

Willamette Basin Restoration Priorities

Watershed Summaries

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Willamette Basin Restoration Priorities: Watershed Summaries

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Appendix: Watershed Limiting Factors List and Descriptions

Introduction

The Watershed Restoration Summaries were developed by local watershed councils and other stakeholders to help identify priorities for restoring fish and wildlife habitat and water quality throughout the Willamette Basin. These summaries will assist OWEB in selecting projects for voluntary restoration actions, mostly on private lands.

There are a number of comprehensive planning efforts in the Willamette Basin, including the Willamette Subbasin Plan, the Willamette River Basin Planning Atlas, and other regional habitat restoration prioritization frameworks. This document is not intended to replace these efforts. The intent is to work within the context of these basin-scale studies to produce a locally derived and accepted set of watershed restoration priorities.

The Watershed Restoration Summaries focus on a “ridgetop-to-ridgetop” perspective, encompassing terrestrial, riparian, and aquatic habitats. This broader watershed context is the basis for developing restoration project priorities that address key factors limiting fish and wildlife populations, biological diversity, and water quality. The conclusions are based on local watershed assessments, other studies, and restoration action plans.

These summaries outline aquatic and terrestrial restoration priorities and geographic focus areas within three major themes:

- Restoration of habitat connectivity (e.g., fish passage and wildlife corridors);
- Restoration of key watershed processes and functions (e.g., large wood delivery, water flows, sediment transport, and disturbance regimes); and
- Restoration of aquatic, riparian, wetland, and upland habitats, including addressing habitats for ESA-listed species and areas that impact water quality.

In addition to the Watershed Restoration Summaries, the watershed councils and other interests have developed a database that describes key factors that limit fish, wildlife and water quality within Willamette Basin watersheds (5th-field hydrologic units). Identifying limiting factors for Willamette Basin watersheds, in combination with the additional information contained in the summaries, provides a framework for selecting restoration projects that address key issues affecting fish and wildlife populations and water quality. The database is available from OWEB. A description of the limiting factors is provided in an appendix to this document.

Scappoose Bay Watershed

Scappoose Bay Watershed

Restoration Priorities

AQUATIC

The Scappoose Bay Watershed historically supported five of the salmonid species found in the Pacific Northwest (coho, chinook, chum, winter steelhead, and cutthroat trout). Coho, winter steelhead, and cutthroat trout continue to utilize many of the main creeks and tributaries for spawning and rearing. Chinook still utilize the lower sections of the creeks and the estuary, but chum have not been documented in the watershed since the 1960's. The Scappoose Bay Watershed Council (SBWC) worked with David Evans and Associates to complete the *Scappoose Bay Watershed Assessment* in 2000 (DEA, 2000). The assessment examined watershed conditions and identified critical refugia areas.

Identification of refugia or "core areas" for salmonids was based on distribution and abundance of populations and relatively intact habitat areas. The key sub-watersheds are Milton and Scappoose Creeks with the highest diversity and largest populations of salmonids. The focal watershed is S. Scappoose Creek as it contains the greatest amount of intact habitat remaining in the entire watershed. Secondary focal watersheds include Raymond, Cox, Salmon and the headwaters of N. Scappoose Creek. These watersheds are more heavily impacted but remain important refugia areas due to the amount of lower gradient tributary habitat. The Scappoose Bay Bottomlands is high priority nodal habitat as it represents a large area of floodplain in its original condition. This area provides critical habitat for a large diversity of species (amphibians, waterfowl, mammals, and rearing areas for salmonids).

Along with critical salmonid habitat, the watershed contains substantial forest resources, wetlands, and remnants of increasingly rare upland habitat such as oak-prairie savanna. The construction of dikes and alteration of the historic flood patterns has heavily impacted the riparian and wetland communities. Residential and commercial development of the historic Columbia River floodplain areas, and the valleys of the main streams, has fragmented and altered the remaining upland plant communities. Some effort has been made to track critical plant species in the watershed, but a more comprehensive effort is needed to understand the impacts of development on the different plant communities in the watershed.

Connectivity/Passage

The SBWC has identified correction of fish passage barriers is one of the most cost effective and successful methods to restore fish habitat. The assessment, *A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed*, conducted on behalf of the watershed council, shows that barriers have a significant cumulative impact on fish habitat on most streams in the watershed. The assessment used biological criteria and findings of the Scappoose Bay Watershed

Scappoose Bay Watershed

Assessment to prioritize barriers for each sub-watershed and for the watershed as a whole. The priorities are based on whether the barrier is in a key watershed (Milton and Scappoose Creeks), is a complete or partial barrier, and on the habitat index score (based on whether the barrier blocks access to upstream refugia and the length of potential upstream habitat).

Geographic Priorities: Refugia streams and tributaries including: 1) South Scappoose Creek and tributaries (Raymond, Gourlay, and Lacey Creeks), 2) North Scappoose Creek and tributaries (Alder, Brush, Fall, Siercks, Cedar, and Lizzie Creeks), 3) Milton Creek and its tributaries (Cox, Salmon, and Dart Creeks). The Scappoose Bay Estuary is a critical nodal habitat and also a priority for barrier removal.

Considerations for project prioritization: Continue to remove remaining high priority barriers recommended in A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed.

Watershed Process & Function

Streams

The headwaters of North and South Scappoose Creek contain the greatest amount of intact habitat remaining in the watershed. Most of the land is owned by private timber companies and is currently being logged or probably will be logged in the near future. BLM manages a small portion of the headwaters forest areas. The area contains a large percentage of steep and potentially unstable slopes.

The mainstem valleys of Scappoose and Milton Creeks have been converted to pastureland and rural residential properties. Historically, these valleys were likely among the most productive salmon habitat in the watershed and important for the greatest diversity of species and life stages of salmonids. These reaches were probably highly connected with adjacent forested floodplains and contained off-channel rearing habitat with a variety of instream habitat (DEA, 2000). On Milton Creek, historic logging practices have stripped the stream of spawning gravel and large woody debris.

Geographic Priorities:

- South Scappoose Creek and tributaries (Raymond, Gourlay, and Lacey Creeks)
- North Scappoose Creek and tributaries (Alder, Brush, Fall, Siercks, Cedar, and Lizzie Creeks)
- Milton Creek and its tributaries (Cox, Salmon, and Dart Creeks)

Considerations for project prioritization: In-stream restoration - Encourage the natural reconstruction of habitat diversity in high priority streams, primarily through the placement of large woody debris. Assist the City of Scappoose to move substrate past

Scappoose Bay Watershed

dams on South Scappoose Creek, Lacey Creek, and Gourlay Creek. Place salmon carcasses in refugia streams to enhance nutrients. Investigate gravel and large woody debris placement options for Milton Creek.

Wetlands

The highest priority habitat identified in the Scappoose Bay watershed is the large area of estuarine channels and wetlands at the south end of Scappoose Bay. This area represents the only remaining large tract of Columbia River floodplain habitat that was not drained, diked, and converted to farmland in the lower watershed. The area contains the mainstem of Scappoose Creek, numerous tidal sloughs and ponds, and extensive beds of wapato plants. The area provides critical habitat for a diversity of fish and wildlife, including log-legged wading birds, migratory waterfowl, and rearing habitat for salmonids (DEA, 2000).

The Wetlands Conservancy developed, *The Scappoose Bay Bottomlands Conservation and Restoration Plan* (WC, 2004) to identify the remaining high quality wetlands in the area and describe opportunities for conserving and restoring these wetlands. According to the plan, there are about 40 plant associations in seven ecological systems known to occur in the Scappoose Bay Bottomlands. Some of the associations identified as conservation targets include: Columbia sedge, Pacific willow/ stinging nettle, Oregon ash/ Dewey sedge- stinging nettle, teal lovegrass/western marsh cudweed, water purslane/ swamp smartweed, and wapato.

Other wetlands in the watershed provide buffer areas for streams, flood storage, and critical habitat for rare species. Some of the species of concern include: red-legged frogs, painted turtles and northwestern pond turtles. Unusual hanging wetlands above the basalt cliffs near St. Helens are host to an amazing variety of plant species.

Geographic Priorities:

- The Scappoose Bay Bottomlands, particularly properties identified in the Conservation and Restoration Plan prepared by the Wetlands Conservancy
- Wetland areas along high priority streams
- Wetland with rare species plant and animal species (ex. hanging wetlands above the city of St. Helens)
- Confluences of major streams and Scappoose Bay (Scappoose Creek, Milton Creek, and McNulty Creek)

Scappoose Bay Watershed

Considerations for project prioritization: Work with landowners to manage invasive species and enhance existing native populations. Remove or restructure failing barriers and water control structures. Work with owners of significant wetland areas to protect the properties through conservation easements or acquisitions.

UPLANDS

Uplands in the Scappoose Bay Bottomlands have been heavily impacted by invasive species. Native understories in the remnants of oak savannas and wet prairies have been almost completely replaced by Himalayan blackberry, European pasture grasses and common herbaceous weeds. Much of the remaining oak savanna habitat has been converted to oak- Douglas fir woodlands (WC, 2004).

There is only an estimated one percent of historic old growth forest left in the watershed. While there are substantial forest resources left in the watershed, most of the forestland is privately held and slated for eventual harvest. BLM manages small pockets of high quality forestland as late-successional reserve. There is a need to identify and protect the most critical forestland in headwaters areas and along refugia streams.

Geographic Priorities:

- The upland portion of the Scappoose Bay Bottomlands
- Forestland along in the headwaters and along high priority streams
- Rare or threatened plant communities

Considerations for project prioritization: Work with landowners to manage invasive species and enhance existing native populations. Work with owners of significant upland areas to protect the properties through conservation easements or acquisitions.

Scappoose Bay Watershed

References

Scappoose Bay Watershed Assessment (David Evans and Associates, Inc., 2000)

A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed (David Evans and Associates, Inc., 2001)

The Scappoose Bay Watershed Action Plan (Scappoose Bay Watershed Council, 2003)

Scappoose Bay Bottomlands Conservation and Restoration Plan (The Wetlands Conservancy, 2004)

Columbia Slough Watershed

Columbia Slough Watershed

Restoration Priorities

OVERVIEW

The Columbia Slough Watershed comprises approximately 50 square miles (37,741 acres) within the Cities of Portland, Gresham, Wood Village, Maywood Park, and Fairview and unincorporated Multnomah County. In addition to these six jurisdictions, activities within the watershed also fall under the jurisdiction of Metro, three drainage districts and the Port of Portland.

According to the 2000 U.S. census, 158,000 people live within the Columbia Slough Watershed—five percent of Oregon's population. A diverse population, including African American, Native American, Hispanic, Eastern European, Southeast Asian, and Pacific Islanders reside, work, and recreate in the watershed's neighborhoods.

The watershed is comprised of a system of wetlands, lakes, channels and uplands within the former floodplain of the Columbia River, spanning 18 miles from Fairview Lake to the Willamette River. The waterway is divided into five distinct reaches: the Lower Slough, Middle Slough, Upper Slough, Fairview Lake, and Fairview Creek.

Uplands are those areas outside the historic floodplain. Approximately 60 percent of the watershed is located outside the historic Columbia River floodplain. The Columbia Slough does not exist as an isolated waterway. Its adjacent wetland, riparian, and upland areas constitute an integrated, interdependent ecological system.

CURRENT CONDITIONS

Land use within the Columbia Slough Watershed is approximately 20 percent industrial and commercial, 24 percent residential, and 36 percent parks, open space, and vacant land. Agricultural use, which dominated the watershed during the late 1800s, now comprises less than 500 acres of land, with only a handful of farms still operating. About 85 percent of the watershed is privately held, and 15 percent is publicly owned. Today, much of Portland's industrial and commercial land is within the watershed's boundaries. Over the years, the watershed has developed from a natural system to agricultural, then industrial, commercial, and residential uses, and the ground has been covered by houses, streets, parking lots, warehouses, and industrial campuses. David Evonuk at Portland State University described the watershed in terms of six different land uses, from industrial to rural. The study estimated the percentage of total impervious area of the Columbia Slough Watershed to be 54 percent (Evonuk 1999).

Along the 60 miles of stream bank, approximately one-third of the land is used for residential purposes and about one-half is committed to commercial/industrial uses. Upland development is largely residential and commercial and occupies the southern portion of the watershed.

The watershed contains 43 schools, two universities, one community college, six golf courses, international marine terminals, and an international airport.

The only streams still flowing in the upland portion of the watershed are Upper Wilkes Creek, Osborne Creek, Fairview Creek, and No Name Creek. Outside of Fairview Creek, habitat in the upland portions is

Columbia Slough Watershed

largely confined to city parks (ranging in size from 1 to 205 acres) with a coniferous canopy, lawn grasses, and limited wildlife species. Portions of Rocky Butte Park (290 acres) and the Grotto complex provide conifer canopy with other opportunities for understory diversification.

Natural resource areas in the watershed include the waterway, riparian areas, wetlands and two core habitat areas - the Smith and Bybee Wetlands Natural Area (2,000 acres) in the lower watershed and the Big Four Corners Natural Area (200 acres) in the upper watershed. These areas provide habitat for a diverse array of resident, migratory, breeding, and wintering fish and wildlife species. Twenty-six fish species have been identified in the Columbia Slough, including federally listed coho and Chinook salmon and steelhead trout. More than 175 species of birds have been recorded in the complex of wetlands, forests, and grasslands, and thousands of waterfowl winter in the Columbia Slough's wetlands. Black cottonwood, ash, and willow offer a shady screen from nearby industrial and commercial areas. A significant Great Blue Heron rookery is found in a black cottonwood grove in the Smith and Bybee Wetlands Natural Area.

Coyote, deer, and an occasional fox live in the upland and riparian habitats, and cougars have been spotted near Blue Lake. The mainstem and secondary channels and lakes are home to beaver, muskrat, otter, several amphibian species, and listed turtle species. Western pond turtles are a U.S. Fish and Wildlife Service (USFWS) species of concern and an Oregon Department of Fish and Wildlife (ODFW) critical species. The watershed also contains two significant populations of the Western painted turtle, an ODFW critical species.

The watershed serves as a critical wildlife corridor from the Sandy River Delta to the Willamette River. In addition to providing an important corridor, several sites provide core habitat for wildlife, as mentioned above: the Big Four Corners area, Kelley Point Park, Vanport Wetlands, and Smith & Bybee Wetlands Natural Area. The watershed is an important link in Portland's chain of urban natural areas, and on a larger landscape scale, has proximity to other large regional core habitat areas: Sandy River Delta lands, Sauvie Island State Wildlife Area, Vancouver Lake and lowlands, Ridgefield National Wildlife Refuge, and Forest Park. The watershed provides important stopover, wintering, and breeding habitat for north and southbound migratory bird species (songbirds, shorebirds, waterfowl, and raptors).

IMPAIRMENTS / LIMITING FACTORS TABLE

Watershed Attribute	Columbia Slough Watershed Condition
Flow	<ul style="list-style-type: none">▪ The Slough's hydrology has been substantially altered from historical conditions. Altered Willamette and Columbia river flows and the watershed's flood control system of levees and pumps have dramatically altered the normal seasonal water elevations.▪ Ditching, draining, filling and piping of overland flows have degraded the quality of the floodplain and waterway.▪ Most of the watershed's perennial and intermittent streams and springs have disappeared, eliminating a source of cold-water inputs to the Slough.
Floodplain Function	<ul style="list-style-type: none">▪ The Lower Slough contains the watershed area subject to 100-year flooding and more closely connected with the floodplain, because it has low areas that are unprotected by levees.▪ The Middle and Upper Columbia Slough are disconnected from their floodplain through levees and water level management, and the floodplain contains extensive urban development. The floodplain no longer provides many of the critical ecological functions that maintain watershed health.

Columbia Slough Watershed

Watershed Attribute	Columbia Slough Watershed Condition
Riparian and Floodplain Vegetation	<ul style="list-style-type: none"> ▪ The riparian areas along the Slough are generally narrow and fragmented. ▪ Riparian areas have a high percentage of understory invasive species, reducing its value in providing bank erosion control, a contiguous riparian corridor for wildlife and breeding habitat for neotropical migratory birds.
Channel Structure	<ul style="list-style-type: none"> ▪ The channel morphology is simplified. The channel lacks important habitat features such as large wood and off-channel habitat. ▪ Overly steep banks preclude interaction between the Slough and its floodplain, and are prone to erosion and instream slumps. ▪ Channel substrate is composed primarily of fine sand and silt sediments, including contaminated sediments, and provides limited habitat for a diverse benthic macroinvertebrate community.
Channel Connectivity	<ul style="list-style-type: none"> ▪ Culverts in the Middle and Upper Slough hinder stream connectivity resulting in limited mobility for aquatic and terrestrial species. ▪ The culverts impounded water, providing ideal conditions for the growth of algae and macrophytes.
Wildlife Habitat	<ul style="list-style-type: none"> ▪ Loss of oak woodland and prairie habitats in the watershed has resulted in a decline in specialist wildlife species in the watershed. ▪ Extensive populations of numerous invasive plant species dominate the watershed and form dense monotypic stands, providing very limited food and cover value for native wildlife species. ▪ Upland areas contain little native forest and include primarily fragmented habitat areas such as city parks and street tree canopy that offer limited habitat value for native wildlife populations and lack of safe corridors for travel.
Contaminated Water, Sediments, Soils and Biota	<ul style="list-style-type: none"> ▪ Fish in the Columbia Slough have elevated levels of persistent organic chemicals that pose a human health risk. ▪ Some contaminated sites contain elevated levels of heavy metals, especially lead and chromium, which may adversely affect benthic organisms and wildlife. ▪ Sediment in the Marx-Whitaker Slough, between NE 122nd and 128th Avenues, contains persistent pesticides that are toxic to benthic organisms.
Water Quality Parameters	<ul style="list-style-type: none"> ▪ Elevated pathogen levels are occasionally high enough to pose a human health risk. ▪ Summer water temperatures are too warm to support cold-water aquatic species. ▪ Eutrophication creates conditions that limit the ability of aquatic species and benthic organisms to survive and thrive in the Slough. ▪ In the fall and winter, high BOD loadings result in low dissolved oxygen concentrations limit the ability of fish and benthic organisms to survive and thrive in the Slough.
Biological Communities	<ul style="list-style-type: none"> ▪ Benthic macroinvertebrate diversity is low, which limits available food resources to other aquatic and terrestrial species. ▪ Throughout the watershed, native fish and wildlife species are in decline, resulting in lower overall biodiversity and an abundance of a few non-native species. Anadromous salmonids are no longer present in the Middle and Upper Slough, reducing the overall diversity of native fish species in the Columbia Slough. Anadromous salmonids are present in the Lower Slough, although in fewer numbers, reducing the overall diversity of native fish species in the Columbia Slough. ▪ Throughout the watershed, the abundance of non-native fish and wildlife species is resulting in declining populations of most native fish and wildlife species.

APPROACH AND CRITERIA TO IDENTIFY AND PRIORITIZE RESTORATION EFFORTS

The Columbia Slough Watershed has been the subject of more than 30 years of studies and evaluations. A request for information was sent to all major stakeholders, agencies, consulting firms, municipalities, and individuals who have engaged in environmental, recreational, or operational activities in the watershed. As a result, 387 historic documents, studies, reports, maps, and data sets were collected.

Typically, a watershed assessment is conducted before preparing a Watershed Action Plan for the Oregon Watershed Enhancement Board (OWEB). Because there is such extensive information for the Columbia Slough Watershed, the existing materials were used to identify watershed characteristics and conditions, in lieu of a watershed assessment.

Following a detailed review of the relevant documents, information was compared with OWEB's Watershed Assessment Guidance criteria. This comparison is called an Information Gap Analysis. It is used to identify inadequate or critical missing information, determine if sufficient information exists to adequately assess the condition of the watershed, and recommend data gaps to be filled.

The Information Gap Analysis helped the Columbia Slough Watershed Council prioritize programs and projects for the Action Plan. It also identified impairments of the Slough.

The Columbia Slough Watershed Council used an objective three-step process to identify, process, and evaluate projects:

- Step 1: Identify and classify potential projects.
- Step 2: Rank potential projects based on environmental and social criteria.
- Step 3: Rank potential projects based on cost and support.

Based on the results of the three-step process, 85 projects and programs were ranked as having top or high priority. Projects and programs received a top-priority ranking if they addressed the majority of watershed impairments and were likely to receive significant support. Projects and programs received a high-priority ranking if they addressed some of the watershed impairments. Projects submitted after publication of the Watershed Action Plan in 2003 have gone through a similar ranking process and are added into a project database.

Additional projects included in this report were identified in the following reports:

- City of Portland Environmental Services in *Actions for Watershed Health: 2005 Portland Watershed Management Plan* (2005);
- Fairview Creek Watershed Council in Fairview Creek Watershed Action Plan (2003); and
- Oregon Department of Fish and Wildlife in their *Comprehensive Wildlife Conservation Strategy for Oregon* (2005).

Columbia Slough Watershed

COLUMBIA SLOUGH WATERSHED RESTORATION PRIORITIES

AQUATIC

Aquatic areas found in the Columbia Slough are diverse and provide habitat for a variety of native and non-native fish and wildlife species. Additionally, these habitat areas are diverse in the ways that they are managed. For instance, approximately half of the historic floodplain is managed for flood control by Multnomah County Drainage District.

Each of the following sections provides a brief overview of the habitat type or reach of the Columbia Slough. These descriptions are followed by a list of focal species for the habitat or reach and a sample list of projects for habitat type or reach. The primary sources include the following: Columbia Slough Watershed Council Watershed Action Plan (2003), City of Portland's Actions for Watershed Health: Portland Watershed Management Plan (Draft 2005), and Oregon Department of Fish and Wildlife's Comprehensive Wildlife Conservation Strategy (2005).

Lower Columbia Slough and North Columbia Slough

The Lower Columbia Slough (RM 0-8.6) is subject to tidal influences and maintains a hydrologic connection to the Willamette River. Water levels are also affected by pumped flows from the Middle Slough. The Lower Columbia Slough is separated from the Middle Slough and the Peninsula Canal by levees located near NE 18th Avenue, but connected hydraulically to Middle Slough by gravity gates or pumping at MCDD Pump Station No. 1. The levee near NE 18th Avenue functions as a fish passage barrier, restricting available anadromous fish habitat to the Lower Columbia Slough.

The North Slough is approximately 1 mile long; lies south of Bybee Wetland and north of (the closed) St. Johns Landfill. The in-channel habitat is marginal to poor, largely because of lack of habitat diversity, marginal in-channel cover, and substrate dominated by 100 percent silt. The north bank is composed primarily of mature Oregon ash. The Lower Columbia Slough is connected to Smith and Bybee Wetlands via North Slough (RM 0-1) through a water control structure that allows fish passage. Rearing juvenile Chinook and coho salmon and steelhead trout use the Lower Slough and have access to over 1,000 acres of refugia habitat in Smith and Bybee Wetlands.

Off-channel habitat areas of Lower Columbia Slough

Along the nine miles of the Lower Columbia Slough, several important off-channel habitat areas provide rearing and refuge habitat for rearing juvenile Chinook and coho salmon and steelhead trout. These ponds, lakes, and off-channel open water areas are remnants of the large, shallow, open water lakes and sloughs historically found in the Columbia River floodplain. They are scattered throughout the lower watershed and are most often ringed by riparian and emergent marsh vegetation. Some of these areas provide only seasonal rearing habitat, while others provide year-round water. Water levels vary but generally correlate to the water levels in the Columbia and Willamette Rivers.

Middle and Upper Columbia Slough, including Buffalo Slough and Whitaker Slough and associated lakes and ponds

The Middle Slough extends east 6.9 miles from the levee near NE 18th Avenue to the cross-dike levee at NE 142nd Avenue. Adjacent land use is predominantly commercial/industrial, with interspersed residential areas and open space, including golf courses. No detailed habitat assessment has been completed in the Middle Slough.

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The Upper Columbia Slough extends 3.3 miles from the cross-dike levee at NE 142nd Avenue to the weir at Fairview Lake. Adjacent land use is predominantly commercial/industrial; extensive open space and agriculture upstream of NE Airport Way is rapidly being converted to commercial/industrial. No detailed habitat assessment has been completed in the Upper Slough.

Buffalo Slough is a 1.0-mile-long channel extending east from its confluence with Middle Slough at NE Argyle Street to just west of NE 43rd Avenue. Several culverts and extensive macrophytes restrict flow through the Broadmoor Golf Course. In-channel habitat quality is poor, according to habitat surveys conducted by HARZA Engineering in 2000.

Whitaker Slough extends from confluence with Middle Slough near NE 42nd Avenue to NE 128th Avenue. Adjacent land use is predominantly commercial/industrial, with interspersed residential areas and open space. In-channel habitat ranges from sub-optimal to poor, according to habitat surveys conducted by HARZA Engineering in 2000.

Several lakes and ponds are also found in the upper watershed, including Whitaker Ponds, Johnson Lake, Mays Lake, Prison Pond.

Secondary Channels in Columbia Slough Watershed

Throughout the three managed drainage districts, approximately 20.0 miles of small, secondary channels or drainageways can be found in the watershed. These secondary channels were once a part of a larger system of channels that connected to the mainstem Columbia Slough, but have been disconnected as a result of levee building, flood control measures and urban development. Hydrology is managed by pumping in these channels, and water from these channels is pumped to the Columbia Slough.

Free-flowing Streams in Columbia Slough Watershed, including Fairview, No Name, Osborn, and Wilkes

Fairview Creek extends south from Fairview Lake approximately 5 miles to its origin, a small wetland complex near SE 181st Avenue and SE Powell Boulevard, where it forms the “headwaters” of the Columbia Slough. Osborn Creek extends south from Fairview Lake approximately 3 miles to its headwaters. No Name Creek extends south from Fairview Creek approximately 1 mile to its headwaters. Fairview Creek and Osborn Creek contain the last known remaining populations of resident cutthroat trout in the watershed. Wilkes Creek extends south from the Upper Columbia Slough approximately 1 mile to its origin, a small groundwater spring near Interstate 84 and NE 155th Avenue.

Aquatic Habitat Area Sample Projects

CSWC Top-Priority and High-Priority Projects

- 1) Improve fish habitat conditions in Lower Slough (GIS #3)
- 2) Remediate sediment at all 13 former CSO outfalls in Lower Slough (GIS #37).
- 3) Remove old pilings within waterway (GIS #62).
- 4) Encourage transfer of Kenton Cove ownership to Portland Parks (GIS #19).
- 5) Create / improve turtle habitat at Whitaker Slough (GIS #45).
- 6) Remove trash from Whitaker Slough (GIS #45).
- 7) Create a wetland bench, and plant mainstem Slough from NE 92nd Avenue to I-205 to prevent bank erosion (GIS #81).
- 8) Purchase a macrophyte harvester to improve water flow during warm-weather months (GIS #110).
- 9) Replace NE 63rd Avenue / Whitaker Slough culvert with a bridge (GIS #39).

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- 10) Replace 14 culverts on Middle Slough (mainstem and Whitaker arms) with bridges (GIS #109).
- 11) Remove and replace culvert west of Fairview Lake Dam (GIS #70).
- 12) Inventory, assess, and restore all secondary drainage ditches in Multnomah County Drainage District No. 1, Peninsula Drainage District No. 1, and Peninsula Drainage District No. 2 (GIS #28)
- 13) Enhance Portland Meadows drainageway (GIS #23).
- 14) Enhance Schmeer Road Forebay Slough (GIS #22).
- 15) Enhance GI Joe's drainageway (GIS #23).
- 16) Preserve and enhance land surrounding Osborn Creek (GIS #67).
- 17) Restore and enhance Fairview Creek site near NE 202nd and Division (GIS #68).

Fairview Creek Watershed Council Action Plan Priority Projects (recently merged with CSWC)

- 1) Fairview Creek Headwaters – Establishment of shrub-scrub vegetation and management of invasives; Construction of pedestrian bridge and conversion of historic railroad tracks to Gresham-Fairview Recreation Trail; Development of new City of Gresham Park; Outreach to agricultural landowners adjacent to site; Outreach to homeowners in Centennial neighborhood
- 2) Fairview Creek near Division Commercial Park – Restoration of native vegetation; Implement business watershed stewardship outreach program; Catch basin inserts
- 3) Fairview Creek near Ruby Junction – Supplement native plantings from recent bank fill removal project; Development of Business Watershed Stewardship outreach program; the FCWC has identified this as a potential pilot program site with willing business landowners
- 4) Fairview Creek from NE 202nd Avenue to Burnside – Support City of Gresham Department of Environmental Services (DES) operations on Baltz Creekside Subdivision Bioswale; Homeowner and business outreach; Native vegetation restoration with willing landowners; Removal of unnecessary impervious surfaces with willing landowners
- 5) Fairview Creek from Burnside to Stark streets – Development of FCWC homeowner outreach program with City of Gresham DES; This project is intended to be a pilot Naturescaping Outreach project with willing residential landowners
- 6) Fairview Creek from Stark Street to Fujitsu Ponds – Development of FCWC homeowner outreach program with City of Gresham DES; Land acquisition with willing landowners
- 7) Fujitsu Ponds – Restoration of native vegetation where needed and invasive species management; Further study of scope and feasibility of wetland and channel restoration; Creation of wetland benches and/or other wetland restoration techniques to mitigate depth of ponds; Development of recreational and interpretive trails and improved public access
- 8) Salish Ponds Wetlands Park – Development of vegetation restoration and education outreach plans; Coordinate restoration plans with Reynolds School District adoption; Further study of the site potential for wildlife and water quality improvements
- 9) Fairview Community Park – Maintenance of SOLV and City of Fairview and Reynolds School District restoration site; Work with the City of Fairview on human and pet access issues in the parks
- 10) Fairview Village – Homeowner outreach program; Outreach and publicity of City of Fairview Community Development Riparian Buffer Information Binder
- 11) Fairview Creek along NE 223rd Avenue in Fairview – Neighborhood homeowner outreach program, conducted neighborhood-wide; Potential coordination with City of Fairview Community Development Department as part of Vision Process and Goal 5 planning; Outreach and publicity of City of Fairview Community Development Riparian Buffer Information Binder
- 12) Smith Memorial Church Area – Outreach with conservation planning tools, such as conservation easements, with willing landowners in riparian areas; Homeowner and business outreach
- 13) Fairview Creek from NE 223rd Avenue Crossing to Fairview Lake – Restoration of native vegetation and invasive species management; Focus on improving wildlife and water quality functions in this 5-acre wetland; Study recreation and environmental education potential on site; Work with willing landowners on homeowner outreach program on wetland stewardship and education

Columbia Slough Watershed

- 14) Fairview Lake – Continue support of Hands Around our Lakes homeowner outreach program; Work with Fairview Lake Property Owners Association with ongoing management of Fairview Lake; Further study of scope and feasibility of additional restoration opportunities; Outreach and publicity of riparian buffer planting and stewardship issues through City of Fairview Community Development Riparian Buffer Information Binder
- 15) No Name Creek – Business and homeowner outreach programs
- 16) Osborn Creek South of Sandy Boulevard – Restoration of native vegetation and invasive species management, including Himalayan blackberry and English Ivy; Homeowner outreach, including exploring zoning overlays and other conservation planning tools
- 17) Osborn Creek North of Sandy Boulevard – Restoration of native vegetation; Business watershed stewardship outreach program; Protection of existing large trees from beaver damage

TERRESTRIAL

The upland portion of the Columbia Slough Watershed is primarily located south of Columbia Boulevard. It is predominantly commercial and residential development that provides little habitat value. The small portions of upland habitat with native vegetation are isolated remnants or recently planted revegetation sites. One of the pressing habitat issues in upland areas is the connectivity of high-quality upland areas with other habitat types, including riparian areas and wetlands. Interspersion of different habitat types in the watershed with connected corridors will help provide the highest-quality habitat possible for native terrestrial and aquatic wildlife species.

Wetlands – Emergent, Scrub-shrub and Forested

The majority of the wetlands found in the Columbia Slough Watershed are relics of the once extensive complex of lakes, channels, marshes, and forested wetlands found in the historic Willamette/Columbia River floodplains. Additionally, some of the wetlands include newly constructed mitigation wetlands or water quality treatment wetlands that have been installed in locations where wetlands may or may not have existed previously.

Much of the watershed's wetland complex has been filled, dredged, channelized, and/or degraded by urban impacts. Still, the remnant wetlands provide important habitat, water quality and water quantity functions, and recreation values in the watershed. Some of these wetlands have been and are being revegetated and restored by various entities. In addition, several restored mitigation wetlands, such as Vanport Wetlands, provide high-quality habitat for over 100 bird species and a diversity of amphibian, reptile, and mammal species.

Wetlands provide a multitude of functions and values for a watershed, such as the hydrologic, geochemical, and biological processes, and water storage. The hydrogeomorphic (HGM)-based assessment method, developed by Oregon Division of State Lands in 2001, highlights 13 functions for wetlands and provides a method for rapidly assessing these functions. HGM assessments have been conducted on a small number of wetland sites in the Columbia Slough Watershed. In general, the Riverine Impounding and Slope/Flats class dominates the wetlands in the Columbia Slough Watershed.

Many of the remaining wetlands found in the watershed are isolated habitat islands. An important habitat need for many wetland wildlife species is adjacent forested upland habitat. This is especially important for many wetland-breeding amphibian species that utilize upland habitats for certain seasons or portions of their life cycle. An additional need is connectivity of wetland habitats through safe corridors to riparian areas, upland areas, and other wetland areas.

Columbia Slough Watershed

Riparian Forest

The majority of the riparian corridor in the Columbia Slough Watershed contains buildings and paved spaces, including large expanses of residential and commercial/industrial property with minimal riparian vegetation. The remaining riparian forest habitat is generally a narrow band dominated by black cottonwood, Oregon ash, willow species, and red osier dogwood, with an understory of Himalayan blackberry (non-native), common snowberry, and reed canarygrass (non-native). A few stands of Oregon white oak are also found. In general, riparian areas along the Columbia Slough are not of a sufficient width to adequately provide the important functions of riparian areas, including a contiguous wildlife travel corridor, microclimate and shade, bank stabilization and sediment control, pollution control, stream flow moderation, organic matter input, and large woody debris.

Of the approximately 96 miles of stream bank in the watershed (48 miles of main and secondary channels), approximately 6 miles along the Columbia Slough are maintained as primary levees (earthen dams) to protect land and property from flooding. These primary levees, located along Peninsula Drainage Districts No. 1 and 2 in the Lower Columbia Slough, are maintained with only grassy vegetation. To protect the integrity of the primary levees, no trees or woody vegetation are allowed to grow; therefore, the levees provide minimal riparian habitat functions. An additional 20 miles of primary levees are located under North and Northeast Marine Drive along the Columbia River.

Wildlife species diversity in the watershed is richest in the riparian fringe because both water-dependent and upland species use this habitat for feeding, resting, breeding, and cover. Upland species also use the riparian areas for travel, feeding, and other life functions. Stands of mature black cottonwood adjacent to waterways provide a particularly important habitat for great blue heron rookeries. One such rookery with over 70 nests exists adjacent to the Lower Slough.

Upland Grassland / Prairie

Numerous areas in the watershed have been severely affected by human activities. These include the St. Johns Landfill (a grassland), dredge material disposal sites, levees, empty lots, and Portland International Airport. These non-forested open areas often contain sparse scrub brush and grass vegetation, and the soil is usually fill and/or compacted. They have taken over the function of natural meadow habitat, which is non-existent in the area. Levees are included in this category because they are maintained with grassy vegetation (to ensure that trees and woody vegetation do not compromise their stability for flood control).

