Shoreline Restoration Plan Update for Shorelines in Cowlitz County

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CERTIFICATION

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APPENDICES

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1. INTRODUCTION

Cowlitz County adopted an updated Shoreline Master Program (SMP) in 2018 (The Watershed Company and Parametrix 2018). Below are a few of the key elements included in that update:

- Increased minimum buffer widths from 10 to 50 feet and maximum buffer widths from 100 to 150 feet
- Established a shoreline restoration plan (SRP; which this document is updating)
- Established a new policy for ensuring no net loss of ecological functions

In 2021, Cowlitz County (County) completed a comprehensive review of the 2018 SMP and determined no changes were needed to the SMP to comply with Washington State Department of Ecology (Ecology) requirements. However, the County decided to pursue a review and update to the 2016 Restoration Plan, which itself builds upon the 2014 Shoreline Analysis Report (SAR; The Watershed Company [TWC] 2016; TWC and Parametrix 2014).

1.1 Purpose

The primary purpose of this Cowlitz County Shoreline Restoration Plan Update is to describe the changes to the restoration goals, existing conditions, County programs, and planned projects since 2016 in Cowlitz County. This plan builds on the goals and policies proposed in the shoreline master program implemented in 2018 (The Watershed Company and Parametrix 2018). Please refer to the Shoreline Restoration Plan for Shorelines in Cowlitz County and Cities of Castle Rock, Kalama, Kelso, and Woodland for the baseline conditions and goals in place in 2016 (The Watershed Company 2016).

1.2 Methods

This update was completed through resource review and personal communications with restoration partners, managers, scientists, and other entities. The primary resource for compiling up-to-date project information was PRISM Online Project Search on the Washington State Recreation and Conservation Office (RCO 2021). Projects were searched for using several criteria including organization, geographic area (Cowlitz County), project type, project name, keyword, and fiscal year. Fiscal years 2015 through 2021 were used as the date search criteria to include projects that may have been granted funding during the writing of the 2016 update.

2. EXISTING CONDITIONS

The following sections describe existing conditions based on defined geographic areas called assessment units that were established in the 2012 Shoreline Analysis Report to evaluate the shoreline areas within unincorporated Cowlitz County (The Watershed Company and Parametrix 2012). Assessment Units and city limit boundaries are shown in Appendix A, Figure 00.

2.1 Columbia River Assessment Unit

Key degraded functions include floodplain disconnection and in-stream habitat diversity. Lower-scoring reaches in the Columbia River represent areas of intensive transportation (port and railroad) infrastructure with limited shoreline vegetation, levees, overwater structures, and extensive impervious surfaces. Because of the intensive industrial development in these reaches, there may be opportunities for enhancement; however, large-scale rehabilitation of functions in these reaches is unlikely. As such, an effective restoration strategy for the Columbia River Assessment Unit should balance enhancement of highly impaired areas with rehabilitation or protection of less-impacted areas.

In general, the islands and confluences of major river mouths with the Columbia River provide some of the least altered shoreline habitats in the assessment unit. Both Fisher and Cottonwood Islands are designated as U.S. Army Corps of Engineers (USACE) dredge disposal sites. Other high functioning reaches include undeveloped wetland areas south of the Cowlitz River mouth and near the mouths of the Kalama and Lewis Rivers. Protection of these high functioning areas should be a priority.

2.2 Lewis River Assessment Unit

The Salmon and Steelhead Limiting Factors report for Water Resource Inventory Area (WRIA) 27 (Wade 2000b) identifies the Lewis River dam network as the primary limiting factor for salmonid habitat in this area. The three mainstem dams alter the natural hydrologic timing of the lakes and downstream areas, limit longitudinal connectivity in the watershed, create fish passage barriers, and restrict downstream transport of sediment and large woody debris. Planned and ongoing actions by PacifiCorp to mitigate for impacts to fish passage and habitat alterations will be instrumental in maintaining and improving shoreline functions in the Lewis River (see Section 4.4).

In addition to dam impacts, disconnected floodplains, poor in-stream habitat complexity, and low riparian vegetation cover are also key factors limiting functions in the Lewis River Assessment Unit. Ecological functions in the reaches in the lower Lewis River downstream from the City of Woodland (Shoreline Analysis Reaches 1-5) are significantly degraded. The shorelines in these lower reaches are lined with levees, devoid of native vegetation, and lack habitat complexity. Despite significant degradation of natural shoreline functions of the lower Lewis River, the agricultural fields in the area do likely provide winter foraging habitat for migratory waterfowl. These reaches also experience tidal influence from the Columbia River estuary and, therefore, have the potential to provide low energy rearing habitats for juvenile salmon, although the lack of shoreline complexity significantly limits the realization of such potential.

There are several key reaches that provide significant habitat functions in the Lewis River Assessment Unit. These areas include off-channel habitat surrounding Eagle Island; the Lewis River mainstem reach between Cedar Creek and Merwin Dam; Cedar Creek watershed and the lower reaches of Johnson, Ross, Robinson, and Colvin Creeks; wetland complexes in the lower 2 miles of the South Fork Chelatchie Creek; and backwater slough areas above the Lewis River Salmon Hatchery (Wade 2000b). These areas should be prioritized for habitat protection and enhancement. Since the 2016 update, a major improvement in the Lewis River watershed is the Paradise Point regional water supply system at the confluence of the North and East Forks of the Lewis River in Clark County (LCFRB 2020). This was identified as a high priority flow improvement action in the WRIA 27/28 plan and will increase summer

base flows in the river by reducing the existing reliance on withdrawals from the East Fork Lewis River hydraulic system.

2.3 Kalama River Assessment Unit

Functional scores identified in the 2014 Shoreline Analysis Report were consistently higher throughout the Kalama River Basin compared to other assessment units in the County because of the dominance of private commercial forest land in much of the Kalama River Watershed (LCFRB 2020).

The lower Kalama River has the most impaired functions in the assessment unit. A study of the lower 10 miles of the Kalama River conducted in Phase II of the Lower Columbia Fish Recovery Board (LCFRB) Watershed Assessment Project (R2 and MBI 2004) found that natural geomorphic processes are severely limited in the lower Kalama River. These processes are impaired by armoring and levees that cover the majority of the shoreline length; much of the armoring is designed to protect Kalama River Road, which parallels the lower Kalama River. As a result of development and channelization of the river, the density of large woody debris is poor in the lower river.

Approximately 69 percent of the Kalama River Watershed was managed for forest production as of 2016; therefore, forestry practices have a significant effect on shoreline functions in the watershed. In smaller tributaries in particular, areas of forest harvest occur on both sides of the stream, and vegetated buffers are smaller compared to the mainstem Kalama River. Fish passage barriers also present a significant impairment to shoreline functions in the Kalama River Assessment Unit.

Areas with significant habitat value for salmonids include the following: mainstem Kalama River between Lower Kalama Falls (RM 10) to around Modrow Bridge (RM 2.4), upper mainstem Kalama River (RM 10 to RM 35), tributaries below Lower Kalama Falls and any remaining off-channel habitat, Gobar Creek, Wildhorse Creek, North Fork Kalama, Langdon Creek, and Lakeview Peak Creek (Wade 2000b).

2.4 Cowlitz River Assessment Unit

As noted in the Lower Cowlitz River and Floodplain Habitat Restoration Siting and Design Report (Tetra Tech 2007), primary limitations on restoration in the Lower Cowlitz are the high sediment load in the upper Toutle River, the regulation of flows, and existing and proposed development within the floodplain and along the riparian zone.

