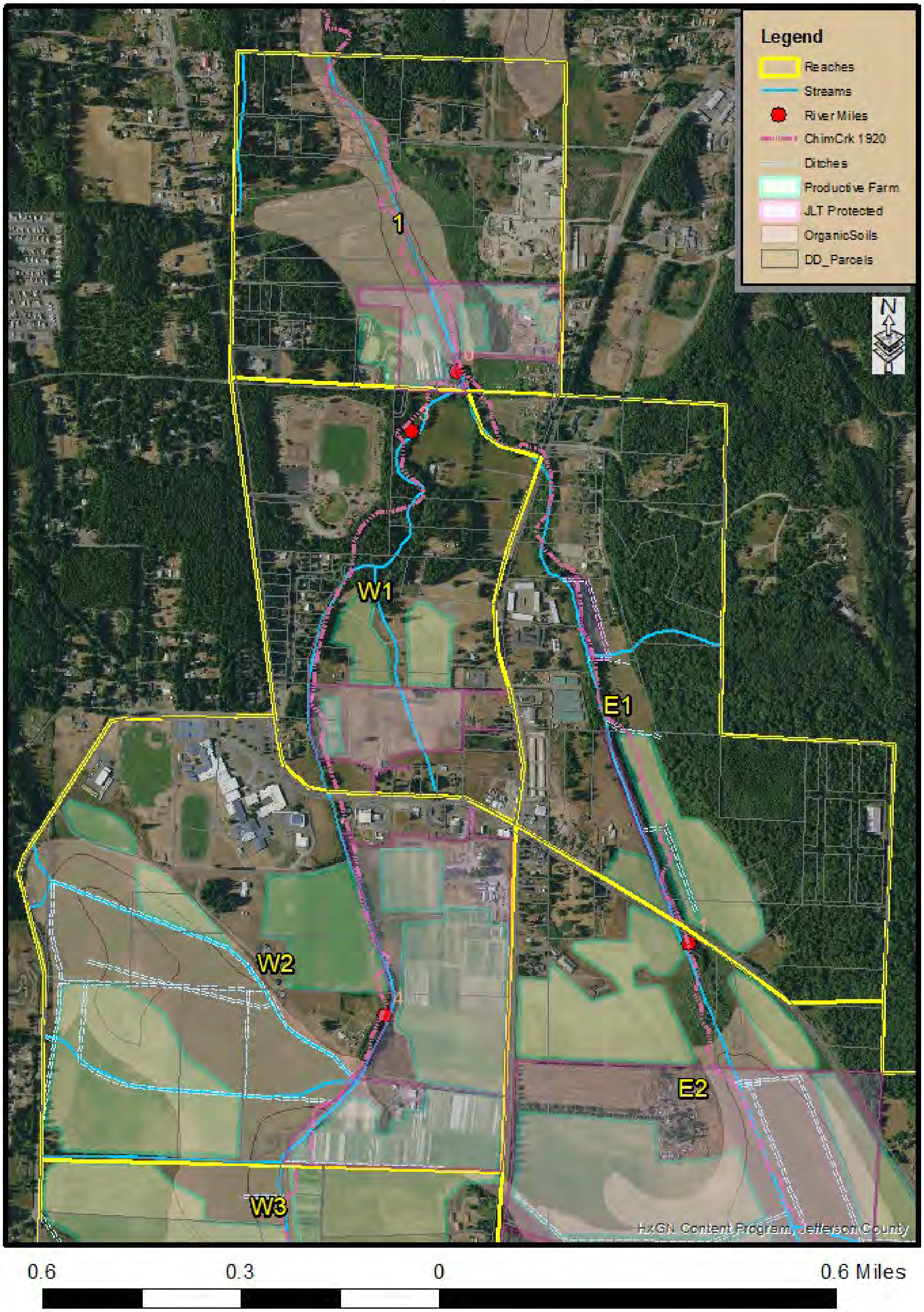
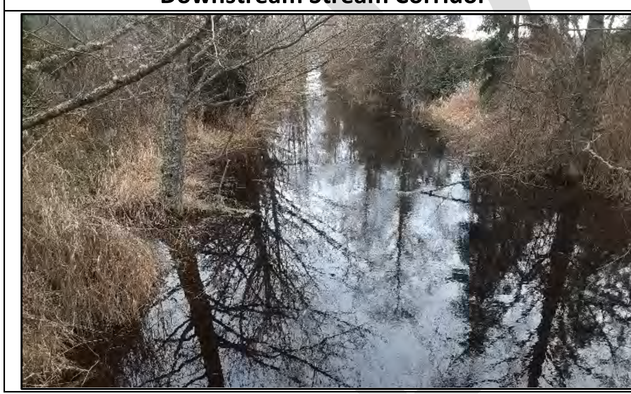
Reaches 1, W1, W2, E1



Reach W3

Chimacum Creek from Putaansuu Creek confluence to downstream of Naylors Creek confluence

Area, River Miles, Length	558 acres. RM 4.3 to 5.4 – 1.1 miles
Stream Gradient	0.1-0.5%
Channel Conditions	Entire channel reach is modified with little complexity.
Tributaries	Putaansuu Creek – 0.37 miles, all highly modified. Two instream livestock watering structures.
Riparian Characteristics and Tree/Shrub Establishment Potential	Single-row forest buffer from about RM 4.55 to 5.0. Double-row forest buffer along tributary. Good to fair tree and shrub establishment potential.
Aquatic Vegetation Impact	Severe throughout reach with some exceptions under forested buffers.
Ditches	4.75 miles
Flooding	Common, widespread, and prolonged throughout reach. Floodplain is important overwintering habitat for trumpeter swans.
Culverts, Fish Barriers	5 (2 stream, 3 ditch) – 3 fish passage barriers
Beaver Dams	1 identified in 2020
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	No data
Temperature Exceedances	96 days; July-August average daily high = 19.0°C
Dissolved Oxygen	Mean = 9.1 mg/L; range = 4.6-11.9
Farmland Area	406 acres (73% of reach area)
Productive Farmland	219 acres (54% of all farmland), (46% marginal farmland)
Non-Agriculture Area	152 acres (27% of reach area)
Organic Soils	245 acres, approximately 60% of farmland

Downstream Stream Corridor	**Upstream Stream and Field**
	

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No inundation in March of 2005.
Extensive inundation (areas in gray) in March of 2024 following less than average precipitation.

Short Farm – March 2005 (source: Google Earth)

Short Farm – March 2014

Reach W4

Chimacum Creek from Naylors Creek confluence to upstream Center Road crossing

Area, River Miles, Length	943 acres. RM 5.4 to 7.0 – 1.6 miles
Stream Gradient	0.1-2.0%, steeper gradient un upstream half mile.
Channel Conditions	Highly modified channel with little complexity, except for RM 6.1 to RM 6.4 where meandering channel was constructed in late 1990s.
Tributaries	Naylors Creek – 4.1 miles, downstream mile is highly modified.
Riparian Characteristics and Tree/Shrub Establishment Potential	No forest buffer RM 5.3-6.1. Restored forest buffer along reconstructed reach. Limited forest buffer on upstream half of reach. Narrow forest buffer along full reach of Naylor's Creek. Good tree and shrub establishment potential on upstream half of reach and along Naylor's Creek.
Aquatic Vegetation Impact	Severe from downstream end of reach to RM 6.1. (~0.8 mi) and on most ditches. Minimal in forested reaches.
Ditches	4.2 miles
Flooding	Common, widespread, and prolonged from about RM 6.1 downstream. Floodplain is important overwintering habitat for trumpeter swans.
Culverts, Fish Barriers	8 (4 stream, 4 ditch) – 2 fish passage barriers
Beaver Dams	2 identified in 2020.
Fish Utilization	Adult coho migration, juvenile rearing in both main stem and tributary. Coho spawning in Naylors Creek and possibly in restored reach.
Bacterial Contamination	E. coli Geometric Mean = 41 MPN/100 mL; range = 17-120
Temperature Exceedances	93 days; July-August average daily high = 19.9ºC
Dissolved Oxygen	Mean = 9.2 mg/L; range = 6.9-11.4
Farmland Area	403 acres (43% of reach area)
Productive Farmland	73 acres (18% of all farmland), (82% marginal farmland)
Non-Agriculture Area	540 acres (57% of reach area)
Organic Soils	232 acres, approximately 58% of farmland

