

Appendix O

Inventory of Existing Programs and Activities in the Lower Willamette Subbasin

Within the Lower Willamette Subbasin area, there are many programs and activities related to protecting and improving watershed health. These programs serve a variety of functions and encompass public and private partnerships, inventories, manuals, regulations, and individual projects for the subbasin's land, streams, and Willamette River reaches.

This appendix summarizes existing programs and activities which currently, or could potentially, help to achieve subbasin biological health objectives. The existing programs and activities are presented below in six categories:

- Fish and Wildlife Habitat Protection and Restoration Activities
- Watershed and River Corridor Planning and Assessment Activities
- Natural Resources and Land Management Activities
- Stormwater and Wastewater Management Activities
- Vegetation and Landscape Management Activities
- Coordination, Review, and Outreach Activities

The general purpose and background of each program or activity is summarized. The programs and activities are then related to the various limiting factors or working hypotheses. Finally, the programs and activities are then evaluated for management gaps between actions needed and actions taken to achieve the working hypotheses.

Summary Descriptions of Existing Programs and Activities

Fish and Wildlife Habitat Protection and Restoration Activities

Willamette Restoration Initiative (WRI). Established by the governor of Oregon in response to recommendations from the Governor's Willamette River Task Force, the WRI is an ongoing project that seeks to coordinate a unified regional approach to managing watershed health within the Willamette Basin. Through the WRI, the Willamette Restoration Strategy was developed for improving fish and wildlife habitat, and enhancing water quality and managing floodplains in the Willamette Basin, within the context of human habitation and projected population growth. The Willamette Restoration Strategy was developed by a diverse stakeholder advisory group, and offers four key recommendations and 27 critical actions that are necessary to restore the health of the Willamette Basin. WRI developed the Willamette Subbasin Summary (2001) as part of the Northwest Power Planning Council's (NPPC) subbasin planning initiative. The Willamette Subbasin Summary provides a detailed description of the watershed (geomorphology, climate, hydrology, land use, etc.), a comprehensive assessment of fish and wildlife resources, a review of existing and past efforts to improve watershed health, a summary of the current management, and recommended projects to improve watershed health.

Oregon Plan for Salmon and Watersheds Implementation Team (Governor's Office). Governor John Kitzhaber unveiled his Oregon Plan for coastal salmon recovery in August 1996. This plan and a subsequent steelhead supplement and Executive Order in January 1999 committed state agencies

to enforce environmental laws, coordinate activities for protecting listed salmonids, and provide technical assistance to local conservation activities. The plan's stated goal is "to restore salmon to a level at which they can once again be part of people's lives." The Oregon Plan identified how private interests could work through local watershed councils, identified restoration activities on forestlands to be completed by forest industries, and identified water quality planning opportunities at a basin level. The City of Portland, which is a member of the Oregon Plan Implementation Team, is committed to embracing the goals and approaches in the Oregon Plan.

Oregon Restoration and Enhancement Program (Oregon Department of Fish and Wildlife). The Oregon Fisheries Restoration and Enhancement Act of 1989 allows the Department of Fish and Wildlife to undertake a comprehensive program to restore state-owned fish hatcheries, enhance natural fish production, expand hatchery production, and provide additional public access to fishing waters. Any public or private non-profit organization may request funds to implement a wide range of fish restoration or enhancement projects. The enhancement program focuses on projects to increase fish production (either hatchery or natural production), increase recreational or commercial opportunities or access to the fish resources, or improve fish management capabilities.

Endangered Species Act (ESA) Program (City of Portland Bureau of Planning). The City of Portland ESA Program was established in 1998 in response to federal listings of several salmon species. The ESA Program provides technical assistance to all City bureaus to assure actions and programs are in compliance with requirements of ESA. The ESA Program has assisted in the completion of watershed assessments for Johnson, Tryon/Fanno, and Willamette watersheds, and in the development and selection of natural resource protection, restoration and mitigation actions within these watersheds. Partnerships have been developed with the National Marine Fisheries Service, US Fish and Wildlife Service, Corps of Engineers, Oregon Department of Fish and Wildlife, and Division of State Lands and others. The program's aim is to go beyond the minimum standards set by the ESA (that is, to avoid take) to help the City of Portland achieve its goal of assisting with the recovery of native fish and wildlife. In addition, the program acts to empower, engage and motivate the community and City government to act strategically and proactively so that the greatest overall community, economic and environmental benefits are achieved.

Willamette River Habitat Restoration and Enhancement Projects (City of Portland Bureau of Environmental Services). The City of Portland is working to improve fish and wildlife habitats in the urban area. These projects include, for example, improving fish access to off-channel habitat at Oaks Bottom and Smith and Bybee lakes for resting and rearing of juvenile fish migrating in both the Willamette and Columbia rivers. The City of Portland is restoring portions of the Willamette River streambank as part of the redevelopment of the South Waterfront District and is implementing a number of revegetation projects along with Willamette. Bioengineered bank treatments have been incorporated into a variety of riverfront parks and redevelopment, including the East Bank Esplanade, the Riverplace Development and South Waterfront Park.

Water Resources Development Act (WRDA) Project (U.S. Army Corps of Engineers, City of Portland). The City is the local sponsor of the U.S. Army Corps of Engineers (Corps) Lower Willamette River Ecosystem Restoration WRDA project to help formulate and implement restoration projects that will meet the City's River Renaissance's "Clean and Healthy River"

vision. The objective of the feasibility study is to develop a publicly-supported plan for ecosystem restoration actions throughout the Lower Willamette River. This project is intended to leverage federal funds to assist in riparian and in-water habitat restoration. Phase 1, expected to last about 6 months, will focus primarily on developing evaluation criteria and selecting restoration opportunities on the Willamette mainstem within the City of Portland boundaries. Phase 2 will include an evaluation of the feasibility of the selected restoration projects. Additional restoration projects outside of the City boundaries on the mainstem and projects on the tributaries to the Lower Willamette also may be considered in Phase 2.

