

Appendix D
WRIA 28 Restoration Opportunities

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Table D-1. Key to Programmatic Restoration Measures

Measure ID	Description
Water Quality	
WQ-1	Protect water quality.
WQ-2	Implement best management practices for use of pesticides and fertilizers.
WQ-3	Use construction best management practices to minimize runoff.
WQ-4	Restrict livestock access to streams.
WQ-5	Remove and/or replace failing septic systems.
WQ-6	Identify and reduce sources of contaminants in soils and water.
WQ-7	Maintain adequate summer flows to control high temperature.
WQ-8	Reduce excessive fine sediments.
WQ-9	Improve water quality (dissolved oxygen, bacteria, temperature).
WQ-10	Decommission or repair logging roads to prevent erosion.
WQ-11	Use timber harvest best management practices to reduce erosion.
WQ-12	Control agricultural runoff.
WQ-13	Educate shoreline property owners on best management practices to minimize impacts to water quality.
Fish Habitat	
F-1	Protect remaining off-channel habitat.
F-2	Create additional side channel habitat.
F-3	Restore off-channel rearing habitat.
F-4	Remove barriers to fish passage.
F-5	Remove or repair failing culverts.
F-6	Supplement large woody debris.
F-7	Enhance spawning gravel.
F-8	Recreate stream meanders.
F-9	Improve stream channel shading.
Hydrology	
H-1	Restore stream connectivity to off-channel and floodplain habitats.
H-2	Remove, lower, or set back dikes and levees.
H-3	Provide for adequate in-stream flows through management of water withdrawals.
H-4	Address water withdrawal policies for lakes.
H-5	Acquire diked properties.
H-6	Protect remaining floodplains.
H-7	Restore natural hydrology and movement of sediment.
Riparian	
R-1	Protect intact riparian areas.
R-2	Acquire riparian properties.
R-3	Enhance riparian vegetation.
R-4	Restore riparian forest.
R-5	Increase native conifer component of riparian vegetation.
R-6	Fence livestock away from riparian areas.
R-7	Restore riparian buffers impacted by agricultural practices.
R-8	Restore topsoil in riparian buffers impacted by fill, compaction, agricultural practices, or other uses.
R-9	Educate and provide incentives to landowners to restore riparian conditions.

Measure ID	Description
Stormwater	
SW-1	Retrofit stormwater facilities to meet performance standards.
SW-2	Implement stormwater best management practices.
SW-3	Improve urban stormwater infrastructure to provide flow treatment.
SW-4	Use groundwater recharge and infiltration techniques as part of stormwater management strategy.
Non-native Species	
NN-1	Take aggressive measures to prevent the introduction of non-native invasive plant and animal species.
NN-2	Control invasive riparian vegetation.
NN-3	Use weed management and education to control invasive plant species.
Wetlands	
W-1	Protect wetland habitat.
W-2	Enhance and restore degraded wetland habitats.

Timeline Definitions:

Short-term (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations.

Long-term (more than 5 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require additional planning and permitting.



Impairments:

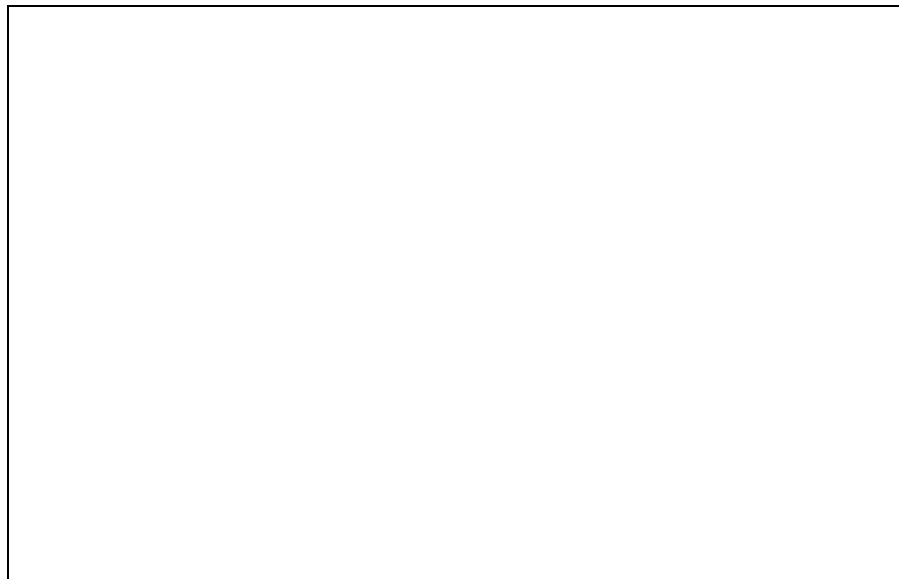
- Structures (e.g., levees, bridges) that limit historical floodplain connections and channel migration zones.
- Forested land converted to impervious surfaces for urban development and agriculture.
- Hydropower dams reduce stream flow variability, sediment delivery, and limit natural fish passage.
- Channel dredging and spoils disposal.
- River channel structures (e.g., jetties, bulkheads, breakwaters, and dikes).
- Disconnected wetlands and off-channel habitats.
- Introduction of non-native and invasive species.
- Degraded water quality.
- Fish passage barriers including tidegates and culverts that prevent access to off-channel habitats.
- Ecology-listed industrial facilities and contaminated sites.

