

California Subwatershed Improvement Strategies Report

2009



Willamette
Watershed
Team



ENVIRONMENTAL SERVICES
CITY OF PORTLAND

working for clean rivers

Willamette Watershed Team

Bureau of Environmental Services (BES)

Paul Ketcham, Watershed Manager

Kristen Acock

Mary Bushman

Jennifer Goodridge

Colleen Mitchell

Anne Nelson

Marc Peters

Naomi Tsurumi

Katie Lethe, Intern

Erica Timm, GRA Intern

California Improvement Strategies Project Team

Mary Bushman, Project Manager

Naomi Tsurumi, Project Manager

Marc Peters

Colleen Mitchell

Katie Lethe

California Improvement Strategies Technical Advisory Team

Nicole Blanchard, Portland Bureau of Transportation

Mindy Brooks, Bureau of Planning

Mike Boyle, Portland Bureau of Transportation

Jennifer Devlin, BES Community Stewardship

Ivy Dunlap, BES Sustainable Stormwater

Joe Dvorak, BES Maintenance

Dave Elkin, BES Sustainable Stormwater

Clark Henry, BES Brownfields

Dawn Hottenroth, BES Regulatory/Policy

Mart Hughes, Portland Parks & Recreation

Alicia Lanier, BES Engineering Systems Analysis

Fred Nilsen, Portland Parks & Recreation

Michael Pronold, BES Source Control

Darian Santner, BES Revegetation

Cindy Studebaker, BES Science, Fish, and Wildlife

Cherri Warnke, Portland Water Bureau

Dave Whitaker, BES Engineering Systems Analysis

Mark Wilson, Portland Parks & Recreation



— CITY OF PORTLAND —
ENVIRONMENTAL SERVICES



1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204 ■ Dan Saltzman, Commissioner ■ Dean Marriott, Director

June 15, 2009

Dear Friends of Portland's Watersheds:

I am pleased to present this *California Subwatershed Improvement Strategies Report* for the Willamette Watershed. This document helps guide the City of Portland's ongoing efforts to manage stormwater runoff and protect and restore our waterways and natural areas. The report describes the current conditions of the California subwatershed and identifies opportunities to protect and improve watershed health.

In March 2006, City Council adopted the Portland Watershed Management Plan (PWMP). The plan describes the city's comprehensive, strategic, and integrative approach to improving watershed conditions. It identifies watershed health goals in hydrology, physical habitat, water quality and biological communities and outlines strategies and actions to meet these goals.

The *California Subwatershed Improvement Strategies Report* builds upon the principles of the PWMP. Taking a watershed approach, we have identified opportunities to better manage stormwater runoff, protect and improve aquatic and terrestrial habitat and revegetate our natural areas. This approach uses collaboration and partnerships with landowners, neighborhood groups, non-profits and local agencies to achieve the greatest benefits from our actions.

We are currently developing Improvement Strategies reports for each of the Willamette watershed's 27 subwatersheds. The Stephens subwatershed in southwest Portland was the first area for which this process was applied. The report, published in 2004, includes a list of over 100 prioritized projects and recommendations. Today, with local citizen support, a number of these projects have been implemented including: the Burlingame Sewer Repair and Streambank Restoration, the SW Texas Green Street and Wetland Enhancement, and the Stephens Creek Confluence Habitat Enhancement project.

In addition to guiding the work of our bureau, it is our hope that this report will provide residents and friends of the California subwatershed an opportunity for community stewardship of their local stream basin. Together, we can work to improve water quality and watershed health, and to protect and restore our natural resources.

Sincerely,

Paul Ketcham
BES Willamette Watershed Manager



Southwest Subwatersheds Improvement Strategies

California Subwatershed Improvement Strategies Final Report

Environmental Services
City of Portland
Watershed Services Group
Willamette Watershed

Final – June 15, 2009

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ACRONYMS

BDS	Bureau of Development Services
BMP	best management practice
BPS	Bureau of Planning and Sustainability (formerly Bureau of Planning)
BES	Bureau of Environmental Services
CIP	City of Portland Capital Improvement Program
CSO	Combined Sewer Overflow
CSSP	Combined System Sewer Plan
DDT	dichlorodiphenyltrichloroethane
DEQ	Oregon Department of Environmental Quality
ECSI	Environmental Cleanup Site Information
EDT	Ecosystem Diagnosis and Treatment
EIA	effective impervious area
ESA	Endangered Species Act
GIS	Geographic Information Systems
IC	inflow control
IS	Improvement Strategies
LID	Local Improvement District
LWD	large woody debris
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
NFWF	National Fish and Wildlife Foundation
NRI	Natural Resources Inventory
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OHSU	Oregon Health Sciences University
OLA	off-leash area
OWEB	Oregon Watershed Enhancement Board
PAH	polycyclic aromatic hydrocarbons
PBOT	Portland Bureau of Transportation
PCB	polychlorinated biphenyls
PP&R	Portland Parks and Recreation
PWMP	Portland Watershed Management Plan
ROW	right of way
SAC	Stormwater Advisory Committee
SHA	Special Habitat Area
SWMM	Stormwater Management Manual
SWMP	Stormwater Management Plan
TEES	Terrestrial Ecology Enhancement Strategy
TMDL	Total Maximum Daily Loads
UIC	Underground Injection Controls
VA	Veterans' Hospital

WRDA Water Resources Development Act

EXECUTIVE SUMMARY

The Bureau of Environmental Services (BES) Willamette Watershed team has developed Improvement Strategies (IS) reports for the Willamette River watershed's Marquam-Woods, Carolina-Terwilliger, and California subwatersheds. The reports identify and prioritize opportunities to protect and improve watershed conditions in the subwatersheds.

Improvement Strategies are groups of actions that individually and collectively improve watershed health. The actions are guided by the goals and objectives outlined in the Portland Watershed Management Plan (PWMP), a plan developed by the City of Portland in 2005 to improve watershed health and to protect and restore natural resources. The IS reports identify and rank recommended projects based on PWMP goals of improving hydrology, water quality, physical habitat, and biological communities.

The purpose of the Marquam-Woods, Carolina-Terwilliger, and California subwatershed IS reports is to provide a guide for City staff as well as other interested stakeholders such as local agencies, non-profits, and volunteer citizen groups, to focus resources and efforts on actions that will best benefit watershed health. Projects are organized by the following strategies: Stormwater Management, Revegetation, Aquatic and Terrestrial Enhancement, Protection and Policy, Operations and Maintenance, and Education, Involvement, and Stewardship.

The IS process is conducted at the subwatershed scale for a number of reasons. The subwatershed scale has been identified as the most effective for evaluating watershed improvements (Schueler and Holland 2000). Conditions that impact resources, such as impervious area, are more consistent and readily assessable at this scale. It is more efficient to encourage and support community and individual stewardship at this scale (e.g., neighborhood groups are organized at a similar scale). Finally, this scale is fine enough to conduct thorough field assessments and allow accurate analysis of the extent to which the identified improvement opportunities can contribute to meeting each watershed objective.

The reports identify recommended actions, grouped as geographic and/or programmatic clusters. The actions were assembled for their ability to address areas that have been identified as important assets to protect or problems to solve in order to improve local subwatershed conditions. Recommendations have been made for the following areas/programs in the California subwatershed: George Himes Park Streams and Willamette Park. Potential projects and programs for these areas include:

	Willamette Park	George Himes Park
<i>Stormwater Management Projects</i>	<ul style="list-style-type: none"> • Willamette Park Stormwater (1) • Willamette Park Off-Leash Area Stormwater Retrofit (2) 	<ul style="list-style-type: none"> • George Himes Park Stream Daylighting, North Reach (*)
<i>Aquatic and Terrestrial Enhancement Projects</i>	<ul style="list-style-type: none"> • Willamette Park North Riparian Enhancement (3) • Willamette Park Central Riparian Enhancement (4) • Willamette Park South Riparian Enhancement (5) • Boat Washing Station and Information Kiosk (9) 	<ul style="list-style-type: none"> • George Himes South Stream Daylighting (7)
<i>Revegetation Projects</i>	<ul style="list-style-type: none"> • Willamette Park Swale (31) • Willamette Park North Revegetation/Increase Canopy Cover (24) • Heritage Oak SHA Revegetation/Enhancement (28) • Willamette Park South Revegetation (30) 	<ul style="list-style-type: none"> • California George Himes Park Revegetation (22) • Carolina-Terwilliger George Himes Park Revegetation (*)
<i>Protection & Policy Projects</i>	<ul style="list-style-type: none"> • Willamette Park Heritage Oak Stand (13) 	<ul style="list-style-type: none"> • Upper George Himes Creek West Property Acquisition (*) • Lower George Himes East Property Acquisition (*) • George Himes West Property Acquisition (6) • George Himes South Property Acquisition (10) • George Himes East Property Acquisition (25)
<i>Education, Involvement and Stewardship Projects</i>	<ul style="list-style-type: none"> • Invasive Species Outreach • Pet Waste Outreach 	<ul style="list-style-type: none"> • Invasive Species Outreach • Residential Non-Point Source Pollution Outreach

SECTION 1: PURPOSE

This report summarizes the Improvement Strategies (IS) process to improve and protect watershed health in the California subwatershed, which is located within the southwest portion of the lower Willamette Watershed. Improvement Strategies are categories of actions that can be taken to improve watershed conditions. The main element of this report is Section 6, which lists and ranks specific projects that have been identified through the IS process to improve the health of the California subwatershed.

The IS process is guided by the 2005 Portland Watershed Management Plan (PWMP; City of Portland 2005). The PWMP, adopted by Portland City Council in 2006, provides a long-term adaptive management approach for identifying, implementing, measuring, and evaluating improvements to the conditions of the watershed. The PWMP uses a watershed approach to outline objectives and strategies for improving watershed health while meeting the City of Portland's (City) and the Bureau of Environmental Services' (BES) missions, BES's service responsibilities, and environmental regulations. The watershed approach considers all activities that affect watershed conditions and maximizes the use of limited resources by looking for solutions that meet multiple objectives. This IS report provides the analysis necessary to identify implementation options and create recommendations that help to achieve these objectives in the California subwatershed.

The IS process is conducted at the subwatershed scale to identify opportunities that will contribute to cumulative improvements for Portland's Willamette Watershed and the Willamette River channel as a whole. The subwatershed scale has been identified as the most effective for evaluating watershed improvements (Schueler and Holland 2000). Conditions that impact resources, such as impervious area, are more consistent and readily assessable at this scale. It is more efficient to encourage and support community and individual stewardship at this scale; citizens generally have higher levels of knowledge and interest in the conditions of their local area or stream basin. In addition, neighborhood groups are organized at a similar scale, providing stewardship opportunities for individual and community actions to improve watershed health. Finally, the subwatershed scale is fine enough to conduct thorough field assessments and allow accurate analysis of the extent to which the identified improvement opportunities can contribute to meeting each watershed objective.

The California IS objectives are built off of the specific conditions of the subwatershed that were identified in the California Characterization (City of Portland 2008). Opportunities to improve watershed health have been identified through a comprehensive process that included data analysis, review of available information about current and historical subwatershed conditions, field assessments, stakeholder involvement, and City staff input. Potential opportunities are organized by the following strategies: stormwater management; revegetation; aquatic and terrestrial enhancement; protection and policy; operations and maintenance; and education, involvement, and stewardship.

SECTION 2: BACKGROUND

Improvement Strategies Process

The purpose of the IS process is to identify specific project and program opportunities to protect and improve subwatershed health. These specific opportunities, called actions, are identified through a series of steps that collectively make up the IS process. These steps, and their supporting technical memoranda for the California subwatershed, are:

Table 1: Improvement Strategies Process and Work Products

Step	Technical Memoranda	Description
Project Management		Plans, schedules, and coordinates each step, and ensures they are completed well and in a timely manner.
Characterization	California Subwatershed Characterization Summary Technical Memorandum (TM)	Reviews and documents existing subwatershed analysis, conditions data, and information on action opportunities.
	California Subwatershed Pipe System Data Analysis and Review TM	
	California Subwatershed Data Analysis and Review TM	
Stakeholder Input	California Subwatershed Stakeholder Input Summary TM	Identifies all key stakeholders, keeps them informed, and obtains their input throughout the IS process.
IS Development	Improvement Strategies Development TM	Identifies opportunities to apply strategies and implement specific actions. Identifies and ranks subwatershed objectives. Completes field work to identify actions.
IS Evaluation	Improvement Strategies Evaluation TM	Prioritizes, maps, and evaluates actions identified in the IS Development step.
Reporting and Information Management	California Subwatershed Improvement Strategies Report	Ensures all information collected is documented and shared appropriately to maximize the utility of the work.

Characterization Overview

The California subwatershed covers 267 acres. It is bounded by the Wilson High School campus to the west, the Willamette River to the east, George Himes Park to the north, and Riverview Abbey Mausoleum to the south (Figure 1, at the end of this section).

The lower elevations along the Willamette River, in what were the former river bottomlands, are Willamette Park and John's Landing, a neighborhood. In the northwestern corner is George Himes Park, and pockets of residential development on the steep hillsides and upper edges. Between the lower elevations and the West Hills is Macadam Boulevard with a mix of commercial development.

Residential land uses comprise about 65 percent of the subwatershed. Commercial zones, located along Macadam Boulevard, comprise approximately 15 percent. Parks and Open Spaces comprise nearly 20 percent, and are located in the northwestern corner of the subwatershed and along the river. Major transportation corridors include Interstate 5, Barbur Boulevard, and Macadam Avenue.

The sanitary and stormwater systems that drain from the California subwatershed are combined. Sanitary waste from residential and commercial areas is combined with stormwater runoff and routed to the Columbia Boulevard Wastewater Treatment Plant for treatment. Stormwater runoff from areas along the riverbank in Willamette Park is routed into pipes that discharge into the Willamette River or flows over land directly into the river (Figure 2, at the end of this section).

Stormwater that is transported through the City's public storm infrastructure and discharged into a public water body is regulated under a permit issued by the Oregon Department of Environmental Quality (DEQ) under the federal Clean Water Act (CWA). The permit, called the Phase I National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit, requires the City to develop and implement a Stormwater Management Plan (SWMP) in order to control pollutants from stormwater to the maximum extent practicable. Many of the projects identified in this IS report will help meet MS4 objectives.

The subwatershed is bisected by Interstate 5, Barbur Boulevard, and Macadam Avenue, each of which represents a potential source of polluted stormwater runoff. There are a number of permitted MS4 outfalls and basins associated with Macadam Avenue. Both the City and Oregon Department of Transportation (ODOT) hold the permits for the MS4 outfalls associated with these roads. At this writing, no MS4 basins have been delineated for Interstate 5 and Barbur Boulevard in this subwatershed.

There are two outfalls associated with City and ODOT MS4 basins in the California subwatershed (Table 1). Outfall 01A receives stormwater only. Outfall 01 is permitted as a combined sewer overflow (CSO) outfall and an MS4 outfall that is shared by the City and ODOT. Overflows to Outfall 01 are predicted to occur on average four times each year during the winter, and once every three years during summer.

