



# SHADING THE CREEK

Ample, cool streamflow is essential for fish and wildlife. Warm water carries less dissolved oxygen, and direct sunlight can cause algal blooms.

During the summertime, Johnson Creek is often hotter than state water quality standards for rearing salmon and trout (64.4 ° F). In fact, the maximum mainstem stream temperature for 2008-2012 was in July 2009, when it reached 80 ° F.

Historically, streams were kept cool by the dense forests that shaded the stream channels. But in 2002, the average effective shade over mainstem Johnson Creek was just under 40%.<sup>5</sup>

Analysis has shown that to keep Johnson Creek cool enough for trout and salmon to thrive in the future, an average of 80% effective shade over the stream channel will be required. To meet this goal, trees must be planted along streambanks everywhere possible. Even a narrow creekside forest buffer in a backyard makes a big difference.

Since it can take up to 30 years for a tree to grow large enough to completely shade the creek, it will be a long time before we will be able to detect a stream temperature response to planting efforts. In the meantime, fish may find refuge in small, shaded tributaries and areas with groundwater springs.



# STREAMFLOW

Johnson Creek is known for flooding. Actually, it would flood more often if rainfall over the most urbanized part of the watershed flowed directly into Johnson Creek, instead of being diverted to underground drywells and into the combined sewer system. In fact, the frequency of flooding hasn't changed since 1941,<sup>7</sup> when consistent measurements of streamflow began, even though the watershed has become more urbanized.

In contrast, summertime streamflows in Johnson Creek don't meet targets set for fish and wildlife. Johnson Creek would run completely dry in the summertime if everyone who legally owns water rights pumped what is allocated to them.<sup>8</sup>

In its natural state, Johnson Creek flowed stronger in the summertime and had less flashy peak flows. Forests and wetlands intercepted and soaked up the rain, and the creek rose more slowly as it spread out over connected floodplains. As a result, more cool groundwater fed the stream during the summers.

Future development and climate change will exacerbate the impacts of summer droughts and higher-intensity rainstorms on aquatic life. But there is hope; modeling has shown that even with predicted changes, implementation of large-scale floodplain and habitat enhancement projects can sustain salmon and trout over the next 30 years.<sup>9</sup>



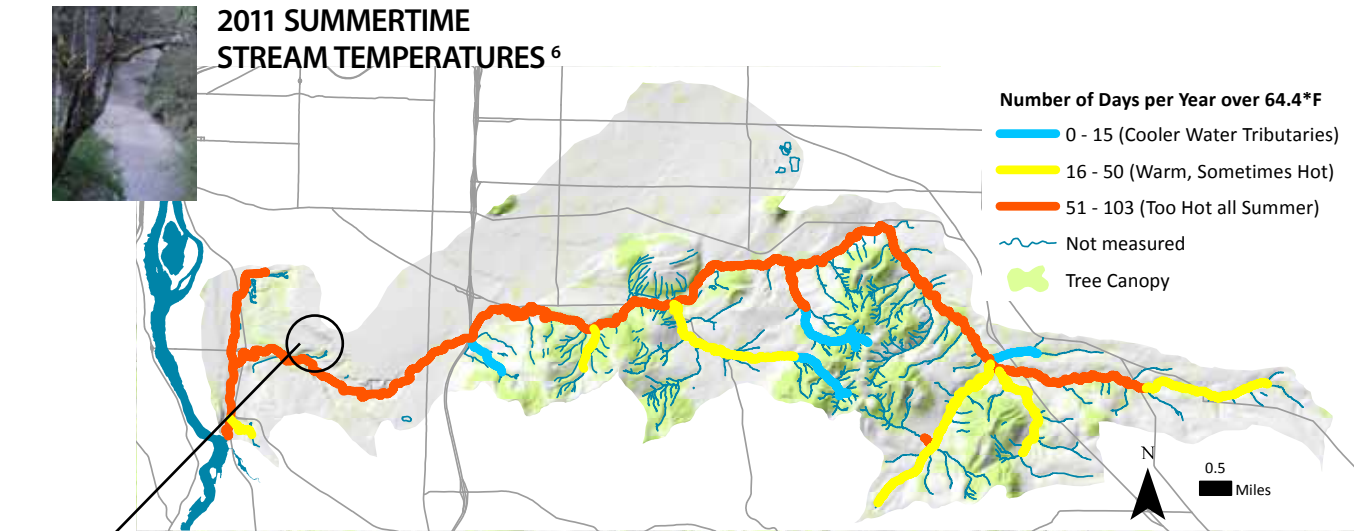
# POLLUTION

In both rural and urban areas, water pollution harms animal and plant life. Some pollutants are water-soluble, while others attach to soil, and others are taken up by living organisms, such as fish.