Downstream Stream and Field

Upstream Stream Corridor

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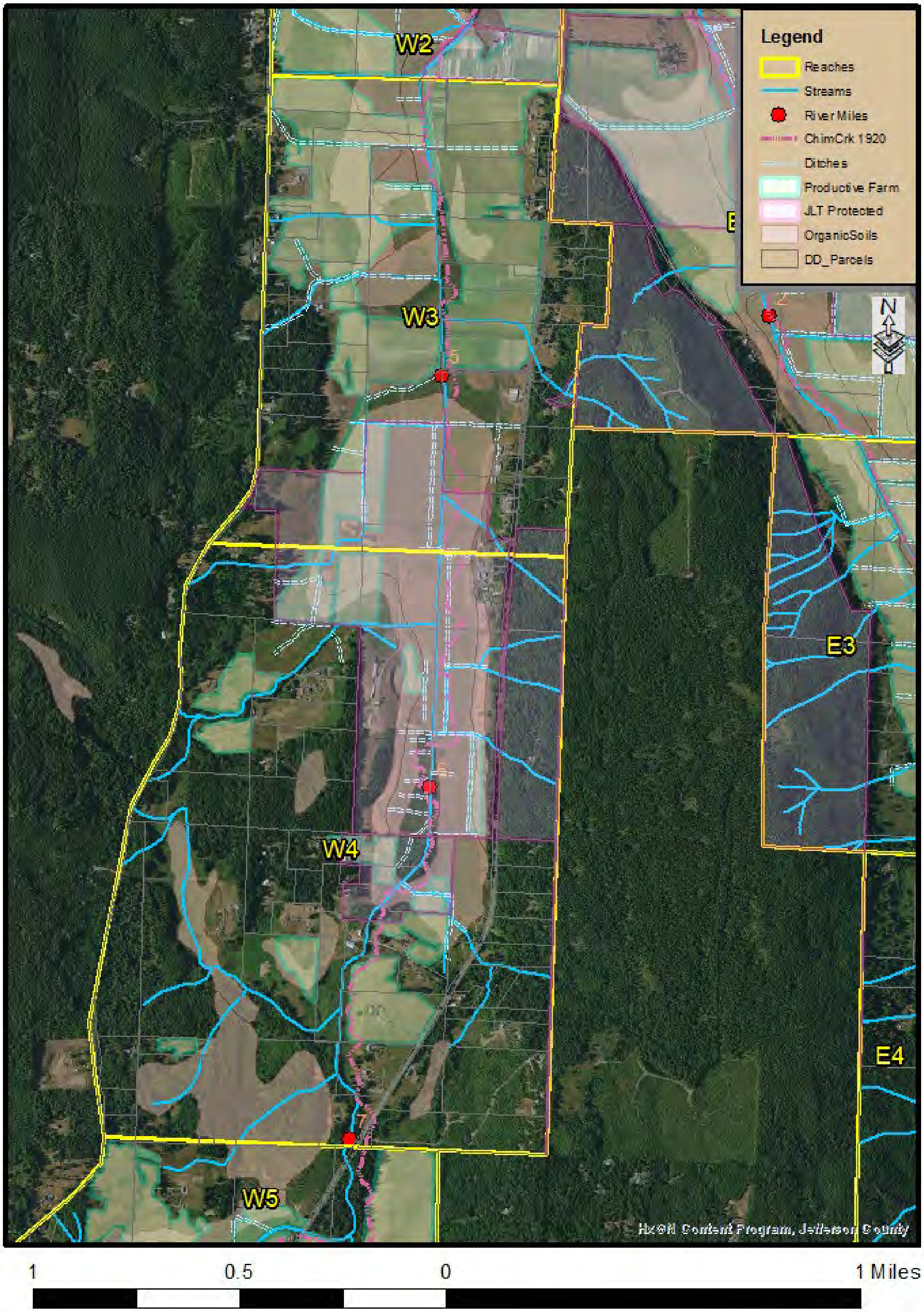
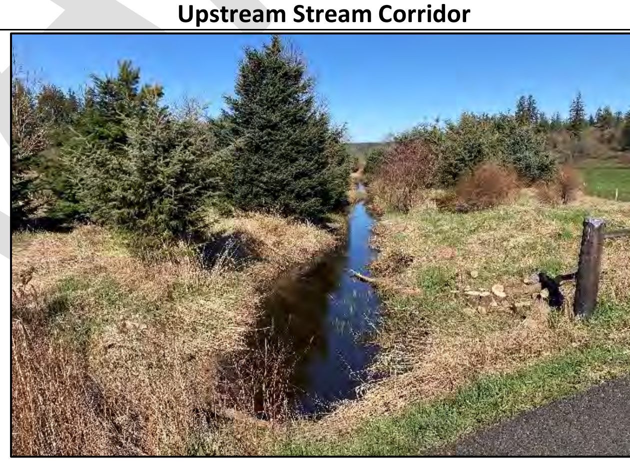
Reaches W3, W4



Reach W5

Chimacum Creek from Center Road crossing to Egg & I Road

Area, River Miles, Length	532 acres. RM 7.0 to 8.2 ~ 1.15 miles
Stream Gradient	0.1-0.5%, steeper gradient in downstream
Channel Conditions	Highly modified with little complexity, except 0.3 miles of downstream reach.
Tributaries	~1.6 miles, all unnamed.
Riparian Characteristics and Tree/Shrub Establishment Potential	No forest buffer, except for downstream 0.2 miles. Poor tree and shrub establishment potential due to high water table, reed canarygrass competition.
Aquatic Vegetation Impact	Severe from RM 7.3 to 8.2 (~0.9 mi) and on most ditches.
Ditches	4.3 miles
Flooding	Common, widespread, and prolonged upstream of Center Rd crossing (RM 7.4).
Culverts, Fish Barriers	12 (3 stream, 9 ditch) – 8 fish passage barriers
Beaver Dams	1 identified in 2020 near Egg & I Road.
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 112 MPN/100 mL; range = 5-687
Temperature Exceedances	68 days; July-August average daily high = 17.2ºC
Dissolved Oxygen	Mean = 7.0 mg/L; range = 5.1-9.5
Farmland Area	304 acres (57% of reach area)
Productive Farmland	125 acres (41% of all farmland), (59% marginal farmland)
Non-Agriculture Area	228 acres (43% of reach area)
Organic Soils	107 acres, approximately 34% of farmland

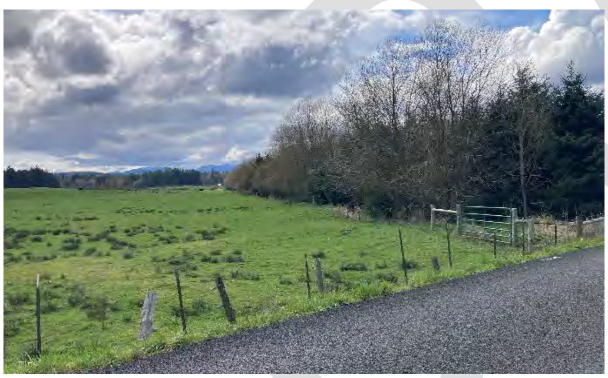
Downstream Stream Corridor	**Upstream Stream Corridor**
	