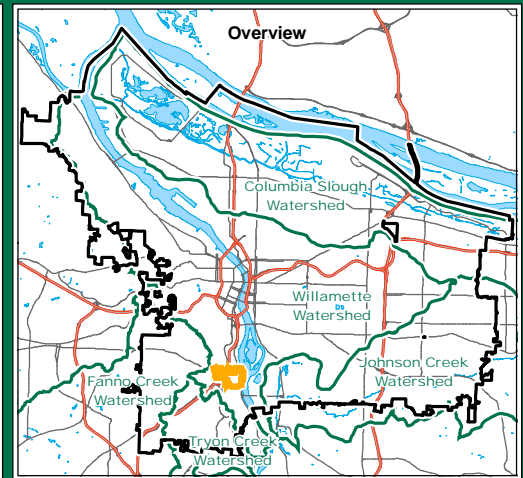
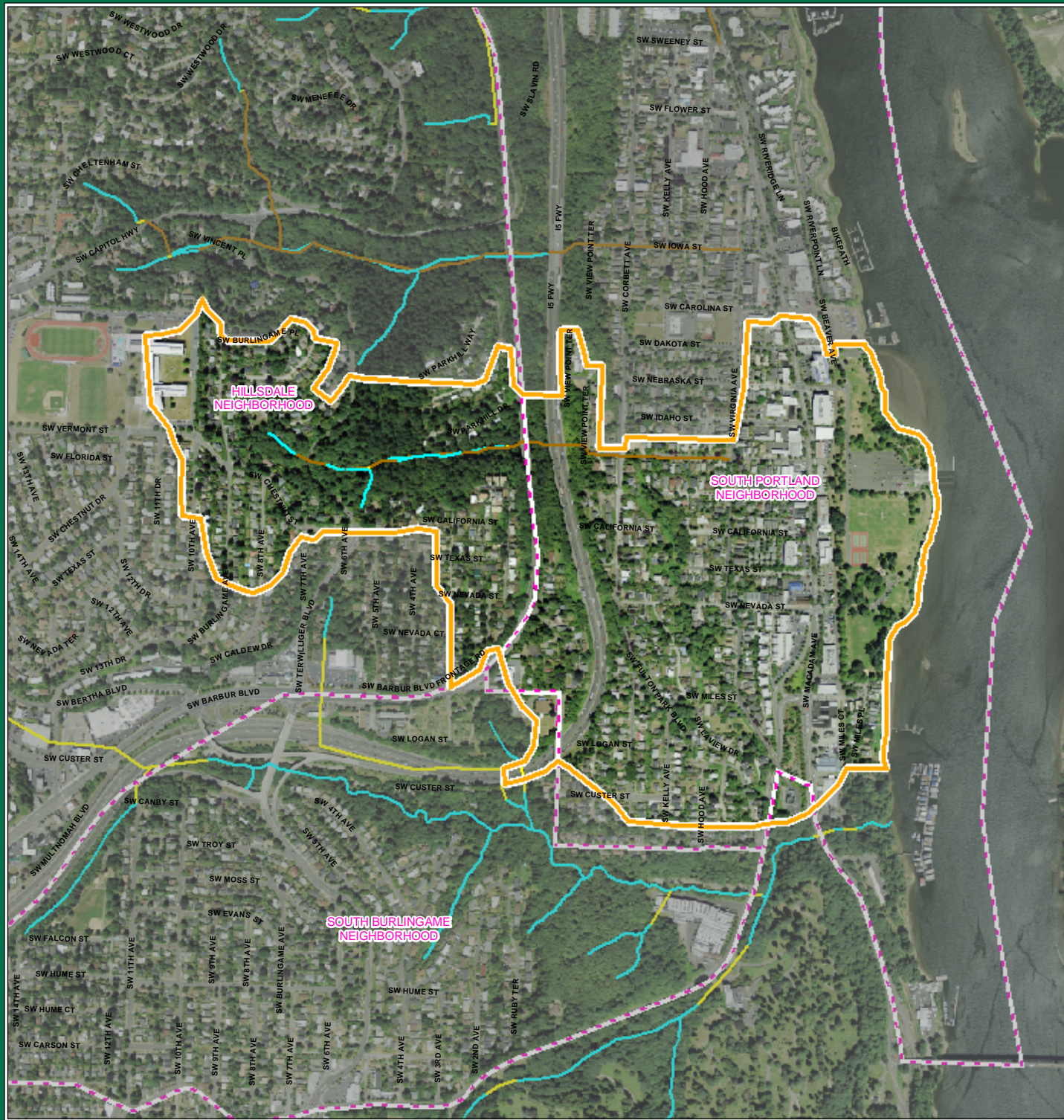
Table 2: Outfall Summary Information for the California Subwatershed

Subwatershed	Outfall	Type	Permitted MS4	Permitted CSO	Owner	River Mile
California	01A	Storm	Yes	No	BES	16
California	01	Control ¹	No	Yes	BES	15.8

¹A controlled outfall is a CSO outfall that has been designed to meet DEQ requirements, and discharges stormwater during most storms from separated areas.

Natural features of the California subwatershed include the southern half of George Himes Park, Willamette Park, and 1.5 miles of the Willamette River (River mile 15.5 to 16.1). Seasonal creeks, perennial George Himes Creek, and associated springs are located in George Himes Park. Below the park, these creeks and springs are piped into the combined sewer system. No open channel streams reach the Willamette River in the California subwatershed.

Environmental zones are located in the George Himes Park area and between Barbur and Terwilliger boulevards. Protection zones make up 14.7 acres or 5.5 percent of the subwatershed. Conservation zones compose 23.6 acres or 8.8 percent of the subwatershed. There are 7.5 acres of Willamette Greenway overlay area in the California subwatershed. The greenway overlay zones are intended to protect, conserve, enhance, and maintain the natural, scenic, historical, economic, and recreational qualities of lands along the Willamette River (Figure 3, below).



Legend

- City of Portland
- Subwatershed Boundary
- Neighborhood Boundaries
- Open Channel Streams
- Stormwater Pipe or Culvert
- Combined Stormwater/Sewer Pipe

1 inch equals 1,000 feet

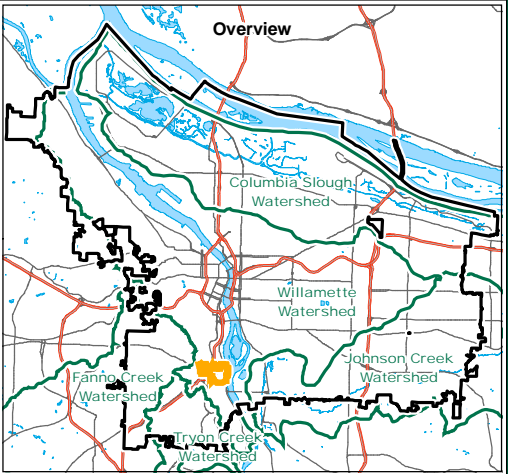
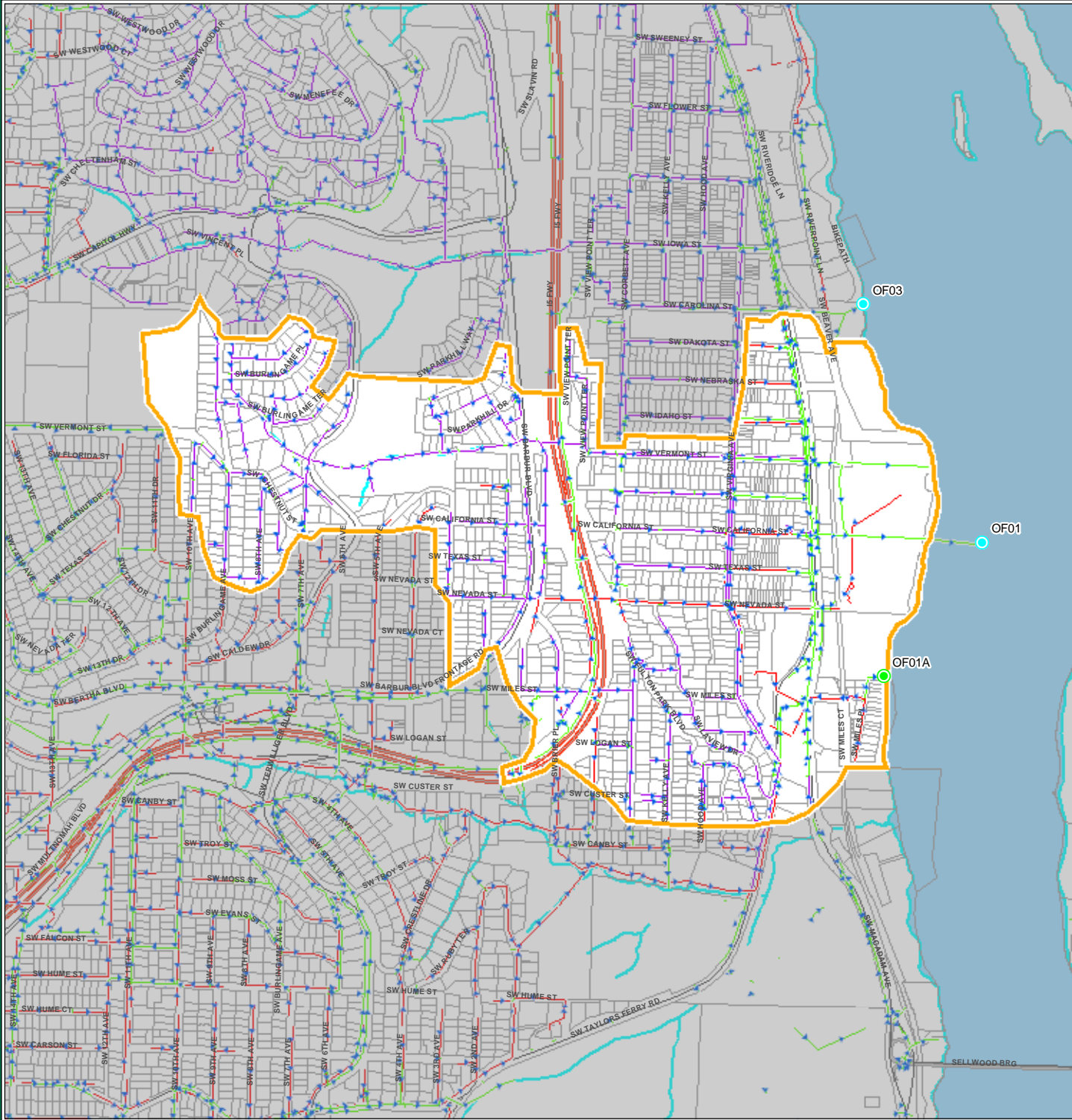
0 1,000 2,000 Feet

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Spatial Analysis and Modeling

Southwest Subwatersheds Improvement Strategies

Figure-1
California
Subwatershed Overview

Project No. 8800	Date Printed: 05/21/09
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Legend

- City of Portland
- Subwatershed Boundary
- Existing Taxlots
- Freeways
- Open Channel Streams

Existing Sewer System

- Sanitary Sewer Pipes
- Sanitary Pressure Mains
- Combined Sewer Pipes
- Stormdrain Pipes
- Stormwater Only Outfalls
- CSO Outfalls With Stormwater
- Controlled CSO Outfalls With Stormwater
- Abandoned Outfalls

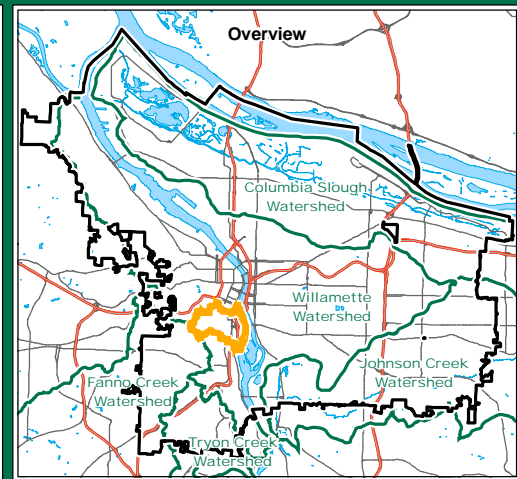
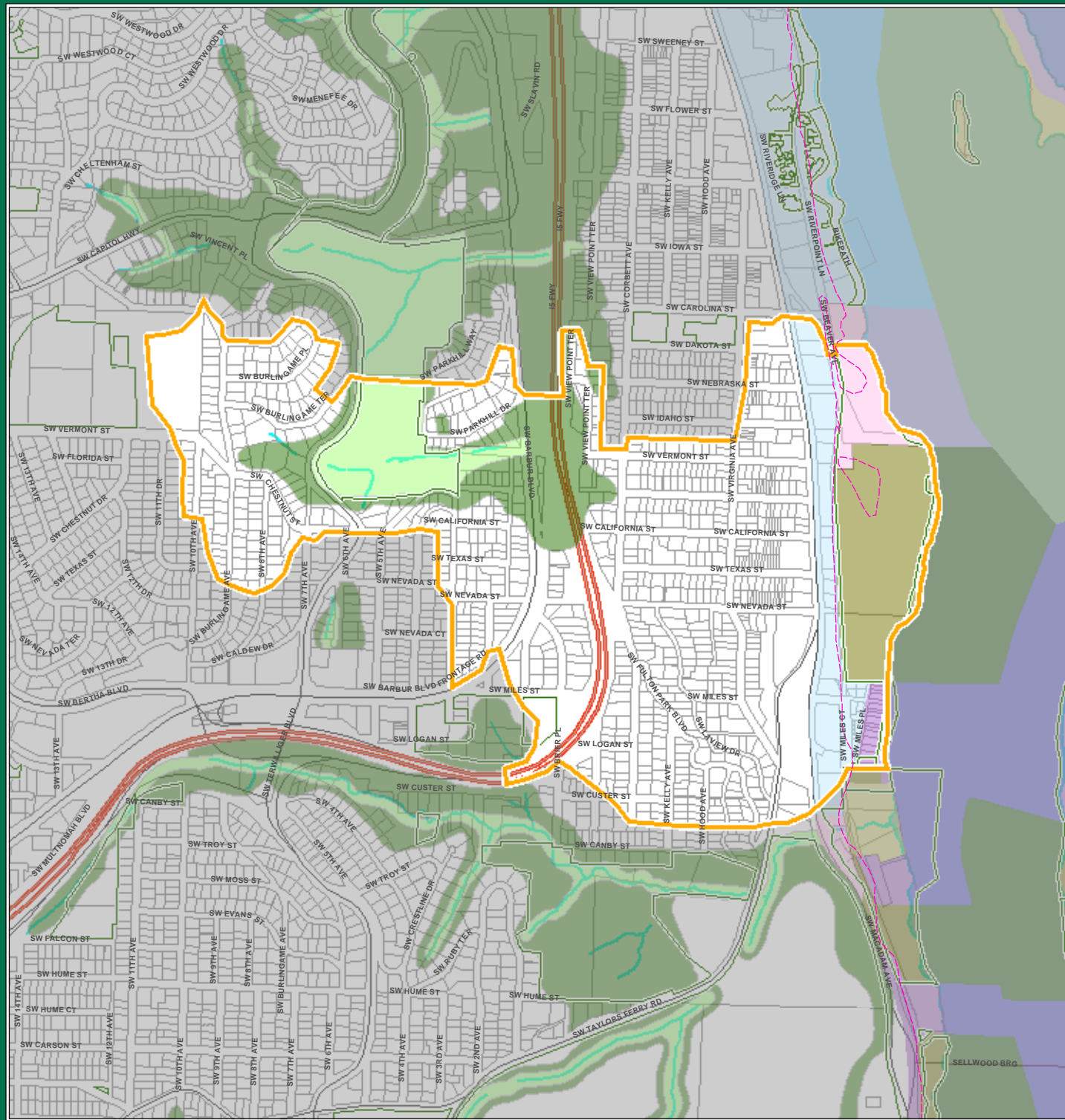
1 inch equals 1,000 feet

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Southwest Subwatersheds Improvement Strategies

**Figure-2
California
Infrastructure**

Project No. 8800	Date Printed: 05/21/09
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Legend

City of Portland	Existing Taxlots
Subwatershed Boundary	Freeways
100yr Floodplain	Open Channel Streams
Parks and Open Spaces	Environmental Zones
Conservation	Protection

Greenway Zones

g	River General Overlay Zone
n	River Natural Overlay Zone
r	River Recreational Overlay Zone
q	River Water Quality Overlay Zone
gq	River Water Quality Overlay Zone
nq	River Water Quality Overlay Zone
r	River Recreational Overlay Zone
rq	River Water Quality Overlay Zone

1 inch equals 1,000 feet

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Systems Analysis
Spatial Analysis and Modeling

Southwest Subwatersheds Improvement Strategies

Figure-3
California
Natural Resources

Project No	Date Printed:
8800	05/21/09

SECTION 3: SUBWATERSHED CONDITIONS

This section describes significant asset and problem areas in the California subwatershed. These areas were identified through a detailed review of existing information on subwatershed conditions, which is documented in the following technical memoranda (TM):

- *California Subwatershed Characterization Summary TM*
- *California Subwatershed Pipe System Data Analysis and Review TM*
- *California Subwatershed Data Analysis and Review TM.*

Technical memoranda are available by contacting Anne Nelson of the Willamette Watershed Team at (503) 823-2584, or at anne.nelson@bes.ci.portland.or.us.

