

4.4.2. Public Works

The City of Kelso implements a Stormwater Management Plan to comply with its Phase II NPDES permit. Activities include education and outreach, illicit discharge detection and elimination, and stormwater management and monitoring programs. The City has also investigated the potential for application of Low Impact Development (LID) techniques within the City.

4.5. City of Woodland

A study completed in 2000 evaluated the City's flood hazard and drainage issues and identified recommended solutions (RW Beck 2000). Study goals included the following:

- Prevent property damage from flooding;
- Maintain good water quality;
- Preserve sensitive resources and maintain varied use; and
- Develop a continuous and comprehensive program for managing surface water.

Recommendations in the plan included both non-structural and structural recommendations. Non-structural recommendations included strengthening regulations, developing public education and outreach measures, and conducting studies and monitoring. Capital improvement projects were generally focused on improving structural stormwater drainage systems.

5. RESTORATION PARTNERS

In addition to the County and cities, state, regional, and local agencies and organizations are actively involved in shoreline restoration, conservation, and protection in and around Cowlitz County. These partners and their local roles in shoreline protection and/or restoration are identified below and generally organized in order by the scope of the organization, from the larger state and watershed scale to the local scale.

5.1. U.S. Army Corps of Engineers

The Corps of Engineers owns and operates the federal dams on the Columbia River and it constructed and maintains the Toutle River Sediment Retention Structure (SRS). As a result of the Federal Columbia River Power System (FCRPS) Biological Opinion, the Corps is obligated to mitigate for its impacts to listed fish species. The Corps is proposing to raise the SRS to limit downstream sedimentation and to conduct maintenance dredging as needed to limit flood risks for cities along the Cowlitz River. The Corps will need to mitigate for impacts to upstream habitats along the Toutle River

and for dredging effects. Specific mitigation measures have not yet been identified. The Corps has also conducted mitigation through habitat restoration projects along the Columbia River to compensate for the effects of dredging to deepen the navigation channel there.

In addition to planning for and funding restoration in the lower Columbia River and its tributaries, the Corps funds ongoing research, monitoring and evaluation studies in the Lower Columbia River as part of its mitigation responsibilities.

The Corps is also engaged in a General Investigation study to recommend approaches to restore ecosystem functions in the lower Columbia River and estuary, including "wetland/riparian habitat restoration, stream and fisheries improvement, water quality, and water-related infrastructure improvements" (Corps 2012). Congress authorized the General Investigation in 2000, and work was first initiated in 2003, and later reinitiated in 2012. Projects being evaluated include floodplain reconnections, channel habitat restoration, and riparian restoration (Corps 2013). Initial projects identified include six areas in the Columbia River Estuary, five areas in tributaries in Washington State, and three areas in tributaries in Oregon (Corps 2013). Projects on the Columbia River include an area bordering Cowlitz and Wahkiakum Counties, and an area between the Cities of Kalama and Woodland. Project areas identified in Columbia River tributaries in Cowlitz County include the entire Cowlitz River up to Mayfield Lake, as well as the lower Toutle River and lower Coweeman River, and a portion of the Lewis River just upstream from the City of Woodland (Corps 2013). An alternatives analysis will be completed to evaluate and select the preferred alternative.

5.2. Northwest Power and Conservation Council Fish & Wildlife Program

The Northwest Power and Conservation Council (NPCC) is a multi-state planning agency responsible for balancing the ecological impacts of energy production in the northwest. Current hydropower programs and operations are engaged in activities to minimize the ongoing impacts of flow regulation on the ecological processes of the Columbia River and its tributaries. These actions are generally the result of obligations under the Endangered Species Act (Section 7 consultations, Section 10 Habitat Conservation Plans (HCPs)) or Federal Energy Regulatory Commission (FERC) relicensing, and therefore, these actions are technically mitigation for ongoing impacts rather than voluntary restoration.

The Council guides Bonneville Power Administration's (BPA's) funding of projects to implement the fish and wildlife program. Projects that are conducted using these funds,

no matter how indirectly related to hydropower impacts, are also a part of mitigation for ongoing dam impacts. Nevertheless, it is expected that despite the funding source, such projects will improve ecosystem functions above the existing functional baseline, and as such, these projects would be considered as restoration within the framework of the County's SMP.

In 2009, the NPCC updated its Columbia River Basin Fish and Wildlife Program. The program identifies impacts to fish and wildlife resulting from hydropower operations in the Columbia Basin, and it identifies strategies to study, monitor, and mitigate those impacts. The project funding agenda identified for the program includes the following:

1. Anadromous Fish, Resident Fish, and Wildlife
 - Bonneville will fulfill its commitment to "meet all of its fish and wildlife obligations." Funding levels should take into account the level of impact caused by the federally operated hydropower system and focus efforts in areas most affected by operations.
2. Land and Water Acquisition Funds
 - Water transaction program: Bonneville established a water transactions program in response to the 2000 Columbia River Basin Fish and Wildlife Program and the 2000 FCRPS Biological Opinion. Bonneville shall fund the continuation of the water transaction program to pursue water right acquisitions in subbasins where water quantity has been identified in a subbasin plan as a primary limiting factor. The water transaction program will continue to use both temporary and permanent transactions for instream flow restoration.
 - Land acquisition fund: Bonneville shall fund a basinwide land acquisition program, which will include, but not be limited to, riparian easements and fee-simple acquisitions of land that protects watershed functions.