Although these areas are often dominated by non-native grasses and invasive vegetation, such as Himalayan blackberry and reed canarygrass, they provide limited habitat for generalist species such as moles, voles, and other small mammals. Predators such as coyotes and raptors use them extensively for hunting grounds. These areas also serve as the last remaining habitats for bird species requiring meadow habitat, such as Streaked Horned Lark and Western Meadowlark, whose populations have rapidly declined in the watershed in recent years. These species may occasionally be found in the last remaining agricultural fields in the upper watershed, at the St. Johns Landfill, and in the undeveloped portions of the Rivergate Industrial Area in the lower watershed.

The Portland International Airport (PDX) airfield is approximately 1,735 acres and contains a large expanse of non-forested open area, in addition to two primary parallel runways, taxiways, and associated roads and buildings, yet it is not suitable habitat for terrestrial wildlife. Due to Federal Aviation Administration (FAA) requirements, the Port of Portland was required to develop a Wildlife Hazard Management Plan, an integrated and adaptive program to effectively manage risk at PDX by reducing the probability of wildlife/aircraft collisions.

Columbia Slough Watershed

The species of concern at PDX include predatory birds (primarily raptors), flocking birds (especially European starlings) and species with a relatively large body mass (Canada goose and great blue heron). Predatory birds such as hawks, owls and herons pose complex challenges regarding prey base (e.g., moles and voles) management. The program utilizes a non-lethal approach to discouraging wildlife from using the airfield area and focuses on immediate operational strategies, ongoing applied research, long-term management strategies, and an information and education component. Additionally, an aircraft landing overlay zone, to provide safer operating conditions for aircraft, limits the heights of structures and vegetation in the area. Both the program and zoning overlay are important to consider when prioritizing future habitat restoration projects in the vicinity of the airport.

Oregon White Oak Woodland

Oak woodlands are characterized by an open canopy dominated by Oregon white oak. In general, the understory is relatively open with shrubs, grasses and wildflowers. The tree canopy of an oak woodlands obscures between 30 percent – 70 percent of the sky as you look up at it. In the Willamette Valley, oaks were originally found in a mosaic of prairies, oak savanna, and riparian habitats throughout the valley floor and low elevation slopes. Oaks were most common on flat to moderately rolling terrain, usually in drier landscapes, and often are found between prairie remnants and conifer forests. Today, oak woodlands often are found in small isolated pockets surrounded by other land-uses, such as development or agriculture. In the Columbia Slough watershed, oak woodlands are found as scattered remnants throughout the watershed. In the Big Four Corners core habitat area, oak woodlands are a priority habitat type for restoration.

Mixed-canopy Forest

Mixed-canopy forests in the Portland area generally occur in areas of low-density urbanization. The forested uplands in the Columbia Slough Watershed are primarily mixed deciduous stands dominated by big leaf maple, black cottonwood, red alder, Oregon ash and willow species, with occasional Oregon white oak. These forests contain a diversity of native and non-native understory vegetation.

Most conifers found in the watershed are within City parks, and on the escarpment in the eastern portion of the watershed, south of Airport Way between NE 154th Avenue and NE 181st Avenue (the Wilkes Creek and Big Four Corners area). In addition, several revegetated areas along the Slough include western red cedar, Douglas fir, and grand fir saplings.

The snags and bare-topped trees found in forested areas provide nesting and roosting habitat for various raptors. Mature stands of trees can provide important nesting habitat for cavity dwellers such as woodpeckers and tree swallows. Diverse foliage heights (limbs and stalks of varying height) correlate to increased bird species diversity. These areas of denser vegetation result in a greater abundance of small mammals, especially rodents (mice, voles), that are essential for healthy biological communities and important in bird food chains.

Miscellaneous Habitats and Priority Projects

The vast majority of land in the Columbia Slough Watershed has industrial, commercial, and residential uses. These urban areas are characterized by built structures and paved surfaces, providing minimal habitat value. Naturescaping and street trees provide shelter and forage for some tolerant species, as well as more sensitive migratory species. Street trees, in addition to providing some habitat value, help restore the natural hydrologic cycle and reduce the volume and negative effect of stormwater runoff. Residential

Columbia Slough Watershed

neighborhoods often have bird feeders, bird baths, and bird houses that support some backyard wildlife during some parts of the year.

Urban areas in the watershed typically have less species diversity and a greater percentage of exotic flora and fauna than the other habitat types. Mammals are primarily limited to tolerant, small rodents such as the non-native house mouse. Both possum and raccoon have adapted to urbanization and can often be sighted in neighborhoods, scavenging around houses for garbage and pet food. Omnivorous birds, such as the European starling (non-native) and house sparrow (non-native), and various species of gulls and corvids (crows and jays), dominate. One sensitive species, the peregrine falcon, has adapted to using Portland bridges for nesting.

Terrestrial Habitat Area Sample Projects

CSWC Top-Priority and High-Priority Projects – wetlands

- 1) Revegetate Smith-Bybee with woody plants (GIS #5)
- 2) Expand Columbia sedge meadow at Smith-Bybee (GIS#6)
- 3) Restore wet meadows at Smith-Bybee margins (GIS #7)
- 4) Construct Time Oil Road wildlife undercrossing (GIS #77).
- 5) Provide money / manpower for Fujitsu Ponds stormwater control / wetland development (GIS #114).
- 6) Improve bat habitat conditions at Smith and Bybee Wetlands Natural Area (GIS #8).
- 7) Improve turtle habitat at Smith-Bybee (GIS #9).
- 8) Restore three “inholdings” at Smith-Bybee area (GIS #11).
- 9) Add “Triangle Piece” and “Wapato Wetlands” to Smith and Bybee Wetlands Natural Area (GIS #12).
- 10) Restore floodplain capacity and native plants on Fairview Creek near NE 202nd Avenue (GIS #69).
- 11) Enhance north wetland at Old Marine Drive (GIS #76).
- 12) Enhance Time Oil wildlife corridor between the Port of Portland West Wye mitigation and Bonneville ponds (GIS #78).
- 13) Restore Force Avenue property (across from Force Lake) (GIS #80).
- 14) Restore Catellus (Big Four Corners) woods and wetlands (GIS #100).
- 15) Restore wetlands / uplands at Big Four Corners and Gresham / Portland border (GIS #111).
- 16) Improve wetland next to Blue Heron Estates (GIS #115).
- 17) Create a wetland bench, and plant mainstem Slough from NE 92nd Ave. to I-205 to prevent bank erosion (GIS #81).
- 18) Preserve and enhance wetlands at NE 33rd Avenue (GIS #63).
- 19) Preserve and enhance Interlachen wetland site (GIS #64).
- 20) Preserve and enhance “Subaru” wetlands (GIS #101).

CSWC Top-Priority and High-Priority Projects – riparian

- 1) Develop Riparian Tree Protection Plan to address beaver predation (GIS #29).
- 2) Restore land around Whitaker Ponds for Whitaker Ponds area enhancements (GIS #56).
- 3) Develop funding and incentives to maintain existing revegetation sites (GIS #61).
- 4) Restore riparian habitat at Old Marine Drive along 40 Mile Loop Trail (GIS #75).
- 5) Restore Force Avenue property (across from Force Lake) (GIS #80).
- 6) Restore Catellus (Big Four Corners) woods and wetlands (GIS #100).
- 7) Restore wetlands / uplands at Big Four Corners and Gresham / Portland border (GIS #111).
- 8) Preserve and enhance land at Big Four Corners wellhead area habitat (GIS #102).
- 9) Preserve and enhance land at Big Four Corners / Marine Drive (GIS #108).
- 10) Add lakefront and protective border along south and west side of Johnson Lake site (GIS #103).
- 11) Continue City of Portland’s Watershed Revegetation Program (Watershed wide).
- 12) Enhance riparian land south of Prison Pond on NE 112th Avenue and Simpson (GIS #58).

Columbia Slough Watershed

CSWC Top-Priority and High-Priority Projects- upland grasslands

- 1) Establish native grassland plants at St. Johns Landfill cap (GIS #16).
- 2) Restore upland grass area adjacent to T-5 mitigation site (GIS #79).

CSWC Top-Priority and High-Priority Projects – mixed canopy forest

- 1) Increase street tree plantings east of NE 82nd Avenue (GIS #57).

CSWC Top-Priority and High-Priority Projects – miscellaneous habitats

- 1) Develop Riparian Tree Protection Plan to address beaver predation (GIS #29).
- 2) Develop funding and incentives to maintain existing revegetation sites (GIS #61).
- 3) Replace 10 ac. of parking lots outside wellfield with porous paving in appropriate areas (GIS #52).
- 4) Increase street tree plantings east of NE 82nd Avenue (GIS #57).
- 5) Enhance vacant lands for development of water quality facilities (GIS #116-123).
- 6) Develop landowner incentive program for proper vegetation maintenance in environmental zones (GIS #31).
- 7) Develop 1-3 ecoroof demonstration projects for commercial and industrial buildings (GIS #53).
- 8) Pre-treat parking lot stormwater on I-5 privately owned sites (GIS #71).

TECHNICAL REFERENCES

- City of Portland, Bureau of Environmental Services. 2005. *Actions for Watershed Health: 2005 Portland Watershed Management Plan (Draft)*.
- City of Portland, Bureau of Planning. 2005. *Natural Resources Inventory Update (Draft)*.
- City of Portland, Endangered Species Act Program. 2002. *Fish Sampling Report for the Columbia Slough 2001-2002*.
- City of Portland, Parks and Recreation. 2005. *Natural Area Vegetation Inventory*.
- Fairview Creek Watershed Council. 2002. *Fairview Creek Watershed Assessment*.
- Fairview Creek Watershed Council. 2003. *Fairview Creek Watershed Action Plan*.
- HARZA Engineering Company. 2000. *Riparian and Stream Habitat Assessment for Whitaker Slough, Buffalo Slough, Wapato Wetland and North Slough*. Prepared for the City of Portland, Bureau of Environmental Services and U.S. Corps of Engineers.
- Lev, E. et al. 1994. *The Biota of Smith and Bybee Lakes Wildlife Area Management Area*. Metro Parks and Greenspaces.
- Metro Regional Government. 2003. *Goal 5 Technical Report*.
- Northwest Power and Conservation Council. 2004. *Willamette Subbasin Plan*.
- Oregon Department of Fish and Wildlife. 2005. *Comprehensive Wildlife Conservation Strategy*.

Columbia Slough Watershed

- Oregon Natural Heritage Information Center (Christy, J. et al.). 2002. Pre-settlement vegetation map for the Willamette Valley, Oregon, compiled from records of the General Land Office Surveyors (c.1850). Oregon Natural Heritage Information Center, Portland, OR.

Lower Willamette River Watershed

Lower Willamette River Watershed

Restoration Priorities

Overview

The Willamette River is the 10th largest river in the contiguous United States in terms of streamflow. The Willamette Basin (Figure 1) covers 11,460 square miles and constitutes 12 percent of Oregon. In 1990, about 70 percent of Oregon's population lived in the Willamette Basin. The lower reach of the Willamette extends from the falls at Oregon City to its confluence with the Columbia River. Portland is situated along the lower 17 of the river's 187 miles.

Topography, hydrology and land use distinguish the east and west sides of the Willamette River in Portland. The westside covers 16,325 acres and is characterized by the Tualatin Mountains (also known as the West Hills) rising from a narrow terrace along the Willamette River. The westside contains approximately 27 miles of piped streams and about 133 miles that flow in open channels, primarily those that drain Forest Park. All of the Forest Park streams flow through culverts or pipes before reaching the Willamette.

The 22,690-acre eastside area is relatively flat except for a few volcanic buttes such as Mt. Tabor and Rocky Butte. The eastside has been almost completely urbanized, and any streams that once crossed the area (other than Johnson Creek) have been diverted into sewers.

For planning purposes, the Willamette watershed is divided into 27 subwatersheds. Except for the Forest Park subwatersheds, they are all highly urbanized with impervious surfaces ranging from 25 to 90 percent. Combined sewers serve about half of the total area. In areas served by separate storm sewers, runoff is discharged to the Willamette River. Discharges to the river through combined sewer overflows (CSOs) and urban stormwater outfalls are the primary flow inputs to the river from the area.



Figure 1: Willamette Basin Dam Locations. More than two dozen major dams have altered the timing and volume of the Willamette River's flows. To view this map in color visit: www.river.ci.portland.or.us.

Conditions and Trends

Hydrology

The Willamette River Basin's storage reservoir/hydropower system has altered the Willamette River's flows (Figure 2). Winter flood flows have been reduced and summer low flows have been increased. For example, before flood control dams were built in the Willamette Basin, flows in Portland were equal or greater than the 1996 flood every six to ten years. Flow changes affect water temperature and river-floodplain interactions.

Portland-area urban activities such as channel deepening and straightening, bank hardening, removal of vegetation, and increases in impervious surfaces--both along tributary streams and in upland areas that drain to tributaries and the mainstem--have local-scale impacts on the Willamette's flows. Bank alterations and floodplain development prevent the river from overtopping its banks and connecting with its floodplain.

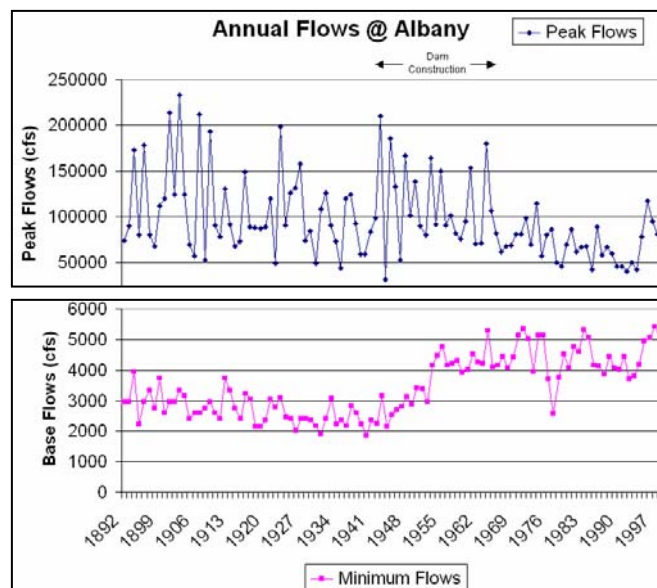


Figure 2: Willamette River Base and Peak Flows. Construction of dams throughout the Willamette Basin has increased base summer flows and decreased peak winter and spring flows. Altered flows influence habitat quality, water quality, fish

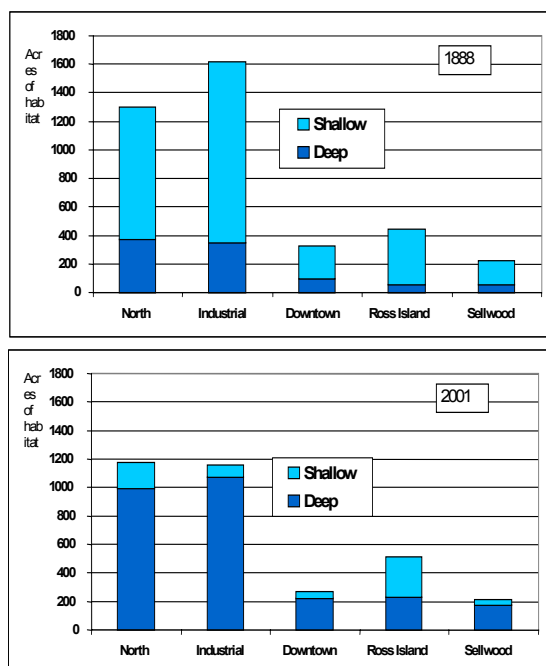


Figure 3: Changes in Shallow and Deep Water Habitat through Portland. Nearly 80 percent of the lower Willamette used to be less than 20 feet deep. Dredging, diking, and channeling of the river have reversed those figures. Nearly 80 percent of the lower river is now deeper than 20 feet.

In sum, changes caused by dams and changes in physical conditions through the Portland reach have altered the interaction between the river and its floodplain, groundwater recharge and discharge, small-scale patterns of flow and velocity, tributary inflows and the nature of the interaction between the tributaries and the mainstem. Continued growth in the Willamette Basin and in Portland will exacerbate these trends.

Lower Willamette River Watershed

Habitat

Upland habitats have been heavily impacted by development in the upland portions of the watershed with the exception of Forest Park. The mainstem has been narrowed and deepened, and off-channel habitat has been virtually eliminated. The river's banks have been hardened precluding important naturally caused channel changes and minimizing the interaction between the river and riparian and floodplain vegetation. Habitat has been simplified and large tracts of riparian vegetation have been

cleared. Actions taken as a result of new regulations and improving scientific knowledge are beginning to reverse some of these trends. However, continued demand for riverside industrial and residential land, and for development in upland areas, has the potential to compete with efforts to improve habitat.

Water Quality

Willamette River temperatures recorded in Portland and upstream regularly exceed state and federal standards during summer (Figure 4). Review of 10 years of data suggests a modest (but not statistically significant) pattern of increasing temperatures from the Morrison Bridge upstream. Progress has been made in reducing the amount of copper, lead, and bacteria in the lower Willamette River, but levels of these pollutants are still of concern. The ongoing Combined Sewer Overflow (CSO) Project ultimately will result in even

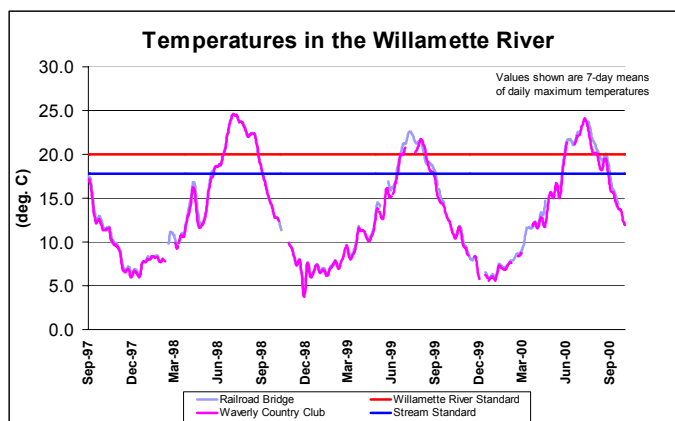


Figure 4: Temperatures in the Willamette River. Temperatures in the Willamette River routinely violate standards during the summer. Addressing temperature problems in the Willamette will require actions across the entire Willamette Basin.

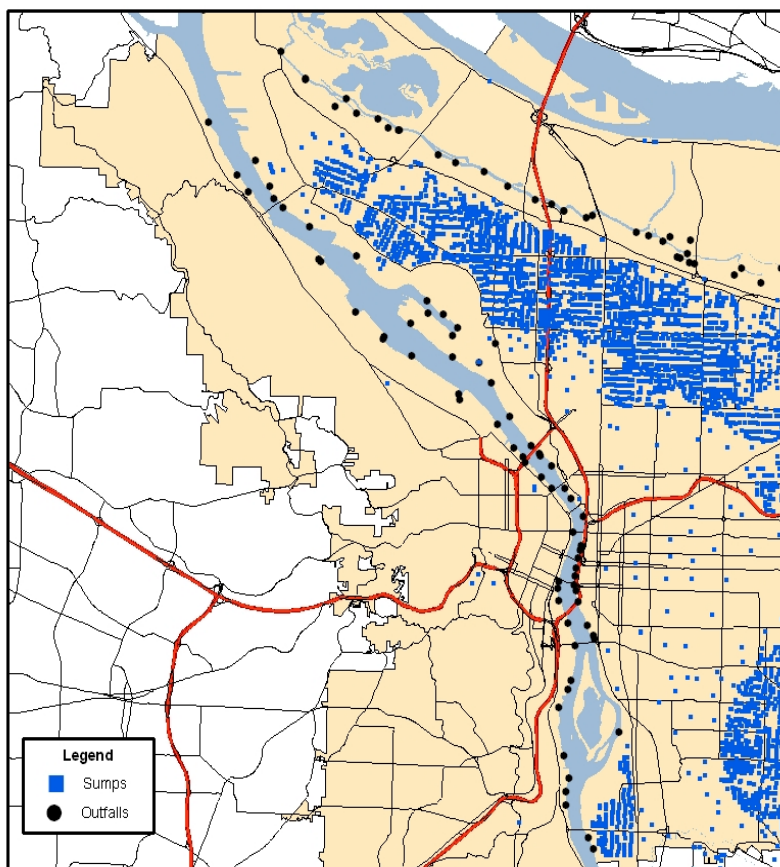


Figure 5: Storm Water Outfalls to the Willamette River. Stormwater is routed to the Willamette River and the Columbia Slough through hundreds of privately owned outfalls (not shown) and dozens of City-owned outfalls. Stormwater also is infiltrated into the ground through more than 9,000 private drywells (not shown) and public sumps and test wells (indicated by blue squares). Keeping stormwater clean to protect and improve water quality will require changes to a variety of common practices and retrofits of existing development with stormwater-friendly facilities.

Lower Willamette River Watershed

greater reductions in the bacteria entering the Willamette in Portland. However, even after the CSO Program is complete, a large amount of stormwater, and the pollutants it carries, will continue to drain to the Willamette River via hundreds of private and dozens of municipal outfalls (Figure 5), creating the need for additional watershed management actions.

Stormwater from streets and developed areas is the most important and most difficult to manage conveyor of pollution because it comes from countless diffuse sources. It is also called non-point source pollution. In addition to direct discharges to waterways, stormwater is also managed through a system of more than 9,000 sumps and test wells located in many parts of the Willamette Watershed in Portland (Figure 5). Protecting and improving the quality of stormwater entering sumps helps protect groundwater, which often returns to local waterways.

Pollutants in water often bind to sediment. Because of the level of pollution in lower Willamette River sediments, the Portland Harbor was added to the federal Superfund cleanup list in December 2000. Pollutants generated throughout the Willamette Basin, including industrial discharges, toxics carried by stormwater, and other sources have contributed to elevated levels of DDT, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and heavy metals in lower Willamette River sediment. These water and sediment issues have become more critical as regulations become more stringent and comprehensive, at the same time that new laboratory techniques allow lower concentrations to be detected.

Continued population growth and development throughout the Willamette Basin likely will increase water temperature and pollutants unless appropriate counteractive actions are taken.

Biological Communities

Development has greatly reduced the biotic integrity of the Willamette River watershed and the mainstem Willamette within Portland. Some native species of fish and aquatic insects have gone extinct, and introduced species currently occupy native species' habitat or compete with them for food, cover, and other habitat features.

In particular, local and upstream salmon populations have been greatly reduced from historical numbers and several have been listed under the Endangered Species Act (Figure 6). Recent city-sponsored research has documented that subyearling salmon are present in the lower Willamette River year-round. That research also documented that at least 39 species of both warm-water and cool-water fish from 17 families inhabit the river. Of these, 19 species from seven families are non-native to the Willamette River system. Recent sampling also indicates that aquatic insect and macroinvertebrate populations are less abundant and diverse than populations in healthier rivers of similar size.

Lower Willamette River Watershed

ESA Status of Fish in the City of Portland

Species	ESU	Status
Steelhead	Lower Columbia/ Upper Willamette	Threatened
Chinook	Lower Columbia	Threatened
Chinook	Upper Willamette	Threatened
Chum	Columbia River	Threatened
Coho	Lower Columbia	Threatened
Coastal Cutthroat	Basinwide	Candidate
Pacific Lamprey	Basinwide	Candidate

Figure 6 In March 1998, steelhead were listed as threatened under the Endangered Species Act – the first listing of an aquatic species in a predominantly urban area. In 1999, Chinook salmon were added to the list.

LOWER WILLAMETTE WATERSHED STATISTICS*	
Acres in Total Basin	7,334,400
Acres within City of Portland	40,030
Miles of Piped Stream	182 ¹
Miles of Open Channel	75 ²
Acres in Environmental Zones	7,600
Acres of Metro Regionally Significant Habitat*	14,300
<i>*Figures are calculated based on natural topographic watershed boundaries. BES's watershed plans may report slightly different figures because their management areas reflect human-altered hydrology</i>	

*within City of Portland

Figure 7: Portland's Willamette Watershed includes Forest Park, the downtown commercial core, industrial districts on both sides of the river, and the City's most densely populated residential neighborhoods.

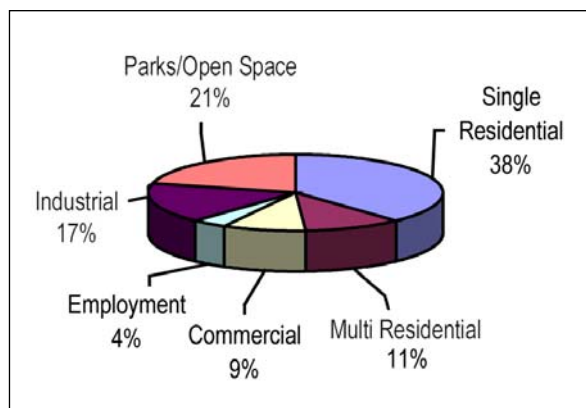


Figure 8: Willamette Watershed Zoning. The Willamette watershed has very diverse land use, including Forest Park, industrial riverfront, residential neighborhoods, and the Central City.

¹The exact location of many historic streams on the eastside of the watershed is speculative, and historic pipe records are incomplete.

² There are no open waterways on the eastside of the watershed.

Lower Willamette River Watershed

Lower Willamette River Watershed Restoration Opportunities

Riparian and Terrestrial Opportunities

Forest Park and most of Portland's riverside parks provide important watershed health benefits. Forest Park is the largest urban park in the nation, providing habitat for many species of birds and mammals. Powers Marine, Sellwood, Willamette, Oaks Bottom, Cathedral, and Kelley Point parks represent, to varying degrees, Portland's remaining natural riparian areas. Although Stephens Creek has been affected by urbanization, its confluence with the Willamette just north of the Sellwood Bridge provides important habitat. Similarly, although the lower reaches are blocked by culverts, the upper reaches of Balch, Saltzman, Doane, and Miller Creeks, along with several unnamed streams in Forest Park are protected from intensive development by their location mostly within the park. While recreational use does cause some erosion, the water quality, hydrology and habitat in the streams' upper reaches contribute to watershed health. Several of these streams also support populations of cutthroat trout, sculpin, and other native fish. The lower reaches are conveyed in pipes and culverts across the industrialized floodplain terrace, blocking fish passage from the mainstem to upper reaches. Even if fish passage is not restored, the confluence areas of these streams provide valuable watershed health benefits, including refuge areas for fish in the Willamette.

Currently, almost 7,360 acres of land in Portland's Willamette Watershed are within environmental overlay zones. Metro's recently completed inventory of riparian and wildlife habitat resources estimates

that more than 10,000 acres of land within this watershed provide regionally significant riparian resources and/or wildlife habitat.

Restoration Opportunities

The City's initial analyses of the Willamette and its banks have identified the Industrial and Ross Island sections as those with the highest potential to provide watershed health benefits if restored (Figure 9). These areas are compromised by dramatic changes in hydrology (seasonal flow patterns), elevated summer water temperatures, bank armoring, loss of shallow water habitat, high levels of bacteria, pollution in river sediments, and the presence of non-native fish species. Similar analyses of the upland portions of the Willamette Watershed within the City Portland are underway.

Hydrology

Changes in seasonal flow patterns will require actions throughout the entire Willamette Basin. These problems cannot be addressed solely or even predominantly through restoration actions in Portland, but Portland can and is required by law to do its part. Actions in Portland can certainly contribute positive benefits but they must be coordinated with broader efforts throughout the basin.

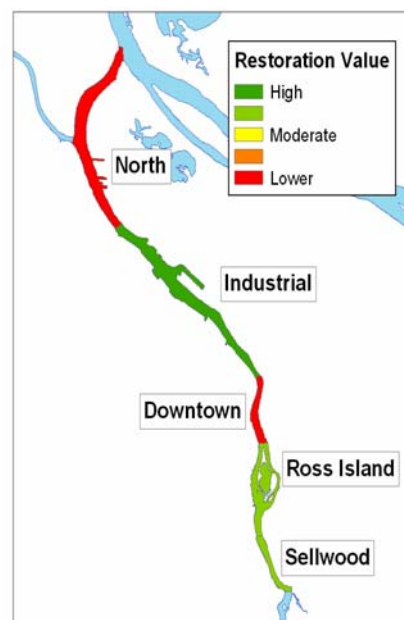


Figure 9: Restoration Value of Willamette Reaches. Sections of the Willamette River in dark green have the best potential to provide increased watershed health benefits if restored. Areas in red indicate relatively less potential benefit because the sites historically were less valuable or because they currently are in relatively good condition. To view this map in color visit www.river.ci.portland.or.us.

Lower Willamette River Watershed

In particular, there are opportunities to work with upstream jurisdictions and the US Army Corps of Engineers to influence the way upstream flood control and hydropower dams are operated. There are a number of regional-scale planning and regulatory efforts underway in which Portland could seek to influence the hydrology of the lower Willamette River. They include NOAA Fisheries' development of new rules and regulations for the operation of the federal dams in the upper basin; action in the Willamette Subbasin Plan being developed by the Northwest Power and Conservation Council; and, recommendations resulting from the Corps of Engineers' Willamette Floodplain Restoration Study. Local actions that improve the Willamette River's

Improving stormwater quality and recharging the groundwater to reduce stormwater impacts are some of the most important restoration priorities for the Willamette Watershed in Portland.

connection to its current and historic floodplain will improve hydrologic conditions at the site-specific scale.

Habitat

Portland has the ability to influence significantly the condition of the banks of the lower Willamette River as well as upland areas through a variety of means including acquisition, incentives, zoning, and other regulations and partnerships. The City also can establish new priorities for the land it owns along the Willamette River. Portland also can work to increase the amount of shallow water habitat, particularly in the areas identified as priorities above. Initial efforts

as part of the development of the Eastbank Esplanade, South Waterfront, and other districts are models for additional restoration actions, as are restoration plans for Ross Island and the Port of Portland's Terminal 4. The work at South Waterfront and Terminal 4 are the result of successful public private partnerships where public money was used to leverage private dollars.

Water Quality

Like hydrology, elevated summer water temperatures will require actions throughout the entire Willamette Basin, but Portland can and is required to play a significant role. High bacteria levels are being addressed by the large investments the City is making in its sewer system and by a state regulatory program that aims to limit bacteria in the upper Willamette and in the tributaries draining to it (e.g., Columbia Slough, Johnson Creek, and the Tualatin River).

Pollution can be significantly (though not solely) addressed by local efforts in Portland.

Pollution, particularly in sediments, will be addressed by risk assessment, source control, and cleanup conducted under the Portland Harbor Superfund Program, and by stormwater management actions throughout the upland portions of Portland's Willamette Watershed planning area and Portland's tributary watersheds that drain to the Willamette. Controlling the sources of pollution is the most cost-effective management approach to improve water quality. The Combined Sewer Overflow (CSO) project work in the Willamette Watershed provides an opportunity to integrate the watershed approach into sewer facility planning. For instance, reducing stormwater flow into the combined sewer system by infiltration helps reduce the CSO problem, relieves overloaded and deteriorating pipes, reduces basement flooding and improves watershed health.

Biological Communities

Non-native species probably will never be completely eliminated from the Willamette River, but their numbers and impact could be reduced by all the actions described above, which will provide conditions that are more favorable to native species and less favorable to non-native

Lower Willamette River Watershed

species. Portland also could increase its efforts to work with regional fish hatchery reform programs like those being conducted by NOAA Fisheries, the Northwest Power and Conservation Council, and the Oregon Department of Fish and Wildlife. A comprehensive inventory of upland, terrestrial wildlife restoration opportunities has not yet been conducted but is currently being planned.

Stormwater Management

Improving urban stormwater management to restore water quality and reduce quantities of stormwater runoff is one of the most important restoration priorities for the Willamette planning area. Runoff from urban areas contains copper, lead, bacteria, and other pollutants. It also can contribute to high water temperatures. Stormwater runoff also causes combined sewer overflows that discharge untreated sewage into the Willamette. It will be especially critical to explore methods for controlling the sources of stormwater pollution and for treating and disposing of stormwater runoff from streets.

Revegetation

The City's Revegetation Program and ongoing support of street tree plantings provide watershed benefits, particularly water quality and habitat functions, throughout the planning area. On the eastside of the Willamette, particularly along the bluffs in the subwatersheds north of the Fremont Bridge, revegetation projects provide examples of active urban restoration with native plantings. A project to improve trail access to the river in the Mock's Bottom subwatershed near Swan Island compliments the revegetation work already underway.

Area and Neighborhood Plans

Area and neighborhood planning projects provide opportunities to improve stormwater management. Considering the effects of proposed zoning and land use changes on stormwater will provide important opportunities to improve watershed health. The Marquam Hills Nature Park in the Sheridan-Woods subwatershed provides water quality, hydrology, and habitat benefits. Planned development in the South Waterfront area includes a creative stormwater swale and bank restoration project and other stormwater and habitat improvements along the Willamette River. There will be additional opportunities for watershed improvements as part of the South Waterfront greenway development project and Oregon Health and Science University (OHSU) and other private development projects.

Johnson Creek Watershed

Restoration Priorities

AQUATIC

Focal Species: The Johnson Creek Watershed provides refugia and rearing habitat for Upper Willamette salmon stocks, as well as, supporting its own populations of steelhead trout, chinook, and coho salmon. NOAA has listed Johnson Creek as critical habitat for stocks in the lower Columbia River ESUs. Chinook salmon have been documented in Johnson Creek Reach 1 & 2. Steelhead trout and coho salmon have been documented in the last 2 years in lower Johnson Creek, Crystal Springs, Errol, Lower Kelley, and Hogan Creeks. There are resident populations of cutthroat distributed throughout the watershed. Fluvial/anadromous cutthroat have been documented in lower Kelley Creek. Pacific lamprey have also been documented in Johnson Creek Reaches 4,6,8,12, & 16, Crystal Springs, and Kelley Creek.

All fish habitat has been inventoried in the watershed and evaluated through the EDT modeling process which indicates that the best remaining habitat occurs in upper and mid-watershed. One of the highest priorities for recovering salmon in Johnson Creek is to protect these core habitat areas from further degradation. Priorities for core habitat protection include Reach 16, Lower Hogan, Upper & Lower Kelley, and Upper Mitchell Creeks. Scattered throughout the watershed are other areas that are close to fully functioning habitats. These sites are also considered priorities, as they have the highest restoration potential and in some cases expand the core habitat areas. Priority areas for restoration are Mainstem Reaches 4-5 (Tideman-Johnson), and 15, Upper Crystal Springs, Errol, Middle Kelley, Lower Mitchell, Lower Sunshine & Badger Creeks. The next step for salmon habitat recovery is to connect core habitat areas, which includes Mainstem Reaches 1, 2, 6-10, 17, as well as, pollution source tracking, identification, and correction throughout the watershed, particularly in the headwater areas and through storm water management.

Connectivity/Passage

Instream passage

Geographic Priorities:

- Complete watershed wide inventory of passage barriers on tributaries and private lands; characterize severity and rank.
- Complete Thermal Barriers inventory and eliminate where they exist.
- Barrier removal on Kelley Creek (2 culverts, 3 dams) and Crystal Springs (2 culverts) would improve access to quality habitat.

Considerations for project prioritization: In 2000-2001, a multijurisdictional effort identified and assessed a total of 226 structures which could pose fish passage barriers in the Johnson

Johnson Creek Watershed

Creek watershed, including culverts, dams, and bridges. Nineteen culverts were inventoried within Portland and a total of 39 structures (16 of which were culverts) within Gresham. Although there are no culverts on the mainstem until the upper reaches of the watershed, they are present on nearly all the tributaries to Johnson Creek. Due to timing restrictions on federal grant fund programs and other constraints, the jurisdictions completed only the first phase of the inventory. Additional assessment will be required to finalize the culvert prioritization process.