California Subwatershed Significant Asset Areas

For the purposes of this report, asset areas are areas that provide important or unique watershed services. Designation as an asset area generally follows recommendations made by two previous City efforts: 1) the City's Draft Natural Resource Inventory: Riparian Corridor and Wildlife Habitat Project Report (NRI), a citywide project to revise and update existing information on natural resources in Portland [Bureau of Planning and Sustainability (BPS)] and 2) the City's Terrestrial Ecology Enhancement Strategy (TEES), which identifies priority wildlife and plant species and terrestrial habitats for protection, conservation, and/or restoration. TEES prioritizes key management and control issues (City of Portland 2007). Assets were also identified through internal and external stakeholder input.

Sanitary and storm sewer infrastructure is also an asset. All pipes within the basin are included as part of a combined sewer and stormwater system. The "type" is defined by the type of sewer lateral that may be connected to the pipe. Stormwater pipes do not have sewage lateral connections. However, stormwater pipes downstream of diversion structures may receive combined flows during large events. Combined pipes in the subwatershed are 7.6 miles in length, stormwater-only pipes are 2.0 miles in length and sanitary only pipes are 2.6 miles in length.

There are three asset areas in the California subwatershed. Each is discussed in terms of its geographic location in the following sections (Figure 4, at the end of this section).

Willamette River Channel and Shoreline

The Willamette River in Portland has been designated as critical habitat for Chinook salmon and steelhead, which are provided protection under the Endangered Species Act (ESA). The designation is reflected in the City's Draft NRI, which identifies the river's beaches and shallow water habitat as Special Habitat Areas (SHA). The TEES identified the river corridor as a site with high restoration value.

The Ross Island to Sellwood reach of the river is an important rearing and refuge complex for juvenile salmonids as they migrate from spawning habitats in the upper reaches of the Willamette and Clackamas rivers. The reach has diverse and abundant shoreline vegetation, gently sloping beaches and a natural riverbed relative to the other city of Portland river reaches. The southern portion of this reach falls within the California subwatershed.

Willamette Park

Willamette Park covers most of the California subwatershed riverfront. The 26 acre park consists of beaches, a boat ramp and dock, and a dog off-leash area.

Important habitat features found at this site include floodplain wetlands,



heritage oaks, bottomland hardwood forest, mud flats, and rock outcrop islands. These areas provide key ecological functions and are considered SHAs by the City's Draft NRI and TEES. TEES has identified the park's mudflats located at the northern end of the park and rock outcrop islands near the southern boundary as sites to protect and restore for Special Status Species (shorebirds and fish).

George Himes Park

George Himes Park is a 35 acre natural area that includes paved and unpaved paths and hiking trails. The southern half of the park is in the California subwatershed. A perennial stream runs through the steep canyon of the park that includes some fragmented sections of open channel, but the majority of the stream is dewatered by a pipe under the stream channel that drains its water into the combined sewer system.

Collectively, the natural areas in the California subwatershed have been identified as the Westside Wildlife Corridor. The Corridor has been identified by TEES as a critical passageway between anchor habitats. These areas provide a forested spine in the west hills of Portland that will help protect remnants of natural habitat and create a continuous wildlife corridor from Forest Park south to Tryon Creek State Park.

California Subwatershed Significant Problem Conditions

For the purpose of this report, “problems” are defined as issues that will need to be resolved to a measured extent in order to achieve watershed health objectives defined in the 2005 PWMP. The problems were identified through a review and analysis of Geographic Information Systems (GIS) data, planning documents, scientific research, stewardship activities, inventories, field assessments, and input from City staff and residents. The problems described below are specific to the California subwatershed, but are organized by their relationship to the citywide watershed health goals and objectives defined in the PWMP.

PWMP Goal #1: HYDROLOGY

PWMP Objective: Stream Flow and Hydrologic Complexity

California Subwatershed Problem Condition: Stream flow regimes have been greatly altered. High stormwater runoff volume impairs water quality, causes flooding and erosion, degrades habitat quality, and contributes to CSOs. In some sections of George Himes Park, natural channels are intact, but stream flows are drained into a combined sewer pipe.

Source of Problem Condition: The underlying source of the altered stream hydrograph is stormwater contributions from the developed portions of the subwatershed. This is exacerbated by the dewatering of natural channels as well as natural conditions such as slopes and moderate to poorly-draining and erodible soils.

Transportation, residential, and commercial development have resulted in a loss of native understory and canopy vegetation and increased impervious surface. This reduces the volume of water that would naturally infiltrate into vegetated soils resulting in increased flow velocity and volume. The increase in flow and volume causes stream incision, channel erosion, and additional pollutant and nutrient loading to the ecosystem.

Impervious surfaces cover 50.7% of the California subwatershed and are distributed throughout all but the northwest corner of the subwatershed. Transportation routes comprise the largest portion of impervious area (33.1% of total subwatershed area) and include major routes such as Interstate 5, Barbur Boulevard, and Macadam Avenue. Much of the impervious area from parking lots (4.6% of total subwatershed area) is concentrated along Macadam Avenue in the eastern half of the subwatershed. Buildings (13.1% of the total subwatershed area) are distributed throughout the watershed and are concentrated along the transportation routes.

PWMP Objective: Channel and Floodplain Function

Problem conditions associated with this PWMP objective relate to both the Willamette River mainstem and to its tributary streams within the California subwatershed.

Willamette River Problem Condition: Floodplain area and connectivity have been greatly reduced or eliminated in the Willamette River bottomland area, which reduces floodplain function.

Source of Problem Condition: Development has eliminated most of the connection between the Willamette River and its current and historic floodplains within city limits. Historically, the Willamette River floodplain bottomland was interconnected with the river's main channel and side channels. Today, the Willamette River bottomlands are piped and filled and the tributaries now flow through pipes.

The reduced level of interaction between the river and the floodplain results in a reduction in attenuation and flood storage functions. Much of the riparian canopy and native vegetation have been removed with the exception of a narrow corridor. Structural complexity from large wood accumulations has been eliminated and the banks have been filled and hardened (City of Portland 2001).

California Subwatershed Streams Problem Condition: Little floodplain exists in the upper watershed. While some of the upper portions of the streams flowing from the southwest hills to the Willamette River remain intact, many have steeply sloped and eroded banks. The lower portions are piped through the developed residential and commercial areas.

Source of Problem Condition: Development has impacted the channel and floodplain function of the streams in the upper subwatershed. Open stream channels are ultimately piped into the combined sewer system. There are no tributary stream channels remaining that reach the Willamette River in the California subwatershed.

PWMP Objective: Stormwater Conveyance

California Subwatershed Problem Condition: Stormwater collection and conveyance infrastructure problems; CSOs.

Source of Problem Condition: Much of the California subwatershed is served by the combined sewer system. Combined sewer areas carry sanitary sewage and stormwater in the same pipe. An increase in impervious surfaces as a result of development has resulted in increased stormwater flow into the combined sewer system. When it rains, stormwater can fill the pipe to capacity causing combined sewer overflows (CSOs) to the Willamette River.

BES began the West Side Big Pipe project in 2002 in order to control CSOs. The project, completed in 2006, increased sewer system capacity and helps alleviate basement flooding problems. The new pipe system significantly reduces but does not completely eliminate CSOs, however, because heavy rains may still fill the system to capacity.

An effective sewer infrastructure is critical to watershed health. Some sewer pipes in the subwatershed have either structural issues or are too small to handle large volumes of

stormwater runoff, which may cause street flooding and/or sewers backing up into basements during heavy rain. System capacity analysis was used to identify and evaluate potential areas of street flooding, high-risk areas for basement sewer backup, and related hydraulic capacity problems in the California subwatershed. Modeling results from the analysis indicated the following:

- *Capacity.* Under existing conditions, 28 pipes have potential capacity problems for the 25-year design storm, representing 7% of pipes in the subwatershed. Under future conditions, potential capacity problems are predicted in 34 pipes, representing 8% of pipes in the subwatershed. Modeling results also indicated 68 pipes (17% of total) may have pipe surcharge¹ problems.
- *Basement flooding.* Under existing conditions, 24 properties were predicted to be at risk of basement sewer backups during the 25-year design storm, and 38 were predicted to be at risk under future conditions.

Detailed information on the California subwatershed pipe system can be found in the California Subwatershed Pipe System Data Analysis and Review Technical Memorandum.

Opportunities to solve the hydraulic and pipe condition problems include: conveyance improvements, stormwater separation, inflow controls, backflow prevention devices, and other watershed projects.

PWMP Goal #2: PHYSICAL HABITAT

PWMP Objective: Aquatic Habitat

Problem conditions associated with this PWMP objective relate to both the Willamette River mainstem and to its tributary streams within the California subwatershed.

Willamette River Problem Condition: Simplified channel morphology, hardened banks, vegetation removal, and extensive filling and development in the floodplain have degraded aquatic habitat in the Willamette River. Off-channel and shallow water habitat have been reduced or eliminated.

Source of Problem Condition: Upstream hydrologic alterations and water quality impacts have reduced channel habitat value. Historic filling and bank hardening as well as vegetation removal have reduced and degraded channel habitat extent and value. Invasive species and overwater structures such as docks, marinas, and houseboats have further reduced habitat value.

¹ Pipe surcharges occur when excess water in pipes causes the flow to become pressurized, which is a problem for the majority of sewer pipes in the subwatershed that use gravity to move water. The degree of surcharging of a pipe system directly relates to the risk of basement sewer backups and street flooding.

California Subwatershed Streams Problem Condition: Open stream reaches are degraded. Piped segments of the streams pose accessibility barriers to potential habitat in the upper subwatershed.

Source of Problem Condition: Development and the subsequent hydrologic alterations, water quality impacts, and vegetation removal have reduced stream channel habitat extent and value. Invasive plant species have further impacted potential habitat. Tributary streams have been piped and filled and are not accessible to Willamette River fish communities. The streams do not support any known fish communities. Data are not available for other aquatic organisms.

Data gaps: Additional study is needed to determine the conditions, extent, and type of aquatic habitat in the California subwatershed including historic extent of fish habitat, and the current use and extent of habitat for other aquatic organisms.

PWMP Objective: Terrestrial Habitat

California Subwatershed Problem Condition: The watershed function and associated terrestrial habitat value throughout the subwatershed are currently degraded.

Source of Problem Condition: Loss and fragmentation of forest canopy, native vegetation, and open, naturally functioning stream channels have reduced the amount and degraded the quality and connectivity of wildlife habitat. The quantity, connectivity, and distribution of these areas are impacted, and continue to be threatened by residential, commercial, and transportation development.

While there are large contiguous tracts of forest in George Himes Park that provide wildlife habitat, the predominance of English ivy and other invasive plants has simplified the forest understory and degraded the habitat quality. Invasive plants are usually introduced into an environment (i.e., are not native) and spread at such a rate that they cause harm to human health, the environment, and/or the economy. They grow and reproduce quickly, out-compete native species, and reduce habitat diversity for biological communities. Many invasive plant species have shallow root systems that do little to hold the soil and control erosion, especially on stream banks. PP&R's surveys have quantified the extent of non-native species in the park and found most areas to be poor to severely degraded. Illegal dumping, adjacent landowner practices, and recreational overuse also contribute to the degradation of terrestrial habitat.

The ability of these natural areas to function as wildlife habitat is further compromised by the major transportation corridors that bisect them, creating barriers to wildlife movement. These wildlife barriers include Interstate 5 and Barbur Boulevard.

Stream channel segments that have been diverted into the combined sewer system have further degraded habitat value and extent by limiting terrestrial biological communities' access to a perennial water supply.

PWMP Goal #3: WATER AND SEDIMENT QUALITY

PWMP Objective: Stream Temperature

Problem conditions associated with this PWMP objective relate to both the Willamette River mainstem and to its tributary streams within the California subwatershed.

Willamette River Problem Condition: The lower Willamette River currently violates federal Clean Water Act temperature standards, which places it on Oregon's 303(d) list of water quality limited waters. The Willamette River has established Total Maximum Daily Loads (TMDLs) for temperature, bacteria, and mercury.

Source of Problem Condition: The Willamette River channel and banks have been extensively filled, cleared and armored, reducing channel and riparian conditions, channel structure, complexity and sources of large woody debris. These activities and upstream hydrologic alterations have likely caused increased stream temperatures as well as other water quality impacts.

Data gaps: Information on water quality, including temperature, in the upper subwatershed streams has not been fully studied.

PWMP Objective: Urban Pollutants and Human Pathogens

California Subwatershed Problem Condition: The lower Willamette River currently violates federal bacteria and mercury standards, which places it on Oregon's 303(d) list. The Willamette River has established TMDLs for the following pollutants: bacteria, temperature, polychlorinated biphenyls (PCBs), dioxin, polycyclic aromatic hydrocarbons (PAHs), and trace metals².

Source of Problem Condition: Urban stormwater nonpoint source pollution is the likely cause of a significant portion of the water quality problems in this subwatershed. Runoff from various land uses (industrial, commercial, and residential properties) carries soil, metals, oil, grease, bacteria, and chemicals to the river. Stormwater from the commercial and transportation corridors can contribute pollutants such as phosphates, copper, lead, zinc, and chromium to levels that impair water quality. Synthetic organic compounds, such as pesticides and fertilizers, are not produced naturally and are attributable to human activity. Metals are present naturally, but human activities have contributed to increased levels of these pollutants. The subwatershed is bisected by Interstate-5, which represents a significant source of polluted stormwater runoff (i.e., heavy metals, petroleum products) that does not currently receive any treatment before reaching the Willamette River.