Downstream Stream and Field	**Upstream Field East of Stream, April 2024**
	

Reach W6

Chimacum Creek from Egg & I Road to Eaglemount Road

Area, River Miles, Length	884 acres. RM 8.2 to 9.4 – 1.2 miles
Stream Gradient	0.6-2.0%, steepest from about RM 9.0 to 9.4
Channel Conditions	Highly modified with little complexity, except for upstream 0.4 miles of reach.
Tributaries	~2.0 miles, all unnamed.
Riparian Characteristics and Tree/Shrub Establishment Potential	Narrow forest buffer RM 8.2-8.4, established forest buffer RM 9.0-9.4. Newly planted hedgerow buffer RM 8.4-8.8. Fair tree and shrub establishment potential.
Aquatic Vegetation Impact	Severe from RM 8.4 to 8.9 (~0.5 mi) and on most ditches
Ditches	7.85 miles
Flooding	Occasional but not prolonged along mainstem, common and severe on ditches.
Culverts, Fish Barriers	7 (2 stream, 5 ditch) – 4 Fish Passage Barriers
Beaver Dams	None identified
Fish Utilization	Adult coho migration, juvenile rearing. Possible spawning in upstream 0.4 miles.
Bacterial Contamination	E. coli Geometric Mean = 77 MPN/100 mL; range = 1-2420
Temperature Exceedances	50 days; July-August average daily high = 16.5°C
Dissolved Oxygen	Mean = 9.4 mg/L; range = 7.9-11.9
Farmland Area	356 acres (40% of reach area)
Productive Farmland	103 acres (29% of all farmland), (71% marginal farmland)
Non-Agriculture Area	528 acres (60% of reach area)
Organic Soils	180 acres, approximately 33% of farmland

Downstream Stream & Field



Upstream Stream Corridor

Downstream Ditch & Field

Upstream Stream & Field

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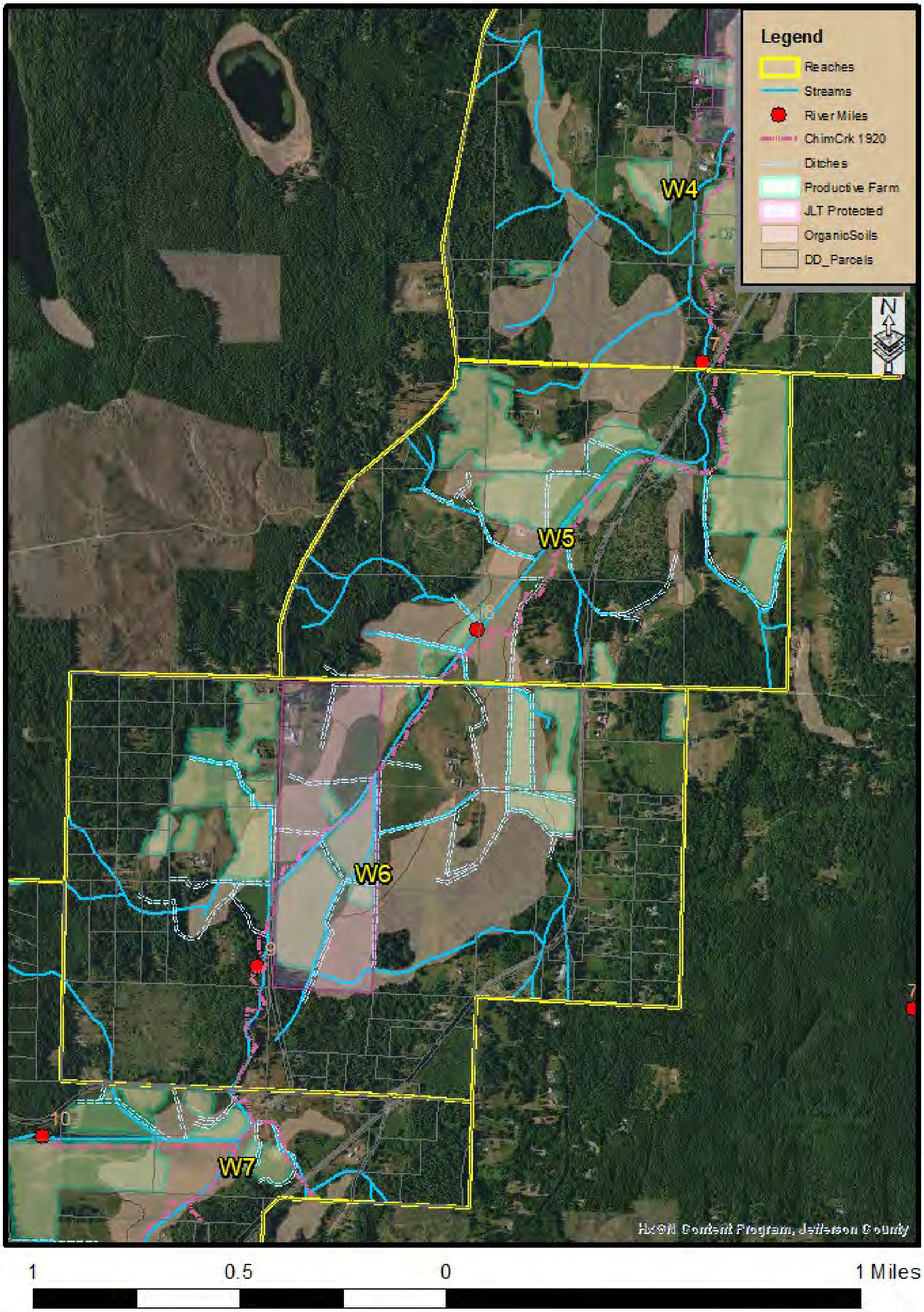
Reaches W5, W6



<u>Reach W7</u>

Chimacum Creek from Eaglemount Road to south end of drainage district

Area, River Miles, Length	984 acres. RM 9.4 to 10.55 – 1.15 miles
Stream Gradient	0.6-5.0%, steepest at upstream end of reach.
Channel Conditions	Highly modified with little complexity downstream of RM 10 and lower half of Barnhouse Creek.
Tributaries	Barnhouse Creek and unnamed streams – over 7.0 miles.
Riparian Characteristics and Tree/Shrub Establishment Potential	Narrow forest buffer along RM 9.9-10.0. Well established forest buffer upstream of RM 10.0 and upstream half or Barnhouse Creek, other tributaries. Good to fair potential for tree and shrub establishment.
Aquatic Vegetation Impact	Moderate to severe throughout reach and on most ditches.
Ditches	3.5 miles
Flooding	Occasional but not prolonged along mainstem and ditches.
Culverts, Fish Barriers	7 (3 stream, 4 ditch) – 3 fish passage barriers
Beaver Dams	None identified
Fish Utilization	Adult coho migration, juvenile rearing, spawning upstream of RM 10.0.
Bacterial Contamination	E. coli Geometric Mean = 120 MPN/100 mL; range = 10-687
Temperature Exceedances	46 days; July-August average daily high = 16.4ºC
Dissolved Oxygen	Mean = 9.3 mg/L; range = 7.4-10.8
Farmland Area	389 acres (40% of reach area)
Productive Farmland	86 acres (22% of all farmland), (78% marginal farmland)
Non-Agriculture Area	595 acres (60% of reach area)
Organic Soils	343 acres, approximately 23% of farmland