5.3. Lower Columbia Fish Recovery Board

The Lower Columbia Fish Recovery Board (LCFRB) is the Lead Entity for salmon restoration in watersheds throughout most of Cowlitz County and watersheds to the east, extending to the Little White Salmon River, and to the west to the mouth of the Columbia River.

In 2010, the LCFRB, in coordination with regional partners, produced the Washington Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan. The Plan provides an integrated approach to addressing salmon recovery, watershed planning,

and Northwest Power and Planning Fish and Wildlife Subbasin Plans. The Plan used a two-pronged approach to evaluate existing conditions and restoration potential. First, an Integrated Watershed Assessment (IWA) approach was applied at the sub-basin scale to assess the need for restoration or protection and the relative priority of the action in the watershed. In addition, the Plan identified habitat factors affecting salmonid production, and developed stream priority rankings based on prioritized salmon populations and habitat factors using an Ecosystem Diagnosis and Treatment (EDT) approach. The EDT approach assesses habitat factors to rank priority areas for achieving population targets for salmon recovery. Population targets were based on scientific, biological, social, cultural, political and economic factors. Based on the results of the EDT analysis, stream reaches were identified by their treatment priority, where Tier 1 represents the highest priority, and Tier 4 represents the lowest priority for salmon recovery. Recovery plan reach priorities are mapped in Appendix A. Reach locations differ between the Shoreline reaches and the Salmon Recovery reaches because the Shoreline Analysis Report identified reaches based on land use considerations as well as stream characteristics, whereas Salmon Recovery stream reach break locations were located at every tributary confluence. Detailed information on the results of the IWA and EDT analyses can be found in Appendix E of the Lower Columbia Recovery Plan (LCPRB 2010).

5.4. PacifiCorp

As a part of its Federal Energy Regulatory Commission relicensing process, PacifiCorp engages in fish passage projects, fish population supplementation programs, habitat enhancement, monitoring, and funding of restoration projects in the Lewis River Basin.

In 2012, PacifiCorp completed installation of new facilities to transfer anadromous fish upstream from the base of Merwin Dam to above Swift #2, opening 117 miles of spawning habitat. The new facilities will also transfer juvenile salmonids downstream past the dams.

In 2008, PacifiCorp developed a Shoreline Management Plan in 2008 for the three major reservoirs in the upper Lewis River. The PacifiCorp Shoreline Management Plan applies to lands extending from the Ordinary High Water Mark (OHWM) to the elevation 10 feet above the OHWM. PacifiCorp owns many of the lands within the Shoreline Management Plan boundary area, and it holds flowage easements on the other lands. The PacifiCorp Shoreline Management Plan was not developed to meet the regulatory requirements of the Shoreline Management Act, but it has many parallels that are consistent with the Shoreline Management Act standards.

5.5. Cowlitz Public Utility District

The Cowlitz Public Utility District (PUD) owns the Swift #2 dam on the Lewis River. As part of its 2008 relicensing agreement, Cowlitz PUD agreed to conduct the following activities, either individually or in coordination with PacifiCorp, which manages the dam operations:

- reintroduce anadromous salmon above Swift Reservoir (complete-see description above)
- fund three salmon hatcheries (ongoing)
- fund aquatic habitat improvement projects (ongoing)
- ensure minimum flows to the North Fork Lewis River between Swift No. 1 and Swift No. 2 dams (ongoing)
- monitor water quality (ongoing)
- manage 525 acres of wildlife habitat (ongoing)

5.6. Lower Columbia Fish Enhancement Group

The Lower Columbia Fish Enhancement Group (LCFHG) is active throughout Cowlitz County as part of its mission to create and implement restoration and salmon recovery strategies through community partnerships. The organization promotes private stewardship and volunteerism through education and outreach, and concentrates funds on salmon recovery, assessment, and habitat restoration, often in partnership with other entities.

General elements of LCFEG's strategic plan are development of relationships with key shareholders; building financial and volunteer support through education and outreach programs; assisting the Lower Columbia Salmon Recovery Board, WDFW, and NOAA Fisheries in identifying, prioritizing, and implementing salmon restoration projects; increase program funding and hire and train staff; and expand the board to include a range of active members from a wide variety of backgrounds.

LCFEG sponsored efforts to identify limiting factors for salmon populations and restoration opportunities in the Lower Cowlitz River (Power and Tyler 2009) and the Kalama River basin (Tetra Tech 2007). The resulting documents provided lists of prioritized restoration opportunities (see Tables 5-4 and 5-5).

LCFEG is the primary sponsor of nutrient enhancement efforts that include the Kalama, Cowlitz, and Lewis watershed. This ongoing collaborative effort utilizes several funding sources (Pacific Salmon Commission, BPA, and/or PacifiCorp) and a wide range of volunteers groups to implement the collection and disperse of salmon carcasses. The

LCFEG recently completed an off-channel habitat enhancement projects on the Lower Kalama River and the North Fork Lewis River. Additional habitat enhancement projects are planned for the near future (see Tables 5-4 and 5-5).

5.7. Lower Columbia Estuary Partnership

The Lower Columbia Estuary Partnership (LCEP) administers a Habitat Restoration Program to protect and restore habitat functions and support salmon recovery in the lower Columbia River estuary, between Bonneville Dam and the mouth of the river. The organization's overall strategy is to take a widespread teaming approach to implement scientifically sound projects, as well as fund partners' projects. LCEP takes a regional approach to habitat restoration, participates in the efforts of other restoration entities, including watershed councils, land trusts, and non-profits.