Lower Willamette River Fish Research (City of Portland ESA Program, Oregon Department of Fish and Wildlife). The City's Endangered Species Act Program partnered with the Oregon Department of Fish and Wildlife in 2000 to conduct a 4-year study in the lower Willamette River to evaluate the habitat functions that bank treatments and near-shore developments provide for salmonids. Information is being collected on the types of bank treatments and near-shore developments that are preferred, how they are distributed in the lower Willamette, and the specific features that distinguish them from other areas. The results will provide the City of Portland with information that will be useful when more certainty is desired regarding planning, permitting and enforcement actions. The work also will help define properly functioning conditions in this reach of the river. The City also is working with the Oregon Department of Fish and Wildlife, Ducks Unlimited and others to conduct fish research in the area's tributary streams. All of Portland's watersheds are being sampled seasonally to determine when fish are present.

Johnson Creek Restoration Plan (City of Portland Bureau of Environmental Services). The City of Portland and the Johnson Creek Watershed Council developed a plan to restore habitat, improve flows and reduce flooding in Johnson Creek. The plan, which is aimed at managing floods, includes more than 60 activities that will restore corridor function. An action plan that is based in part on City analyses will help inform City and private protection and restoration priorities.

Assessment of City of Portland Activities for Potential to Affect Steelhead (City of Portland). The City of Portland commissioned this assessment in 1998 to determine whether City activities have the potential to affect steelhead and steelhead habitat. Activities assessed include planning, permitting, inspection and enforcement; water delivery; stormwater and wastewater management; structure and road construction and maintenance; environmental enhancement; and emergency response. The assessment also evaluated Endangered Species Act compliance approaches and potential conservation strategies for Portland-area watercourses used by steelhead and other salmonids.

ESA Section 7 Streamlining Agreement (City of Portland ESA Program). In October 2002, the City entered into a federal ESA Section 7 streamlining agreement with the National Marine Fisheries Service in the National Oceanic and Atmospheric Administration (NOAA Fisheries), the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service (USFWS). This agreement establishes a cooperative process for streamlining ESA Section 7 consultations among the four parties to the agreement for City projects that require federal permit approval or funding. Benefits of the agreement include increased coordination for review, analysis and documentation of City projects, programs and activities so that they proceed in a timely manner while meeting federal agency and City goals for ensuring ESA compliance and assisting in the conservation of listed species.

Fish-Friendly Maintenance Practices Manual (City of Portland Bureau of Environmental Services, City of Portland ESA Program). The City of Portland's Maintenance Bureau, in conjunction with the Endangered Species Act Program, developed a manual of fish-friendly maintenance practices. The manual was the basis for a City application to NOAA Fisheries for an ESA Section 4(d) take limitation program, to help ensure that City road maintenance activities do not harm listed species.

Salmon Safe Certification for Portland Parks (City of Portland Bureau of Parks and Recreation). The City is working with the independent, third-party environmental certification organization called Salmon Safe to seek certification of City parks management as "fish-friendly". Certification criteria have been developed and are being applied to a variety of Portland parks. Improvements in park management identified through the certification process will be addressed on an ongoing basis. Portland is the first city to undergo a third-party certification of its parks.

Watershed and River Corridor Planning and Assessment Activities

Total Maximum Daily Load (TMDL) Development (Oregon Department of Environmental Quality). The state is required by the Federal Clean Water Act (Section 303(d)) to periodically publish a list of water quality limited streams and rivers. The current 303(d) list includes Johnson Creek, Tryon Creek, Fanno Creek, the Columbia Slough, and the Willamette River. Inclusion on the 303(d) list is the first step in setting Total Maximum Daily Loads (TMDLs) that limit the amount of pollutants that can be discharged to the waterway. EPA has approved TMDLs for Fanno Creek and the Columbia Slough. DEQ must develop draft TMDLs for Johnson Creek, Tryon Creek, and the Willamette River by the end of 2003. Bacteria, mercury, and temperature are being modeled and analyzed in preparation for allocation, TMDL setting, Water Quality Management Plan development, and public review. The City of Portland is developing comprehensive watershed plans for these basins to meet TMDLs and other regulatory requirements.

Watershed Restoration Projects and Watershed Councils Support (Oregon Watershed Enhancement Board). OWEB administers State Lottery proceeds to fund watershed restoration projects and support watershed councils. OWEB will collaborate with the federal government as it implements its mission to promote and implement programs to restore, maintain, and enhance watersheds in Oregon, and to protect the economic and social well-being of the state and its citizens. OWEB considers grant applications for watershed restoration, enhancement, assessment, monitoring, education, outreach, land acquisition, watershed council support, technical assistance, and a new small grants program.

River Renaissance (City of Portland Bureau of Planning). River Renaissance is a partnership of City bureaus and agencies working toward the revitalization of the Willamette River. This comprehensive and integrative approach is intended to align City efforts, build strong public and private partners, leverage resources for implementation, and involve the public in a long term strategy for river management. It recognizes that the City needs to involve many partners in order to make the vision a reality, and that this will take time. The River Renaissance vision is a "call to action" to (1) assure a clean and healthy river, (2) maintain and enhance our prosperous working harbor, (3) embrace the river as Portland's front yard, (4) create vibrant waterfront districts and neighborhoods, and (5) promote partnerships, leadership, and education.

Watershed Planning and Analysis (City of Portland Bureau of Environmental Services). The City performs watershed planning and analysis for Portland's urban watersheds, including the Columbia Slough, Fanno, Tryon, and Johnson Creeks, and the Willamette River. The watershed planning process includes formulation of watershed health goals and objectives, assessment and characterization of watershed conditions, and identification of recommended actions. Each Planning Group coordinates closely with other City programs to integrate regulatory compliance, Clean River Plan, and River Renaissance goals into the watershed planning process. Watershed plans provide a comprehensive approach to address multiple objectives including: water quality and in-stream flow improvement, fish and wildlife habitat enhancement, protection of public health and responding to environmental regulations. Actions may include implementation measures such as restoration projects or administrative approaches such as policy and code changes and the integration of watershed protection and restoration efforts into other City programs.

