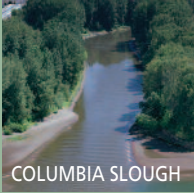


# ACTIONS *for* WATERSHED HEALTH

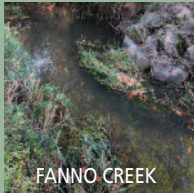
## **Portland Watershed Management Plan**

**5-Year  
Implementation Strategy**

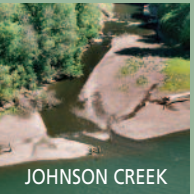
**2012 - 2017**



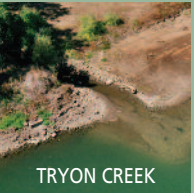
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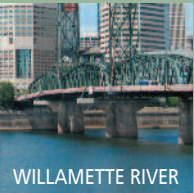
FANNO CREEK



JOHNSON CREEK



TRYON CREEK



WILLAMETTE RIVER

*working for clean rivers*



ENVIRONMENTAL SERVICES  
CITY OF PORTLAND  
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Dean Marriott, Director

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# 5-Year Implementation Strategy

## CONTENTS

<b>I. Introduction</b>	<b>4</b>
<b>II. Implementation: Summary of Progress, Opportunities and Challenges</b>	<b>7</b>
<b>III. Portland's Watersheds: A Brief Overview</b>	<b>12</b>
<b>IV. Five Year Strategy: Focus Areas and Implementation Opportunities for 2012 - 2017</b>	<b>19</b>
1: STORMWATER MANAGEMENT	19
2: REVEGETATION	22
3: AQUATIC AND TERRESTRIAL ENHANCEMENT	24
4: PROTECTION AND POLICY	26
5: OPERATIONS AND MAINTENANCE	28
6: EDUCATION, INVOLVEMENT AND STEWARDSHIP	30
<b>V. Conclusion</b>	<b>32</b>
<b>VI. References and Notes</b>	<b>33</b>



# I. Introduction

## WATERSHED PLAN BACKGROUND

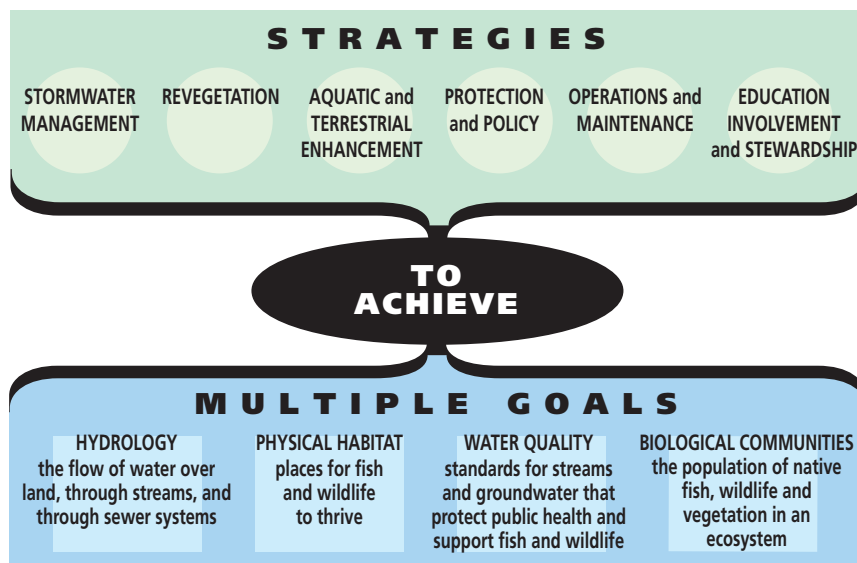
In Portland, the community and city government believe that healthy watersheds are the solution to many urban problems including stormwater management, flooding, air pollution and urban heat effects. The widely held assumption that urban watersheds are so degraded that it is not worthwhile to restore them, or that doing so conflicts with growth and economic development goals, is not consistent with Portland's approach. By shifting our thinking to plan, protect and restore the city's natural resources as vital infrastructure - similar to how roads and sewer pipes are infrastructure - Portland is setting a course to improve community livability and health through healthy watersheds. Streams and rivers have always served as part of our urban infrastructure by managing stormwater (and, in the past, sewage). Recognizing this and reframing natural resources as public assets is helping Portland respond in a cost-effective way to regulations, community expectations and environmental goals. The City of Portland adopted the *Portland Watershed Management Plan* (PWMP) in 2006 to establish high-level, science-based goals, objectives and strategies for improving watershed health. The PWMP acknowledges that implementation depends on inter-bureau and community collaboration. Environmental Services is the lead bureau<sup>1</sup> in implementing the plan, but the mission, core services and infrastructure of many city bureaus directly and indirectly affect the condition of Portland's watersheds and are integral to the success of PWMP implementation.

The PWMP creates the city's "watershed approach" as guidance to protect and restore our rivers, streams, groundwater and open space; develop or redevelop property; and maintain infrastructure like roads, sanitary and storm sewer systems while complying with multiple federal, state and regional regulations. This is accomplished through integrated solutions that address the four watershed health goals: enhancing hydrology, habitat, water and sediment quality, and biological communities.

**To reach those goals, the Plan outlines six strategies (see Figure 1):**

- 1 Stormwater Management**
- 2 Revegetation**
- 3 Aquatic and Terrestrial Enhancement**
- 4 Protection and Policy**
- 5 Operations and Maintenance**
- 6 Education, Involvement and Stewardship**

Figure 1. PWMP strategies and Goals



The city’s watersheds are urban environments, and it is impossible to bring back the conditions that existed before development began in the metropolitan area. However, it is possible to restore watersheds to a properly functioning condition within the urban setting. Urban watershed restoration works in tandem with goals for human health and safety, such as clean water and air, livable neighborhoods, stable forests and hillsides, and equitable access to nature. Portland is monitoring progress toward the four watershed health goals.

## PURPOSE OF THIS DOCUMENT

When the PWMP was adopted in 2006, Portland’s City Council requested annual reports on implementation and a five-year update from the bureaus. The PWMP is a long-term commitment by Portland to work toward watershed health. The original plan’s goals, objectives and strategies remain relevant in 2012. Annual progress reports and other information about the many projects, programs, and other implementation accomplishments are available at [www.portlandonline.com/bes/watershed](http://www.portlandonline.com/bes/watershed).

This new Implementation Strategy serves as the five-year update, summarizing the city’s progress since 2006 and guiding the city’s work for 2012-2017. Environmental Services developed the strategy in consultation with community stakeholders and partners, and in collaboration with:

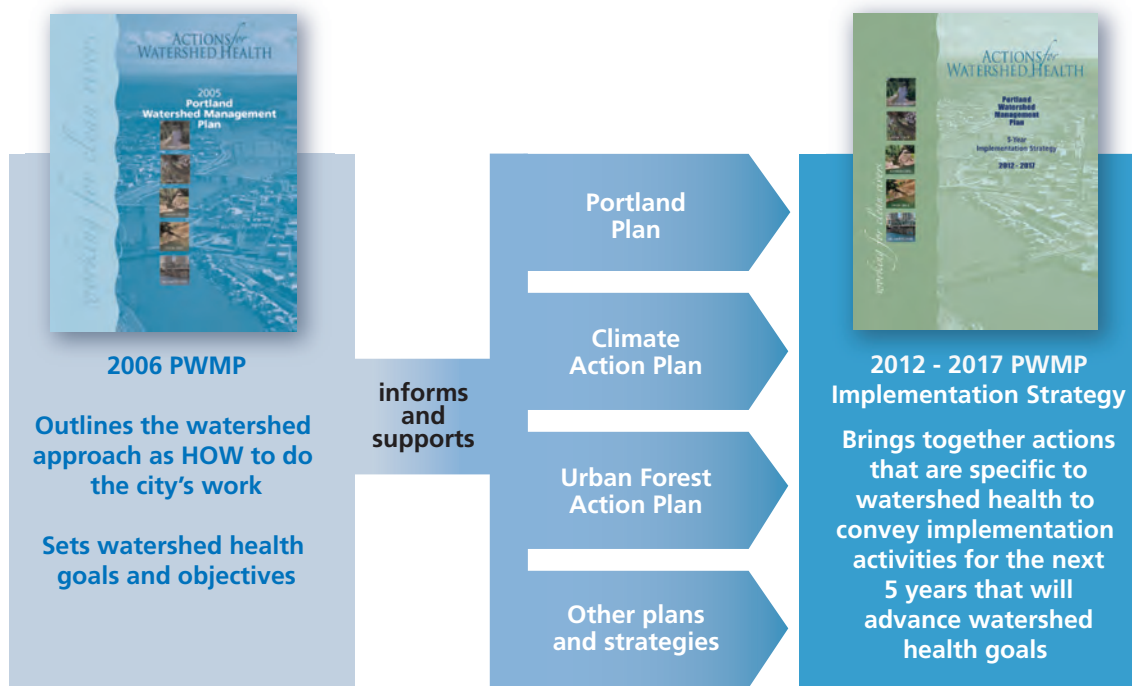
- ✓ Bureau of Planning and Sustainability
- ✓ Bureau of Transportation
- ✓ Bureau of Development Services
- ✓ Office of Healthy Working Rivers
- ✓ Portland Development Commission
- ✓ Portland Housing Bureau
- ✓ Portland Parks & Recreation
- ✓ Portland Water Bureau