Programmatic Restoration Opportunities:

- F-1, F-2, H-1, WQ-2, WQ-6, WQ-7, WQ-9, H-2, H-5, W-1, R-1, R-3, SW-2, NN-1, NN-2 (see Table D-1)
- Protect rearing and spawning habitat for salmonids, sturgeon, Pacific lamprey, and eulachon.
- Enhance connections between side-channels, sloughs, lakes, and the mainstem.
- Protect existing bald eagle nesting and foraging habitat (i.e., large, old trees on shorelines and islands).
- Remove or modify abandoned pilings and overwater structures in restore in-stream habitats.
- Coordinate and support LCFRB and LCREP efforts to restore and protect habitats.
- Support efforts by NOAA Fisheries, LCFRB and other entities to implement the salmon recovery management actions.

Information Sources and Organizations:

- Lower Columbia River Salmon Recovery & Fish and Wildlife Subbasin Plan (LCFRB, 2010).
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Lower Columbia River Estuary Program, web page: <http://www.lcrep.org/>
- Columbia River Estuary Study Task Force (CREST), web page: <http://www.columbiaestuary.org/restoration.html>
- Columbia River Inter-Tribal Fish Commission, web: <http://www.critfc.org/>.
- Cowlitz Tribe, web site: <http://www.cowlitz.org/>.



Information Sources and Organizations:

- Bonneville Power Administration, web page: <http://efw.bpa.gov/>
- US Army Corps of Engineers
- NOAA Fisheries Salmon Recovery, web page: <http://www.nwfsc.noaa.gov/trt/index.cfm>
- Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead, NOAA Fisheries (2011), web: <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Estuary-Module.cfm>.
- EPA Water Quality in the Columbia Basin, web site: <http://yosemite.epa.gov/r10/ECOCOMM.NSF/Columbia/WQS>.
- Ecology Columbia River Management Program: <http://www.ecy.wa.gov/programs/wr/cwp/crwmp.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
COLU_RV_02	<ul style="list-style-type: none"> • The Port of Vancouver mitigation bank site presents opportunities to reestablish native wetland vegetation and habitat. 	High	Hydrologic, sediment, water quality and habitat functions.	Short term
COLU_RV_03	<ul style="list-style-type: none"> • Protect springs in and around Vancouver and Camas near the I-205 bridge to protect spawning chum salmon in the mainstem Columbia River. 	High	Habitat	Long term
COLU_RV_03	<ul style="list-style-type: none"> • Remove invasive species and replant native vegetation at Steamboat Landing and William Clark Park. 	Medium	Habitat	Short term
All reaches	<ul style="list-style-type: none"> • Protect floodplain areas and associated wetlands. 	High	Habitat, Hydrology	Long term



Impairments:

- Development in the floodplain along tributary streams.
- Historical filling of Mulligan Slough.
- Increased sediment loading from urban runoff.
- Intense blue-green algae blooms occur during to excessive nutrients.
- Lack of shade and riparian forests along tributary streams.
- Poor agricultural practices contribute to water quality degradation.
- Decreased tidal flushing.
- Degraded water quality, including fecal coliform, low dissolved oxygen, PCBs and other contaminants.
- Lack of vegetation and structure for habitat.
- Invasive species in the watershed.
- Inadequate stormwater treatment and flow control.
- Failing septic systems.

Programmatic Restoration Opportunities:

- W-1, H-1, H-2, F-6, F-9, WQ-2, WQ-4, WQ-5, WQ-12, NN-2, SW-1, SW-2, SW-3, SW-4, R-5 (see Table D-1)
- Protect and restore floodplain wetlands in the Vancouver Lake lowlands.
- Control invasive fish species such as common carp through management and angler education.
- Increase habitat structure by reducing turbidity and allowing light penetration.
- Support public outreach and education efforts by Vancouver Lake Watershed Partnership.
- Support ongoing TMDL studies for Salmon Creek and Burnt Bridge Creek, upstream tributaries.

Information Sources and Organizations:

- Vancouver Lake Watershed Partnership web page: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>
- Technical Foundation for Future Management of Vancouver Lake, May 2011 (Vancouver Lake Watershed Partnership).
- Vancouver-Clark Parks and Recreation web page: http://www.cityofvancouver.us/parks-recreation/make_difference/parktrail_volunteering.asp
- Clark County Public Works, 2008 SNAP: Subwatershed Needs Assessment Report, Vancouver Lake/Lake River (March 2009).
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> Riparian forest restoration 	High	Habitat, LWD, Water Quality	Short term
	<ul style="list-style-type: none"> The Port of Vancouver mitigation bank site presents opportunities to reestablish native wetland vegetation and habitat. 	High	Habitat, LWD, Water Quality	Short term
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Water quality	Short term
Various	<ul style="list-style-type: none"> Control invasive vegetation at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	High	Habitat	Short term

CANVASBACK LAKE**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Agricultural practices nearby limit native tree and shrub cover.
- Forested riparian buffer lacking on east shoreline.

Programmatic Restoration Opportunities:

- NN-2, R-3 (see Table D-1)
- Continue to implement the Ridgefield National Wildlife Refuge management plan that controls and replaces invasive plants and noxious weeds.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats within the refuge.
- Coordinate with U.S. Fish and Wildlife Service during implementation of the conservation plan for Ridgefield National Wildlife Refuge.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Partnership, restoration projects map: <http://maps.lcrep.org/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Re-vegetation of forest riparian buffer on east lake shore.	High	Habitat, LWD	Short term



Impairments:

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Agricultural practices limit native tree and shrub cover.
- Forested riparian buffer lacking on eastern shoreline.