The North Fork Toutle River and upper South Fork Toutle River still maintain an extremely high sediment load resulting from the 1980 eruption of Mount St. Helens, particularly on the North Fork Toutle River upstream of the USACE sediment retention structure. The high sediment load has resulted in a broadly braided and frequently migrating channel. Because these braided channels each convey a relatively small portion of the total flow and because each channel is wide relative to its depth, the sediment plain can act as a fish barrier, preventing upstream migrations during low flow conditions (AMEC 2010).

The Shoreline Analysis Report identifies reaches just north of the City of Kelso (Shoreline Analysis Cowlitz Reaches 9 to 13) as impaired compared to other reaches in the assessment unit (See Appendix A, Figure 00). The Cowlitz River is artificially constrained by levees in these reaches, and shoreline vegetation is limited. Other degraded reaches include highly developed reaches along Silver Lake (Shoreline Analysis Cowlitz Reaches 105, 111, and 112), which have a high density of overwater structures and other shoreline modifications. Several sites along the Cowlitz River were used as dredge disposal locations following the eruption of Mount Saint Helens in 1980. These sites occur in several

locations on both sides of the river between the City of Kelso and Castle Rock. Today, these disposal sites remain unvegetated, and former floodplain areas are disconnected as a result of the disposal activities. The 1980 event also impacted tributaries, leaving them disconnected as a result of mud flows. Many of these tributaries are still in the process of recovering, as dredge spoil stockpiles were located directly on their banks. Ongoing erosion of thesestockpiles adds to the fine sediment accumulation and poor water quality in the Cowlitz River.

In contrast to the artificially confined reaches in the lower Cowlitz River, shoreline areas near the northern County border occur on a broad floodplain with significant riparian wetland areas. Wetland areas in the vicinity of the Horseshoe Bend area, south of Castle Rock, also provide high functioning riverine wetland habitats (Shoreline Analysis Cowlitz Reaches 15 and 16). Similarly, undeveloped reaches of Silver Lake (Shoreline Analysis Cowlitz Reaches 104, 106 to 110, 113 to 116) have high hydrologic, vegetated, and habitat functions resulting from the large areas of relatively undisturbed forested and shrub wetlands.

2.5 Mill, Abernathy, Germany Creek Assessment Unit

Ecological functions in Mill, Abernathy, and Germany Creeks are primarily influenced by forest harvest activities, agriculture, and rural residential development. The Shoreline Analysis Report did not identify any particularly low functioning reaches in this assessment unit. However, fish passage barriers in Germany and Coal Creeks block nearly one third of potential instream habitat, and correction of those barriers is a significant restoration opportunity.

2.6 South Fork Chehalis River Assessment Unit

Dominant land use in the upper South Fork is commercial forestry, and agricultural uses predominate in the lower river. Both agricultural and forestry uses have resulted in significant alterations to the shorelines of the South Fork Chehalis River. Degraded riparian vegetation, high sediment loads originating from the upper watershed, and a high density of fish passage barriers are the primary impairments in the upper watershed (Chehalis Basin Partnership Habitat Work Group 2008).

The Chehalis Basin Lead Entity Strategy was published in 2011, and an update was due in 2021 (Chehalis Basin Lead Entity 2021). Although adequate data has been compiled for this update, the publication date is delayed due to a constraint on time and resources. The Chehalis Basin Lead Entity has an ongoing Fish Passage Barrier Prioritization program and web map, though no priority barriers are mapped within Cowlitz County (WDFW 2021).

3. EXISTING COUNTY PROGRAMS

3.1 Cowlitz County Comprehensive Plan

The Cowlitz County Comprehensive Plan is in place as required by RCW 36.70.320, and the updated version was adopted in 2017 (Cowlitz County 2017). The plan outlines a vision of Cowlitz County for the next 20 years and what practices will help achieve that vision. The goals and policies of the plan are represented in the updated Comprehensive Plan Map, appended to the Cowlitz County Comprehensive

Plan, by identifying land use designations. Policies within the plan that address restoration are as follows:

- Policy NER (Natural Environment and Resources) 1.7: Ensure prompt restoration of land after grading and vegetation removal through phased clearing and grading, replanting requirements, and other appropriate revegetation and engineering techniques.
- Policy NER 2.1: Promote enhancement or restoration of degraded wetlands and riparian corridors to maintain or improve ecological functions.
- Policy LU (Land Use) 27.1: Evaluate potential restoration projects based on likelihood of successful restoration of prior wetland, habitat and/or floodplain functions.
- Policy LU 27.2: Encourage restoration efforts on dredge disposal sites that previously provided a high level of wetland, habitat and/or floodplain function.

3.2 Public Works

The 2016 SMP Restoration Plan describes the National Pollution Discharge Elimination System (NPDES) permit issued to the County in 2007. A Stormwater Management Program Plan (SWMP) was created to fulfill the NPDES requirements, and this SWMP was updated in March 2021 (Cowlitz County Department of Public Works 2021). Within the SWMP are several strategies for watershed health in addition to stormwater treatment. A large component of this is public outreach including stewardship activities to remove noxious weeds, plant native vegetation, and encourage nurseries to promote native species.

4. RESTORATION PARTNERS

4.1 U.S. Army Corps of Engineers

The USACE maintains the Toutle River Sediment Retention Structure (SRS), created to manage the continued movement of sediment since the 1980 eruption of Mount St. Helens. According to the 2017 Cowlitz County Comprehensive Plan, the USACE initially expected the basin behind the SRS to be filled with sediment by 2035, but the basin was in fact filled as of 2012 (USACE 2018). In 2017, sediment was overflowing from behind the SRS and entering the river system. The USACE initiated a project to raise the SRS spillway by 7 feet, increasing the capacity for up to 2 million cubic yards of sediment. The Mount St. Helens Long-Term Sediment Management Plan – Final Supplemental Environmental Impact Statement (FSEIS) was produced by USACE in 2018 to assess environmental impacts from several proposed alternatives to the current SRS regime.

A Record of Decision was published in September 2018 that recommends the preferred alternative identified in the FSEIS (USACE 2018). The recommended plan includes:

- Phased Construction of Sediment Management Measures
  - Up to two incremental raises of the SRS spillway crest elevation (totaling up to 23 feet) to a total elevation of 970 feet (NGVD29) without raising the top of dam elevation
  - Constructing grade-building structures in the sediment plain upstream of the SRS

  - Conducting as-needed dredging in the lower Cowlitz River
- Modify Fish Collection Facility
  - Modifying the fish collection facility in partnership with the State of Washington
  - Establishing a new fish release site at a location to be determined on Deer Creek

The USACE is now in the design phase and does not yet have a firm date for construction of the next phase (M. Turaski, USACE, personal communication, May 21, 2021). The USACE will be required to improve fish passage as required by the National Marine Fisheries Service (NMFS) Biological Opinion.

4.2 Northwest Power and Conservation Council Fish and Wildlife Program

The Northwest Power and Conservation Council (NPCC) continues to lead the largest regional effort to recover and protect fish and wildlife in the nation, funded by the Bonneville Power Administration.

The NPCC adopted the 2020 Addendum to the 2014 Columbia River Basin Fish and Wildlife Program (NPCC 2020). The two documents are intended to be read together, as the 2020 Addendum complements the 2014 program, which remains in full effect. The 2020 Addendum consists of two parts: Program Performance and Program Implementation. The findings on recommendations and responses to comments are also included.