In addition to summarizing PWMP accomplishments from the first five years of the Plan, the strategy pulls together new and existing work efforts, action items and opportunities from other city plans and

strategies (see Figure 2) to communicate direction and major opportunities for the next phase of PWMP implementation. The document does not include all environmental programs and projects in the city, but rather highlights key opportunities where Portland can continue its momentum on watershed improvement, including those that are tied to the city's responsibilities for stormwater management and other regulatory and policy commitments. It is important to note that several actions in the *Portland Plan*—the citywide strategic plan—relate to watershed health. Those actions are echoed in this PWMP 5-Year Strategy, labeled with “PP.”

The strategy will be used to inform budget discussions, to focus internal work planning at Environmental Services and across city bureaus where relevant, and to communicate with partners in other organizations and agencies. It also informs future updates to related plans, such as the City of Portland's Comprehensive Plan.

Figure 2.



This document is organized into three main parts:

**Section II:** A summary assessment of the city's watershed work since 2006, and a summary of city-wide issues and themes for implementation moving forward;

**Section III:** A brief overview of Portland's four watersheds, including some of the limiting conditions that the city is working to address in the coming years; and

**Section IV:** Priority focus areas and key opportunities to advance watershed health goals over the next one to five years. The key opportunities are intended to guide citywide program implementation as well as support watershed-specific activities.

## II. Portland Watershed Management Plan Implementation: Summary of Progress, Opportunities and Challenges

The current state of degradation of Portland's watersheds did not occur overnight, but resulted from many small actions and cumulative impacts over more than a century. Similarly, halting impacts and setting a positive trajectory for improvement in all watersheds requires a long-term commitment from the city and community.

Efforts to improve Portland's watersheds began long before the 2006 PWMP, but adopting the plan added significant focus and momentum to the work of the City of Portland and its partners. Watershed restoration and stormwater improvement projects are funded and implemented by multiple bureaus and through non-city funding. In 2008 the Portland City Council made a significant decision to allocate \$55 million of the Environmental Services budget over several years to boost implementation of the PWMP through the *Grey to Green Initiative*. Grey to Green is a suite of programs that expand natural stormwater management and green infrastructure<sup>2</sup> approaches while protecting existing natural resources. The programs are consistent with the Best Management Practices (BMPs) in Portland's MS4 stormwater permit<sup>3</sup> and have successfully expanded city and community capacity to implement PWMP strategies.

As documented in *annual reports*, many projects and programs have been completed under each of the six PWMP strategies. Since 2006, Portland has also made marked progress in the way the work is done, including:

- **Addressing sources of problems instead of symptoms** - Implementing the PWMP strategies is driven by intentional, science-based efforts to address sources and causes of environmental problems rather than focusing solely on symptoms or opportunistic approaches. Many years of combining this planning and implementation produces successes such as the Johnson Creek Willing Seller program. Pre-dating the PWMP, the program has been operating since 1996 to move people and property out of the Johnson Creek floodplain to reduce flood risk to homes and businesses and allow for creek and floodplain restoration. This long-term commitment has resulted in acquisition of 262 acres to date. Large-scale floodplain and stream restoration work is currently underway on 70 acres in the East Lents area.
- **Achieving scale and synergy in projects and programs** - Portland has moved from implementing individual projects and pilot approaches to more comprehensive watershed restoration and sustainable stormwater management projects and programs. Pilot green street facilities built to demonstrate the effectiveness of reducing peak stormwater flow to combined sewer pipes have

As part of a long-term commitment to healthy rivers and streams, Portland completed the Combined Sewer Overflow (CSO) control program in 2011. The \$1.4 billion program includes large infrastructure construction projects, such as the East and West side big pipes, and individual actions by thousands of Portlanders to disconnect their downspouts. The result is a reduction in CSO volume to the Columbia Slough of more than 99% and to the Willamette River of 94%, which means Portlanders will have a cleaner river now and for future generations. The long-term success of the CSO projects and other parts of Portland's stormwater system depends on continued efforts to manage stormwater naturally and keep as much as possible out of the piped system.

The replacement of culverts and restoration of wetlands and riparian buffers along Crystal Springs Creek will restore hydrology and fish and wildlife access to 2.7 miles of the creek, and supports the creek's contribution of cold, clean water to Johnson Creek. To date, the city has leveraged more than \$5 million from outside partners to match the approximately \$3.4 million of project funding from Environmental Services, Parks & Recreation, and the Bureau of Transportation.

evolved into large-scale integrated planning and implementation efforts, starting with the *Tabor to the River Program*. This program incorporates green streets, private property retrofits, tree planting, invasive plant removal and revegetation, and community stewardship partnerships with combined sewer pipe upgrades and repairs. Another example of the scaled-up, comprehensive nature of watershed work is the *Crystal Springs restoration effort*, where individual projects beneficial in their own right (culvert replacement, wetland restoration, riparian enhancement, and construction of a stormwater facility) achieve higher benefits and greater community partnerships when implemented strategically and collectively to restore an entire subwatershed.<sup>4</sup>

- **Meeting multiple objectives** - For example, green street projects manage stormwater naturally and cost-effectively, while alleviating basement sewage backups and reducing the volume of stormwater entering the piped system. At the same time, they can address regulatory requirements, add nature to neighborhoods and complement transportation goals such as traffic calming and creating safer pedestrian and bike routes. Similarly, acquiring and protecting natural areas preserves natural resource functions that provide clean water while also providing other benefits. Since 1892, Portland has recognized the long-term value of this approach with the protection of the Bull Run watershed to preserve our drinking water supply. Within the city limits, we are now protecting natural areas to prevent risks such as water quality impacts and costly stormwater management fixes while also providing more green spaces in underserved neighborhoods, protecting forest canopy that cleans the air, and connecting habitat corridors for native fish and wildlife.
- **Coordinating across city bureaus and integrating watershed benefits into many facets of city infrastructure and service provision** - Although Environmental Services spearheaded the PWMP, recognition of watershed health goals and integration of watershed considerations are increasingly embedded in other bureaus' projects and planning efforts. Recent examples include the integration of green street facilities into the Bureau of Transportation's NE Cully Boulevard project, continued activities for *Salmon Safe* certification by Portland Parks and Recreation, and a commitment to multi-bureau coordination for the Bureau of Planning and Sustainability-led *Tree Policy Review and Regulatory Improvement Project* and the *Invasive Plants Project*.
- **Increasing stewardship, outreach, and public participation** - Community involvement and partnerships with other jurisdictions, agencies, and non-governmental organizations ensures broad ownership and stewardship of Portland's watershed resources and green infrastructure. This collaboration provides opportunities to leverage resources and accomplish far more than city government can achieve alone. The Tabor to the River Program, *Community Watershed Stewardship Program*, *Ecoroof Incentive Program*, classroom environmental education and the *Neighborhood Tree Inventory Project* are all examples of successful efforts to continue and expand Portland's tradition of community partnerships and environmental stewardship across generations.



- **Defining urban watershed health targets and creating a robust citywide monitoring approach -** Environmental Services has selected a set of citywide watershed health indicators, completed one year of monitoring under the new Portland Area Watershed Monitoring and Assessment Program (PAWMAP), and has set targets for each indicator that illustrate healthy urban watershed conditions. The PAWMAP approach allows for efficient and consistent collection of data that can be used to identify trends within and across Portland’s watersheds over time. Progress toward the targets will be communicated with the public and used to inform policies and budget priorities.

As we approach the next five years of implementation the Portland region continues to grow and change: more people, more diversity, a changing climate, strained public funding, a struggling economy. The city is also facing evolving federal and state regulations, including potential new species listings under the Endangered Species Act and new MS4 stormwater permit requirements for quantification of progress toward pollution reduction goals, and a stormwater retrofit plan to address impacts from existing development.