Programmatic Restoration Opportunities:

- R-3, NN-2 (see Table D-1)
- Continue implementing the Ridgefield National Wildlife Refuge management plan to control and replace invasive plants and noxious weeds.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats within the refuge.
- Coordinate with U.S. Fish and Wildlife Service during implementation of the conservation plan for Ridgefield National Wildlife Refuge.
- Support ongoing vegetation and biological monitoring of Campbell Slough by LCREP.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Partnership, web site: <http://maps.lcrep.org/monitoringsite/2661>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore native riparian forest on eastern shoreline.	High	Habitat, LWD	Short term
All reaches	Protect lands through acquisition or conservation easement.	High	Habitat	Long term

WHIPPLE CREEK**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Conversion of watershed to impervious surfaces.
- Streambank hardening, channelization, and scour.
- Fish passage barriers.
- Diking and roads disconnecting streams from floodplains.
- Fine sediment accumulation.
- Stormwater runoff resulting in head-cutting and erosion.
- Lack of grade controls such as large wood.
- Invasive species in the understory.
- Degraded water quality.
- Livestock access to stream channels.

Programmatic Restoration Opportunities:

- H-1, H-2, H-3, F-4, F-6, NN-2, R-3, R-6, R-8, WQ-8, SW-1 (see Table D-1)
- Prevent additional channel modifications (channel incising, head-cutting, etc.).

Information Sources and Organizations:

- Inter-Fluve, Inc. 2006. Technical assessment of the Whipple Creek Basin to support stormwater basin planning efforts in Clark County.
- Clark County Public Works, Clean Water Program.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Legacy Lands Program, web page: <http://www.clark.wa.gov/legacylands/land.html>
- Upper Whipple Creek Habitat Protection Project, web site: <http://www.clark.wa.gov/water-resources/engineering/whipplehab.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower watershed	<ul style="list-style-type: none"> • Add spawning gravels in Packard Creek. 	Medium	Habitat	Long term
Lower watershed	<ul style="list-style-type: none"> • Protect oak woodland habitat near Packard Creek. 	High	Habitat	Long term
All	<ul style="list-style-type: none"> • Protect important habitats upstream and protect stream flows. 	High	Habitat, Hydrology, Hyporheic functions	Long term
Upper watershed	<ul style="list-style-type: none"> • Preserve important intact areas such as the mainstem above Union Road, the Packard Basin, Tributary W2.04, and wetlands. 	High	Habitat	Long term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper watershed	<ul style="list-style-type: none"> Install LWD jams on the mainstem above Union Road, below I-5, near Packard Creek, below the NW 179th St. crossing, the area near RM 2.3, and lower Packard Creek. 	Medium	Habitat, LWD	Long term
All	<ul style="list-style-type: none"> Enhance riparian habitats and protect wetland habitats during development of the Whipple Creek Greenway Trail (proposed). 	High	Habitat, Hydrology	Long term
Upper watershed	<ul style="list-style-type: none"> Address potential fish passage issues on the mainstem including the NW 11th Ave. crossing, I-5 crossing, and Union Road crossing. 	High	Habitat, Access	Long term
Reach 1	<ul style="list-style-type: none"> Install cattle fencing on the mainstem at the pasture area near RM 2 and on Packard Creek. 	Medium	Water Quality, Channel stability	Long term
All	<ul style="list-style-type: none"> Restore maintained lawns along the mainstem channel with riparian vegetation near RM 2.4, downstream of NW 179th St., near RM 5.7, and near RM 7.1. 	High	Habitat, LWD	Long term
Upper watershed	<ul style="list-style-type: none"> Remove old fill and abandoned crossing structures on the mainstem near RM 7.3, RM 5.2 and RM 4.2. 	High	Habitat, Hydrology	Long term
Lower watershed	<ul style="list-style-type: none"> Proposal to acquire 50 acres of wetlands, shoreline and floodplain on Whipple Creek. Funding pending approval through the Washington Wildlife and Recreation Program (2011). 	High	Habitat, Hydrology	Short term



Impairments:

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Forested cover lacking in the riparian zone.
- Agricultural practices have reduced tree and shrub cover.

Programmatic Restoration Opportunities:

- H-2, R-3, R-4, NN-2 (see Table D-1)
- Continue implementing the Ridgefield National Wildlife Refuge management plan to control and replace aggressive, weedy plants.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats.
- Coordinate with U.S. Fish and Wildlife Service during preparation of conservation plan for Ridgefield National Wildlife Refuge.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Program, web page: http://maps.lcrep.org/program/habitat_restoration.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Breach the dike separating Post Office Lake from the Columbia River, to allow tidal influence to return to this area.	High	Hydrology	Long term
All reaches	Restore riparian forest habitat along shorelines	High	Habitat, LWD	Short term
All	Preserve lake through conservation easement or acquisition.	High	Habitat	Long term

GREEN LAKE	WRIA 28	Lower Columbia River Tributaries & Lakes
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- Impairments:**
- Runoff from roads and other development.
 - Conversion of forest land to agriculture, shrubs, and impervious surfaces.
 - Railroad tracks within eastern shoreline.
 - Ditching and draining of associated wetlands.

- Programmatic Restoration Opportunities:**
- NN-2, W-1, W-2, R-3, R-8 (see Table D-1)
 - Coordinate restoration efforts with Vancouver Lake Watershed Partnership.

- Information Sources and Organizations:**
- Vancouver Lake Watershed Partnership, web site:
<http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore forested riparian zones within shorelines.	High	Habitat	Short term

**Impairments:**

- Dikes, roads, railroads have disconnected floodplains from streams.
- Low habitat diversity, lack of riparian trees result in low supply of large woody debris.
- Stormwater runoff from urban areas impairs water quality in Vancouver Lake and Lake River system.
- Invasive species abundant in riparian zone.
- Lack of side channels negatively affects salmonid habitat.
- Agricultural uses and upstream residential uses contribute sediment and pollutants to Vancouver Lake and Lake River.
- Intense blue-green algae blooms occur during to excessive nutrients.