Key priorities established by the program include:

- Ensure effectiveness of ongoing projects
- Learn from new information and adapt accordingly
- Support efforts to address predation, reduce toxic contaminants, and prevent the spread of non-native and invasive species
- Explore opportunities to increase upper Columbia Basin salmon through reintroduction into blocked areas, enhancing fish passage, and habitat improvements
- Address passage and research needs for sturgeon and lamprey
- Continue updating local subbasin recovery plans to inform efforts
- Improve floodplain habitats

4.3 Lower Columbia Fish Recovery Board

The LCFRB continues to act as a regional salmon recovery organization tasked with forming recovery plans and coordinating implementation across 18 subbasins, 10 of which occur wholly or partially within Cowlitz County.

The LCFRB provided comments to NMFS on the 2020 5-year status review for Pacific salmon and steelhead (LCFRB 2020). These comments report that from 2015 to 2020, there have been 58 projects completed to improve habitat conditions within 164 miles of stream within the southwest Washington footprint of the LCFRB. The aim of these habitat improvement projects included creating pools, adding cover and complexity, decreasing width to depth ratios, enhancing and reconnecting off-channel and

side-channel habitat, reducing water temperatures, and/or reconnecting floodplains (LCFRB 2020). In the same time frame, 34 additional projects were completed to restore and enhance over 3,460 acres of riparian habitat. Part of these efforts was to exclude livestock from 135 acres. This rate of riparian restoration from 2015 to 2020 was lower than reported from 2010 to 2014, and this may be due to a reduction of available restoration opportunities or a shift in restoration project prioritization. Fish passage is also a priority for LCFRB, and it has assisted with 97 such projects in the region, opening 79 miles of stream habitat.

4.3.1 Upper Cowlitz and Cispus

The LCFRB is also working with community stakeholders to monitor and improve habitat outside of Cowlitz County in the Upper Cowlitz and Cispus Watersheds (Inter-Fluve, Cramer Fish Sciences, and Lower Columbia Fish Recovery Board in collaboration with the Upper Cowlitz Cispus Work Group 2019). This has downstream impacts within Cowlitz County, primarily by reducing sediment load in the Lower Cowlitz River. The Upper Cowlitz and Cispus Watersheds are a focal area for salmon recovery efforts, hosting historical “core” and “genetic legacy” populations of spring Chinook.

4.3.2 East Fork Lewis River

LCFRB is involved with the Lower Columbia Salmon Recovery Plan Partner Program Implementation Review for the East Fork Lewis River (PC Trask and Associates, Inc. 2020). This is discussed in further detail in Section 5.2, Lewis River Assessment Unit.

4.4 PacifiCorp

PacifiCorp continues to facilitate fish passage projects, fish population supplementation programs, habitat enhancement, monitoring, and funding of restoration projects in the Lewis River Basin.

Since 2016, there have been two published restoration reports supported by the PacifiCorp/Cowlitz PUD Lewis River Aquatics Fund: the 2016 Lewis River Mainstem Fish Habitat Restoration and the 2017 Spencer Creek Alluvial Fan and Channel Rehabilitation. Both projects were partnerships between the Mount St. Helens Institute and the U.S. Forest Service Gifford Pinchot National Forest, and both are situated east of Cowlitz County, approximately 10 miles upstream on the Lewis River from the Swift Reservoir.

PacifiCorp has also constructed fish release ponds in Woodland, Washington. The facility is a set of four raceways where juvenile fish are held overnight following their transport from the Swift Dam fish collector (personal communication, Todd Olson, PacifiCorp, May 28, 2021).

4.5 Cowlitz Public Utility District

Public Utility District No. 1 of Cowlitz County, Washington (Cowlitz PUD), owns the Swift No. 2 Hydroelectric Project located on the Lewis River. There have been no changes to management at Swift No. 2 since the 2016 SRP. There is a potential license amendment in the future, which would change the directives from NMFS and the U.S. Fish and Wildlife Service for fish passage measures at the Lewis River Hydroelectric Projects (personal communication, Amanda Froberg, Cowlitz PUD, May 19, 2021).

As part of its 2008 Federal Energy Regulatory Commission license, Cowlitz PUD agreed to conduct the following activities, either individually or in coordination with PacifiCorp, who operates and maintains Swift No. 2 under contract:

- Reintroduce anadromous salmon above the Swift Reservoir (complete, see description in Section 4.4); note that the Swift Reservoir lies in Skamania County
- Fund three salmon hatcheries (ongoing)
- Fund aquatic habitat improvement projects (ongoing)
- Ensure minimum flows to the Lewis River Bypass Reach and Yale Reservoir (ongoing)
- Monitor water quality (ongoing)
- Manage 525 acres of wildlife habitat (ongoing), most of this habitat is in Skamania County

4.6 Lower Columbia Fish Enhancement Group

The Lower Columbia Fish Enhancement Group (LCFEG) promotes habitat as the primary driver for salmon recovery. The group continues to provide nutrient enhancement in the Lower Cowlitz and Kalama River Basins. Although there are several projects on the Coweeman and South Fork Toutle Rivers, no LCFEG projects are currently active on the Kalama or Lower Cowlitz Rivers (personal communication, Shauna Hanisch-Kirkbride, LCFEG, May 20, 2021). All projects are funded through the Washington State Recreation and Conservation Office Salmon Recovery Funding Board.

4.7 Lower Columbia Estuary Partnership

The Lower Columbia Estuary Partnership continues to provide ecosystem and restoration effectiveness monitoring in the Lower Columbia. The most recent annual report for their Ecosystem Monitoring Program was published in 2020 (Rao et al. 2020). The program inventories habitats, water quality, hydrology, and site conditions across tidally influenced freshwater emergent wetlands with backwater sloughs.

4.8 Intensively Monitored Watershed Program Partners

The Intensively Monitored Watershed (IMW) program is a joint effort of the Washington State Departments of Fish and Wildlife and Ecology, NOAA Fisheries, the Environmental Protection Agency, the Lower Elwha Klallam Tribe, and Weyerhaeuser Company. Funding for the IMW program is provided by the Washington Salmon Recovery Funding Board. The Mill-Abernathy-Germany Watershed is one of three IMWs in the state. The IMW cooperators collected water quantity, water quality, habitat, summer juvenile fish abundance, and smolt production data and are identifying specific restoration actions for each IMW treatment watershed. A 2016 update was produced to supplement the Abernathy and Germany Creeks Intensively Monitored Treatment Plan (LCFRB 2016; HDR Inc. and Cramer Fish Sciences 2009). The 2016 update incorporates new fish and habitat knowledge and project prioritization in the Lower Columbia IMW following project initiation. This also supplements but does not replace previous efforts.

The 2016 update provides the following updates:

- Compare treatment plan proposals to completed, in-progress, and proposed projects
- Summarize nutrient treatment and results in the two treatment streams
- Summarize habitat assessments and biological monitoring results
- Compile recommendations for future monitoring and treatment prioritization within the IMW
- Revise reach descriptions to reflect recent projects or new knowledge on habitat or fish populations
- Review the literature cited section of the IMW treatment plan and incorporate more recent reports and scientific literature related to experimental design and treatment results

4.9 Columbia Land Trust

The Columbia Land Trust has two restoration projects listed on PRISM Online, both completed in 2009: Willow Grove Conservation and Germany Creek Conservation/Restoration. The former established 380 acres of intertidal wetland and off-channel habitat along the Columbia River under permanent protection. The latter did the same for 155 acres of critical riparian and floodplain habitat in the lowest mile of Germany Creek in Cowlitz County. These projects are mentioned here because they are discussed briefly in the 2016 update, and they are large efforts located at the collective downstream end of the assessment units.