Willamette River Greenway Plan (City of Portland Bureau of Planning). The Bureau of Planning is updating the Willamette River Greenway Plan, last revised in 1987, to better address new environmental mandates and improve implementation strategies, including zoning code. This multi-objective plan will help implement Portland's River Renaissance Plan and Statewide Planning Goal 15 objectives. Goal 15's purpose is to protect, conserve, enhance, and maintain the natural, scenic, historical, economic, and recreational qualities of lands along Portland's rivers.

Healthy Portland Streams Project (City of Portland Bureau of Planning). The Healthy Portland Streams project is an important part of the City's comprehensive River Renaissance effort. This project is designed to update the City's policies, natural resources inventories and tools for protecting wildlife habitat, streams and the streamside functions of Johnson, Tryon and Fanno creeks, the Columbia Slough and the West Hills watersheds. Through the project, the City is evaluating and recommending both voluntary and regulatory measures, including changes to Portland's Comprehensive Plan goals, policies and codes. The project is intended to help protect existing high-quality natural resources, prevent erosion, landslides, and water quality degradation, manage floods, and conserve natural spaces for wildlife, fish, and people to enjoy. The project also will advance the City's compliance with the ESA, the CWA and Title 3 of Metro's *Urban Growth Management Function Plan*.

Clean River Plan (City of Portland Bureau of Environmental Services). The Clean River Plan serves as an over-arching, guiding document for all of the programs and responsibilities of BES. The Plan sets forth a comprehensive approach to catching and treating stormwater before it enters the sewer system or reaches a receiving stream. The Clean River Plan was designed as a major supplement to the Combined Sewer Overflow (CSO) Abatement Program to more effectively and efficiently address sewer overflows and bacterial pollution, as well as overall watershed health and stewardship. It uses a variety of innovative techniques to reduce stormwater runoff, reduce pollutant levels, restore floodplains, and foster environmental education, and stewardship. Of the ten actions offered by the Clean River Plan, eight specifically address stormwater impacts on watershed health, and the other two focus on sewer system improvements to protect receiving waters.

Portland Harbor Superfund Program (U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Lower Willamette Group). The Portland Harbor Superfund Site is a heavily

industrialized stretch of the Lower Willamette River from Swan Island to the southern tip of Sauvie Island. Contaminants found in sediments included metals, pesticides, herbicides, PCBs and petroleum products. EPA is responsible for cleanup decisions. EPA and DEQ have entered into an agreement, with EPA taking the lead for river work and DEQ taking the lead for upland cleanup and controlling sources of contamination to river sediments. Determination of responsible parties, identification of sources, characterization of contaminant distribution and impacts, and evaluation of clean-up options are currently underway. Also as part of Superfund, the federal and state natural resource agencies and Tribes will determine natural resource damages (NRD). A NRD claim seeks compensation for losses to the public resulting from the injury to publicly-owned or managed resources. The Lower Willamette Group (LWG), a subset of businesses and public agencies (including the City of Portland) that may have responsibility for contamination in the site, is working with EPA and DEQ to conduct the investigation of the Harbor.

Upper Tryon Creek Corridor Assessment (City of Portland Bureau of Environmental Services). The Bureau of Environmental Services completed the Upper Tryon Creek Corridor Assessment in 1998 as part of the City's Public Facilities Plan. The corridor assessment analyzes stream corridors in Upper Tryon Creek Watershed and identifies high-priority areas for restorations. The report also contains an assessment of the hydrologic and hydraulic conditions in the watershed. Some actions recommended in this report have been implemented. This report also provided critical technical support to the Planning Bureau's Southwest Community Plan project.

Natural Resources and Land Management Activities

Metro Title 3 Project (Metro). The goal of this project is to identify strategies for managing corridors in the Portland Metro region to protect fish and wildlife habitat. Title 3 of Metro's *Urban Growth Management Functional Plan* regulations focus on water quality and flood management standards. Title 3, Section 5, identifies the need to protect regional resources for fish and wildlife. Metro, with some input from the City of Portland, is developing a regional program to conserve, protect, and restore fish and wildlife habitat.

Metro Natural Resources Planning (Metro). Metro's Natural Resource Planning Division works to create regional policy directives for the conservation and enhancement of parks, natural areas, water quality, and fish and wildlife habitat. The 2040 Growth Concept explains the planning policies adopted in 1995 that will allow the metropolitan area to manage growth, make improvements to facilities and infrastructure, and protect natural resources. The Urban Growth Management Functional Plan was adopted by the Metro Council in 1996 to help the region meet goals in the 2040 Growth Concept. The Fish and Wildlife Habitat Protection Plan provides ways to develop an effective, fair and efficient approach to protecting fish and wildlife. The Water Quality and Floodplain Protection Plan provides region-wide protection measures for water quality and floodplain management. The Greenspaces Master Plan update identifies a cooperative regional system of parks, natural areas, greenways and trails. The 1995 Greenspace bond measure marked a major first step. It provided \$135.6 million to purchase 8,000 acres of ecologically significant habitat and trail linkages throughout the region. The Livable Streets Program explains how street systems can be designed to reduce stormwater runoff and impacts from stream crossings.

Open Spaces Acquisition Program (Metro). Metro's Natural Resource Planning Division purchases natural areas, trails and greenways to be held for future use as parks, trails, and fish

and wildlife habitat. Metro is acquiring property in 14 regional natural areas and six regional trails and greenway projects. In addition, a "local share" portion of the bond monies is funding more than 100 local park projects, located in almost every city, county and park district in the region. As of March 3, 2003, Metro has acquired more than 7,880 acres of land for regional natural areas and regional trails and greenways, in 243 separate property transactions. These properties protect more than 62 miles of stream and river frontage.

Preservation and Restoration of Natural Areas (City of Portland Bureau of Environmental Services, City of Portland Bureau of Planning). The protection of natural areas is important in helping the City meet its goals regarding benefits to both wildlife and aquatic organisms. The City has proposed an expansion of its environmental overlay zone designations. Environmental overlay zones are elements within the zoning code that protect waterways and upland natural resource areas and prevent, limit or require certain design standards for development in their vicinity. The City also has purchased properties during the last few years—including riparian areas—for purposes of flood storage, natural parks and resource protection and restoration.