LCEP produced the Management Plan for the Lower Columbia River; actions recommended in the plan are listed in Section 6.1.1 Key habitat work led by the organization includes creating fish habitat with large woody debris, restoring riparian vegetation, and removing fish barriers. LCEP also conducts ecosystem condition monitoring, tracking toxins and habitat, as well as monitoring the success of restoration projects. They've produced several map sets using monitoring data, and make the spatial information available to the public, along with reports and publications. Volunteers are utilized for restoration and monitoring work. Finally, LCEP conducts education programs in school classrooms and through field trips.

Current LCEP projects in shoreline area are reference site monitoring at the mouth of the Lewis River, Dredge Spoil Island habitat monitoring, and Martin Island habitat monitoring.

5.8. Intensively Monitored Watershed Program Partners

The Intensively Monitored Watershed (IMW) project is a joint effort of the Washington Departments of Fish and Wildlife, Ecology, NOAA Fisheries, the Environmental Protection Agency, 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. An updated plan for monitoring fish and habitat responses to restoration was proposed for Lower Columbia watersheds in 2012 (Zimmerman et al. 2012).

5.9. Columbia Land Trust

The Land Trust, a non-profit in place since 1990, works throughout the Columbia River Region. The organization works collaboratively with private landowners, local governments, and other non-profits to develop stewardship plans that restore degraded habitat and protect natural resources. Private landowners who work with the Trust are generally conservationists, ranchers, farmers, foresters, and orchardists. Land acquisition and forest planning are major parts of the Trust's effort; more local efforts include a backyard habitat certification program, outreach events, and volunteer work crew events.

Land Trust work within Cowlitz County shoreline jurisdiction includes a recent two-phase acquisition and restoration on Germany Creek. More than 185 acres floodplain, riparian, and upland habitat have been removed from the threat of development and placed in permanent protection. Additional onsite improvements, including log placement, off-channel habitat enhancement, and invasive weed removal, will help restore rearing, spawning, and migrating habitat for salmonids.

5.10. Cowlitz Indian Tribe

The Tribe focuses protection and restoration actions on culturally relevant species and landscapes. Key in their mission is to work to educate and inspire the community to promote their mission of conservation. The Tribe specifically recognizes elk, deer, mountain goat, salmon, eulachon, sturgeon and lamprey as important species to the Cowlitz people. Landscapes of significance that may occur within shoreline jurisdiction include estuaries; freshwater lakes and wetlands; the Cowlitz, Lewis, and Kalama Rivers and their tributaries; deciduous and coniferous forest; sub-alpine meadows; and mountains.

The Tribe is presently engaged in several restoration projects in Cowlitz County, including two active projects on Abernathy Creek and two active side channel restoration projects at Eagle Island on the North Fork Lewis River. An additional project is presently proposed on Abernathy Creek. Projects on Abernathy Creek consist of abandoned roadbed removal to restore floodplain and channel migration zone connectivity and restoration of two acres of riparian wetlands and a side channel to created wintering habitat and high-flow refugia for steelhead and coho. The proposed project on Abernathy Creek would install large wood for instream habitat enhancement. Projects are described further in Section 6.

5.11. Cowlitz Conservation District

The Conservation 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. A basin-wide effort to implement all three types of projects is presently in place in the Mill-Abernathy-Germany area. Secondly, 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. Currently funded projects by the District include the installation of woody debris in several reaches of Abernathy Creek to restore habitat and reduce flow and erosion.

5.12. 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 River Keeper
- Lower Columbia Basin Audubon Society
- Trout Unlimited
- Ducks Unlimited

6. POTENTIAL PROJECTS

The Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan (LCFRB 2010a) identified several actions applicable to shoreline areas throughout Cowlitz County.

Some of these actions apply to programs or regulations, while others relate to projects that could be implemented at many sites throughout the watershed (Table 6-1).

Table 6-1 Restoration opportunities applicable to all Assessment Units.

	Action	Status	Entity
Land Use Planning/Regulations	Expand standards in local government comprehensive plans to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program	County, Cities
	Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of agriculture and timber lands to developed uses through zoning regulations and tax incentives (consistent with urban growth boundaries)	Expansion of existing program	County, Cities
	Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program	County, Cities, Ecology
	Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR
	Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR
	Review and adjust operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	Expansion of existing program	County, Cities
Funding/ Technical Assistance	Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)
	Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program	NRCS, C/WCD, WDNR, WDFW, LCFEG, County, Cities
	Increase technical support and funding to small forest landowners faced with implementation of Forest and Fish requirements for fixing roads and barriers to ensure full and timely compliance with regulations	Expansion of existing program	WDNR
Protection/Restoration Projects	Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/WCD
	Implement the prescriptions of the WRIA Watershed Planning Units regarding instream flows	Activity is currently in place	Ecology, WDFW, WRIAs, County, Cities
	Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/WCD, LCFEG

	Action	Status	Entity
	Protect and restore native plant communities from the effects of invasive species	Expansion of existing program	Weed Control Boards (local and state); NRCS, CWCD, LCFEG
	Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats	Expansion of existing program	WDFW, WDNR, County, Cities, WSDOT, LCFEG

Potential and existing restoration projects and actions within each assessment unit are presented in the following sections and summarized in tables. Each project/action has an identification (ID) code; codes comprise a unique number (not intended to imply priority) and a locator tag that identifies the assessment unit within which the project or action is located. Project/action "type" codes are listed for each item. When an entry includes more than one type of project or action, all are listed within the type code.