4.10 Cowlitz Indian Tribe

The Cowlitz Indian Tribe has several ongoing projects in unincorporated Cowlitz County including several projects within the Abernathy Creek Watershed (personal communication, Eli Asher, Cowlitz Indian Tribe, June 8, 2021). The Abernathy Creek work supports the IMW program. The Cameron, Wisconsin, Midway, and Headwaters sites along Abernathy Creek have all been constructed since 2016. Projects on Sarah and Erick Creek were completed in 2019 and 2020, while the Abernathy Mainline site is complete except for ongoing riparian planting. These projects include installation of large woody debris and engineered log jams, as well as improvement to side channel access. The watershed has also had several barrier culverts removed under the direction of the Tribe in the last 10 years, improving fish access to existing high quality habitat.

4.11 Cowlitz Conservation District

The Cowlitz Conservation District (District) works through two primary avenues. First, the District works with communities to implement projects on a watershed scale. Projects focus on salmon recovery, water quality, and invasive weed removal. The District has completed projects in the Kalama River Assessment Unit and the Mill, Abernathy, and Germany Creeks Assessment Unit.

Second, the District provides technical and financial assistance to individual landowners throughout the County to promote sound management of natural resources—advising on restoration, salmon needs, and forestry issues. The District works directly with landowners and provides information through watershed plans, timber plans, and farm plans.

The District has been a partner in the Cowlitz/Wahkiakum Watershed planning effort, which defined strategies to best collect and compile data in order to identify limiting factors. This ongoing approach

has identified fish barrier improvements, riparian restoration projects, in-stream habitat enhancement, livestock exclusion, and other potential restoration projects to address limiting factors, particularly in the Kalama and Lewis Rivers and Mill Creek. Current District-funded projects include the installation of woody debris in several reaches of Abernathy Creek to restore habitat and reduce flow and erosion.

4.12 Other Volunteer Organizations

Many recreational groups and private organizations are active in Cowlitz County. While some of these groups may not have historically worked in the shoreline jurisdiction of Cowlitz County, this does not preclude involvement in voluntary restoration activities in the future. Probably the most important volunteer is the landowner that acts as a steward of the land following the completion of the project. Potentially active groups include:

- Columbia Riverkeeper
- Lower Columbia Basin Audubon Society
- Trout Unlimited
- Ducks Unlimited

5. POTENTIAL PROJECTS

The following sections identify restoration priorities and opportunities within each unincorporated Cowlitz County assessment unit. On occasion, a project with impacts upstream of the assessment unit is included so the potential downstream benefits can be noted.

Please refer to Appendix A for a figure set showing proposed, active, and completed projects. Figure 00 provides an overview of the Assessment Units, and Figures 01-07 provide individual project locations. Projects have been color coded by status according to the available data. All projects are within Cowlitz County, and those within city limits of the major towns have been removed.

A status of “other” means the project is neither underway nor completed rejected, but it may be a board alternate selection or not yet funded.

5.1 Columbia River Assessment Unit

No projects appeared in the PRISM Online search for restoration projects from fiscal years 2015 to 2021. Also, no projects were noted from the restoration partners consulted for the 2021 Update within the Columbia River Assessment Unit.

Habitat restoration priorities identified in the Habitat Strategy (LCFRB 2010b) for the lower Columbia River and Estuary that are applicable to potential actions within Cowlitz County shorelines include:

- Restoring subbasin valley floodplain function and stream habitat diversity
- Managing forests to protect and restore watershed processes
- Addressing immediate risks with short-term habitat fixes

In addition to shoreline restoration opportunities focused primarily on aquatic ecosystem restoration, restoration of shoreline habitats for terrestrial species should also be pursued. The U.S. Fish and Wildlife Service has listed the streaked horned lark (*Eremophila alpestris strigata*) as threatened in 2013 and designated 4,629 acres of critical habitat in Washington and Oregon. Current potential breeding grounds occur in the Willamette Valley, along the Lower Columbia, and north along the Cowlitz River to the South Puget Lowlands into Thurston, Pierce, and Mason Counties (USFWS 2019).

Streaked horned larks inhabit flat, sparsely vegetated areas, including prairie, grasslands, wetlands, mudflats, and open spaces of anthropomorphic origin such as airports, dredge spoils islands, and agricultural fields. Vegetation is typically low and primarily herbaceous. Breeding and wintering habitats are similar. On the Columbia River, the species inhabits sandy islands.

Effective conservation measures for recovery have been identified through research and monitoring and include creating bare or sparsely vegetated areas within or adjacent to suitable, if not occupied, habitat; creation of suitable habitat and protected nest sites in areas protected from human disturbance, predators, and flood events; creation of seasonal mudflats; and the planned timing and placement of dredge materials to create nesting habitat. Elements of proposed or potential restoration projects described in this restoration plan may benefit streaked horned lark; conversely, some salmon-focused restoration actions could negatively impact the species if not planned appropriately to avoid impact.

5.2 Lewis River Assessment Unit

As noted in Section 4.3.2, LCFRB is involved with the Lower Columbia Salmon Recovery Plan (Recovery Plan) Partner Program Implementation Review for the East Fork Lewis River (PC Trask and Associates, Inc. 2020). This is primarily outside of Cowlitz County, but again, does carry significance for the Lower Cowlitz basin within the county. This review of available data and interviews found that the programs involved with implementing recovery projects were aligned in their function. However, they were not regularly in alignment with and using the Recovery Plan as a guiding tool. LCFRB has engaged with the programs to improve alignment with the Recovery Plan in the future. Other notes include that LCFRB be more structurally connected with the regulatory programs, as they have strong existing relationships with restoration partners. Recommendations are made within the review to improve the effectiveness of the Recovery Plan, database tracking, presentation of information through GIS, and maturing relationships among the partners to allow for more predictable or uniform data gathering and request practices.

As noted in Section 2.2, management of dam impacts is among the most significant potential restoration opportunities in the Lewis River Assessment Unit. In addition to addressing dam management, other key strategies for restoring the Lewis River subbasin include restoring floodplain connections and in-stream habitat complexity and improving riparian habitat. In the upper basin, protection of higher functioning areas is a priority, and restoration should address agricultural and forestry impacts to stream corridors (LCFRB 2010a).

No new restoration projects from fiscal years 2015 to 2021 appeared in a PRISM Online search for the Lewis River Assessment Unit.

A summary of priority restoration opportunities is provided in Table 1.

Table 1. Restoration Opportunities in the North Fork Lewis River (Assessment Unit NL)

ID	Type*	Action	Status	Entity	Source Plan/ID
12 NL	YG	Manage regulated stream flows to provide for critical components of thenatural flow regime	Expansionof existing program or activity	PacifiCorp, Cowlitz County PUD, FERC, WDFW, NMFS, USFWS	LCFRB 2010a/ L-Lew 1
13 NL	HfO	Conduct floodplain restoration where feasible along the mainstem and in major tributaries that have experienced channel confinement, build partnerships with landowners and agencies and provide financial incentives	New	NRCS, C/WCD,CCD, NGOs, WDFW, LCFRB, USACE, LCFEG	LCFRB 2010a/ L-Lew 4
14 NL	QG	Address water quality issues through the development and implementation of water quality clean-up plans (TMDLs)	Expansionof existing program or activity	Ecology, Cowlitz County	LCFRB 2010a/ L-Lew 17
15 NL	AG	Limit intensive recreational use of the mainstem Lewis during critical periods	Expansionof existing program or activity	Cowlitz County, WDFW	LCFRB 2010a/ L-Lew 18
16 NL	Hirf	Instream large woody debris, riparian,and side-channel enhancement in the Eagle Island area.	Designs Complete	LCFEG, Cowlitz Tribe	Interfluve etal. 2009
17 NL	Hf	Off-channel habitat enhancement at RM 13	Design Complete	LCFRB	Unknown
18 NL	P	Anadromous fish passage at Merwin and Swift dams.	Facilities complete, Beginning Operations	PacifiCorp	PacifiCorp and PUD #1 2004
19 NL	Hi	Continue to install large woody debris below Merwin Dam.	Ongoing	PacifiCorp	PacifiCorp and PUD #1 2004
20 NL	MHi	Monitor and maintain gravel conditions below Merwin Dam for spawning habitat.	Ongoing	PacifiCorp	PacifiCorp and PUD #1 2004
21 NL	M	Monitor predator relationships in Lake Merwin and manage as necessary.	Ongoing	PacifiCorp	PacifiCorp and PUD #1 2004
22 NL	MG	Continue to manage wildlife habitat and forest resources per the integrated Wildlife Habitat Management Plans	Ongoing	PacifiCorp, Cowlitz PUD	PacifiCorp and PUD #1 2004
23 NL	M	WRIA 27/28 Nutrient Enhancement. Disperse surplus hatchery salmon carcasses in high-priority mainstem and tributary habitat. (Also in Kalama River AU)	Completed	LCFEG	PRISM