Floodplain connectivity

Geographic Priorities:

Sites that are identified as having high restoration potential &/or help connect the core habitat areas:

- Lower Johnson Creek projects including Tideman Johnson/Errol Heights
- Crystal Springs projects including Westmoreland Park Restoration
- Middle Kelley Creek (reaches 4 & 5)
- Middle Johnson Creek projects including Alsop Brownwood
- JC Reaches 1, 2, and 3
- Crystal Springs Reach 1
- Bell Station Reach 7
- Middle Johnson Creek (Reaches 8 to 14) including West Lents Restoration and East Lents Restoration including south of Foster and Springwater Wetland Complex Restoration projects
- Upper Johnson Creek Reach 17 including lower Sunshine and lower Badger

Considerations for project prioritization: Recent studies underscore the importance of restoring floodplain connectivity in Johnson Creek. Creating floodplain connectivity increases flood storage capacity and can provide refugia during high flow events. These projects are usually combined with wetland, riparian restoration, and in-stream habitat improvements.

Watershed Process & Function

The most critical key limiting factors for coho salmon in the Johnson Creek Watershed include: Low habitat diversity due in part to a lack of wood; Simplified channel structure; Degraded banks; Degraded riparian areas; High summer water temperatures; Excessive sedimentation; Lack of food; and Toxic pollutants.

Due to current fish presence and EDT modeling middle and lower Johnson Creek are considered generally higher priority for restoration. These areas, historically forested wetlands, have lost much of their habitat value. Restoration activities should address the lack of large wood in the creek, grading of banks and lining of channels as a result of WPA work, degraded riparian areas, high summer water temperatures, excessive sediment loading and sedimentation, and lack of food sources.

Specific reaches that will provide the most benefit from restoration include Reaches 4-5, and 15 in Johnson Creek, Upper Crystal Springs Creek, Errol Creek, Lower Sunshine Creek, Badger

Johnson Creek Watershed

Creek, middle Kelley Creek, as well as those areas that are presently contributing to water quality problems downstream including Johnson Creek Reaches 17-23, middle Sunshine Creek, and middle Kelley Creek.

Restore riparian area function

Degraded riparian areas are not able to promote channel complexity and integrity and contribute to poor water quality (temperature and sediment).

Geographic Priorities:

- Lower Johnson Creek (Reaches 1 & 2)
- Middle Johnson Creek (Reaches 6-10)
- Crystal Springs Creek
- Errol Creek
- Middle Kelley Creek
- Lower Sunshine
- Upper Johnson Creek (reaches 17-23)

Considerations for project prioritization: High summer water temperatures limit production of coho salmon throughout Johnson Creek. Therefore, water temperature sources should be investigated and riparian buffers should be established to provide shade. Riparian restoration actions include controlling invasive weeds.

Ensure Adequate Water Flow

Geographic Priorities:

- Upper Johnson Creek (Reaches 17-23)- address illegal water withdraws and impoundments; and increase ground water and wetland storage.
- Middle Johnson Creek (Reaches 6-10)- increase groundwater storage by restoring valley bottom areas
- Lower Johnson Creek- limit development impacts by decreasing pervious surface, and promoting on-site stormwater management.

Considerations for project prioritization: Restoring natural stream flow is being addressed in several ways: by removing impoundments, restoring valley bottom areas, decreasing impervious surfaces (where feasible), promoting on-site stormwater management, green street development and procuring in-stream water rights.

Control sediment inputs

Geographic Priorities:

- Sediment Source Identification to locate areas of bank erosion, channel scour, lack of ditch lining, and poor agricultural & development practices

Johnson Creek Watershed

Considerations for project prioritization: Excessive sedimentation limit production of coho salmon throughout Johnson Creek. Therefore, sediment sources should be identified and riparian buffers established to provide natural biofiltration.

Restore channel complexity and hydrologic processes

Geographic Priorities: Scattered throughout the watershed are areas that are close to functioning. These sites are a priority, as they have the highest restoration potential and in some cases expand the core habitat areas. The next priority for Salmon recovery is to connect the core habitat areas by restoring middle Johnson Creek reaches.

Priority areas for restoration are:

- Johnson Creek 1 & 2
- Johnson Creek Reaches 4-5 (Tideman-Johnson)
- Johnson Creek Reach 15 & 17
- Crystal Springs Creek
- Errol Creek
- Middle Kelley Creek
- Lower Mitchell Creek
- Lower Sunshine Creek
- Badger Creek

Considerations for project prioritization: Restoring habitat complexity includes adding large wood and creating off channel habitat. Hydrologic processes are addressed through increasing flood storage (floodplain connectivity), restoring wetlands, and controlling storm water run-off. In some cases improving channel complexity involves day lighting creeks.

Water Quality

Reduce toxics

Geographic Priorities:

- Source Identification- Projects are underway, with recent data indicating that the largest impacts are from the upper stream reaches dominated by agricultural land use.

Considerations for project prioritization: Recent information on pesticides and other toxics that were not incorporated into the EDT Model indicate that water quality may be a significant limiting factor, especially following storm runoff events. There is the potential for both chronic and acute toxicity levels for aquatic organisms throughout the watershed. However trend monitoring does show significantly reduced levels in the last 10 years.

Johnson Creek Watershed

Decrease bacteria levels

Geographic Priorities:

- Source Identification

Considerations for project prioritization: Both animal and human wastes cause high fecal coliform and E. coli bacteria levels. A wide variety of animals utilize habitats throughout the Johnson Creek watershed - both native (wildlife) and domestic (pets and livestock). Human wastes can contribute to high bacteria levels through failing onsite septic systems and wastewater spills and overflows.

Decrease sediment inputs

Geographic Priorities:

- See above (Control Sediment Inputs)

Considerations for project prioritization: Excessive sedimentation limit production of coho salmon throughout Johnson Creek. Therefore, sediment sources should be investigated and riparian buffers should be established to provide natural biofiltration. In some cases, controlling erosion entails re-grading banks combined with bio-engineering and riparian restoration.

Decrease water temperature

Geographic Priorities:

- See above (Restore Riparian Function)

Considerations for project prioritization: Excessive summer temperatures limit production of coho salmon throughout Johnson Creek. Therefore heat sources should be investigated and riparian buffers re-established to reduce thermal loading. In some cases, improving the thermal regime entails removing impoundments combined with making improvements to the stream channel and riparian zone.

Johnson Creek Watershed

TERRESTRIAL

Focal Species: Sensitive species known to occur in the riparian areas of Johnson Creek include three salamander species (long-toed, northwestern, and Columbia), two frog species, and one toad species. Painted turtles have been identified in the watershed. Other focal species include great horned owls, pileated woodpeckers, neo-tropical migrant birds, giant pacific salamanders and red-legged frogs.

Mature/ Old Growth Forest

Geographic Priorities:

- Boring Lava Domes mature upland forests
- Riparian Forests along Johnson Creek reaches 13, 16, 17, Upper Mitchell, and Upper Kelley Creek

Considerations for project prioritization: Forest clearing has increased dramatically in recent years as housing development expanded from the lowlands onto the ridges and hillside slopes. Promoting protection of the remaining intact forested stands is a priority.

Riparian/Emergent Marsh/Oxbow/Backwater Slough/Beaver Pond/Marsh/Wetland

Geographic Priorities:

- Crystal Springs Watershed
- Errol Heights Wetland
- Beggars Tick Marsh
- Springwater Wetland Complex in Middle Johnson Creek (111th to 122nd)
- Powell Butte Wetland
- Wetland Complex along Reach 16
- Sunshine Creek Wetland
- Mainstem 5 Creek confluence

Considerations for project prioritization: Hydrologic processes can be addressed through increasing infiltration, floodplain connectivity, restoring wetlands, and backwater sloughs.

Upland Prairie & Oak Savannah/ Rare Upland Habitat

Geographic Priorities:

- Oregon white oak & Madrone stands in the lower watershed. Three initial areas of emphasis are Errol Heights, Johnson Creek Park, and Windsor Open Space. Additional assessment is needed.

Johnson Creek Watershed

Considerations for project prioritization: Habitat diversity is optimized by protecting and restoring these existing rare habitats which support numerous species of birds, small mammals, and amphibians.

References

Johnson Creek Restoration Plan, City of Portland, June 2001

Johnson Creek Watershed Action Plan, JCWC, 2003

“Preliminary findings of NOAA fisheries’ critical habitat analytical review team for lower Columbia River ESUs”, NOAA Fisheries, 2005

Johnson Creek Watershed

Johnson Creek Watershed Council **Approach and criteria to identify and prioritize restoration efforts**

The Council has a comprehensive Watershed Assessment and Action Plan, which was completed Fall 2003. In creating the action plan the Council first did an assessment of the watershed. The assessment included collecting water quality monitoring data, fish passage inventory data, and ODF&W habitat survey information, as well as information from previous studies, and on the ground research. This data was coupled with the Ecosystem Diagnostic Treatment model to determine the areas of the watershed that have the highest potential for salmon habitat recovery. The assessment led to the identification of critical habitat areas and key limiting factors to address watershed function. The next step was to create a list of projects to address the limiting factors. The long term strategy outlined in the plan is to protect the areas that continue to function well, restore the areas that are closest to functioning, and then connect the functioning areas together by eliminating physical, chemical, and thermal barriers to provide passage for all species, and all life stages.

The Action Plan identifies key areas for protection, restoration, and connection based on the watershed assessment, scientific studies, and professional judgment. The restoration projects which are listed in the plan were prioritized by scoring them on an evaluation matrix. The projects with the highest scores are assigned to the Top Tier. The Top Tier projects are the main focus of the Council for restoring watershed health. The prioritized list of projects is revisited on an annual basis to update the project completion list, add new projects that have been identified, and re-evaluate the projects based on the most current information.

The Council's overall conservation strategy is:

- 1) **Protect high quality habitats**, areas that have sufficient to high quality functions, currently.
- 2) **Restore or enhance habitats and hydrologic functions that are close to functioning** and therefore have high restoration potential.
- 3) **Connect high quality habitats** together.
- 4) **Identify and control sources of degradation**. Causes of degradation can come from many sources and their cumulative impacts impair water quality. Therefore sources need to be identified and addressed through on the ground projects, as well as, education and outreach of best management practices.

Tryon Creek Watershed

Restoration Priorities

Overview

Tryon Creek is a seven-mile long free-flowing stream that drains a roughly 4,200-acre watershed. The stream flows in a southeasterly direction from Mt. Sylvania in the Southwest Hills of Portland to the Willamette River near Lake Oswego. Including all of its tributaries, Tryon Creek includes approximately 27 miles of stream drainage. This includes those streams that flow year-round and those that flow seasonally when it rains. It is primarily a moderate gradient stream with steep slopes, which results in a high frequency of landslides and erosion. The upper watershed has suffered impacts commonly associated with urban development, including increased instream flow velocities and volumes following storm events and subsequent stream bank erosion. Soils in the watershed are underlain by clay that impedes

water infiltration and root penetration, resulting in a high incidence of trees being blown down by wind, landslides, channel incision, and bank erosion.

Conditions and Trends

Hydrology

Historical information on flows in Tryon Creek is lacking. Modeling information indicates that the creek is “flashier,” or in other words has higher peak flows, which is corroborated by marked channel incision in a number of reaches.

Habitat

Instream habitat conditions range from marginal to optimal (optimal only in a few areas), with most of the marginal habitat within the more heavily urbanized upper watershed. Highest quality instream and upland habitats are located

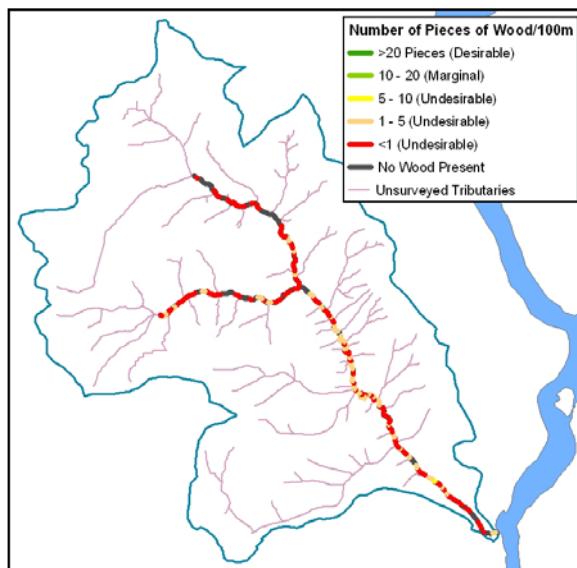


Figure 1: Large Wood in Tryon Creek. The number of pieces of wood per 100 meters of stream length. Scientists consider 20 or more pieces per 100 meters of stream length desirable. The vast majority of Tryon Creek has less than 1 piece of wood per 100 meters, significantly less than desired conditions. To view this map in color visit www.river.ci.portland.or.us.

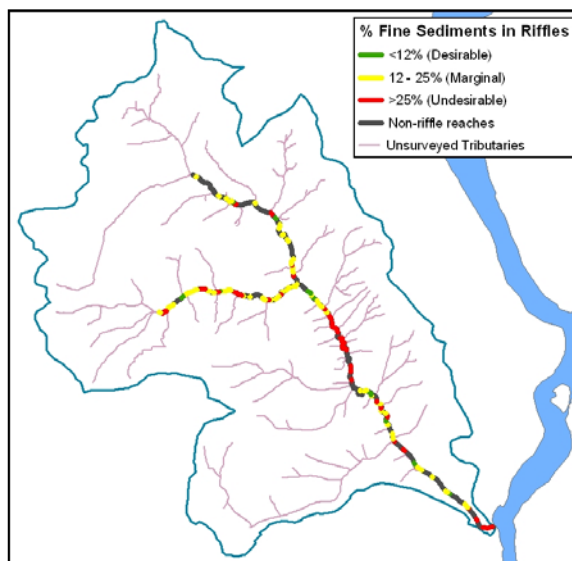


Figure 2: Percentage of Fine Sediments in Riffles in Tryon Creek. State of Oregon fine sediment criteria are only applied in riffle habitats; other habitat types are indicated in black. Much of the high quality habitat in Tryon Creek is smothered by fine sediment created by upland activities and practices and carried to the creek by stormwater. Sediment also is created when stormwater from paved surfaces rushes to the creek instead of infiltrating into upland soils. The increased flows following storms scour streambanks, causing erosion and sedimentation. To view his map in color visit www.river.ci.portland.or.us.

Tryon Creek Watershed

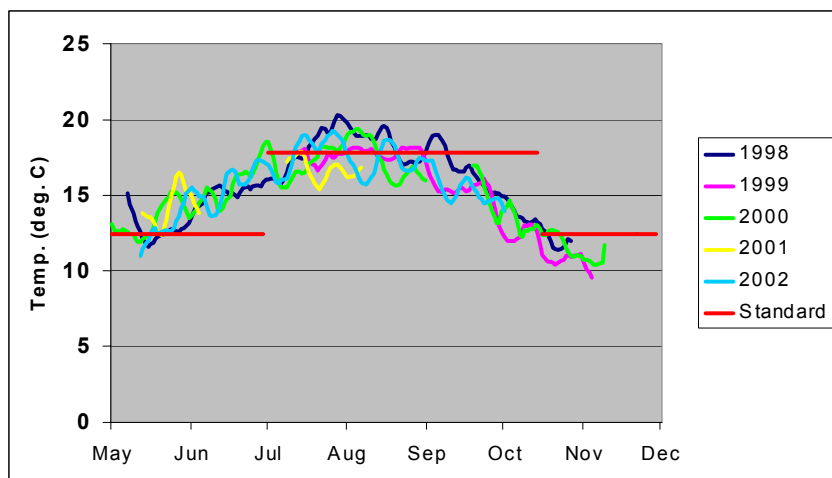


Figure 3: Seven-Day Average Daily Maximum Summer Temperatures in Tryon Creek. Temperature is typically measured from May through November in Tryon Creek. Summer temperatures typically exceed the summer standard, but the length and severity of exceedences vary by year. Early summer temperatures exceed the spawning and incubation standard, which applies when salmon are rearing in the gravel. The likely period during which rearing takes place is indicated by red lines on the graph.

within the Tryon Creek State Natural Area. Impassable or partially passable culverts limit salmon access and affect watershed processes through much of the watershed. Stream complexity and habitat quality have been greatly reduced by significant channelization, downcutting, lack of wood (Figure 1), lack of floodplain connectivity, underground piping of tributaries, and bank erosion, particularly in the upper watershed. Sedimentation is an ongoing problem because it degrades instream habitat (Figure 2). Development and

streamside disturbance have reduced streamside vegetation along many sections of Tryon Creek and its tributaries.

Portland has applied environmental zones to approximately 1,020 acres in the Tryon Creek watershed. Metro identified approximately 1,500 acres of significant resources in the watershed. Some of these are covered by environmental zoning, others are not.

Water Quality

Continual water quality monitoring at Boones Ferry Road indicates that temperatures in Tryon Creek exceed state standards for 7-day averages 27 to 42 days each summer (Figure 3). Random sampling of Tryon Creek also shows bacteria levels that exceed standards. Nutrients, dissolved oxygen, and suspended solids do not exceed standards, but are found in elevated levels throughout the watershed.

The City of Portland is currently monitoring the concentrations of 13 different pollutants and recently completed an analysis of available water quality data. The analysis indicates that with the exception of temperature, water quality generally meets state standards; however, there are no standards for a number of pollutants that are found in stormwater that can affect aquatic species. There is anecdotal information that suggests that toxic contamination related to motor vehicles and stormwater may be harming benthic communities below the Interstate 5 bridge and the urbanized upper watershed. Recent research by NOAA Fisheries documents that relatively low levels of pollutants typically found in urban stormwater can affect the health of salmon.

Biological Communities

While the biotic integrity of Tryon Creek has been greatly reduced from historical conditions, many assets still remain. Tryon Creek watershed contains large parks including the 630-acre Tryon Creek State Natural Area, 25-acre Marshall Natural Area and 17-acre Maricara Nature

Tryon Creek Watershed

Park. These wooded areas contain many native vegetation species providing habitat for a range of wildlife including over 60 species of birds and fish species. Invasions of nonnative plants are evident even within the higher quality areas of Arnold Creek and Tryon Creek State Natural Area and are a threat to habitat integrity.

Tryon Creek Restoration Opportunities

To achieve a healthy watershed, the City will need to restore sections of Tryon Creek that have been degraded. The City's initial analyses have revealed that the lower section of Tryon Creek has the greatest potential to provide watershed health benefits if restored (Figure 6).

TRYON CREEK WATERSHED STATISTICS*	
Acres in Total Basin	4,200
Acres in City of Portland	3,050
Miles of Known Piped Stream*	3
Miles of Open Channel	27
Acres in Environmental Zones	1,020
Acres of Metro Regionally Significant Habitat*	1,671
*Figures are calculated based on natural topographic watershed boundaries. BES's watershed plans may report slightly different figures because their management areas reflect human-altered hydrology. * Within City of Portland	

Figure 4: The Tryon Creek Watershed in southwest Portland covers an area of approximately 6.5 square miles. About 21 percent of the watershed is outside the City of Portland's boundary and within the jurisdictions of Multnomah County, Clackamas County, and the City of Lake Oswego.

Hydrology

Increased peak flows after storm events have caused deep incisions and erosion in the Tryon

Reductions in the amount of pavement would increase infiltration and help reduce the volume and rate of stormwater entering the creek.

Creek channel. The incisions often prevent the creek from accessing its historic floodplain, further contributing to increased flows and velocities within the creek. Reductions in the amount of pavement and other impervious surfaces in the watershed, if accompanied by on-site stormwater management, tree planting and revegetation programs, would help reduce the volume and rate of stormwater entering the creek. This is because fewer paved surfaces generally means more opportunities for stormwater to infiltrate into the ground instead of flowing

directly to creeks and streams. Removing or improving culverts and other crossings that currently block fish passage and alter the volume and timing of instream flows would help restore the health of the watershed.

Habitat

Improving conditions at the culverts at Highway 3 and at Boones Ferry Road is an important restoration opportunity. Providing fish access above Highway 43 and Boones Ferry Road would provide critical habitat to native steelhead, coho, cutthroat, and perhaps chinook (in the lower reaches).

Tryon Creek has lost a significant amount of its former habitat complexity (e.g., winding back channels and large trees in the creek). In Lower Tryon, there is potential to improve the connectivity between the creek and its floodplain in certain areas up to the confluence with

Tryon Creek Watershed

Arnold Creek. Channel incision has reduced the creek's access to its historic floodplain, changing the nature and extent of vegetation along the creek.

Arnold Creek, one of the larger tributaries to Tryon, has good instream habitat within its lower section, but fine sediments, bank erosion, and channel incision have degraded the creek's upper

sections. Arnold Creek also is highly segmented by culverts from road and driveway crossings.

Falling Creek, another major tributary to Tryon, has poor to marginal instream habitat, with a lack of instream cover, poor bank and streamside structure, and excessive fine sediments.

Restoration actions could be designed to address these problems. Invasive non-native plant species are evident throughout the higher quality areas of Arnold and Falling Creeks. These species compete with native species, resulting in diminished habitat quality.

Water Quality

There is excessive sediment in Tryon Creek throughout Tryon Creek State Natural Area.

Sediment is transported in stormwater from upland sources. Loose sediment is also generated by storm-driven peak flows scouring streambanks. Sediment smothers fish spawning beds and is linked to a variety of toxic pollutants such as oil, grease, metals, and pesticides. Addressing the sediment challenge will require a variety of stormwater and other upland management actions. Those actions would be most effective if they are aimed at reducing sediment-laden runoff and the excessive peak flows that scour streambanks. Tree planting and revegetation programs, water quality swales, and reductions in pavement and other impervious surfaces in the watershed will help reduce peak flows, and therefore are likely to be effective techniques for reducing sediment loads.

Tryon Creek also suffers from elevated summer water temperatures. Tree planting and reductions in impervious area would help address the temperature problem. Stormwater also contributes to bacteria, phosphorous, and other pollution problems in Tryon Creek. The upper section of Tryon Creek is heavily urbanized. Initial information

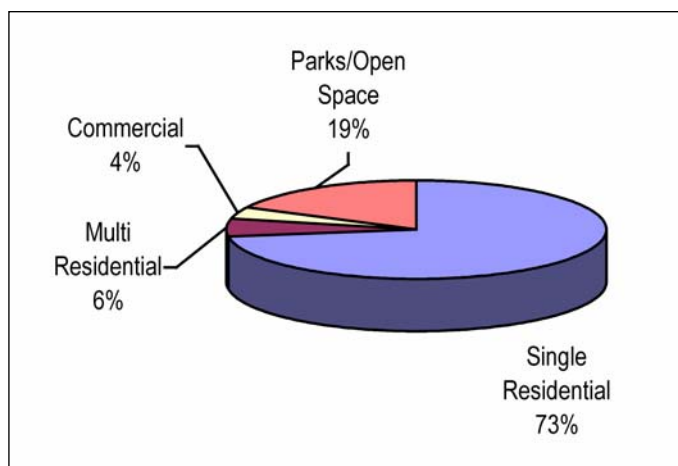


Figure 5: Tryon Creek Watershed Zoning – Tryon Creek Watershed is predominantly residential. The large proportion of parks and open space can be attributed to Tryon Creek State Park.

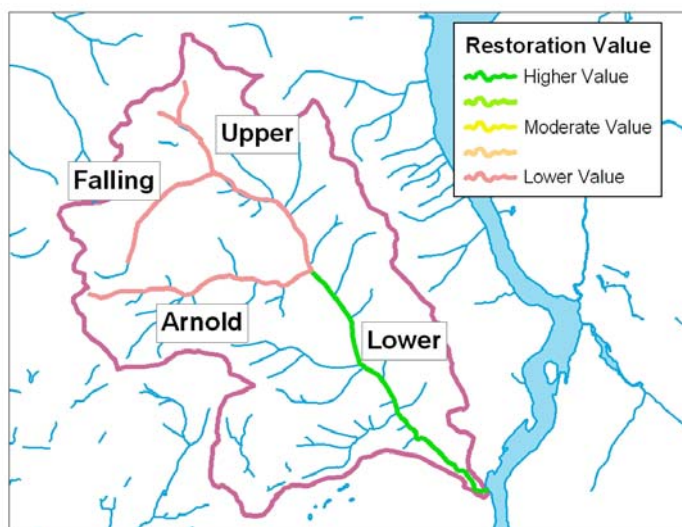


Figure 6: Restoration Value of Tryon Creek Tributaries. Based on an analysis of salmon needs, areas of Tryon Creek in dark green have the potential to provide the most significant watershed health benefits if restored. Areas in lighter green, yellow, and pink have less potential because they are currently relatively healthy or because they historically provided less value for salmon. To view this map in color visit www.river.ci.portland.or.us.

Tryon Creek Watershed

from the City's detailed pollutant load analyses and water quality monitoring suggest that pollution from roads and other urban sources entering upper Tryon Creek may be a significant problem for the entire creek.

Biological Communities

Addressing the flow, habitat, and water quality issues also will address the needs of fish and wildlife in the Tryon Creek watershed. Creating and investing in strategies to address invasive plant species is a high priority restoration action. Additional research on insects and benthic organisms would help frame additional management priorities.

Prioritizing source control and stormwater treatment actions would produce significant watershed health benefits.

Stormwater Management

The heavily urban sections of the upper Tryon Creek Watershed and the Interstate 5, Barbur Boulevard, and Terwilliger Boulevard transportation corridors are likely the largest potential sources of ongoing stormwater related watershed health problems. Prioritizing source control and stormwater treatment actions such as green streets, treatment swales, and detention along these corridors would likely produce the greatest watershed health benefits.

For more information, visit the [Fanno-Tryon Creek Watershed Management Plan](#) (on the City's website).

Fanno Creek Watershed

Fanno Creek Watershed

Restoration Priorities

Overview

Fanno Creek is a tributary to the Tualatin River Basin, which drains about 20,500 acres. Of that land area, 4,528 acres falls within the City of Portland jurisdiction. Land use in the Fanno Creek Watershed is dominated by residential, industrial, and commercial activities. Impervious surfaces cover about 1,500 acres of the watershed. Within the City of Portland, the Fanno Creek watershed contains approximately 5 miles of piped streams and about 28 miles that flow in open channels.

Conditions and Trends

Hydrology

The hydrology of Fanno Creek has been altered by impervious surfaces and a decrease in the infiltration and retention of water in vegetated areas. This results in higher peak flows, particularly during the winter, which increase erosion and decrease channel stability. Summer flows are probably low compared to historical conditions.

Habitat

Instream habitat quality in Fanno Creek and two of its tributaries – Vermont and Woods creeks – is rated as extremely impaired or threatened, primarily due to the adverse effects of excessive fine sediment (Figure 1). Channel complexity and habitat quality have been greatly reduced by significant channelization, downcutting, lack of wood (Figure 2), lack of floodplain connectivity, underground piping of tributaries, and bank erosion, particularly in the upper watershed. Watershed development and streamside disturbance have reduced riparian vegetation along many sections of Fanno Creek and its tributaries. Impassable or semi-passable culverts

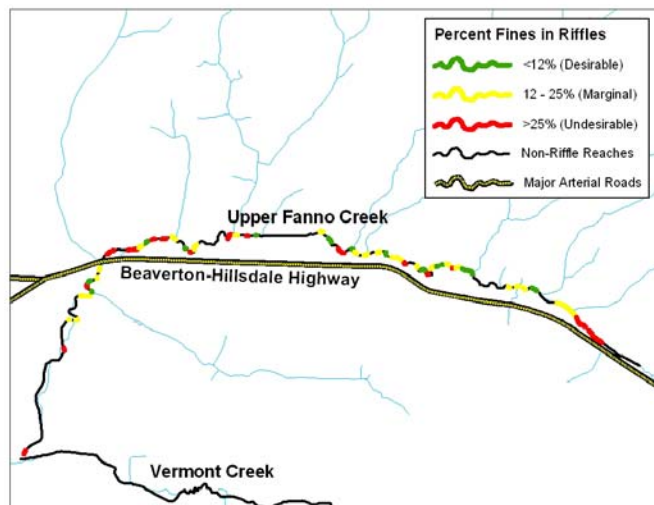


Figure 1: Fine Sediment in a Section of Fanno Creek.

The City of Portland has detailed information about sediment in Fanno Creek and its tributaries. Sediment, which carries pollution and smothers fish spawning beds, is created by upland practices and by the increased velocity of stream flows created by stormwater that flows off pavement and other impervious areas throughout the watershed.

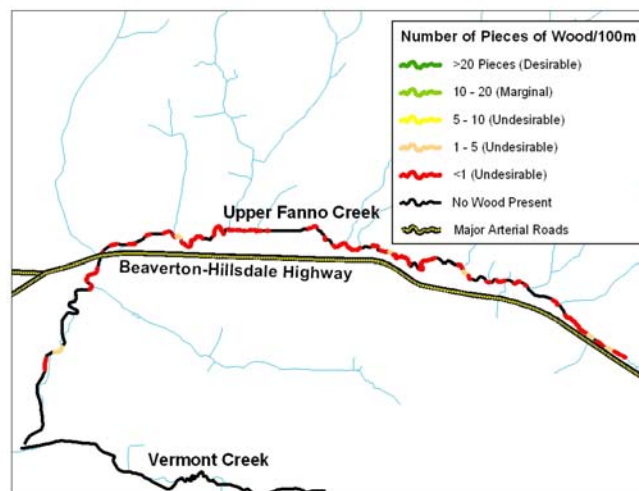


Figure 2: Fanno Creek – Large Wood. The number of pieces of large wood per 100 meters of stream length in a section of Fanno Creek. Scientists consider 20 or more pieces per 100 meters of stream length desirable. The vast majority of Fanno Creek has less than two pieces of wood per 100 meters, an order of magnitude less than what is considered healthy.

Fanno Creek Watershed

limit salmon access and affect flows and other stream processes throughout much of the watershed.

Portland's environmental zones cover about 690 acres of the watershed. Metro identified about 1,500 acres of significant resources in the watershed. Some of these are within the environmental zones, others are not.

Water Quality

Water temperatures in Fanno Creek regularly exceed state standards 44 days on average through the summer (Figure 3). The creek has four established TMDLs for bacteria, dissolved oxygen, total phosphorus, and temperature. Background concentrations of phosphorus in Fanno Creek are generally below the standard. Dissolved oxygen levels are low during the summer. Data on toxics is limited and DEQ determined that background levels are not from human sources. Urban and suburban development within the watershed has contributed to these water quality problems by reducing or eliminating streamside vegetation and by increasing stream temperatures and nutrient loadings (nutrient loadings cause algae and other plants to grow, reducing the amount of oxygen available for fish and other aquatic species).

Biological Communities

The health of Fanno Creek's biological communities has been greatly reduced from historical conditions. Many native species of fish and aquatic insects are at risk, and many introduced or nuisance species currently compete with native species for food and habitat. The abundance of salmon, both locally and downstream, has been greatly reduced from historical numbers.

Fanno Creek's limited habitat quality leaves too few places in the creek for fish and wildlife to rest and hide from predators. Most of Fanno Creek within the City of Portland is inaccessible to salmon and steelhead because of impassable culverts downstream of city limits. The City of Portland sampled fish populations in 1993 and found reticulate sculpin, reddsideshiner, cutthroat trout and peamouth present in the upper reaches.

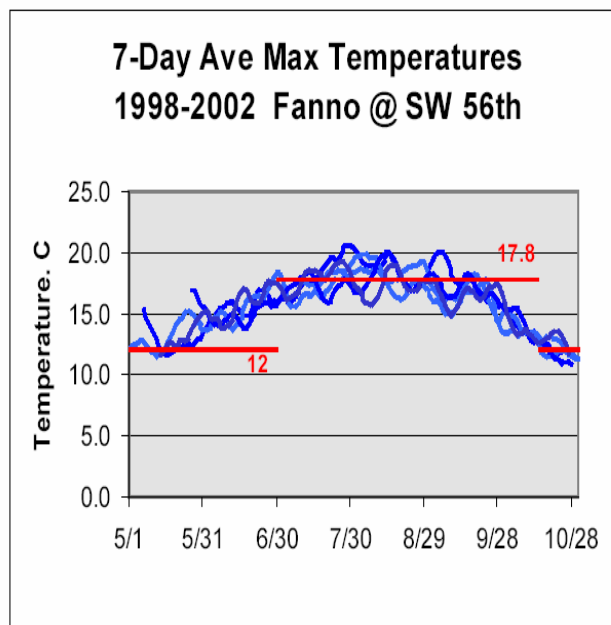


Figure 3: Seven-Day Average Temperature in Fanno Creek. Temperatures regularly fail to meet state standards during the summer. Improving tree canopy and vegetation in the upland areas of the Fanno Creek Watershed and improving stormwater infiltration by reducing the amount of impervious area would help address temperature problems.

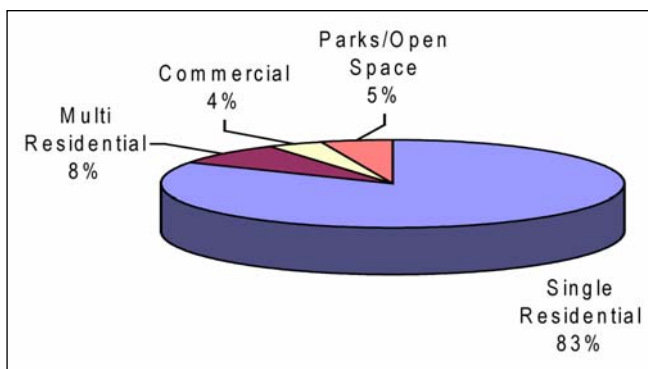


Figure 4: Fanno Creek Watershed zoning Similar to Tryon Creek, single-family residential represents the largest zoning designation.

Fanno Creek Watershed

FANNO CREEK WATERSHED STATISTICS*	
Acres in Total Basin	20,310
Acres in City of Portland	4,528
Miles of Known Piped Stream*	5
Miles of Open Channel*	28
Acres in Environmental Zones*	695
Acres of Metro Regionally Significant Habitat*	2,057
<i>*Figures are calculated based on natural topographic watershed boundaries. BES's watershed plans may report slightly different figures because their management areas reflect human-altered hydrology</i>	

*within City of Portland

Figure 5: Fanno Creek flows in a southwesterly direction to the Tualatin River, which then flows east to the Willamette River. Three fourths of the watershed is within the jurisdictions of Washington County.

Fanno Creek Restoration Opportunities

Hydrology

Figure 6 shows areas of Fanno Creek with significant restoration potential. Reclaiming lost upland drainageways, creeks, and intermittent flows (seeps, springs and groundwater recharge) in the headwaters would likely provide significant watershed health benefits (e.g., improved water storage, additional habitat, and enhanced water filtration.)

Habitat

In the Upper Fanno mainstem and its northern tributaries, reclaiming stream connectivity at the Beaverton-Hillsdale Highway and Scholls Ferry Road intersection would provide additional habitat for anadromous salmon as well as resident trout. Areas above these roadways contain spawning and rearing habitat; improved access would significantly improve fish productivity.

Adding boulders, large downed trees, overhanging vegetation, and channel complexity (side channels, backwater pools, deep pools, and undercut banks) in this section would improve channel roughness and help the creek withstand high scouring flows. In addition, added channel complexity would provide refuge to fish during winter storm flows and cover from predators. Repairing this section's actively eroding streambank, and enhancing habitat quality in the short-term would prevent further streamside erosion.

Water Quality

The sources of water quality problems in Fanno Creek are not completely known; however, dogs and other urban pets and wildlife may be contributing to elevated levels of bacteria. Improving tree canopy, planting vegetation in swales and other water quality friendly approaches that reduce stormwater runoff and filter sediment would help address these problems as well as summer high temperature problems.

Fanno Creek Watershed

Fanno Creek's banks are highly erosive, delivering sand, silt and other pollutants into the creek and infusing soil, particulate matter, and phosphorus into the creek. Subsequently, these sediments and pollutants settle to the stream bottom and cover potential spawning and rearing habitat. Streambank erosion and scour result from development in the upland portions of the watershed and the increased stormwater development creates. Repairing actively eroding banks, and enhancing habitat quality would prevent further streamside erosion.