Downstream Stream Corridor	**Upstream Stream Corridor**
	
Downstream Field and Stream Corridor	**Upstream Field and Stream Corridor**
	

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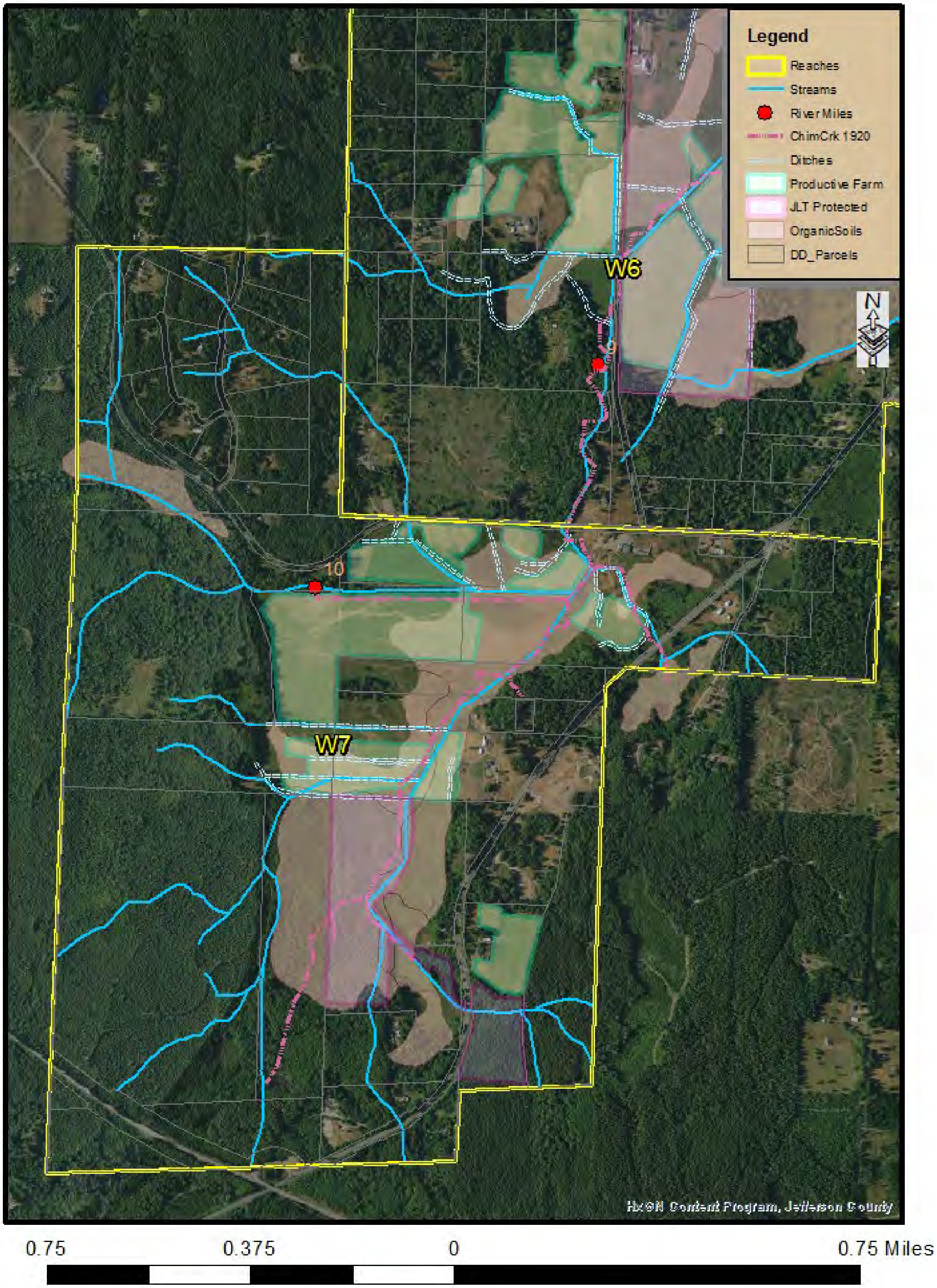
Reaches W7



Legend
Reaches
Streams
River Miles
ChimCrk 1920
Ditches
Productive Farm
JLT Protected
OrganicSoils
DD_Parcels
W6
W7
9
10
N
HxGN Content Program, Jefferson County
0.75
0.375
0
0.75 Miles

Reach E2

SR 19 crossing upstream to approximately river mile 2.4

Area, River Miles, Length	609 acres. RM 1.0 to 2.4 – 1.4 miles
Stream Gradient	0.1-0.5%
Channel Conditions	Highly modified with little complexity throughout reach. No discernable channel in portions of reach.
Tributaries	None identified
Riparian Characteristics and Tree/Shrub Establishment Potential	Previously planted forest buffer along downstream 0.2 miles and upstream 0.3 miles of reach. Downstream buffer in decline due to beaver and flooding. Poor tree and shrub establishment potential due to high water table.
Aquatic Vegetation Impact	Severe impacts from RCG throughout reach except under established forest buffer. Impacts to channel from willows.
Ditches	6.1 miles
Flooding	Common, widespread, and prolonged.
Culverts, Fish Barriers	3 (2 stream, 1 ditch) – no fish passage barriers identified
Beaver Dams	Numerous, especially where forested buffers have been re-established.
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 24 MPN/100 mL; range = 3-344
Temperature Exceedances	76 days; July-August average daily high = 17.0^{o}C
Dissolved Oxygen	Mean = 5.7 mg/L; range = 1.6-9.0
Farmland Area	391 acres (64% of reach)
Productive Farmland	215 acres (55%of all farmland), (45% marginal farmland)
Non-Agriculture Area	219 acres (36% of reach)
Organic Soils	247 acres, approximately 63% of farmland

Downstream Photo	Upstream Photo
	

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Reach E3

RM 2.4 upstream to Peat Plank Road

Area, River Miles, Length	436 acres. RM 2.4 to 3.5 – 1.1 miles
Stream Gradient	0.1-0.5%
Channel Conditions	Highly modified with little complexity throughout reach.
Tributaries	2.3 miles, all unnamed
Riparian Characteristics and Tree/Shrub Establishment Potential	Previously planted forest buffer along upstream 0.5 miles of reach. Much of buffer is in poor condition due to beaver and flooding. Poor tree and shrub establishment potential due to high water table, reed canarygrass competition.
Aquatic Vegetation Impact	Severe throughout reach except under established forest buffer. Willow in stream channel.
Ditches	4.5 miles
Flooding	Common, widespread, and prolonged.
Culverts, Fish Barriers	5 (2 stream, 3 ditch) – 2 fish passage barriers
Beaver Dams	Too numerous to count.
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	No data
Temperature Exceedances	0 days
Dissolved Oxygen	8.0-9.4 at upstream end of reach.
Farmland Area	266 acres (61% of reach)
Productive Farmland	101 acres (38% of all farmland), (62% marginal farmland)
Non-Agriculture Area	170 acres (39% of reach)
Organic Soils	156 acres, approximately 59% of farmland