Columbia and Willamette River Natural Resource Inventories (City of Portland Bureau of Environmental Services). Preliminary habitat inventories for both the Willamette and Columbia rivers have been completed. The inventories identified data gaps that the City of Portland is now attempting to fill and were instrumental in the development of high-priority protection and restoration actions.

Natural Resources Inventories and Management Plans (City of Portland Bureau of Environmental Services). The City has compiled and adopted eight natural resources inventories and management plans, including for the Johnson Creek Basin, Columbia Corridor, Balch Creek, Northwest Hills, Southwest Hills, East Buttes, Fanno Creek and tributaries Protection Plan, Skyline West, and Forest Park. These plans provide a regulatory overlay that helps ensure protection of important natural features and functions. The plans provide a legislative mechanism for adopting changes to the City's natural resource policies.

Natural Resource Program (City of Portland Bureau of Parks And Recreation). Created in 1988, the Natural Resource (NR) Program manages over 7,000 acres of natural areas and trails across 30 sites, as well as management of approximately 35 miles of the 40 Mile Loop and the Willamette Greenway Recreational Trail System, and management of 183 acre Hoyt Arboretum. The Program's mission is to protect and restore natural resource values in Portland parks, and contribute to the natural resource quality of a larger, connected system of greenspaces. The Program plans to design and implement a science-based Ecosystem Management Program to manage natural area sites as interrelated systems rather than as separate sites, and to involve the community in the protection and management of natural area sites and natural resource systems.

Ross Island Lands Transfer (City of Portland, Ross Island Sand & Gravel Company). Ross Island Sand and Gravel and the City are negotiating the transfer of Ross Island to the City. The island presents a tremendous opportunity for habitat restoration and long-term research on the costs and benefits of various restoration measures.

Johnson Creek Culvert Replacements (Cities of Portland, Gresham, and Milwaukie; Multnomah County; Clackamas County). The Cities of Portland, Gresham, and Milwaukie are working with Multnomah County and Clackamas County to coordinate the replacement of culverts throughout the Johnson Creek watershed. The jurisdictions are developing a unified prioritization scheme to

identify the culvert replacements that provide the maximum benefit for salmonids. The City of Portland also worked with Metro and state and federal resource agencies to remove a culvert that blocks access to high-quality steelhead habitat in Kelly Creek, a tributary to Johnson Creek, and is working with the U.S. Army Corps of Engineers to remove culverts in Crystal Springs, a tributary to Johnson Creek.

Transportation System Planning (City of Portland Department of Transportation). The Planning Program's major responsibilities are the Transportation System Plan (TSP), major regional transportation planning projects and the development of transportation capital projects in Portland. Plans include recommendations for transportation and design improvements, and establish a blueprint for public and private development. Chapter 3 of the TSP describes Portland's 20-year list of major transportation system improvements, including general location and timing, responsible agency, and approximate cost. These projects include streetscape improvements, which may provide opportunities to improve watershed health.

Stormwater and Wastewater Management Activities

National Pollution Discharge Elimination System (NPDES) Stormwater Permits (City of Portland, Port of Portland, and Multnomah County). The City of Portland, Port of Portland, and Multnomah County are co-permittees of an NPDES (National Pollution Discharge Elimination System) Municipal Stormwater Permit. The NPDES permit and annual reports describe activities undertaken by the co-permittees that consist of stormwater management programs to reduce pollutant discharges "to the maximum extent practicable" from their respective municipal stormwater systems. The permit was first issued in September 1995. In February 2000, the co-permittees submitted an NPDES permit renewal to DEQ. The application is still under review by DEQ, to be followed by a 30-day public comment period. While the review continues, the City and its co-permittees are working under an administrative extension of the existing permit and implementing revised BMPs identified in the February 2000 submittal.

Combined Sewer Overflow (CSO) Abatement Program (City of Portland Bureau of Environmental Services). Portland has passed the halfway mark of a 20-year program to reduce combined sewer overflows (CSOs) to the Columbia Slough and Willamette River. The CSO Program involves 100 individual projects including the construction of storm-water separation systems, constructed wetlands, wet-weather treatment plants, and infiltration sumps for storm-water disposal, and large-diameter interceptor pipelines and tunnels. The Columbia Boulevard Wastewater Treatment Plant will be expanded with more treatment capacity and new odor control facilities to handle the additional volume of CSOs. An important step in reducing CSOs is getting stormwater out of the combined sewers. Installing street sumps, disconnecting residential downspouts, diverting underground streams, and building separate sewers for stormwater are all strategies the City is using to reduce the amount of stormwater that contributes to CSOs.

Stormwater Management Manual (City of Portland Bureau of Environmental Services). Stormwater management is a key element in maintaining and enhancing environmental conditions within Portland. The City of Portland has developed a comprehensive stormwater management manual to provide design professionals with specific requirements for reducing the impacts of stormwater runoff and pollution resulting from new development and redevelopment within Portland. The manual's requirements apply to all development, whether public or private. The City and NOAA Fisheries are working together to develop an ESA Section 4(d) take limitation proposal based on the *Stormwater Management Manual* (City of Portland 2000).

Structural Controls (City of Portland Bureau of Environmental Services). The City has created or retrofitted a number of stormwater management facilities to reduce stormwater quantity and improve the quality of stormwater runoff. The City offers incentives and assistance for projects that control stormwater runoff from commercial and industrial properties. This includes disconnection of downspouts, replacement of pavement with porous materials and the use of vegetated swales, planters or other landscape features that assist stormwater management.

Sustainable Stormwater Program (City of Portland Bureau of Environmental Services). The City is implementing this program to promote innovative strategies and techniques for an integrated, ecosystem-based approach to development and stormwater management. The goal of the program is to affect and change stormwater management and site development practices on the ground. Elements of the program include education and outreach, policy development, technical assistance, demonstration projects and incentive funding. The program promotes sustainable onsite stormwater management measures such as eco-roofs, infiltration planters, street and parking lot vegetated swales and other natural system based approaches. These projects assist the City in reducing the volume of stormwater entering the combined system and filtering out stormwater pollutants.