Biological Communities

Because riffles generally comprise a low proportion of available habitat, reclaiming high quality riffle habitat and additional riffle area is critical to improving fish productivity throughout Fanno Creek and its tributaries. Notably, the abundance of deep pools and lack of riffles, severely limit the number of fish that can survive in Fanno Creek.

Reclaiming stream connectivity in Vermont, Woods, Ash, and Sylvan creeks would provide additional habitat to resident fish. Notably these tributaries might provide additional spawning and rearing areas, and provide off-channel habitat for fish living in mainstem Fanno Creek. Improved access into these areas could substantially improve fish productivity.

Stormwater Management

Beaverton-Hillsdale Highway runs parallel to mainstem Fanno Creek and occasionally crosses over the creek. The proximity of this major arterial highway to the headwaters of Fanno Creek impairs stream connectivity (for migratory fish) and disrupts some wildlife movements. In addition, the stormwater runoff from the highway has very high pollutant load potential, and is likely a major contributor of suspended solids and other urban pollutants into the creek.

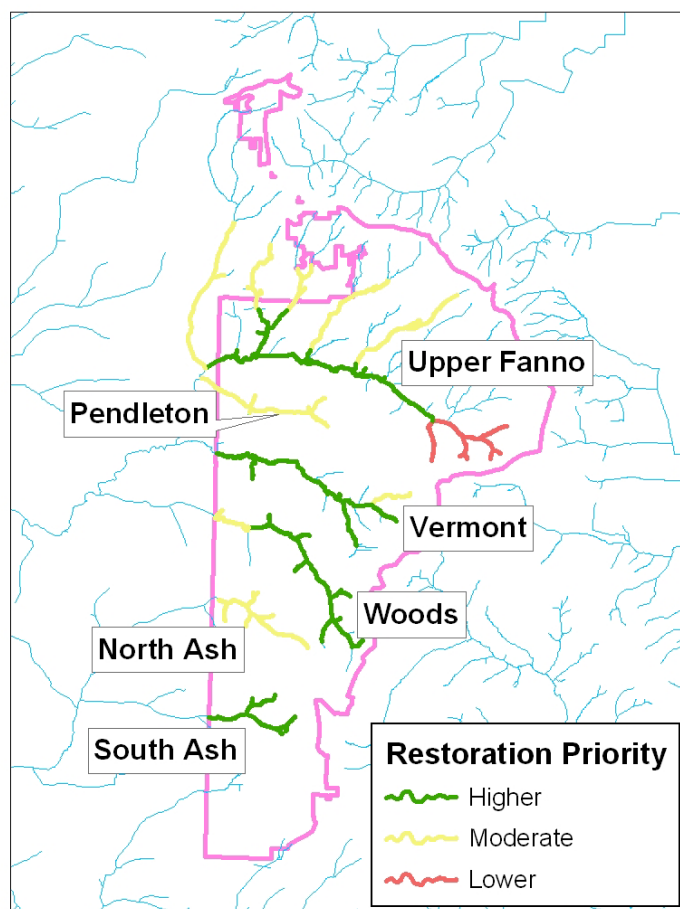


Figure 6: Restoration Values of Fanno Creek Tributaries. Areas in dark green likely would provide the greatest watershed health benefits if restored. Areas in yellow and red would likely provide less restoration benefits because they currently are in relatively good condition or because they historically provided fewer watershed benefits. To view this map in color visit www.river.ci.portland.or.us.

Storm runoff from Beaverton-Hillsdale Highway is likely a major contributor of suspended solids and other urban pollutants into Fanno Creek.

Fanno Creek Watershed

Corridors along Woods and Ash creeks provide good tree canopy cover, which helps reduce stormwater impacts. Conversely, extensive impervious areas along mainstem Fanno, Vermont, Sylvan, and Red Rock creeks create stormwater flows and pollution that impairs watershed health.

Maintaining existing riparian corridors, increasing canopy cover and diversity, and maintaining open spaces within the entire corridor and remnant floodplain are possible means to reduce or eliminate the stormwater-related problems in Fanno Creek and its tributaries.

The upland areas that drain to Pendleton Creek, Vermont Creek, Woods Creek, and Ash Creek contain valuable natural resources that detain and treat stormwater. The City of Portland and Metro manage open areas in this lower region of the watershed (parks, schools, and other public institutions).

For more information, visit the [Fanno-Tryon Creek Watershed Management Plan](#) on the City's website.

Clackamas River Basin

Clackamas River Basin

Restoration Priorities

AQUATIC

Connectivity/Passage

Culverts, small dams and other diversion structures

Geographic Priorities:

Lower basin

Clear Creek

Foster Creek

Deep/Goose Creeks

Eagle Creek

Other lower basin tributaries, such as Rock and Richardson

Upper Basin

Selected tributaries

***Considerations for project prioritization:** The Clackamas River Basin Council has completed a comprehensive inventory of fish passage barriers in Clear/Foster, Deep/Goose, Wade and Eagle Creek watersheds. The inventory includes information on all identified culverts and prioritizes addressing problems based on anadromous fish use and extent of habitat affected. There is additional information on fish passage barriers on other private lands in the lower basin and Federal Lands (primarily Forest Service) in the upper basin.*

Watershed Process & Function

The highest priority areas for restoring aquatic and riparian functions are the mainstem of the Clackamas River below and above River Mill dam. Large sections of the river, particularly below the dam, are disconnected from the floodplain, and have reduced floodplain and riparian vegetation composition and extent. There is limited large wood in the river system, and there is extensive loss of historic backwater habitats, including side channels and alcoves. Other priority areas include key lower basin tributary watersheds and selected areas in the upper basin watersheds. Key lower basin watersheds for anadromous and resident (particularly cutthroat trout) production are Clear, Foster and Eagle Creeks. Development has changed the flow of water, particularly during storm events.

Clackamas River Basin

Restore riparian area function

Geographic Priorities:

Clackamas River

Rock/Richardson Creeks

Clear/Foster Creek

Deep/Goose Creek

Eagle Creek

Other lower basin tributaries below Deep Creek

Upper basin tributaries in areas to accelerate succession to mature forest

***Considerations for project prioritization:** Restoration of riparian areas should be combined with protection of high quality riparian habitats. There are opportunities to restore degraded riparian/floodplain habitats between high quality areas, creating corridors across watersheds. Riparian restoration should be combined with control of invasive weeds, such as Knott weed.*

Restore channel complexity

Geographic Priorities:

Lower Clackamas River

Middle Clackamas River

Clear Creek

Foster Creek

Deep/Goose Creek

Eagle Creek

Wade Creek

Oak Grove Fork

Collawash River

Selected upper basin tributaries

Clackamas River Basin

Considerations for project prioritization: Restoring channel complexity includes adding wood, constructing side channels, re-meandering streams and creating other complex habitats in the river and tributary streams. Restoring channel complexity to the lower and middle Clackamas River is a very high priority. There are sections of streams (for example, North Fork Deep Creek) that have been channelized where it is important to restore channel function. Large wood can be added to streams where there are limited supplies, primarily in most of the lower basin streams (and some upper basin tributaries).

Restore hydrologic processes

Geographic Priorities:

Lower Clackamas River

Rock/Richardson Creeks

Lower Clear Creek

Foster Creek

Deep/Goose Creeks

Other lower basin tributaries below Deep Creek

Wade Creek

Considerations for project prioritization: Many of the watersheds in the lower basin have been developed, which has changed hydrologic processes from loss of wetlands and increased impervious surfaces. These actions include managing storm water in developed areas and restoring wetlands. Wetlands are also a key aquatic-terrestrial habitat type. A high priority is to restore river and stream-associated wetlands that contribute to aquatic habitat and floodplain connectivity.

Clackamas River Basin

Manage invasive weeds

Geographic Priorities:

Lower Clackamas River

Middle Clackamas River

Clear Creek

Foster Creek

Deep/Goose Creek

Eagle Creek

Selected upper basin tributaries

***Considerations for project prioritization:** Invasive weeds, especially Japanese Knotweed, Butterfly bush and False Brome, are spreading in the watershed. There are opportunities to address this problem through outreach, education and targeted weed eradication in collaboration with Metro, the Soil and Water Conservation District and the Department of Agriculture.*

Water Quality

Decrease nutrient levels

There are high levels of nitrate and phosphorous in some of the lower basin tributaries.

Geographic Priorities:

Cow Creek

Sieben Creek

Rock Creek

Deep Creek

Clear Creek – particularly Bargefeld and Hattan Fk

***Considerations for project prioritization:** There is a need to increase sparse riparian areas, reduce nutrient rich runoff and target education for lower Clackamas River landowners with an emphasis on natural landscaping, increased buffer strips and using fewer chemicals.*

Clackamas River Basin

Decrease bacteria levels

Geographic Priorities:

Cow Creek

Sieben Creek

Rock

Clear Creek

Deep Creek

***Considerations for project prioritization:** Storm water systems, agricultural run off and septic systems are priority areas.*

Decrease pesticide levels

Geographic Priorities:

Sieben Creek

Rock Creek

Deep Creek

***Considerations for project prioritization:** There is a need to target pesticide education for lower Clackamas River landowners. Engage nursery and agricultural industry to reduce/control pesticide application.*

Decrease temperature and increase summertime flow

Geographic Priorities:

Lower Basin Tributaries

Lower Mainstem

***Considerations for project prioritization:** There is a need to increase riparian zones where possible in the lower river and tributaries in partnership with landowners. Deep Creek and Clear Creek are priority areas for increased summer flows.*

Decrease fine sediment

Geographic Priorities:

Clackamas River Basin

Deep Creek

Bargfeld Creek on Clear Creek

Foster Creek

Considerations for project prioritization: *There is a need to increase riparian zones where possible in the lower river tributaries in partnership with landowners. Deep Creek has an extensive unpaved road network that may contribute to winter turbidity. Buffer strips and riparian fencing should be considered where needed.*

TERRESTRIAL

Oak Woodlands and Savanna

This habitat is a top priority because of the number of listed species, the extent to which the habitat has been altered and eliminated.

Geographic priorities:

Lower basin

Considerations for project prioritization: In the Clackamas River Basin, most of the wetland prairies and seasonal marshes are found within the lower basin near the valley floor or at the base of the foothills within the Prairie Terraces and Valley Foothills Ecoregions. Seasonal marshes also occur in the forested upper portions of the basin within the Cascade Mountains. In lower basin watersheds that are undergoing development, particularly Rock/Richardson and Deep Creek watersheds, it is important to protect and restore these habitats.

Upland Prairie

Geographic priorities:

Lower basin

Considerations for project prioritization: *Most of the upland prairie habitats within the Clackamas Basin are located within the Prairie Terraces and Valley Foothills Ecoregions. Historically, prairies, savanna, and oak woodlands formed a successional mosaic in the low elevations of the Clackamas Valley. These habitats were among the first areas to be converted by early settlers of the valley. Today, these habitats are lost to new residential and commercial development. In lower basin watersheds that are undergoing development, particularly Rock/Richardson and Deep Creek watersheds, it is important to protect and restore upland prairie habitats.*

Wetland Prairie, Seasonal Marsh, and Wetlands

Geographic priorities:

Clackamas River Basin

Lower basin watersheds

Richardson

Middle and Lower Clear Creek

Foster Creek

Deep Creek

Lower Clackamas River floodplain

Wade Creek

Considerations for project prioritization: *In the Clackamas River Basin, most of the wetland prairies and seasonal marshes are found within the lower basin near the valley floor or at the base of the foothills within the Prairie Terraces and Valley Foothills Ecoregions. Seasonal marshes also occur in the forested upper portions of the basin within the Cascade Mountains.*

Riparian Habitats and Floodplain Forest

There are opportunities, particularly in the lower basin, to restore private land riparian areas that serve as corridors, connecting high quality habitats on federal lands and other areas (for example, Metro properties).

Geographic priorities:

All lower basin watersheds

Floodplain of the Clackamas River

Floodplain areas where tributaries join the Clackamas River

Considerations for project prioritization: *Riparian habitats occur along streams throughout the Clackamas Basin's ecoregions. Floodplain forests are concentrated along the Clackamas River and larger tributary streams, such as the Collawash River, where there are wide areas subject to periodic flooding. Many of the widest floodplain areas, historically dominated by hardwoods and large conifer trees, are located along the lower Clackamas River within the Prairie Terraces and Valley Foothills Ecoregions.*

This category also includes standing water areas that are inundated year-round and their associated riparian vegetation and includes natural ponds, sloughs, lakes, and beaver ponds. Projects should be prioritized to address riparian habitats and floodplain forests, particularly in the lower portions of the Clackamas River Basin, which have been altered through residential and urban developments, conversion to agricultural lands, and timber harvest. There are opportunities to restore riparian areas that combine multiple species and objectives, including simultaneously addressing terrestrial wildlife, amphibian, water quality, and fish habitat issues.

Clackamas River Basin

Mature and Old-Growth Conifer Forest

Geographic priorities:

Lower basin

Upper basin

***Considerations for project prioritization:** Old-growth and mature conifer forests were once a major component of the lower Clackamas River Basin. Nearly all of the low elevation older forest has been converted to agricultural, residential and other land uses. Most of the remaining older conifer forests within the Clackamas Basin are western slopes and foothills of the Cascade Mountains on Bureau of Land Management and Forest Service lands (Western Cascades Lowlands and Valleys and Western Cascades Montane Highlands Ecoregions). There are opportunities, particularly in the lower basin, to restore private land riparian areas to older forest stands that serve as corridors, connecting high quality mature forest habitats on federal lands and other areas (for example, Metro properties).*

References

Clackamas River Basin Action Plan, 2005.

Tualatin River Watershed

Tualatin River Watershed

Restoration Priorities

AQUATIC

Focal species: *Winter steelhead, (non-native) Coho salmon, and resident cutthroat trout spawn in the upper reaches of West and East Fork Dairy Creeks, Gales Creek, the main stem and tributaries of the Upper Tualatin and Scoggins Creek, upper reaches of Rock Creek and McFee Creek, Fanno Creek and Chicken Creek. Non-native Spring Chinook salmon are located only in the lower basin and use the Tualatin River for juvenile rearing and refuge. The Tualatin River and lower main stem tributaries are used by winter steelhead and coho salmon for migration. There are resident populations of cutthroat trout throughout the tributaries in the watershed. Pacific Lamprey are present and spawning in the basin.*

Wetlands have been significantly reduced in number and those remaining have limited support for amphibian species. Several amphibian species of concerns found within the Dairy-McKay sub-basins include red-legged frogs, tailed frog, and Columbian torrent salamander. Red-legged frogs are found in a number of sub-basin watersheds throughout the Tualatin.

Connectivity/Passage

Anadromous fish migrate from the Willamette River up into the Tualatin River and its tributaries. Access to habitat and refuge by winter steelhead, cutthroat trout and Coho salmon is a top priority.

Dams/Culverts/Barriers

Remove barriers and/or mitigate their impacts

Geographic Priorities

Priority watersheds for: 1) anadromous species include main stem Tualatin River, Scoggins Creek basin, Dairy-McKay basins, Gales Creek basin, upper Rock Creek basin, Chicken and Cedar Creek sub-basins, Jaquith and McFee sub-basins; 2) cutthroat trout include Bronson, Willow, Cedar Mill, Wapato, Ayers, Hill, Christensen, Burris, Fanno, and Davis sub-basins; 3) native residents include the urbanized portions of the main stem Tualatin, and Christensen, Burris, and Davis sub-basins.

Considerations for project prioritization: *amount, type, and quality of habitat to be opened up, as well as position in the sub-watershed (with downstream positioned culverts being higher priority).*

1) Keep the mainstem barrier free; 2) Begin fixing/replacing culverts within tributaries that support anadromous fish and offer high quality habitat. Work from the mouth first up to the headwaters; 3) Link to Washington County and Clean Water Services' lists of priorities for culvert repairs. If more detail is needed, refer to the data collected by these organizations or the Tualatin River Watershed Council matrix of priority stream reaches.

Tualatin River Watershed

Watershed Process & Function

Evaluate hydrology, geomorphology and vegetation in order to improve stream ecology and focal species' range and access to habitat.

Geographic Priorities

Main stem and all sub-basins.

Habitat Emphasis and associated Project Types (in priority order):

Improve hydrologic conditions:

1) Ensure adequate water flow to meet anadromous fish needs:

Flow is a limiting factor; streams without sufficient water cannot support fish. Further, as flows diminish in the summertime, stream temperatures rise to unsustainable high levels for fish. Strategies include trading re-used water for instream water rights where feasible, pumping water back into tributary streams during low flow times, and removal of instream ponds.

2) Manage peak flows and storm water in urbanized areas:

Strategies include increased requirements for stormwater detention with new development, or options to use low-impact development techniques to reduce impervious area. In addition, restoring stream channel connectivity to floodplain provides natural storage of peak flows.

Improve geomorphic conditions

These include a) increasing bank stability; b) increasing sinuosity, i.e., removing channel straightening; and c) decreasing channel entrenchment/increasing flood plain connectivity. Improving geomorphic conditions is generally a priority in low to mid gradient areas.

Restore Riparian Conditions

These include a) management of non-native and invasive species to gain an increase in plant community diversity; b) expanding stream canopy cover; c) woody debris recruitment.

Considerations for project prioritization: project sites are considered higher priority relative to other projects as they: affect longer stretches and on both sides of the stream, achieve larger riparian zone widths (in proportion to stream size).

Water Quality

List broad causes: which include water quality limited parameters.

Tualatin Basin is listed by the DEQ as water quality limited for temperature (low flows and lack of riparian shade), dissolved oxygen (oxygen consuming substances that end up in the sediment), and bacteria. The main-stem Tualatin River is listed as water quality limited for dissolved oxygen (high ammonia) and chlorophyll *a* (high total phosphorus). In 2001 a TMDL was issued that addressed these issues.

Tualatin River Watershed

Ammonia and phosphorus limits were placed in the wastewater treatment plant permits. A stormwater management plan is being developed for the stormwater permit that will address the stream dissolved oxygen levels, the levels of bacteria in both the tributaries and the main-stem, and the phosphorus from the tributaries that contribute to the phosphorus in the lower river. To address the temperature issue many miles of stream will be planted to provide shade.

List plans which will include best management practices: 1) urbanized areas include Clean Water Services Stormwater Management Plan, (November 2006); 2) agricultural land uses include Senate Bill 1010; 3) forested land uses include Oregon Forest Practices Act; 4) all areas include Clean Water Services temperature plan. Implement best management practices in plans.

Priority areas are 1) urbanized areas; 2) agricultural land uses; 3) forested land uses.

TERRESTRIAL

Much of the vegetation pattern of the lower watershed (the Tualatin plains) is highly fragmented with limited early to mid-successional forested and riparian areas, some possible migratory corridors and severely deficient late-successional habitat. Native species richness and diversity is being lost due to habitat fragmentation. Invasive, exotic, and noxious flora and fauna increase habitat loss and fragmentation.

Tualatin Mountains, headwater forests may be dominated by species typical in western hemlock zone, while the foothills are dominated by Douglas-fir stands.

Actions:

- 1) Preserve, restore and enhance wetlands and floodplains, including emergent wetlands, scrub-shrub, wet prairies, riparian forests.**
- 2) Preserve intact upland areas, such as oak woodlands, prairie and oak savannas.**
- 3) Remove invasive species throughout the watershed.**
- 4) Give priority to connectivity of uplands through corridors.**

Geographic Priorities:

These habitats are a priority in all areas of the watershed.

Wetlands and floodplains: Focal species include Northwestern pond turtles, red-legged frogs, Pacific salamander, bald eagle, peregrine falcon, water howellia, Lobaria pulmonaria, fungus, Hevella compressa, and the Western Wahoo.

Oak Woodlands: Add focal species if identified.

Bottom hardwood and riparian forests: Add focal species if identified.

Wet Prairie: Add focal species if identified.

Upland Prairie and Oak Savannas. Nelson's checker-mallow and Kincaid's lupine.

This is the stepping-stone habitat needed for movement north of the species dependent on these habitats. This is needed for linkage and dispersal, and interchange with other populations for genetic diversity.

Tualatin River Watershed

Tualatin River Watershed Council Criteria to identify and prioritize habitat restoration

When determining the strategy for each ecological goal, the Council considers the following sequence of activities:

In addition, when prioritizing geographic areas, habitat emphasis, project types, and finally projects themselves, the Tualatin River Watershed Council uses the following documents and methods:

Documents:

Review Watershed Assessments outside the Urban Growth Boundary and the Healthy Streams Plan inside the Urban Growth Boundary and its fringe areas.

Review Matrix of Stream Priority Reaches.

Review of Culvert/Barrier inventory.

Review Council Action Plan priorities.

<i>Task</i>	<i>Based on</i>	<i>Result</i>
<i>Identify priority areas for conservation and restoration</i>	<i>Ecological data; professional judgment; existing plans</i>	<i>Selected sub-watersheds or areas, and habitat emphasis</i>
<i>Determine restoration potential; likelihood of effect</i>	<i>Considerations such as geomorphology, hydrology, habitat condition, surrounding influences</i>	<i>Reaches or parcel groups identified for possible restoration; project types applicable</i>
<i>Move from possible sites to implementation</i>	<i>Considerations such as landowner interest, funds, time constraints, permits</i>	<i>Final selection of projects</i>

Yamhill & Chehalem Watersheds

Yamhill & Chehalem Watersheds

Restoration Priorities

The Yamhill Basin Council recently completed the 2005 Action Plan, which included geographic priorities and more in-depth action opportunities. The 2005 Action Plan is available online at <http://www.co.yamhill.or.us/assessments>. As a living document, the 2005 Action Plan and the priorities below will be modified and revised as new information becomes available and re-prioritization is conducted.

The following sections describe priorities and project types for addressing limiting factors of the Yamhill and Chehalem Watersheds. In order to implement or support project types listed, the Council must maintain a healthy organizational structure and conduct educational and outreach activities to build support for the Council, our partners, and the efforts we make to improve our watersheds.

AQUATIC

Historically, the larger channels in the upper reaches of the watershed had extensive areas of large woody debris. This provided cover and food sources for fish and aquatic insect species, as well as attenuating the energy of high-flow events, preventing channel degradation. Large wood can increase habitat complexity, provide cover for rearing juvenile fish, increase aquatic insect habitat, trap spawning gravel, create scour pools, etc. Gravel and debris were retained in the streambeds, improving water storage and quality.

Large wood is currently lacking in upper reaches of the basin and stream complexity is low due to channel modifications and lack of natural meanders. Historic splash-damming has resulted in lack of spawning gravels and sediments in the upper reaches of the basin. Until mature riparian vegetation is re-established along riparian areas, large woody debris recruitment is not possible in some stream reaches without man made restoration efforts as a catalyst.

Focal species: *Spring Chinook in lower Yamhill River*

Winter Steelhead, cutthroat trout, Oregon chub, Pacific lamprey, western brook lamprey, western pond turtle

Connectivity/Passage

While fish barriers existed historically that affected the Yamhill basin, they were natural features such as logjams and Willamette Falls at Oregon City. This influenced the natural complement of anadromous fish in the basin, which were able to surmount these obstacles.

Fish passage barriers in the Yamhill Basin include culverts, dams, waterfalls, logjams and beaver ponds. Culverts that act as fish barriers on state and county roads are reported in an ODFW database and GIS layer. These barriers impede fish migration, which is necessary for fish populations to breed, adapt to changing habitat conditions, maintain a diverse gene pool and respond to catastrophic events. Barriers on private land have not been surveyed and barriers reported by the county have not had detailed surveys completed.

Yamhill & Chehalem Watersheds

This is a top priority for access to and between habitats and refuge by Winter Steelhead, cutthroat trout and spring Chinook. The need increases where temperature problems exist in specific areas and refuge is necessary. The YBC will be working with other watershed partners to continue barrier inventories where not yet complete and establish priority structures. The geographic priorities identified below should be considered general recommendations as a complete inventory and analysis for priorities is not yet available.

Culverts, dams and diversion structures

Identify, prioritize and eliminate fish passage barriers to open up quality upstream habitat.

Geographic Priorities (high):

Willamina subwatershed

Upper South Yamhill subwatershed

North Yamhill subwatershed

Mill subwatershed

Considerations for project prioritization: Amount, type and quality of habitat re-opened, benefits to priority species, cost, number of barriers to remove, position in relation to other barriers (presence and number of other barriers down stream and potential for removal), landowner interest, partnership opportunities.

Water Quality

Work collaboratively to improve water quality in the Yamhill and Chehalem watersheds.

Historically, stream flow in the basin was more moderated by intact floodplains, extensive side channels, wetlands and riparian areas. High waters overtopped banks, flooding adjacent lands and allowing for filtering and infiltration. Groundwater recharge then slowly released water to streams during summer periods of low flow.

Currently, water quality in the Yamhill Basin is generally considered to be poor, as identified by the results of the YBC 2003-2004 Water Quality Monitoring Project, and Department of Environmental Quality (DEQ) Ambient Monitoring Program. Water quality is affected by pollution, nutrients, temperature, bacteria, chemicals, and stream flow. Of the 1,069 total stream miles in the basin, 228.8 miles are on the 303(d) list with the following breakdown of parameters (in stream miles): Temperature (165.7), Iron (31.6), Fecal coliform (191.6), Dissolved Oxygen (52.9), Manganese (44.0), Chlorophyll a (32.8), and Chlorpyrifos (5.2).

Geographic Priorities: Upper streams have been shown to have generally higher water quality, but are still impaired. Lower reaches are generally impaired under several water quality parameters. Efforts will be made to prevent future water quality impairment for those conditions that are in good state, and improve water quality for impaired parameters. The YBC considers subwatersheds that have mid and high water quality as priorities for sustaining and improving water quality. Subwatersheds that have the lowest water quality conditions may be considered lower priorities for the YBC as opportunity for improvement is more costly and less likely in the

Yamhill & Chehalem Watersheds

capacity of the YBC. Project types include: Reduce nutrient, bacteria, and sediment inputs in streams; Participate in TMDL process; reduce roadside impacts on water quality; education; monitoring; See also actions to Restore Riparian Area Function. Geographic priorities for improving water quality include the following subwatersheds: Chehalem; North Yamhill; Lower South Yamhill; Willamina; Lower Mill Creek; and Salt Creek.

Considerations for project prioritization: *measurable results, cooperation of other agencies/partners, 303(d) listed streams and others identified as impaired by the YBC Water Quality Monitoring Report.*

Watershed Process & Function

These actions also relate to water quality

Restore Riparian Area Function

Riparian vegetation is minimal with only grasses or shrubs or non-existent along approximately 1/3 of the streams in the Yamhill Basin, as estimated from the riparian conditions maps found in the YBC watershed assessments. Lower to mid reaches in all subwatersheds are impaired. The lack of riparian trees and shrubs impairs wildlife habitat and connectivity for wildlife migration between habitat patches. The riparian vegetation functions of filtering pollutants, stabilizing stream banks, and providing shade are degraded throughout the Yamhill Basin. *Project types include:* Eradicating invasive plants, planting native species, re-establishing conifer species; education to landowners on restoration methods, education to landowners on incentive programs; native seed collection and propagation (See restore riparian area function in Terrestrial section). Geographic Priorities include:

Lower South Yamhill (Muddy Creek)

Chehalem

North Yamhill

****Riparian enhancement is a priority and throughout the entire basin.**

Considerations for project prioritization: *stream miles improved, width of riparian buffer affected; connectivity to other projects; feasibility; landowner interest and contribution; ability to engage community members, opportunity for education.*

Restore channel complexity

This is a priority in all subwatersheds, with highest priorities in the lower reaches of basin for spring Chinook habitat and the upper reaches for winter steelhead and cutthroat trout habitat.

Considerations for project prioritization: *fish presence; other habitat factors such as riparian cover; connectivity to other projects. Project types: Large wood placement; in-stream and hydrologically-connected wetland restoration; off-channel habitat creation; expand and restore floodplain; and reconnecting and restoring flow to historic channels.*

Yamhill & Chehalem Watersheds

Restore adequate stream flows

Priority as adequate flow reduces summer stream temperatures and is crucial for in-stream habitat.

Low stream flow impacts habitat and water quality. Lower flows result in higher stream temperatures and greater concentrations of pollutants. Low flow conditions were reported in the assessments for North Yamhill (Haskins Creek), Lower Yamhill (Palmer Creek), Willamina (Upper Willamina, Coast and East Creeks), Mill, and Salt Creek Watersheds. Haskins Creek and Palmer Creek are the most impaired by stream flow.

The Oregon Water Resources Department (OWRD) and Oregon Department of Fish and Wildlife (ODFW) jointly identified 37,599 acres in the Lower South Yamhill-Deer Creek Watershed as high priority for water availability. Ranked by ODFW on habitat characteristics and by WRD on flow, these are priority areas where OWRD will have specific activities each year aimed at restoring flow, such as leasing in-stream water rights, obtaining cancelled water rights, and where ODFW will target habitat restoration/protection.

Geographic Priorities:

North Yamhill subwatershed –Haskins Creek

Lower Yamhill subwatershed – Palmer Creek

Deer Creek subwatershed

Willamina subwatershed

Lower Mill Creek drainage

Urban areas

**All areas: Priorities for monitoring stream flow, as little data is available.*

Considerations for project prioritization: *impact of project implementation; willingness of landowners/partners. Project types: Monitor summer stream flow; identify key areas for implementing flow related projects; encourage leasing or donation of in-stream water rights; protection and identification of functional wetlands; education about water conservation; development of partnerships with OWRD, SWCD's, NRCS, ODA, Drinking Water Task Force, Oregon Water Trust and others in the following matters: identification and development of future off-stream storage sites, improvement of irrigation efficiency; identification of important groundwater resources in the basin; understanding of significances of groundwater/surface water interaction.*

TERRESTRIAL

Riparian areas

This habitat is a priority due to importance in connecting other quality habitats, providing essential habitat to focal species, fish, and its impact on water quality.

Focal species: Bald eagle, Red-eyed vireo, Willow flycatcher, American beaver, Coastal Tailed Frog.

Yamhill & Chehalem Watersheds

Geographic Priorities: All areas, especially mid to lowlands, with high ecological priority in the following subwatersheds that have high suitability for focal species: North Yamhill & Chehalem.

Considerations for project prioritization: *Acres of habitat restored/protected, opportunity for education and community involvement, connectivity to other quality habitats, and connectivity to other projects, cost and funding available, maintenance needed and landowner interest. Project types:* Eradicating invasive plants, planting native species, education to landowners on restoration methods, education to landowners on incentive programs; native seed collection and propagation (See restore riparian area function in Aquatic section).

Wetlands, Ponds and Floodplains

Wetlands were once extensive along most of the lower watershed, in the form of cutoff oxbows, side channels, wet prairies, seasonal seeps, marshes and ponds. These features provided water storage in the dry season, flood reduction, and refuge habitat for fish species.

Over the past century and a half, wetland acreage has been significantly reduced for agriculture and development, through filling, draining and tiling. Wet prairie is a type of wetland that is now almost non-existent in the watershed. It once played a significant role in providing habitat for fish and other wildlife, off-channel storage of flood waters, and groundwater recharge to the system during low flow summer months. Wetlands can provide off-channel rearing habitat, which is often a limiting factor for juvenile fish survival, and are also a great filter/sink for runoff and pollutants.

Wet Prairie is a top priority due to the listed plants and candidate-listed wildlife species and due to the extent the habitat has been highly impacted compared to the historic extent. Key incoming knowledge: USFWS Willamette Prairie Recovery Plan, 2005. Wetland, ponds and floodplain habitats are considered priority for restoring habitat and watershed processes. Projects may address focal habitats with consideration given, but not limited to the following species: Green Heron, purple martin, western pond turtle, wood duck, and migratory birds, Osprey, Common Yellowthroat, Nelson's Checkermallow, Northern Harrier, and Red Legged Frog.

Geographic Priorities:

Lower reaches of subwatersheds:
Lower South Yamhill/Deer Creek
Mill
Salt
Lower Yamhill
North Yamhill
Chehalem

Considerations for project prioritization: *Acres of habitat restored/protected, known presence of focal species, opportunity for education, opportunity for community involvement, connectivity to riparian areas and other quality habitats, connectivity to other projects, cost and funding available, maintenance needed. Project Types include:* Landowner education/outreach, habitat restoration, protection, and monitoring, wetland enhancement; removal/fill of artificial drainage structures, invasive species removal and placement of habitat structures

Yamhill & Chehalem Watersheds

Uplands

Terrestrial upland habitat has been altered by land use and management. The lower portions of the watershed were once home to extensive oak savannahs. Upland forests are now mostly managed for timber production. Oak savannah habitats which were historically burned by indigenous peoples are now encroached on by conifer forests or converted to agriculture, vineyards, or other uses. Because of conversion of oak woodlands, upland prairies and savannahs, several species that depend on those habitats are now listed as threatened, endangered or at-risk. The Fender's blue butterfly that depends on the Kincaid's lupine of upland prairie habitat is listed as endangered by the Endangered Species Act. Additionally, eight other species are listed as rare, threatened or endangered. The BLM lists another 16 special status species and seven sensitive species in the watershed.

Upland prairie & oak savannah

This habitat is a high priority because of the number of listed species, the extent to which the habitat has been and is predicted to be altered and eliminated. Key incoming knowledge: USFWS Willamette Prairie Recovery Plan, 2005. Because of the limited technical support currently available for such projects, the YBC will focus most of its efforts on providing landowner education and building technical resources and partnerships for restoration projects. Focal species: American kestrel, western meadowlark, western rattlesnake, black-tailed jackrabbit, Taylor's checkerspot, Fender's blue butterfly, Kincaid's lupine, white rock larkspur, white-topped aster, and western bluebird.

Geographic Priorities:

Deer Creek/Lower South Yamhill

Upper South Yamhill

North Yamhill

(Salt Creek, Lower Yamhill River Subwatershed, Mill Creek, Chehalem, Willamina)

The Deer Creek drainage is of high priority because of known occurrences of Fender's Blue Butterfly and habitat for other species. There are also significant conservation opportunities here in working with private and public landowners on habitat restoration and water availability.

Considerations for project prioritization: *Amount of habitat restored/protected, known presence of focal species, opportunity for education, opportunity for community involvement, connectivity to riparian areas and other quality habitats, connectivity to other projects, cost and funding available, maintenance needed. Project Types: Education/outreach; reduce and control invasives, controlled burning, conifer thinning, planting and re-vegetation, reintroduce native forbs and especially nectar plants, planting oaks.*

Oak woodland

This habitat is a priority as conifer encroachment of this habitat is significant in the basin as well as conversion to other land uses.

Focal species: acorn woodpecker, chipping sparrow, white-breasted nuthatch, alligator lizard, sharptail snake, western gray squirrel, western wood pewee.

Yamhill & Chehalem Watersheds

Geographic Priorities:

Chehalem
Willamina
North Yamhill

Considerations for project prioritization: Acres of habitat restored/protected, known presence of focal species, opportunity for education, opportunity for community involvement, connectivity to riparian areas and other quality habitats, connectivity to other projects, cost and funding available, maintenance needed. Project Types: Vegetation Management: thinning; encourage high biodiversity; controlled burning.

Old growth forest

This habitat is less of a priority as remaining stands are already somewhat protected and managed for habitat values by BLM, ODF, and CTGR; there is not a significant amount in the Yamhill and Chehalem Watersheds relative to other basins.

Focal species: Pileated woodpecker, Northern spotted owl, olive-sided flycatcher, red tree vole.

Geographic Priorities:

BLM Late Successional Reserves,
Private owned forest lands (Weyerhaeuser and Stimson Lumber).

Considerations for project prioritization: Acres of habitat restored/protected, known presence of focal species, opportunity for education, opportunity for community involvement, connectivity to riparian areas and other quality habitats, connectivity to other projects, cost and funding available, maintenance needed, presence of focal species.