Downstream Photo	**Upstream Field & Riparian Buffer**
	

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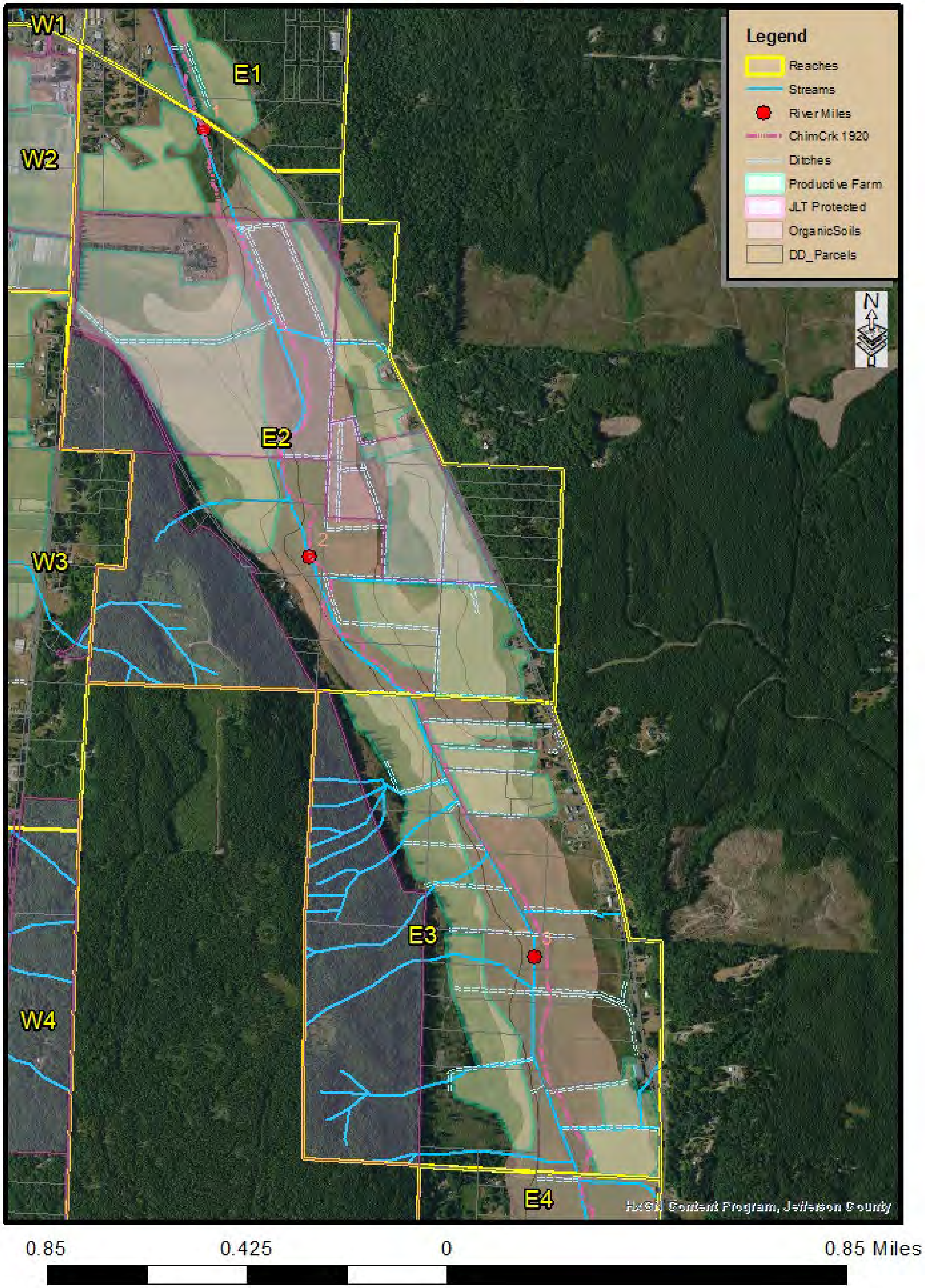
Reaches E2, E3



Reach E4

Peat Plank Road upstream to approximately river mile 4.8

Area, River Miles, Length	434 acres. RM 3.5 to 4.8 – 1.3 miles
Stream Gradient	0.1-1.0%, steepest in upstream half of reach.
Channel Conditions	Highly modified with little complexity throughout reach.
Tributaries	2.3 miles, all unnamed
Riparian Characteristics and Tree/Shrub Establishment Potential	Well established planted forest buffer along about 0.06 miles near downstream end of reach and narrow buffer on right bank along lowest 0.15 miles of reach. Fair to poor tree and shrub establishment potential.
Aquatic Vegetation Impact	Severe throughout reach except under established forest buffer.
Ditches	3.4 miles
Flooding	Common, widespread, and prolonged.
Culverts, Fish Barriers	7 (4 stream, 3 ditch) – 2 fish passage barriers
Beaver Dams	1 identified
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 38 MPN/100 mL; range = 1-156
Temperature Exceedances	7 days; July-August average daily high = 15.2°C
Dissolved Oxygen	Mean = 8.9 mg/L; range = 7.5-10.1
Farmland Area	195 acres (45% of reach)
Productive Farmland	21 acres (11% or all farmland), (89% marginal farmland)
Non-Agriculture Area	239 acres (55% of reach); includes former farmland no longer farmed
Organic Soils	225 acres, approximately 100% of farmland

Downstream Field, Riparian Buffer Looking US - East	**Upstream Photo**
	

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Downstream Stream Corridor	Upstream Stream Corridor Looking Upstream
	

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Reach E5

East Chimacum Creek RM 4.8 (Tall Tree Lane) upstream to south end of drainage district

Area, River Miles, Length	490 acres. RM 4.8 to 5.95 – 1.15 miles
Stream Gradient	1.0-2.0+%, steepest in upstream end of reach.
Channel Conditions	Highly modified with little complexity throughout reach.
Tributaries	Swansonville Creek and unnamed – 2+ miles.
Riparian Characteristics and Tree/Shrub Establishment Potential	Well established forest buffer along about 0.09 miles at downstream end of reach, buffer on right bank upstream 0.17 miles to Egg & I Road. Partial forest buffer along about 0.18 miles in vicinity of Swansonville-East Chimacum Creek confluence. Good tree and shrub establishment potential.
Aquatic Vegetation Impact	Severe throughout reach except under established forest buffer.
Ditches	1.85 miles
Flooding	Occasional, not prolonged or destructive.
Culverts, Fish Barriers	15 (10 stream, 5 ditch) – 4 fish passage barriers
Beaver Dams	None identified.
Fish Utilization	Adult coho migration, juvenile rearing.
Bacterial Contamination	E. coli Geometric Mean = 43 MPN/100 mL; range = 2-308
Temperature Exceedances	0 days; July-August average daily high = 13.7°C
Dissolved Oxygen	Mean = 10.0 mg/L; range = 9.1-11.2
Farmland Area	204 acres (42% of reach)
Productive Farmland	135 acres (66% of all farmland), (34% marginal farmland)
Non-Agriculture Area	284 acres (58% of reach)
Organic Soils	113 acres, approximately 55% of farmland

Downstream Photo	**Upstream Stream Looking Upstream**
	

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	Upstream Stream Looking Downstream
	