Industrial Stormwater Program (City of Portland Bureau of Environmental Services). The Industrial Stormwater Program addresses discharges to the City's sanitary and storm sewer systems from industrial and commercial properties. The City administers industrial stormwater permits for those facilities that are located within the City of Portland. These permits require development of a Stormwater Pollution Control Plan (SWPCP) and twice yearly monitoring of stormwater runoff from the facility. The SWPCP must identify Best Management Practices (BMPs) to minimize the amount of pollutants in the stormwater runoff. The City reviews the SWPCPs and inspects facilities Stormwater Inspection Forms to ensure compliance with the plan and permit conditions. The Program also evaluates non-stormwater discharges to the storm sewer system, including uncontaminated pumped ground water, non-contact cooling water, and illicit discharges, among others.

Environmental Systems Program (City of Portland Bureau of Maintenance, City of Portland Bureau of Environmental Services). This program is charged with maintaining the surface storm drainage system within the City of Portland. The Clean Water Act of 1972 established the City's responsibility for the quality of the outflow from the City's sewer and drainage systems. In order to comply with the regulations and guidelines set forth by a variety of federal, state and local agencies, a comprehensive program to manage the storm water drainage system and roadside vegetation has been developed. The program is responsible for cleaning and inspecting the sewer system, repairing and reconstructing damaged, broken or deteriorated sewers, maintenance of drainages and ditches, and conversion of roadside ditches into infiltration shoulders.

Stormwater Advisory Committee (City of Portland, Bureau of Environmental Services). The current Stormwater Advisory Committee (SAC) was appointed in September 2000 to guide City compliance with federal clean water regulations. SAC's three major advisory topic areas are new development/redevelopment (implementation and evaluation of the City's Stormwater Management Manual, or SWMM), existing development, and transportation-related development.

Wastewater Treatment Plants (City of Portland Bureau of Environmental Services). The Columbia Boulevard Wastewater Treatment Plant operates every day, around the clock. Dozens of pump

stations and hundreds of miles of sewer lines are part of the system that brings wastewater to the facility. The Tryon Creek Wastewater Treatment Plant, a second wastewater treatment plant south of Portland, is also monitored at the Columbia Boulevard facility. The Columbia Boulevard Plant has a two-phase treatment process. After disinfection, the water flows into the Columbia River. Biosolids are used as a soil supplement on dry pasture land.

Illicit Discharge Control Program (City of Portland Bureau of Environmental Services). The City of Portland has developed an illicit discharge elimination program to prevent, search for, detect and control illicit discharges to the City's stormwater systems and surface waters. The program includes identification and tracking of public and private outfalls, verification of commercial and industrial connections to the City storm system, monitoring to detect non-permitted discharges and evaluation of non-stormwater discharges to the storm system. The City also maintains a Spill Protection and Citizen Response (SPCR) Team to reduce the frequency and impact of spills and inappropriate discharges to the combined sewer system and the storm system.

Industrial Pretreatment Program (City of Portland Bureau of Environmental Services). The Industrial Pretreatment Program manages industrial discharges to the sanitary sewer system by identifying and regulating sources of water pollution from discharges of point sources (outfalls) and non-point sources (street run-off). Pretreatment reduces the amount of pollutants and neutralizes wastewater to meet federal and local discharge requirements. Permits are issued to industries based on their wastewater characteristics or amount of discharge. The permits require industries to monitor for pollutants of concern and to comply with reporting schedules, along with general conditions listed in the permit. any industrial/commercial activity with spill potential is required to prepare Accidental Spill Prevention Plans (ASPPs).

Spill Protection and Citizen Response Section (City of Portland Fire Bureau, City of Portland Bureau of Environmental Services). The City of Portland Fire Bureau Hazardous Materials Response Team is a certified Oregon State Regional Hazardous Materials Response Team. BES maintains regular communication with the Fire Bureau regarding hazardous materials procedures and techniques that may have an impact on water quality. BES also maintains a 24 hour Spill Response "Duty Desk" to receive spill reports. The City responds in particular to spills that threatens the City's storm or sanitary sewer systems. In the case of spills from auto accidents and small spills of gasoline, oil, diesel, and similar pollutants the Bureau of Maintenance will respond to clean up the spill. Containment or other controls may be imposed if appropriate.

Underground Injection Control (UIC) Program (Oregon Department of Environmental Quality, City of Portland Bureau of Environmental Services). The Oregon Department of Environmental Quality (DEQ) UIC program manages injection of fluids into the ground in order to protect groundwater for beneficial uses such as drinking water. The City of Portland Bureau of Environmental Services uses an Underground Injection System to dispose of stormwater below the surface of the ground in east Portland. The City submitted a system wide assessment that included an estimation of land use and activities in areas drained by sumps, evaluation of groundwater elevations across the city, and BMPs for source control and operations and maintenance. The City is currently seeking a final permit from DEQ to operate the UICs.

Vegetation and Landscape Management Activities

Erosion Control Program (City of Portland Bureau of Environmental Services, City of Portland Bureau of Maintenance). In response to ESA listings, the City assembled a citywide team to

expand and improve on the City's erosion control program, which works to reduce erosion and its impacts on fish and their habitat. This effort produced new erosion control regulations as well as an erosion control manual. The manual provides guidelines that require all sites of ground disturbance to comply with a "no visible or measurable" sediment discharge standard. There also are enhanced controls for large, sloped and sensitive development sites. Erosion, sediment and pollutant control plans are required for all sites needing a City permit.

Integrated Pest Management Program (City of Portland Bureau of Parks and Recreation). Portions of Portland Parks and Recreation's Integrated Pest Management Program have been acknowledged by NOAA Fisheries as protective of listed salmon under ESA Section 4(d). Other City bureaus also follow the program to ensure effective and environmentally sound pest management. The City is working with NOAA Fisheries and a variety of environmental and other organizations to continue its ongoing efforts to refine, improve and expand its integrated pest management practices.