Some upland sites and river sediments are contaminated with a variety of pollutants such as PCBs, dichlorodiphenyltrichloroethane (DDT), and metals at levels that pose risks to

² The mercury TMDL is a phased TMDL for which no load allocations for nonpoint sources or wasteload allocations for point sources were set; however, a reduction target was set in 2006 (City of Portland 2008b).

ecological and human health. The DEQ Environmental Cleanup Site Information (ECSI) inventory lists sites that may have groundwater, surfacewater, soil, or sediment contamination. Sites in ECSI comprise a wide variety of sizes, locations, features, contaminant profiles, and degrees of Cleanup Program information. Some ECSI sites have minimal information available and need an initial evaluation, while others have completed investigative and remedial actions, and have earned a No Further Action (NFA) decision from DEQ. It is important to note that information contained in ECSI may be unconfirmed, outdated, or incomplete and information is subject to change at any time. There are three ECSI locations listed in the California subwatershed.

Data Gaps: Monitoring data are not available for the MS4 outfalls in the California subwatershed. Monitoring and/or data analysis are needed to quantify the magnitude of contamination at these outfalls, as well as specific sources of pollutants, their locations within the watershed, and their relative contributions.

PWMP Goal #4: BIOLOGICAL COMMUNITIES

PWMP Objective: Fish and Other Aquatic Organisms

Problem conditions associated with this PWMP objective relate to both the Willamette River mainstem and to its tributary streams within the California subwatershed.

Willamette River Problem Condition: Native fish and other aquatic biological communities in the Willamette River have been greatly impacted by extensive urban development. Native fish species are in decline, and several invasive non-native species are established. Several salmonid species are listed under the state and federal ESA as threatened or endangered.

Source of Problem Condition: The hydrology, habitat, and water quality problems listed previously have contributed to adverse impacts on fish and other biological populations. Little off-channel habitat remains in the California subwatershed. Off-channel sites (alcoves, lagoons, backwaters, secondary channels) have been eliminated, and degraded aquatic habitat conditions such as hardened banks and invasive species are prevalent. These factors reduce the quantity and quality of habitat, and alter and reduce habitat complexity.

California Subwatershed Streams Problem Condition: Stream channels in the upper subwatershed do not support any known fish communities.

Source of Problem Condition: The historic channel to the east of George Himes Park has been piped and filled and does not support any known fish communities.

Data gaps: Additional study is needed to determine the conditions, extent and type of aquatic organisms in the California subwatershed, including historic extent of fish habitat and the current extent of other aquatic organisms. In-stream habitat in the tributary reaches should be evaluated to determine the current and potential habitat quality. Data regarding amphibian and macroinvertebrate populations are not available, however, local

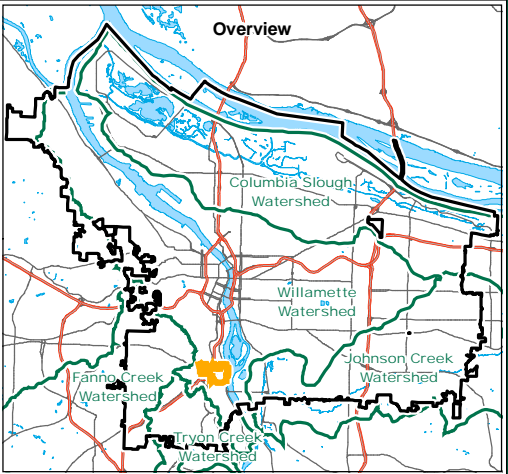
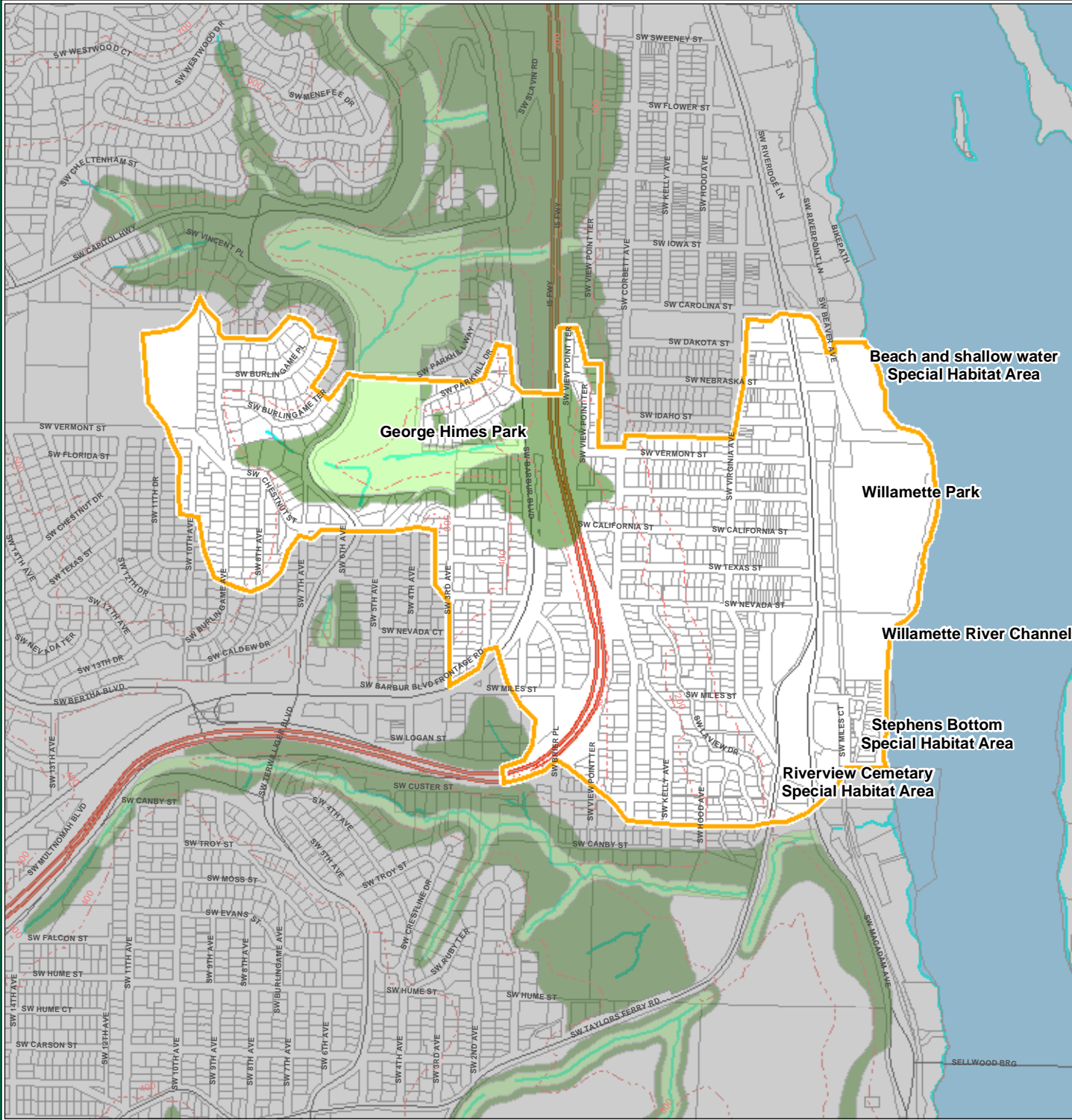
populations of amphibians and resident fish may be viable in some of the remaining reaches.

PWMP Objective: Terrestrial Wildlife and Vegetation

California Subwatershed Problem Condition: The native plant and wildlife communities in the subwatershed have been greatly impacted by residential, commercial, and transportation development. The proliferation of invasive species and the inadequate resources devoted to their management in natural and undeveloped areas have further impacted native communities.

Source of Problem Condition: Development throughout the subwatershed has resulted in a loss and fragmentation of forest canopy and native understory vegetation. The problem of non-native invasive plants is prevalent and persistent in the California subwatershed. The predominance of English ivy, a highly invasive plant species, has simplified the forest understory and degraded the habitat quality for native species. Terrestrial wildlife habitat barriers also exist at major transportation corridors in the subwatershed, including Interstate 5, Barbur Boulevard, and Macadam Avenue.

Diverting tributary streams has further impacted structural diversity of the forest/plant communities and wildlife habitats by eliminating or reducing wetlands and year-round stream flows.



Legend

- City of Portland
- Subwatershed Boundary
- Existing Taxlots
- Freeways
- Open Channel Streams
- 100 ft Contours

Environmental Zones

- Conservation
- Protection

1 inch equals 1,000 feet

CITY OF PORTLAND ENVIRONMENTAL SERVICES
Systems Analysis
 Spatial Analysis and Modeling

Southwest Subwatersheds Improvement Strategies

Figure-4 California Asset Areas

Project No	Date Printed:
8800	05/21/09

SECTION 4: OPPORTUNITY SELECTION AND RANKING

The Willamette Watershed objectives were developed in coordination with the other BES watershed teams, and are documented in the PWMP. The objectives serve as a guide for identifying potential subwatershed actions for improvement strategies. A measure was developed for each objective, to quantify the degree to which potential actions would provide benefit towards achieving the watershed objective.

For the southwest subwatersheds, the PWMP objectives were reviewed and then ranked in order of importance relative to improving the current conditions in the subwatersheds. Results are shown in Table 3. The weights in Table 3 were calculated by applying a formula based upon the objectives' assigned ranks, to refine the analysis for determining their benefits towards improving subwatershed conditions [i.e., improving stream flow (which is ranked number 1) is not necessarily twice as beneficial as improving aquatic habitat (which is ranked number 2)] in the subwatershed.

The ranked objectives, their weights, and their associated measures were then used to prioritize specific subwatershed improvement opportunities, using a multi-attribute utility analysis (MUA) tool. Detailed information on how the PWMP objectives were ranked to produce the southwest subwatersheds objectives and on how the MUA was applied to the improvement opportunities can be found in the Technical Memorandum included in Appendix A.

The results of the MUA assigned scores to each subwatershed improvement opportunity. The opportunities with the highest scores for the highest-ranking objectives were identified as priorities. More information about how the opportunities were identified for evaluation is described in detail in Section 5.

Helpful Definitions

Strategy: Broad categories of approaches to meet subwatershed objectives. There are six strategies in the PWMP. See Section 5 for more detail.

Action: Finer scale than strategy. Actions are projects or programs that are not site-specific.

Opportunity: Project or program that is site-specific. Opportunities are based on needs identified during field assessment.

Table 3: Results of Ranking Process for SW Subwatershed Objectives and Measures

Objective	Measure	Rank	Weight
Stream Flow and Hydrologic Complexity: Protect and increase rainfall interception areas, create infiltration and detention areas to normalize stream hydrographs, reduce stormwater flow to sewer systems, and reduce basement flooding.	Effective Impervious Area (EIA) reduced (acres)	1	0.146

Objective	Measure	Rank	Weight
Aquatic Habitat: Protect and improve aquatic, riparian, and floodplain habitat extent, quality, and connectivity that supports the persistence of native fish and wildlife communities.	Aquatic habitat restored/enhanced (linear feet)	2	0.139
Urban Pollutants: Manage the sources and transport of urban stormwater and industrial pollutants and nutrients to limit surfacewater, groundwater, soil, and sediment contamination to levels that protect ecological and human health and achieve applicable water quality standards.	Urban pollutants reduced in soil or water (Y/N)	3	0.131
Channel and Floodplain Function: Protect and restore the extent, connectivity, and function of streams, other open drainageways, wetlands, riparian areas, and floodplains to improve bank stability and natural hydrologic functions and reduce risk to development and human safety.	Channel/Floodplain restored or enhanced (acres)	4	0.117
Fish and Other Aquatic Organisms: Implement watershed actions to maximize the persistence of native Willamette and Columbia River fish and other aquatic organisms and assist with species recovery and potential population productivity by protecting and improving hydrology, habitat, and water quality.	Biotic measures improved (Y/N)	5	0.102
Terrestrial Wildlife and Vegetation: Implement watershed actions to restore populations of terrestrial organisms to healthy, self-sustaining levels, protect and restore the composition and structure of native vegetation communities, and reduce populations of non-native plants and organisms to levels that do not compete with native species.	Terrestrial wildlife and vegetation restoration and enhancement (acres)	6	0.095
Terrestrial Habitat: Protect and improve upland habitat extent, quality, and connectivity that support the persistence of native terrestrial communities and connectivity to aquatic and riparian habitat.	Terrestrial habitat protected through acquisition (acres)	7	0.088
Human Pathogens: Maintain and manage sewer infrastructure and stormwater inputs and runoff to limit sewage overflow and the delivery of pathogens to waterways and achieve applicable water quality and sewer design manual standards.	Fecal inputs reduced (Y/N)	8	0.080
Stream Temperature: Protect and improve stream temperatures, dissolved oxygen, and pH levels that protect ecological health and achieve applicable water quality standards.	Stream temperature maintained/reduced (Y/N)	9	0.058
Stormwater Conveyance: Maintain stormwater collection and conveyance infrastructure capacity.	Substandard Stormwater pipes maintained (Y/N)	10	0.044

SECTION 5: STRATEGIES AND ACTIONS

The watershed health objectives outlined in Section 4 describe the desired changes in watershed conditions and functions. The PWMP outlines six strategies to bring about those changes. Strategies are broad approaches that are used to work toward the watershed goals and objectives. The six strategies are: Stormwater Management, Revegetation, Aquatic and Terrestrial Enhancement, Protection and Policy, Operations and Maintenance, and Education, Involvement, and Stewardship.

Actions are general projects or programs implemented to achieve the strategies. Table 4 summarizes the watershed strategies and actions as outlined in the PWMP. Additional actions, specific to the California subwatershed, were identified by a city-staffed technical advisory team (Appendix A) and external stakeholder input. This information is summarized in this section.

Table 4: PWMP Strategies and Actions

STRATEGIES	ACTIONS
Stormwater Management	Modify the storm drainage system to increase infiltration and maximize evapotranspiration
	Modify the storm drainage system to increase reuse or detain stormwater
	Modify the storm drainage system to treat stormwater pollutants
	Modify the storm drainage system to separate the flow from combined storm/sanitary sewer
Revegetation	Increase the extent of canopy and other vegetative cover
	Improve the quality and composition of vegetative cover
Aquatic and Terrestrial Enhancement	Restore channel and floodplain function and stability
	Restore or create river, stream, wetland, and terrestrial habitat structure and function
	Restore habitat connectivity and access
	Manage for appropriate native species
Protection and Policy	Implement management of erosion, sediment, and pollutant discharge from construction sites
	Implement management of stormwater for all new and redevelopment projects
	Implement management of pollutant discharges for industrial and commercial sites
	Protect sites and features with high watershed values and functions
Operations and Maintenance	Operate and maintain the storm sewer system, public rights-of-way, greenspaces and other city facilities and infrastructure to remove and prevent pollutant discharges
	Reduce illicit and non-stormwater discharges

	Maintain and repair sewer systems to ensure conveyance for current demand and future growth
Education, Involvement and Stewardship	Promote watershed awareness with city staff, schools, the business community, organizations, and general public
	Provide pollutant prevention education to city staff, the business community, organizations, and general public
	Provide technical assistance and incentives to city staff, schools, the business community, organizations, and general public

Once the actions were identified, they were evaluated for the California subwatershed using field assessments to develop opportunities, or site-specific projects and programs. The field assessments verified current subwatershed conditions (i.e., asset areas and problem conditions) and identified opportunities to address the problems and/or to protect these assets. The field assessments involved an overview of all streams, resource areas, and developed and undeveloped upland areas within the subwatershed, and resulted in detailed documentation of all potential action sites (See Appendix A for more information).