For example, road runoff carries harmful heavy metals and oil from cars to the stream. Research is showing that high levels of copper in creeks are derived from brake pad dust created every time we brake. Copper concentrations found in Johnson Creek stormwater are high enough<sup>13</sup> to affect the neural development of young coho salmon and their ability to detect predators. In some urban streams in Seattle, adult coho salmon are dying before they can spawn due to road runoff pollution.<sup>14</sup>

Pesticides and herbicides can be dangerous to aquatic life. Studies have shown dangerous levels of residual DDT in mainstem and upper Johnson Creek.<sup>15</sup> Because DDT is attached to soil particles, it's possible to reduce levels of this contaminant by preventing erosion and keeping soil out of the creek. In Johnson Creek, over 99% of the sediment is transported during the highest 50% of the flows, which is why it resembles chocolate milk after storm events.<sup>16</sup>

Lastly, rainstorms and floods carry garbage into the creek. Each year, volunteers remove shopping carts, remnants of flooded homeless camps, and plastic bottles among other trash, to help maintain the natural beauty of the stream.



## Improving Access to Cool Water Refuge Areas ERROL CREEK CONFLUENCE PROJECT



Many freshwater springs and wetlands contribute cool water to Johnson Creek year-round, including Crystal Springs, Spring Creek, and Errol Springs.

To provide fish access to cooler water, in 2009, the City of Portland removed part of SE 44<sup>th</sup> Avenue and restored the 300 feet of Errol Creek that had been piped under the road.

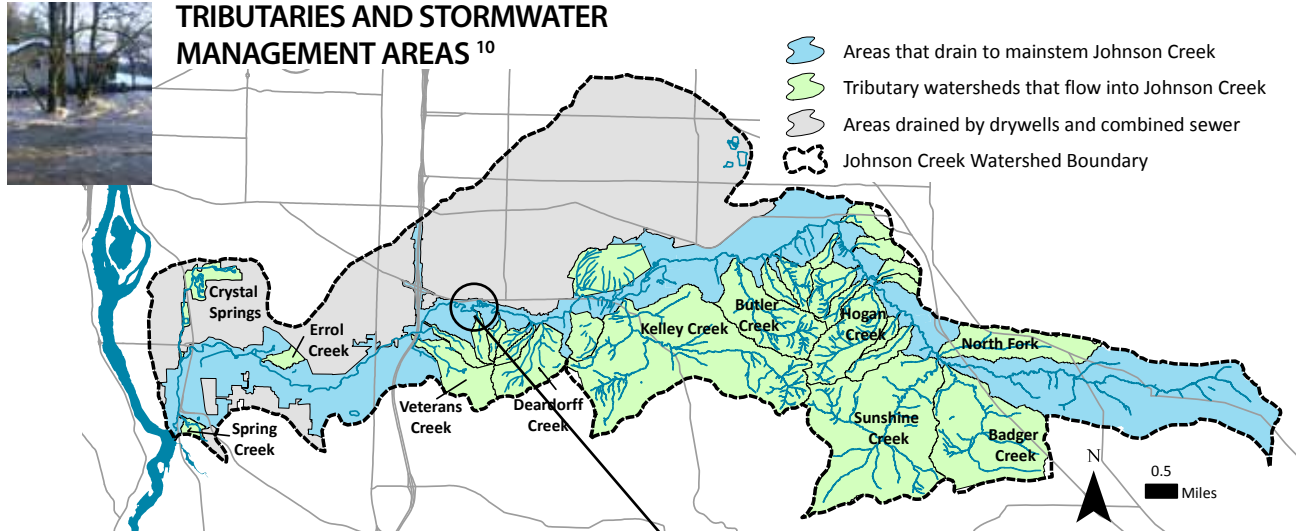
In addition, 1.4 acres of floodplain forest were restored and 77 large logs with rootwads were installed along the streambanks to prevent erosion and enhance aquatic habitat.