Mixed Forest (Douglas Fir/Big leaf Maple/Oak)

This habitat is a priority for wise use as most of the uplands are of this habitat type and the affects of poor management has impacts on water quality and aquatic habitat.

Geographic Priorities:

Upper Willamina
Upper Mill
North Yamhill
Chehalem

Considerations for project prioritization: Acres of habitat restored/protected, known presence of focal species, opportunity for education. Project Types: Recognition of good management practices, encouragement of good management practices; education to forestry/small woodlands groups on watershed impacts.

Yamhill & Chehalem Watersheds

Watershed Council

Criteria to identify and prioritize habitat restoration

Please see the following Project Priority Evaluation Sheet, which was developed in the 2005 Action Plan process.

References

Yamhill Basin Council Action Plan, 2005
Willamette Subbasin Plan, Draft

Geographic Priorities

In combining the processes of developing this Action Plan and the Willamette Subbasin Priorities planning project, the YBC has been able to study indicators of watershed health and develop geographic priorities for projects addressing these. These priorities were developed using the following sources of input:

- Watershed assessment matrix to compare watershed factors between the eight different watersheds.
- Information provided in the Willamette Subbasin Plan, including habitat for and presence of focal species, conservation and restoration opportunities, priority conservation areas and priorities for restoring fish habitat.
- Presence, area, and land area percentage of conservation and restoration opportunities by type in each watershed.
- Local input from council members and partners.

Within the context of the larger Willamette Basin, these priorities reach for maximum watershed benefits to the Yamhill Basin and the greater Willamette Basin. Further discussion between stakeholders and watershed groups of the Willamette Basin will likely alter and fine-tune these priorities. The geographic priorities for the Yamhill Basin projects are highlighted in the following summary table and subsequent maps by the following action opportunity categories: water quality, stream flow, riparian health, aquatic, and terrestrial habitat (oak woodlands, wet prairie, upland prairie/oak savanna, wetlands and ponds, and floodplains).

Yamhill & Chehalem Watersheds

Table A1: Summary of YBC Geographic Priorities

Watershed Name	Fish Passage	Aquatic Habitat	Wetlands and Ponds	Wet Prairie	Upland Prairie/ Oak Savannah	Oak Woodland	Floodplain forest
Lower South Yamhill River/Deer Creek	Medium Priority	High Priority	High Priority	Highest Priority	Highest Priority	High Priority	Priority in lower subwatersheds
Mill Creek	Medium-High Priority	Highest Priority	High Priority	Medium-High Priority	Medium-High Priority		Priority in lower Mill and Gooseneck
North Yamhill River	High Priority	Highest Priority	Highest Priority	High Priority	High Priority	High Priority	Priority in lower subwatersheds
Salt Creek	Medium-High Priority		Highest Priority	High Priority	High Priority	High Priority	Priority in lower Salt
Upper South Yamhill River	Highest Priority	Highest Priority	High Priority	High Priority	Highest Priority		
Chehalem Creek	Medium-High Priority	High Priority	High Priority	Medium-High Priority	High Priority	High Priority	Priority in lower Chehalem
Willamina Creek	High Priority	Highest Priority	High Priority	Medium-High Priority	High Priority		Priority in Willamina
Yamhill River			High Priority	Medium-High Priority	High Priority		Priority

Table A1 (cont.): Summary of YBC Geographic Priorities

Yamhill & Chehalem Watersheds

Watershed Name	Water Quality	Stream Flow	Riparian Health
Lower South Yamhill River/Deer Creek	Improve water quality	High Priority in Deer Creek drainage, unknown elsewhere (more data needed)	Highest Priority in Ballston and Muddy Creek Drainages; High Priority in Middle and Lower Deer Creek; Medium Priority in S. Yamhill/Rock Creek drainage; and Protect in Upper Deer.
Mill Creek	Improve water quality	Medium-High Priority in Lower Mill drainage, unknown in upper Mill (more data needed)	Highest Priority in lower Mill Ck. Drainage; High Priority in Upper Mill Ck. Drainage.
North Yamhill River	Improve water quality	Highest Priority in Haskins Creek and Middle N. Yamhill drainages, High Priority in Turner Creek, Medium Priority in Upper N. Yamhill drainage, and unknown elsewhere (more data needed)	High Priority throughout. Highest Priority in Lower N. Yamhill and Yamhill Creek
Salt Creek	Improve water quality	Unknown (more data needed).	Highest Priority in Lower Salt and Ash Creeks; High Priority in upper drainages.
Upper South Yamhill River	Protect water quality in Upper Agency Ck. subwatersheds and Improve throughout.	Unknown (more data needed).	Protect in Rock, Rogue and Upper Agency Creeks, High priority in Upper S. Yamhill and Rowell Creek, Medium-High Priority in Gold Creek.
Chehalem Creek		Unknown (more data needed).	High Priority in Chehalem Ck. drainage, Highest Priority in Hess Ck. Drainages.
Willamina Creek		Medium-High Priority throughout.	Highest priorities in East Ck and lower Willamina drainages, medium priority along upper Willamina and Coast Ck. Drainages
Yamhill River		High Priority in Palmer Creek drainage, unknown elsewhere (more data needed).	Highest Priority along S. Yamhill and lower Yamhill Rivers, High Priority in Palmer Ck. drainage

Molalla River Watershed

Molalla River Watershed

Restoration Priorities

AQUATIC

Focal species: *Spring Chinook salmon (migration, spawning, and rearing) winter steelhead (migration, spawning and rearing). Resident and fluvial cutthroat trout are present. Oregon Chub were historically present and could be reintroduced. Pacific lamprey and western brook lamprey are present and spawning in the basin.*

Watershed Connectivity

Culverts and diversion structures

Geographic Priorities:

There are numerous culverts in the watershed that are fish passage barriers. There are probably some unscreened diversions on the Molalla River and some of the lower tributary streams.

Watershed Process & Function

Ensure adequate water flow

Geographic Priorities:

The highest priorities for flow restoration in the watershed are the lower Molalla River and Milk Creek (highest).

Restore and protect riparian area function

Geographic Priorities:

Riparian function is reduced throughout the watershed. There is a greater proportion of the impacted riparian areas in the lower watershed, where there is reduced width and connectivity, and issues with weed species. Priority areas for restoration include Milk, Cedar, and Canyon Creek subwatersheds. Invasive (exotic) plants affect riparian function and all other habitats.

Restore channel complexity

Geographic Priorities:

Loss of large wood within stream channels contributes to lowered channel complexity, particularly in the lower Molalla River and the subwatersheds where private lands are concentrated. Channels in the lower portions of the Molalla River, particularly near the city of Molalla and some of the lower tributaries (particularly Milk Creek), have been simplified as a result of revetments and other actions.

Molalla River Watershed

Water Quality

Water Temperature

Geographic Priorities:

Lower watershed tributaries and Molalla River, particularly the Milk Creek subwatershed. It is important to combine restoration of riparian canopy cover with improvements in summer flows to maximize stream temperature improvements.

Bacteria

Geographic priorities:

High bacteria levels have been observed in the lower Molalla River.

TERRESTRIAL

Priority Terrestrial habitats for restoration:

Upland prairie

Oak savannah and oak woodlands

Wetlands and wet prairie

Riparian and bottomland forests

Geographic Priorities:

Lower watershed.

Invasive Plants

Geographic Priorities:

Invasive plants are the greatest threat in the lower watershed, but they are a problem throughout watershed. Invasive (exotic) plants affect all terrestrial habitats. It is important to track the extent of invasive plants through surveys of Japanese Knotweed and other species.

References

Lower Molalla and Milk Creek Watershed Assessment, 2005.

Willamette Subbasin Plan, 2004.

Pudding River Watershed

Pudding River Watershed

Restoration Priorities

AQUATIC

Focal Species:

Spring Chinook Salmon, Winter Steelhead, and cutthroat trout. Native runs of anadromous fish are thought to have occurred in Butte, Abiqua, Silver Creeks. Pacific and Brook lamprey are also thought to exist within the subbasin. Oregon Chub once existed in the subbasin and could be reintroduced.

*The Council's highest priority is to complete the **Pudding River Watershed Assessment**. The assessment (scheduled for completion in December 2005) will provide more information on aquatic habitat restoration priorities and geographic focus areas for projects.*

Connectivity/Passage

Geographic Priorities:

Upper basin

Butte Creek

Abiqua Creek

Silver Creek

Considerations for project prioritization: *The Cascade foothill streams of the Pudding basin, particularly Butte, Abiqua, and Silver Creeks are productive for salmon because of their spawning gravels and clear spring-fed streams. There are a number of river miles above each dam on three creeks that have current or historic fish use where access could be improved before the streams have significant impassable falls.*

Work to improve fish passage at Abiqua, Butte and Silver Creek Dams, which all have fish ladders with poor attraction and do not function at all during low flow conditions. The Silverton Water Supply dam fish ladder on Abiqua Creek is the highest priority for a remedy.

Complete ground truthing of potential culvert blockages that are identified in the Watershed Assessment. Few blockages are anticipated in the lower basin because of the low overall gradient of the valley floor streams.

Pudding River Watershed

Watershed Process & Function

Temperature, streams flows, and limited wood/complexity in channels are limiting factors for juvenile salmon trout use in lower basin stream during warm season.

Ensure adequate water flow

If flow is a primary factor in high summer temperatures, ensure flow, especially in late summer.

Geographic Priorities:

Lower Basin

Low portions of tributaries draining the western Cascades (e.g., Rock, Butte, Abiqua, Silver, and Drift Creek)

Considerations for project prioritization: Stream flow relates to water temperatures and other water quality parameters. Work to provide information on flow levels and irrigation needs in lower subwatersheds. Work to improve instream flows.

Restore riparian area function

Geographic Priorities:

Lower Basin

Lower portions of tributaries draining the western Cascades (e.g., Rock, Butte, Abiqua, Silver, and Drift Creeks)

Considerations for project prioritization: Shade, which relates to water temperatures, and large wood in streams are limiting factors that need to be address through riparian restoration. Restore riparian area function by promoting restoration plantings and demonstration sites. Work to educate the public about the threats posed by invasive weeds in the watershed.

Restore channel complexity

Geographic Priorities:

Low portions of tributaries draining the western Cascades (e.g., Rock, Butte, Abiqua, Silver, and Drift Creeks)

Considerations for project prioritization: Limited large wood in stream is a key limiting factor, influencing channel complexity, deep pools and spawning gravels. The focus for improving channel complexity should be on key winter steelhead spawning and rearing areas.

Pudding River Watershed

Water Quality

Primary water quality issues are temperature (see riparian function), chemical runoff, and sediment delivery to stream channels.

Geographic Priorities:

Lower Basin

This will involve working primarily with agricultural interests, but also municipalities such as the city of Salem and Woodburn.

Lower portions of tributaries draining the western Cascades (e.g., Rock, Butte, Abiqua, Silver, and Drift Creek

This will involve working primarily with agricultural interests (primarily Christmas tree farms), rural residential areas, and municipalities such as the city of Silverton

Considerations for project prioritization: Work to engage landowners, municipalities and other stakeholders in improving water quality by advocating BMPs that reduce chemical runoff and soil loss such as filter strips, grass ditches, increased riparian buffers, streamside shading and restored wetlands.

TERRESTRIAL

Information for the watershed assessment and other studies will be integrated in order to provide a context for prioritizing terrestrial habitat restoration priorities. The lower Pudding River Watershed historically had extensive wetland areas, bottomland forests along the river, wet prairies, and oak woodlands.

Wetlands

Oak Woodlands

Bottomland Hardwood and Riparian Forests

Wet Prairie

Upland Prairie

Glenn-Gibson Creek Watersheds

Glenn-Gibson Creek Watersheds

Restoration Priorities

AQUATIC

The Glenn-Gibson watershed is experiencing rapid urban growth in the upper western portions of the watershed. This urban growth is affecting aquatic habitat and water quality through increased runoff from impervious surfaces and increased sediment input from construction, roads and higher peak flows.

Connectivity/Passage

There are a number of dams and other obstructions in the watershed. The most down stream obstruction is Salemtowne pond, which has a fish ladder that is passable if it receives adequate maintenance. There are also numerous culverts at road crossings.

Watershed Process & Function

Increased impervious surfaces and urban runoff

Increased water flows down channels and sediment delivery to wetlands. There is a need to decrease impervious surfaces and control runoff.

Geographic priorities:

Throughout the watershed

Restore riparian area function

Geographic priorities:

Throughout the watershed

Current riparian corridor and wetland restoration work: Focus: Brush College Park

Considerations for project prioritization: Water temperature and sediment control issues are important considerations. Invasive weeds are an issue.

Channel complexity

Channels have been modified and there has been loss of wood and other structures in the streams. Wood continues to be removed from streams to improve flood conveyance. The council has worked with the City of Salem to increase knowledge of the stream cleaning team to improve selectivity in removing/leaving woody material. There is also potential for restoring channel complexity in the lower and mid reaches of the watershed through partnerships with landowners by placement of woody material, boulders and creation of off-channel habitats.

Glenn-Gibson Creek Watersheds

Water Quality

Dissolved oxygen and water temperature are limiting factors. Loss of riparian shade and impervious surfaces are contributing to water temperature increases.

Decrease water temperature and increase dissolved oxygen by decreasing impervious surfaces and increasing retention of stormwater in constructed facilities and restored wetlands. Protecting and restoring upland areas that receive and store precipitation and wetlands in the upper/middle watershed is critical to maintaining summer stream flows to improve water quality.

Geographic Priorities:

Throughout the watershed

References

Pringle, Claggett, Glenn-Gibson and Mill Creeks Watershed Assessment, 2002

Salem-Keizer Area Watersheds

Salem-Keizer Area Watersheds

Restoration Priorities

AQUATIC

Small urban streams with impaired aquatic and terrestrial habitats are further stressed through residents' recreational interactions especially children who are drawn to the waters. Impacts include the pursuit and capture of fish, frogs, and crayfish by hand or rod (often leading to their demise), creating fish passage barriers through construction of rock dams, and increasing bacteria levels through feeding large numbers of ducks and geese. Mill Creek's wildlife may also be stressed through local youths' summertime inter-tubing. Studies quantifying these collective impacts are not available.

While recognizing that Salem area streams have a significant number of severe limiting factors for native cold-water fish, sustainable water quality has to be the prime watershed restoration priority. Without adequate water quality other restoration efforts will not produce optimum benefits.

Claggett Creek's headwaters include the Landcaster Mall's parking lot in SE Salem. Mill Creek receives a substantial infusion of high quality water from the upper North Santiam River at Stayton. If Claggett Creek was regularly monitored for water quality its turbidity, temperature, metals, and other measurements would far exceed Mill Creek' data.

It has been documented that pesticides impact native fish behavior directly and habitat indirectly through impacts on potential food sources. Some pesticides accumulate in tissues and concentrate in the food chain. Pringle Creek has a 303-(d) listing for pesticide and other. Salem Keizer streams may be listed if monitoring efforts included pesticide detection. For related pesticide study citations review the Northwest Alternatives to Pesticides website.

Informally Salem Keizer groups have identified some restoration priorities for their watersheds:

Claggett Creek Watershed Council

Members continue to be involved in restoring wetlands in the Keizer area.

Pringle Creek Watershed Council

Members have expressed ongoing interest in controlling invasive plant species and conducting native plantings in headwaters.

Mill Creek

Participants are involved in mitigating for transportation and economic development impacts in the Mill Creek watershed.

Salem-Keizer Area Watersheds

Greater Salem-Keizer Area Watershed Councils Approach and criteria to identify and prioritize restoration efforts

Unfortunately the combined watershed assessment did not include channel habitat data for the covered watersheds. No watershed action plans have been initiated and completed for the covered watersheds. Given the scale of limiting factors described in the draft Sub-basin Plan prioritizing the whole range of potential projects will be challenging.

Pringle, Claggett, and Mill Creek watershed members have access to recommendations and early action items contained in their combined 2002 watershed assessment document. The draft WRI Sub-basin Plan identifies limiting factors for the Salem Keizer area watersheds utilizing the EDT approach.

In addition, a consultant is producing a Pringle Creek habitat assessment due soon and Salem Public Works will be producing watershed management plan for Pringle Creek.

The Claggett Creek Watershed Council continues to secure fiscal resources for the development of their watershed action plan.

The Pringle Creek habitat assessment funded by Salem public Works has not been completed at this time.

Rickreall Creek Watershed

Rickreall Creek Watershed

Restoration Priorities

AQUATIC

The Rickreall watershed provides habitat for several salmonids including Winter Steelhead, Cutthroat Trout, Coho and possibly juvenile Chinook. Fish surveys have also revealed other species of interest including Pacific Lamprey, Sand Rollers and Oregon Chub.

Connectivity/Passage

There are a number of dams, culverts and other obstructions in the watershed. On the mainstem there are two significant barriers. A concrete low water ford at RM 7.5 is partially passable but is a barrier to all species at some life stage and/or flow level. An earthen dam creating Mercer Reservoir at RM 26 is impassible to all fish. Several of the tributaries containing spawning and rearing habitat are also partially blocked by culverts and other obstructions.

Geographic Priorities:

To open steelhead and cutthroat habitat to free passage by juveniles and adults by addressing passage at the lowest mainstem barrier first and then in the tributaries with the best current or potential habitat. The council also maintains a conversation with the City of Dallas and partners about long-term options for passage above Mercer Reservoir.

Watershed Process & Function

Through riparian plantings and weed abatement projects, the Council is improving both aquatic (steelhead) and terrestrial habitats.

Ensure adequate water flow

Increasing summer stream flows in the Rickreall Watershed is considered an area of priority (303d list). During the summer months, the flows are low and this is contributing to higher water temperatures. Water conservation efforts, increasing municipal storage capacity and restoring wetland/upland function will help retain water during the critical summer months and riparian plantings will help shade the stream.

Geographic Priorities:

Throughout the watershed. (see Water Quality)

Rickreall Creek Watershed

Restore riparian area function

Large wood is lacking in most areas below the reservoir. This is primarily due to a combination of loss of large conifers in the riparian areas and the reservoir preventing the movement of coarse woody material downstream

Geographic Priorities:

Riparian function is most limited in areas below the reservoir.

***Considerations for project prioritization:** Areas adjacent to, or upstream from steelhead habitat. Combine riparian plantings with weed management.*

Weed management

Focus on invasive weeds with small populations that may be eradicated or controlled such as Japanese Knotweed and on pervasive weeds in sensitive areas.

Geographic Priorities:

Throughout the watershed in riparian areas and along roadways which can spread invasive weeds through runoff and transportation on vehicles, animals and people.

Channel complexity

Channels have been modified and there has been loss of wood and other structures in the streams as well as significant reaches of entrenchment that lead to loss of connectivity with floodplain and off-channel habitat.

Geographic Priorities:

Steelhead rearing habitat

Currently pursuing stream channel reclamation in Forestry Creek.

Water Quality

Water temperature and flow modification are two factors limiting water quality. Loss of riparian shade and low summer flows are contributing to water temperature increases. Rickreall Creek is on the 1998 303(d) list for temperature and flow modification.

Rickreall Creek Watershed

Geographic Priorities:

Temperature is most limiting in the middle and lower reaches of the watershed. Projects in these reaches focus on restoring riparian shade, reducing illegal withdrawals of water and increasing wetland and riparian function. Projects in the upper reaches of the watershed focus on increasing summer streamflow by working with the city on studies that would increase storage capacity to allow more instream flow and identifying potential sites to increase upland infiltration.

References

Rickreall Watershed Assessment, Rickreall Watershed Council and Ecosystems Northwest, 2001

Rickreall Watershed Action Plan, Rickreall Watershed Council, 2003

North Santiam River Watershed

Restoration Priorities

The council has divided the watershed into 4 geographic areas based on fifth field hydrologic units as follows: the Lower Reach from Lyons to the Willamette, the Middle Reach from Detroit Dam to Lyons, the Little North Fork and the Upper Reaches that includes 3 fifth fields above Detroit Dam.

AQUATIC

1. **Connectivity/Passage**

- a. Fish passage and habitat connectivity

Geographic Priorities: *Lower and Middle Reaches.*

Considerations for project prioritization: Address fish passage barriers. Provide passage for migrating fish and access to off-channel habitats.

2. **Watershed Process & Function**

- a. Ensure adequate water flow

Geographic Priorities: Entire watershed. Withdrawals in Lower Reach were identified in the assessment as a high priority.

Considerations for project prioritization: Find water rights available for instream to improve water quality and quantity. Install water conserving irrigation. Educate citizens regarding water conservation.

- b. Restore channel complexity

Geographic Priorities: Lower and Middle Reaches.

Considerations for project prioritization: Restore off-channel, backwater and wetland habitats. Reconnect channels with the floodplain. Add large wood and/or boulders to create channel complexity and pools. Restore historic channels.

- c. Restore riparian/floodplain function

Geographic Priorities: Lower and Middle Reaches.

North Santiam River Watershed

Considerations for project prioritization: Restore native riparian vegetation, especially riparian forests and wetlands, to increase large wood recruitment, provide shade to protect water quality reconnect floodplain to streams. Use fencing to protect vegetation. Remove riprap and dikes when possible to reconnect stream channels with floodplain.

- d. Noxious weed eradication

Geographic Priorities: Entire watershed.

Considerations for project prioritization: Remove invasive species and replant with natives. Restore riparian and wetland vegetation.

3. Water Quality

- a. Temperature

Geographic Priorities: Lower and Middle Reaches and Little North Fork.

Considerations for project prioritization: Add buffers to riparian areas, secure instream water rights, install water conserving irrigation, use fencing and off-channel watering to protect riparian vegetation, help landowners set up conservation easements to protect riparian areas, educate and help landowners implement Best Management Practices, etc.

- b. Turbidity

Geographic Priorities: Entire watershed. Concern is primarily to protect drinking water beneficial use. Areas of particular interest for producing sediment are the Little North Fork, Sevenmile Creek, Rock Creek and Blowout Creek.

Considerations for project prioritization: Educate and help landowners implement Best Management Practices to reduce erosion associated with timber and agricultural practices. Reconstruct, decommission and/or obliterate roads that are possible sediment sources.

- c. Other Water Quality Parameters: Nutrients, E. coli and Toxics from Pesticides

Geographic Priorities: Primarily Lower Reach.

North Santiam River Watershed

Considerations for project prioritization: Collect data and design projects as needed to address concerns. Educate and help landowners implement Best Management Practices to reduce inputs.

Terrestrial/Upland

1. Habitat Structure/Function

- a. Restore habitat structure

Geographic Priorities: Entire watershed.

Considerations for project prioritization: Oak savanna in the Lower Reach and late successional conifer forests in the remaining watershed areas.

- b. Noxious weed eradication

Geographic Priorities: Entire watershed.

Considerations for project prioritization: Remove invasive species and replant with natives to restore upland vegetation.

2. Habitat Connectivity

- a. Road impacts

Geographic Priorities: Entire watershed, primarily timber areas (North Fork, Middle Reach and above Detroit Dam).

Considerations for project prioritization: Restore habitat connectivity for upland species through road reconstruction, decommissioning and obliteration.

3. Habitat Quality

- a. Recreation impacts

Geographic Priorities: North Fork and above Detroit Dam.

North Santiam River Watershed

Considerations for project prioritization: Trash pick-ups. Dispersed recreation site rehabilitation and hardening, riparian planting, sediment control and traffic control within riparian areas. Education, rehabilitation and monitoring should be completed to implement these.

North Santiam Watershed Council

Approach and criteria to identify and prioritize restoration efforts

The Council is in the process of developing a prioritization process and action plan. The following are the principles and criteria the Council has identified and ranked (one being the most important).

Overarching Principles:

- Identify and protect existing high quality resources (e.g. habitat, water quality, etc.).
- Reconnect existing high quality resources.
- Restore process/function to restore watershed resources.
- Restore specific sites that will address high priority concerns for the watershed.

Criteria:

1. Does the proposed project have a likelihood of success?
2. Is the proposed project technically or practically feasible?
3. Is there a presence of fish or other endangered or threatened species at the proposed project site?
4. Is the proposed project site adjacent to location of currently existing intact, high quality habitat, therefore, will connect areas of high quality habitat?
5. Does the proposed project address multiple resource concerns (e.g. fish passage and water quality)?
6. Is the proposed project cost efficient? (# of acres or stream miles restored per cost).
7. Does the proposed project have a likelihood of local citizens, organizations and/or agencies participating in project implementation?
8. Does the proposed project have a likelihood of securing funds?
9. Is the proposed project site in areas that have historically been known to have high quality habitat, high fish productivity or other endangered or threatened species?
10. Does the proposed project address a higher or lower priority resource need or concern? For example, does the Council restore habitat for endangered fish species over a species of concern such as pond turtle, or do they rank them equally given a project opportunity exists?
11. Will the proposed project have the fastest, most measurable effect?
12. Will the project impact local economy positively or negatively?

North Santiam River Watershed

References

North Santiam River Watershed Assessment of the Lower and Middle Reaches by E & S Environmental, 2002.

Little North Santiam Watershed Analysis by BLM, Cascade Resource Area, Salem Area Office, and USFS, Willamette National Forest, Detroit Ranger District, 1997.

Detroit Tributaries Watershed Analysis by USFS, Willamette National Forest, Detroit Ranger District, 1997.

Breitenbush Watershed Analysis by USFS, Willamette National Forest, Detroit Ranger District, 1996.

Upper North Santiam Watershed Analysis by USFS, Willamette National Forest, Detroit Ranger District, 1995.

EDT for the Santiam Basin by R2 Resource Consultants.

USGS just recently completed a water quality report for the watershed around January.

Blowout Watershed Analysis, USFS Willamette National Forest, Detroit Ranger District, 2000.

South Santiam River Watershed

South Santiam River Watershed

Restoration Priorities

AQUATIC

Focal Species: *Spring Chinook salmon, Winter Steelhead, fluvial and resident Cutthroat Trout, Pacific Lamprey, and Oregon Chub (lower subbasin only).*

Connectivity/Passage

Geographic Priorities: Lower Subbasin

The following lower subbasin watersheds have been identified as the highest priority for restoration:

- Little Wiley/Wiley/SF Wiley Cr.
- McDowell Cr.
- Ames Cr.
- Hamilton Cr.
- Thomas Cr.
- Lower South Santiam R.
- Neal Cr.
- Noble Cr.
- Crabtree Cr. (Lower, SF, and NF)
 - Improve fish passage and screen at Lebanon Dam
This is an ongoing project that is currently being addressed by the City of Albany (owner of the dam). Antiquated fish ladder is being renovated to allow for better fish passage.
 - Ensure fish passage and screen water withdrawals within Division of State Lands Essential Salmonid Habitat (DSLESH)
Assess culverts and fish screens that exist within DSLESH. Evaluate amount, type, and quality of habitat to be opened up with downstream culverts being highest priority. Encourage and assist landowners to screen water withdrawals and install fish screen at the Albany-Lebanon canal intake (ongoing).
- Upper Subbasin
Above Foster Dam, stream reaches are in a relatively good condition, with few passage issues. However, there is no anadromous fish passage at Green Peter Dam.

Considerations for prioritization: *Amount, type, and quality of habitat opened up.*

South Santiam River Watershed

Watershed Process & Function

Ensure Adequate Water Flow

Geographic Priorities:

- *Entire Watershed*
- *Neal, Thomas, Ames, and Crabtree Creeks.*

Considerations for prioritization: *These subwatersheds have been identified for high dewatering potential. Work with irrigation districts and individual landowners to improve irrigation efficiency*

Channel Complexity

Geographic Priorities:

- **Lower Subbasin**

Considerations for prioritization: *Instream projects (large woody debris, boulder structures, etc); off-channel/backwater habitats, floodplain connectivity.*

Riparian Area Function

Geographic Priorities:

- **Lower Subbasin**

Considerations for prioritization: *Restore native riparian vegetation and improve canopy closure over small streams to provide fish/wildlife habitat and protect water quality.*

Noxious Weed Control

Geographic Priorities:

- **Lower Subbasin**
- **Crabtree and Thomas Creeks**

Considerations for prioritization: *Control spread of non-native, invasive species and replant with native vegetation. Focus on areas with large infestations and landowners willing to work with Council. Target treatment in a strategic fashion, i.e. treat knotweed beginning upstream and working down.*

South Santiam River Watershed

Water Quality

Geographic Priorities:

- **Lower Subbasin**
- **Crabtree, Thomas, McDowell, Hamilton, Beaver, Wiley, Ames Creeks**

Considerations for Prioritization: *Water bodies on 303 (d) list as water quality limited for summer temperatures. Work with willing landowners to implement restoration projects. See Riparian Area Function and Noxious Weed Control.*

Criteria to identify and prioritize habitat restoration

The South Santiam Watershed Council consults the following documents in identifying and prioritizing habitat restoration projects:

- *South Santiam Watershed Assessment*
- *South Santiam Watershed Council Action Plan*
- *BLM Crabtree Creek Analysis*
- *BLM Thomas Creek Analysis*
- *BLM Hamilton Creek Analysis*

Luckiamute River Watershed

Luckiamute River Watershed

Restoration Priorities

AQUATIC

Focal Species:

Upper Willamette winter steelhead spawn and rear in the upper Luckiamute watershed. Juvenile rearing also occurs in the lower reaches of the North and South Forks of Ash Creek and Lower Soap Creek. Upper Willamette spring Chinook juveniles rear in the lower reaches of the Luckiamute River and Ash Creek watersheds, and fluvial cutthroat trout spawn and rear in the Luckiamute and Little Luckiamute Rivers and their tributaries. Resident populations of cutthroat also inhabit the watershed, and an isolated population exists above the Falls City natural waterfall on the Little Luckiamute River. Oregon chub were historically present and could be reintroduced. Pacific and western brook lamprey, state-listed sensitive species, likely spawn in the watershed.

Connectivity/Passage

The Luckiamute watershed has no major dams, although several relatively small impoundments may be found. A dam on South Fork Ash Creek in Independence is a barrier to fish passage. Barriers to tributary streams are suspected throughout the watershed where improperly designed or damaged road culverts exist. This is a top priority for access to habitat and refuge by winter steelhead, spring Chinook and cutthroat trout, and is crucial where high temperatures create a need for thermal refuge.

Culverts

Geographic priorities:

The 7th field sub-watersheds below are listed in priority order within basins. Basins are listed in priority order:

Luckiamute River Basin:

- Maxfield Creek
- Price Creek
- Woods Creek
- Plunkett Creek
- Bump Creek
- Vincent Creek
- Lower Pedee Creek
- Upper Pedee Creek
- Ritner Creek
- Clayton Creek
- Hoskins

Luckiamute River Watershed

Cougar Creek
Miller Creek
Wolf Creek
Upper Luckiamute
Ira Hooker
McTimmonds
Middle Luckiamute
Jont Creek

Little Luckiamute River Basin:

Lower Teal Creek
Upper Teal Creek
Waymire Creek
Grant Creek
Bridgeport
Falls City
Socialist Valley
Cooper Creek
Fern Creek
Simpson
Zumwalt
Helmick
Parker

Soap Creek Basin:

Upper Soap Creek
Upper Berry Creek
Middle Soap Creek
Lower Berry Creek
Rifle Range
Peterson Creek
Stats Creek
E.E. Wilson

Ash Creek Basin

All

Considerations for prioritization: Evaluate barriers to fish passage and habitat quality in sub-watersheds that have the greatest potential of producing strong runs of steelhead, Chinook, and cutthroat trout. Specific considerations: Which barriers block only juveniles and which barriers block both juveniles and adults? Which downstream barriers require a solution prior to fixing upstream barriers? Additionally, the goal is to identify high-priority and cost effective opportunities for improving and increasing fish habitat in the Luckiamute watershed. Specific considerations: Likelihood that the action will lead to success; willing landowners to participate in the action; availability of funding from various sources for the action. Project Types: Identify

Luckiamute River Watershed

barriers to passage through culvert inventories, landowner outreach, culvert removal, replacement or modification, repair or replace un-screened water diversions, fish passage structures, correcting road/stream crossings.

Dams/Structures

Geographic Priorities:

South Fork Ash Creek Dam

The south fork of Ash Creek within the City of Independence has a dam that prevents all upstream fish movement. Juvenile steelhead and Chinook rear in the lower portion of SF Ash Creek.

Other impoundments located throughout the two watersheds.

Considerations for prioritization: Project types: Barrier analysis, sedimentation analysis, fish passage structures, removal of structure, alternatives to push-up dams, survey dams or other significant passage barriers in the watershed, and channel reconfiguration and habitat restoration.

Stream Complexity

Complex channels, a result of large wood and or boulders in the channel and geomorphic diversity, provide off-channel habitats for refuge from peak winter flows, and cool, deep pools for cover and food during the summer. Much of the wood in the high priority streams has been intentionally removed, and the major sources of natural recruitment have been harvested. Placing large wood and/or boulders in the upper reaches of high priority streams would create and improve habitat conditions in the Luckiamute watershed. This is a top priority to expand steelhead and cutthroat ranges, provide more high quality habitat, and restore ecological function at the aquatic/terrestrial interface.

Geographic priorities:

Upper Luckiamute River Basin (7th field sub-watersheds):

- Upper Luckiamute
- Miller Creek
- Maxfield Creek
- Price Creek
- Woods Creek
- Plunkett Creek
- Vincent Creek
- Wolf Creek
- Cougar Creek
- Hoskins
- Upper Pedee Creek
- Lower Pedee Creek

Luckiamute River Watershed

Clayton Creek
Ritner Creek

Little Luckiamute River Basin (7th field sub-watersheds)

Lower Teal Creek
Upper Teal Creek
Grant Creek
Falls City
Black Rock Creek
Socialist Valley
Waymire Creek
Bridgeport
Cooper Creek
Lower Little Luckiamute

Lower Luckiamute River Basin (7th field sub-watersheds)

Helmick
Simpson
Peterson Creek
Ira Hooker

Considerations for prioritization: Focus on medium-sized streams with that are not blocked by inadequate culverts or natural waterfalls. High priority areas include streams in forested portions of the upper watershed and include the streams flowing through the basalt geology (cooler temperature) along the southern boundary, upper Luckiamute River and its tributaries, and the larger tributaries between the Luckiamute River and the Little Luckiamute River. These streams offer the most potential for high quality salmonid habitat.

Project Types: Conduct habitat assessments on streams within identified high priority sub-watersheds, large wood placement; expand and restore floodplain connectivity particularly with high-flow channels; stream habitat enhancement, in stream boulder placement; log boulder structures, channel and bank alteration, develop meanders and side channels, streamside terracing and bank sloping, wetland restoration, and off-channel habitat creation.

Water Quantity and Quality

Riparian area function

Increase shade along selected high priority streams to expand cool water zones. Protect intact riparian areas and restore other areas to increase the number of trees, particularly conifers, along the streams to improve large wood recruitment potential for the channel and wildlife habitat.

Luckiamute River Watershed

Geographic priorities (7th field sub-watersheds):

Middle Luckiamute (Luckiamute RM 25-36)

Wolf Creek (Luckiamute RM 52-54)

Cougar Creek (Luckiamute RM 45-50)

Ira Hooker

Ritner Creek

Lower Berry Creek

Middle Soap Creek

Waymire Creek

Lower Little Luckiamute

Simpson

Helmick

E.E. Wilson

Others

Considerations for Prioritization: Specific Luckiamute River locations based on thermal shading potential modeling done for DEQ's TMDL report. Tributaries to the main stem Luckiamute with greatest potential for cooling. Salmonid bearing tributaries. Provide multiple improvements to fish habitat. Willing landowners. Project Types: Riparian planting; riparian conifer restoration; riparian fencing; invasive species removal; conservation easements for high quality areas; off-channel watering for livestock; beaver management; and off-channel watering for livestock.