Each bureau also has its own unique mission, strategic direction and pressures. For example, Environmental Services recently updated its *strategic plan*, which outlines priorities for the next few years including balancing between the need to protect, rehabilitate and maintain existing infrastructure and the need to invest in new natural and built systems to protect public health and improve watershed health. Activities outlined in this PWMP 5-Year Strategy are consistent with that direction. It should also be noted that in addition to the watershed activities outlined in this strategy, Environmental Services’ continuing efforts to manage our sewer and stormwater infrastructure include:

- Addressing the backlog of aged and deteriorating sewer pipes, and addressing capacity in the combined sewer system;
- Upgrading the pumping and treatment system for reliability and capacity; and
- Addressing water quality and other stormwater impacts outside the combined sewer system.

There are many opportunities across city bureaus to integrate best practices for watershed health and stormwater management, whether in planning efforts, development projects, or through basic services and infrastructure. Although it is not expected that Portland will meet the set watershed health targets in five—or even ten—years, pursuing the key opportunities outlined in this document will provide positive benefits in the near-term and the long-term. The city will use adaptive management to refine priorities and project approaches for watershed health based on monitoring data, and to quantify the impacts of actions, programs and projects that move the dial toward watershed improvement.

**Since the Grey to Green initiative started in 2008, over 6,000 Portlanders have volunteered 27,000 hours with Friends of Trees to plant 15,000 street and yard trees citywide and in the Tabor to the River area. Over 1,500 people have planted additional trees on their properties using the Treebate incentive program.**

## ***Several overarching themes will inform implementation of the PWMP moving forward, including:***

### **Equity**

Access to a healthy and safe environment is critical. There are opportunities to use equity indicators and diverse partnerships to help guide the setting of watershed project and program priorities and where and how the work is done. Recent successes such as prioritizing diversity in ecoroof contracting, focusing tree-planting efforts in underserved neighborhoods, and ongoing programs such as classroom education and stewardship activities with diverse communities are a foundation upon which to build. Supporting community empowerment will strengthen Portland's watershed health efforts.

### **Partnership**

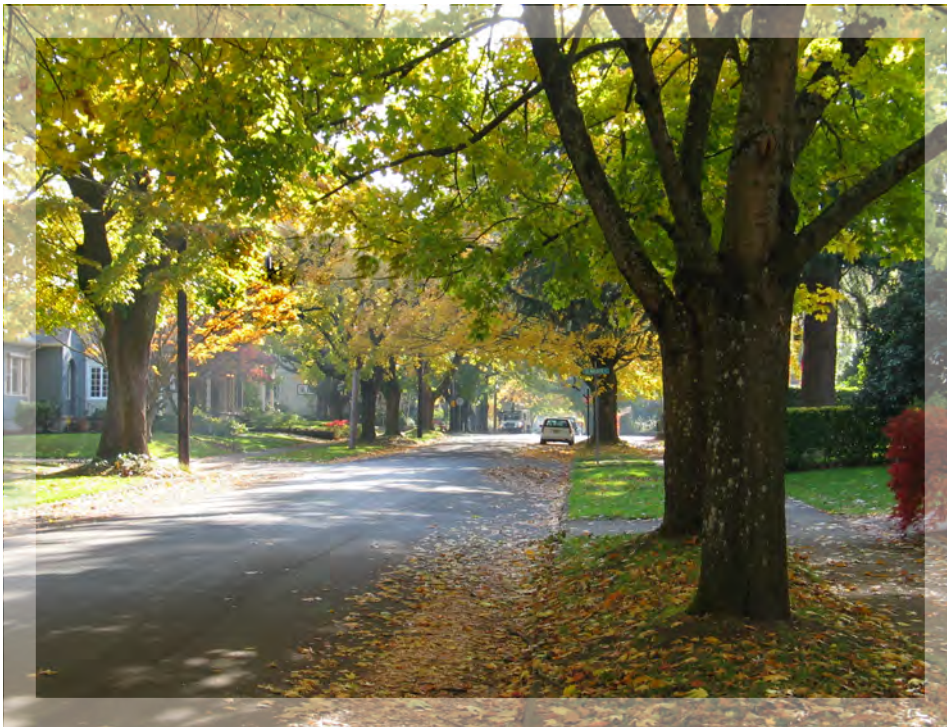
Momentum in partnering across bureaus, other agencies and jurisdictions, community organizations, businesses and residents will make the most of everyone's efforts and continue to fuel successful implementation of the PWMP. Nurturing successful partnerships and coordinating across multiple agencies may take more time up front, but will result in more positive impact and smoother implementation. Leveraging funding, coordinating with related efforts, and supporting volunteers and community groups stretches limited public funding and establishes broader ownership of the community's natural resources.

### **Meeting Multiple Objectives and Providing Multiple Benefits**

In the face of limited budgets and constraints on utility rates, the city must achieve multiple objectives with every dollar spent. The actions outlined in this strategy are echoed in many other plans and strategies. For example, preserving and planting trees for stormwater management also advances Portland's climate change goals, urban forest canopy goals, neighborhood livability and public health goals. Ecoroofs manage stormwater while also providing energy savings and urban wildlife habitat. A stream restoration project can protect an exposed sewer pipe, address local flooding, and increase access to nature in a neighborhood while addressing regulatory requirements. The city will continue to meet regulatory obligations with a watershed approach where appropriate, addressing root causes of environmental problems while also providing multiple benefits to the community. The new *NPDES MS4 permit* (2011) emphasizes the use of green infrastructure and low impact development to address stormwater problems, and requires a retrofit plan to address stormwater impacts from existing impervious area and development.

## Community Resiliency

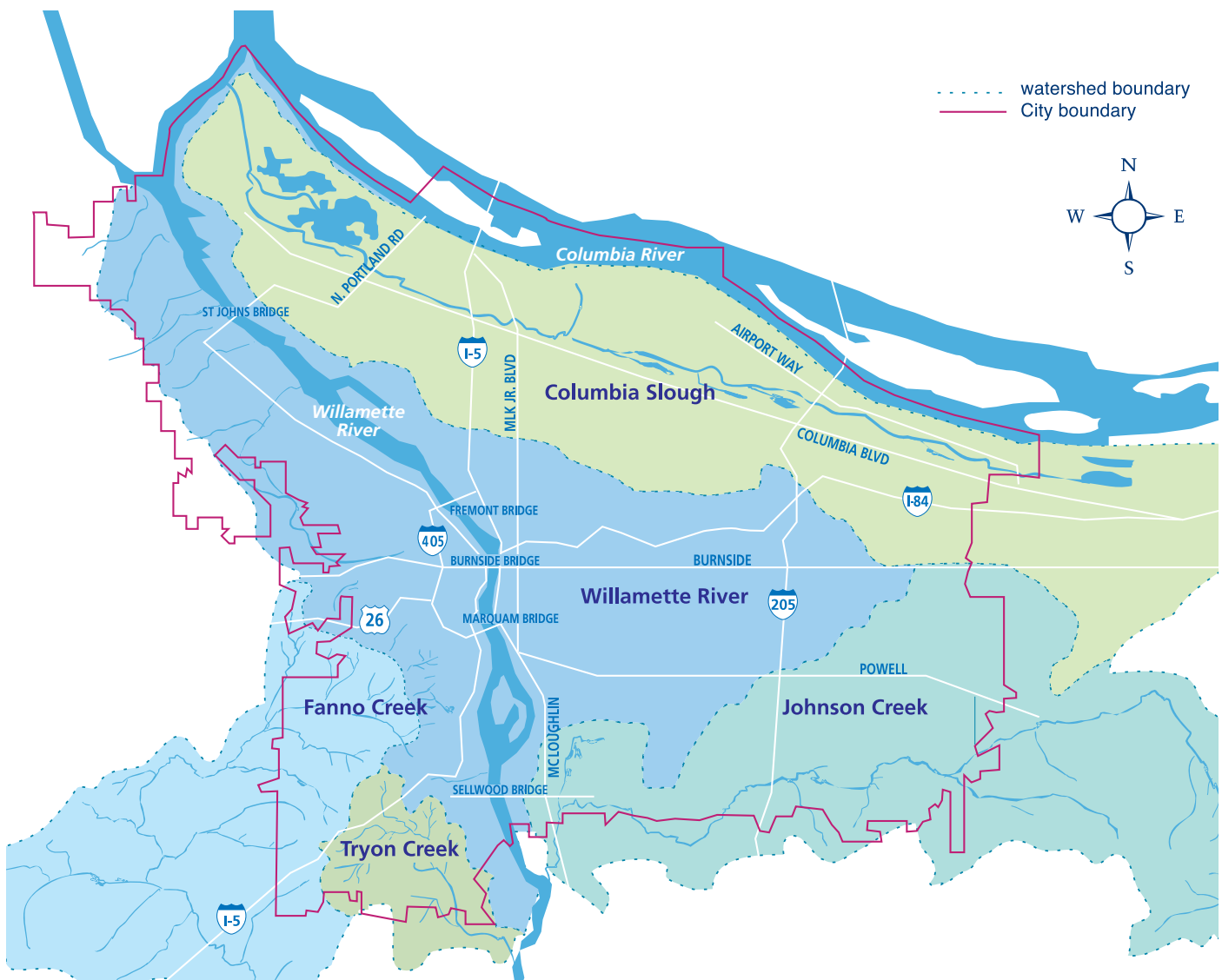
As the climate changes and diverges from historical trends, and we learn more about the probability of a major earthquake, the city's actions under the PWMP will help the built and natural environment buffer our community from impacts, prevent or reduce catastrophic losses, and facilitate adaptation and recovery. With proper planning, we can minimize risk through activities such as managing stormwater through green infrastructure, locating stormwater outfalls differently, restoring floodplains and rivers, planting resilient and diverse tree and plant species, and building bridges in new ways. Protection of key habitats and habitat corridors will help Portland's native wildlife populations adapt to change as well. Early modeling indicates that climate change will not undo the watershed improvements already underway.<sup>5</sup> Moreover, if these activities continue at the right scale and intensity they can help buffer the region from some of the most damaging predictions. Climate preparation and adaptation planning for infrastructure, natural resources and community health is currently underway by the city and Multnomah County.