*TYPE = project type: H=habitat (f=floodplain, w=wetland, i-instream, r=riparian), M=management, W=water quality,Y=hydrology, P= fish passage, A=acquisition/protection, R=research/investigation, G=regulatory, O=outreach

5.3 Kalama River Assessment Unit

The following actions were proposed to restore and enhance shoreline functions in the Kalama River (Table 2). This table includes specific actions prioritized for salmon recovery identified in a 2009 study to restore habitat conditions in the most developed lower 2.5 miles of the Kalama River (Powers and Tyler 2009). In the upper watershed, recommended actions are primarily related to forest management to protect high functioning habitats.

Table 2. Restoration Opportunities in the Kalama River (Assessment Unit KR)

ID	Type*	Action	Status	Entity	Source Plan/ID
24 KR	G	Fully implement and enforce the Forest Practices Rules (FPRs) on private timberlands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Currently in place	WDNR	LCFRB 2010a/KAL 1
25 KR	GHfO	Conduct floodplain restoration where feasible along the lower mainstem that has experienced channel confinement.Build partnerships with the Port of Kalama and other landowners and provide financial incentives	New	NRCS, C/WCD, NGOs, WDFW, LCFRB, USACE, Port of Kalama	LCFRB 2010a/ Kal 5
26 KR	W	Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansionof existing program	Cowlitz County,C/W CD	LCFRB 2010a/ Kal 15
27/ 32 KR	YWP	Address potential low-flow and thermal passage problems on the bar at the mouth of the Kalama	New	Port of Kalama,LCFEG	Wade 2000b, Powers and Tyler 2009
28 KR	RP	Assess and look for solutions to graveland debris buildup near the mouths of tributaries in the upper river	New	CowlitzCounty	Wade 2000b
29 KR	Hfw	Look for opportunities to increase and enhance off-channel and rearing habitatwithin the lower Kalama River	New	Cowlitz County/Cityof Kalama	Wade 2000b
30 KR	Hf	Ledgett Groundwater Channel, Left bank at RM 2.5. Create 2.56 acres of year-round rearing habitat witha potential for some spawning habitat.	New	TBD	Powers andTyler 2009
31 KR	Hir	Pipeline Removal and LWD, Left bank at RM 2.2	New	TBD	Powers andTyler 2009
33 KR	Hi	Lower Kalama Reach 1A Tidal Design: Install large wood structures to increasesalmonid rearing and holding cover at the mouth of the Kalama River.	Completed	LCFEG	PRISM
34 KR	Hf	Port Tidal and Backwater Channels, Leftbank at RM 0.1	New	Port of Kalama	Powers andTyler 2009

ID	Type*	Action	Status	Entity	Source Plan/ID
35 KR	Hfri	Lower Kalama Habitat Enhancement. Install approximately 12 wood structures to improve and expand pool and rifflehabitat; restore 5 acres of riparian habitat; enhance 500 feet of existing side channel with woody debris	Other	LCFEG	PRISM
36 KR	Hfi	Spencer Creek Riparian and LWD at RM 0.5. Restore riparian, spawning, and rearing habitat. The mouth of Spencer Creek is at Kalama RM 1.8	New	TBD	Powers andTyler 2009
37 KR	P	Fish Passage Culvert, Spencer Creek at RM 1.8	New	TBD	Powers andTyler 2009
38 KR	RHi	Pursue opportunities to reduce the effects of existing hardened shoreline armoring or replace or modify existing armoring with softer alternatives (e.g., large woody debris)	New	TBD	T. Rymer,NMFS, personal comm.
The following projects are identified in the unincorporated UGA of the City of Kalama					
39 KR	Hf	Port of Kalama Groundwater Channel, Right bank at RM 2.2. Create off- channel rearing habitat.	New	Port of Kalama	Powers andTyler 2009
40 KR	Hfi	GW Channel System (private), Excavate existing side channel to groundwater source and connect to mainstem, Right bank at RM 2.1	New	TBD	Powers andTyler 2009
41 KR	Hif	Riprap Removal/Floodplain Reconnection, Right bank at RM 2.4	New	TBD	Powers andTyler 2009
42 KR	Hf	Evaluate potential to enhance existingactive side channel, Right bank at RM 1.8	New	TBD	Powers andTyler 2009
43 KR	HfwY	Improve hydrologic and habitat connectivity from the Columbia River towetlands just east of Interstate-5.	New	TBD	T. Rymer,NMFS, personal comm.
44 KR	M	WRIA 27/28 Nutrient Enhancement. Dispersal of surplus hatchery salmon carcasses in high priority mainstem andtributary habitat. (Also in Lewis River AU)	Completed	LCFEG	PRISM
45 KR	Hfir	Kalama Stream Restoration Project – Gaddis; add wood structures and enhance off-channel habitat in Kalama River.	Completed	Cowlitz Conservation District	PRISM
46 KR	H	Kalama 1A Tidal Restoration	Completed	Cowlitz Conservation District	PRISM
47 KR	Hf	Gobar Pond Restoration Project. Focused on floodplain reconnection in 15-acre project and removal of 2.6-acre hatchery pond, aiming for Stage 0 condition. Tributary to Kalama River	Ongoing	Cowlitz Indian Tribe	PRISM
48 KR	Hi	Lower Kalama Restoration Phase 1. Project will install large wood structures in the tidal zone of the Kalama River to enhance pools, providing cold water refuge and enhancing overall floodplain roughness	Board alternate since 12/5/2014	LCFEG	PRISM

*TYPE = project type: H=habitat (f=floodplain/off-channel, w=wetland, i-instream, r=riparian), M=management, W=waterquality, Y=hydrology, P= fish passage, A=acquisition/protection, R=research/investigation, G=regulatory, O=outreach

5.4 Cowlitz River Assessment Unit

The Water Resource Inventory Area (WRIA) 26 Water Supply and Stream Flow Review Findings were published in 2013 and adopted in 2014 (LCFRB 2014). This document describes findings applicable to the Cowlitz River Basin regarding:

- The establishment of water reservations for cities, water districts, communities, rural domestic wells and other beneficial uses
- The closure of watersheds to further water appropriations beyond recommended reservations
- The setting of instream flows to further the protection of fish, aquatic resources, and other beneficial instream uses

Based on the review, the WRIA 25/26 Planning Unit recommends significant changes to the existing 2006 plan's water supply and stream flow provisions.