Summer low flows

Low flows, combined with warm air temperatures, result in high stream temperatures in significant portions of the Luckiamute and Ash Creek watersheds. High stream temperatures in these watersheds have been identified as a limiting factor to optimal survival and growth of coolwater fishes, such as steelhead, cutthroat trout, and coho salmon. Sufficient flow levels also provide living space for these species. Decreasing diverted flow for irrigation and reestablishing floodplain connectivity would provide more in-stream flow and cooler water temperatures. This priority helps to address high summer water temperatures, a primary limiting factor in the Luckiamute watershed. Geographic focus on middle and low reaches in the watersheds.

Geographic priorities (7th field sub-watersheds within these basins):

Luckiamute River Watershed

Middle Luckiamute

Lower Luckiamute

Lower Little Luckiamute

Berry Creek

Soap Creek/Lower Luckiamute

Ash Creek

Considerations for prioritization: Stream segments that typically have low flow and high temperature in summer months, points of diversion, water rights, willing landowners, potential high quality areas for re-connectivity. Project types: Water right leases, in stream water enhancement, in stream water leases, in stream water enhancement, irrigation efficiency projects, wetland enhancement and/or creation projects, education and outreach for conservation practices, create in stream water rights for Maxfield, Price and Ritner Creeks.

Water quality

Identifying sources of high temperatures, low dissolved oxygen, and high concentrations of E. coli bacteria, for which portions of the Luckiamute watershed are DEQ-listed; seek to address causes of these water quality limitations. This also includes correcting sediment supply to more natural amounts and quality and reducing nutrient and pesticide levels. Geographic focus will be on middle and lower reaches in the watershed.

Geographic priorities

Lower Luckiamute Basin:

- Luckiamute River
- Little Luckiamute
- Soap Creek
- Berry Creek
- Ash Creek
- Whole basin

Considerations for prioritization: 303 (d) listed water bodies, point source pollution, willing landowners, likelihood of successful action. Project Types: Monitor water temperatures, bacteria, and dissolved oxygen in streams to identify sources of pollution; upgrade feedlot operations; fencing off streams; off-channel watering system for livestock. Education and outreach program to work with agricultural landowners on best management practices to reduce impact of fertilizers and other nutrients to streams. Also see actions to restore riparian area function.

Luckiamute River Watershed

Terrestrial Priorities

Restoring and Maintaining Landscape Connectivity

Many of the habitat types that were common in the Willamette Valley at the time of European settlement have been greatly reduced in extent. For example, it is estimated that less than 1% of the pre-settlement area of savanna and upland prairie habitats remain today. Habitat loss and fragmentation is expected to impede the dispersal of plant and animal populations, as well as other ecological processes. Roads and human developments also form significant barriers to animal migration and dispersal.

Focal Species: *Rare prairie plants, Fender's blue butterfly, prairie-associated wildlife, arboreal wildlife (e.g. western gray squirrel), Roosevelt elk.*

Geographic priorities:

Known locations of T&E prairie plant and Fender's blue butterfly populations (database maintained by USFWS State Office).

Considerations for prioritization: *Project Types: Landscape-scale planning studies that can identify critical habitat corridors, habitat refugia, and source populations, to guide conservation efforts. Education/outreach efforts designed to promote riparian buffer strips, hedgerows, "stepping stone" habitats, and other landscape features that maintain landscape connectivity on agricultural lands. Identify road segments characterized by high rates of traffic-related wildlife mortality. Improve signage; design/construct safer wildlife road crossings.*

Restoring Habitats for Threatened, Endangered, and Sensitive Species

It has been estimated that the Luckiamute watershed supports more than 1000 species of native plants, 225 species of vertebrates, and an unknown number of invertebrate species (LWC 2004). Habitat loss, pesticide use, road-related ecological impacts, and a number of other factors pose risks to substantial portion of the native biodiversity in the watershed. At least 39 terrestrial or semi-aquatic species (11 plants, 3 invertebrates, 25 vertebrates) have been listed as threatened, endangered, candidates for listing, or otherwise designated as a species at risk by the USFWS or ODFW. Ensuring the viability of these species in the watershed will require not only habitat restoration efforts, but population monitoring, addressing barriers to dispersal and migration, and educating agricultural producers about how farming and forestry practices impact species at risk.

Focal species and geographic priorities

Conifer forest associates: marbled murrelet (LT), olive-side flycatcher (SV), band-tailed pigeon (SOC), pileated woodpecker (SV), northern spotted owl (LT), dusky tree vole (SOC), silver-haired bat (SOC), long-legged myotis (SOC).

Geographic priorities: BLM lands, Little Sink ACEC, Beazell County Park (Benton County), OSU College Forests, private small woodlands.

Luckiamute River Watershed

Prairie & savanna associates: streaked horned lark (C), acorn woodpecker (SOC), Lewis' woodpecker (SC), Oregon vesper sparrow (SC), western bluebird (SV), western meadowlark (SC), camas pocket gopher (SOC).

Geographic priorities: Fort Hoskins & vicinity, ODFW E.E. Wilson Reserve, ODF Vanderpool property.

Stream & riparian associates: tailed frog (SV), southern torrent salamander (SV), bald eagle (LT), white-footed vole (SOC).

Geographic priorities: OPRD Luckiamute Landing State Park, BLM Riparian Reserves, Willamette and Luckiamute River gallery forest ecoregion.

Wetland associates: northern red-legged frog (SV), Oregon spotted frog (SC); painted turtle (SC), northwestern pond turtle (SC), little willow flycatcher (SV).

Geographic priorities:

ODFW E.E. Wilson Reserve

OPRD Luckiamute Landing

Vanderpool property

Others: common nighthawk (SC), American peregrine falcon (State LE), yellow-breasted chat (SC), purple martin (SC), long-eared myotis (SOC), fringed myotis (SOC), yuma myotis (SOC), western gray squirrel (SU).

Geographic priorities: Known population locations, ODFW E.E. Wilson Reserve.

Considerations for prioritization: *Project Types: Species-specific habitat restoration efforts. Easements or land purchases of sites that are critical for listed species. Promote rare plant and wildlife inventories in the watershed to improve the location of habitat restoration projects. Monitor the response plant and animal populations at habitat restoration sites to determine the project effectiveness.*

Addressing Impacts of Human-Related Disturbance

Human developments and land management practices have resulted in the degradation of native habitats and have impaired a number of ecological processes. Some examples include:

Alteration of natural hydrological regimes and confinement of stream channels has resulted in the loss of wetlands and riparian areas.

Luckiamute River Watershed

Widespread use of pesticides on agricultural lands has decreased the abundance of prey for insectivores.

Deliberate and accidental introductions of non-native plants and animals have increased the risk to some native species by altering patterns of interspecific competition and predation.

Changes in landscape-scale vegetation patterns through forestry and agriculture have shifted the composition and distribution of plant and animal communities and have impaired the dispersal and migration of some populations.

Mechanized agricultural practices (e.g., mowing, fertilizer applications, tilling) can result in direct mortality of ground-nesting birds and small mammals.

Focal Species: *Although it is likely that all plant and animal communities are affected by human disturbance, the focus should be on guilds and assemblages that are most imperiled in the watershed. These plant and animal populations are associated with upland prairies, savannas, oak woodlands, and late-successional conifer forests.*

Geographic Priorities:

Throughout the watershed.

Considerations for prioritization: *Project Types: Restore prairie and savanna plant communities through the use of prescribed fire where feasible. Create large-diameter snags in conifer forests and valley woodlands for wildlife that require cavities for nesting or dens. Construct new ponds and wetland plant communities for red-egged frogs, northwestern pond turtles, wintering waterfowl, and shorebirds. Educate landowners about the value of beaver impoundments so they are less likely to destroy beaver dams. Develop education/outreach materials for farmers that describe how common agricultural practices affect rare plants and wildlife. Develop workshops for farmers, resource agencies, and conservationists to identify alternative agricultural practices.*

References

Luckiamute Watershed Council. 2004. Luckiamute / Ash Creek / American Bottom Watershed Assessment.

Calapooia River Watershed

Calapooia River Watershed

Restoration Priorities

AQUATIC

Focal species: *Spring Chinook salmon (migration, spawning, and rearing) winter steelhead (migration, spawning and rearing). Resident and fluvial cutthroat trout are present. Oregon Chub were historically present and could be reintroduced. Pacific lamprey and western brook lamprey, both state-listed sensitive species, are present and spawning in the basin.*

Watershed Connectivity

Dams

Because the Calapooia River dams affect migrating winter steelhead, spring Chinook salmon, cutthroat trout, and lamprey, this is the highest restoration priority.

Geographic Priorities:

Thompson's Mill Complex

Issues here include passage problems at Sodom Dam, which is delaying spring Chinook movement. Steelhead and lamprey are spawning in Sodom Ditch, which may be due to delays at the dam. Spawning in the Ditch is a concern because juvenile winter steelhead probably do not survive the high summer water temperatures in this portion of the Calapooia River.

Brownville Dam

Velocity and jump barriers at this dam present passage problems to juvenile steelhead and cutthroat trout and to the migration of adult fluvial cutthroat trout and winter steelhead.

Irrigation Diversion Dam Near Mouth of West Fork Brush Creek

Considerations for prioritization: *This is a top priority for access to high quality habitat in the upper watershed for spring Chinook winter steelhead, fluvial cutthroat trout, and lamprey spawning and rearing. Projects should foster participation among all of the interested parties. Need to gather specific data on each dam, then correct passage problems.*

Culverts and diversion structures

Geographic Priorities:

Lower basin

Completed culvert inventory helps prioritize barriers
Brush Creek subwatershed

Calapooia River Watershed

County roads

Other tributaries that provide cold-water refuge for winter steelhead and cutthroat trout.

Upper basin

- Most of the high-priority culverts have been addressed by forest landowners
- Remaining barriers that impact winter steelhead and cutthroat trout

Considerations for prioritization: Amount, type, and quality of habitat to be opened up, as well as position in the sub-watershed (with downstream positioned culverts being higher priority). Species considerations, with an emphasis on winter steelhead and cutthroat trout. Seek opportunities to collaborate with landowners and Linn County. There is a need to gather specific data on each potential barrier, then correct passage problems.

Watershed Process & Function

Ensure adequate water flow

Geographic Priorities:

Middle and Lower Watershed

Considerations for prioritization: Focus on cooler streams with higher quality habitat (for example, Brush Creek). Explore options with landowners for leasing water rights.

Restore and protect riparian area function

Geographic Priorities:

Middle and Lower Watershed

Brush Creek

Lower Calapooia River

Considerations for prioritization: Select stream sections for increasing shade that have water temperatures near 70 degrees for purpose of expanding cool water zone (such as Brush Creek). Calapooia River: Select sites where fencing, weed control, and planting of native conifers is appropriate. Project sites are considered higher priority relative to other projects as they: affect longer stretches and on both sides of the stream, achieve larger riparian zone widths (in proportion to stream size). Focus conifer restoration along the middle portions of the Calapooia River.

Outreach/education on the importance of channel meandering

Geographic Priorities:

Calapooia River Watershed

Middle Watershed

Considerations for prioritization: *Work with landowners on alternatives to installing riprap along the banks of the Calapooia River and Tributary Streams.*

Restore channel complexity

Geographic Priorities:

Upper Calapooia River

Middle and upper basin tributaries

Brush Creek

Considerations for prioritization:

Upper Calapooia River: Identify areas with deep pools to add wood for spring Chinook adult and other fish cover. Also work to minimize, through education and other measures, harassment of spring Chinook in upper river holding pools. Middle and upper basin tributaries: Focus on streams with year-round flow. Select cool streams with gradients less than 4% and add large wood jams capable of creating habitat features that offer refuge during high flows (such as Brush Creek).

WATER QUALITY

Water Temperature

Water Quality Limited Streams: Calapooia River Mainstem: RM 0 to 42.8

Geographic Priorities:

Lower Oak Creek

Brush Creek

Courtney Creek

Upper Watershed Tributaries

Considerations for prioritization: *Lack of shade, loss of channel complexity to retain water and capture gravels, loss of wetland storage capacity, decrease of flows in the summer – early fall – are all contributing to water temperature impacts. See section on Riparian Functions and Wetland Habitats.*

Calapooia River Watershed

Bacteria

Water Quality Limited Streams: Calapooia River Mainstem: RM 0 to 42.8

Geographic priorities:

Oak Creek

Courtney Creek

Lower Calapooia River

***Considerations for prioritization:** Most of the bacteria are from agricultural (grazing and confined areas), urban (Albany and Brownsville), and rural residential sources (leaking septic systems). There is a need to identify specific sources. High priority projects include educating small farm owners on pasture and livestock management to reduce manure input to streams, and education on proper septic system maintenance.*

TERRESTRIAL

Pond turtle habitats

Geographic priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Improve nesting habitat along the lower Calapooia River by removing exotic vegetation near ponds along the river and converting it to native grasses.*

Upland prairie & oak Savannah

Focal species: *American kestrel, horned lark, vesper sparrow, western meadowlark, western rattlesnake, black-tailed jackrabbit, Taylor's checkerspot, Fender's blue butterfly, Kincaid's lupine, golden paintbrush, white rock larkspur, white-topped aster.*

Geographic priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Focus on larger intact patches in the middle watershed area in the vicinity of Brownsville. Work collaboratively with landowner to control conifers and invasive weeds and enhance these habitats.*

Calapooia River Watershed

Wet Prairie

Focal species: dunlin, common yellowthroat, northern harrier, sora, red-legged frog, water howellia, Bradshaw's lomatium, Nelson's checkermallow, Willamette Valley daisy, peacock larkspur.

Geographic priorities:

Lower Watershed

Middle Watershed

***Considerations for prioritization:** Restore wetlands by encouraging farmers and other landowners to restore non-functioning wetlands on marginally productive land through the use of wetland banks or other measures. Project types: Wetland enhancement, excavation/removal of fill, elimination of drainage structures, invasive species removal, and native vegetation planting*

Riparian and Bottomland Forests

Geographic Priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Focus on large intact areas in the lower watershed. Control invasive weeds. Focus conifer restoration on in the middle portions of the watershed and the middle reaches of the Calapooia River.*

Wetlands

Geographic Priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Restore wetlands by encouraging farmers and other landowners to restore non-functioning wetlands on marginally productive land through the use of wetland banks or other measures. Project types: Wetland enhancement, excavation/removal of fill, elimination of drainage structures, invasive species removal, and native vegetation planting*

Calapooia River Watershed

Oak Woodlands

Geographic Priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Work collaboratively with landowners to restore existing large patches of oak woodlands through conifer control and other measures.*

Invasive Plants

Geographic Priorities:

Lower Watershed

Middle Watershed (Brownsville Area)

***Considerations for prioritization:** Invasive (exotic) plants affect riparian function and all other habitats, including pond turtle areas. It is important to track the extent of invasive plants through surveys of Japanese Knotweed and other species.*

References

Calapooia River Watershed Assessment, 2004.

Marys River Watershed

Marys River Watershed

Restoration Priorities

AQUATIC

Focal species: *Juvenile spring Chinook rear in lower Marys River Watershed. There are resident populations of cutthroat in the watershed and there may be fluvial populations. Oregon Chub. Pacific lamprey and western brook lamprey. Western Pond Turtle.*

Connectivity/Passage

Geographic Priorities:

Upper Marys (including the Cardwell Hills)

Upper Marys (including the Cardwell hills) we intend to work closely with landowners, citizen's groups and Oregon Solutions to implement a strategic, subbasin restoration effort. We have funding currently to develop 8 projects, but with the Oregon Solutions support we expect to be able to increase that to around 20 landowners over the next biennium.

Woods Creek

This drainage has the highest potential for cutthroat trout restoration. The Council has is looking to fund the removal/repair of 8 fish passage barriers that would re-open 20 miles of high quality historic cutthroat habitat. Simultaneously we will be conducting a massive outreach effort to landowners in the woods creek subbasin about the work of the watershed council and the resources we can provide for restoration projects and implementation of best management practices.

Rock Creek

This is the main drainage used for drinking water by the cities of Philomath and Corvallis. Several fish passage barriers exist on the drainage, The Marys River Watershed Council convened a team of stakeholders including Benton County, Benton SWCD, BLM, Forest Service and the City of Corvallis (who owns much of upper watershed and hold most of the water rights) , has convened and agreed to work together to develop a plan of action for identifying barriers and identifying funds to remove barriers and replace fish passage. Additionally, this effort is closely tied with water use. A team of water use and fish passage committee members as well as cooperators will convene to develop a plan of action to identify water use issues, and prioritize, then implement actions to remedy low flow.

Watershed Wide Pond Turtle Habitat enhancement

This effort is in conjunction with US Fish and Wildlife Service and Oregon Department of Fish and Wildlife. The council is in the process of surveying properties of willing landowners in the upper Marys River for potential pond turtle habitat. This effort will continue throughout the watershed as project areas shift.

Marys River Watershed

Watershed Process & Function

Ensure adequate water flow

The Council currently ranks flow restoration as one of its top priority issues. The Council is in the midst of an effort to convene major stakeholders around this issue to help develop the course of action.

Geographic Priorities:

Entire watershed

Considerations for project prioritization: *Low flow in the Marys River is the single most important limiting factor for water quality of the river. The council purchased its own flow meter, and has an ongoing water level monitoring effort. The results are conveyed monthly to the watershed council and will soon be added to our website. We are currently investigating methods for making river level a more public issue, on par with fire danger levels. The Council is working closely with regulators as well as users to develop some early projects to restore flow to the Marys. The entire watershed is targeted for this study and it will be a priority item for our outreach coordinator. Potential projects include finding sources of funding to lease in stream flow from agricultural producers who use contracted water from BPA, augmenting existing outreach efforts about water conservation, and launch educational programs where needed to explain opportunities for water conservation, to identifying pumps in the stream and working with landowners to move them onto wells, and communicating opportunities for landowners to donate water rights.*

Restore riparian area function

Understand Groundwater Function

Geographic Priorities:

Upper Marys (including the Cardwell hills)

The Council will work closely with landowners, citizen's groups and Oregon Solutions to implement a strategic, subbasin restoration effort.

Woods Creek

Riparian improvement will follow stream passage projects to enhance benefit of each.

Rock Creek

Muddy Creek

Considerations for project prioritization: *The Council will use the Cardwell Hills model in other subbasins and expect to have numerous riparian, wetland and upland restoration projects and management plans in the works for the 07-09 biennium.*

Marys River Watershed

Water Quality

Major restoration foci include restoring adequate flow to the river, eliminating direct sources of bacterial contamination, increasing dissolved oxygen levels, enhancing and increasing wetlands and riparian areas, identifying phosphorus loading on muddy creel, and improving upland areas that relate directly to water quality.

TERRESTRIAL HABITATS

Focal species: ESA listed species, species of concern, Oregon Listed Species including but not limited to Fender's blue butterflies, sharp tail snakes, Kincaid's lupine western meadowlark, Taylor's checkerspot butterfly

Connectivity/Passage

Geographic Priorities:

Upper Mary's (including Cardwell Hills)

Prairies, oak savanna and woodlands once occupied over 1,700,000 acres in the western interior valleys of Oregon, Washington, and British Columbia, but today less than one percent of the habitats remain, making them among the most endangered ecosystems in the North America. Benton County is home to some of the highest quality remaining prairie, oak savanna and oak woodland remnants in Oregon. A significant portion of this habitat is located within the area known as the Corvallis-Philomath Oaks within which the Mary's River Watershed Council, Benton County, and David Evans and Associates are developing the Cardwell Hills Regional Conservation Planning Strategy. These lands are home to a number of endemic Willamette Valley plants, invertebrates, and vertebrate species that are either federally listed under the Endangered Species Act, candidates for listing, or species of concern. For example, a regionally significant population of listed Fender's blue butterfly and Kincaid's lupine is found within the planning area.

The Cardwell Hills Regional Conservation Planning Strategy (Strategy) proposes a river-to-ridgetop approach linking upland conservation and restoration to the overall health of riparian corridors and rivers. One of the upland Strategy's over-arching goals is to develop a linked system of participating landowner properties that provides long-term protection for Fender's blue butterfly and Kincaid's lupine. The result would be a viable metapopulation secured from the current situation of highly fragmented and isolated patches of occupied habitat, a condition that puts local populations of Fender's blue butterfly at risk of extirpation

The Council will work closely with landowners, citizen's group, Benton County, and partners through the Oregon Solutions project in this region to implement a strategic, comprehensive subbasin restoration effort.

Woods Creek

Priorities will emerge throughout the 2005 – 2007 biennium

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Rock Creek

Priorities will emerge throughout the 2005 – 2007 biennium

References

Hammond, Paul C. 2003. 2003 Study of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Benton, Polk, and Yamhill Counties. Oregon Natural Heritage Program and US Fish and Wildlife Service. Portland, Oregon.

Schultz, Cheryl B. 2001. Restoring resources for an endangered butterfly. *Journal of Applied Ecology*. (2001) 38 (1007–1019).

Schultz, Cheryl B. and Elizabeth E. Crone. 2005. Patch Size and Connectivity Thresholds for Butterfly restoration. *Conservation Biology*. 19(3), 887-896.

Watershed Council

Criteria to identify and prioritize habitat restoration

The Project Implementation Strategy is a guide that addresses three needs: a way to organize assessment data and see where more data is needed (via a Limiting Factors Analysis); a way to prioritize project activities (via prioritization criteria); and a way to select projects (via ecological principles and decision-making factors).

All MRWC work thus far feeds into this Strategy. The MRWC Assessment is a compendium of data that will jumpstart and feed into the Limiting Factors Analysis (LFA). The Restoration Opportunities Screening maps and Field Assessment Manuals are tools that can obtain small-scale, missing data during the LFA. Linkages to the above mentioned documents can be found throughout the Strategy.

Opportunistic Projects: Although an LFA is a systematic, methodical approach, it will not exclude the potential implementation of opportunistic projects as they arise. An opportunistic project can be defined as a project that is brought about by a landowner or partnering agency contacting the council or Coordinator for collaboration. If opportunistic projects arise, as long as they are compatible with the MRWC overarching ecological goals, cost and human resources are the only potential limiting factors to consider before implementation can begin (unless professional judgment deems otherwise). Opportunistic projects will serve as pilot studies for this strategy.

The general approach to project implementation in the Marys River watershed will be to *define ecological goals, and base project activities on the ecological functions and processes that support the goals*. Restoration is most workable when we talk about restoring particular ecological functions or processes, rather than restoring “historic” or “reference” conditions that are often arbitrarily defined, and no longer supported by current-day ecological processes.

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Conditions are traits that describe what we see at any given time. Examples include: 25% shrubs, many old trees; incised stream banks. Ecological conditions are always changing and highly variable, both throughout the watershed and through time. How a watershed's conditions change over time and space is influenced by many factors, including climate, soil type, seed source, management history, and fire history.

Functions are the characteristics of the conditions that provide building blocks for ecological goals. For example, the characteristics of riparian vegetation – vegetation type, distribution, and size – either directly or indirectly provide key functions, or building blocks, for fish and wildlife habitat, water quality and quantity. Some key riparian functions include:

- ◆ Providing organic material that serve as food for fish and other aquatic life.
- ◆ Contributing large wood that creates pools and hiding cover for fish.
- ◆ Creating a vegetation canopy to provide hiding areas for fish and shade to help moderate water temperatures.
- ◆ Slowing floodwaters to create areas for fish to hide during high flows and slow-water zones for sediment deposition.
- ◆ Providing critical wildlife habitat and access to water.
- ◆ Filtering sediment and pollution.

Although conditions are ever changing, functions and processes might not change. Ecological functions and processes have more to do with how the conditions are working or contributing to the ecosystem; they are something that is 'happening.' One way to think about these terms is to say that we manage the conditions to provide functions; or, conditions influence the key functions that support ecological goals.

The use of *reference sites* (areas with seemingly similar climate, landforms, stream gradients, soils, and vegetation types) or *historical data* (aerial photos, maps, books, pictures, local knowledge, etc.) can be helpful within a well-defined context. Since watershed conditions are always changing and highly variable across time and space, basing restoration goals on one specific reference site or one point in time from the past or future is limiting and impractical. No two sites in either time or space can be the same nor maintain the same disturbance patterns, seed sources, fire histories, or management patterns. The historic or reference site approach denies the dynamic nature of ever-changing watershed conditions by carrying the incorrect assumption of a static ecosystem. It is therefore misleading to copy the particular conditions or structures of a single reference site or historical map for a restoration project. Basing restoration on particular reference conditions or historical maps also omits the step of explicitly defining the underlying subjective interests and values.

Instead, reference conditions and historical data are most useful for broadening one's perspective during the assessment phase or limiting factors analysis. Viewing historical information and *multiple* local reference sites (current conditions within different land uses, different management protocols, and different locations in the watershed, etc.) is applicable for getting a broad sense (basin-wide or watershed-wide) of the local range in variability in both time and space, of various traits (for example, vegetation types). Obtaining a broad perspective on the

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variability of the landscape in both time and space can allow for a multitude of management options.

Summary of Whole Project Implementation Process

(All data will be entered into a GIS-linked database)

1. Develop overarching ecological goals for the MRWC (See Goals below. Add to or further specify as desired for each project).
2. Use technical assistance to carry out a Limiting Factors Analysis (See below).
3. Carry out Prioritization (See below).
4. Carry out Selection (See below).
5. Carry out Outreach in locations where projects have been selected but do not yet have landowner collaboration.
6. Carry out Implementation (See below).
7. Carry out Education programs in tandem with project efforts in the form of tours, panels, speaker series, community workshops, or other venues.
8. Develop Outreach materials to report the environmental, social, and economic impacts of projects.

Overarching Ecological Project Goals

Below are overarching, ecological project goals for the MRWC. The goals are based on watershed need as defined in the Assessment and Action Plan, from Committee work, and from goals of partnering agencies, including the Benton SWCD. They will provide a method for categorizing, prioritizing, and selecting projects. Any additional goals must be compatible with the overarching goals. Additional goals can get more specific than the overarching goals. Examples include: aesthetics (e.g. big trees), economic factors, social factors (e.g. working with schools; demonstration sites). Additional goals can be defined together by the council and landowner/others. Socioeconomic goals are addressed both throughout the MRWC Mission and Goals and during site-specific management plan development.

1. **Aquatic Habitat** - Providing functions and processes to support water-based target species such as fish, waterfowl, and macro-invertebrates; providing access to habitat. *Refer to MRWC Field Manual 3.0, Modules V and VII.*
2. **Terrestrial Habitat (riparian areas, wetlands, uplands)** - Providing functions and processes to support land-based target animals such as amphibians, reptiles, mammals, songbirds, and insects (such as Fender's blue butterfly), and target plants, such as Kinkaid's lupine; providing access to habitat; providing habitat diversity (such as oak savannah, wet prairie). *Refer to MRWC Field Manual 3.0, Modules IV, VI, VII, IX.*
3. **Water Quality**– Providing functions and processes to meet the goals of the federal Clean Water Act, specifically but not limited to EPA and DEQ parameters that indicate water quality, including stream temperature and low flow. *Refer to OWEB Water Quality Monitoring Guidebook.*

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4. **Water Quantity** - Providing functions and processes for hydrologic connectivity (connecting channels with floodplains and wetlands during higher flows), and at a minimum, meeting the State required in-stream flow requirements. *Refer to OWEB Water Quality Monitoring Guidebook and MRWC Field Manual 3.0, Module III.*
5. **Soil Quality** – Providing the functions and processes that contribute to soil condition qualities such as organic matter, water infiltration, and a balance of nutrients; reducing or eliminating the processes that contribute to various types of erosion; reducing or eliminating the processes that contribute to contaminants.

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Restoration Priorities

Introduction to the Restoration and Enhancement Priorities:

One set of priorities focuses on aquatic habitat, stream processes, and water quality. The second set addresses terrestrial habitats. There are obvious interconnections between these two elements of a watershed, but we chose to separate them so as to avoid prioritizing one over the other and to facilitate funding of projects in these areas. Within the Aquatic and Terrestrial categories, priority is implied by the order in which elements and actions are listed.

In this document, the “focal species” are used to characterize each habitat and to help indicate the habitat’s function and value in the watershed. However, the council’s restoration and enhancement program is focused on habitats as opposed to species-level conservation. When a specific at-risk³ species occurs on a project site, the project site plan will shift to include specific needs of that species.

Regarding the maps that are referenced in this document, the mapping of priorities is included only to assist in the depiction of the priorities as they are described here. Importantly, the maps are not intended to hamstring the evaluation of priorities and project development. The Council’s Technical Team recommendations will supersede the maps and written priorities as necessary to include the most current scientific understanding and knowledge of watershed conditions.

AQUATIC

Focal species: *Cutthroat trout and spring chinook are the native salmonid species in the watershed. Juvenile spring chinook seasonally migrate from the Willamette River to rear in the lower Long Tom River. Fluvial cutthroat trout migrate from the Willamette to streams in the lower Long Tom for spawning, juvenile rearing and refuge. A separate group of fluvial cutthroat migrate among the streams in the upper portion of the watershed, but are blocked from the lower part of the basin and the Willamette River by Fern Ridge dam. Resident cutthroat trout are supported by the watershed where conditions allow both above and below the dam. Oregon chub were historically present and may be reintroduced. Pacific lamprey and western brook lamprey, both state-listed sensitive species, are likely present and spawning in the basin. Significant native amphibian and vertebrates present in the basin are the western pond turtle and red-legged frog,*

Status and Priority: *Changes to channel morphology, instream habitat, hydrology, riparian zones, and water quality and reduced access to historical spawning and rearing areas have negatively affected the productivity of all life-stages of cutthroat trout and rearing of juvenile spring chinook. The amount of available spawning habitat for fluvial cutthroat trout in the watershed has been reduced by 70% due to lack of fish passage at Fern Ridge dam. Similarly, lack of passage at Fern Ridge has reduced rearing habitat for spring chinook by 70%. This makes the quality of and access to spawning and rearing habitat below the dam, in the Bear and Ferguson Creek sub-watersheds, particularly important.*

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Connectivity/Passage

Status and Priority: This is a top priority because passage allows fluvial and resident cutthroat trout, spring chinook, and other aquatic species, including amphibians, access to higher quality habitats at certain life-history stages, and as stream conditions change seasonally. Dams and impassable culverts prevent these species from reaching critical spawning habitat and refuge during the summer and winter, and block access to refuge habitat as stream conditions change seasonally. Where temperature problems exist in specific areas the need for refuge is further increased.

Mainstem Barriers

Address fish passage at barriers on the mainstem of the lower Long Tom River

Geographic Priorities:

- Monroe Drop Structure
Passes adult trout only under some condition but does not pass juvenile trout or chinook salmon. Analyze potentials for removal of dam or improving fish passage.
- Stroda Drop Structure
Hydraulic modeling results indicate this is a barrier at all flows for juvenile trout, and at some or most flows for adult trout. This blocks access to Ferguson Creek and Bear Creek habitat for fish migrating from the Willamette.
- Ferguson Drop Structure
This blocks passage to Bear Creek habitat from the mainstem Long Tom River. A bypass exists at some flows via a historic segment of the Long Tom River.
- Fern Ridge Dam

Fish passage here would reconnect the entire basin's fish populations.

Possible Project types:

Barrier analysis, dam/drop structure modification or removal, fish passage structures (FPS), provide fish passage alternatives

Culverts, small dams and other diversion structures

Status and Priority: Replace culverts, remove or provide fish passage over small dams and other diversion structures.

Geographic Priorities:

- Lower basin
 - Ferguson sub-watershed, Bear sub-watershed
 - Other tributaries to the lower Long Tom River
 - High priority for resident and fluvial trout, chinook salmon*
- Upper basin
 - Upper Long Tom, Elk, Coyote sub-watersheds

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High priority for resident and fluvial trout

- Spencer sub-watershed

Medium priority for resident and fluvial trout

Considerations for project prioritization: *Lower basin:* amount, type, and quality of habitat to be opened up, as well as position in the sub-watershed (with downstream positioned culverts being higher priority depending on suspected fish use – e.g. resident or fluvial trout, chinook). Gather specific data on each potential barrier, then correct passage problems. *Upper Basin:* amount, type, and quality of habitat to be opened up, more than position in the basin, due to the presence of resident as well as fluvial cutthroat trout in this area of basin.

Possible Project types:

Barrier inventory, fish passage structures (FPS), small dam removal, alternatives to push-up dams (APD), correcting road/stream crossings (CRSC), culvert removal, replacement or modification, provide fish passage through or around impoundments, screen diversions.

When considering project types, we will further prioritize them based on their potential effectiveness in achieving restoration in a given area.

Watershed Process & Function

Status and Priority: Re-routing, straightening, and subsequent down-cutting of many valley bottom streams has led to disconnection of streams from their floodplains, leading to greater scouring of channel bottoms during flood events, less deposition of gravel and fine sediment, and a loss of material and nutrient flows between the floodplain and channel. Fern Ridge Reservoir has altered historic habitat in a number of significant ways. First it blocks upstream fish passage to the good-quality habitat in the upper watershed. Second, sediment trapping and flood control by the dam change the amount and timing of sediment flow and distribution and affects floodplains downstream. Because there is now less flooding downstream of the dam, sediment that used to be dropped out in the floodplain ends up in the Willamette River. Third, the shallow nature of the reservoir leads to higher summer water temperature and higher winter turbidity levels in the lower Long Tom River. A natural flow regime that mimics pre-dam conditions for the lower Long Tom River, including low flows, pulses and overbank flows, was important for supporting native aquatic organisms and their food sources.

Addressing watershed process and function is a top priority in order to expand cutthroat trout distribution and access to habitat, as well as the habitat for other aquatic species. Habitat emphasis includes flow, riparian area functions and channel complexity and hydrologic processes. Groundwater recharge is not a specific focus but is improved through project types that address hydrologic process and wetland habitat.

Ensure Appropriate Water Flow

Status and Priority: Where flow is limiting habitat availability for native species, ensure a more natural flow regime, especially to ensure minimum flows. Temperature is the primary limiting factor to the distribution and productivity of cutthroat trout and a

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diversity of native aquatic species. This is based on ODFW information that trout will use streams with poor physical habitat, albeit at lower densities, as long as temperature is suitable. Flow affects how much habitat is available, and provides dilution for pollutants.

Geographic Priorities:

- Ferguson sub-watershed, Bear sub-watershed
High priority for resident and fluvial trout, chinook salmon
- Upper Long Tom, Elk, and Coyote sub-watersheds
High priority for resident and fluvial trout
- Lower Long Tom sub-watershed
Fern Ridge contributes flow; consider establishing instream right.

Possible Project types:

In-stream water enhancement (IWE); irrigation efficiency projects (IEP); re-establish minimum flow recommendations for the mouths of all sub-basins (except Lower Long Tom); in-stream water rights; education on conservation; other projects that restore hydrologic processes.

Restore Riparian Area Function

Status and Priority: Significant limiting conditions to proper riparian zone function in the watershed include: loss of large conifers in the upper reaches, loss of bottomland hardwood forest, replacement of trees and native shrubs with invasive species, grasses, or bare soil, and an overall reduction in the density and number of trees in riparian areas. In some cases, the loss of function is due to a streamside wetland or prairie area being overgrown by forest. Almost 60% of riparian areas had moderate to high loss of ecological function due to one or more of these causes. Loss of shade contributes to warmer stream temperatures, which has had a significant impact on cutthroat trout. In addition, many species depend wholly or in part on riparian habitat and have been negatively affected by this loss in function (see also, Terrestrial section)

Restoring riparian area function is a high priority throughout the watershed. Healthy and well-functioning riparian areas provide a host of water quality and habitat benefits, and creating and sustaining these areas is a relatively simple and cost-efficient restoration option. In addition, restoration actions taken to achieve this goal directly benefit others, especially channel complexity and water quality. Restoring riparian function is important especially in areas where channels have been straightened and loss of stream-flood plain interaction has occurred, and/or where channel migration has been limited, and therefore natural formation of channel complexity is limited. And in areas where channels have not been straightened or banks have not been armored, riparian restoration is important because it will be easier to achieve healthy riparian function.