The summary is not intended to be exhaustive of opportunities to improve watershed health in the California subwatershed, but rather serve as an illustration of how the project team arrived at the specific action opportunities outlined in Section 6.

Some potential actions address many needs and could be included under more than one strategy, but in order to avoid duplication, they are listed under only one strategy.

Stormwater Management

Stormwater management is an essential component of watershed health improvements. Development, and the consequent increase in impervious surfaces, increases the volume and velocity of stormwater runoff which can lead to flooding and erosion, habitat degradation, and impaired water quality. Managing stormwater runoff through site design or retrofits of existing development can reduce these effects. Directing runoff to natural systems like landscaped planters, swales, and rain gardens, or installing an ecoroof reduces and filters stormwater runoff. Consideration should be given to site constraints arising from geotechnical (e.g., soils/infiltration) and environmental issues (e.g., contamination) before implementing stormwater management practices.

The following is a summary of potential stormwater management actions for the California subwatershed:

- Identify opportunities to increase infiltration for onsite stormwater management at schools and institutions, taking advantage of low grade areas and large public rights of way where available.

- Explore daylighting options for the streams that are currently draining into the combined sewer system.
- Identify opportunities to treat polluted stormwater runoff from major transportation corridors such as Interstate 5.
- Explore opportunities in the right of way (ROW) at Miles Place.

Revegetation

Removing non-native, invasive species and planting native vegetation is a key strategy to meet watershed goals. Increasing the amount of canopy cover and native vegetation improves the physical-biological elements of the urban environment such as water quality, stream integrity, and fish and wildlife habitat. Vegetation intercepts, stores, and absorbs rainfall as well as filters pollutants and nutrients from stormwater runoff. Revegetation efforts can also produce aesthetic, economic, and other community benefits.

The following is a summary of potential revegetation actions for the California subwatershed:

- Increase the extent of canopy and other vegetative cover.
- Manage vegetation for fire safety: remove invasives from high fire risk areas.
- Reduce and revegetate informal trails on public land.
- Improve native vegetation as food sources for wildlife.
- Enhance oak understory habitat in Willamette Park.



Aquatic and Terrestrial Enhancement

Aquatic and Terrestrial enhancements improve hydrology, physical habitat, water quality, and biological communities. Restoring channel complexity and increasing riparian vegetation helps normalize stream flows, provide flood storage, and recharge ground water. Natural area enhancements can improve habitat and protect biodiversity.

The following is a summary of potential aquatic and terrestrial enhancement actions for the California subwatershed:

- Increase connectivity between the Willamette River and the floodplain.
- Improve bank conditions by softening banks.
- Vegetate floodplain with bottomland hardwood forest species.
- Increase shallow water habitat and protect off-channel areas (alcoves, lagoons, backwaters, secondary channels) and riparian habitats.
- Enhance beaches to improve habitat for young age classes of Chinook and coho salmon.
- Revegetate stream banks in the upland natural areas of the subwatershed.
- Retain snags and downed wood in ravines of the southwest hills.
- Reduce yard and other debris on public land.
- Reduce the impacts of domestic animals on public lands.
- Restore habitat connectivity and access.
- Manage or reduce the number of structures such as pilings, docks, marinas, and houseboats that are common in the reach to reduce cover for introduced aquatic species that prey on salmonids.

Protection and Policy

Protecting important watershed functions and applying policies that integrate sustainable practices into citywide plans and projects are important to watershed health. Conservation and protection of existing vegetation, stream channels, and wetlands are critical strategies to achieve watershed health.

The following is a summary of potential actions for the California subwatershed:

- Pursue acquisitions of privately owned land that would benefit PWMP goals and objectives.
- Partner with Bureau of Planning and Sustainability (BPS) on the River Plan and other projects to protect, conserve, and restore natural resources.

Operations and Maintenance

The City operates and maintains a wide variety of infrastructure, such as storm, sanitary and combined sewer systems, and wastewater treatment plants, that benefits and helps protect public health and safety, water quality, and property. Effective operation and maintenance practices are essential to watershed health.

The following is a summary of potential operations and maintenance actions for the California subwatershed:

- Work collaboratively with Maintenance Operations in the Portland Bureau of Transportation to remove/control roadside invasive plant species, and install sustainable stormwater management strategies such as green streets in public ROWs.
- Support staffing for PP&R maintenance staff to include trail maintenance, invasive removal, and trash removal (including pet waste).

Education, Involvement and Stewardship

The Education, Involvement, and Stewardship strategy is integrated into all other strategies. Public involvement and stewardship encourages citizens to get involved in the work of protecting our natural resources. Raising awareness of watershed issues and fostering stewardship of city-owned natural areas promotes healthy watersheds.

The following is a summary of potential education, involvement, and stewardship actions for the California subwatershed:

- Provide education to the general public and organizations on the impacts of informal trails and domestic animals on watershed functions.
- Provide education to organizations and the general public on the problem of non-native invasive plants and their impacts on watershed functions.
- Develop signage to increase public awareness.
- Provide education to landowners at the headwaters of streams on riparian protection and enhancement and the importance of planting native vegetation.

SECTION 6: PROJECT OPPORTUNITIES

This section describes specific actions that can be taken throughout the California subwatershed to improve subwatershed health. They are geographically specific applications of the potential actions outlined in Section 5. Opportunities to improve watershed health were identified according to the process that included data analysis, review of available information of current and historical subwatershed conditions, field assessments, stakeholder involvement, and City staff input, and then scored and ranked according to the process described in Section 4. They are organized by the six PWMP strategies presented in Section 5 (Figure 5 at the end of this section).

A single list of ranked projects was developed across all strategies; however, for descriptive purposes, the projects are organized below in tables by PWMP strategy. Therefore, the ranking is not sequential within each set of strategies. Citywide programmatic opportunities were not included in the subwatershed objective ranking

process and did not receive a ranking; however, they are included in the tables in this section.

Stormwater Management Opportunities

The specific stormwater projects and programs presented in Table 5 are designed to improve natural stormwater function, and are the foundation for all other watershed protection and improvement efforts. These projects help minimize the effects of development on watershed processes and natural conditions, providing water quality treatment, flow attenuation, interception and infiltration, reduced channel erosion, improved aquatic habitat conditions, and protection of downstream restoration projects. Projects include structural retrofits and other stormwater management measures that reduce effective impervious area (EIA) by promoting interception, infiltration, retention, and detention as well as by collecting and limiting contaminant transport. Some potential project sites may be constrained by geotechnical (soils/infiltration) concerns and other environmental issues (contamination). Environmental site assessments will be conducted at a later planning stage. Education and outreach is a critical element of improving watershed health and will be incorporated into all stormwater management projects.

Selection, design, and implementation of these projects will be coordinated with or rely directly on a variety of City partners and programs. Critical partners, programs, and associated regulatory requirements include: Portland Bureau of Transportation (PBOT), PBOT Maintenance Operations, Urban Forestry, NPDES MS4 permit program, Underground Injection Control Program, TMDLs, CSOs, Clean River Rewards (stormwater discount) Program, Clean Rivers Education Program, Downspout Disconnection Program, Sustainable Stormwater Program, Community Watershed Stewardship Program, and the 2008 Stormwater Management Manual (SWMM).

The process of identifying stormwater management opportunities through watershed field assessments included many internal and external stakeholders. The BES Asset Management System Analysis and Sustainable Stormwater groups were key players in this process. Staff from both groups took part in a mapping workshop and provided feedback that was used to guide the IS field assessments and the subsequent development of potential projects.

The subwatershed IS process also integrated information gathered from the Combined System Sewer Plan (CSSP) inflow control (IC) field assessments conducted in spring 2007. These assessments were used to identify potential projects and were organized by stormwater facility type and project area.

Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities identified on properties owned or managed by PP&R will follow the process established through a Memorandum of Understanding (MOU) between PP&R and BES. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Table 5: California Subwatershed Stormwater Opportunities

Rank	Project/Program	Location	Project/Program Description
1	Willamette Park Stormwater	Willamette Park	Treat parking lot and roadway stormwater runoff before it reaches the river. The existing swale is poorly connected to the parking lot runoff. Add a speed bump at pedestrian crossing to channel rain runoff to existing swale. Conduct pet waste outreach adjacent to off-leash area (OLA).
2	Willamette Park Off-Leash Area Stormwater Retrofit	Willamette Park	Currently water drains from an inlet in the Willamette Park OLA directly to the Willamette River. Treat water before it enters the inlet with possible fenced rain garden.
8	Burlingame Baptist Church Parking Lot Retrofit	125 SW Miles Street	This tax lot was identified by the Systems Analysis Group for potential disconnection from the combined system. It is in an area where there is a need for pipe upsizing and/or stormwater separation to reduce the risk of basement sewer backups. This project would retrofit the church parking lot by reconfiguring the lot to allow for a swale along the eastern edge of the paved lot. Install speed bump berm to capture a portion of the northern lot runoff. Could also incorporate some of the gravel ROW that is immediately east of the parking lot that the church is using as an extension of the parking lot.
11	California Subwatershed Green Streets	Multiple	This area has been identified by the Combined Sewer System Plan (CSSP) as having sewer capacity issues. In this project area, the CSSP field team identified three potential locations for stormwater facilities.
14	Burlingame Green Street	SW Burlingame Avenue	Potential green street project on Burlingame Avenue between SW Chestnut and SW Burlingame Place. Project based on citizen interest in traffic calming/green street. Opportunity for coordination with PBOT.
15	Miles Place ROW Stormwater	SW Miles Place @ SW Miles Street intersection	ROW between street intersection and the river could act as a stormwater pretreatment and infiltration location. The ROW is currently a mowed lawn, opportunity for tree plantings. Outreach to street residents could encourage them to disconnect downspouts, direct roof runoff to planters. Explore possible Local Improvement District (LID), pervious street surface.
16	SW Florida Street Swales	SW Florida Street at intersection with SW Virginia	Place street swales (curb extensions) on either side of SW Florida Street as it approaches the intersection of SW Virginia Avenue. This is a good candidate for the proposed work based on condition of curbs (fair to poor), need for pedestrian ramps, and no apparent conflict with existing parking.
17	Burlingame Baptist Church Downspout Disconnect	125 SW Miles Street	This tax lot was identified by the Systems Analysis Group for potential disconnection from the combined system. It is in need of pipe upsizing and/or stormwater separation to reduce the risk of basement sewer backups. Disconnect church downspouts to rain garden (south downspout) and soakage trench (west downspout). This half of the church drains to the Stephens subwatershed.
18	CSSP Parking Lot Retrofits: California Project Area	Multiple	This area has been identified by the CSSP as having sewer capacity issues. In this project area, the CSSP field team identified two potential parking lots for retrofits.

Revegetation Opportunities

Efforts to preserve native vegetation will increase the City's ability to achieve and maintain healthy watersheds. Increasing canopy cover and native vegetation improves the physical-biological elements of the urban environment, such as water quality, stream

integrity, and fish and wildlife habitat. Revegetation projects can also result in cost savings on infrastructure expenditures, as well as produce aesthetic, economic, and other community benefits.

Removing invasive plant species is a critical element of the citywide revegetation strategy. Invasive plants impact watershed health by degrading water quality by increasing erosion, reducing biodiversity, altering habitat quality, reducing tree cover, and changing soil characteristics. The City of Portland has a number of plans and programs that support invasive plant removal including the



PWMP, the City’s Invasive Plant Strategy, the BES Early Detection and Rapid Response Program, and PP&R’s Protect the Best program. Selection, design, and implementation of revegetation opportunities will be coordinated with these plans and programs.

The Willamette team worked closely with the BES Watershed Revegetation team, PP&R’s City Nature, the West Willamette Restoration Partnership, and others to identify potential projects. Education and outreach is a critical element of improving watershed health and will be incorporated into all revegetation projects.

Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities identified on properties owned or managed by PP&R will follow the process established through a MOU between PP&R and BES. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Table 5: California Subwatershed Revegetation Opportunities

Rank	Project/Program	Location	Project/Program Description
22	California George Himes Park Revegetation	George Himes Park	Upland and riparian habitat is severely degraded by invasive plants. Remove invasive ivy, blackberry, clematis, and weedy trees (Norway maple) in the southern section of the park (that falls in California) subwatershed).
24	Willamette Park North Revegetation/Increase Canopy Cover	Willamette Park, North of boat ramp parking	Increase canopy cover with a mosaic of native trees and shrubs in an area that is composed primarily of landscape turf.
26	ODOT Lairhill South Revegetation	ODOT ROW between Interstate 5 and	ODOT ROW between Interstate 5 and Barbur Boulevard has greater than 50% invasive cover trees and understory. This area could be proposed as secondary

Rank	Project/Program	Location	Project/Program Description
		Barbur Boulevard	mitigation area for Iowa Bridge (ODOT Lairhill North in Carolina-Terwilliger subwatershed primary mitigation area).
28	Heritage Oak SHA Revegetation/Enhancement	Willamette Park	Protect/enhance Willamette Park SHA. Adapt current park management policy to allow natural recruitment of native oak vegetation and next generation of native oak trees. Current use is OLA.
29	Miles Place Revegetation	SW Miles Place	Project is at south end of California subwatershed. Riverside of 16 private properties. It was previously a revegetation project, and includes shoreline owned by PP&R, in Willamette Park. Landowner cooperation provides opportunity. Shallow water, wide beach provides potential habitat for aquatics and terrestrials. Good connectivity to floodplain (see 1996 flood footprint).
30	Willamette Park South Revegetation	Willamette Park	Enhance tree canopy at the south end of Willamette Park. Improve understory vegetation and maintain native habitat for both aquatic and terrestrial habitat features.
31	Willamette Park Swale	Willamette Park	Expand native plantings, control invasives encroaching into swale planting area. Swale and native plant area could be expanded to enhance protection of mudflats and general riparian function.

Aquatic and Terrestrial Enhancement Opportunities

These specific stream enhancement projects are designed to improve the amount and quality of important habitat in the Willamette River Channel and its California subwatershed tributaries. The lower Willamette functions as a critical salmonid migration corridor and rearing ground, and the ecological effects of local conditions impact Chinook, coho, and steelhead populations throughout the entire Willamette subbasin. These projects will increase habitat extent and diversity by daylighting stream channels, improving streambank conditions, creating shallow water and off channel habitat, increasing tributary stream accessibility, adding channel complexity, and increasing channel stability.

Examples of specific terrestrial enhancements to protect, restore, and enhance aquatic and terrestrial habitat conditions (as appropriate to the site) include:

- Snag creations
- Seasonal ponds for amphibian breeding
- Bat or bird habitat artificial structures
- Oak replacement

Once a dominant habitat type in the Portland area, Oregon white oak woodlands are particularly important both locally and regionally. Many different wildlife species, such as neo-tropical migrant birds and Western gray squirrels, utilize this valuable plant community for nesting and foraging.