Project/action types and codes are as follows:

- Habitat-related restoration action (Code H): The project or action is intended to improve habitat in jurisdictional shorelines.
 - Subcode f = floodplain/off-channel work such as side/off-channel creation or enhancement, meandering, adding spawning gravels, and oxbow reconnection
 - Subcode w = wetland creation, restoration, or enhancement
 - Subcode i = instream work such as LWD placement, dredging, and bank armor removal
 - Subcode r = riparian work, including planting, removing invasive vegetation, and gravel bar creation
- Water quality related actions (Code W): Improving water quality is a primary goal of these actions. They may include a habitat component (for example, when riparian restoration is intended to impact water temperatures) or may be aimed solely at water quality, such as completion of a TMDL or restriction of contaminant use.
- Management actions (Code M): This category describes actions that usually require a greater degree of decision-making and research to implement than most habitat actions. It includes management or manipulation of fish or

predator populations, nutrient enhancement, and fish population monitoring. This code also includes most habitat, hydrologic, and water quality monitoring, except where monitoring is implemented as part of a particular habitat restoration project.

- Hydrologic actions (Code Y): This category addresses hydrologic processes and functions that affect the shoreline, and specifically fish habitat. It includes actions that impact flow levels where they affect or impede fish passage or where they affect habitat.
- Fish passage (Code P): Projects related to fish passage include culvert replacement, tributary access, and improvements to dams and other water control devices,
- Habitat acquisition and/or protection (Code A): This code applies where the acquisition of land for the primary purpose of habitat protection, or the use of easements or protective covenants for the same purpose. It includes non-regulatory land use policy changes that apply to specific areas, such as cattle exclusion.
- Research and investigation (Code R): Both formal research projects and less formal gathering of information and literature review are considered in this category.
- Regulatory actions (Code G): Actions in this category include regulatory enforcement and proposed or recommended changes to existing regulations.
- Outreach (Code O): Conducting educational outreach to the public and other entities, identifying potential partners in conservation efforts, pursuing collaborative relationships with other entities, and disseminating information are considered outreach.

6.1. Unincorporated Cowlitz County

6.1.1. 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:

1. Restoring subbasin valley floodplain function and stream habitat diversity

2. Managing forests to protect and restore watershed processes
3. Addressing immediate risks with short-term habitat fixes

The Lower Columbia Estuary Partnership (LCEP) has recently updated its Management Plan for the Lower Columbia River, which includes several programmatic and project recommendations (LCEP 2011).

Key actions identified by LCEP to address restoration, land use, and water quality improvement include the following:

- Identify and prioritize habitat types and attributes that should be protected or conserved.
- Protect, conserve, and enhance priority habitats, particularly wetlands, on the mainstem of the lower Columbia River and in the estuary.
- Monitor status and trends of ecosystem conditions.
- Establish and maintain Columbia River flows to meet ecological needs of the lower Columbia River and estuary.
- Avoid the introduction of non-native invasive species.
- Manage human-caused changes in the river morphology and sediment distribution within the Columbia River channel to protect native and desired species.
- Develop floodplain management and shoreland protection programs.
- Reduce and improve the water quality of stormwater runoff and other non-point source pollution.
- Ensure that development is ecologically sensitive and reduces carbon emissions.
- Expand and sustain regional monitoring of toxic and conventional pollutants.
- Reduce conventional pollutants.
- Clean up, reduce or eliminate toxic contaminants, particularly contaminants of regional concern.
- Provide information about the lower Columbia River and estuary that focuses on water quality, endangered species, habitat loss and restoration, biological diversity, and climate change to a range of users.
- Create and implement education and volunteer opportunities for citizens of all ages to engage in activities that promote stewardship of the lower Columbia River and estuary.

Action objectives from the LCFRB (2010a) are identified in Table 6-2 below.

Table 6-2. Restoration opportunities in the Lower Columbia River and Estuary (Assessment Unit LC).

ID	Type*	Restoration Opportunity	Limiting Factor Addressed	Source Plan
01 LC	Hwi	Protect existing rearing habitat to ensure no further degradation.	Availability of preferred habitat	LCFRB 2010a
02 LC	Hf	Increase shallow water peripheral and side channel habitats toward historic levels.	Availability of preferred habitat; Loss of habitat connectivity	LCFRB 2010a
03 LC	Hfi	Restore connectivity between river and floodplain, tidally influenced reaches of tributaries, as well as in-river habitats.	Loss of habitat connectivity; Microdetritus-based food web; Availability of preferred habitat	LCFRB 2010a
04 LC	M	Reduce predation mortality on emigrating juveniles.	Predation mortality	LCFRB 2010a
05 LC	W	Reduce contaminant exposure of emigrating juveniles.	Contaminant exposure	LCFRB 2010a
06 LC	RM	Document the interaction between emigrating juvenile salmonids and introduced species; minimize negative interactions.	Interaction with introduced species	LCFRB 2010a
07 LC	R	Develop an understanding of emigrating juvenile salmonid life history diversity and habitat use in the lower mainstem, estuary, and plume.	Availability of preferred habitat; Loss of habitat connectivity; Density dependence	LCFRB 2010a
08 LC	YW	Maintain favorable water flow and temperature throughout migration period.	Fitness and timing of juvenile salmonids entering the subbasin	LCFRB 2010a
09 LC	M	Reduce predation mortality on migrating adults.	Predation losses (Adults)	LCFRB 2010a
10 LC	AG	Protect existing spawning habitat to ensure no further net degradation.	Availability of spawning habitat	LCFRB 2010a
11 LC	YW	Maintain favorable water flow and temperature throughout mainstem spawning and incubation period.	Decreased flows during spawning and incubation; Dewatering of redds	LCFRB 2010a

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

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 is proposing to list the streaked horned lark (*Eremophila alpestris strigata*) as threatened, and to designate 12,159 acres of critical habitat in Washington and Oregon. Proposed critical habitat units include several mid-channel islands in the Columbia River, including three islands in Wahkiakum County, as well as one island immediately across from the City of Kalama on the Oregon side of the Columbia River. There are no breeding records of the species in Cowlitz County.