Programmatic Restoration Opportunities:

- F-2, F-3, R-4, R-6, NN-2, W-1, W-2, WQ-9, H-2, H-3 (see Table D-1)
- Create and/or restore side channel and off-channel habitat for chum spawning and coho overwintering.
- Restore riparian forest on the western shore.
- Support stewardship and volunteer opportunities for restoration through LCREP.
- Improve treatment of stormwater discharge to Vancouver Lake/Lake River system.
- Support ongoing TMDL studies for Salmon Creek and Burnt Bridge Creek, upstream tributaries.

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Water Resources & Clean Water Program: <http://www.co.clark.wa.us/water-resources/>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Vancouver Lake Watershed Partnership: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>.
- Clark County Public Works 2008 SNAP: Subwatershed Needs Assessment Report, Vancouver Lake/Lake River (March 2009).

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
LAKE_RV_01	<ul style="list-style-type: none"> Improve water quality by excluding livestock from riparian areas, increasing riparian shading, and reducing chemical contamination. 	High	Water Quality, Habitat	Long term
All reaches	Riparian forest restoration and restoration of hillslope processes (SNAP 2008)	High	Water Quality, LWD, Habitat	Long term

**Impairments:**

- Stream dredged, drained, and rerouted.
- Dikes and roads have disconnected stream from floodplain.
- Excessive peak flows and sediment transport from urban runoff.
- Degraded water quality – TMDL under development.
- Low stream shading levels and lack of riparian forested habitat. Greatest lack of shade and riparian canopy is near Andressen Road crossing and in lower Greenway (Ecology).
- Ditching and drainage of floodplain and wetlands.
- Livestock damage to riparian vegetation and stream.
- Fish passage barriers exist.
- Riparian vegetation devoured by non-native species, nutria.

Programmatic Restoration Opportunities:

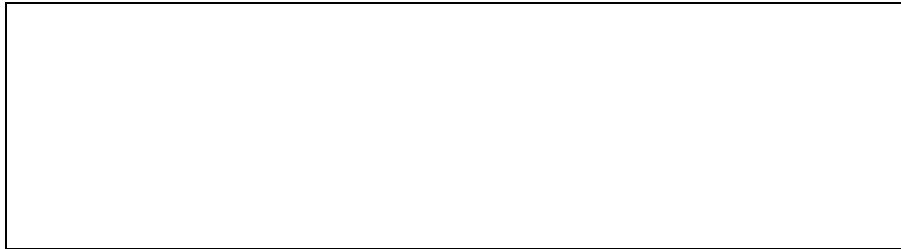
- NN-2, R-3, R-4, R-8, W-1, W-2, H-1, H-2, H-3, H-6, WQ-5, WQ-8, WQ-9, F-4, F-6, F-8, F-9, SW-1, SW-2, SW-3, SW-4 (see Table D-1)
- Continue to trap and remove nutria.
- Public outreach and education related to residential lawn care and stormwater runoff.
- Preserve and protect associated wetlands which support stream baseflow and habitat.

Information Sources and Organizations:

- City of Vancouver Burnt Bridge Creek Watershed. <http://www.cityofvancouver.us/waterallaround.asp?menuid=10463&submenuID=20299&itemID=20392>
- Vancouver Lake Watershed Partnership web page: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>
- Vancouver-Clark Parks and Recreation web page: http://www.cityofvancouver.us/parks-recreation/make_difference/parktrail_volunteering.asp
- Vancouver Watersheds Council web page: <http://www.vancouverwatersheds.org/>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Clark County Public Works Clean Water Program. 2008 SNAP- Lower Burnt Bridge Creek Subwatershed Needs Assessment Report. <http://www.co.clark.wa.us/water-resources/documents/SNAP/2008/LowerBCSNAPReport.pdf>.

Information Sources and Organizations:

- Clark County Public Works Clean Water Program.



2010. 2009 Stormwater Needs Assessment Program – Upper Burnt Bridge Creek/Middle Burnt Bridge Creek Subwatershed Needs Assessment Report.

- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Burnt Bridge Creek. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/burntbridge/burntbrtmdl.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Reach 2	<ul style="list-style-type: none"> Continue efforts to restore native habitat and reconnect stream to wetlands through the Burnt Bridge Creek Regional Wetland Bank & Greenway Trails Project from I-205 to 112th Avenue, and from Oakbrook Way to NE 127th Avenue. 	High	Habitat, Hydrology	Short term
Reach 2	<ul style="list-style-type: none"> Restore riparian forest, restore stream meanders, and remove reed canarygrass in the Meadowbrook North area between Burton Road and Royal Oaks Drive. 	High	Habitat	Long term
Upper watershed	<ul style="list-style-type: none"> Restore riparian forest, restore stream meanders, and remove reed canarygrass in the Beaver Marsh area from 39th Street to I-205. 	High	Habitat	Long term
Reach 1	<ul style="list-style-type: none"> Reforest riparian area and control invasive vegetation at the confluence of lower Burnt Bridge Creek and Cold Creek. 	High	Habitat	Short term
Reach 1	<ul style="list-style-type: none"> Restore degraded wetlands in County-owned property at Saint Johns Park. 	High	Habitat	Short term
Reach 1	<ul style="list-style-type: none"> Restore degraded wetlands in County-owned property north of Minnehaha Street below power lines. 	High	Habitat, Hydrology	Short term
Reach 1	<ul style="list-style-type: none"> Replace culvert at Hazel Dell Avenue that is a partial barrier to upstream movement of coho salmon. 	Medium	Hydrology, Access	Long term
All Reaches	<ul style="list-style-type: none"> Fence livestock out of stream and riparian area. 	Medium	Water Quality	Long term

GIBBONS CREEK**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Floodplains reduced or eliminated along Lower Columbia River.
- Forests converted to residential lots and pastures.
- Increased impervious surfaces such as roads.
- Poor riparian habitat; lack of large woody debris.
- Degraded water quality – TMDL for fecal coliform.
- Invasive vegetation in riparian areas, particularly Japanese knotweed, reed canarygrass, and Himalayan blackberry.
- Fish passage barriers.