## Restoring Riparian Forests to Shade Johnson Creek PRIVATE LANDOWNERS PLANT TREES

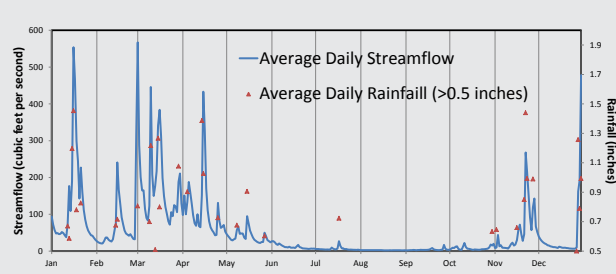


In rural areas of upper Johnson Creek, private landowners are working with Conservation Districts and the Watershed Council to restore riparian forests. Since 2009, East Multnomah SWCD's StreamCare Program has planted over 29,000 trees on 32 properties along 2.5 stream miles.

Throughout the watershed, the Johnson Creek Watershed Council and partners have helped over 100 other private landowners plant over 100,000 trees along Johnson Creek and tributaries. In urban neighborhoods, Friends of Trees has planted over 4,500 street trees in the Johnson Creek Watershed.



## 2011 STREAMFLOW AND RAINSTORMS IN JOHNSON CREEK<sup>11, 12</sup>



Streamflow in Johnson Creek is closely related to rainfall over the landscape, which varies from an average of 40 to 60 inches per year in different parts of the watershed. This annual hydrograph (a chart of streamflow over time) shows very low summertime streamflows and frequent, flashy peak flows that are closely related to rainstorms.

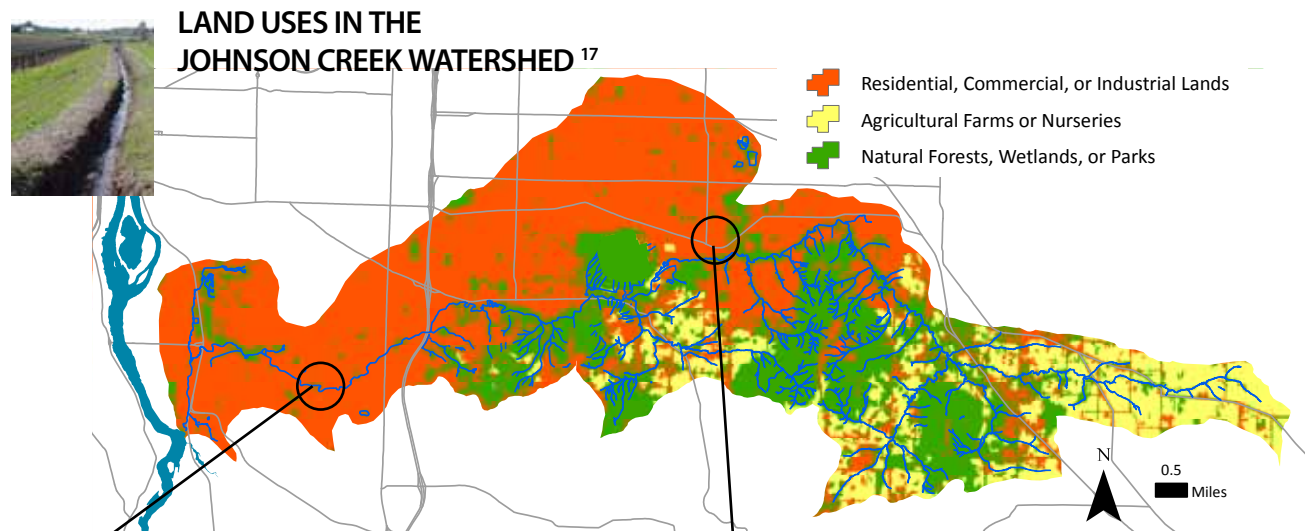
## Giving Johnson Creek Space to Flow EAST LENTS FLOODPLAIN RESTORATION



An economic analysis showed that it is less expensive to restore floodplains along Johnson Creek, where houses and businesses were flooded each year, than to annually repair damaged infrastructure.