Watershed Revegetation Program (City of Portland Bureau of Environmental Services, City of Portland Bureau of Parks and Recreation). Through the Watershed Revegetation Program, the City is working to restore native habitat and improve water quality throughout Portland area watersheds. Partnerships are formed with public and private landowners to restore degraded stream bank, wetland, and upland areas. This restoration work improves water quality by controlling erosion, reducing stormwater pollution, aiding in long-term salmon recovery, and enhancing wildlife habitat. The Program is currently working the Parks Bureau to improve fish and wildlife habitats in the urban area. Example projects include improving fish access to off-channel habitat at Oaks Bottom and Smith and Bybee Lakes for resting and rearing of juvenile fish migrating in both the Willamette and Columbia Rivers. The City is restoring portions of the stream bank along Willamette Park and is participating in the updating of a comprehensive restoration plan for Ross Island.

Urban Forestry Program (City of Portland Bureau of Parks And Recreation). In 1972 the City of Portland adopted an ordinance to protect and preserve trees located along city streets and other public areas. The ordinance created the Urban Forestry Program to manage and care for public trees, but requires property owners to maintain trees located on adjoining street right-of-ways. The Urban Forestry Program maintains and manages Portland's urban forest. The primary responsibility is to manage the 140,000 publicly owned trees in parks, along streets and around public buildings.

Parking Lot Landscaping (City of Portland Bureau of Planning, City of Portland Bureau of Environmental Services). The Planning Bureau, Bureau of Environmental Services and Endangered Species Act Program developed new parking lot landscaping requirements designed to reduce water quality and stormwater impacts.

Coordination, Review, and Outreach Activities

Metro ESA Coordinators Group (Various Local Governments). The Metro ESA Coordinators Group is made up of natural resource and planning staff representing many of the 23 government jurisdictions within the boundary of the Portland area's regional government, Metro. The group meets monthly to share information and provide a single forum for federal and other natural resource staffs to provide briefings and answer questions related to the Endangered Species Act and plans for species protection and recovery in the region.

Willamette Urban Watershed Network (Various Entities). The Willamette Urban Watershed Network (WUW-Net) is a group of environmental professionals who have volunteered to work toward watershed health and salmon recovery in the urban areas of the Willamette River Basin. The purpose of the WUW-Net is to promote collaboration among local, state and federal agencies to help solve watershed and species problems related to urbanization. An important focus of this effort is addressing Endangered Species Act compliance and species recovery needs in the urban setting. WUW-Net provides a unique forum for the City of Portland to share information and collaborate on basinwide issues.

Oregon Subbasin Planning Coordination Group (Various State, Federal and Tribal Agencies). This group is made up of key state, federal and tribal agencies responsible for managing fish, wildlife and other natural resources. The group is responsible for organizing and managing the state of Oregon's work related to the Northwest Power Planning Council's subbasin planning process. The group also manages a team of state technical experts who support local planners.

Pacific Northwest Ecosystem Research Consortium (PNERC). PNERC is an interdisciplinary research group made up of scientists from Oregon's state universities, the EPA, private research consultants, and others (Pacific Northwest Ecosystem Research Consortium 2002). The consortium's goals are to understand the ecological consequences of societal decisions in the Pacific Northwest, develop transferable tools to support management of ecosystems at multiple spatial scales, and strengthen linkages between ecosystem research activities and ecosystem management applications in the Pacific Northwest. Specific objectives are to characterize ecosystem condition and change, identify and understand critical processes, and evaluate outcomes (including modeling alternative future scenarios and potential consequences of these alternatives to humans and the environment).

Environmental Review (City of Portland Bureau of Environmental Services). Since 1989, the City has used environmental overlay zoning to protect more than 19,000 acres of environmentally sensitive areas in Portland. The environmental overlay zones regulate the way development can take place. Specifically, Environmental protection zones (p-zone) provide the highest level of protection; this zone includes a regional network of urban natural areas and stream corridors. The environmental conservation zone (c-zone) is less restrictive than the p-zone, allowing limited urban development. For example, the c-zone limits the amount of land area that may be disturbed during development, limits the number of trees that may be removed, and establishes minimum setbacks from streams, lakes, wetlands, and other water bodies.

Site Development Review Process (City of Portland). The City is undertaking a comprehensive review of all aspects of the administration and enforcement of the City's environmentally related programs. Receiving particular attention in this project are the programs concerning erosion control, stormwater management, trees and landscaping standards, subsurface drainage and the enforcement of site-related conditions and standards from the Zoning Code and Land Use Reviews. The purpose of this review is to ensure the effective administration and enforcement of development regulations that affect the environment. The review will result in recommendations for both substantive and administrative modifications and improvements. Primary areas that will be addressed include code consolidation, regulatory coordination, clarification of responsibilities and procedures, modifications to fee structures and revenue distribution, staff training and expertise, the handling of complaints, and enforcement tools.

Development Standards Review (City of Portland Bureau of Environmental Services). All building permit applications and public works improvements are routed to BES for review of storm and sanitary disposal issues. Reviews relate to Title Codes 17 and 21. Development standards have been put in place to comply with the City's NPDES MS4 permit and the City's policies pertaining to a sustainable environment and the recovery of threatened or endangered species. The City of Portland's Stormwater Management Manual (City of Portland 2000), for example, requires specific measures to reduce the impacts of stormwater runoff and pollution resulting from new development and redevelopment within the city.

Building Code Review (City of Portland Bureau of Development Services). All building permit applications are routed to the Portland Bureau of Development Services for review of building code issues. Reviews relate to Title Codes 10, and 24 to 29. BDS review applications for building design standards and erosion control practices. Erosion, sediment and pollutant control plans are required for all sites needing a City permit. In response to ESA listings, the City assembled a citywide team to expand and improve on the City's erosion control program, which works to reduce erosion and its impacts on fish and their habitat. This effort produced new erosion control regulations as well as a revised erosion control handbook. The City of Portland's Erosion Control Manual (City of Portland 2000) provides guidelines that require all sites of ground disturbance to comply with a "no visible or measurable" sediment discharge standard. There also are enhanced controls for large, sloped and sensitive development sites.