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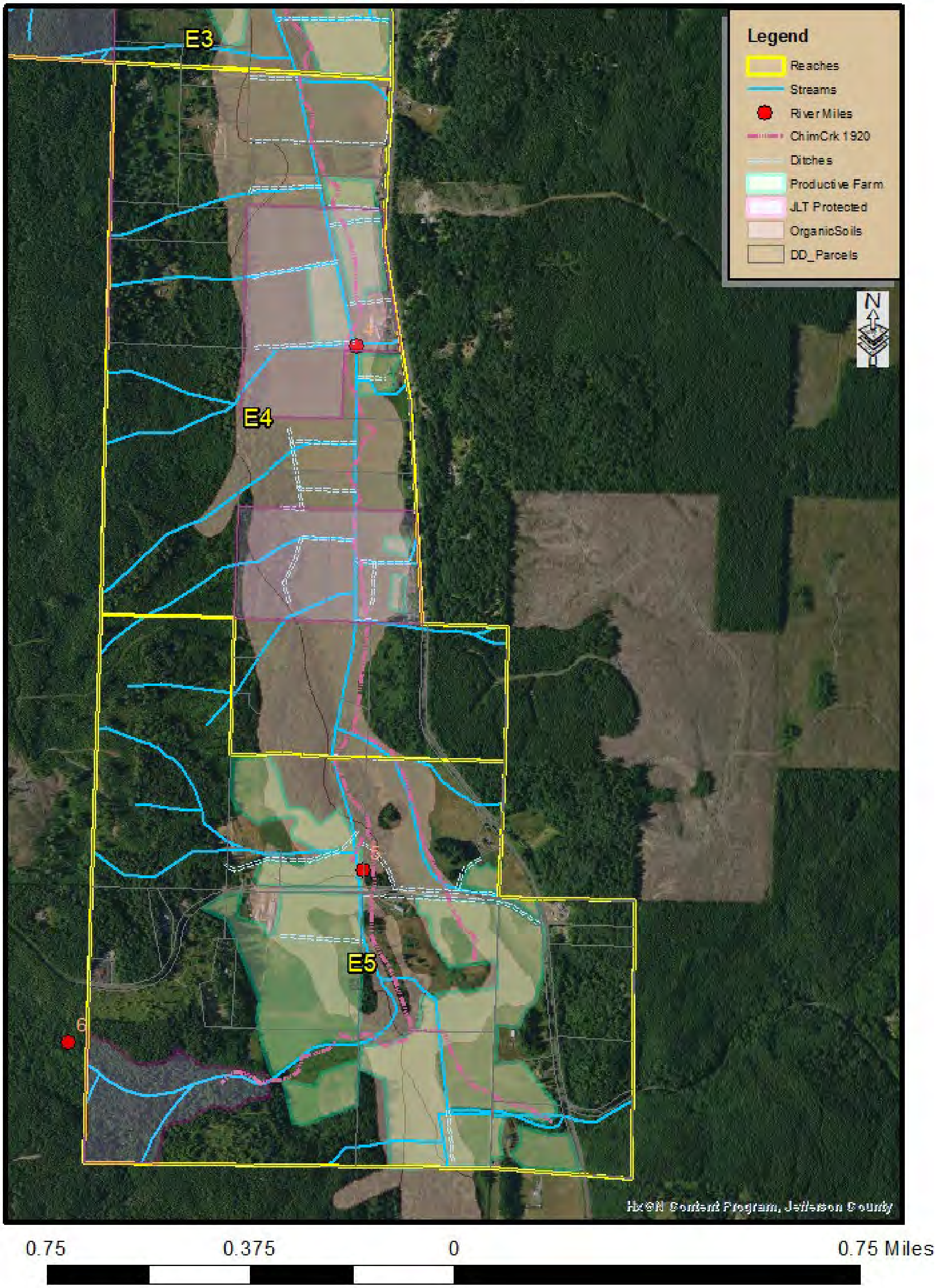
Reaches E4, E5



SECTION 4: DRAINAGE DISTRICT OPERATIONS, ESTIMATED COSTS, AND ALTERNATIVES

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If reactivated, the drainage district will have certain ongoing fixed operational and routine maintenance expenses, and potentially costs for special projects. Annual routine work and expenses will be fairly consistent and predictable, whereas special project costs will be variable. Grants are a potential source of funding for special projects but are not an option to cover ongoing operational expenses.

Drainage district revenues are commonly generated by assessing the properties within the district. Assessments are typically per acre and adjusted according to the benefits received. Benefit determinations are usually based on the elevation of the land in relation to waterways that contribute to flood risks. In other words, the lowest elevation lands, being the most susceptible to flooding, receive the greatest benefits from maintenance of a drainage system, thus are assessed at the highest rate. Higher ground in the district, which contributes to flooding but receives comparatively little benefit from the drainage system is assessed at a lower rate. There may be multiple zones and associated rates within a district to reflect varying degrees of benefits. If land within the district were to be taken out of agricultural production and converted to wetlands, it would no longer benefit from drainage system maintenance and flood protection. However, continued management of beaver dams would be necessary to avoid adverse impacts to upstream properties.

If the Chimacum Drainage District is reactivated, it will need to adopt a management plan. Plan development is best undertaken as a collaborative project involving regulatory/permitting agencies, area tribes and salmon recovery organizations, as well as agricultural interests. Considerable preliminary planning work has already been done by the North Olympic Salmon Coalition to address many of the issues and opportunities as they relate to salmon habitat, which should be a critical component of the management plan. Staff time from partner organizations, including Jefferson County Conservation District can contribute to plan development.

A preliminary analysis of drainage districts in Whatcom County (Bierlink 2022) revealed budgets that ranged from an average of about $2 to $8 per acre of district land. Given the variable rates assessed, it is assumed that the highest assessment rates are higher than these averages and the lowest are below the average. Total annual assessments collected in 2020 for Whatcom County drainage districts ranged from a low of $2,000 to a high of $20,000. The smallest district is 171 acres and had an annual assessment of $2,000. The largest is 14,322 acres and had an annual assessment of $15,000. One district with 2,572 acres had annual assessment revenues of $20,000.

In 2022, Jefferson County reported a total of 7,526 acres under 387 separate ownerships in Chimacum Drainage District (Hitchcock 2022). Of those 387 landowners, 60 were enrolled in the open space agriculture property tax program, totaling 127 out of 586 parcels.

4.1 Fixed Costs: Elections, Insurance, Bonding, and Audits

Drainage districts are governed by a three-member board of commissioners, each serving a six-year term. Drainage district elections do not fall under the general election statute, thus are typically held independently. However, they are required to be held on the first Tuesday after the first Monday in February in each even-numbered year. Drainage district voting rights are somewhat complicated, but essentially, only property owners within the district who are qualified voters are eligible to vote. Elections are not held if no one or only one person files for the position. The county auditor is responsible for drainage district election notices and is required to conduct the election if the district has less than 500 qualified voters. If there are over 500 qualified voters, the district may conduct its own elections or contract with the county auditor. At last count (date), there were 606 parcels and 403 property owners in the DD1. Since the drainage district elections statute allows up to two votes per landowner, it appears that DD1 would have the option to conduct its own elections. Election expenses incurred by the county auditor are to be reimbursed by the district.

According to Whatcom County Public Works, which oversees the drainage districts in Whatcom County, each district is required to have a public official bond and an audit officer bond. The current annual cost of those bonds is $75 per public official and $175 for the audit officer.

Drainage districts are audited by the state every three years. In Whatcom County, these audits generally cost less than $1,000.

4.2 Annual Maintenance

The most routine activity of an established drainage district is maintenance of the waterways to provide for adequate flow. In the case of the Chimacum watershed, this means reed canarygrass (RCG) and other vegetation control/removal, and maintenance of beaver dams and associated pond leveler devices, and possibly beaver trapping.

As noted in Section 2.2, JCCD sponsored a RCG removal project in 2020 that benefited about five miles of stream. The cost was $62,500, not including administrative costs for permitting and project management, resulting in a $12,500 cost per mile of treated channel. Taking inflation into account, a current reasonable estimated cost would be at least $15,000 per mile for RCG removal.

An estimated seven to eight miles of stream channel is significantly impacted by chronic RCG infestations. The number of miles of drainage ditch with chronic RCG infestations has not been determined. RCG removal is effective for about two years before new growth significantly inhibits flow and impacts aquatic habitat. If a total of ten miles of channel required RCG removal, and treatments were performed every other year, five miles would need to be treated annually. At $15,000 per mile, annual maintenance costs just for RCG removal would likely be at least $75,000.