As a result, Portland has purchased 84 parcels from willing sellers and helped 60 property owners move out of this flood-prone area since 1994. In 2011, after removing the houses, Portland excavated 50,000 cubic yards of soil (5,000 dump truck loads) from a 70-acre area and re-planted it with native forest.

Heavy rains in January 2012 tested the project with a 5-year flood, which previously would have inundated Foster Road businesses. Even though 1,500 cfs (cubic feet per second) of water rushed down Johnson Creek, it didn't overflow the project area.



## Making Johnson Creek Safer to Play In CLACKAMAS WES SEWER PROJECT



Johnson Creek doesn't meet state health standards for contact recreation because of high levels of E. coli bacteria, which come from the poop of warm-blooded creatures, including humans.

In 2011, Clackamas County Water Environment Services completed a new sanitary sewer collection system to serve nearly 1,000 customers in the Milwaukie area. It will replace old septic tanks and cesspits and will reduce bacteria input to Johnson Creek.

To focus pollution-prevention efforts, the Watershed Council and partners are launching a study in 2012 to identify the sources of these E. coli bacteria in Johnson Creek, whether they are birds, dogs, cows, or people.

## Filtering Road Runoff and Contaminants POWELL/HWY 26 STORMWATER RETROFITS



In 2005, the City of Gresham reduced road runoff to Johnson Creek from Powell Blvd by 4 million gallons annually by installing permeable pavers and vegetated median swales.

To improve water quality, road runoff is now filtered by oil/water separation catch basins before entering Johnson Creek. By using native drought- and flood-tolerant plants, summertime watering and use of fertilizers and pesticides were reduced.

Many other stormwater retrofits and innovative water treatment designs are being constructed in the Johnson Creek watershed due to Portland's "1% for Green" and other progressive development codes.

<sup>5</sup> Oregon Department of Environmental Quality. 2006. "Johnson Creek Temperature TMDL; Lower Willamette Subbasin TMDL." Portland, OR; <sup>6</sup> Lindbo, T. 2012. "Watershed-Wide Temperature Assessment of Johnson Creek." presented at UERC Symposium, Portland, OR.

<sup>7</sup> Lee, K.K. and D.T. Snyder. 2009. "Hydrology of the Johnson Creek Basin, Oregon." U.S. Geological Survey Scientific Investigations Report 2009-5123; <sup>8</sup> Oregon Department of Water Resources (<http://www.oregon.gov/OWRD/WR/wris.shtml>); <sup>9</sup> ICF International. 2011. "Johnson Creek salmonid potential with future urban development, climate change and restoration: 2009 - 2040s." prepared for the City of Portland, OR; <sup>10</sup> USGS StreamStats was used to delineate subbasins, and approximate stormwater management areas were provided by City of Portland BES. <sup>11</sup> Hydrograph data source: U.S.G.S. Sycamore Gage (<http://waterdata.usgs.gov/nwis/rt/>); <sup>12</sup> HYDRA rainfall gage data, provided by City of Portland BES.

<sup>13</sup> Johnson Creek stormwater data provided by City of Portland BES; <sup>14</sup> Scholz, N.L. et al. 2004. "Impacts of stormwater runoff on coho salmon in restored urban streams." Society of Environmental Toxicology and Chemistry's 4th World Congress, Portland, OR; <sup>15</sup> Johnson Creek Inter-jurisdictional Committee. 2005. "Johnson Creek Legacy Pesticide Study 2003-2005." Milwaukie, OR; <sup>16</sup> Stonewall, A.J. and H.M. Bragg. 2011. "Suspended-Sediment Budget for the Johnson Creek Basin, Oregon, Water Years 2007-2010." USGS Draft Scientific Investigations Report, Portland, OR; <sup>17</sup> National Land Cover Database, 2006, downloaded from <http://www.mrlc.gov/nlcd2006.php>