Selection, design, and implementation of these projects will be coordinated with or rely directly on a variety of existing City and other agency programs. Critical programs,

partners, and associated regulatory requirements include: the BES Science Fish and Wildlife Program, TEES, the ESA, Water Resource Development Act (WRDA), River Renaissance Program, BPS and Metro’s riparian corridor and wildlife habitat inventories, PP&R, Oregon Department of Fish and Wildlife (ODFW) Restoration and Enhancement Program, and Oregon Watershed Enhancement Board (OWEB).

Education and outreach is a critical element of improving watershed health and will be incorporated into all aquatic and terrestrial enhancement projects. Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities identified on properties owned or managed by PP&R will follow the process established through a MOU between PP&R and the Bureau. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Table 6: California Subwatershed Aquatic and Terrestrial Enhancement Opportunities

Rank	Project/Program	Location	Project/Program Description
3	Willamette Park North Riparian Enhancement	Willamette Park, riparian area north of boat ramp parking	Widen the riparian area by moving the walk path (Greenway Trail) west approximately 20 feet; redesign the bank by laying it back and reducing the slope; remove invasive species and plant native riparian vegetation.
4	Willamette Park Central Riparian Enhancement	Willamette Park, riparian area east of oaks/tennis courts	Widen the riparian area by moving the walk path (Greenway Trail) west approximately 20 feet. Remove invasive species and plant native riparian vegetation. Lay back the streambank to reduce bank slope and remove bank hardening/riprap.
5	Willamette Park South Riparian Enhancement	Willamette Park, riparian area south of oaks	Widen the riparian area by moving the walk path (Greenway Trail) west approximately 20 feet. Remove invasive species and plant native riparian vegetation. Add large wood to enhance fish habitat.
7	George Himes Park South Stream Daylighting	South reach of George Himes Park	Daylight stream reach in southern section of George Himes Park. Begin at upper end on Burlingame and end at Interstate 5. Reduce stormwater inputs to combined system in natural areas. Increase year round access to streamflow for terrestrial wildlife and aquatic organisms.
9	Boat Washing Station and Information Kiosk	Willamette Park Boat Ramp	Install a boat washing station at Willamette Park boat ramp with information kiosk to educate boat owners about invasive zebra mussels.

Protection and Policy Opportunities

Projects and programs in this category identify opportunities to protect and improve watershed function, habitat value, and connectivity through acquisition, zoning overlay, resource tracts, Riverside Plan protections, development standards review, building code review, and other natural resource protection measures and programs. This approach strives to ensure that the highest quality areas are protected, and that development planned in or near resource areas is completed with the most environmentally sensitive design and minimal impact.

Protection of areas with the highest remaining function and value has been identified as a cornerstone for effective watershed management (City of Portland 2004). Areas for which protection and policy actions could be pursued include:

- Remaining forested areas, stream remnants, and associated ravines that serve as key habitat area anchors and connections between larger habitat areas
- Any area where vegetated floodplain is accessible to the river, or where natural, gently sloped streambanks are present
- Wetlands and forested areas, natural streambanks, and tributary confluences that provide high quality habitat and are the most sensitive portions of the watershed
- Citywide development issues related to the amount of hardened streambanks, shallow water habitat, and riparian or floodplain vegetation

A number of policy and regulatory strategies have been effectively used by the City to protect watershed resources. Selection, design, and implementation of these projects will be coordinated with or rely directly on a variety of existing City programs. Critical partners and programs include: BPS Portland Plan and River Plan projects, Regulatory Improvement Program, PBOT Planning, Urban Forestry Program, SWMM, development standards review, building code review, environmental review, Metro natural resources planning, and Portland Development Commission.

Willamette Watershed Property Acquisition Program

Acquisition is a tool under the Protection and Policy strategy of the PWMP. These projects are listed below. Properties were chosen on the basis of their ability to protect watershed assets or to allow BES to implement an IS project that would be more appropriately located on public property. Properties identified for potential acquisitions in the Willamette Watershed in Portland will be managed through a “willing seller” approach. Through the program, willing sellers are offered fair market value for their property and are under no obligation to sell. If they choose to sell, the land acquired through the willing seller program will be managed to improve fish and wildlife habitat, restore wetlands, improve water quality, and may provide passive recreation activities. Some properties identified as potential acquisition sites may be constrained by contamination and/or other feasibility issues. These issues will be identified and addressed at a later planning stage.

Land conservation easements may also work to achieve some of the PWMP protection and policy goals, and thus the IS goals. A conservation easement is a legally binding agreement made by the property owner not to develop part of a property, but to leave it permanently "natural". The landowner retains title to the property. The easement becomes part of the land deed, meaning that all future property owners will be bound by the terms of the easement.

In November 2007, the City’s Grey to Green Initiative was launched to accelerate some principal elements of PWMP implementation. The Grey to Green Land Acquisition Program will build on previous and current efforts to permanently protect important natural resources areas by placing land in public ownership.

Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities identified on properties owned or managed by PP&R will follow the process established through a MOU between PP&R and BES. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Some protection and policy projects/programs that have been identified are citywide opportunities and were not included in the subwatershed objective ranking process; however, they are included in the following table.

Table 7: California Subwatershed Protection and Policy Opportunities

Rank	Project/Program	Location	Project/Program Description
6	George Himes West Property Acquisition	Between SW Burlingame and Terwilliger	These five lots have Himes Creek headwaters running through their steep canyon. Protect steep canyon of Himes Creek from development. Invasive removal includes ivy and clematis. Debris is present in canyon, educate neighborhood about dumping yard debris. Conduct outreach on invasives and the Backyard Habitat Certification program. Explore grant opportunities for vegetation management.
10	George Himes South Property Acquisition	South of George Himes Park	Project area is undeveloped land containing headwaters of stream. Acquisition provides potential for stream protection/enhancement. Remove invasives.
13	Willamette Park Heritage Oak Stand	Willamette Park, west of the boat ramp parking	Protect an existing stand of Oregon oaks that are in an OLA west of the boat ramp parking area. Site should be nominated as a SHA and proposed as an oak heritage site. It can be further enhanced by planting an understory oak shrub habitat.
19	Huntington Rubber Corporation ECSI Site	7030 SW Macadam	This property is listed in the DEQ's ECSI database. DEQ recommends "other remedial or investigative action", so a cleanup measure has not yet been implemented. Potential project activities at the site could include, 1) outreach to property owners through the BES Brownfield program and 2) identify opportunities for monitoring of cleanup activities and long term impacts of the contaminant sources.
20	Former Rodda Paint Building ECSI Site	6932 SW Macadam	This property is listed in the DEQ's ECSI database. The site is still under investigation by the DEQ, so a cleanup measure has not yet been implemented. Potential project activities at the site could include, 1) outreach to property owners through the BES Brownfield program and 2) identify opportunities for monitoring of cleanup activities and long term impacts of the contaminant sources.
21	Willamette Oaks Building ECSI Site	6720 SW Macadam	This property is listed in the DEQ's ECSI database. The site is in the "Remedial Design" phase, so a cleanup measure has not yet been implemented. Potential project activities at the site could include, 1) outreach to property owners through the BES Brownfield program and 2) identify opportunities for monitoring of cleanup activities and long term impacts of the contaminant sources.
23	Corbett Cliffs Property Acquisition	East of SW Corbett Avenue; between SW Florida and Miles	This is an undeveloped area in southwest Portland. It is comprised of approximately 4.5 acres of steeply sloped land and approximately 2,000 linear feet of connected habitat. Potential to maintain connectivity of wildlife corridor.
25	George Himes East	Between SW	This site is undeveloped habitat adjacent to stream. Potential to

Rank	Project/Program	Location	Project/Program Description
	Property Acquisition	Parkhill Drive and SW Barbur Boulevard	implement Project # 7 <i>George Himes Park South Stream Daylighting</i> north of the properties to connect to stream. Remove invasive plants and enhance stream habitat.
27	Miles Place Property Acquisition	SW Miles Place	Consider willing seller Federal Emergency Management Act (FEMA) grant program at locations with repetitive loss.
Not ranked	Environmental Land Use and Zoning Program	Citywide	Participate in the City's natural resource inventory update to protect high quality habitats and sensitive portions of the watershed. The update of this program is needed to reflect recent science and better data and to enhance protections for streams and drainages, wetlands, riparian areas and upland wildlife habitat. As part of this update, the City will address compliance with Metro Title 13 Nature in Neighborhoods, and State Land Use Goals 5 (Significant Resources) and 6 (Air and Water Quality). The update will also inform potential changes to the Environmental Overlay zones.
Not ranked	The Portland Plan	Citywide	Participate in the BPS planning process for the Portland Plan. The Portland Plan will update the City comprehensive plan, including policies and goals related to natural resources and watershed health.
Not ranked	The River Plan	Citywide	Participate in the BPS planning process for the River Plan. The River Plan project will address protection, conservation, and restoration of natural resources in the Willamette River corridor east of Interstate 5. Beginning in 2009, the River Plan will focus on the central and south reaches of the project area, which include portions of the southwest subwatersheds. As part of the project, previously adopted natural resource inventories and environmental overlay zoning will be updated as needed to address current natural resource information, City watershed goals and policies, and Metro Title 13 Nature in Neighborhoods requirements.
Not ranked	NPDES Coordination	Citywide	Participate in NPDES permit-related efforts within the City to maximize opportunities for Watershed Services to provide input on future modifications to the City's NPDES permit, allow earlier identification of potential impacts of permit modifications on watershed restoration planning, and provide opportunity to recommend modifications of the NPDES monitoring program to optimize data collection efforts.
Not ranked	River Bank Treatment Policy	Citywide	Participate in City policies pertaining to river banks to eliminate construction of new vertical walls, minimize use of pilings, encourage alternative and bio-engineered bank treatments, and protect existing beach, off-channel, vegetated, and shallow water habitats.
Not ranked	Subwatershed-Specific Stormwater Management Manual	Citywide	Develop subwatershed-specific stormwater manual guidelines for new and redevelopment sites with the Bureau of Development Services (BDS). Develop EIA (Effective Impervious Area) targets for new and existing development with each subwatershed. Pursue City policy and codes that would limit EIA to a maximum level.
Not ranked	Tree Canopy Management	Citywide	Participate in the Citywide Tree Policy Review and Regulatory Improvement Project. This project is a two-year effort to clarify, simplify, and improve the consistency and effectiveness of the City's regulations pertaining to trees. Options under consideration include restructuring code, establishing a single point of contact to address tree-related inquiries and requests, consolidating permitting functions, and amending code to improve tree preservation replacement and protection during construction.
Not ranked	ODOT Coordination	Interstate-5 and Barbur Blvd.	Coordinate with ODOT on water quality issues to facilitate the treatment and detention of stormwater runoff from ODOT transportation corridors.

Rank	Project/Program	Location	Project/Program Description
Not ranked	Wood Retention Policy	Citywide	Develop an interbureau wood retention policy.

Operations and Maintenance Opportunities

Maintaining a functional sewer infrastructure is a core BES charge. Opportunities in this category are broad undertakings that include citywide sewer maintenance actions related to the protection and improvement of watershed conditions.

Selection, design, and implementation of these projects will be coordinated with or rely directly on a variety of existing City programs. Critical partners and programs include: PBOT Maintenance Operations, and the BES Wastewater Maintenance group, Spill Protection and Citizen Response Section, Illicit Discharge Controls, Industrial Pretreatment Program, and the Industrial Stormwater Program.

Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities identified on properties owned or managed by PP&R will follow the process established through a MOU between PP&R and BES. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Operations and maintenance projects that have been identified are citywide opportunities and were not included in the subwatershed objective ranking process; however, they are included in the following table.

Table 8: California Subwatershed Operations & Maintenance Opportunities

Rank	Project/Program	Location	Project/Program Description
Not ranked	Maintenance Staff BMP Program	Citywide	Coordinate adoption of BMPs with Maintenance Operations staff in the interest of watershed health.
Not ranked	Maintenance Inspection Program	Citywide	Conduct maintenance inspections of existing facilities, illicit discharges, etc.

Education, Involvement, and Stewardship Opportunities

Education and outreach is a critical element of improving watershed health and will be incorporated into all California IS projects. The following projects are solely focused on this strategy. Public and commercial education programs are necessary to reach out to watershed residents and businesses to help improve watershed conditions. Projects in this category relate to a range of issues, such as maintenance practices, commercial pollution control practices, public stormwater education, pet waste cleanup, yard design and invasive species education, and dumping prevention outreach.

Selection, design, and implementation of these projects will be coordinated with or rely

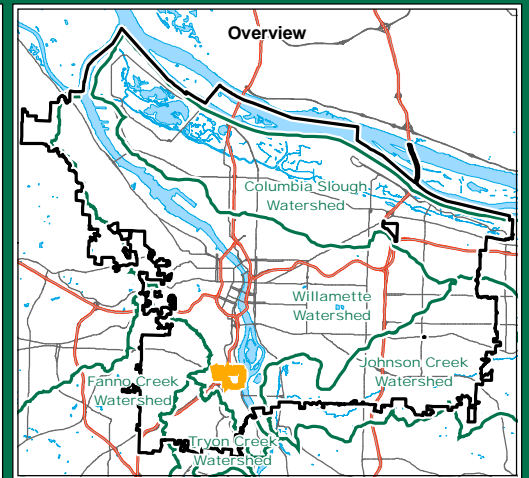
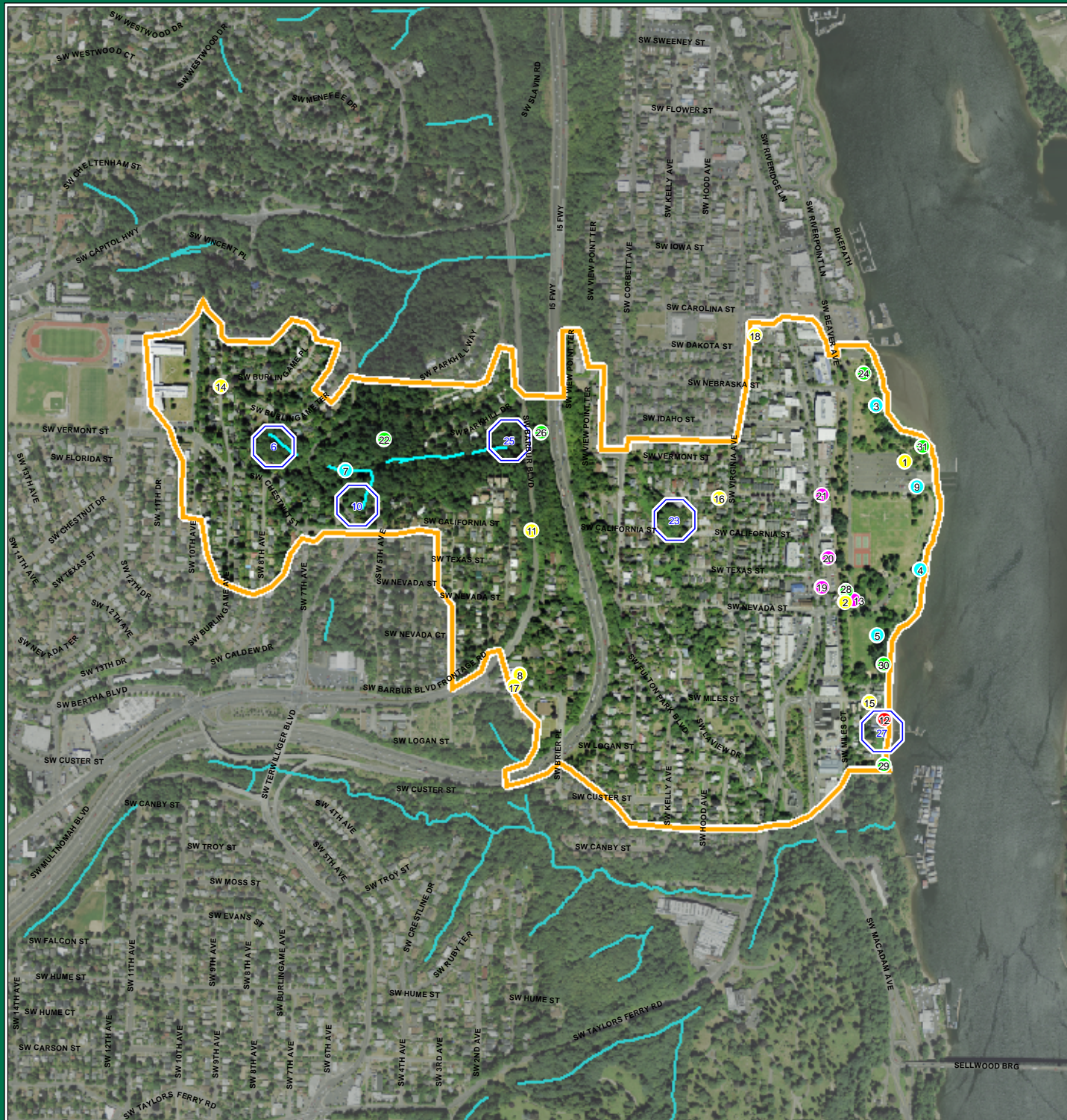
directly on a variety of existing City programs. Leveraging existing resources and encouraging and supporting watershed improvement actions at the community level is a key factor in the Education, Involvement and Stewardship strategy. Critical existing programs include: Neighborhood groups and associations, local business groups, Friends groups, the Community Watershed Stewardship Program, Three Rivers Land Conservancy’s Backyard Habitat program, the West Willamette Restoration Partnership, Metro, and the West Multnomah Soil & Water Conservation District.