Programmatic Restoration Opportunities:

- H-1, H-7, SW-1, SW-2, SW-3, F-4, F-6, F-8, R-3, R-7, R-8, WQ-5, WQ-9, NN-2 (see Table D-1)
- Restore floodplains.

Information Sources and Organizations:

- Clark County Public Works Water Resources. 2007 SNAP – Gibbons Creek/Steigerwald Subwatershed Needs Assessment Report.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.html>. Accessed February 2010.
- Steigerwald Lake National Wildlife Refuge, web site: <http://www.fws.gov/ridgefieldrefuges/steigerwaldlake/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
GIBB_CR_01	<ul style="list-style-type: none"> • Explore restoration opportunities on Columbia Land Trust property upstream from SR-14. 	Medium	Habitat	Long term
Various	<ul style="list-style-type: none"> • Conduct further analysis of fish passage barriers and replace culverts as needed (2007 SNAP report). 	Medium	Access	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation noted in 2007 SNAP report. 	Medium	Habitat	Short term

LAWTON CREEK**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Floodplains reduced or eliminated by development and infrastructure.
- Poor quality riparian habitat and lack of tree cover.
- Gravel roads within shoreline areas.
- Invasive plants.
- Placement of dikes and levees to confine channel.

Programmatic Restoration Opportunities:

- H-2, H-3, F-6, F-8, WQ-9, NN-2, R-3, R-6, R-8 (see Table D-1)
- Focus restoration actions on lower Lawton Creek.
- Assess floodplain conditions on Lawton Creek affected by past gravel mining.
- Acquire property or conservation easements along the lower reaches to provide opportunities to remove dikes and restore natural stream meanders within the floodplain.

Information Sources and Organizations:

- Clark County Public Works Water Resources. 2007 SNAP – Gibbons Creek/Steigerwald Subwatershed Needs Assessment Report.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Conserve agricultural lands and promote best practices	High	Habitat, LWD	Long term
All	Work with private property owners to promote restoration of riparian zones.	High	Habitat, LWD	Long term



Impairments:

- Urban and suburban development in the lower mainstem has altered hydrology; sediment delivery; and degraded habitat.
- Loss of floodplain connectivity.
- Forest practices increase runoff that scours stream channels.
- Agricultural runoff.
- Degraded water quality.
- Fish passage barriers.
- Lack of forested canopy cover to below state stream shading standards.
- Lack of large woody debris.
- Levees and roads confine channel migration.

Programmatic Restoration Opportunities:

- F-2, F-3, F-4, F-6, F-7, H-1, H-3, H-7, R-3, R-4, R-6, R-8, SW-3, NN-2, WQ-5, WQ-10, W-1 (see Table D-1)
- Increase public awareness about erosion issues associated with ATV use in and near streams.
- Manage forest practices, agriculture, and development to minimize impacts to sediment supply, runoff, and water quality.

Information Sources and Organizations:

- Parametrix. 2008. Washougal River Greenway Shoreline Inventory and Characterization.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- G. Wade. 2001. Salmon and Steelhead Habitat Limiting Factors – WRIA 28. <http://www.scc.wa.gov/index.php/259-WRIA-28-/View-category.html>.
- Lower Columbia River Estuary Partnership site: http://maps.lcrep.org/program/habitat_restoration.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
WASH_RV_02	<ul style="list-style-type: none"> • Improve Hathaway Park by replacing degraded boat launch, stabilize bank, and restore riparian area. 	High	Water quality, habitat	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
WASH_RV_02	<ul style="list-style-type: none"> Remove invasive knotweed/plants, especially at Sandy Swimming Hole and within and east of Riverbend Park area. 	High	Habitat	Short term
WASH_RV_01 and 02	<ul style="list-style-type: none"> Restore historical off-channel and side channel habitats and create new spawning channels on the lower Washougal River mainstem. 	High	Habitat	Long term



Impairments:

- Hydrology and sediment delivery (middle/lower reaches) altered by urban/suburban development.
- Conversion of agricultural land to residential in middle reaches.
- Loss of floodplain connectivity.
- Surface water diversions and impoundments.
- Forest practices in upper watershed.
- Agricultural runoff.
- Degraded water quality – TMDL under development for dissolved oxygen, fecal coliform, pH, temperature.
- Loss of rearing habitat, channel simplification and lack of LWD.

Programmatic Restoration Opportunities:

- H-1, H-6, SW-3, WQ-2, WQ-7, WQ-12, R-4, R-8, F-6, W-2 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower	<ul style="list-style-type: none"> • Enhance floodplain and side channel habitat within public parks along lower Lacamas Creek. 	Medium	Hydrology	Short term
Lower	<ul style="list-style-type: none"> • Address minimum and maximum flow limitations on water diversions and releases from Round Lake that affect Lacamas Creek. 	High	Hydrology	Long term
All	<ul style="list-style-type: none"> • Conserve agricultural lands and promote best practices. 	High	Water Quality	Long term
All	<ul style="list-style-type: none"> • Maintain adequate flows in Lacamas Creek to buffer water temperatures during summer months. 		Water Quality	Long term

ROUND LAKE**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Hydrology of Lacamas Creek altered by diversion of water from Round Lake to Mill Ditch, and by large water releases from Round Lake to the creek.
- Conversion from pervious to impervious surfaces.
- Degraded water quality.

Programmatic Restoration Opportunities:

- WQ-13, H-4 (see Table D-1)
- Preservation of forested habitats and existing prairie.