Monitoring in Washington State indicates steep declines in abundance of the species in recent years.

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 habitat 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.

6.1.2. Lewis River Assessment Unit

As noted in Section 2.1.2, management of dam impacts are 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 instream 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).

A summary of priority restoration opportunities is provided in Table 6-3.

Table 6-3. 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 the natural flow regime	Expansion of 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.	New	NRCS, CWCD, CCD, NGOs, WDFW, LCFRB,	LCFRB 2010a/ L-Lew 4

ID	Type*	Action	Status	Entity	Source Plan/ ID
		Build partnerships with landowners and agencies and provide financial incentives.		USACE, LCFEG	
14 NL	QG	Address water quality issues through the development and implementation of water quality clean-up plans (TMDLs)	Expansion of 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	Expansion of existing program or activity	Cowlitz County, WDFW	LCFRB 2010a/ L-Lew 18
16 NL	Hlrf	Instream large woody debris, riparian, and side-channel enhancement in the Eagle Island area.	Designs Complete	LCFEG, Cowlitz Tribe	Interfluve et al. 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.	Ongoing	LCFEG	PRISM

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

6.1.3. Kalama River Assessment Unit

The following actions were proposed to restore and enhance shoreline functions in the Kalama River (Table 6-4). 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 6-4. 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 timber lands 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/W CD, 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	Expansion of 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 gravel and debris buildup near the mouths of tributaries in the upper river	New	Cowlitz County	Wade 2000b
29 KR	Hfw	Look for opportunities to increase and enhance off-channel and rearing habitat within the lower Kalama River	New	Cowlitz County/City of Kalama	Wade 2000b
30 KR	Hf	Ledgett Groundwater Channel, Left bank at RM 2.5. Create 10,400 square meters of year round rearing habitat with a potential for some spawning habitat.	New	TBD	Powers and Tyler 2009
31 KR	Hir	Pipeline Removal and LWD, Left bank at RM 2.2	New	TBD	Powers and Tyler 2009
33 KR	Hi	Lower Kalama Reach 1A Tidal Design: Install large wood structures to increase salmonid rearing and holding cover at the mouth of the Kalama River.	Design	LCFEG	PRISM
34 KR	Hf	Port Tidal and Backwater Channels, Left bank at RM 0.1	New	Port of Kalama	Powers and Tyler 2009
35 KR	Hfri	Lower Kalama Habitat Enhancement. Install approximately 12 wood structures to improve and expand pool and riffle habitat; restore 5 acres of riparian	Proposed	LCFEG	PRISM

ID	Type*	Action	Status	Entity	Source Plan/ ID
		habitat; enhance 500 feet of existing side channel with woody debris.			
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 and Tyler 2009
37 KR	P	Fish Passage Culvert, Spencer Creek at RM 1.8	New	TBD	Powers and Tyler 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 and Tyler 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 and Tyler 2009
41 KR	Hif	Riprap Removal/Floodplain Reconnection, Right bank at RM 2.4	New	TBD	Powers and Tyler 2009
42 KR	Hf	Evaluate potential to enhance existing active side channel, Right bank at RM 1.8	New	TBD	Powers and Tyler 2009
43 KR	HfWY	Improve hydrologic and habitat connectivity from the Columbia River to wetlands 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 and tributary habitat.	Ongoing	LCFEG	PRISM

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

6.1.4. Cowlitz River Assessment Unit

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 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 and lower 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; and
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 Sediment Retention Structure on the NF Toutle (LCFRB 2010a).

A summary of restoration opportunities throughout the assessment unit is presented in Table 6-5 below.

Table 6-5. Restoration opportunities in the Cowlitz River Assessment Unit (Assessment Unit CR).

ID	Type*	Action	Status	Entity	Source Plan/ID
45 CR	YG	Manage regulated stream flows to provide for critical components of the natural flow 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

ID	Type*	Action	Status	Entity	Source Plan/ ID
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	New	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 protections are 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 replace on-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 Structure on the NF Toutle.	Expansion of existing program or activity	WDFW, USACE, LCFEG	LCFRB 2010a/ Toutle 1, Wade 2000a
51 CR	YP	Assess and, if possible, alter the Silver Lake Dam to increase flows in Outlet Creek to assure fish passage into the Silver Lake watershed.	New	TBD	Wade 2000a
52 CR	G	Continue to manage federal forest lands according to the Northwest Forest Plan.	Activity is in place	USFS	LCFRB 2010a/ Toutle 4
53 CR	W	Address temperature impairments through development of water quality clean-up plans (TMDLs)	Expansion of existing program or activity	Ecology	LCFRB 2010a/ Coweeman 15
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, Cowlitz County	Wade 2000a