Opportunities that have been identified on private properties will not be pursued without the consent and cooperation of affected property owners. Opportunities on properties owned or managed by PP&R will follow the process established through a MOU between PP&R and BES. The MOU process will be used to guide the implementation of any opportunities selected for concept planning or design development.

Most of the Education, Involvement, and Stewardship programs/projects that have been identified are citywide opportunities and were not included in the subwatershed objective ranking process; however, they are included in the following table.

Table 9: California Subwatershed Education, Involvement, and Stewardship Opportunities

Rank	Project/Program	Location	Project/Program Description
12	Miles Place Invasive Species Outreach	Residences along Miles Place	Conduct invasive species outreach among residents of Miles Place.
Not ranked	Riparian Zone Outreach	E zones and Drainage Reserve areas	Conduct outreach and education to homeowners living in a riparian zone. Potential partnership with Three Rivers Land Conservancy’s Backyard Habitat program.
Not ranked	Riverbank Maintenance Practices Outreach	Willamette River property owners	Conduct outreach and education to improve riverbank maintenance practices related to stormwater routing, stream protection, and landscaping practices.
Not ranked	Illegal Dumping Outreach	Citywide	Develop trash and yard debris disposal education program for homeowners adjacent to natural areas. Install signs, fences.
Not ranked	Invasive Species Outreach	Citywide	Support landowner education throughout the Willamette Watershed to control the spread of existing problem species, to prevent introduction of new invasive species, and to provide educational opportunities particularly in parks and other public and open spaces.
Not ranked	Naturescaping and Yard Tree Outreach	Citywide	Support landowner education throughout the Willamette Watershed to encourage yard trees, naturescaping, and backyard habitat. Provide educational opportunities particularly in parks and other public and open spaces.
Not ranked	Pet Waste Outreach	Citywide	Support pet waste education throughout the plan area. Install signs, bag stations, and trash bins in natural areas.
Not ranked	Residential Maintenance Practices Outreach	Citywide	Conduct outreach, training, education for apartment and condominium owners, managers, and maintenance workers to protect and improve conditions of stream and riparian areas.
Not ranked	Residential Non-Point Source Pollution Outreach	Citywide	Conduct outreach and education to reduce impacts of non-point source pollutants such as oil, fertilizers, and lawn chemicals.
Not ranked	Promote Fire Safe Landscaping	Residences in high fire hazard areas	Support education of property owners in high fire hazard areas of the City. Help residents learn about fire safe methods of landscaping their property.



Legend

- City of Portland
- California Subwatershed Boundary
- Open Channel Streams

California Potential Project Strategies

- Aquatic Terrestrial Enhancement
- Education Involvement Stewardship
- Protection and Policy
- Revegetation
- Storm Water Management
- Easements or Acquisitions

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CITY OF PORTLAND
ENVIRONMENTAL SERVICES

Systems Analysis

Spatial Analysis and Modeling

Southwest Subwatersheds
Improvement Strategies

Figure-5
California
Potential Projects

Project No <p style="text-align: center; font-weight: bold;">8800</p>	Date Printed: <p style="text-align: center; font-weight: bold;">05/21/09</p>
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SECTION 7: RECOMMENDATIONS

This report summarizes the IS process for the California subwatershed and identifies opportunities, in the form of ranked site-specific projects, to protect and improve watershed health. This process is only one step in the larger watershed management process, a long-term adaptive management system that will include implementation, monitoring, evaluation and improvement of projects and programs.

The projects in this IS report were developed through a rapid assessment method that is based on a well established science-based method for the identification of subwatershed improvements. The method was developed by the Center for Watershed Protection. Selecting the improvement strategies involved the collaboration of various stakeholders including City bureaus with an interest or expertise in the area, non-profit organizations and citizens local to the subwatershed.

The following recommended actions are grouped relative to geographic and/or programmatic clusters. Actions in this section have been grouped and prioritized based on an integrated approach that addresses multiple goals and needs including watershed health, sewer capacity, pipe rehabilitation, and combined sewer overflow (CSO) control. The groups of actions are intended to protect areas that 1) have been identified in the IS process as assets, or 2) work toward improving local subwatershed conditions in areas that have been identified as problematic. The projects individually and collectively work toward achieving the goals and objectives identified in the Portland Watershed Management Plan (PWMP). Additionally, the actions were grouped based on the Technical team's understanding of opportunities that exist for funding, partnerships, and/or local support. A concept plan is provided in Figure 6, at the end of this section.

Willamette Park Stormwater and Aquatic and Terrestrial Habitat Enhancements

Background

Willamette Park covers most of the California subwatershed riverfront, and is managed by Portland Parks and Recreation (PP&R). It is a *hybrid park* that contains both developed and natural areas, and is managed accordingly. Prior to the 1930s, the park was subject to annual flooding. The mud flats in the northeast section of the area are remnant of the once larger floodplain that was once present at this site. Remnant oak stands from that time period line the west boundary of the park.

A large area has been designated as Special Habitat Area (SHA: BOP 2009, DRAFT) for the presence of the following resources:

- Corridor between wildlife patches or habitats
- Area critical to sensitive species life history on more than an incidental basis

- Critical habitat as designated by National Oceanic and Atmospheric Administration (NOAA)

Willamette Park is also the location of a potential Water Resources Development Act (WRDA) project.

Site Description

The 26 acre park includes a boat dock, boat ramp, disabled access picnic area, disabled access restroom, dog off-leash area, paved and unpaved paths, picnic sites, a playground, soccer fields, and a lighted tennis court. Important wildlife habitat features found at this site include

floodplain wetlands, bottomland hardwood forest, mudflats, and rock outcrop islands. These areas provide key ecological functions and are considered SHAs by the City’s Draft NRI and TEES.



PP&R completed an ecological health survey in

October 2004 of the natural area vegetation in Willamette Park. The area surveyed was ranked as poor. More information on the ecological health survey is available at <http://www.portlandonline.com/parks>.

Constraints

Project constraints include costs and potential conflicts with park usage.

Partnerships

The Willamette Watershed team will partner with staff from City bureaus, local, state and federal agencies, citizens' groups, and private property owners to protect the area’s natural resources and implement stormwater management solutions that integrate the urban area with the natural environment. Potential partners include: PP&R, the BES Revegetation Team, and the Sustainable Stormwater Group.

Potential Funding Sources

Potential funding sources include: Oregon Department of Agriculture (ODA), Oregon Watershed Enhancement Board (OWEB), Oregon Department of Fish & Wildlife (ODFW), and the National Fish & Wildlife Foundation (NFWF).

Benefits

The projects grouped below reduce, detain, and/or treat stormwater flows, address flood storage and bank stabilization issues, improve water quality, and restore aquatic and terrestrial wildlife habitat.

Potential Projects and Programs

The following potential projects and programs were identified for Willamette Park. Descriptive information for each is available from the contact provided earlier in this report. The potential projects and programs are conceptual; no design or project development was conducted during the assessment and development of this Improvement Strategies (IS) report. Potential project and programs for the Willamette Park area that are prioritized through the IS process include:

Stormwater Management Projects

All stormwater management projects will require agreements with property owners. Potential projects and their rankings are as follows:

- Willamette Park Stormwater (1)
- Willamette Park Off-Leash Area Stormwater Retrofit (2)

Aquatic and Terrestrial Enhancement Projects:

All aquatic and terrestrial enhancement projects will require agreements with property owners. Potential projects and their rankings are as follows:

- Willamette Park North Riparian Enhancement (3)
- Willamette Park Central Riparian Enhancement (4)
- Willamette Park South Riparian Enhancement (5)
- Boat Washing Station and Information Kiosk (9)

Revegetation Projects:

All revegetation projects will require agreements with property owners. Potential projects and their rankings are as follows:

- Willamette Park Swale (31)
- Willamette Park North Revegetation/Increase Canopy Cover (24)
- Heritage Oak SHA Revegetation/Enhancement (28)
- Willamette Park South Revegetation (30)

Protection and Policy Projects:

All protection and policy projects will require agreements with property owners. Potential projects and their rankings are as follows:

- Willamette Park Heritage Oak Stand (13)

Education, Involvement, and Stewardship Projects:

Education, Involvement, and Stewardship projects are as follows (these projects and programs have not been ranked):

- Invasive Species Outreach
- Pet Waste Outreach

George Himes Stream Daylighting

Background

Streams that flow through George Himes Park are ultimately piped into the combined sewer system. This exacerbates pipe system capacity issues and delivers nutrient-rich cold water tributary flows to the treatment plant rather than the Willamette River where it could benefit fish habitat. The following group of recommended actions would improve watershed health while removing flow from the combined sewer system:

Site Description

George Himes Park spans both the Carolina-Terwilliger and the California subwatersheds. The park contains dense forests and headwater streams that are an integral part of a chain of natural areas that traverse the West Hills of southwest Portland. The open stream channels provide stormwater drainage, aquatic and terrestrial habitat, and groundwater recharge.

PP&R completed an ecological health survey of the natural area vegetation in George Himes Park in October 2004. The area surveyed ranged from poor to fair. More information on the ecological health survey is available at <http://www.portlandonline.com/parks>.

Constraints

Construction of an open channel through the developed portion of the subwatershed will be constrained by development. Where it is found to be feasible (in rights of way and through private landowner agreements) construction may be constrained by costs. Acquisition will be constrained by landowner willingness to sell their property and costs.

Partnerships

The Willamette Watershed team will partner with staff from City bureaus, local, state and federal agencies, citizens' groups, and private property owners to protect the area's natural resources, and implement stormwater management solutions that integrate the urban area with the natural environment. Potential partners include: PP&R, the BES Revegetation Team, and the Sustainable Stormwater Group.

Potential Funding Sources

Potential funding sources include: ODA, OWEB, ODFW, and NFWF.

Benefits

The projects grouped below address flood storage and bank stabilization issues, improve water quality, and enhance aquatic and terrestrial wildlife habitat.

Potential Projects and Programs

The following potential projects and programs were identified for the George Himes Park area. Descriptive information for each is available from the contact provided on the inside cover of this report. The potential projects and programs are conceptual; no design or project development was conducted during the assessment and development of this Improvement Strategies (IS) report. Potential project and programs for the George Himes Park Stream Daylighting area that are prioritized through the IS process include:

Stormwater Management Projects

All stormwater management projects will require agreements with property owners. Potential projects and their rankings are as follows:

- George Himes Park Stream Daylighting, North Reach (*)

Aquatic and Terrestrial Enhancement Projects:

All aquatic and terrestrial enhancement projects will require agreements with property owners. Potential projects and their rankings are as follows:

- George Himes South Stream Daylighting (7)

Revegetation Projects:

All revegetation projects will require agreements with property owners. Potential projects and their rankings are as follows:

- California George Himes Park Revegetation (22)
- Carolina-Terwilliger George Himes Park Revegetation (*)

Protection and Policy Projects:

All protection and policy projects will require agreements with property owners. Potential projects and their rankings are as follows:

- Upper George Himes Creek West Property Acquisition (*)
- Lower George Himes East Property Acquisition (*)
- George Himes West Property Acquisition (6)
- George Himes South Property Acquisition (10)
- George Himes East Property Acquisition (25)

Education, Involvement and Stewardship Projects:

Education, Involvement, and Stewardship projects are as follows (this project has not been ranked):

- Invasive Species Outreach
- Residential Non-Point Source Pollution Outreach

*These projects are ranked in the Carolina-Terwilliger Subwatershed Improvement Strategy Report.