Community Watershed Stewardship Program (City of Portland Bureau of Environmental Services, Portland State University, Americorps, Friends of Trees, SOLV, Others). The City has joined with Portland State University, Americorps, local watershed councils, neighborhood associations, Friends of Trees, SOLV and the community to raise awareness of watershed health City-wide. BES offers education and restoration grants, educational workshops (e.g., Naturescaping for Clean Rivers), restoration project technical assistance, and informational resources. Watershed stewardship grants provide up to \$5,000 to citizens and organizations to encourage watershed protection and enhancement at the local level. Grant money can be used for supplies, materials, equipment, room rentals, feasibility studies or technical assistance.

Watershed Health Public Education and Outreach (City of Portland Bureau of Environmental Services). The City of Portland offers a variety of public education programs about watershed health. Examples include classroom and field studies on water chemistry, macroinvertebrate identification and stormwater issues and solutions. Educators offer canoe and jetboat tours to groups that have taken on a significant stewardship project. The City's education programs also provide community service projects and curriculum resources. The City has recently worked with students at Oak's Bottom for restoration and education, marked permanent messages on storm drains, and conducted tours of innovative stormwater sites.

Public Education and Outreach about Stormwater (City of Portland Bureau of Environmental Services). The City of Portland offers a variety of public education programs about stormwater. Examples include free education programs to schools and community groups and technical assistance and partnerships with businesses and industry groups. The City's education programs also provide community service projects, stewardship grants and curriculum resources.

Office of Sustainable Development (OSD). The City of Portland created the OSD to provide leadership and create policies and programs to promote environmental, social and economic health in Portland and to encourage sustainable development to protect our environment and

economy for future generations. OSD integrates efforts related to energy efficiency, renewable resources, waste reduction and recycling, green buildings and sustainable practices and education.

Relationship of Existing Programs and Activities to the Working Hypotheses

The relationship of existing programs and activities described above to the working hypotheses are summarized in Table O-1 for fish and wildlife habitat protection and restoration activities, Table O-2 for watershed and river corridor planning and assessment activities, Table O-3 for natural resources and land management activities, Table O-4 for stormwater and wastewater management activities, Table O-5 for vegetation and landscape management activities, and Table O-6 for coordination, review, and outreach activities. The tables indicate a relationship between existing activities and hypotheses at four different levels of detail using the following letter symbols:

- *P – Planning* level. This level indicates the activity is directed at the hypothesis at a planning level only. As such, the activity indicates or suggests a plan to address factors related to the hypothesis, but does not assess or describe any specific characteristics related to the hypothesis, does not assess or recommend any particular solutions, and does not take any actions directed at the hypothesis or related factors.
- *C – Characterization* level. This level indicates the activity has provided data or information that describes and characterizes factors or conditions related to the hypothesis. However, at this level, the activity does not assess or recommend any particular solutions, and does not take any specific actions directed at the hypothesis or related factors. An example would include a specific study that has helped to identify and describe a specific hypothesis or related factors (e.g., a fish sampling study that has determined limited off-channel habitats to be preferred refuge areas for juvenile salmonids).
- *S – Solutions* level. This level indicates the activity has provided information that characterizes factors or conditions related to the hypothesis, and offers or recommends solutions to address the hypothesis or related factors. However, it does not take, or to-date has not resulted in any specific actions directed at the hypothesis or related factors.
- *A – Actions* level. This level indicates the activity has resulted in specific action (or actions) directed at the hypothesis or related factors. An example would include a specific habitat enhancement project that addresses a specific hypothesis or related factors (e.g., riparian plantings that have increased streamside shading and thereby decreased summer temperatures).

A blank indicates no relationship is explicitly made or assumed.

TABLE O-1

Hypotheses and Strategies Addressed by Existing Fish and Wildlife Habitat Protection and Restoration Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat								Water Quality			Biota		Other	
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
Willamette Restoration Initiative	S	C	S	S	S	S	C	C	S	S	S	S	S	S	S	A	A
Oregon Plan for Salmon and Watersheds Implementation Team	S		S	S	S	S			S	S	S	S	S	S	S	A	A
Oregon Restoration and Enhancement Program			P	P	P	P	P	P	P	P	P	P				P	P
Endangered Species Act (ESA) Program	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	A	A
Willamette River Habitat Restoration and Enhancement Projects			S	A	S	A	A	A	S	A		S	A	S		A	A
Water Resources Development Act (WRDA) Project			P	P	P	P	P	P	P	P	P	P	P	P		P	A
Lower Willamette River Fish Research	C		C	C	C	C	C	C	C	C		C	C	C		A	A
Johnson Creek Restoration Plan	A	A	S	A	S	A	A	A	S	A	S	S	S	S		A	A
Assessment of City of Portland Activities for Potential to Affect Steelhead	C	C	C	C	C	C	C	C	C	C	C	C		C	A	C	
ESA Section 7 Streamlining Agreement	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A
Fish-Friendly Maintenance Practices Manual	S	S		S			S	S		S	S	S	S			A	A
Salmon Safe Certification for Portland Parks	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

TABLE O-2

Hypotheses and Strategies Addressed by Existing Watershed and River Corridor Planning and Assessment Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat								Water Quality			Biota		Other	
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
Total Maximum Daily Load (TMDL) Development												C	C			A	A
Watershed Restoration Projects and Watershed Councils Support	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A
River Renaissance																A	A
Watershed Planning and Analysis	C	C	C	C	C	C	C	C	C	C	C	C	C	C		A	A
Riverside Plan	C	C				C	C	C		C		C	C			A	A
Healthy Portland Streams Project	C	C	C	C	C	C	C	C	C	C	C	C				A	A
Clean River Plan		S		S			S	S		S	S		S			A	A
Portland Harbor Superfund Program													C			A	A
Upper Tryon Creek Corridor Assessment	C	C		C			C	C			C					A	A