ID	Type*	Action	Status	Entity	Source Plan/ ID
55 CR	RHi	Look for opportunities, both short- and long-term, to increase Large Woody Debris (LWD) supplies within stream systems.	Projects underway on Toutle and Coweeman	Cowlitz County, LCFEG	Wade 2000a
56 CR	Hr	Replant degraded riparian areas with native conifers. To begin with, focus riparian restoration efforts along the more productive tributaries including Baird, Mulholland, and Goble creeks.	Expansion of existing program or activity	Cowlitz County and partners	Wade 2000a
57 CR	PR	Address fish passage barriers in the Toutle River and tributaries to the lower Cowlitz River and prioritize for repair 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 riparian and wetland bench	Conceptual plan	TBD	Tetra Tech 2007
59 CR	Hrwi	Cowlitz RM 7.3 right bank remove some dredged materials and create riparian/floodplain bench; construct setback levee if necessary.	Conceptual plan	TBD	Tetra Tech 2007
60 CR	Hrif	Cowlitz RM 8.5 right bank set back levee and plant riparian/floodplain vegetation on bench	Conceptual plan	TBD	Tetra Tech 2007
61 CR	Hrif	Cowlitz RM 9.0 left bank dredged materials removal to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
62 CR	Hr	Place LWD and vegetate with willows (mouth of Ostrander Creek)	Conceptual plan	TBD	Tetra Tech 2007
63 CR	Hr	Remove noxious weeds and restore riparian zone along length of Ostrander Creek.	Conceptual plan	TBD	Tetra Tech 2007
64 CR	Hf	Cowlitz RM 9.7 right bank bar and island enhancement.	Conceptual plan	TBD	Tetra Tech 2007
65 CR	P	Culvert replacement on Leckler Creek at Hazel Dell Road.	Conceptual plan	TBD	Tetra Tech 2007

ID	Type^	Action	Status	Entity	Source Plan/ ID
66 CR	Hrfi	Cowlitz RM 9.8 left bank riparian restoration: Remove revetment and some dredged material and create riparian and floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
67 CR	Hrfi	Cowlitz RM 10.5 left bank riparian restoration: Remove some dredged materials and create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
68 CR	Hrfi	Cowlitz RM 11.2 left bank bar and island enhancement: Place wood to promote side-channel scour and provide cover.	Conceptual plan	TBD	Tetra Tech 2007
69 CR	Hrfi	Cowlitz RM 12.5 left bank side channel restoration and enhancement: Enhance low bar with remnant side channel by placing wood and minor excavation.	Conceptual plan	TBD	Tetra Tech 2007
70 CR	Hrfi	Cowlitz RM 12.5 right bank riparian restoration: Remove riprap and bioengineer as feasible, remove dredged materials to create riparian/floodplain bench	Conceptual plan	TBD	Tetra Tech 2007
71 CR	Hrfi	Cowlitz RM 13.5 left bank riparian restoration: Remove some dredged materials and bioengineer recent riprap placement to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
72 CR	Hfi	Cowlitz RM 14.0 left bank side channel restoration and enhancement: Excavate remnant side channel, place LWD.	Conceptual plan	TBD	Tetra Tech 2007
73 CR	Hrfi	Cowlitz RM 14.5 right bank side channel restoration and enhancement: Excavate remnant side channel, place LWD, plant riparian vegetation.	Conceptual plan	TBD	Tetra Tech 2007
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 Tech 2007

ID	Type*	Action	Status	Entity	Source Plan/ ID
74 CR	Hrfi	Cowlitz RM 16.0 right bank side channel restoration and enhancement: Create defined boat launch area and restore historic side channel and improve floodplain with plantings and wood.	Conceptual plan	TBD	Tetra Tech 2007
75 CR	P	Delameter Creek Culvert replacement at Delameter Road.	Conceptual plan	TBD	Tetra Tech 2007
76 CR	HrA	Fence off Delameter Creek from livestock and restore riparian at RM 4.	Conceptual plan	TBD	Tetra Tech 2007
77 CR	P	Monahan Creek Culvert replacement at Delameter Road.	Conceptual plan	TBD	Tetra Tech 2007
78 CR	Hr	Monahan Creek Riparian restoration: Remove Japanese knotweed along lower 4 miles and revegetate.	Conceptual plan	TBD	Tetra Tech 2007
79 CR	Hrfi	Cowlitz RM 18.5 left bank dredged materials removal to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
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/riparian habitat.	Conceptual plan	TBD	Tetra Tech 2007
81 CR	Hrfi	Cowlitz RM 19.8 left bank dredged materials removal to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
82 CR	Hrfi	Toutle River RM 0.2 right bank dredged materials removal to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
83 CR	Hrfi	Toutle River RM 3.2 right bank Off-channel restoration and enhancement: Reconnect off-channel ponds behind dredged material, enhance with LWD and riparian restoration.	Conceptual plan	TBD	Tetra Tech 2007
84 CR	Hrfi	Cowlitz RM 20.2 left bank dredged materials removal to	Conceptual plan	TBD	Tetra Tech 2007