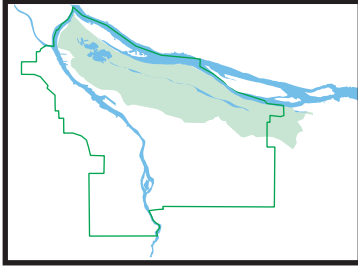


### III. Portland's Watersheds: A Brief Overview

To understand watershed health efforts in Portland, it is important to understand the unique geography, history, stormwater management systems, and other conditions of Portland's five watersheds (Figure 3.). More detailed watershed characterizations can be found in the 2006 *Portland Watershed Management Plan* and Environmental Services' [website](#).

Figure 3. Map of Portland Watersheds





## Columbia Slough

The Columbia Slough originates in the east Portland suburb of Fairview and flows west for 19 miles to join the Columbia River. The watershed drains 51 square miles of land and includes 30 miles of secondary waterways. The area was once a natural floodplain of the Columbia River between the Sandy and Willamette rivers,

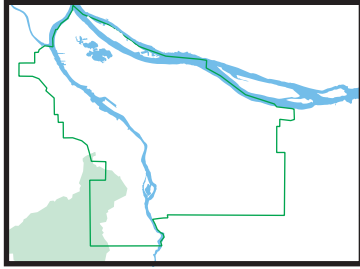
but the system of channels, lakes and wetlands was drained and filled to allow for development. The Upper and Middle Sloughs are now largely controlled by levees, dikes and pumps. The Lower Slough is tidal.

This history—combined with heavy industrial, commercial and agricultural use - contributed to a significant loss of habitat, flood storage capacity and ability to filter sediments and pollutants, leaving the slough heavily impacted. Despite this, the nine miles of the Lower Slough still provide valuable resting habitat for migrating juvenile Columbia River Basin salmon, and native fish and wildlife are found throughout the slough. The slough is also located along a key route for migratory birds traveling the Pacific and Columbia flyways. The watershed is home to the Columbia South Shore Well Field, part of Portland’s drinking water supply, and is an important economic and transportation hub for the city, providing thousands of jobs. It also has an increasingly important role in providing recreation and access to nature for the metro region, and includes opportunities for more open space and parks for underserved neighborhoods in north and northeast Portland.

### **Conditions that limit healthy function of the Columbia Slough Watershed include:**

- **Lack of large wood and channel complexity;**
- **Water quality limitations, including high temperature, nutrients and eutrophication;**
- **Toxic pollutants (especially legacy chemicals) in the sediment;**
- **Narrow or absent riparian buffers and upland habitat connections;**
- **Stormwater runoff volume and pollutants from impervious areas.**

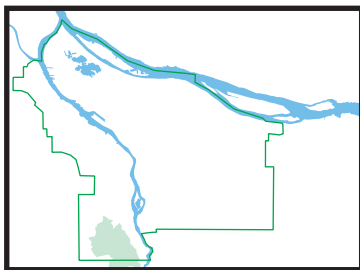
Both combined sewer and separated stormwater conveyance systems route stormwater drainage to the slough, although in some areas stormwater is managed by UICs (underground injection controls such as sumps and drywells) that infiltrate stormwater into the ground. In 2000, completion of the Columbia Slough Big Pipe as part of Portland’s Combined Sewer Overflow Control Program reduced combined sewer/stormwater overflow volume to the slough by 99%. Protection of valuable habitats like Smith and Bybee Wetlands and Big Four Corners Natural Area, ongoing work to revegetate the banks of the slough, construction of green streets, and stormwater pollution controls by businesses along the slough have improved conditions in the watershed, but significant challenges remain. The city is working through a Consent Order with the Oregon Department of Environmental Quality to investigate and improve sediment quality in the slough.



## Fanno and Tryon Creeks

Fanno Creek and Tryon Creek are two adjacent watersheds in southwest Portland. Fanno Creek's headwaters are in the Council Crest area, from which the creek flows 15 miles to the Tualatin River. Approximately one-fifth of the watershed is within Portland city limits, and the vast majority of that area is in single-family residential use. Tryon Creek's headwaters are near Multnomah Village.

The majority of the seven-mile stream's watershed is within Portland, although its confluence with the Willamette River is in the City of Lake Oswego. Portland's portion of both watersheds is primarily drained by the separated storm sewer system, where stormwater runoff flows through ditches or pipes and discharges to streams.



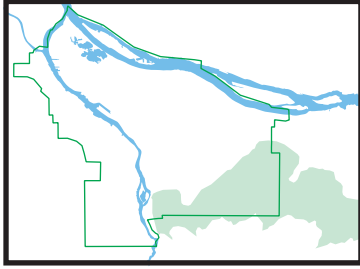
Tryon Creek watershed includes the Tryon Creek State Natural Area and other parks and natural areas that provide valuable, yet fragmented, habitat for salmon and other fish and wildlife. Native resident fish are found in Tryon Creek, but salmon, steelhead and other migratory fish

are largely excluded by the culvert under Highway 43. Several of the tributaries to Fanno Creek provide cool water and habitat for native fish species. Impervious area from development, combined with local geology and steep slopes, results in flashy stream flows and unstable slopes and banks. Stream bank erosion is an issue in both watersheds, especially in areas where native riparian vegetation has been removed. Stormwater runoff from major transportation corridors including I-5, Barbur Boulevard and Terwilliger Boulevard discharges to Tryon Creek.

The city's focus in recent years has been on small-scale habitat enhancement projects and stormwater system retrofits, such as improving roadside drainage ditches and building green streets to address water quality issues. As elsewhere in Portland, implementation of the Stormwater Management Manual has reduced the impacts of new development and redevelopment on water quality, habitat and hydrology. Protection and restoration of intermittent streams, seeps and springs—particularly in the upland areas—and improving stream connectivity through culvert retrofits are important to improve the condition of these resources and reduce flooding downstream.

### **Conditions that limit healthy function of the Fanno and Tryon Creek watersheds include:**

- **Runoff from impervious surface that causes altered flows and stream flashiness;**
- **Culverts and other barriers that impact in-stream habitat, fish and wildlife migration, hydrology and water quality;**
- **Water quality limitations, including high temperature and bacteria;**
- **Stormwater infiltration and inflow into sanitary sewer pipes, causing overflows and impacting treatment plant capacity;**
- **A fragmented stormwater system that results in drainage problems, erosion, and impacts to streams.**



## Johnson Creek

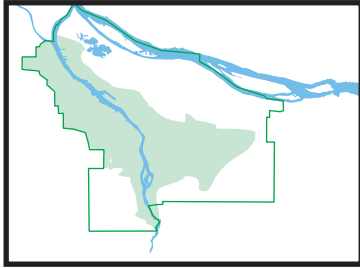
Portland shares the Johnson Creek watershed with our neighbors in the cities of Milwaukie, Gresham, Damascus, and other communities in Clackamas and Multnomah counties. Johnson Creek runs 25 miles from its headwaters in Boring to the confluence with the Willamette River in Milwaukie. The watershed has a mix of land uses: agricultural, commercial and light industrial, and increasingly dense residential development. The 40% of the watershed within Portland contains a mix of land uses, extensive floodplains and buttes. Stormwater is managed through two different systems. In some areas, Johnson Creek receives runoff from the separated storm sewer system, while in others, underground injection controls (UICs), infiltrate stormwater into the ground. Fifteen miles of the creek's channel is lined with concrete and rock from Works Progress Administration (WPA) attempts to control flooding in the 1930s.