Information Sources and Organizations:

- Wade, G. 2001. Salmon and Steelhead Habitat Limiting Factors. Water Resource Inventory Area 28. Washington State Conservation Commission, Final Report.
- City of Camas Parks Department, web page: <http://www.ci.cammas.wa.us/parks/parktrail.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Address minimum and maximum flow limitations on water diversions and releases from Round Lake. 	High	Hydrology, stream base flow	Long term

FALLEN LEAF LAKE**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Conversion of forests to residential uses and roads.
- Historical use of shoreline as a cemetery.
- Sedimentation from uphill developments and urban runoff.

Programmatic Restoration Opportunities:

- NN-2, R-3, R-8 (see Table D-1)
- Acquisition of properties by the City of Camas to preserve lake and shoreline habitats through the use of Washington Wildlife and Recreation Office funds.

Information Sources and Organizations:

- City of Camas Parks, web page:
<http://www.ci.camass.wa.us/parks/parktrail.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	<ul style="list-style-type: none"> • Reestablish native plantings, particularly in areas on the eastern side of the lake impacted by recreational access. 	Medium	Habitat	Short term



Impairments:

- Conversion from pervious to impervious surfaces results in increased stormwater runoff and habitat loss.
- Excessive aquatic plant growth contributes to high nutrient levels.
- Algal blooms.
- Degraded water quality, especially increased phosphorus and nutrients.
- Residential and road development has reduced riparian forested habitat.
- Dam impounds lake and prevents natural fish passage.

Programmatic Restoration Opportunities:

- NN-3, WQ-9, H-4, R-3, W-1, W-2, H-6 (see Table D-1)
- Control noxious Brazilian elodea growth.
- Prohibit or limit motorized watercraft.
- Support WSU Watershed Steward Program to continue restoration activities and public outreach.

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>
- WSU Clark County Extension Office, Watershed Stewards, web page: <http://clark.wsu.edu/volunteer/ws/index.html>
- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore riparian forest and enhance shoreline vegetation.	High	Habitat	Short term
All reaches	Reduce riprap and replace with bioengineered stabilization.	Medium	Habitat, Hydrology	Long term



Impairments:

- Converted forests to agricultural and rural residential uses.
- Conversion of pervious to impervious surfaces.
- Ditching, draining and loss of associated wetlands due to residential development and agricultural practices.
- Invasive species.
- Impaired water quality.
- Degraded habitat in wetlands.

Programmatic Restoration Opportunities:

- W-1, W-2, R-3, R-8, NN-2, WQ-5, WQ-12, SW-1, SW-2 (see Table D-1)
- Protect associated wetlands to protect stream baseflow and downstream habitats.
- Restore wetlands and riparian areas that have been impacted by grazing and agricultural activities.

Information Sources and Organizations:

- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forests and native vegetation.	High	Habitat	Short term
All	Preserve associated wetlands to protect stream baseflow and downstream water quality	High	Habitat, Hydrology	Short and Long Term
All	Remove ditches and drains to restore natural hydrology.	Medium	Hydrology	Long term
All	Conserve agricultural lands and promote best practices.	High	Habitat, Hydrology, Water Quality	Long term

MATNEY CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Conversion of forested lands into residential and pasture.
- Degraded habitat aquatic habitat.
- Impaired water quality.

Programmatic Restoration Opportunities:

- WQ-7, W-1, W-2, R-5, WQ-13 (see Table D-1)
- Educate residential and agricultural landowners on best management practices.

Information Sources and Organizations:

- Clark County Monitoring Documents web page:
<http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Maintain summer baseflow in stream to control high temperature through the protection of wetlands. 	Medium	Hydrology	Long term

NORTH FORK LACAMAS CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Degraded riparian habitat due to rural residential development and agricultural uses.
- Degraded water quality.
- Lack of riparian forest.

Programmatic Restoration Opportunities:

- WQ-7, WQ-10, WQ-13, R-4, F-5, W-1, W-2 (see Table D-1)
- Develop and enhance thermal refugia for rearing cutthroat trout.

Information Sources and Organizations:

- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Conserve agricultural lands and promote best practices to reduce runoff.	High	Water Quality	Long term



Impairments:

- Forests converted to residential and agricultural uses in the lower reaches.
- Agricultural diversion in the lower reaches.
- Degraded riparian habitat in the lower reaches.
- Low flow conditions from water withdrawals.
- Diked and armored streambanks channelize flows and reduce floodplain habitat.
- Degraded water quality.

Programmatic Restoration Opportunities:

- H-1, WQ-3, NN-2, R-3, R-7, R-8, F-3, F-4, F-7, W-1, W-2 (see Table D-1)
- Continue to remove invasive knotweed.
- Protect salmonid habitat in headwater reaches.
- Protect existing forests for timber and reforest vacant farm land.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All Reaches	<ul style="list-style-type: none"> • Remedy passage barriers along several small tributary streams such as Jackson Creek; Cotter Creek, and Larson Creek. 	High	Habitat, Access	Long term
Tributaries	<ul style="list-style-type: none"> • Reconnect the lower Little Washougal River with its floodplain. 	High	Hydrology	Long term
All	<ul style="list-style-type: none"> • Protect existing riparian forest 	High	Habitat, LWD	Long term

EAST FORK LITTLE WASHOUGAL RIVER

WRIA 28

Washougal River Tributaries & Lakes**Impairments:**

- Lack of large wood debris in lower segments of the East Fork Little Washougal River and Jones Creek.
- Lack of adequate stream shading.