Geographic Priorities:

- *Along the lower Long Tom the areas without levees are more important than those with levees.*
- *Other priorities will be determined by site characteristics that make a potential action higher priority.*

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Some site characteristics to be considered higher priority:

- Links existing riparian habitats
- Restores riparian areas that lack any other channel complexity because they are straightened
- Restores riparian area at a site where focal or at-risk³ species can be benefited
- All things being equal, project sites are considered higher priority relative to other projects as they affect longer stretches and on both sides of the stream and/or achieve larger riparian zone widths (in proportion to stream size).

Possible Project types:

Riparian vegetation planting (RVP); removing invasive species; riparian fencing (RF); off-channel watering for livestock (LWO); riparian conifer restoration (RCR); native shrub and forb filter strips; Beaver management (BM); Conservation Easements or agreements for high-quality areas (RCP); Riparian Area Enhancement (RAE); other projects that restore hydrologic processes.

Restore Channel Complexity and Hydrologic Processes

Status and Priority: Hydrologic processes include different states of flows: low flows, within-bank pulses, overbank flooding, and flushing flows that remove fine sediment and mobilize the bed material. In restoring hydrologic processes, it is important to consider both the flow magnitude and flow duration for these different states of flows. Channel complexity refers to in-channel features, including channel sinuosity, variability in slope, depth and bed characteristics, and cover provided by large woody debris and other components. Native aquatic organisms are adapted to channels with complexity, and loss of complexity may negatively affect them. Restoring hydrological processes and channel complexity is a holistic way of ensuring the health of native aquatic organisms.

Geographic Priorities:

This is a priority in mid- to lower-reach habitat.

- Ferguson, Bear, and Lower Long Tom sub-watersheds
High priority for resident and fluvial trout, chinook salmon
- Upper Long Tom, Elk and Coyote sub-watersheds
High priority for resident and fluvial trout
- Spencer, Upper Amazon, Lower Amazon, and Fern Ridge Tributaries sub-watersheds

Possible Project types:

Stream Habitat Enhancement (SHE) and Channel and Bank Alteration (CBA); reconnecting and restoring flow to historic channels (RHC); develop meanders and side-channels (DMSC); expand and restore floodplain such as with in-stream high-flow channels; streamside terracing and bank sloping (BS); off-channel habitat creation (OCHC); large wood placement (LWP); in-stream and hydrologically-connected wetland restoration (WE); other project types to increase floodplain interaction and move important parts of the watershed toward more natural hydrologic regimes; other project types that restore hydrological processes themselves (instream flow restoration broadly including; low flows,

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pulses, overbank flows); other project types that specifically support turtles and amphibians.

Water Quality

Status and Priority: Limiting conditions caused by water quality include 1) high summer water temperatures and low dissolved oxygen levels in the mid and lower portions of the watershed, 2) high nutrient levels in streams running through the urban and heavily irrigated agricultural lands, 3) high turbidity levels in the Long Tom River below Fern Ridge Reservoir, some portions of Coyote Creek, and upper Amazon Creek, and 4) high *E. coli* levels in the upper Amazon, Ferguson, and Bear Creek sub-watersheds. These water quality conditions limit cutthroat trout and other native fish production in many parts of the watershed, negatively impact Spring Chinook rearing habitat on the lower Long Tom, and, in the case of *E. coli*, pose a risk to human health. No instream water rights currently exist in the Long Tom Watershed, however anecdotal information from long-time residents suggests that summer stream levels are lower than historically. Low summer flows contribute significantly to high summer water temperature. Poor water quality can have not only a local impact, but a downstream impact on the Willamette River and further.

This category focuses on efforts to improve water quality not already addressed by restoration of watershed processes and functions. It highlights specific water quality goals that need to be addressed to meet water quality standards set by the Oregon Department of Environmental Quality (DEQ). Our geographic priorities were developed from Council water quality data as well as DEQ water quality limited streams in the watershed. The priorities address limiting factors to aquatic life and human health. Notably, two municipalities obtain their drinking water from sources within the watershed – Veneta and Monroe. Both rely on wells. Veneta currently faces issues relating to quantity. Monroe is located within the Southern Willamette Valley Groundwater Management Area and contamination by nitrates is of primary concern.

Decrease water temperature and increase dissolved oxygen

Status and Priority: Temperature is the primary limiting factor to cutthroat trout productivity and this makes all fish-bearing streams a priority. Due to Fern Ridge Reservoir acting as a heat sink, sub-watershed improvements may not contribute significantly to cooling in the Willamette. Individual sub-watersheds are prioritized based on fish populations and use. This is based on ODFW data showing that trout will use streams with poor physical habitat as long as temperature is suitable. See also the previous section on ensuring adequate water flow.

DEQ Water Quality Limited Streams: Ferguson Creek (temperature); Coyote Creek (DO), Amazon Diversion (DO).

Additional Water Quality Limited Streams for temperature and DO (per Council data): Long Tom River below the dam, Lower and Upper Amazon Creek, and the lower sections of Upper Long Tom, Elk Creek, Bear Creek, Spencer Creek and Fern Ridge tributaries.

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Geographic Priorities:

None of the major tributary streams meet the state temperature standard along their middle and lower reaches. The upper, forested stream reaches meet the standard all or most of the time. Dissolved oxygen data follows a similar trend compared to the state standard for cold-water aquatic life.

- Ferguson, Bear sub-watersheds
High priority for resident and fluvial trout, chinook salmon
- Upper Long Tom, Elk, Coyote sub-watersheds
High priority for resident and fluvial trout
- Spencer (seasonal), Upper Amazon, Fern Ridge Tributaries, Lower Amazon, Lower Long Tom sub-watersheds
Medium priority

Possible Project types:

Those that produce shade and increase flow: Riparian Area Enhancement (RAE); riparian vegetation planting (RVP); riparian fencing (RF); off-channel watering for livestock (LWO); education and monitoring to reduce or eliminate use of fertilizers which can contribute to nutrient loading in streams; Conservation Easements or agreements for high-quality areas (RCP)

Pesticides and Toxins

Status and Priority: USGS Willamette River Water Quality report findings suggest a reduction in pollution levels is needed in the Long Tom River Basin. This could be a significant limiting factor threatening aquatic health, yet specific geographic data is sparse, and collection is limited due to the prohibitive cost. Acute levels are especially important as they can quickly impair or kill aquatic life. High levels are transferable and become a problem downstream also. Pesticides and toxins are not only a local problem, however, and the types of actions it requires to change the pollution sources and levels suggests an approach needs to be prioritized and addressed at a larger scale than the individual watershed.

DEQ Water Quality Limited Streams: Amazon Creek (arsenic, lead)

Additional Water Quality Limited Streams (per Council data): no Council data; collection of data or review of current and relevant studies is a priority.

Geographic Priorities:

- Upper Amazon – *high priority as we assume that this is the likely source of significant pollution contribution.*
- Lower Amazon, Lower Long Tom – *high priority to the extent that sources of pollution exist, not because it is where the problem has accumulated.*

Possible Project types:

Prevention to minimize risk to local waterways; Reduction in use, especially in urban and rural resident areas where over-application is common; Monitoring (in collaboration with USGS or local college). See also actions to Restore Riparian Area Function.

It is important to note that these project types are not sufficient to address what may be a significant threat to aquatic health. Monitoring is essential

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to determine the extent of the problem, especially on the pesticides and toxins present and with known toxicity levels. Possible incoming knowledge: Clackamas Watershed Council's report on local pesticide monitoring program.

Decrease nutrient levels

High nutrient levels encourage excessive algal growth, which deprives the stream of oxygen. This effect can also occur downstream. Council monitoring data show high levels of nitrate and phosphorus in some streams compared to average levels throughout the watershed. The City of Monroe is located within the Southern Willamette Valley Groundwater Management Area and contamination by nitrates is of primary concern.

DEQ Water Quality Limited Streams: *A state standard is not currently set for nutrients so there are no state listings.*

Additional Water Quality Limited Streams for temperature and DO (per Council data): Bear (P), Coyote (P), Spencer (P), Elk (N), Ferguson (N and P), Lower Amazon (N and P), Lower Long Tom (N and P), Upper Amazon (N and P), Upper Long Tom (N), Fern Ridge Reservoir (P).

Geographic Priorities:

These priorities were set based on severity.

- Lower Amazon, Lower Long Tom, and Upper Amazon sub-watersheds
High Priority
- Ferguson Creek, Coyote Creek, Bear Creek, Upper Long Tom, and Fern Ridge Tributaries sub-watersheds
Medium Priority – in these areas the situation is less severe but important due to downstream impact.

Possible Project types:

Riparian Area Enhancement (RAE); riparian vegetation planting (RVP); riparian fencing (RF); off-channel watering for livestock (LWO); native shrub and forb filter strips; education and monitoring to reduce or eliminate use of fertilizers; manure management and storage facilities; Conservation Easements or agreements for high-quality areas (RCP).

Decrease bacteria levels

Bacteria is primarily a problem for human health. Excessive levels also imply riparian degradation, nutrient loading and subsequent oxygen depletion of streams, which impacts the vitality of trout. This is often caused from livestock access to streams, and manure.

Note: It is not known how much of a problem the delivery of bacteria from septic sources is. Assessment methods to determine bacteria source are prohibitively expensive and still produce unclear results. Funding for assessment and repair of individual systems is not known to be available. Professional opinion is that domestic livestock are a significant source based on a) the land use patterns in sub-watersheds with high bacteria levels, and b) the bacteria levels at headwater sites that set a probable “background” level for the wildlife contribution.

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DEQ Water Quality Limited Streams: lower Long Tom River, Coyote Creek, Fern Ridge Reservoir, Amazon Creek, Amazon Diversion.

Additional Water Quality Limited Streams (per Council data): Bear Creek, Ferguson Creek, Spencer Creek.

Geographic Priorities based on Council *E. coli* monitoring data:

Viewing high bacteria as an indicator of riparian degradation, high priority areas affect both humans and fish.

- Bear, Ferguson, Coyote, and Spencer sub-watersheds
High Priority
- Upper Amazon Creek sub-watershed; Fern Ridge Reservoir (human health issue; probable sources include inflow from Coyote and Amazon Creeks, and septic); Lower Amazon Creek sub-watershed (seasonal issue; probable sources include sheep, nutria, Upper Amazon inflow); Lower Long Tom River sub-watershed (probable sources are upstream, some domestic livestock)
Medium Priority

Possible Project types:

Manure management and storage facilities; Riparian fencing (RF); off-channel watering for livestock (LWO); Riparian Area Enhancement (RAE); riparian vegetation planting (RVP); native shrub and forb filter strips; Conservation Easements or agreements for high-quality areas (RCP).

Correct sediment supply

High sediment levels impair aquatic life in respiration, visible feeding, and by clogging spawning gravels. Duration is a significant factor as this watershed experiences chronic turbidity levels. Projects and management changes should aim to correct sediment supply to a more natural amount, variation and timing.

DEQ Water Quality Limited Streams: Fern Ridge Reservoir

Additional Water Quality Limited Streams (per Council data): lower Long Tom River (turbidity)

Geographic Priorities:

Note: these may be reordered upon secondary review based on sediment as a limiting factor versus where the worst problems exist.

- Bear Creek Sub-watershed, Coyote Creek Sub-watershed, Spencer Creek Sub-watershed
High Priority
- Upper Amazon Sub-watershed, Lower Amazon Sub-watershed
Medium Priority
- Lower Long Tom Sub-watershed and Fern Ridge Reservoir itself
Although a significant problem, any correction here is unlikely due to the configuration and depth of Fern Ridge Reservoir, and the amount of sediment it contributes to the lower river.

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Possible Project types:

Limit/prevent sediment delivery from road/stream intersections or proximity; Channel and Bank Alteration (CBA); streamside terracing and bank sloping (BS); water/sediment control basins (WSCB); updating practices in ditch maintenance, fallow fields, tree farms, construction sites; Riparian Area Enhancement (RAE); riparian vegetation planting (RVP); riparian fencing (RF); off-channel watering for livestock (LWO); native shrub and forb filter strips; Conservation Easements or agreements for high-quality areas (RCP).

References for Aquatic Priorities

Long Tom Watershed Assessment 2000, Long Tom Watershed Council

Long Tom River Water Quality Report 1998-2003, Long Tom Watershed Council

Gary Galovich, Biologist, ODFW, Personal Communication, Feb., Oct., Dec. 2005.

Technical Team, Long Tom Watershed Council, November and December 2005.

Note: other references were reviewed to develop the understanding of staff and technical team during the development of these priorities such as the Draft Willamette Basin Sub-basin Plan (NWPC, 2004) and Willamette TMDL (DEQ, 2004), USGS Willamette River Water Quality Report (2000, pp. 20-21).

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TERRESTRIAL

Five key habitat types in the watershed have been significantly reduced or modified from historic levels in a way that severely limits the distribution of native fish and wildlife. These are: upland prairie and oak savanna, wet prairie, dry conifer and hardwood forest, perennial ponds and backwaters, and riparian areas.

“The Long Tom Watershed is the anchor area for Willamette basin terrestrial species in upland prairie, oak savannah, and wet prairie habitats – it should be the geographic focus as we will not be able to recover listed species without it.”

- Steve Smith, USFWS, February 2005.

Upland prairie & Oak savannah

Focal species¹: American kestrel, horned lark, vesper sparrow, western rattlesnake, western pond turtle, black-tailed jackrabbit, Fender’s blue butterfly, Kincaid’s lupine, white-topped aster, Nelson’s checkermallow.

Status and Priority:

Upland prairie and oak savannah are the rarest habitat types in the Long Tom Watershed and the entire Willamette Valley. Historically they covered a significant portion of the watershed. Their loss is mainly due to conversion to urban and agricultural land, and fire suppression which has allowed shrubs, trees, and non-native invasive species to colonize these sites. Upland prairie provides habitat to a number of sensitive or threatened plant and animal species.

This habitat is a top priority because of the number of listed species, the extent to which the habitat has been altered and eliminated, and the limited dispersal ability of the Fender’s blue butterfly. The West Eugene Wetlands and prairies in the southeast portion of the Long Tom Watershed are the anchor for this habitat in the entire Willamette Valley.

Geographic Priorities:

Please also refer to the associated map for this habitat.

High Priority:

- Spencer Creek, Fern Ridge south, parts of Coyote, lower end of Upper Long Tom, areas east of Fern Ridge Reservoir up to City of Eugene UGB.
Habitat in these sub-watersheds is the best of what’s left in condition and extent.
- Bear Creek, Ferguson Creek, Lower Long Tom
These sub-watersheds contain habitat needed to expand northward the range of prairie/savannah-dependent species. This is needed to link habitats for species’ dispersal and to promote interchange with other populations for genetic diversity.
- Within the priority areas, TNC portfolio sites are specific known opportunities.

Considerations for prioritization:

- This habitat type is fragmented and thus restoration should 1) expand the functionality of existing habitat by restoring areas of adjacent habitats and 2) connect existing concentrations or patches. Conservation measures

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should prioritize sites with concentrations of existing at-risk³ species, that are designated critical habitat, or that are identified in a *Recovery Plan*.

Possible Project Types:

Vegetation Management (VM): reduce and control invasives (ISM), controlled burning (CB)², conifer thinning (CT), thinning to create savannah conditions; planting and re-vegetation, reintroduce native forbs and especially nectar plants, planting oaks; upland bird management practices for agriculturally productive lands.

Wet Prairie

Focal species¹: dunlin, common yellowthroat, western meadowlark, common snipe, northern harrier, sora, water howellia, Bradshaw's lomatium, Nelson's checkermallow, Willamette Valley daisy, peacock larkspur.

Status and Priority:

Wetland prairie historically covered an estimated 34,500 acres in the Long Tom Watershed. Over the past 150 years these wetlands have been converted and filled, overgrown by wetland trees and shrubs due to fire suppression, or altered to other wetland types. Today there are approximately 1,000 acres, several hundred of which are in the West Eugene Wetlands. Significantly, the acreage in the southeast portion Long Tom probably represents more than half of what exists in the entire Willamette Valley today. This network of sites provides an important hub for restoring a connected matrix of wet prairie. This habitat is a top priority due to the listed plants and candidate-listed wildlife species it hosts and because of the degree to which the habitat has been reduced and altered compared to the historic extent.

Geographic Priorities:

Please also refer to the associated map for this habitat.

- High priority areas are those within the 100-year floodplain and/or with hydric soils, combined with those in low fertility/capability class.
- High priority areas are those shown highlighted on map
- Medium priority areas are those not highlighted on map

Considerations for prioritization:

- Other factors for prioritization include the size of the parcel, adjacency and connectivity with other high quality habitats, and sites with the presence or proximity of at-risk³ species.
- This habitat type is fragmented and thus restoration should 1) expand the functionality of existing habitat by restoring areas of adjacent habitats and 2) connect existing concentrations or patches. Conservation measures should prioritize sites with concentrations of existing at-risk³ species, that are designated critical habitat, or that are identified in a *Recovery Plan*.

Possible Project Types:

Wetland Enhancement (WE), Excavation/removal of fill (ERF), Elimination of drainage structures (EDS), invasive species removal, native vegetation planting, woody species removal, controlled burning (CB)².

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Riparian/Emergent Marsh/Oxbow/Backwater Slough/Beaver Pond/Marsh

Riparian Focal species¹: red-legged frog, red-eyed vireo, willow flycatcher, green heron, yellow warbler, dusky-footed woodrat.

Emergent Marsh, etc. Focal species¹: red-legged frog, western pond turtle, American dipper, bald eagle, purple martin, wood duck, American beaver, river otter.

Status and Priority:

Significant limiting conditions to proper riparian zone function in the watershed include loss of large conifers in the upper reaches, loss of bottomland hardwood forest, replacement of trees and native shrubs with invasive species, grasses, or bare soil, and an overall reduction in the density and number of trees in riparian areas. In some cases, the loss of function is due to a streamside wetland or prairie area being overgrown by forest. Almost 60% of riparian areas have moderate to high loss of ecological function due to one or more of these causes. Many species depend wholly or in part on riparian habitat and have been negatively affected by this loss in function. In addition, loss of shade contributes to warmer stream temperatures, which has had a significant impact on cutthroat trout.

Perennial oxbow ponds and slow-moving backwaters were much more common in the watershed then they are today. Many of these oxbows were filled in to make way for farming, and the meandering paths of lowland streams were straightened to provide quicker evacuation of high flows. These development patterns have reduced habitat for Oregon chub (historically present in the watershed), western pond turtle, and red-legged frog, among other species.

Both these habitats are a priority due to neo-tropical migrants, amphibians, and the western pond turtle. Restoration conducted here will also address fish and water quality needs. Riparian areas are a priority throughout the watershed, especially in third-order and larger streams because this is when the hydrology creates a distinctive vegetation component and affects the tree canopy.

Geographic Priorities:

Please also refer to the associated map for this habitat.

These habitats are a priority in all areas of the watershed;

Known opportunities exist in:

- Coyote and Upper Long Tom floodplain areas
- Lower Long Tom, lower reaches of Bear and Ferguson, Lower Amazon
This links the Long Tom and Willamette Rivers for key aquatic species (migratory fish, pond turtles, chub)
- Fern Ridge wildlife area, Veneta complex, and the lower basins around the southern end of the reservoir.
- Poodle Creek (in Elk Creek) and other areas

Considerations for prioritization:

- Third-order and larger streams
- The larger the site the better
- Presence or proximity of at-risk³ species
- Potential wildlife response
- A small area of habitat in a disturbed area may be just as valuable to nearby individual animals as a large contiguous block is to sustain populations.

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- Seasonal streams can be just as important as perennial if they have rare or unusual species (e.g. Willow Creek within Amazon sub-watershed).

Possible Project Types:

See project types for Aquatic – Water Quality – Restore Riparian Area Function

Dry Conifer/Hardwood Forest

Focal species¹: acorn woodpecker, chipping sparrow, western wood peewee, white-breasted nuthatch, Northern spotted owl, southern alligator lizard, sharptailed snake, western gray squirrel, red-legged frog, wayside aster

Status and Priority:

Dry Conifer/Hardwood forest includes two types - Woodland/Shrubland, characterized by scattered conifer or scattered oak and conifer with a significant native shrub component and a sparse canopy, and Closed Forest characterized by conifer (ponderosa pine and incense cedar) and broad leaf evergreens (madrone, chinquapin, and some oak).

Historically, both of these forest types were widespread in the watershed, covering much of the Coast Range foothills. A significant amount of this habitat has been lost by conversion to forestry or agriculture, or invasion of Douglas fir, which is most likely due to fire suppression. Dry conifer and hardwood forests provide habitat for a particularly diverse assemblage of species, and restoration is a priority due to the large number of species that depend on it.

Geographic Priorities:

Please also refer to the associated map for this habitat.

- Between approximately 500' and 1,000' elevation zone of the southern and western Coast Range foothills surrounding the watershed.
- Within the priority areas, TNC portfolio sites are specific known opportunities.

Possible Project Types:

Vegetation Management (VM): Similar to those for Upland Prairie & Oak Savannah habitat, but especially: limit conifer invasion; thin trees; plant for species diversity based on what site historically supported; controlled burning (CB) ². Include specific habitat requirement of rock outcrops for the southern alligator lizard.

Old Growth Forest

Focal species¹: Pileated woodpecker, olive-sided flycatcher, Vaux's swift, marbled murrelet, spotted owl, great gray owl, Oregon slender salamander, American marten, red tree vole, Townsend's big-eared bat, red-legged frog.

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Status and Priority:

This habitat is less of a priority as it is already somewhat protected and managed for habitat values by BLM, ODF, and there is not a significant amount in the Long Tom Watershed relative to other basins.

Geographic Priorities:

- BLM Late Successional Reserves, state-owned lands, and forest areas adjacent to those or adjacent to other projects.

Possible Project Types:

Old-growth conifer forest conservation.

Notes for Terrestrial Priorities

1. *Federally listed threatened or endangered species are underlined.*
2. *At this point controlled burning and land acquisition are two project types the Council will not undertake.*
3. *“At-risk” species are those listed with some kind of concern for their status in the Natural Heritage Info. Center database. There is a specific list for the Long Tom River watershed. Each species is evaluated regarding their population and breeding population status and ranked in relation to their statewide, federal and global situations, as applicable.*

References for Terrestrial Priorities

Long Tom Watershed Assessment 2000 Long Tom Watershed Council

Steve Smith, Biologist, USFWS, Personal Communication, February 2005.

Kat Beal, Biologist, US Army Corps of Engineers, Personal Communication, Oct., Nov. 2005.

Ed Alverson, The Nature Conservancy, Personal Communication, Nov., Dec. 2005.

Technical Team, Long Tom Watershed Council, November and December 2005.

Note: other references were reviewed to develop the understanding of staff and technical team during the development of these priorities such as the Draft Willamette Basin Sub-basin Plan 2004 and The Nature Conservancy’s habitat priorities for the Willamette Basin/Puget Sound Trough.

Key incoming knowledge: USFWS Willamette Prairie Recovery Plan, 2005

Approach and criteria to identify and prioritize restoration efforts

Overall Strategy

When determining the overall strategy for conservation, the Council considers the following sequence of activities, (adapted from Roni, et al.):

- 1) **CONSERVE: Maintain and protect** in places where there is sufficient to high quality function currently. *Note: The Council does not take the lead in implementing this project type. The Council collaborates with partners in their prioritization of conservation areas, then discusses conservation (i.e. protection) with landowners where appropriate and refers that specific action to partners for implementation.*
- 2) **RESTORE: Reconnect** high quality, functioning habitats to each other (this especially applies when considering fish passage or upland species population viability)
- 3) **RESTORE: Restore processes and functions** that will passively restore habitat, and do so for the long-term
- 4) **RESTORE: Restore or enhance habitat** at specific sites

Identifying and Prioritizing Restoration Efforts

The Council uses the following steps to prioritize geographic areas, habitat emphasis, project types, and projects:

Step	Based on	Result
Identify priority areas and habitats for conservation and restoration	Ecological data; professional judgment; existing plans	Selected sub-watersheds or areas, and habitat emphasis
Identify potential project areas	Strategic location; potential landowner interest	A set of potential project sites within key areas with landowners willing to collaborate in restoration
Determine restoration potential and likelihood of effect	Considerations such as geomorphology, hydrology, habitat condition, surrounding influences	Refined set of potential sites and project types applicable
Move from possible sites to developing projects for implementation	Considerations such as landowner interest, funds, time constraints, permits	Final selection of projects

Evaluating Individual Projects

The Council uses the following principles to evaluate potential projects: 1) Meets Priorities, 2) Acres or stream length affected and benefit to multiple species possible, 3) Proximity of project to high quality habitat or restored land, 4) Likelihood of restoration success in improving habitat and function, 4) Level of landowner interest and capability to implement and steward project, 5) Funding potential, 6) Partnership opportunities, 7) Community support, especially in terms

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of interest from other potential project landowners, and/or lack of controversy, especially with neighbors, 8) Potential for long-term protection of habitat or function, 9) Surrounding threats to project success or longevity, such as from land-use, and 10) Council is most appropriate entity.

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McKenzie River Watershed

Restoration Priorities

The watershed/habitat restoration strategies/priorities that are at work in the McKenzie are outlined within the *McKenzie River Conservation Strategy* (developed by the McKenzie Watershed Council in 2002), and adhere to the following guidelines:

I) Protect and Restore Key Fish and Wildlife Habitats

Aquatic Habitats

River and stream channel habitats in the McKenzie have been lost through activities such as riverbank stabilization and changes to flood flows due to dams. River channel and tributary stream areas (especially side channels and backwaters) offer diverse aquatic habitats, refuge for fish and other aquatic species during floods, and important rearing areas for spring Chinook salmon and other fish. Aquatic habitat restoration is focused on areas where human influences have caused the river to become simplified and on areas with complex and diverse habitats; especially river channel and tributary stream sections where the channel is (or historically was) actively moving and connected to the floodplain. Stream and river channel restoration approaches include creation of side channels, pools, and other off channel habitats, and placement of wood to create cover and pools.

Geographic Priority Areas: river channel segments within the McKenzie-Willamette Confluence area; lower river segments downstream from I-5 bridge; river channel segments along the north edge of the city of Springfield, river and tributary stream channel segments in the Walterville area, Camp Creek area, and Cedar Creek area; other historically complex lower river reaches such as between Hayden Bridge and Hendricks Bridge.

Project Types: Excavating upstream end of plugged side-channels to reconnect and restore flow to historic channels; excavating alcoves and ponds; remove dykes and riprap for stream habitat enhancement and channel and bank alteration (develop meanders and side-channels); streamside terracing and bank sloping to reduce sediment flow/erosion; large wood placement

Riparian and Floodplain Vegetation

Roads, houses, and other human developments concentrated next to the McKenzie River and its tributaries have contributed to significant loss of riparian vegetation; especially in the entire Lower McKenzie River corridor below Leaburg Lake (including tributary watersheds such as Camp Creek and the Mohawk). Floodplain and riparian area habitat protection is focused on low elevation river and tributary stream areas that historically flooded at regular intervals and had extensive native riparian vegetation, especially large trees and other native plants. A key component of restoration is the removal/control of invasive plants such as Himalayan blackberry, reed canarygrass and Scotch broom in riparian areas and the replanting of native site-appropriate vegetation. Stream margins with adequate native cover are critical for the earliest life stages of spring chinook salmon in particular.

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Geographic Priority Areas: Within floodplain along entire lower stretch of McKenzie River below Vida and down to the McKenzie-Willamette Confluence; the floodplain within the Camp Creek, Cedar Creek and Mohawk River watersheds.

Project types: Riparian restoration in collaboration with landowners on private lands: mowing/controlling invasive weeds; native tree/shrub planting; continued post-planting maintenance of planting sites; fence construction to protect riparian areas from livestock; off-stream watering system development for livestock

Note - *Considerations for riparian enhancement project prioritization:* project sites are considered higher priority relative to other projects as they affect longer contiguous stretches of habitat, along with available opportunities to impact both sides of the stream and achieve larger riparian zone widths (in proportion to stream size).

Wetlands

Wetland habitat protection and restoration is focused on reconnecting remaining areas with functioning wetlands. Historically, the Lower McKenzie Valley had extensive wetland habitats. In addition to providing valuable fish and wildlife habitat, wetlands in the McKenzie offer benefits such as absorbing flood flows, reducing erosion and storm damage, and maintaining water quality.

Geographic Priority Areas: wetlands in the McKenzie-Willamette Confluence area; wetlands in the lower Mohawk Valley near the city of Springfield; wetlands in the lower Cedar Creek drainage; wetlands in the Camp Creek area; wetlands in the Walterville area

Project Types: Wetland enhancement; Conservation of existing wetlands; Excavation & removal of fill; Elimination of drainage structures; pond construction; invasive species removal and native vegetation planting

Western Pond Turtle Habitat

Western pond turtle habitat restoration is focused on the areas where there are population strongholds and remnants of returning habitat, with an emphasis on McKenzie River floodplain areas. Pond Turtle populations are declining throughout Lower McKenzie Valley. Protection of ponds and other areas key for pond turtle habitat is critical to ensure future survival.

Geographic Priority Areas: McKenzie-Willamette Confluence area; lower Mohawk Valley; lower McKenzie floodplain along both the east and north edge of city of Springfield

Project Types: Riparian restoration (but with pond turtle habitat focus) in collaboration with landowners on private lands: mowing/controlling invasive weeds; native grass/shrub planting in coordination with Pond Turtle habitat needs; continued post-planting maintenance of planting sites; fence construction to protect pond turtle habitat areas from livestock; off-stream watering system development for livestock

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Rare Upland Habitats

Rare upland habitat restoration is focused on conserving the little remaining oak woodlands, grasslands, and ponderosa pine areas, along with existing old growth conifer forests. Historically, the lower McKenzie River Valley, especially in the Springfield area and lower Mohawk and Camp Creek valleys, had extensive oak woodlands, ponderosa pine stands and grasslands. These vegetation types have been lost through conversion to other land uses and suppression of historical fire regimes.

Geographic Priority Areas: upland habitats near the edge of the city of Springfield; the Mohawk River Valley; Cedar Creek area; Camp Creek area; old growth forests of the upper McKenzie

Project types: Vegetation Management: reduce and control invasive plants; controlled burning; conifer thinning; planting and re-vegetation; reintroduction of native forbs; planting pine and oaks; protect/conserv old-growth conifer forests.

Habitat Connections

Restoring habitat connections within the McKenzie focuses on two areas: 1) barriers to fish and other aquatic species; with an emphasis on replacing barriers within streams (culverts, etc), especially those that are impediments to passage for federally listed species such as spring Chinook and Bull Trout, and 2) maintaining and reestablishing quality habitat between protected terrestrial areas, with focus placed on creating linkages between oak woodlands, grasslands, and ponderosa pine forests.

Geographic Priority Areas: *Short term:* main-stem of Lower McKenzie River below Leaburg Lake and down to the confluence of the McKenzie and Willamette; tributary streams in the lower McKenzie Valley and within uplands throughout the Mohawk River watershed; *Long term:* fish passage at dams

Project types: Identification and prioritization of passage barriers (barrier analysis and inventory: culvert removal, replacement or modification; fish passage structure development; correcting connection inhibiting road/stream crossings; screen diversions; dam/drop structure removal or modification, fish passage structure development; provide fish passage alternatives; invasive plant control and native plant establishment; protect established woodlands, prairies, and old growth conifer forests.

Note - *Considerations for barrier removal project prioritization:* The amount, type, and quality of habitat to be opened up is to be considered, as well as the position in the sub-watershed: with downstream positioned culverts being higher priority. Specific data is gathered on each potential barrier.

II) Protect, Maintain and Restore Water Quality and Quantity:

The majority of McKenzie (with a few exceptions) is blessed with outstanding water quality and adequate in-stream flows. The McKenzie River is the source of drinking water for the city of Eugene. Maintaining and protecting this high water quality is high priority; non-point source pollution will continue to be a threat, and continued and increased water quality monitoring will

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be crucial to learning of potential water quality problems as they occur and tracking water quality trends.

Geographic Priority Areas: Emphasis on lower McKenzie River Valley and tributary streams, especially in the Springfield area and Mohawk watershed; along with Cedar Creek, Camp Creek, and Walterville area; additional focus to be placed on identified 303(d) limited stream segments (all primarily listed for temperature concerns) found within the Lower McKenzie and Mohawk watersheds

Project Types: Monitoring of temperature, DO, nutrients, bacteria, and heavy metals; riparian restoration practices such as invasive weed management/native tree planting and livestock-exclusion fencing; wetland enhancement

McKenzie Watershed Focal Species:

Aquatic Species: *Spring Chinook, Rainbow Trout, Bull Trout, Cutthroat Trout, Mountain Whitefish, Three-spine stickleback.*

Terrestrial Species: *Western Pond Turtle*

Avian Species: *Total of 21 neo-tropical migrant bird species, 6 other migrant bird species, and 2 basin bird species; included are the Western Meadowlark, Willow Flycatcher, Yellow-breasted chat, and Osprey*

Focal Plant Communities: *Riparian Cottonwood Forests, Oak Woodlands, Wetlands*

References of Note:

McKenzie River Subbasin Assessment 2000 McKenzie Watershed Council

McKenzie River Conservation Strategy 2002 McKenzie Watershed Council

Mohawk Watershed Assessment 1999 East Lane Soil and Water Conservation District

Middle Fork Willamette River Watershed

Middle Fork Willamette River Watershed

Restoration Priorities

AQUATIC

Focal Species: *Spring Chinook, bull trout, Oregon chub and cutthroat trout are present in the Middle Fork Willamette Watershed. Spring Chinook spawn in the lower reaches of the main stem and its tributaries Little Fall Creek and Lost Creek. Spring Chinook are transported above Fall Creek, Dexter-Lookout Point and Hills Creek dams, providing access to otherwise unavailable habitat. Spawning occurs in the upper reaches of Fall Creek and lower reaches of Winberry Creek, the North Fork of the Middle Fork Willamette River and the Middle Fork Willamette River above Hills Creek Reservoir. Spring Chinook also use Wallace, Anthony, Middle, and Rattlesnake Creek for rearing and migration. Resident bull trout are present above Hills Creek dam in the upper watershed and rear in the upper reach tributaries and springs, including Swift and Bear creeks, and Chuckle, Indigo and Iko springs. Oregon chub are present in the side channels and tributaries to the lower reaches of the main stem. Dense populations exist at the confluence of Lost Creek and the Middle Fork of the Willamette River. There are resident populations of cutthroat trout throughout the tributaries in the watershed.*

Connectivity/Passage

The dams on the main stem create barriers to fish passage, affecting migration patterns and eliminating valuable habitat for spawning and rearing. Mitigating for this impact is a priority for access to habitat and refuge by spring Chinook and cutthroat trout. Currently, Spring Chinook are transported above Fall Creek, Dexter-Lookout Point and Hills Creek dams, providing access to otherwise unavailable habitat.

Dams:

Mitigate the impacts of dams to improve viability of spring Chinook populations throughout entire watershed.

Geographic Priorities:

- **Dexter**

Removing this dam or mitigating its impact would reconnect spring Chinook habitat and populations in the lower and upper reaches of the main stem Middle Fork Willamette River. Passage could be addressed with installation of fish ladder.

- **Lookout Point**

Removing this dam or mitigating its impact would reconnect spring Chinook habitat and populations in the lower and upper reaches of the main stem Middle Fork Willamette River. Passage and temperature need to be addressed.

- **Fall Creek**

Removing this dam or mitigating its impact would reconnect spring Chinook habitat and populations in the lower and upper reaches of Fall and Winberry Creek. Passage to be addressed.