Prioritized restoration measures for the Lower Cowlitz basin are identified below as excerpted from the Lower Columbia Salmon Recovery and Fish and Wildlife SubbasinPlan (LCFRB 2010a):

1. Protect stream corridor structure and function in high priority reaches at risk of degradation.
2. Protect hillslope processes in functional subbasins contributing to Tier 1 reaches.
3. Restore degraded hillslope processes in the Lower Cowlitz subbasin.
4. Create/Restore off-channel and side-channel habitat in the mainstem Cowlitz andlower reaches of major tributaries.
5. Restore floodplain function and channel migration processes.
6. Restore access to habitat blocked by artificial barriers (priority locations at Mill Creek, Leckler Creek, Salmon Creek, Foster Creek, Skook Creek, and Blue Creek).
7. Provide for adequate instream flows during critical periods in tributaries.
8. Restore degraded hillslope processes on forest, agricultural and developed lands.
9. Restore riparian conditions throughout the basin (Priority locations in Tier 1 reaches).
10. Restore degraded water quality with an emphasis on temperature.
11. Restore channel structure and stability.

The same set of general priorities apply to the Coweeman and Toutle Rivers, except that in the Coweeman River, restoring channel structure and stability is a higher priority than in the lower Coweeman. In the Toutle River, an additional high priority action is to address fish passage and sediment issues at the SRS on the NF Toutle (LCFRB 2010a).

A summary of restoration opportunities throughout the assessment unit is presented in Table 3 below.

Table 3. Restoration Opportunities in the Cowlitz River Assessment Unit (Assessment Unit CR).

ID	Type*	Action	Status	Entity	Source Plan/ID
45 CR	YG	Manage regulated streamflows to provide for criticalcomponents of the naturalflow regime	Expansion of existing program or activity	Tacoma Power, Lewis County PUD, FERC, WDFW	LCFRB 2010a/ L Cow 1, Wade 2000a
46 CR	R	Monitor and notify FERC of significant license violations, enforce terms and conditions of Section 7 consultations on FERC relicensing agreements, and encourage implementation of Section 7 conservation recommendations	Expansion of existing program or activity	NMFS, USFWS	LCFRB 2010a/ L Cow 4
47 CR	HfRO	Conduct floodplain restoration where feasible along the mainstem and in major tributaries that have experienced channel confinement, and especially in areas affected by dredging and floodplain filling following the 1980 Mt. St. Helens eruption. Survey landowners, build partnerships, and provide financial incentives	Board Not Funded since 6/27/2019	NRCS, Cowlitz CD, NGOs, WDFW, LCFRB,USACE, LCFEG	LCFRB 2010a/ L Cow 6; Toutle 2; Coweeman 6, Wade 2000a
48 CR	G	Expand local government Comprehensive Planning to ensure consistent protectionsare in place to initiate review of development and real estate transactions that may affect natural resources	Expansion of existing program or activity	Cowlitz County, Kelso, Longview, Castle Rock	LCFRB 2010a/ L Cow 15
49 CR	W	Assess, upgrade, and replaceon-site sewage systems that may be contributing to water quality impairment.	Expansion of existing program or activity	Cowlitz County, Cowlitz CD	LCFRB 2010a/L Cow 19; Toutle 18
50 CR	PW	Address fish passage and sediment issues at the Sediment Retention Structureon the NF Toutle.	Record of Decision produced in 2018	WDFW, USACE, LCFEG	USACE 2018
51 CR	YP	Assess and, if possible, alter the Silver Lake Dam to increase flows in Outlet Creek to ensure fish passage into the Silver Lake watershed.	New	TBD	Wade 2000a
52 CR	G	Continue to manage federalforest lands according to theNorthwest Forest Plan.	Activity is inplace	USFS	LCFRB 2010a/ Toutle 4
53 CR	W	Address temperature impairments through development of water qualityclean-up plans (TMDLs)	Expansion of existing program or activity	Ecology	LCFRB 2010a/ Coweeman 15

ID	Type*	Action	Status	Entity	Source Plan/ID
54 CR	W	Assess, repair, and where possible, decommission roads that are contributing chronic sediment to stream systems or that may fail and lead to landslides, especially within areas with road densities above 3.0 miles/square mile.	Expansion of existing program or activity	USFS, CowlitzCounty	Wade 2000a
55 CR	RHi	Look for opportunities, both short- and long-term, to increase Large Woody Debris(LWD) supplies within streamsystems.	Projects underway on Toutle and Coweeman	Cowlitz County, LCFEG	Wade 2000a
56 CR	Hr	Replant degraded riparian areas with native conifers. Tobegin with, focus riparian restoration efforts along the more productive tributaries including Baird, Mulholland, and Goble creeks.	Expansion of existing program or activity	Cowlitz Countyand partners	Wade 2000a
57 CR	PR	Address fish passage barriersin the Toutle River and tributaries to the lower Cowlitz River and prioritize forrepair and replacement.	Expansion of existing program or activity	USFS, Cowlitz County, and partners	Wade 2000a
58 CR	Hrwi	Cowlitz RM 0.5 right bank remove some dredged materials and create riparianand wetland bench	Conceptualplan	TBD	Tetra Tech2007
59 CR	Hrwif	Cowlitz RM 7.3 right bankremove some dredged materials and create riparian/floodplain bench;construct setback levee ifnecessary.	Conceptualplan	TBD	Tetra Tech2007
60 CR	Hrif	Cowlitz RM 8.5 right bank setback levee and plant riparian/floodplain vegetationon bench	Conceptualplan	TBD	Tetra Tech2007
61 CR	Hrif	Cowlitz RM 9.0 left bank dredged materials removal tocreate riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
62 CR	Hr	Place LWD and vegetate with willows (mouth of Ostrander Creek)	Conceptualplan	TBD	Tetra Tech2007
63 CR	Hr	Remove noxious weeds andrestore riparian zone along length of Ostrander Creek.	Conceptualplan	TBD	Tetra Tech2007
64 CR	Hf	Cowlitz RM 9.7 right bank barand island enhancement.	Conceptualplan	TBD	Tetra Tech2007
65 CR	P	Culvert replacement on Leckler Creek at Hazel DellRoad.	Conceptualplan	TBD	Tetra Tech2007
66 CR	Hrfi	Cowlitz RM 9.8 left bank riparian restoration: Removerevetment and some dredgedmaterial and create riparian and floodplain bench.	Conceptualplan	TBD	Tetra Tech2007

ID	Type*	Action	Status	Entity	Source Plan/ID
67 CR	Hrfi	Cowlitz RM 10.5 left bank riparian restoration: Removesome dredged materials andcreate riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
68 CR	Hrfi	Cowlitz RM 11.2 left bank barand island enhancement: Place wood to promote side channel scour and provide cover.	Conceptualplan	TBD	Tetra Tech2007
69 CR	Hrfi	Cowlitz RM 12.5 left bank side channel restoration and enhancement: Enhance low bar with remnant side channel by placing wood andminor excavation.	Conceptualplan	TBD	Tetra Tech2007
70 CR	Hrfi	Cowlitz RM 12.5 right bank riparian restoration: Removeriprap and bioengineer as feasible, remove dredged materials to create riparian/floodplain bench	Conceptualplan	TBD	Tetra Tech2007
71 CR	Hrfi	Cowlitz RM 13.5 left bank riparian restoration: Removesome dredged materials andbioengineer recent riprap placement to create riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
72 CR	Hfi	Cowlitz RM 14.0 left bank side channel restoration and enhancement: Excavate remnant side channel, placeLWD.	Conceptualplan	TBD	Tetra Tech2007
73 CR	Hrfi	Cowlitz RM 14.5 right bank side channel restoration and enhancement: Excavate remnant side channel, placeLWD, plant riparian vegetation.	Conceptualplan	TBD	Tetra Tech2007
113 CR	Hi	Cowlitz RM 15.0 left bank bar enhancement: Enhance low bar and Sandy Creek and backwater by placing wood and minor excavation.	New	TBD	Tetra Tech2007
74 CR	Hrfi	Cowlitz RM 16.0 right bank side channel restoration and enhancement: Create definedboat launch area and restore historical side channel and improve floodplain with plantings and wood.	Conceptualplan	TBD	Tetra Tech2007
75 CR	P	Delameter Creek Culvert replacement at DelameterRoad.	Conceptualplan	TBD	Tetra Tech2007
76 CR	HrA	Fence off Delameter Creekfrom livestock and restore riparian at RM 4.	Conceptualplan	TBD	Tetra Tech2007
77 CR	P	Monahan Creek Culvert replacement at DelameterRoad.	Conceptualplan	TBD	Tetra Tech2007