Agricultural runoff, especially in headwater areas, and legacy pollutants such as DDT are a significant challenge to stream health and require collaboration among the multiple jurisdictions. Within Portland, development on the steep slopes of the East Buttes is challenging because natural drainage, local seeps and springs make on-site stormwater management difficult. Regular flooding, exacerbated by WPA alterations, has historically defined Johnson Creek's problems, particularly in the Lents neighborhood. Through the implementation of the 2001 Johnson Creek Restoration Plan (JCRP), the city of Portland, working with FEMA, Metro and the local community, has purchased 262 acres of frequently flooded property. The goal of the JCRP is to curb impacts from nuisance flooding while improving fish and wildlife habitat and water quality; reversing the damage from earlier attempts to control flooding that altered the natural channel of the creek.

Salmon, steelhead and other native fish species are found throughout significant portions of the watershed. Johnson Creek provides many opportunities to assist in native species recovery. Several large and medium-scale floodplain restoration projects completed in the last 10 years are making cumulative improvements in the watershed's natural resource functions. Crystal Springs Creek is a focus of current restoration efforts, as it can provide clean, cold and constant flows to Johnson Creek and is home to native fish populations. The city is also working to protect and restore upland areas and other tributaries.

### **Conditions that limit healthy function of the Johnson Creek Watershed include:**

- **Altered flows (low summer flows) and frequent flooding from storms;**
- **Water quality limitations including bacteria, high temperature, and toxics;**
- **Lack of protection of seeps and springs in some areas, and lack of a complete inventory of these resources in other areas;**
- **Habitat function limited by culverts and other structures, low populations of macroinvertebrates, and lack of amphibian habitat.**



## Willamette River

The Willamette River is 187 miles long. The lowermost 17 miles of the river are within the city of Portland, ending at the Willamette's confluence with the Columbia River. This section of the Lower Willamette is in approximately 0.5% (69 square miles) of the river's total basin and flows through some of the most urbanized area in the state. Most stormwater runoff from large developed areas of Portland's inner southeast, northeast, and the central city is collected

via the combined sewer system, routed to the Columbia Boulevard Wastewater Treatment Plant in North Portland, and discharged after treatment to the Columbia River. Stormwater from other areas of Portland's Willamette watershed is managed through the separated stormwater system, sumps, or stream tributaries that discharge to the river.

This highly altered portion of the river serves as the gateway for salmon, steelhead, lamprey and other native fish and wildlife into the entire Willamette Basin. Despite heavy urbanization, valuable pieces of habitat still exist in this portion of the watershed that are critical for both fish and wildlife for feeding, refuge, rearing and mating. This convergence of conditions adds great importance to Portland's efforts to improve the health of the Willamette and its tributaries.

The river is a significant place for people to encounter nature through active or passive recreation. Water quality is important, both because of the impacts to fish and the aquatic food chain and because of human contact with the river. Completion of the **Combined Sewer Overflow (CSO) Program** in 2011 reduced CSO discharge events to the Willamette River from an average of 50 per year to no more than four per winter and one every third summer. But other significant challenges remain. The city will continue to implement projects to address combined sewer system capacity, and will work to address water quality, hydrology and habitat in the river's subwatersheds and tributaries (such as

### **Conditions that limit healthy function of the Willamette Watershed (river mainstem) include:**

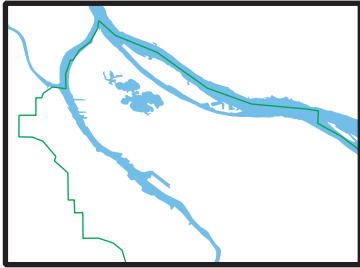
- **Limited shallow water and off-channel habitat, and lack of woody debris that provides refuge for migrating salmon and other native species;**
- **Disconnected or filled floodplains, resulting in a loss of habitat function and flood storage capacity;**
- **Fragmented and degraded riparian corridors; lack of connectivity to uplands due to culverted streams and development;**
- **Water quality limitations including bacteria, toxics, and high temperature;**
- **Toxic pollutants in the sediment.**

### **Conditions that limit healthy function of the Willamette Watershed's subwatersheds and tributaries include:**

- **Degraded or lost in-stream and riparian habitat, lack of large wood and channel complexity;**
- **Water quality limitations including high temperature, erosion and toxic pollutants;**
- **Flashy hydrology (dramatically fluctuating stream levels) due to local soils, geology and extensive impervious development;**
- **Degradation/loss of upland resources, especially due to development and invasive species.**



Stephens Creek) as well as implement restoration projects along the river. Watershed improvement along the main stem Willamette can be very complex because of diverse stakeholders and interests, and the use of portions of the river as a working industrial harbor. In addition, nine of the 17 miles of river in Portland are a designated federal Superfund site. The City of Portland's efforts to improve the watershed are coordinated with, and integral to, efforts by other jurisdictions and regional partners.



### Columbia River

Although it is not one of the five Portland watersheds addressed in the Portland Watershed Management Plan, it should be acknowledged that Portland is an important part of the Columbia River watershed. Portland only occupies about 1/16 of one percent of the entire Columbia River Basin's area, but the city sits at an important ecological site at the confluence of two large rivers: the Columbia and the Willamette, providing a diversity of species and habitats. The confluence is an important area for salmon migration, rearing and resting. Salmon migratory routes through the confluence are from Canada and the Willamette Valley, to and from the ocean. Similarly, the site sits at the crossroads of bird migratory routes from South America to the Arctic and from the Pacific Ocean to the Columbia Gorge. Although there are many challenges for the Columbia River over which Portland has little to no influence, one challenge in the confluence areas is limited shallow water and off-channel habitat, and a lack of large wood that provides refuge for fish and wildlife. West Hayden Island provides some of the best shoreline and shallow water habitat in Portland's Urban Services Boundary.



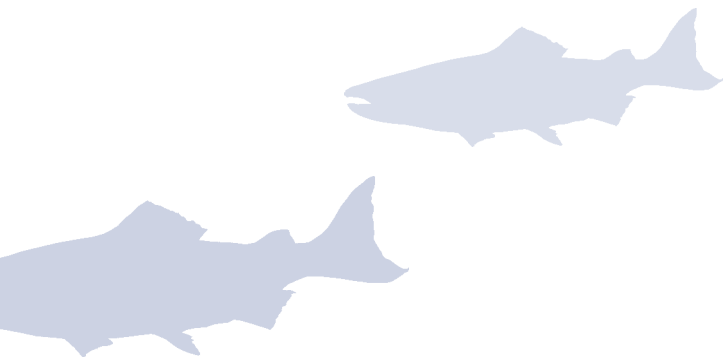
*Columbia Slough Refugia*

Table A summarizes the conditions that limit healthy function in Portland’s watersheds. The key opportunities identified in Section IV are designed to address these conditions (for example Table 1). Individual watershed and subwatershed-scale analysis, planning and prioritization tailors projects and programs to the specific geographies.

**TABLE A. Summary of conditions that limit healthy watershed function.**

	Columbia Slough	Fanno Creek	Tryon Creek	Johnson Creek	Willamette River (mainstem)	Willamette River (tributaries)
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Lack of large wood and/or channel complexity	✓	✓	✓	✓	✓	✓
Limited shallow and off-channel habitat	✓			✓	✓	✓
Altered hydrology-summer low flow and winter flooding	*	✓	✓	✓	*	✓
Inflow and infiltration into sewer pipes		✓	✓	✓		
Culverts and other in-stream barriers	✓	✓	✓	✓		✓
Lack of inventory and protection of seeps and springs				✓		
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓
Disconnected or filled floodplains	✓	✓	✓	✓	✓	✓

\* The Columbia Slough and Willamette Rivers have altered hydrology due to management by dams and dikes.



## IV. 5-Year Strategy: Focus Areas and Implementation Opportunities for 2012 - 2017

The city's work to improve watershed health over the next five years continues to be guided by the six strategies originally outlined in the Portland Watershed Management Plan, whether through projects in individual watersheds or through citywide, programmatic approaches. The focus areas and key opportunities for each strategy are outlined below.

The six strategies are intertwined, providing multiple benefits to watershed health. As such, many of the key opportunities intentionally satisfy multiple watershed health strategies and goals, but are listed under just one strategy for brevity. Opportunities labeled with "PP" reflect actions that overlap with the [Portland Plan](#), to illustrate consistency with the citywide strategic plan. The key opportunities identified under each strategy are linked to addressing a subset of the watershed conditions in Table A (pg 18).