ID	Type*	Action	Status	Entity	Source Plan/ ID
		create riparian/floodplain bench.			
85 CR	Hrfi	Cowlitz RM 22.2 left bank dredged materials removal to create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
86 CR	Hf	Cowlitz RM 23.0 left bank off-channel and floodplain restoration.	Conceptual plan	TBD	Tetra Tech 2007
87 CR	Hr	Cowlitz RM 23.2 right bank bar and island enhancement: Place LWD alongside channel and revegetate where appropriate on Hog Island.	Conceptual plan	TBD	Tetra Tech 2007
88 CR	P	Rock Creek Culvert replacement at West Side Highway.	Conceptual plan	TBD	Tetra Tech 2007
89 CR	PHr	Remove water control structure and reconnect Hill Creek; riparian revegetation along lower 1000-2000 feet of creek.	Conceptual plan	TBD	Tetra Tech 2007
90 CR	Hrf	Cowlitz RM 24.5 left bank riparian restoration: Slope back banks and create riparian/floodplain bench.	Conceptual plan	TBD	Tetra Tech 2007
91 CR	Hrfi	Lower Olequa Creek enhancement: Restore side channel and riparian zone, remove invasive species, place LWD.	Conceptual plan	TBD	Tetra Tech 2007
92 CR	A	Cowlitz RM 25.0 Acquire easements in active channel migration area.	Conceptual plan	TBD	Tetra Tech 2007
93 CR	Hrfi	Cowlitz RM 25.0 side channel restoration and enhancement: Remove car bodies, place LWD and riparian restoration.	Conceptual plan	TBD	Tetra Tech 2007
94 CR	Hri	Cowlitz RM 26.0 left bank riparian restoration: Slope back banks to create riparian bench; remove riprap; may need to move road in one area.	Conceptual plan	TBD	Tetra Tech 2007
95 CR	Hr	Cowlitz River habitat enhancements upstream of Cowlitz County (RM 27-43)	Conceptual plan	TBD	Tetra Tech 2007

ID	Type*	Action	Status	Entity	Source Plan/ ID
96 CR	Hf	Connect gravel ponds and other off-channel areas near RM 7 on the Coweeman River to provide rearing and overwintering 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.	Underway	LCFEG	PRISM
98 CR	Hr	Coweeman riparian vegetation enhancement and knotweed 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 by incorporation large wood into bank protection.	New	TBD	TWC

*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

6.1.5. Mill, Abernathy, Germany Creek Assessment Unit

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 lower mainstems 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 in Tributaries to Mill Creek and Coal Creek).

A summary of restoration opportunities throughout the assessment unit is presented in Table 6-6 below.

Table 6-6. Restoration opportunities in Mill, Abernathy, and Germany Creeks (Assessment Units MC, AC and GC, respectively).

ID	Type ^a	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	LCFRB 2010a/ M-A-G 4
101 All units	W	Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of 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 Coal Creeks where 30-34% of the habitat is blocked	Expansion of 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.	Underway	Cowlitz Tribe	HDR and Cramer Fish Sciences 2009; Inter-Fluve 2011
104 GC	Hf	Enhance off channel habitat in Germany Creek.	New	LCFRB, Cowlitz County	HDR and Cramer Fish Sciences 2009
105 AC GC	Hri	Construct engineered log jams and enhance riparian areas to produce future large woody debris in Abernathy and Germany Creeks.	Project underway on Abernathy Creek	LCFRB, Cowlitz County, Cowlitz Tribe	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 instream channel diversity.	New	LCFRB, Cowlitz County	Wade 2002
107 All units	Hr	Target riparian restoration efforts along the most productive and/or degraded streams including the agricultural areas (generally lower and middle reaches) of Germany and Abernathy Creeks,	Project underway on Abernathy Creek	LCFRB, Cowlitz County, Cowlitz CD, Cowlitz Tribe	Wade 2002, HDR and Cramer Fish Sciences 2009

ID	Type*	Action	Status	Entity	Source Plan/ ID
		and the residential areas of Mill Creek.			
108 GC	M	Germany Creek Nutrient Enhancement. Placement of salmon carcass analogs and monitoring of salmon population response.	Underway	LCFEG	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

6.1.6. South Fork Chehalis River Assessment Unit

The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA 22 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) in locations with excessive erosion (sediment input)
 - Abandon roads on steep geologically sensitive areas
 - Upgrade existing roads to comply with Forest Practices Act rules and regulations
 - 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

6.2. City of Castle Rock

The most significant opportunities for restoration in the City of Castle Rock and its UGA include riparian and floodplain restoration. A summary of restoration opportunities identified within and supported by the City is presented in Table 6-7a.

Table 6-7a. Restoration opportunities in and supported by the City of Castle Rock (Assessment Unit CR).

ID	Type*	Action	Status	Entity	Source Plan/ ID
110 CR	Hri	Cowlitz RM 16.8 right bank tributary enhancement: Create riparian bench, place LWD and riparian restoration along lower end of Arkansas Creek	New	TBD	Tetra Tech 2007; TJ Kleran, City of Castle Rock, personal communication
114 CR	Hrf	Channel and riparian restoration at lower Whittle Creek: Remove invasive species, revegetate, re-meander channel.	On-going	City of Castle Rock; Cowlitz Conservation District; Castle Rock School District; WDFW	Tetra Tech 2007; TJ Kleran, City of Castle Rock, personal communication
115 CR	Hfi	Reconnect backwater channel and place LWD at Janisch Creek, just north of the City limits. Consider re-meandering the creek away from railroad tracks.	On-going	City of Castle Rock; Cowlitz Conservation District; Castle Rock School District; WDFW	Tetra Tech 2007; TJ Kleran, City of Castle Rock, personal communication
116 CR	Hr	Restore and enhance riparian vegetation along the Cowlitz River, including School District site.	On-going	North County Recreation Assoc; Castle Rock School District; City of Castle Rock	TJ Kleran, City of Castle Rock, personal communication

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

In addition to the projects identified above in Table 6-7a, the projects identified in Table 6-7b are within the City of Castle Rock and its UGA, however, they are not necessarily supported by the City of Castle Rock.

Table 6-7b. Restoration opportunities in the City of Castle Rock (Assessment Unit CR).