Programmatic Restoration Opportunities:

- F-5, F-6, F-9, WQ-10, R-4 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forests to enhance habitats.	High	Habitat	Long term

BOULDER CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Timber harvest has reduced forested cover in the watershed.
- Logging roads cross creek and contribute to sediment loading.
- Low flows due to municipal water withdrawals.

Programmatic Restoration Opportunities:

- F-6, F-7, WQ-11 (see Table D-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:
<http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page:
<http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Protect forested areas in the upper watershed.	High	Habitat, Hydrology	Long term
All	Restore riparian forests where appropriate	Medium	Habitat	Long term
All	Address low flows due to water withdrawals.	Medium	Habitat, Hydrology	Long term

COUGAR CREEK	WRIA 28	Washougal River Tributaries & Lakes
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Impairments:

- Forests converted to agricultural and residential uses.
- Impaired hydrologic conditions due to high road densities.
- Lack of mature trees for wood recruitment.

Programmatic Restoration Opportunities:

- WQ-10, WQ-11, R-4, R-8, F-5 (see Table D-1)
- Retain current forest cover.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:
<http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forested cover.	High	Habitat	Long term

HAGEN CREEK	WRIA 28	Washougal River Tributaries & Lakes
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Impairments:

- Timber harvest has reduced forested cover in upper watershed.
- Forest roads cross creek and its tributaries contributing sediment.

Programmatic Restoration Opportunities:

- WQ-10, WQ-11, R-1, R-4, F-5 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Protect forested cover in upper watershed	High	Habitat	Long term
All	Protect and restore stream channels to protect downstream water quality.	High	Hydrology, Water Quality	Long term



Impairments:

- Conversion from pervious to impervious surfaces increases magnitude, duration and frequency of peak flows and reduces summer base flows.
- Streambank hardening, channelization, and incision.
- Limited Channel Migration Zones (CMZs).
- Shade levels below state targets in lower reaches.
- Inadequate stormwater treatment and flow control.
- Failing septic systems.
- Poor agricultural practices contribute to water quality degradation.
- Fish passage barriers.
- Disconnected floodplains due to diking, roads, and railroads.
- Impaired streambank stability.
- Lack of large woody debris.
- Low pool and riffle frequency.
- Lack of side channel habitat due to channelization, filling, and bank armoring.
- Sedimentation and compaction of spawning gravels.
- Degraded riparian conditions.

Impairments:

- Impaired water quality – TMDL for fecal coliform, turbidity,

Programmatic Restoration Opportunities:

- F-1, F-3, F-6, F-9, H-1, H-3, H-7, WQ-2, WQ-4, WQ-5, WQ-12, NN-2, R-3, R-5, R-6, R-8, R-9, W-2, SW-1, SW-2, SW-3, SW-4 (see Table D-1)
- Reconnect, restore, and protect cold-water side channels.
- Manage forest practices, agriculture, and development to minimize impacts to sediment supply, runoff, and water quality.
- Remove or limit ponds to improve water temperatures.
- Continue to build on reforestation projects being undertaken by Clark County in the Salmon Creek Greenway.
- Control reed canarygrass and plant native vegetation in wetlands associated with lower Salmon Creek.
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Vancouver-Clark Parks and Recreation web page: http://www.cityofvancouver.us/parks-recreation/make_difference/parktrail_volunteering.asp
- Clark County Legacy Lands web page: <http://www.co.clark.wa.us/legacylands/index.html>
- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Stormwater Needs Assessment Program reports.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:

temperature.

- Stream channel avulsion into gravel pits.

<http://www.lcfrb.gen.wa.us/default1.htm>.

- G. Wade. 2001. Salmon and Steelhead Habitat Limiting Factors – WRIA 28. <http://www.scc.wa.gov/index.php/259-WRIA-28-/View-category.html>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.html>. Accessed February 2010.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper Watershed	<ul style="list-style-type: none"> • Protect headwaters above 182nd Avenue for coho and steelhead spawning. 	High	Habitat	Long term
All Reaches	<ul style="list-style-type: none"> • Revegetate the mainstem particularly within the Greenway. 	High	Habitat	Short term
Upper Watershed	<ul style="list-style-type: none"> • Plant conifers and hardwood tree in riparian areas of RM 21.4 to 22.3 to increase large wood availability. 	Medium	Habitat, LWD	Short term
SALM_CR_01	<ul style="list-style-type: none"> • Stabilize the streambank and enhance in-stream habitat between I-5 and Highway 99 where the mainstem avulsed into streamside gravel mining ponds in 1996. 	High	Hydrology	Long term
SALM_CR_01	<ul style="list-style-type: none"> • Reestablish floodplain connectivity and protect floodplain wetlands in the lower and middle reaches of Salmon Creek. 	Medium	Hydrology	Long term
All Reaches	<ul style="list-style-type: none"> • Limit intensive use of stream channel at Salmon Creek County Park during fall Chinook and chum salmon spawning, egg incubation, and early rearing periods. 	High	Habitat, Access	Short term
RM 0.6	<ul style="list-style-type: none"> • Enhance wetlands along lower Salmon Creek floodplain. 	High	Habitat, Hydrology	Long term
SALM_CR_01	<ul style="list-style-type: none"> • Acquire parcels near Salmon Creek treatment plant for wetland enhancement (Clark County Legacy Lands potential acquisition project). 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in Stormwater Needs Assessment Program reports. 	High	Habitat	Short term

Impairments:

- Conversion of forests to agricultural and residential uses.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces.
- Undersized culverts.
- Non-native invasive vegetation in riparian areas (particularly reed canarygrass and Himalayan blackberry).
- Degraded water quality.
- Runoff from agricultural areas.
- Small private dams and associated ponds on tributaries.
- Incised channels.
- Creation of drainage channels.
- Disconnected floodplain.
- Streambank damage in upper reaches caused by livestock access and clearing.
- Lack of large woody debris.
- Poor pool quality.
- Lack of riparian habitat diversity.