### 1: STORMWATER MANAGEMENT

Stormwater management is fundamental to improving water quality, stream function and meeting the city's environmental regulatory requirements. Reducing impervious area, protecting and enhancing trees, vegetation and natural areas, and managing stormwater with swales, planters, green streets, ecoroofs and other vegetated facilities treats stormwater as a resource by filtering it naturally; recharging groundwater, cleaning and cooling surface water, and reducing downstream treatment costs and risks from landslides and flooding. These approaches also provide habitat and other benefits to the community, such as adding access to nature and attractive places to walk or bike. Effective stormwater management controls runoff and protects property, infrastructure and natural resources, while coordinated planning and implementation of projects can maximize environmental, stormwater system, and community benefits.

**1. Focus:** Significantly reduce the impact of impervious area from roads and development.

#### **Key Opportunities:**

- a) Partner with ODOT, TriMet, and Multnomah County to leverage funding for new and retrofit projects to address runoff from major transportation projects and highways such as I-5, I-205, and Barbur Boulevard.
- b) Expand upon the successes of the [Tabor to the River Program](#) to design and implement stormwater system upgrades in the combined sewer and MS4 areas, integrating green infrastructure and community partnerships.
- c) Expand community greening efforts on private property, including the use of rain gardens, ecoroofs, tree planting and other sustainable stormwater approaches through a robust mix of technical assistance, community partnerships, incentives and policy. Pursue partnerships with large building owners to install ecoroofs.
- d) In city-funded projects, including affordable housing, maximize stormwater elements that have multiple benefits, such as trees and ecoroofs. Strengthen implementation of the Green Building Policy for city-owned buildings.
- e) Update the [Stormwater Management Manual](#); explore inclusion of watershed-specific guidelines.

**2. Focus:** Demonstrate innovative sustainable stormwater management in urban design.

**Key Opportunities:**

- a) Design, implement and monitor new designs for green street facilities that effectively slow, infiltrate and treat stormwater in the separated stormwater system; in conjunction with new designs for alternative right-of-way for unimproved streets, provide additional options where traditional approaches are not feasible. (PP)<sup>6</sup>
- b) Coordinate implementation of a neighborhood greenways network to complete new neighborhood greenways that support access, connectivity and mobility for humans and wildlife while addressing stormwater issues. (PP)
- c) Identify and develop new right-of-way designs for key transit streets that integrate frequent transit and bike facilities, pedestrian crossings, landscaped stormwater management, large canopy trees and place-making amenities. (PP)
- d) Integrate sustainable stormwater management in *EcoDistrict*<sup>7</sup> planning; explore approaches for district-wide natural resource conservation and stormwater management. (PP)

**3. Focus:** Integrate green infrastructure approaches into Portland’s long-range planning.

**Key Opportunities:**

- a) Complete the city’s Stormwater System Plan, utilizing an integrated watershed and asset management approach to identify and prioritize stormwater projects based on risk. Prioritize green infrastructure approaches in recommended solutions. (PP)
- b) Integrate green infrastructure approaches into infrastructure policies and actions in the *Central City 2035 Plan*, *Comprehensive Plan* and *Transportation System Plan*.
- c) Incorporate green infrastructure/sustainable stormwater management in *122nd Avenue planning*, MAX Tacoma Street Station, *Foster Lents Integration Partnership*, and the *Barbur Concept Plan*. (PP)

**Portland has a total of 1,200 green street facilities that manage stormwater runoff from approximately 100 acres of streets. This is about 0.8% of the city’s total impervious area that is streets or other public right-of-way. Use of green street facilities has increased significantly in recent years.**

**TABLE 1. The Stormwater Management Strategy actions identified here will help directly or indirectly address the following conditions:**

	<i>Columbia Slough</i>	<i>Fanno Creek</i>	<i>Tryon Creek</i>	<i>Johnson Creek</i>	<i>Willamette River (mainstem)</i>	<i>Willamette River (tributaries)</i>
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Altered hydrology-summer low flow and winter flooding		✓	✓	✓		✓
Inflow and infiltration into sewer pipes		✓	✓	✓		✓
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓



*Atwater ecoroof*

## 2: REVEGETATION

Restoring native plant communities, removing invasive plant species in natural areas, open spaces and developed areas, and planting street and yard trees supports urban watershed function and stormwater management. In natural areas, healthy native plant communities prevent erosion and intercept, store and absorb rainfall to protect and improve water quality in downstream creeks and waterways. Invasive species management and revegetation efforts protect water quality, enhance and connect wildlife habitats, and preserve native biodiversity and natural resources that manage stormwater. In developed areas, street and yard trees enhance property values, public health and neighborhood livability while providing shade, habitat connectivity, and naturally managing stormwater. These activities help the city adapt to climate change by providing cooling and energy savings, sequestering carbon, and supporting a more resilient urban forest.

**Between 2006 and 2011, the Watershed Revegetation Program treated for invasive plants and restored native vegetation on over 4,600 acres of natural area. Ongoing management of these properties, as well as work by thousands of volunteers helps protect Portland's natural resources.**

**1. Focus:** Increase urban tree canopy across Portland.

### **Key Opportunities:**

- a) Continue a publicly funded street and yard tree planting program to help meet goals in multiple city plans, including Portland's [Urban Forestry Management Plan](#) and [Climate Action Plan](#). Explore new financing options for trees to expand street trees for stormwater management.
- b) Increase tree planting in underserved areas, such as canopy-deficient, low income and diverse communities, with innovative models and expanded community partnerships. (PP)
- c) Explore new models for street tree maintenance, including public-private partnerships and incentive programs. Build on existing stewardship, education and communication programs to increase capacity for urban forest preservation, expansion and stewardship. (PP)
- d) Implement the new Tree Code (Title 11, Trees) and other code improvements adopted through the [Citywide Tree Project](#), including additional emphasis on preserving large canopy trees, maintaining baseline tree density, improving the distribution of trees, and creating a system for consistent and routine tree replacement.

**2. Focus:** Stabilize, restore and maintain healthy ecosystems in Portland's publicly and privately owned natural areas.

### **Key Opportunities:**

- a) Coordinate restoration efforts and management activities in Portland Parks' natural areas based on the 2010 Natural Areas Restoration Plan, and assess and prioritize long-term revegetation efforts on non-Parks property (public and private) through a citywide Revegetation Implementation Plan. (PP)
- b) Explore new approaches to work with property owners to restore and revegetate privately-owned property, in coordination with the soil and water conservation districts and other partners.
- c) Continue to foster and develop new partnerships with local "friends" groups and support their efforts to protect and enhance natural areas such as Baltimore Woods and Mt. Tabor Park.

**Environmental Services and Portland Parks & Recreation's invasive species programs have treated more than 2,700 acres in parks, right-of-way, and private property since the start of the Grey to Green initiative in 2008.**

**3. Focus:** Continue implementing *Portland's Invasive Plants Strategy* to manage and control invasive species.

**Key Opportunities:**

- a) Refine the tools and techniques the city and its partners use to control and monitor invasive plants. Follow the city's Integrated Pest Management program (IPM).
- b) Continue implementing the recently updated Titles 11 (Trees), 29 (Property Maintenance Regulations) and 33 (Planning and Zoning) to control the spread of invasive plants.
- c) Sustain the city's outreach efforts and coordination with other jurisdictions, the public, private enterprises and community organizations around invasive species education and volunteer opportunities.
- d) Continue coordinated invasive species management programs like Protect the Best (for Portland's parks) and Early Detection Rapid Response (targeting identified priority species) to protect investments in public natural areas and support urban forest management and biodiversity by preventing the spread of new invasive plants. (PP)

**TABLE 2. The Revegetation Strategy actions identified here will help directly or indirectly address the following conditions:**

	<i>Columbia Slough</i>	<i>Fanno Creek</i>	<i>Tryon Creek</i>	<i>Johnson Creek</i>	<i>Willamette River (mainstem)</i>	<i>Willamette River (tributaries)</i>
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Lack of large wood and/or channel complexity	✓	✓	✓	✓	✓	✓
Limited shallow and off-channel habitat	✓	✓	✓	✓	✓	
Inflow and infiltration into sewer pipes		✓	✓			✓
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓

Since 2006, Environmental Services and partners have restored over 32 miles of stream and stream bank in Portland, and 46 acres of wetlands and floodplains.

12 culverts have been removed or retrofitted since 2008 to improve fish passage, hydrology, and water quality.