TABLE O-3

Hypotheses and Strategies Addressed by Existing Natural Resources and Land Management Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat							Water Quality			Biota		Other		
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
Metro Title 3 Project				A			A	A		A	A	A	A			A	A
Metro Natural Resources Planning	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A
Open Spaces Acquisition Program			A	A	A	A	A	A	A	A		A				A	A
Preservation and Restoration of Natural Areas			A	A	A	A	A	A	A	A		A				A	A
Columbia and Willamette River Natural Resource Inventories				C		C	C			C						A	A
Natural Resources Inventories and Management Plans			S	S	S	S	S	S	S	S	S	S	S	S		A	A
Natural Resource Program	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A
Ross Island Lands Transfer				S		S	S		S	S						A	A
Johnson Creek Culvert Replacements		A	A					A		A						A	A
Transportation System Planning		P											P			A	A

TABLE O-4

Hypotheses and Strategies Addressed by Existing Stormwater and Wastewater Management Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat							Water Quality			Biota		Other		
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
National Pollution Discharge Elimination System (NPDES) Stormwater Permits		S									S	S	S			A	A
Combined Sewer Overflow (CSO) Abatement Program		A											A			A	A
Stormwater Management Manual		S									S		S			A	A
Structural Controls	A	A								A	A		A			A	A
Sustainable Stormwater Program	P	P								P	P	P	P			A	A
Industrial Stormwater Program													A			A	A
Environmental Systems Program	A	A								A	A		A			A	A
Stormwater Advisory Committee	P	P								P	P	P	P				
Wastewater Treatment Plants													A			A	A
Illicit Discharge Control Program													A			A	A
Industrial Pretreatment Program													A			A	A
Spill Protection and Citizen Response Section													A			A	A
Underground Injection Control (UIC) Program	A	A											A			A	A

TABLE O-5

Hypotheses and Strategies Addressed by Existing Vegetation and Landscape Management Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat							Water Quality			Biota		Other		
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
Erosion Control Program							S	S		S	S		S			A	A
Integrated Pest Management Program													A			A	A
Watershed Revegetation Program				A			A	A		A		A	A			A	A
Urban Forestry Program				A			A	A		A		A	A			A	A
Parking Lot Landscaping		S											S			A	A

TABLE O-6

Hypotheses and Strategies Addressed by Existing Coordination, Review, and Outreach Activities in the Lower Willamette River Subbasin.

Existing Programs and Activities	Hypotheses/Strategies																
	Flow		Habitat							Water Quality			Biota		Other		
	Increase summer flows	Decrease peak flows	Improve stream connectivity	Increase large wood	Increase channel length and complexity	Increase off-channel habitat	Increase bank vegetation	Increase bank stability	Increase deep pools	Increase riparian and floodplain function	Balance sediment input/output	Decrease summer temperature	Control sources of contaminants	Increase macroinvertebrates	Increase stream nutrients (via carcass placement)	Public education	Regional coordination
Metro ESA Coordinators Group																A	A
Willamette Urban Watershed Network.																A	A
Oregon Subbasin Planning Coordination Group																A	A
Pacific Northwest Ecosystem Research Consortium																A	A
Environmental Review																A	A
Site Development Review Process																A	A
Development Standards Review																A	A
Building Code Review																A	A
Community Watershed Stewardship Program																A	A
Watershed Health Public Education and Outreach																A	A
Public Education and Outreach about Stormwater																A	A
Office of Sustainable Development																A	A

Management Gaps Between Actions Needed and Actions Taken

The relationship of existing programs and activities to the working hypotheses as summarized in the tables above suggest several findings between actions needed and actions taken to date.

These findings are as follows:

- Public education and regional coordination actions are the most comprehensive and widespread actions taken to date. Most of the programs and activities involve some degree of stakeholder or public outreach, and coordination with stakeholders and regulatory agencies. While these actions do not directly address the hypothesis or its related factors, these actions are nonetheless essential precursor steps to gaining the support for implementing such actions when the time comes (such as a specific habitat enhancement project).
- Of the 15 working hypotheses, the hypothesis aimed at controlling sources of urban-related chemical contamination has received the most emphasis relative to actions taken to date. Of the various programs and activities described in this appendix, 13 have resulted in actions that help to address this hypothesis or related factors. Many of these actions result from several existing stormwater and wastewater management programs and activities (Table O-4).
- The several existing stormwater management activities also have resulted in actions that help to address the hypothesis or related factors related to decreasing peak flows. In addition, notable natural flood control and culvert replacement actions have been taken in the Johnson Creek watershed to decrease peak flows.
- Several activities have resulted in actions that help to address the five hypothesis related to increasing riparian vegetation and function (including associated bank stability, LWD recruitment potential, and enhancing shade to decrease summer temperatures). For example, many habitat restoration or enhancement projects undertaken to date by Metro (e.g., *Open Spaces Acquisition Program, Preservation and Restoration of Natural Areas*) and the City of Portland (e.g., *Willamette River Habitat Restoration and Enhancement Projects, Watershed Revegetation Program, Johnson Creek Restoration Plan*) have directly targeted protection and enhancement of riparian areas.
- Several programs or activities have recommended solutions, but little actions have been taken to date with regard to the six hypotheses aimed at increasing deep pool and off-channel habitat, improving stream connectivity and channel length/complexity, increasing summer baseflows, and balancing sediment input/outputs. These hypotheses relate to key habitat features known to be of high importance to salmonids, but that involve complex environmental factors and functions that can be demanding to address with actions, particularly in the urban setting. The activities that have resulted in actions to date have been few in number and localized. However, the existing significant efforts to characterize and offer solutions to these key habitat needs (e.g., *Lower Willamette River Fish Research, Watershed Planning and Analysis, Ross Island Lands Transfer, Preservation and Restoration of Natural Areas*) bodes well for more future actions related to these key habitat needs.

- There are few recommended solutions and no specific actions to-date with regard to the two hypotheses aimed at increasing macroinvertebrates and stream nutrients (via salmon carcass replacement). Macroinvertebrate characterization work has been done in the lower Willamette River and several tributaries that could support further development of potential solutions and actions.