Programmatic Restoration Opportunities:

- NN-2, W-1, H-1, WQ-8, WQ-9, WQ-12, F-4, F-6, R-6, R-8, R-9 (see Table D-1)
- Protect floodplain wetlands in upper reaches.
- Increase large woody debris availability in lower reaches.
- Protect headwaters for coho and steelhead spawning.
- Explore potential restoration opportunities with WSDOT as part of the future SR502 widening project.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Water Resources. 2008. 2007 Stormwater Needs Assessment Program – Mill Creek Subwatershed Needs Assessment Report.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
MILL_CR_01	<ul style="list-style-type: none"> • Address fish passage barrier at NE 179th Street crossing. 	Medium	Access	Long term
MILL_CR_01	<ul style="list-style-type: none"> • Protect forest and wetland habitats on property near WSU Vancouver campus, through acquisition or easements. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	Medium	Habitat	Short term

CURTIN CREEK	WRIA 28	Salmon Creek Tributaries & Lakes
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- Impairments:**
- Loss of floodplain and associated wetlands.
 - Impaired floodplain connectivity due to culvert crossings.
 - Lack of riparian habitat diversity and large woody debris availability.
 - Channel straightened and incised.
 - Conversion of forests to agriculture resulting in increased drainage ditches.
 - Poor pool quality.
 - Impaired water quality.

- Programmatic Restoration Opportunities:**
- W-1, R-9, F-6, WQ-4, WQ-8, WQ-9 (see Table D-1)
 - Protect headwaters for coho and steelhead spawning.
 - Protect all associated wetlands, especially those with floodplain connectivity.

- Information Sources and Organizations:**
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
 - Ecology, Water Quality Improvement Project: Salmon Creek Area TMDL, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/SalmonCr/SalmonCr.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Protection of all associated wetlands.	Medium	Habitat, Hydrology	Long term

MORGAN CREEK**WRIA 28****Salmon Creek Tributaries & Lakes****Impairments:**

- Deforestation and conversion of forests to agricultural and residential uses.
- Section of stream channelized and culverted.
- Damaged streambank due to livestock access.
- Clearing and draining of wetlands for agricultural use.
- Lack of large woody debris.
- Poor pool quality.
- Elevated fecal coliform levels.
- Runoff from agricultural land and roads.
- Invasive species in riparian areas.
- Lack of shade in some areas.
- Excess sediment loading from developed and agricultural areas.
- Failing road culverts.

Programmatic Restoration Opportunities:

- W-2, F-4, F-5, F-6, F-9, NN-2, R-3, R-4, R-6, R-9, WQ-4, WQ-5, WQ-8, WQ-12, SW-1, SW-2 (see Table D-1)
- Acquire parcels containing intact habitat.
- Disconnect or provide shade to ponds that affect stream water temperature.
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Clean Water Program. 2010. 2009 Stormwater Needs Assessment Program – Morgan Creek/Salmon Creek (RM 14.66) Subwatershed Needs Assessment Report.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper watershed	<ul style="list-style-type: none"> • Restore riparian forest canopy along 1-mile reach downstream of NE 182nd Avenue. 	Medium	Habitat	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Hydrology	Long term
MORG_CR_01 and SALM_CR_03	<ul style="list-style-type: none"> Preserve mature forest near confluence of Morgan and Salmon Creeks. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> Investigate acquisition of parcels for habitat preservation, wetland creation, and additional stormwater facilities, at locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat, Hydrology	Long term

Impairments:

- Conversion of forests to residential and agricultural uses.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces, clearing, and ditching.
- Impaired streambank stability.
- Limited side channel habitat.
- Lack of large woody debris.
- Elevated stream temperatures.
- Invasive vegetation in riparian areas.
- Runoff from agricultural lands and roads.
- Lack of stream shading in some areas.
- Failing culverts.

Programmatic Restoration Opportunities:

- F-4, F-5, F-6, F-9, R-4, R-5, R-9, SW-1, SW-2, SW-4, NN-2, WQ-12 (see Table D-1)
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Clean Water Program. 2010. 2009 Stormwater Needs Assessment Program – Rock Creek/Salmon Creek (RM 22.20) Subwatershed Needs Assessment Report.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower Watershed	<ul style="list-style-type: none"> • Prevent riparian degradation, especially at RM 0 to RM 1.1. 	High	Habitat	Long term
Lower Watershed	<ul style="list-style-type: none"> • Improve riparian condition by hardwood and conifer riparian plantings to increase large woody debris recruitment at RM 0.0 to 1.1. 	High	Habitat, LWD	Short term
Various	<ul style="list-style-type: none"> • Investigate acquisition of parcels for restoration, habitat preservation, wetland creation, and additional stormwater facilities, at locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Conduct further analysis of fish passage barriers and replace culverts as needed in locations noted in 2009 SNAP report. 	Medium	Habitat, Fish access	Long term

BATTLE GROUND LAKE**WRIA 28****Salmon Creek Tributaries & Lakes****Impairments:**

- Infestation of Brazilian elodea.
- Impacts from public recreational uses as state park.

Programmatic Restoration Opportunities:

- R-3, NN-3 (see Table D-1)
- Restore native vegetation along lakeshore impacted by recreational activities.
- Public education and outreach.

Information Sources and Organizations:

- Clark County Monitoring Documents web page:
<http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Washington State Parks web page:
[http://www.parks.wa.gov/parks/?selectedpark=Battle Ground Lake](http://www.parks.wa.gov/parks/?selectedpark=BattleGroundLake).

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Continue efforts to reduce and remove invasive aquatic plants.	High	Habitat	Short term