### 3: AQUATIC AND TERRESTRIAL ENHANCEMENT

River, stream, wetland, riparian, floodplain and upland habitats all exist within Portland, and restoration and enhancement of these areas improves natural watershed processes. In addition to improving habitat for fish and wildlife, enhancement and restoration work can address stormwater management concerns, flooding and water quality. Diversity and complexity of habitat strengthens resiliency to climate change and reduces the risks associated with invasive plant and animal species, diseases, wildfire or other threats to the urban ecosystem. Increasing diversity is a key strategy for managing our natural resource infrastructure. The 2006 PWMP has a strong focus on aquatic habitat, with an acknowledgement that more work was needed to develop approaches for terrestrial enhancement to support watershed functions. This resulted in the creation of the *Terrestrial Ecology Enhancement Strategy* (TEES) to add to the body of information and guidance for habitat improvement in the city.

**1. Focus:** Protect, restore and connect anchor habitats and special habitat types.

#### **Key Opportunities:**

- a) Continue to protect, preserve and enhance high-priority natural areas through willing-seller acquisition, restoration projects, regulatory updates, agreements and partnership. (PP)
- b) Protect and restore special habitat types, such as native Oregon white oak and grasslands habitats, to sustain and increase the diversity and complexity of the city's natural resources and wildlife species.
- c) Work with public and private partners to complete the culvert replacement, stream and wetland restoration program on Crystal Springs Creek; replicate the program for other high-priority culvert projects such as those in Tryon Creek. (PP)
- d) Maintain and increase channel diversity through restoration projects that increase large wood, reconnect floodplains, and remove hardened riverbank (e.g., Oaks Bottom and the Lower Slough refugia project). Identify and protect cold water refugia in the Willamette River to meet TMDL requirements.
- e) Continue the Watershed Investment Fund to implement small-scale watershed restoration and stormwater management projects, especially those that leverage other funding. Explore ways to incorporate diversity and equity into project prioritization criteria.
- f) Complete a plan for West Hayden Island, including protection and enhancement of natural resources and existing shallow water habitat, guidance for development, and a net increase in ecosystem function.

**2. Focus:** Integrate wildlife habitat and approaches to reduce wildlife risks into Portland's built environment and urban design.

#### **Key Opportunities:**

- a) Renew Portland's Salmon Safe Certification for the parks system and continue to implement and update best management practices that support salmon habitat, human health and property protection (e.g., Integrated Pest Management, irrigation and erosion management practices, riparian restoration).



- b) Finalize TEES guidelines for special habitat types and features; identify opportunities to integrate key species considerations (e.g., turtles, bats) into public projects such as bridges, and include value-added terrestrial habitat improvements to all restoration and public works projects as appropriate and feasible.
- c) Include bird and wildlife friendly design policies, incentives and guidelines in the Central City 2035 Plan and address this issue in the Comprehensive Plan.
- d) Monitor the habitat function and species use of ecoroofs and green street facilities; refine and expand design types and approaches as appropriate.
- e) Engage with regional partners, including Metro and The Intertwine Alliance to connect, expand and maintain Portland trails, green spaces and habitat corridors as part of the regional system. Create a long-term investment strategy for public natural areas, beginning with the Johnson Creek Restoration Partnership. (PP)

**TABLE 3. The Aquatic and Terrestrial Enhancement Strategy actions identified here will help directly or indirectly address the following conditions:**

	<i>Columbia Slough</i>	<i>Fanno Creek</i>	<i>Tryon Creek</i>	<i>Johnson Creek</i>	<i>Willamette River (mainstem)</i>	<i>Willamette River (tributaries)</i>
Water quality limitations	✓	✓	✓	✓	✓	✓
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Lack of large wood and/or channel complexity	✓	✓	✓	✓	✓	✓
Limited shallow and off-channel habitat	✓			✓	✓	✓
Altered hydrology-summer low flow and winter flooding		✓	✓	✓		✓
Culverts and other in-stream barriers	✓	✓	✓	✓		✓
Lack of inventory and protection of seeps and springs				✓		
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓
Disconnected or filled floodplains	✓	✓	✓	✓	✓	✓

## 4: PROTECTION AND POLICY

The City of Portland is expecting more than 100,000 new households in the next 20-25 years. Applying policies and tools that address development practices will continue to be important to preserving and enhancing watershed functions, preventing further degradation and protecting water quality. Preventing damage to watersheds through policy, restoration activities, and acquisition of natural areas is far more efficient and cost-effective than restoring damaged or lost natural resources. It also helps the city avoid potentially more costly stormwater management measures or regulatory requirements and protects past public investments in Portland's built and natural infrastructure.

**1. Focus:** Address current and emerging federal and state regulations through the watershed approach; avoid costly, "silo" responses to regulatory programs that are not integrated with other city and community goals and objectives.

### **Key Opportunities:**

- a) Continue implementation and monitoring of best management practices to effectively and proactively respond to anticipated new Endangered Species Act decisions, including those for streaked horned lark and Pacific lamprey.
- b) Coordinate watershed and stormwater system planning and projects with requirements under the **NPDES MS4 program** to address stormwater runoff from existing development and implement the 2014 MS4 Permit Retrofit Plan. Incorporate results of the NPDES MS4 permit hydromodification assessment in watershed planning.
- c) Coordinate stormwater management programs and projects in compliance with requirements in the **UIC Water Pollution Control Facilities permit** (2005) to address stormwater runoff from public rights of way to city-owned UICs and to support watershed health. Utilize green infrastructure approaches where appropriate.
- d) Respond to changes in FEMA guidelines regarding floodplain development and restoration, using the PWMP as a basis for local policy changes.

**2. Focus:** Integrate watershed health-focused goals, objectives and practices into local plans, code and regulations.

### **Key Opportunities:**

- a) Integrate watershed health objectives and directions in the city's updated **Comprehensive Plan** goals, policies, alternative growth and land use scenarios, and implementing tools. (PP)
- b) Explore revisions to development-related requirements and process (land use and permitting) to more strongly encourage consideration of watershed health in development proposals.
- c) Adopt the updated citywide **Natural Resource Inventory** (NRI) as a basis for updating Portland's

Since the PWMP was adopted in 2006, the City of Portland has fully developed and is implementing a UIC management program that utilizes watershed health principles and integrates green infrastructure solutions into projects where feasible, particularly to address UICs in areas of shallow groundwater to comply with the permit. Green street facilities are used to increase distance between the bottom of a UIC and seasonal high groundwater by increasing surface infiltration, or allowing either the removal or shallowing of a UIC.

Comprehensive Plan, and to inform the updates of plans for the Willamette River (north, south, and central reaches) and the Columbia Corridor. (PP)

- d) Develop a Healthy Connected City Framework and map that identifies a system of neighborhood hubs and greenways that supports watershed health goals and stormwater system needs; use it to coordinate policy across elements of the Comprehensive Plan as well as implementation projects. (PP)
- e) Identify focus areas for preserving and enhancing neighborhood tree canopy for stormwater management, hazard mitigation, wildlife habitat benefits, air quality and climate change adaptation. Consider options in public works projects to minimize loss of existing canopy. (PP)
- f) Explore creation of a new revegetation City Code title to outline and authorize goals and values for revegetation and mitigation.

**TABLE 4. The Protection and Policy Strategy actions identified here will help directly or indirectly address the following conditions:**

	<i>Columbia Slough</i>	<i>Fanno Creek</i>	<i>Tryon Creek</i>	<i>Johnson Creek</i>	<i>Willamette River (mainstem)</i>	<i>Willamette River (tributaries)</i>
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Altered hydrology-summer low flow and winter flooding		✓	✓	✓		✓
Lack of inventory and protection of seeps and springs				✓		
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓
Disconnected or filled floodplains	✓	✓	✓	✓	✓	✓

## 5: OPERATIONS AND MAINTENANCE

The city owns, operates and maintains a wide range of infrastructure. This includes both built infrastructure such as roads, pipes, buildings and stormwater facilities; and natural infrastructure such as parks, natural areas, and trees. Effective operations and maintenance practices are critical to protecting watershed health and ensuring the lowest long-term cost to sewer ratepayers and taxpayers. Monitoring watershed health as a routine city operation allows us to track changes and help inform local policy and future investments in projects and programs. Managing both our built and natural infrastructure as assets helps prioritize spending to ensure efficient use of public resources as we maximize ecological and community benefits.

**1. Focus:** Manage, maintain and operate the city's built and natural infrastructure using asset management approaches.