ID	Type*	Action	Status	Entity	Source Plan/ID
78 CR	Hr	Monahan Creek Riparian restoration: Remove Japanese knotweed along lower 4 miles and revegetate.	Conceptualplan	TBD	Tetra Tech2007
79 CR	Hrfi	Cowlitz RM 18.5 left bank dredged materials removal tocreate riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
80 CR	Hrfi	Cowlitz RM 18.8 right bank bar and island enhancement: segregate boat launching from riparian zone and bars; cut chute overflow channels and restore floodplain/riparianhabitat.	Conceptualplan	TBD	Tetra Tech2007
81 CR	Hrfi	Cowlitz RM 19.8 left bank dredged materials removal tocreate riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
82 CR	Hrfi	Toutle River RM 0.2 rightbank dredged materials removal to create riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
83 CR	Hrfi	Toutle River RM 3.2 right bank Off-channel restoration and enhancement: Reconnect off-channel pondsbehind dredged material, enhance with LWD and riparian restoration.	Conceptualplan	TBD	Tetra Tech2007
84 CR	Hrfi	Cowlitz RM 20.2 left bank dredged materials removal to create riparian/floodplainbench.	Conceptualplan	TBD	Tetra Tech2007
85 CR	Hrfi	Cowlitz RM 22.2 left bank dredged materials removal tocreate riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007
86 CR	Hf	Cowlitz RM 23.0 left bank off-channel and floodplain restoration.	Conceptualplan	TBD	Tetra Tech2007
87 CR	Hr	Cowlitz RM 23.2 right bank bar and island enhancement:Place LWD alongside channel and revegetate where appropriate on Hog Island.	Conceptualplan	TBD	Tetra Tech2007
88 CR	P	Rock Creek Culvert replacement at West SideHighway.	Conceptualplan	TBD	Tetra Tech2007
89 CR	PHr	Remove water control structure and reconnect Hill Creek; riparian revegetation along lower 1000-2000 feet ofcreek.	Conceptualplan	TBD	Tetra Tech2007
90 CR	Hrf	Cowlitz RM 24.5 left bankriparian restoration: Slopeback banks and create riparian/floodplain bench.	Conceptualplan	TBD	Tetra Tech2007

ID	Type*	Action	Status	Entity	Source Plan/ID
91 CR	Hrfi	Lower Olequa Creek enhancement: Restore sidechannel and riparian zone, remove invasive species, place LWD.	Conceptualplan	TBD	Tetra Tech2007
92 CR	A	Cowlitz RM 25.0 Acquire easements in active channelmigration area.	Conceptualplan	TBD	Tetra Tech2007
93 CR	Hrfi	Cowlitz RM 25.0 side channel restoration and enhancement: Remove car bodies, place LWD and riparian restoration.	Conceptualplan	TBD	Tetra Tech2007
94 CR	Hri	Cowlitz RM 26.0 left bank riparian restoration: Slope back banks to create riparianbench; remove riprap; may need to move road in one area.	Conceptualplan	TBD	Tetra Tech2007
95 CR	Hr	Cowlitz River habitat enhancements upstream ofCowlitz County (RM 27-43)	Conceptualplan	TBD	Tetra Tech2007
96 CR	Hf	Connect gravel ponds and other off-channel areas nearRM 7 on the Coweeman River to provide rearing andoverwintering habitat for juvenile salmonids.	New	TBD	Wade 2000a
97 CR	Hi	Coweeman Bedrock Channel Restoration. Install large diameter logs in various configurations on the Coweeman River in order to restore 2,700 feet of low gradient stream channel scoured to bedrock by historical log drives and other anthropological disturbances.	Other	LCFEG	PRISM
98 CR	Hr	Coweeman riparian vegetation enhancement andknotweed control.	Underway	C/WCD	PRISM
99 CR	Hri	Explore opportunities to enhance shoreline habitat where bank armoring exists. This could be accomplished through bioengineering or byincorporation large wood intobank protection.	New	TBD	TWC
100 CR	P	Turner Creek Fish Passage_SiteID 106c0152 – Trib to Coweeman River, and will open 2.5-miles of pristine habitat upstream	Underway	Cowlitz County	PRISM
101 CR	P	Baxter Creek Fish Passage Site ID 106c0048 – Trib to Arkansas Creek, then Cowlitz River	Underway	Cowlitz County	PRISM

ID	Type*	Action	Status	Entity	Source Plan/ID
102 CR	Hfir	SF Toutle Lower Brownell Reach Restoration. Instream and floodplain woody materials plus island forming structures.	Application Returned Since 4/2/2021	LCFEG	PRISM
103 CR	Hr	SF Toutle at Johnson Creek Riparian Restoration. Installing 40+ floodplain roughness structures loaded with organic matter to develop floodplain forest	Underway	LCFEG	PRISM
104 CR	Hfi	Camp Coweeman Restoration. Enhancing two side channels in Phase 3, sister project of 20-1080.	Underway	LCFEG	PRISM
105 CR	Hir, P	Baird Creek Liberation – Splash Dam Removal. Establish fish passage upstream, and sediment and LWD passage downstream of the historic Baird Creek splash dam	Underway	LCFEG	PRISM
106 CR	Hfr	Coweeman, Nineteen, and Skipper Restoration. Floodplain activation and beaver-focused habitat enhancement.	Underway	LCFEG	PRISM
107 CR	Hfir, P	Coweeman River and Baird Creek Restoration. Restored natural processes to 1.28-miles previously degraded by splash damming.	Underway	LCFEG	PRISM
108 CR	Hfir	SF Toutle – Little Cow Restoration. Habitat enhancement to make available for fish at critical life stages with structures and riparian habitat	Underway	LCFEG	PRISM
109 CR	Hfir	SF Toutle Bear-Harrington Restoration. Aims to extend range of usable habitat for Chinook in the SF Toutle	Underway	LCFEG	PRISM
110 CR	Hr	Toutle Confluence Riparian – Install 50k native trees and shrubs over 50 acres of riparian upland habitat along confluence of NF and SF Toutle Rivers	Underway	LCFEG	PRISM
111 CR	Hr	SF Toutle Riparian Restoration. 25k riparian plantings into Reach 2 of the Toutle River to address channel stability.	Completed 2019	LCFEG	PRISM
112 CR	Hfir	Toutle River Confluence Restoration – Phase 1. Preserve off-channel habitat and beaver ponds, side channels, stream banks, and a vegetated island.	Completed 2017	LCFEG	PRISM

ID	Type*	Action	Status	Entity	Source Plan/ID
113 CR	Hfi	SFK Toutle @ Johnson Creek Restoration. Immediately upstream of four previously completed project phases.	Completed 2018	LCFEG	PRISM
114 CR	P	Ostrander Creek Fish Barrier Removal. Remove the perched railroad culvert and install a roughed channel to restore access to 9.8 miles of spawning and habitat for several species.	Ongoing	Cowlitz Indian Tribe	PRISM

*TYPE = project type: H=habitat (f=floodplain/off-channel, w=wetland, i-instream, r=riparian), M=management, W=water quality, Y=hydrology, P= fish passage, A=acquisition/protection, R=research/investigation, G=regulatory, O=outreach

5.5 Mill, Abernathy, Germany Creek Assessment Unit

Cowlitz Indian Tribe, Cowlitz Conservation District, and LCFEG have all had several projects in the Mill, -Abernathy, and Germany Creek Assessment Unit since the 2016 Restoration Plan.