ID	Type*	Action	Status	Entity	Source Plan/ ID
109 CR	Hrifi	Cowlitz RM 16.7 left bank bar and island enhancement: Enhance bar with LWD and riparian plantings and promote side channel maintenance	New	TBD	Tetra Tech 2007;
111 CR	Hr	Cowlitz RM 17.0 left bank riparian restoration: Setback or slope back levees and create riparian bench along Castle Rock	New	TBD	Tetra Tech 2007
112 CR	Hr	Cowlitz RM 17.0 right bank riparian restoration: Setback or slope back	New	TBD	Tetra Tech 2007

ID	Type*	Action	Status	Entity	Source Plan/ ID
		levees and create riparian bench along Castle Rock			

*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

6.3. City of Kalama

Several potential restoration opportunities are present with the City of Kalama and its Urban Growth Area.

Two areas within the City are proposed as mitigation, meaning that they would be restored to compensate for an action (or actions) that negatively affect(s) ecological functions. As such, mitigation projects are not truly restoration projects, and they may or may not result in a net gain in ecological functions. These potential mitigation sites include a portion of the land around Kress Lake, which is primarily forested, and the land along the north and south banks of the Kalama River, west of I-5.

In addition to these areas, a summary of additional restoration opportunities is presented in Table 6-8 below.

Table 6-8. Restoration opportunities in the City of Kalama (Assessment Unit KA).

ID	Type*	Action	Status	Entity	Source Plan/ ID
117 KA	HfO	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/W CD, NGOs, WDFW, LCFRB, USACE, Port of Kalama	LCFRB 2010a/ Kal 5
118 KA	YHw	Improve hydrologic and habitat connectivity from the Columbia River to wetlands just east of Interstate-5.	New	TBD	T. Rymer, NMFS, personal communication
119 KA	RHf	Look for opportunities to increase and enhance off-channel and rearing habitat within the lower Kalama River	New	Cowlitz County/ City of Kalama	Wade 2000b
120 KA	Hf	Groundwater Channel, Left bank at RM 1.4	New	TBD	Powers and Tyler, 2009
121 KA	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	TWC

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

6.4. City of Kelso

Several sites on the Cowlitz River in the City of Kelso have been used to deposit dredge spoils associated with the dredging following the eruption of Mount Saint Helens. These sites are predominantly under private ownership. Restoration of hydrologic connectivity and riparian vegetation at these sites could potentially significantly improve floodplain functions in the lower Cowlitz River.

A wetland, known as Hart's Lake, in the City of Kelso UGA is noted as an area for potential restoration. The City Parks Department owns a portion of the wetland and the abutting Coweeman shoreline. This area is identified in the City's Parks Plan as undeveloped open space. The area is within the floodplain of the Coweeman River, and has the potential to function as a backwater habitat during floods. As noted in Section 3.4, the portion of the parcel along the Coweeman shoreline is presently mowed. The shoreline would benefit from planting riparian shrubs and trees to provide shade to the Coweeman River and to improve fish and wildlife habitat. There may also be opportunities to improve hydrologic connectivity to the wetland from the west. Discussions are underway for potential wetland mitigation at Hart's Lake for impacts that may occur within shoreline jurisdiction at the Southwest Washington Regional Airport. As noted above, if used as mitigation, the project may or may not result in a net improvement of functions on a City-wide basis.

A summary of restoration opportunities is presented in Table 6-9 below.

Table 6-9. Restoration opportunities in the City of Kelso (Assessment Unit KE).

ID	Type*	Action	Status	Entity	Source Plan/ ID
122 KE	Hrfi	Cowlitz RM 1.0 Left Bank Side channel restoration and enhancement: Remove some dredged materials and reconnect side channel, create riparian bench.	Conceptual Design	TBD	Tetra Tech 2007
123 KE	Hrf	Coweeman RM 3.5 Right Bank Tributary enhancement: Reconnect remnant oxbow and restore riparian zone.	Conceptual Design	TBD	Tetra Tech 2007
124 KE	Hi	Coweeman RM 4.0 Tributary enhancement: Place LWD for sediment trapping, cover, and in-stream enhancement upstream of levees.	Conceptual Design	TBD	Tetra Tech 2007

ID	Type*	Action	Status	Entity	Source Plan/ ID
125 KE	Hri	Cowlitz RM 3.0 Left Bank Riparian restoration; Slope back banks to create riparian bench; remove riprap; revegetate with riparian species.	Conceptual Design	TBD	Tetra Tech 2007
126 KE	Hrf	Conduct floodplain restoration where feasible along the Cowlitz River. In particular, consider restoration of floodplain and riparian functions at former dredge disposal sites.	New	TBD	T. Rymer, NMFS, personal communication
127 KE	HrAR	Discontinue mowing and plant riparian vegetation along the shoreline in the Hart Lake Recreation Area. Evaluate potential to increase hydrologic connections to the wetland from the west.	New	City of Kalama Parks Department	TWC
128 KE	HrO	Plant native trees and shrubs along the shoreline at Tam O'Shanter Park. Consider opportunities for interpretive signage.	New	City of Kalama Parks Department	TWC
129 KE	RHfw	Explore opportunities to improve hydrologic and habitat connectivity from the Columbia River to Owl Creek and associated wetlands just east of Interstate-5.	New	TBD	T. Rymer, NMFS, personal communication
130 KE	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.

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

6.5. City of Woodland

There are several restoration sites available within the City of Woodland. The areas zoned for floodway are the most obvious areas for restoration and are generally found in the Lewis 13, 14 and 15 reaches. There are also restoration opportunities to found south of the CC Street Bridge within the floodway. This location has significant invasive species coverage and impacts from informal camping.

A summary of restoration opportunities is presented in Table 6-10 below.