Roughly two to three miles of RCG-infested channel is in areas of marginal farmland or is unlikely to result in productive farmland from RCG removal. Another two to three miles of RCG-infested channel has good potential for riparian forest buffer establishment, thus long-term RCG control through shading. Given these estimates, over time the total channel length requiring RCG removal could be reduced by about half to roughly five miles, thus reducing the annual costs to under $40,000. If RCG treatments were to be performed once every three years instead of every other year, the annual costs could be around $25,000. Some adaptive management will be necessary to better determine treatment schedules, but it may turn out that some areas require treatment every other year, while others may only need to be treated once every three or four years.

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Following the adoption of a drainage management plan, prepared in consultation with permitting agencies, drainage districts are typically granted five-year permits for the ongoing activities identified in their plans.

Mowing of RCG is another effective treatment in some areas. Regular mowing reduces the need for RCG removal and is far less expensive than removal. However, to significantly reduce the impacts of RCG on stream flow and aquatic habitat, mowing needs to be done at least twice annually. Typically, no permits are required for mowing invasive noxious vegetation.

Beaver control is highly variable, depending on how diligently dams are monitored and managed. Monitoring should be done throughout the year. And management of dams or trapping of beavers depends on the conditions of the permits issued by the Washington Department of Fish & Wildlife. Installation of pond levelers more likely falls under the category of special projects than annual maintenance, but annual inspections and maintenance should be performed.

Table 2. Estimated Annual Maintenance Activities and Costs

[These cost estimates need further analysis. Aquatic vegetation removal estimate is based on 2020 data; no data for other estimates]

Maintenance Activity	**Estimated Cost**
RCG Mowing	$17,000
Aquatic Vegetation Removal	$30,000
Beaver and Dam Monitoring	$1,000
Beaver Dam Management	$2,000
TOTAL ESTIMATED ANNUAL COST	**$50,000**

4.3 Special Projects

The drainage district may sponsor or co-sponsor special projects that fall outside of those covered by routine maintenance and the permits that cover such maintenance. These projects might include special drainage system projects, including decommissioning of obsolete drainage ditches, conversion of willow-dominated riparian areas to other species, hedgerow establishment along drainage ditches and narrow stream channels, installation of beaver dam pond levelers, and removal of sediment buildup in specific reaches of drainage ways.

In addition to projects to support the proper functioning of the drainage system, a drainage district may undertake or partner with other organizations to undertake habitat improvement or restoration projects. This might include correcting barriers to fish passage or large-scale ecological restoration projects. Some stream reaches are candidates for major restoration work that would include restoration of natural channel meanders and riparian forest buffer establishment. Some reaches that suffer from chronic inundation well into the growing season or otherwise are marginally productive farmland are candidates for large-scale wetland restoration. Many potential projects have already been identified and some preliminary analyses have already been conducted. Projects of this nature will require special planning and engineering to ensure satisfactory results and minimize adverse environmental impacts. Any wetland restoration is contingent on willing participation by landowners, and easement purchases or property acquisition.

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On December 31, 2009, the Quilcene-Snow watershed water resources management program rule (WAC 173-517) was adopted by the Washington Department of Ecology. The water rule greatly curtails new water uses after that date. No new water is available for agriculture in the Chimacum sub-basin without mitigation. However, winter water is available for new water rights; therefore, if the water can be stored, it may be possible to obtain a water right for water use during the growing season. Whether or not this is feasible or how this might work is yet to be determined. However, with projections of wetter winters characterized by more intense storm events and drier summers, it may become important to pursue some form of storage in the future. Given the other water and drainage management activities that the drainage district would be responsible for, water storage for irrigation might also fall under its jurisdiction.

Funding for some of the smaller special projects may be generated by setting aside a portion of the annual assessment revenues and/or through limited increases in assessments. Grants or other revenue sources will be necessary for the larger projects. Grant programs, including the Regional Conservation Partnership Program administered by the USDA Natural Resources Conservation Service, and the Floodplains by Design program administered by the Washington Department of Ecology, are options for a multitude of projects that incorporate a combination of habitat restoration and drainage system enhancement.

4.4 Alternatives to Drainage District Reactivation

While reactivation of Jefferson County Drainage District #1 may be the most expeditious path forward for management of the Chimacum drainage system, there are other alternatives. Some alternatives follow.

Do Nothing

The "do nothing" alternative is the simplest alternative, but it does not adequately and comprehensively address chronic flooding problems. Maintenance is left to each landowner. The main advantage of the current system is the financial burden of performing maintenance work falls only on those that undertake such work. However, perhaps the most serious issue with this alternative is with the problems that result from haphazard maintenance. When maintenance is neglected downstream it can have adverse impacts on properties upstream.

Obtaining permits for instream work is another challenge with the current system. While it is not impossible for individual landowners to obtain permits, the application process is onerous. Furthermore, processing multiple individual permit applications and enforcing permit conditions for several projects that are likely to be implemented simultaneously on multiple properties by individuals with varying degrees of knowledge and experience presents staffing challenges for regulatory agencies.

Agencies and organizations could continue to pursue ecological restoration and habitat enhancement projects with willing landowners under this alternative, but such projects would most likely happen as opportunities arise, rather than through a more strategic approach.

Organizational Assistance to Landowners Hybrid

A hybrid alternative to the current system would have individual landowners take responsibility for routine maintenance but receive technical and possibly financial assistance from agencies and/or organizations. Organizations, such as Jefferson County Public Works, Jefferson County Conservation

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District, the North Olympic Salmon Coalition, WSU Extension, and/or a cooperative of landowners could serve as the agent(s) for individual landowners or groups of landowners. Outreach and education could be conducted to inform the community about resource concerns and best practices for addressing those concerns, and assistance could be provided for permit applications and compliance. However, routine maintenance work would remain the responsibility of individual landowners and participation would be entirely voluntary. If landowners were to opt out of doing maintenance, thus adversely impact the properties of their upstream neighbors, nothing could be done about it. Organizations could work with individual landowners or groups of landowners to pursue ecological restoration or habitat enhancement projects.

Flood Control Zone Districts

Flood control districts (RCW 86.15) are special purpose districts with a similar mission and purpose as drainage districts. Jefferson County already has a flood control district with subzones in the Quilcene and Brinnon areas. Additional subzones can be established by the board of county commissioners (BOCC). The BOCC can serve as the governing board, can appoint an advisory board, or can appoint an independent governing board. Flood control zone districts have broad powers for revenue generation.