### **Key Opportunities:**

- a) Identify existing stormwater and sewer infrastructure that has a high risk of failure due to limited or deferred maintenance, age, hazard or impacts of climate change (e.g., increased storm intensity). Prioritize these assets for monitoring, planning and investment to protect human and environmental health and safety. (PP)
- b) Plan, fund and manage green infrastructure as part of the city's capital systems. Complete green asset inventories and condition assessment where needed, and include valuation of green assets and risk considerations in life cycle planning. (PP)
- c) Develop a strategy for more adequate, stable and equitable funding for development, long-term maintenance and management of green infrastructure, including natural areas; explore and utilize new partnership models and incentives to provide community partnership opportunities and help maintain some green infrastructure (e.g., Green Streets Stewards Program, stormwater facilities at schools).
- d) Link stormwater system and street maintenance and operations with Endangered Species Act (ESA) considerations.
- e) Continue to adapt and refine green street facility designs and planting approaches to lessen maintenance requirements.

**The City of Portland inspects hundreds of public stormwater facilities each year, repairing and maintaining them as needed. As more green streets and other sustainable stormwater facilities are built, there is a growing need for inspections and maintenance to ensure these facilities function as designed and continue to be assets to the surrounding neighborhoods.**



*Removing invasive blackberry and clematis*

**2. Focus:** Continue robust monitoring to track overall watershed health and the impacts of project and program approaches; utilize data to inform future investments.

**Key Opportunities:**

- a) Implement the city’s comprehensive watershed monitoring strategy (PAWMAP) to provide consistent, comparable data over time and across watersheds. Use data to inform short- and long-term planning, to prioritize actions and projects across watersheds and to populate the Watershed Health Index communication tool.
- b) Continue monitoring the performance of restoration projects and sustainable stormwater projects. Use the results to inform design and implementation of future projects, to understand costs and ensure optimal benefits.
- c) Explore ways to utilize social equity and health indicators along with environmental indicators and monitoring data to inform planning and implementation of watershed health activities.

**TABLE 5. The Operations and Maintenance Strategy actions identified here will help directly or indirectly address the following conditions:**

	Columbia Slough	Fanno Creek	Tryon Creek	Johnson Creek	Willamette River (mainstem)	Willamette River (tributaries)
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Inflow and infiltration into sewer pipes		✓	✓			



## 6: EDUCATION, INVOLVEMENT AND STEWARDSHIP

Community education, stewardship and partnerships have a direct and long-term impact on the health of Portland's watersheds. Education and involvement show residents and businesses how individual actions relate to watersheds, and ultimately can result in improvements to urban watershed function and river and stream health beyond what government could do on its own. Providing educational opportunities and building stewardship among Portlanders ensures that future generations value and protect natural resources. Stewardship programs leverage city investments, build stronger community partnerships and spread the sense of community connection and stewardship for watershed health.

**1. Focus:** Engage more Portlanders in the siting, planning, building, planting and stewarding of our green infrastructure. Expand partnerships with neighborhood groups, coalitions, businesses, other agencies and community-based watershed and environmental organizations to leverage efforts and involve the private sector in watershed solutions.

### **Key Opportunities:**

- a) Establish or expand technical assistance and matching grant programs to build community capacity and support community-based watershed health projects and initiatives that support PWMP goals and the Healthy Connected City Strategy in the Portland Plan. (PP)
- b) Partner with educational institutions and workforce organizations to boost green job training programs—especially for diverse communities—that relate to watershed health and green infrastructure efforts. Support career awareness, training and environmental career-path programs for youth. (PP)
- c) Continue K-12 schools partnerships around watershed, drinking water source and water conservation education and stewardship programs for youth, including classroom and field experiences.
- d) Build upon partnerships with universities and other research entities to conduct, support and share research around urban ecology, green infrastructure, and community engagement.
- e) Enhance and build upon existing successful models of community stewardship of green infrastructure, such as the Green Street Steward Program, Tabor to the River Program approaches, and Neighborhood Tree Inventory Project.

**2. Focus:** Expand and improve communication and education about watershed health and stormwater with the public and internally at the city.

### **Key Opportunities:**

- a) Refine messages about green infrastructure and watershed health and restoration as part of Portland's ongoing investments in clean rivers and streams, and the linkage between this work, stormwater rates and regulatory requirements. Include messages about the multiple benefits of green infrastructure, such as the relationship to public health.

**In 2011, Friends of Mt. Tabor Park volunteers contributed over 2,400 hours removing invasive plants in the park, up from 380 hours in 2009, thanks in part to support from the Tabor to the River Program.**

- b) Roll out the Portland Watershed Health Index<sup>8</sup> as a communication tool about targets for healthy watersheds and progress toward goals. Issue periodic reports on the health of our rivers and streams and related projects and programs.
- c) Celebrate accomplishments and community partnerships; create new opportunities to recognize citizen work for watershed health. Make stronger linkages to success and results to inspire future partnering opportunities with community members and groups.

**TABLE 6. The Education, Involvement and Stewardship Strategy actions identified here will help directly or indirectly address the following conditions. Particularly for this strategy, actions related to education and outreach will support work the city and other agencies are doing to address all of the watershed conditions. In addition, direct citizen participation and engagement can directly address some of the conditions:**

	Columbia Slough	Fanno Creek	Tryon Creek	Johnson Creek	Willamette River (mainstem)	Willamette River (tributaries)
Water quality limitations	✓	✓	✓	✓	✓	✓
Toxic pollutants in sediment	✓			✓	✓	
Stormwater runoff volume and/or pollutants	✓	✓	✓	✓	✓	✓
Inadequate riparian buffers	✓	✓	✓	✓	✓	✓
Inadequate or degraded upland habitat connections	✓	✓	✓	✓	✓	✓
Lack of large wood and/or channel complexity	✓	✓	✓	✓	✓	✓
Limited shallow and off-channel habitat	✓			✓	✓	✓
Altered hydrology-summer low flow and winter flooding		✓	✓	✓		✓
Inflow and infiltration into sewer pipes		✓	✓	✓		
Culverts and other in-stream barriers	✓	✓	✓	✓		✓
Lack of inventory and protection of seeps and springs				✓		
Low macroinvertebrate population and diversity	✓	✓	✓	✓	✓	✓
Disconnected or filled floodplains	✓	✓	✓	✓	✓	✓

## V. Conclusion

Working for watershed health improvement is a long-term commitment that involves many partners and individual—as well as government—actions. This strategy communicates priority focus areas and key opportunities related to the City of Portland's efforts in the coming years. Although the strategy may appear ambitious, many of the programs and projects are already underway. Working together with the community, other agencies and jurisdictions, and across city bureaus, Portland will achieve key components of the strategy that will continue to improve watershed health.

Success will be measured not only by periodic progress reports on the actions outlined in this strategy, but also by the changes in various indicators in the Watershed Health Index over time. Adaptive management that takes into account monitoring data, community input, asset management principles, and funding availability will help shape approaches to the work.





Willamette River  
Portland Oregon



## VI. References and Notes

<sup>1</sup> The Bureau of Environmental Services is the City of Portland’s lead bureau responsible for complying with the regulations of the Clean Water Act, Endangered Species Act and Safe Drinking Water Act, ensuring that the condition of Portland’s streams and rivers are improved and maintained to meet their designated beneficial uses.

<sup>2</sup> Green infrastructure includes both constructed facilities and natural resources that facilitate, mimic, or preserve natural processes for groundwater, surface water and habitat. Green infrastructure approaches for stormwater infiltrate, evapotranspire or detain stormwater through the utilization of soils or vegetation (definition: BES 2010). This includes urban trees, sustainable stormwater facilities (green streets, swales, planters and other on-site management), ecoroofs, natural area parks and open space, streams, wetlands, riparian areas and floodplains.

<sup>3</sup> Under the city’s *National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit*, a Stormwater Management Plan is required that describes measures the city will implement to control pollutant discharges to the stormwater system.

<sup>4</sup> Study by ICF International, 2011: *Johnson Creek Salmonid Potential with Future Urban Development, Climate Change and Restoration: 2009 to the 2040s*

<sup>5</sup> Ibid.

<sup>6</sup> PP: Reflects actions from the Portland Plan

<sup>7</sup> An EcoDistrict is a neighborhood or district with a broad commitment to accelerate neighborhood-scale sustainability through performance goals, district investments and community action, and tracking the results over time ([www.pdxinstitute.org](http://www.pdxinstitute.org)). Active planning is underway for four Portland EcoDistricts.

<sup>8</sup> The Portland Watershed Health Index is a tool that uses monitoring data from PAWMAP and other sources to communicate changes in certain watershed health indicators over time. The tool was developed after adoption of the PWMP and is now populated with the first year of PAWMAP data (2011).





ENVIRONMENTAL SERVICES  
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