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Culverts/Revetments:

Removing, repairing or replacing blockages to streams and their tributaries would increase access to habitat for spring Chinook and cutthroat trout throughout the watershed. Removing revetments in the lower watershed would help to minimize the downcutting of streams, and would allow for the natural processes between the stream and its floodplain to occur. This would greatly improve the quality and quantity of backwater habitats. Unscreened diversions affect adult and juvenile rearing habitat.

Geographic Priorities: (5th field sub-watersheds)

Lower Watershed

- Little Fall Creek
- **Lower Middle Fork Willamette River**
- **Fall Creek**
- Lost Creek

Upper Watershed

- **North Fork of the Middle Fork Willamette**
- **Salmon Creek**
- **Salt Creek**
- **Hills Creek**

***Considerations for project prioritization:** High priority sub-watersheds for fish passage have been prioritized based on criteria that identifies them as having high density populations of focal species, habitat quality, and the greatest potential of producing strong runs of spring Chinook and cutthroat trout. Additional considerations include: Which barriers block only juveniles and which barriers block both juveniles and adults? Which downstream barriers require a solution prior to fixing upstream barriers? Additionally, the goal is to identify high-priority and cost effective opportunities for improving and increasing habitat throughout the Middle Fork Willamette watershed. Specific considerations: Likelihood that the action will lead to success; willing landowners to participate in the action; availability of funding from various sources for the action. Identify revetments and unscreened diversions that affect floodplain/channel interaction and rearing habitat. Identify revetments whose removal would help restore the natural processes without causing significant damage to existing land uses.*

Watershed Process & Function

Improving watershed process and function is key to achieving a viable ecological system that supports the residents and focal aquatic species in the watershed. Habitat emphasis: riparian and instream projects that benefit anadromous and resident fish species, including spring Chinook, cutthroat trout, and bull trout. Groundwater recharge areas that provide drinking water to local municipalities should be the highest priority wherever in conjunction with projects that address hydrologic process, wetland and channel habitat.

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Restore riparian area function

The goal is to increase shade along selected high priority streams to lower water temperature and to provide food and cover to aquatic species. Riparian enhancement projects include removal of exotic plant species and establishment of native vegetation.

Geographic Priorities:

- **Confluence of Lost Creek and the Middle Fork Willamette River (Elijah Bristow)**
- **Confluence of Coast and Middle Fork Willamette River (Mount Pisgah)**
- **Lost Creek**
- **Little Fall Creek**
- **Fall Creek**
- **Lower Middle Fork Willamette River**
- **Tributaries to these creeks**

***Considerations for project prioritization:** Geographic emphasis is based on areas with the highest potential for protecting intact riparian areas and reconnecting riparian floodplain forest within the lower watershed. Projects focus on increasing the number of native trees along the streams to improve water temperature and large wood recruitment potential to create channel complexity. Specific considerations include areas and or sub-watersheds with high numbers of willing landowners and high-density populations of threatened and endangered species.*

Channel Complexity and Hydrologic Processes

Channel complexity and reconnectivity with the floodplain are two key factors to improving the ecological processes in the watershed. Complex channels, a result of large wood in the channel and other geomorphic factors, provide off-channel habitat and cool, deep pools for cover and food during the summer. Much of the wood in the high priority sub-watersheds was intentionally removed, so the major source for natural recruitment has been minimized. Placing wood in the streams will provide and or enhance habitat for spring Chinook, Oregon chub and bull trout. Reconnecting the channel to its floodplain in the lower watershed will enhance wetland habitat, and off-channel habitat for spring Chinook. Additionally, dams on the main stem have resulted in decreased variability of high and low flows, affecting natural processes of complex channel formation.

Geographic Priorities:

Lower watershed

- **Confluence of Lost Creek and Middle Fork Willamette River**
- **Lower Middle Fork Willamette River**
- **Confluence of Coast and Middle Fork Willamette River**
- **Lost Creek and its tributaries**
- **Little Fall Creek**
- **Fall Creek and its tributaries**

Upper watershed

- **North Fork of the Middle Fork Willamette River**
- **Salt Creek**

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- **Upper Middle Fork Willamette River and its tributaries**

Considerations for project prioritization: Improved channel complexity should occur in the upper and lower watershed, and floodplain restoration efforts should occur in the lower watershed below Dexter Dam. Focus on medium-sized streams with year-round habitat that are not blocked by poorly designed culverts or natural water falls. Cost benefit and landowner willingness to collaborate on project is a strong consideration. Specific floodplain restoration projects will be determined by the USACE floodplain feasibility study for the lower Middle Fork Willamette River, in addition to landowner willingness. Work with USACE and Nature Conservancy to establish flow regulations that are adequate for providing suitable conditions and creating habitat for spring Chinook.

Water Quantity

Adequate flow in tributaries to the main stem is needed to sustain viable fish populations during summer months. Maintaining a minimum flow would lower the water temperature, providing suitable habitat. Best management practices should be identified and implemented in these sub-watersheds to retain a flow adequate for species present.

Geographic Priorities:

- **Lost Creek**
- **Little Fall Creek**

Considerations for project prioritization: Work with landowners with water rights to improve irrigation practices, and work with local water master and landowners who are extracting water without rights. Identify areas with highest potential for flow contribution.

Water Quality

High water temperatures throughout the watershed affect juvenile and adult spring Chinook. Reducing high water temperatures in the lower reaches of the main stem and its tributaries is a high priority for the Council. Reestablishing floodplain forest and riparian canopy would lower water temperatures. Temperature control on Lookout Point Dam affects water temperature in the lower watershed. Working with USACE on a project for temperature control at this reservoir would positively impact spring Chinook in the lower reaches of the main stem Middle Fork of the Willamette River. Reducing input of toxic chemicals will improve drinking water supply for residents of the watershed.

Geographic Priorities:

Lower watershed

- **Lookout Point Dam**
- **Lost Creek**
- **Fall Creek**
- **Lower Middle Fork Willamette River**

Upper watershed

- **Hills Creek reservoir**
- **Salt Creek**
- **North Fork of the Middle Fork Willamette**

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Considerations for project prioritization: High priority has been assigned to areas that would have the most beneficial impact on high water temperatures if addressed. Addressing temperature control at Lookout Point Dam is highly dependant on working together with USACE. Specific considerations for riparian planting include, soil types, benefit to both aquatic and terrestrial species, potential to provide shade cover across the width of stream, create contiguous habitat, and landowner willingness. Work with TMDL process.

Habitats for ESA-Listed Species

Restoration of Oregon chub habitat

Dense populations of Oregon chub are found throughout the middle and lower reaches of the Middle Fork Willamette River. These are some of the most viable chub populations in the Willamette Valley.

Geographic Priorities:

- **Confluence of Lost Creek and Middle Fork Willamette River (Elijah Bristow)**
- **Lower Middle Fork Willamette River**
- **Dexter and Lookout Point areas (Mid Middle Fork Willamette)**

***Considerations for project prioritization:** Historic side channels and sloughs will be given the highest priority for habitat restoration. The results of the USACE floodplain feasibility study would be used to determine reconnectivity projects that create backwater sloughs. Areas with the potential for large wood recruitment and retention of substrate will also be considered.*

TERRESTRIAL HABITAT

***Focal species:** There are abundant populations of the western pond turtle, Oregon chub and northern Red-legged frog at the confluence of Lost Creek and the Middle Fork Willamette River located in Elijah Bristow State Park. Red-legged frogs are suspected to be present upstream and downstream of the confluence area as well (Christopher Pearl, pers. comm. 2005). Populations of western pond turtle and Oregon chub have been documented in the historic side channels connected to the upper, middle and lower reaches of the main stem Middle Fork of the Willamette River (Greg Taylor and Kat Beal, USACE, pers. comm., 2005).*

Wetland/Oxbow/Beaver Pond

Populations of western pond turtles are present in the historic side channels and backwater sloughs of the main stem Middle Fork Willamette River. Habitat can be created and enhanced by placing large wood in backwater sloughs. Removing invasive plant species, such as, Armenian blackberry, will greatly improve habitat conditions.

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Focal species: *Oregon chub, red-legged frog, western pond turtle, green heron, American dipper, wood duck, American beaver, river otter*

Geographic Priorities:

Lower Watershed

- **Confluence of Lost Creek and Middle Fork Willamette River**
- **Confluence of Coast Fork and Middle Fork Willamette River**
- **High priority private sites in lower watershed**

Upper Watershed

- **Buckhead Creek**
- **North Fork of the Middle Fork Willamette (lower reaches)**
- **Staley Creek**
- **Hills Creek reservoir (below and above)**

Restoration activities supported: *riparian fencing, reconnecting flow to historic channels (where impacts to chub and turtles have been evaluated), restore floodplain, large-wood placement, turtle nesting habitat creation and maintenance.*

Riparian Forest

Between the Middle Fork dams and the confluence of the Coast Fork and Middle Fork of the Willamette, remnants of a once greater and contiguous cottonwood gallery forest remain. Riparian forests also occur along numerous waterways and streams. These forests provide important habitat for neo-tropical migrant birds.

Focal species: willow flycatcher, yellow warbler, red-eyed vireo, American beaver, river otter

Geographic Priorities:

- **Lower Watershed**
- **Lower Middle Fork Willamette River**
- **Fall Creek**
- **Lost Creek**

Restoration activities supported: *riparian fencing, plant understory shrubs, remove/control exotic species, restore gallery forest*

Weed control and management

The control and management of invasive weed species is key to improving the ecological integrity of the watershed. The species of concern include Armenian blackberry, Japanese knotweed, English ivy, Scot's broom, false-brome, and butterfly bush. The removal of these species would improve terrestrial habitat and allow for native plant species to be reestablished.

Geographic Priorities:

Middle Fork Willamette River Watershed

- **Lost Creek (specifically for Japanese knotweed)**
- **Lower watershed**
- **Main stem Middle Fork (upper and lower watershed)**

Savannah

White oak savannah supports many focal species, including some that are now extirpated from the Valley (Lewis' woodpecker). Restoring and protecting Oak savannah habitat would influence the abundance and distribution of wildlife species in the watershed including, Pacific tree frog, American kestrel, western bluebird, and western meadowlark.

Focal species: northwestern pond turtle, western rattlesnake, southern alligator lizard, American kestrel, western bluebird, chipping sparrow

Geographic Priorities:

Lower Watershed

- **Lowell Butte**
- **Buford Park**

Upper watershed

- **Jim's Creek**

Restoration activities supported: thin, release oaks, conduct prescribed burning, promote large diameter oaks, plant understory shrubs, remove/control exotic species.

White Oak Woodland

White Oak woodland habitat supports so many species, it should be considered a priority everywhere it occurs in the watershed.

Focal species: sharp-tailed snake, acorn woodpecker, white-breasted nuthatch, house wren, western bluebird, western gray squirrel,

Geographic Priorities:

- **Lower Watershed**
- **Lower Middle Fork Willamette River**
- **Little Fall Creek**
- **Lost Creek**

Restoration objectives supported: thin, release oaks, plant understory shrubs, remove/control exotic species

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Old Growth Forest

Focal species: spotted owl, olive-sided flycatcher, Vaux's swift, great gray owl, Oregon slender salamander, American marten, Townsend's big-eared bat, red-tree vole

Geographic Priorities:

- Lower Watershed
- Lost Creek
- Little Fall Creek
- Upper Watershed
- Private sites

Restoration objectives supported: Thinning to promote old-stand structure, snag creation, coarse wood, and remove/control exotic species.

Wetland/Prairie Habitat

Much of this habitat has been eliminated due to the change in flood regime. Restoring and preserving this habitat is a priority for plant and wildlife species present. ESA-listed species of concern include, Bradshaw's lomatium, Willamette Valley Daisy, and northern red-legged frog.

Geographic Priorities:

- Confluence of Coast and Middle Fork Willamette
- Lower reaches of Middle Fork Willamette (near Springfield)
- Confluence of Fall Creek and Middle Fork Willamette

Restoration Priorities and Goals of the MFWWC (in order of priority):

1. Increase streamside shading along high priority riparian areas; connect and extend the intact areas of floodplain forest; and promote large wood recruitment potential.
2. Restore fish passage and access to high quality aquatic habitat throughout the watershed.
3. Control and eradicate invasive weeds in high priority sites throughout the watershed.
4. Maintain and restore the habitats of endangered, threatened, and sensitive species.
5. Promote efforts to restore the Middle Fork Willamette River's connection to the floodplain.
6. Restore oak savanna habitat at high priority sites.

Middle Fork Willamette River Watershed

Watershed Council

Criteria to identify and prioritize habitat restoration

Priorities and associated actions are described in the MFWWC 2005-2007 work plan and in the *Middle Fork Willamette River Lower Watersheds Assessment and Action Plan*.

In the fall of 2002, the MFWWC prioritized habitat restoration and other actions in its *Middle Fork Willamette River Lower Watersheds Action Plan*. The recommendations and priorities outlined in the action plan are based primarily on recommendations from the Council's assessment for the lower watershed. While the plan does not outline specific prioritization criteria, it does identify the focus geographic areas in the lower watershed, describes high priority watershed issues (protection and restoration of floodplain and riparian forest areas and barriers to fish migration), and assigns priority levels (high, medium, low) to specific action items.

In addition to the Action Plan, the Council has completed a fish passage database and prioritization project that covers the entire watershed. The results of the fish passage database and prioritization project have been used to prioritize both fish passage and riparian restoration projects. This project was developed with evaluative criteria and a standardized prioritization Protocol.

The priority level of projects in the upper watershed have been evaluated on a project-by-project basis (the Council has worked on two high priority restoration sites in the upper watershed: English Ivy removal on Salmon Creek; riparian restoration at the confluence of Gray's Creek and the Middle Fork Willamette River), and with the assistance of agencies such as the USFS and ODFW.

References

- Middle Fork Willamette River Lower Watersheds Action Plan, 2002.*
- Lower Middle Fork Willamette River Watershed Assessment, August 2002.*
- Middle Fork Willamette Subbasin Analysis, 2004.*
- Jim Reed, Hydrologic Group, MFWWC Fish Passage and Database Project, November 2005.*
- Christopher Pearl, Wildlife Biologist, Northern Red-legged frog egg mass survey for the MFWWC, April 2005 and personal communication, May 2005.*
- Jeff Ziller and Kelly Reis, Fisheries Biologist, ODFW, personal communication, June 2005.*
- Greg Taylor, Fisheries Biologist, USACE, personal communication, June 2005.*
- Bill Castillo, Wildlife Biologist, ODFW, personal communication, June 2005.*
- Kat Beal, Wildlife Biologist, USACE, personal communication, June 2005.*
- Bruce Newhouse, Botanist, Salix Associates, personal communication, July 2005.*

Coast Fork Willamette River Watershed

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Restoration Priorities

AQUATIC

Anadromous fish migrate up the Willamette River into the Coast Fork Willamette and tributary streams until blocked by the Dorena and Cottage Grove dams. Mosby Creek is one of the larger tributary streams not impeded by a dam. Habitat has been severely impacted throughout much of the lower Coast Fork Willamette and these associated tributary streams. Providing access to and improving habitat in these areas is a top priority. Silk Creek and Camas Swale sub-basins are next on our priority list because of their proximity to the communities of Cottage Grove and Creswell—they endure high impacts of urbanization.

Oregon chub is a federally listed endangered species endemic to the Willamette Valley. At this time, there are three known populations of Oregon chub within the watershed. A new population referred to as the Coast Fork side channel, Camas Swale (where a remnant population was just re-discovered) and a few years ago, Herman Pond (USFS) was stocked with Oregon chub. Enhancement, restoration and conservation of habitat associated with these populations are a priority.

Opportunities for restoration efforts to improve western pond turtle habitat exist at East Lane Regional Park, along an adjacent corridor area upstream and at Mt. Pisgah/Buford Park as well as at other yet-to-be identified locations.

Native wetlands have been significantly reduced in number across the southern Willamette Valley. However, a variety of opportunities for restoration exists with the enhancement of current wetlands, the transformation of former barrow pits into useable habitat and in the restoration of natural floodplain.

Priority Aquatic Species:

Western pond turtles (*Clemmys marmorata*)

Spring chinook salmon (*Oncorhynchus tshawytscha*)

Coastal cutthroat trout (*O. clarki*)

Oregon chub (*Oregonichthys crameri*)

Red-legged frog (*Rana aurora*)

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Southern torrent salamander (*Rhyacotriton variegatus*)

Restore channel/watershed connectivity: Elimination of existing human-made barriers is a priority in the Coast Fork basin especially those that impede fish passage and limit stream flows in the Lower Coast Fork and Mosby Creek sub-basins. Opportunities to restore historic floodplain will be high-priority as well because the absence of these key habitat areas are a significant limiting factor for several species including Oregon chub, western pond turtles and red-legged frogs. A partnership to protect pond turtles along a riparian corridor on the Row River is also essential connectivity work for the watershed.

In-Stream Habitat Restoration: Large Woody Debris (LWD) is significantly absent from most tributaries and the main stem of the Coast Fork Willamette. Placement of LWD is a priority in all feasible parts of the watershed. Restore natural channel and bank structure and increasing stream complexity are also important components of the Coast Fork aquatic restoration plan.

Wetland Restoration: Restoration, protection and enhancement of existing wetland/wet prairie habitats and wetland hydrology is a priority.

Geographic Priorities:

Lower Coast Fork—Main-stem and tributaries: Actions in this priority sub-basin will benefit all three target fish species: Spring Chinook, cutthroat trout and Oregon chub. Current barriers are: culverts, including Hill Creek and City Creek, revetments near Short Mountain landfill and other barriers associated with irrigation.

Mosby Creek sub-basin: This sub-basin is high-priority habitat for spring Chinook as it is a free-flowing tributary with historic and modern spring Chinook use.

Considerations for project prioritization: Geographic location, remnant historic floodplain conditions.

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Terrestrial

Habitat corridors, connectivity and diversity blocks are a conservation priority in the Coast Fork Willamette watershed. This southern-most Willamette sub-basin is the last point north before Washington that a corridor of dispersal habitat for Northern spotted owls exists between the Coast Range and Cascades mountains. The genetic diversity of the numerous species that use both ranges depends on connectivity and the preservation of key habitats. In the same manner, riparian areas provide corridors of refugia for all terrestrial species. Late-successional reserves (identified as priority by the BLM in Mosby Creek), remnant old growth Douglas fir forest, upland fir and oak forests, wetlands, riparian forest and floodplain are a few of the priority key habitat areas (many specific locations still need to be identified. Native species richness and diversity is being lost due to habitat fragmentation which informs the protection of connectivity and diversity blocks. Invasive, exotic, and noxious flora and fauna increase habitat loss and fragmentation.

Priority Terrestrial Species:

Northern spotted owl (*Strix occidentalis caurina*)

Northern pygmy owl (*Glaucidium gnoma*)

Pileated woodpecker (*Dryocopus pileatus*)

Western bluebird (*Sialia mexicana*)

Bald & golden eagles

Northern goshawk (*Accipiter gentilis*)

Lynx (*Lynx Canadensis*)

10 sensitive plant species

Riparian Restoration: Restoration projects that use site-specific solutions from the toolboxes of Upland Erosion Control, Channel and Bank Alteration and Riparian Area Enhancement that address the following limiting factors will be highest priority: reducing erosion and deposition of fine sediment into the basin, noxious weed abatement and native plantings for shade and habitat.

Noxious Weed Control: Many miles of riparian vegetation in the Coast Fork basin is dominated by non-native species that include: Himalayan blackberry, English ivy, Scot's broom, reed canary grass, bindweed and invasive clematis. Other non-native species that dominate in uplands, wetlands and prairie need to be identified. Revegetation of native species is high priority for this watershed's ecosystems where invasive plants are removed.

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Key Habitat Protection: There is a significant diversity of unique habitat remnants across the low to mid-elevation range of ecosystems native to the Coast Fork basin. Efforts to inventory, document or survey these places in protection and enhancement efforts in the watershed is a priority. Enhancement activities that improve species diversity, nesting and forage habitat for all species are a priority.

Uplands: In the BLM Mosby Creek Watershed Analysis, the following recommendations apply to all forest stands in their management area: Increase the amount of down wood in thinned stands; Improve snag conditions to 1.7-3.4 snags per acre to meet the needs of avian cavity nesters; Retain large big leaf maples if present (for specific mollusks and fungi); and Maintain the presence of pine species and Canyon Live Oak where they occur in and near ground-disturbing actions proposed in the watershed. Oak savannah is a key habitat type found in the uplands in this watershed.

Actions: Include components from action plan (line items) or cut

Geographic Priorities

Lower Coast Fork—Main stem and tributaries and Mosby Creek sub-basin: As these sub-basins are high-priority habitat for spring Chinook the adjacent terrestrial habitats are also priority.

Row River Pond turtle corridor: from the City of Cottage Grove, East Regional park upstream to lower Mosby Creek there is an existing plan and partnership—this could potentially be extended downstream to the confluence of the Row and the Coast Fork.

Need to identify habitats that meet these criteria: Intact riparian forest & floodplain, intact key habitats (late-successional, upland springs and oak savannah, dispersal habitat, wetlands are highest), degraded areas adjacent to key habitats in corridors and potential corridor areas.

Considerations for project prioritization: *project sites are considered higher priority relative to other projects as they: occur within existing or potential habitat corridors, increase overall area or length of quality habitat or structure, synchronize with other priorities for a greater overall affect.*

Water Quality

The Coast Fork Willamette Watershed Council is developing a data-gathering strategy in order to address water quality as one of three primary categories of concern. Beginning with a WQ database that will elucidate data gaps and synthesize historic & existing monitoring efforts, the council will open lines of communication and begin to prioritize its own monitoring efforts. Sediment, temperature and mercury contamination are the three biggest limiting factors to water quality in the Coast Fork Willamette Watershed.

Impaired water bodies: Reduction of human impacts and inputs is the biggest challenge to water quality in a low-elevation, high-population watershed such as the Coast Fork Willamette. Upland priority issues include reducing erosion (educate agricultural users; improve roadways, drainage patterns; and restore disrupted watershed structure) and reducing pesticides and toxins (educate agricultural and road maintenance decision makers, mitigate run-off from historic mining). Lowland priority issues include reducing erosion, reducing bacteria delivery and nitrate contamination (septic and domestic livestock-education) and mitigating impacts of

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development pressures (develop stormwater TMDL, plan for and educate about changes in demographic from rural to suburban).

In-Stream Flow: Quality, temperature and volume of stream flow are all priorities for the watershed. Addressing the impacts of the two reservoirs in the basin on these criteria would provide solutions downstream.

City of Cottage Grove Drinking Water: “City of Cottage Grove’s public water system draws water from the Row River, Prather Creek, and Laying (Layng) Creek . . . Within the Cottage Grove drinking water protection area for surface water sources, there are large areas identified as sensitive to contamination. Areas that are adjacent to the streams/river, areas that have high erosion potential, high runoff potential, and high permeability should all receive special considerations for protection.” (Oregon Source Water Assessment Report, City of Cottage Grove—PWS # 4100236) This Assessment report serves as guidance for areas sensitive to natural and human disturbance as well as a foundation for TMDL plans.

Geographic Priorities

Cottage Grove Reservoir and methyl mercury run-off from upland contamination site(s): This body of water is 303d listed for *Tissue & water-mercury*, *Trace metals* (probably arsenic) and *Dioxin 2,3,7,8 TCDD (Sediment)* parameters. One historic mine site upstream may still be releasing contaminated tailings (Black Butte, Champion) and is currently being monitored by the DEQ.

Dorena Reservoir: Also listed for *Tissue-mercury*, both reservoirs carry fish consumption advisories. Education around toxics, water quality in general and specific to the other 303d listings is a priority for these two reservoirs and adjacent 303d listed water bodies in the following parameters: sediment, DO, temperature, flow and habitat modifications, Chlorophyll a, pH, nutrient, and aquatic weeds or algae.

Mosby Creek and the lower Coast Fork: As water quality and in-stream flow are priorities for fish species, these issues are priorities in our priority fish areas.

Areas facing urban/suburban pressures: Reduction of human impacts is important in areas being subject to rapid change.

Areas used for drinking water sourcing: Row River, Prather Creek, and Laying (Layng) Creek are important for protection.

Considerations for project prioritization: *Geographic location and capacity of the action to move a water body off of the 303d list for a current or potential parameter. Priority areas are 1) historic mining areas; 2) urbanized areas; 3) agricultural land uses.*

List plans which will include best management practices: 1) TMDL review, ODEQ consultation 2) Agricultural land uses include Senate Bill 1010; 3) forested land uses include Oregon Forest Practices Act and USFS General Water Quality Best Mgmt Practices, Pacific NW Region, Nov., 1988; 4) ODFW salmonid and other aquatic species recovery plans. Implement best management practices in plans

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Criteria to identify and prioritize habitat restoration

When determining the strategy for each ecological goal, the Council considers a decision matrix similar to the following sequence of activities:

<i>Task</i>	<i>Based on</i>	<i>Result</i>
<i>Identify priority areas for conservation and restoration</i>	<i>Ecological data; professional judgment; existing plans</i>	<i>Selected sub-watersheds or areas, and habitat emphasis</i>
<i>Determine restoration potential; likelihood of effect</i>	<i>Considerations such as geomorphology, hydrology, habitat condition, surrounding influences</i>	<i>Reaches or parcel groups identified for possible restoration; project types applicable</i>
<i>Move from possible sites to implementation</i>	<i>Considerations such as landowner interest, funds, time constraints, permits</i>	<i>Final selection of projects</i>

In addition, when prioritizing geographic areas, habitat emphasis, project types, and finally projects themselves, the Coast Fork Willamette Watershed Council uses the following documents and methods:

Documents:

CFWWC Lower Coast Fork Assessment and revisions

Review Action Plan Matrix

Review Water Quality Data and Habitat Priority Data.

Local Watershed Data Sources including:

- CFWWC Lower Coast Fork Assessment (2003)
- BLM Mosby Creek Watershed Analysis (November 2002)
- BLM Cottage Grove Lake-Big River Watershed Restoration Plan (April 2000)
- USFS Layng Creek Watershed Analysis (October 1995)
- USFS Brice Creek Watershed Analysis Recommendations (4/1997)
- USFS and BLM Sharps Creek Watershed Analysis (1999)
- Weyerhaeuser Sharps Creek Watershed Analysis (May 1999)
- City of Cottage Grove, Source Water Assessment Report (December 2000)

Middle and Upper Willamette River

Middle and Upper Willamette River

Restoration Priorities

The middle and upper portions of the Willamette River encompasses the river channel and associated floodplain from Willamette Falls upstream to the confluence of the Coast Fork and Middle Fork Willamette Rivers.

Please see the *Willamette River Basin Planning Atlas* (Pacific Northwest Ecosystem Research Consortium, 2002) for an overview of limiting factors and restoration opportunities within the Willamette River and associated floodplain habitats.

Appendix

Watershed Limiting Factors List and Descriptions

Watershed Process / Habitat	Limiting Factor	Description of Limiting Factor
Upland Precipitation Reception and Storage	Vegetation Cover	Loss/alteration of vegetative cover that affects upland water reception and/or storage. For example, changes in water flow patterns resulting from increased numbers of juniper trees.
	Soil Erosion / Compaction	Soil erosion/compaction that modifies upland water reception and/or storage. For example, construction practices that reduce water infiltration rates.
	Increased Sediment / Water Runoff	Increased sediment and/or water runoff from changes in land use patterns and management. For example, agricultural practices that increase soil erosion rates and delivery to stream channels.
	Altered Hydrologic Regime	Altered flow and routing of water from changes in upland reception and storage. For example, loss of wetlands that impact peak and low flows.
	Roads and Impervious Surfaces	Roads and impervious surfaces that affect the water runoff timing, magnitude of peak and low flows, and storage. For example, urbanization and improper storm water management that modifies peak flows through stream channels.
Terrestrial/Upland Habitats	Habitat Fragmentation / Connectivity	Fragmented terrestrial habitats that affect wildlife/plant dispersal and connectivity across the landscape. An example would be changes in land use that impact corridors connecting intact areas of habitat.
	Altered Disturbance Regime	Altered disturbance regimes (e.g., fire) that change vegetation types and/or structure and affect habitat quality and quantity.
	Habitat Loss	Conversion or loss of terrestrial habitats from management and land use actions.
	Changes in Plant and Animal Species Composition	Changes in native plant and animal species affect habitat quality and quantity. An example is increased conifer tree composition within an area that historically was oak woodland.
	Invasive Terrestrial Species	Non-native plants and animals that modify habitats and displace native species.
	Domestic Animal Impacts	Domestic livestock and other animal impacts that modify terrestrial vegetation patterns and quality, impact watershed processes (e.g., soil compaction and runoff), and influence wildlife habitats.
	Altered Habitat Structure	Changes in habitat structure that affect wildlife and watershed processes. For example, loss of areas with multi-layered forest canopy structure that is required by specific wildlife species.
	Priority Habitat Restoration	Priority terrestrial habitats for restoration. Examples in the Willamette Valley include Oak Woodlands, Oak Savanna and late successional conifer forests.

Riparian/Floodplain Habitats	<p>Habitat Fragmentation / Connectivity</p> <p>Loss of Shade / Cover</p> <p>Altered Floodplain Structure</p> <p>Altered Channel Structure</p> <p>Altered Hydrologic / Disturbance Regime</p> <p>Changes in Species Composition</p> <p>Domestic Animal Impacts</p> <p>Altered Habitat Structure</p> <p>Invasive Species</p> <p>Priority Habitat Restoration</p>	<p>Fragmented riparian/floodplain habitats that affect wildlife/plant dispersal and connectivity across the landscape and modify watershed processes (e.g., modified canopy closure over stream channels affecting the thermal regime).</p> <p>Changes in canopy cover and shade over the aquatic system that influence aquatic life (e.g., limiting nutrient inputs from leaves) and/or that affect water temperatures.</p> <p>Modified riparian/floodplain structure that influences the quality and quantity of floodplain habitats and limits floodplain interaction with the aquatic system. For example, floodplain roads that reduce riparian vegetation and influence the ability of the channel to interact with the floodplain.</p> <p>Changes to channel structure that impact the quality and quantity of riparian/floodplain habitats. For example, channelized sections of stream that modify channel interaction with the floodplain.</p> <p>Altered disturbance regimes that affect the quality and quantity of riparian/floodplain habitats. For example, changes in peak flows from upstream dams that limit habitat-forming processes such as channel meander patterns and interaction with the floodplain.</p> <p>Changes in native plant and animal species that affect riparian/floodplain habitat quality and quantity, and species interaction. An example would be increased hardwood tree composition within a riparian area that was historically conifer.</p> <p>Domestic livestock and other animal impacts that modify riparian and floodplain vegetation patterns and quality, impact watershed processes (e.g., soil compaction and runoff), and influence wildlife habitats.</p> <p>Altered disturbance regimes that affect the quality and quantity of riparian/floodplain habitats. For example, reduced peak flows from upstream dams limiting habitat-forming processes such as channel meander patterns and interaction with the floodplain.</p> <p>Non-native plants and animals that modify riparian/floodplain habitats and displace native species.</p> <p>Priority floodplain and riparian area habitat types for restoration. Willamette Basin examples include most lowland riparian areas and lowland cottonwood gallery forests.</p>
Aquatic/In-Channel Habitats	<p>Habitat Fragmentation / Connectivity / Fish Passage</p> <p>Altered Disturbance Regime</p> <p>Changes in Species Composition</p>	<p>Fragmented aquatic habitats that affect the dispersal of aquatic life and reduce access to key habitats. This includes structures blocking fish passage and unscreened water diversions. For example, reduced access to spawning/rearing habitat in tributaries from a culvert that is a barrier to fish passage.</p> <p>Altered disturbance regimes that affect the quality and quantity of aquatic habitats. For example, changes in peak flows from upstream dams that limit habitat-forming processes, influencing aquatic habitat complexity (e.g., amount of large wood and depth of pools).</p> <p>Changes in native plant and animal species affect aquatic habitat quality and quantity, and species interaction. An example would be hatchery fish displacing native fish.</p>

Invasive Aquatic Species	Non-native plants and animals that modify aquatic habitats and displace native species.
Domestic Animal Impacts	Domestic livestock and other animal impacts that modify aquatic habitat patterns and quality, or directly influence the behavior of the fish and other aquatic species. For example, livestock reducing vegetative cover that increases sediment delivery to stream channels.
Altered Habitat Complexity	Changes in aquatic habitat that alters the quality and quantity of complex habitats (e.g., large wood, multiple channels, back water areas). For example, a channelized section of a stream that changes the width:depth ratio and reduces habitat capacity.
Inputs of Bacteria	Increases in <i>Escherichia coli</i> (abbreviated E. coli) in the aquatic system. Sources can include leaking septic systems and domestic livestock. This includes streams that are listed as water quality limited (DEQ 303d list) because they do not meet the water quality standards for E. coli.
Altered Thermal Regime	Changes in water temperature patterns that affect aquatic life. This includes streams that are listed as water quality limited (DEQ 303d list) because they do not meet water quality standard for temperature.
Limited In-Channel Wood	Limited in-channel large wood and changes in the process that deliver and route wood through the system that modify aquatic habitat quality and complexity.
Inputs of Pesticides / Toxins	Inputs of pesticides or other toxins into the aquatic system that impact aquatic life and water quality. Examples of pesticides used in the watershed include herbicides, fungicides, and insecticides.
Floodplain Connection	Connections between channels and the floodplain that modify habitat capacity and complexity. For example, berms along a river channel that reduce channel overflow into the floodplain during flood events.
Excessive Inputs of Nutrients	Key nutrients (primarily nitrogen and phosphorus) that control the amount of algae found in waters and that influence productivity of the aquatic system. For example, nutrients and organic matter contained in wastewater or leached from farm fields that boosts algal growth.
Altered Hydrologic Regime	Altered hydrologic regimes that affect the quality and quantity of aquatic habitats. For example, increased peak flows from impervious surfaces that reduce stream habitat complexity.
Altered Sediment Regime / Excessive Inputs	Changes in the sediment regime (both increased and decreased sediment or substrate) that affect aquatic habitat quality. For example, increased sediment delivery to stream channels from land use practices or decreased supply of spawning gravels from upstream sources.
Instream Flow	Changes in stream flows that impact habitat capacity and/or water quality. For example, reduced summer flows from water diversions.
Priority Habitat Restoration	Priority aquatic and in-channel habitat types for restoration. Willamette Basin examples include side channels, sloughs, and other off-channel features, ponds, and low gradient channels within active channel migration areas.

Wetland Habitats	Habitat Fragmentation / Connectivity	Fragmented wetland habitats that affect wildlife/plant dispersal and connectivity across the landscape and modify watershed processes (e.g., storing and releasing water).
	Habitat Loss	Conversion or loss of wetland habitats from management and land use actions.
	Altered Hydrologic Regime	Altered hydrologic regimes that affect the quality and quantity of wetland habitats. For example, changes in water routing into wetland areas from urbanization.
	Domestic Animal Impacts	Domestic livestock and other animal impacts that modify wetland vegetation patterns and quality, impact watershed processes (e.g., soil compaction and runoff), and influence wildlife habitats.
	Altered Species Composition	Changes in native plant and animal species that affect wetland habitat quality and quantity, and species interaction. An example would be increased tree composition within a wetland area from changes in the fire disturbance regime.
	Invasive Species	Non-native plants and animals that modify wetland habitats and displace native species.
	Altered Soil Condition / Compaction / Fill	Altered soil/hydrologic conditions that modify wetland habitats and species composition. For example, a wetland that is modified through the addition of fill materials.
	Floodplain Connection	Connections between wetland areas and channels within a floodplain that modify habitat types and complexity. For example, berms along a river channel that reduce channel interaction with the floodplain and modify wetland habitats.
	Priority Habitat Restoration	Priority wetland habitat types for restoration. Willamette Basin examples include most wetland and wet prairie systems and stream-adjacent wetlands.