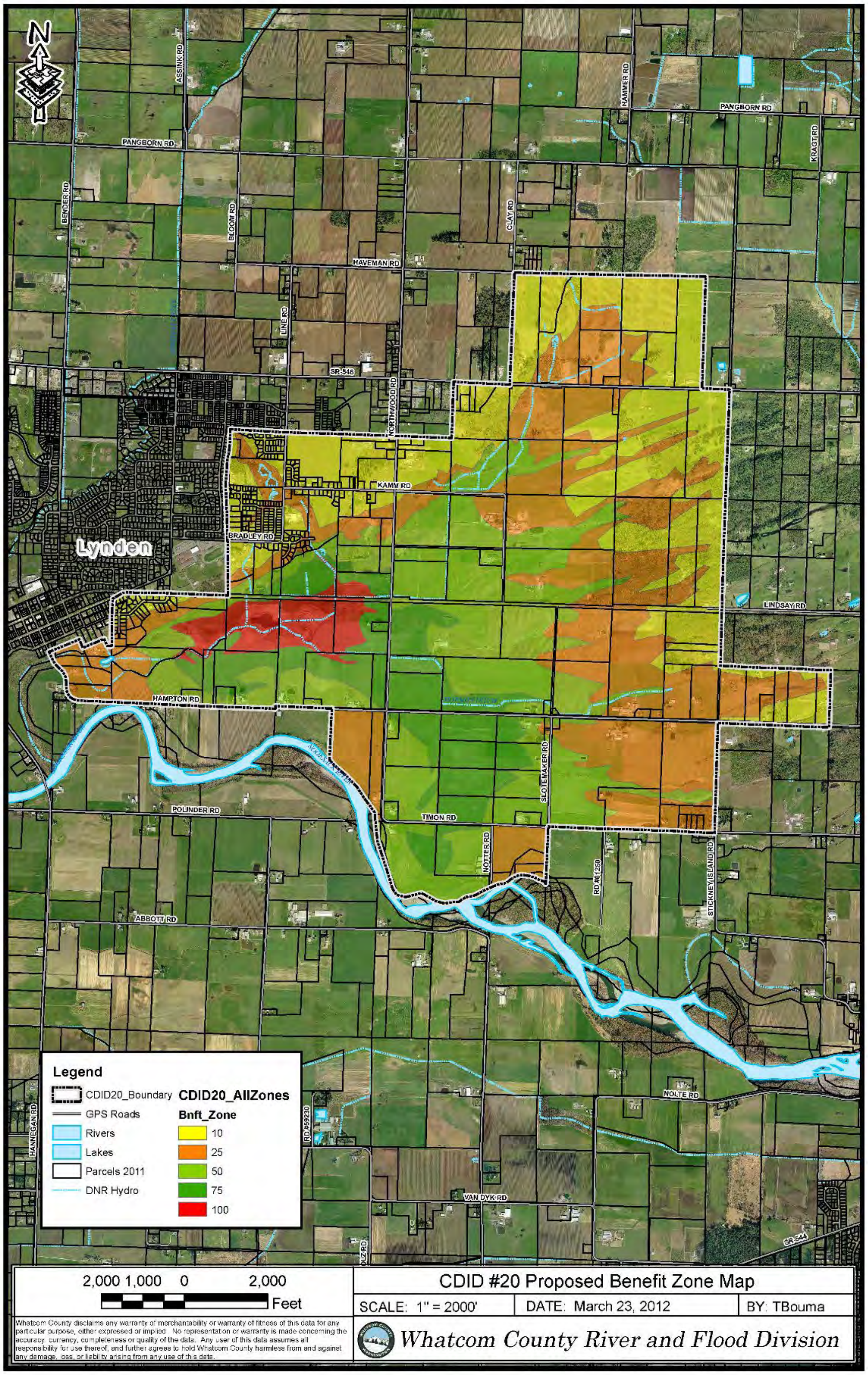
Watershed Improvement Districts

Watershed improvement districts (WIDs) are governed under the irrigation district statute (RCW 87.03). They are special purpose districts like drainage districts, but their primary purpose is the maintenance of an irrigation system, including serving as the custodians of water rights on behalf of district property owners and delivery of irrigation water. They may take on additional responsibilities beyond management and delivery of irrigation water, including but not limited to the responsibilities of a drainage district. Because there are very few adjudicated water rights in the Chimacum watershed, and the watershed is a closed basin to new, unmitigated water rights, a WID would appear to have limited value; however, if storage of winter runoff for summer irrigation were to be identified as a high priority, a WID would be a good alternative. Formation of a WID would require an election of district voters following a hearing by the BOCC resulting in favor of forming the district. A feasibility study would likely be required before forming a WID.

Benefit Zones

The map below shows the proposed benefit zones for a drainage district in Whatcom County. These zones are based on elevations and flooding vulnerabilities. The most vulnerable properties are assessed the highest fees, as they presumably benefit the most from the work of the drainage district. Similar assessments could be done for flood control zone districts and watershed improvement districts.

Figure 3. Benefit Zones Map



REFERENCES CITED

Bahls, P. and J. Rubin. 1996. Chimacum Watershed Coho Salmon Restoration Assessment.

Bierklink, H. 2022. Director, Bertrand Watershed Improvement District. Personal communications.

Hitchcock, K. 2022. Jefferson County GIS. Personal communications.

Jefferson County Conservation District. 2015. Chimacum Watershed Water Quality and Fishes; A Comprehensive Review. Jefferson County Conservation District.

Jefferson County Conservation District. 2022. Chimacum Drainage District; History, Current Conditions, and Potential Options for the Future.

Johnson, T.H. and C. Weller. 2003. On-going supplementation programs for summer chum salmon in the Hood Canal and Strait of Juan de Fuca regions of Washington State.

Lichatowich, J. 1994. The status of anadromous fish stocks in the streams of eastern Jefferson County. Dungeness-Quilcene Pilot Project.

North Olympic Salmon Coalition. 2018. Chimacum Creek Restoration and Protection Plan.

Soil Conservation Service. 1955. Report of Field Examination; Chimacum Valley Watershed, Jefferson County, State of Washington.

Soil Conservation Service. 1975. Soil Survey of Jefferson County Area, Washington.

Soil Conservation Service. 1987. Unpublished Chimacum Creek geologic assessment.

WDFW 2022. Washington Department of Fish and Wildlife fisheries and fish passage barrier data.

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APPENDIX A – EXCERPTS FROM DRAINAGE DISTRICT LAW AND RELAVENT LINKS

Drainage District Powers (RCW 85.06 and 85.38.180)

Drainage District Elections (RCWs 85.38.100 through 85.38.130)

Drainage District Financing

Special District Financing – Alternative Method (RCW 85.38.140)

Rates and Charges (RCW 85.38.145)

Special Assessments – Valuation – Assessment Zones – Criteria for Assessments (RCW 85.38.150)

Systems of Assessment – Hearing – Notice – Adoption of Ordinance – Appeals – Review – Emergency Assessment (RCW 85.38.160)

Drainage District Reactivation (RCW 85.38.220)

Suspension of Operations—Procedure—Reactivation.

Any special district may have its operations suspended as provided in this section. The process of suspending a special district's operations may be initiated by: (1) The adoption of a resolution proposing such action by the governing body of the special district; (2) the filing of a petition proposing such action with the county legislative authority of the county in which all or the largest portion of the special district is located, which petition is signed by voters of the special district who own at least ten percent of the acreage in the special district or is signed by ten or more voters of the special district; or (3) the adoption of a resolution proposing such action by the county legislative authority of the county in which all or the largest portion of the special district is located.

A public hearing on the proposed action shall be held by the county legislative authority at which it shall inquire into whether such action is in the public interest. Notice of the public hearing shall be published in a newspaper of general circulation in the special district, posted in at least four locations in the special district to attract the attention of the public, and mailed to the members of the governing body of the special district, if there are any. After the public hearing, the county legislative authority may adopt a resolution suspending the operations of the special district if it finds such suspension to be in the public interest, and shall provide a copy of the resolution to the county treasurer. When a special district is located in more than one county, the legislative authority of each of such counties must so act before the operations of the special district are suspended.

After holding a public hearing on the proposed reactivation of a special district that has had its operations suspended, the legislative authority or authorities of the county or counties in which the special district is located may reactivate the special district by adopting a resolution finding such action to be in the public interest. Notice of the public hearing shall be posted and published as provided for the public hearing on a proposed suspension of a special district's operations. The governing body of a reactivated special district shall be appointed as in a newly created special district.

No special district that owns drainage or flood control improvements may be suspended unless the legislative authority of a county accepts responsibility for operation and maintenance of the improvements during the suspension period.

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