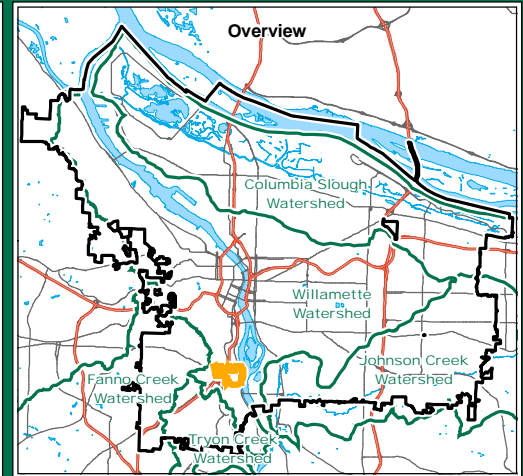
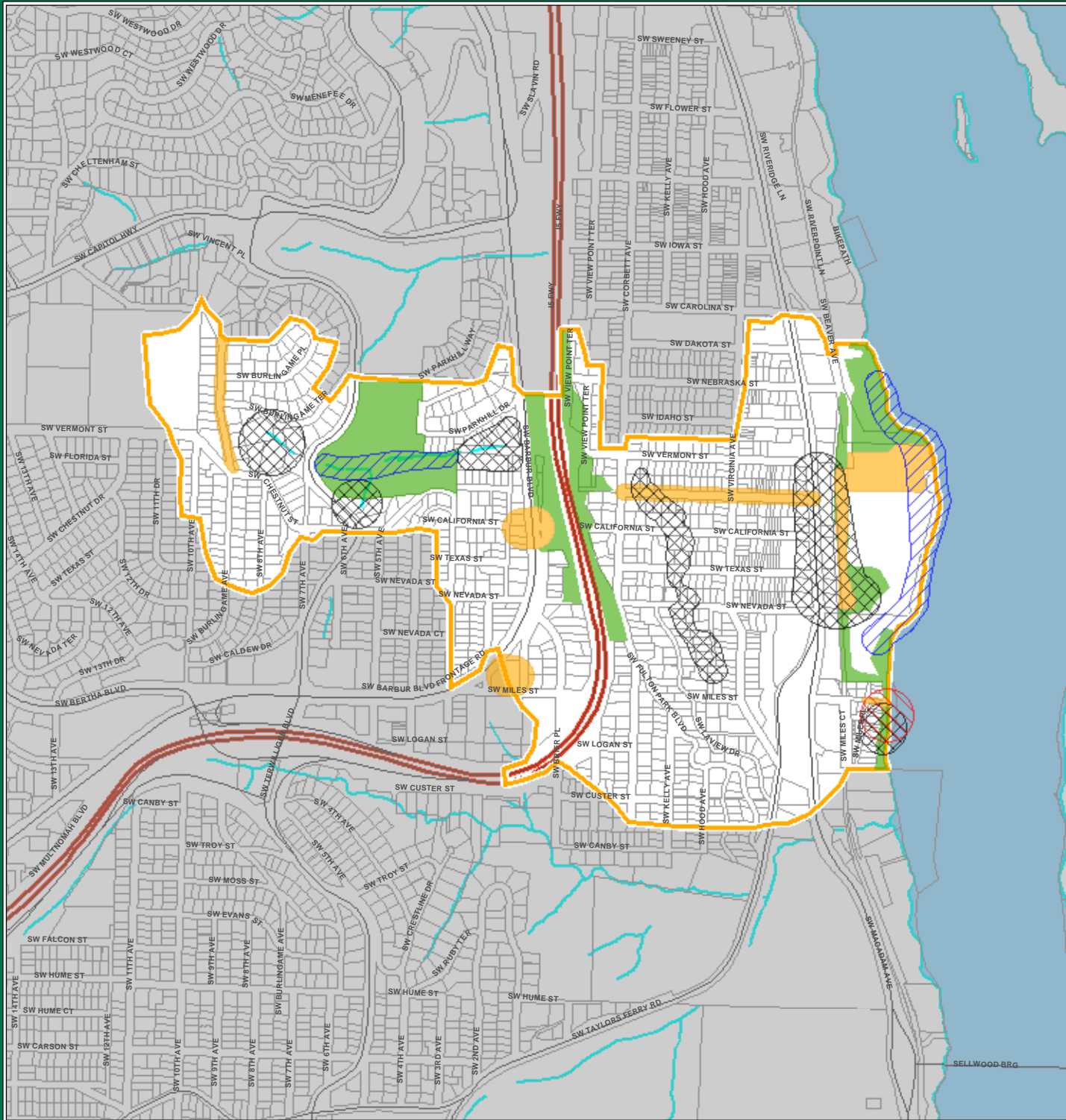
Implementation

Opportunities to implement the recommendations will occur through a number of avenues. Project implementation will coincide with opportunities to:

- Reduce combined sewer overflows (CSOs)
- Mitigate for developments in the subwatershed
- Reduce non-point pollution entering local streams or the Willamette River
- Protect city investments and assets
- Coordinate with infrastructure improvements identified through the BES Systems Plan update process
- Coordinate with the Bureau of Planning and Sustainability's (BPS) River Plan
- Support and coordinate with PP&R on park improvement and habitat restoration projects
- Involve local citizens in education and stewardship
- Involve local citizens in on the ground restoration activities
- Involve property owners in building stormwater inflow control facilities
- Coordinate with other government agencies on development projects in the subwatershed

The Willamette Team will also work to move some projects forward by developing select projects (i.e. highest ranking) that will be implemented as Willamette Watershed Improvement Projects. Moving those projects forward would include:

- Developing projects that qualify as Capital Improvement Plan (CIP) projects through a rigorous selection and alternatives analysis process
- Analyzing projects developed as CIP projects through concept planning and pre-design
- Seeking opportunities for funding through local, state, and federal funding sources - projects that may be implemented through this process could include revegetation; property acquisition; and education, involvement, and stewardship



Legend

- City of Portland
- California Subwatershed Boundary
- Existing Taxlots
- Freeways
- Open Channel Streams

California Subwatershed Concept Strategies

- Education, Involvement & Stewardship
- Aquatic & Terrestrial Enhancement
- Protection & Policy
- Revegetation
- Stormwater

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Spatial Analysis and Modeling

**Southwest Subwatersheds
Improvement Strategies**

**Figure-6
California
Concept Plan**

Project No 8800	Date Printed: 05/21/09
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The following technical memoranda were prepared for the purposes of developing this final report:

- California Subwatershed Data Analysis and Review Technical Memorandum 2.1
- California Subwatershed Pipe System Data Analysis and Review Technical Memorandum 2.2
- California Subwatershed Characterization Summary Technical Memorandum 2.3
- California Subwatershed Stakeholder Input Technical Memorandum 3.2
- California Subwatershed Improvement Strategies Development Technical Memorandum 4.5
- California Subwatershed Improvement Strategies Evaluation Technical Memorandum 5.5



Southwest Subwatersheds Improvement Strategies

Memo

To: S.W. Subwatershed Project Team
From: Willamette Watershed Planning Team
Task ID: IS Evaluation: Opportunities Ranking Process
Date: 4/28/2009 5:43:00 PM
Subject: **Improvement Strategies Task 5.1**

The subwatershed improvement strategy opportunity ranking process demonstrates how to assign a relative value to each opportunity (i.e., a project or program in a specific location) for improving subwatershed health conditions. The process does not take into consideration any feasibility or implementation factors. The rankings are not intended to represent a set order in which to implement projects or programs. Rather, they will inform the selection and implementation processes to guide which projects to pursue as opportunities become available.

The following steps were used to complete the ranking of improvement strategy opportunities for the Marquam-Woods, California, and Carolina-Terwilliger subwatersheds in 2008-2009, and can be replicated for future use:

1. **Develop a list of assets and problem areas** for the subwatershed based on literature review, inventories, and stakeholder input.
2. **Conduct field assessments to evaluate actions** (i.e., potential projects and programs) in areas identified through Step 1 for watershed improvement strategies. The necessary information for each action is stored in a database maintained by Willamette Watershed staff. Information collected and recorded for each action includes:
 - General information on the site assessed, staff involved, ownership, location, zoning, etc.
 - Description of the type of action proposed - size, location, potential actions etc.
 - Implementation considerations – limitations, coordination factors, etc.

The field information documented for each site is used in the steps that follow to help quantify the degree to which potential actions will help improve watershed conditions.

3. **Select opportunities** from the identified actions based on the following objectives in the 2005 Portland Watershed Management Plan (PWMP):

1. Stream Flow and Hydrologic Complexity
 2. Channel and Floodplain Function
 3. Stormwater Conveyance
 4. Aquatic Habitat
 5. Terrestrial Habitat
 6. Stream Temperature
 7. Human Pathogens
 8. Urban Pollutants
 9. Fish and Other Aquatic Organisms
 10. Terrestrial Wildlife and Vegetation
4. **Rank PWMP objectives** based on their contribution to subwatershed health through a review of results in Steps 1-3, and the Willamette Watershed technical team's best professional judgment. Use the following process to rank the PWMP objectives to show which are most important for improving subwatershed conditions. First, each team member assigns a grade for the current subwatershed condition associated with each PWMP objective. Five grade levels are possible
- low = 1 point
 - low average = 2 points
 - average = 3 points
 - high average = 4 points
 - good = 5 points

Second, obtain a consensus grade based on group discussion for the current subwatershed condition associated with each objective. Some of the chief considerations leading to the graded results in the Southwest subwatersheds were:

- These subwatersheds are part of the combined sanitary and stormwater infrastructure.
- The characterization results provided by the BES Systems Analysis team determined that the combined system infrastructure in these subwatersheds has problems related to capacity.
- There are large natural areas that provide habitat for wildlife and likely for aquatic organisms (not fish).
- The streams in the subwatersheds do not reach the Willamette River, stormwater is directed to the Columbia Treatment Plant.
- There are 25 Environmental Cleanup Site Inventory (ECSI) sites in the South Waterfront redevelopment area.
- The natural areas are degraded by invasive plant species [Portland Parks and Recreation (PP&R), Ecohealth assessment.

The grade levels assigned are the inverse of the Final Ranks. That is, objectives that received the lowest grade were given the highest rank of importance for their contribution to Southwest subwatershed improvement. The following table lists the final ranked objectives for the Southwest subwatersheds:

SW Subwatersheds Objectives Ranking Results

SW Subwatersheds Health Objectives	Final Rank
Stream Flow and Hydrologic Complexity: Protect and increase rainfall interception areas, create infiltration and detention areas to normalize stream hydrographs, reduce stormwater flow to sewer systems, and reduce basement flooding.	1
Aquatic Habitat: Protect and improve aquatic, riparian, and floodplain habitat extent, quality, and connectivity that supports the persistence of native fish and wildlife communities.	2
Urban Pollutants: Manage the sources and transport of urban stormwater and industrial pollutants and nutrients to limit surface water, groundwater, soil, and sediment contamination to levels that protect ecological and human health and achieve applicable water quality standards.	3
Channel and Floodplain Function: Protect and restore the extent, connectivity, and function of streams, other open drainageways, wetlands, riparian areas and floodplains to improve bank stability and natural hydrologic functions and reduce risk to development and human safety.	4
Fish and Other Aquatic Organisms: Implement watershed actions to maximize the persistence of native Willamette and Columbia River fish and other aquatic organisms and assist with species recovery and potential population productivity by protecting and improving hydrology, habitat, and water quality.	5
Terrestrial Wildlife and Vegetation: Implement watershed actions to restore populations of terrestrial organisms to healthy, self-sustaining levels, protect and restore the composition and structure of native vegetation communities, and reduce populations of non-native plants and organisms to levels that do not compete with native species.	6
Terrestrial Habitat: Protect and improve upland habitat extent, quality, and connectivity that support the persistence of native terrestrial communities and connectivity to aquatic and riparian habitat.	7
Human Pathogens: Maintain and manage sewer infrastructure and stormwater inputs and runoff to limit sewage overflow and the delivery of pathogens to waterways and achieve applicable water quality and sewer design manual standards.	8
Stream Temperature: Protect and improve stream temperatures, dissolved oxygen, and pH levels that protect ecological health and achieve applicable water quality standards.	9
Stormwater Conveyance: Maintain stormwater collection and conveyance infrastructure capacity.	10

5. **Assign a weight to each objective.** Weights were calculated by applying a formula based upon the objectives' assigned ranks, to refine the analysis for determining their benefits towards improving subwatershed conditions [i.e., improving stream flow (which is ranked number 1) is not necessarily twice as beneficial as improving aquatic habitat (which is ranked number 2)] in the subwatershed.

6. **Assign a metric to each objective.** Each PWMP objective listed in Step 3 is assigned a metric that, when measured, would indicate a positive improvement in subwatershed health. Metrics are chosen based on the assets and problems specific to the subwatershed. Metrics are assigned based on PWMP objectives. In the Southwest subwatersheds the metrics have been assigned as follows:

Objective/Measure

1. Stream Flow and Hydrologic Complexity/ Effective impervious area (EIA) reduced (acres)
2. Channel and Floodplain Function/ Channel Floodplain restored or enhanced (acres)
3. Stormwater Conveyance/ Substandard stormwater pipes maintained (Y/N)
4. Aquatic Habitat/ Aquatic habitat restored/enhanced (linear feet)
5. Terrestrial Habitat/ Terrestrial Habitat protected through acquisition (acres)
6. Stream Temperature/ Stream temperature maintained/reduced (Y/N)
7. Human Pathogens/ Fecal inputs reduced (Y/N)
8. Urban Pollutants/ Urban pollutants reduced in soils or water (Y/N)
9. Fish and Other Aquatic Organisms/ Biotic measures improved (Y/N)
10. Terrestrial Wildlife and Vegetation Terrestrial/ native vegetation enhanced, restored protected through revegetation projects (acres)
11. Improve watershed health by maximizing stewardship, education and partnerships/ Opportunities for education, involvement and stewardship (Y/N)

Each objective is assigned at least one measure (i.e., there can be more than one) based on the predicted ability of the recommended action(s) to improve subwatershed health. As indicated above, measures can be based on acres, linear feet, or the detectable accomplishment (Y/N) for the recommended actions.

7. **Analyze opportunity projects using a multi-attribute utility analysis tool.** Multi-Attribute Utility Analysis (MUA) is a formal, analytic approach for evaluating and comparing alternatives for decisions with multiple objectives. This decision-making tool allows the decision-maker to incorporate objectives that are measured on different scales, and to generate a prioritized list of alternatives based upon scores.

Scores are calculated using anticipated measurable improvements (i.e., metrics) for each opportunity, and the final ranks and weights assigned to each objective by the Project Team. Each action is first assigned a value for each measure.

For example:

- Action: Create a vegetated stormwater infiltration facility that could receive water from a 0.5 acre catchment area
- Measure: Reduce Effective Impervious Area (EIA)
- Value associated with one measure: 0.5 acres

The following formula is then applied:

$$Score = \sum_{i=1}^m k_i U_i$$

where m = the initial value for the measure identified in Step 6 (in the example above, 0.5 acres)

k = the weight assigned to each objective

U = the normalized value for the measure³

The final score for each opportunity (i.e., project or program in a specific location) demonstrates a relative value towards improving subwatershed health conditions and does not take into consideration any feasibility, implementation, or cost factors. The scores are not intended to represent a set order in which to implement opportunities. Rather, they will inform the selection and implementation processes to pursue as resources become available.

8. A draft version of the complete scored and prioritized list of opportunities is then developed by Willamette Watershed staff and sent to the Technical Advisory Team for review. The team includes:

- BES Revegetation (Darian Santner)
- BES Sustainable Stormwater (Linda Dobson)
- BES Regulatory/Policy (Dawn Hottenroth)
- BES Maintenance (Joe Dvorak)
- BES Engineering Systems Analysis (Alicia Lanier)
- BES Education (Jennifer Devlin)
- BES Science, Fish, and Wildlife (Cindy Studebaker)
- BES Source Control (Michael Pronold)
- BES Brownfields (Clark Henry)
- Bureau of Maintenance (Mike Boyle)
- Portland Department of Transportation (Nicole Blanchard)
- Portland Parks and Recreation (Fred Nilsen, Mart Hughes, Dan Moeller & Mark Wilson)
- Portland Water Bureau (Cherri Warnke)
- Bureau of Planning (Mindy Brooks)
- Mayor and Commissioners' Office
- BES Communications staff/Office of the Director

³ Values for the metrics associated with each action were normalized to a 0 to 1 scale using the following formula, where U is the action's normalized score for each measure:

$$U = \frac{X - Worst}{Best - Worst}$$

The opportunities list is reviewed by city stakeholders and the Willamette Watershed Team, and is then finalized based on consideration of comments received.