Prioritized restoration measures for the Lower Cowlitz basin are identified below as excerpted from the Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan (LCFRB 2010a):

1. Protect stream corridor structure and function.
2. Protect hillslope processes.
3. Restore degraded hillslope processes on forest, agricultural, and developed lands.
4. Restore floodplain function and channel migration processes along the lowermainstems and major tributaries.
5. Restore riparian conditions throughout the basin.
6. Restore degraded water quality with an emphasis on temperature.
7. Create/restore off-channel and side-channel habitat.
8. Restore channel structure and stability.
9. Provide for adequate instream flows during critical periods.
10. Restore access to habitat blocked by artificial barriers (priority locations inTributaries to Mill Creek and Coal Creek).

A summary of restoration opportunities throughout the assessment unit is presented in Table 4 below.

Table 4. Restoration Opportunities in Mill, Abernathy, and Germany Creek Assessment Unit respectively).

ID	Type*	Action	Status	Entity	Source Plan/ID
100 All units	O	Seize opportunities to conduct voluntary floodplain restoration on lands being phased out of agricultural production. Survey landowners, build partnerships, and provide financial incentives.	New	NRCS/WCD, NGOs, WDFW, LCFRB, USACE,LCFEG	CFRB 2010a/M-A-G 4
101 All units	W	Assess, upgrade, and replaceon-site sewage systems that may be contributing to water quality impairment	Expansionof existing program or activity	Cowlitz County, Cowlitz CD	LCFRB 2010a/M-A-G 15
102 GC	P	Address fish passage barriers, particularly in Germany and CoalCreeks where 30-34% of the habitat is blocked	Expansionof existing program or activity	LCFRB, Cowlitz County	Wade 2002
103 AC	Hf	Enhance off channel habitat in Abernathy Creek near Sarah Creek, Two Bridges and Abernathy hatchery sites.	Completed	Cowlitz Tribe	PRISM
104 GC	Hf	Enhance off channel habitat inGermany Creek.	New	LCFRB, Cowlitz County	HDR and Cramer Fish Sciences 2009
105 ACGC	Hri	Construct engineered log jamsand enhance riparian areas to produce future large woody debris in Abernathy and Germany Creeks.	Project underwayon Abernathy Creek	LCFRB, Cowlitz County, CowlitzTribe	HDR and Cramer Fish Sciences 2009
106 All units	RHfi	Identify areas where channel modifications (LWD or large rocks) could help slow flows, capture scarce spawning gravels, reconnect floodplain habitat, and enhance instreamchannel diversity.	New	LCFRB, Cowlitz County	Wade 2002
107 All units	Hr	Target riparian restoration effortsalong the most productive and/ordegraded streams including the agricultural areas (generally lower and middle reaches) of Germany and Abernathy Creeks, and the residential areas of MillCreek.	Project ongoingon Abernathy Creek as of 2019	LCFRB, Cowlitz County, Cowlitz CD, Cowlitz Tribe	Wade 2002, HDR and Cramer Fish Sciences 2009
108 GC	M	Germany Creek Nutrient Enhancement. Placement of salmon carcass analogs and monitoring of salmon population response.	Underway	LCFEG	PRISM
109 GC	Hfir	IMW Godinho Restoration. LWD structures placed in Germany Creek.	Underway	Cowlitz Conservation District	PRISM
110 GC	Hfir	Upper Germany Creek Restoration Project – LWD	Application returned since 4/2/21	Cowlitz Conservation District	PRISM

ID	Type*	Action	Status	Entity	Source Plan/ID
111 AC	P	Erick Creek Culvert Replacement – Uses work from LCFRB in Abernathy Creek area.	Board Alternate since 9/16/2020	Cowlitz County	PRISM
112 GC	Hir	Germany Creek Restoration Smith Site. Instream wood with excavation along Germany Creek and two tributaries	Completed 2020	Cowlitz Conservation District	PRISM
113 GC	Hir	Germany Creek Restoration Andrews Site. In-channel wood structures emphasizing scouring pool habitat plus riparian plantings	Completed 2020	Cowlitz Conservation District	PRISM
114 GC	Hir	Germany Creek Stream Restoration Kosiba. Adds LWD and restore riparian function.	Underway, planned completion 2022	Cowlitz Conservation District	PRISM
115 AC	Hfir	Abernathy Creek Davis Site. Adds LWD to create channel margin habitat and side and off channel habitat.	Completed 2019	Cowlitz Conservation District	PRISM
116 AC	Hir	IMW – Abernathy Headwaters Implementation. Install 169 whole trees and wood accumulation structures in 1.3 miles of streams.	Completed 2020	Cowlitz Indian Tribe	PRISM
117 AC	Hfir	Abernathy Creek Cameron Site. Improving spawning and rearing habitat for SW Washington winter steelhead, LCR coho, Chinook, and chum, plus riparian plantings.	Completed 2018	LCFEG	PRISM
118 AC	Hfi	Abernathy Creek Midway Project. Wood placement, removing a DNR derelict bridge, and pre-excavate side channels to increase rearing habitat for steelhead and LCR coho	Completed 2019	Cowlitz Indian Tribe	PRISM
119 AC	Hir	Abernathy Creek Mainline Restoration IMW. Proposed 18 channel-spanning log jams to accumulate gravel, force scour pools, add cover, and reconnect flooplains.	Ongoing	Cowlitz Indian Tribe	PRISM
120 AC	Hfir	IMW- Erick Creek In-Stream Habitat Restoration. Placement of wood and plantings along 4,200 linear feet of Erick Creek.	Completed 2020	Cowlitz Indian Tribe	PRISM
121 AC	P, Hir	IMW Sarah Cr. Habitat & Passage Enhancement. Enhance access to 1.72 miles of in-stream habtat by placing large wood and boulders to build grade up to low bedrock falls.	Completed 2020	Cowlitz Indian Tribe	PRISM

*TYPE = project type: H=habitat (f=floodplain/off-channel, w=wetland, i-instream, r=riparian), M=management, W=water quality, Y=hydrology, P= fish passage, A=acquisition/protection, R=research/investigation, G=regulatory, O=outreach

5.6 South Fork Chehalis River Assessment Unit

The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA22 and 23 (Chehalis Basin Partnership Habitat Work Group 2008) identified several restoration recommendations for the Chehalis watershed, including several recommendations applicable to the upper South Fork Chehalis River. These recommendations include:

- Riparian Restoration
    - Conifer Underplanting
    - Control of Invasive Species
    - Control Excess Sedimentation Implement alternative methods of bank stabilization (bioengineering) inlocations with excessive erosion (sediment input)
    - Abandon roads on steep geologically sensitive areas
    - Upgrade existing roads to comply with Forest Practices Act rules andregulations
    - Revegetate streaming and riverbanks for added protection from erosion
- Correct Fish Passage Barriers
- Remove Hard Armoring or Implement Bioengineering Techniques
- Enhance or Restore Potential Off-Channel, Floodplain, and Wetland Habitat

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Appendix A – Figures 00-07