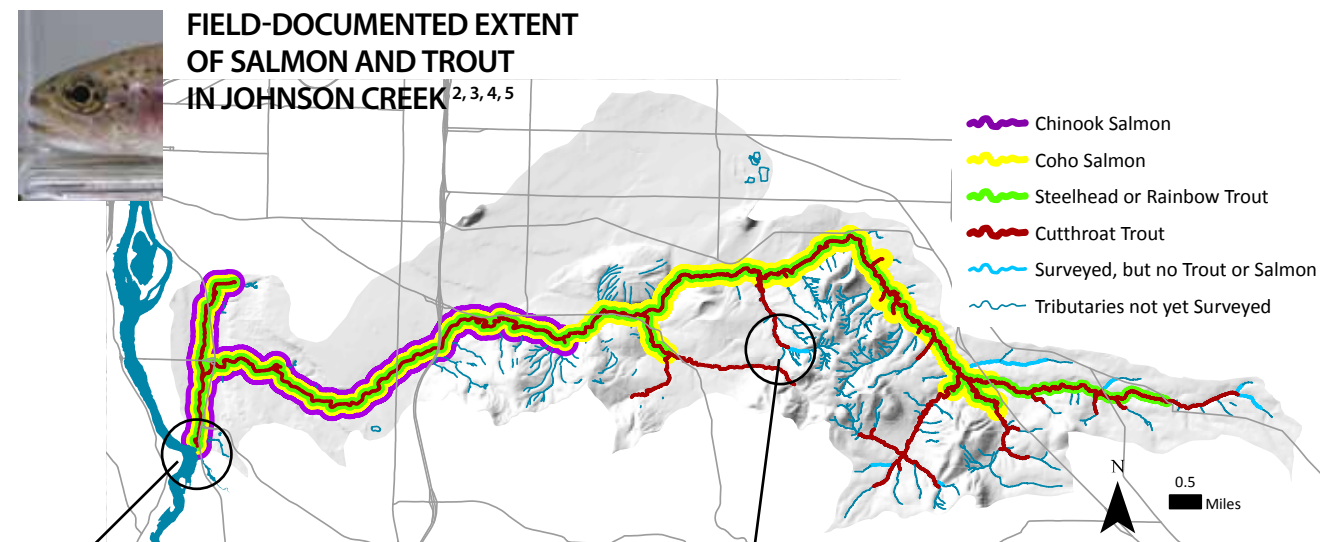


## FISH AND WILDLIFE

Wildlife in the Johnson Creek watershed includes river otters, painted turtles, black-tailed deer, and coyotes. Native frogs and salamanders have been found in most wetlands surveyed. Dense beds of western pearlshell freshwater mussels, whose reproduction depends on native fish, have been found from SE 156<sup>th</sup> up to the headwaters of Johnson Creek—many of them likely over 80 years old.<sup>1</sup> Beaver are active throughout the watershed, building dams that provide important habitat for juvenile salmon. Pileated woodpeckers, great blue herons, bald eagles, and many other birds depend on the forests, streamside areas, and wetlands in the watershed.

Salmon and trout still swim in Johnson Creek, though fewer than historically. In 2010 and 2011, wild coho salmon were seen spawning over 15 miles up Johnson Creek near Gresham. And, recent fish surveys have found salmon and trout further upstream than previously documented.<sup>2</sup> In fact, native fish species were found in nearly every tributary surveyed, even in the small, intermittent streams.

Habitat has been damaged throughout the watershed, and the resilience of native species has been tested. We are working to enhance and expand the remaining patches of good habitat so that native fish and wildlife can survive into the future.



### Enhancing Habitat and Removing Migration Barriers JOHNSON – WILLAMETTE CONFLUENCE



In 2011, private landowners, the City of Milwaukie, and JCWC collaborated to construct engineered log jams and a riffle at the confluence of Johnson Creek with the Willamette River. Over 150 logs were installed to provide cover and shelter for salmon and trout and to allow year-round fish passage over an exposed sewer pipe.

While Johnson Creek is free-flowing, a number of tributaries are still blocked to salmon by undersized or perched culverts. In many places, aquatic habitat is in poor condition due to hardened streambanks, channelization, and lack of instream woody debris and cover.

### Identifying and Protecting Healthy Headwater Habitats METRO NATURAL AREA ACQUISITIONS



Water pollution and damaged habitat negatively impact benthic macroinvertebrates (aquatic bugs), upon which trout and salmon feed, in most of Johnson Creek. But, we've found surprisingly healthy and diverse macroinvertebrate communities in tributaries that originate on forested buttes near Gresham.

Voter-approved bond measures in 1995 and 2006 funded the purchase of 1,089 acres of key natural areas in the Johnson Creek watershed, including the headwaters of Kelley and Butler Creeks. These headwater habitats are now protected, so that the species who live there may expand and colonize new areas as habitat is restored downstream.



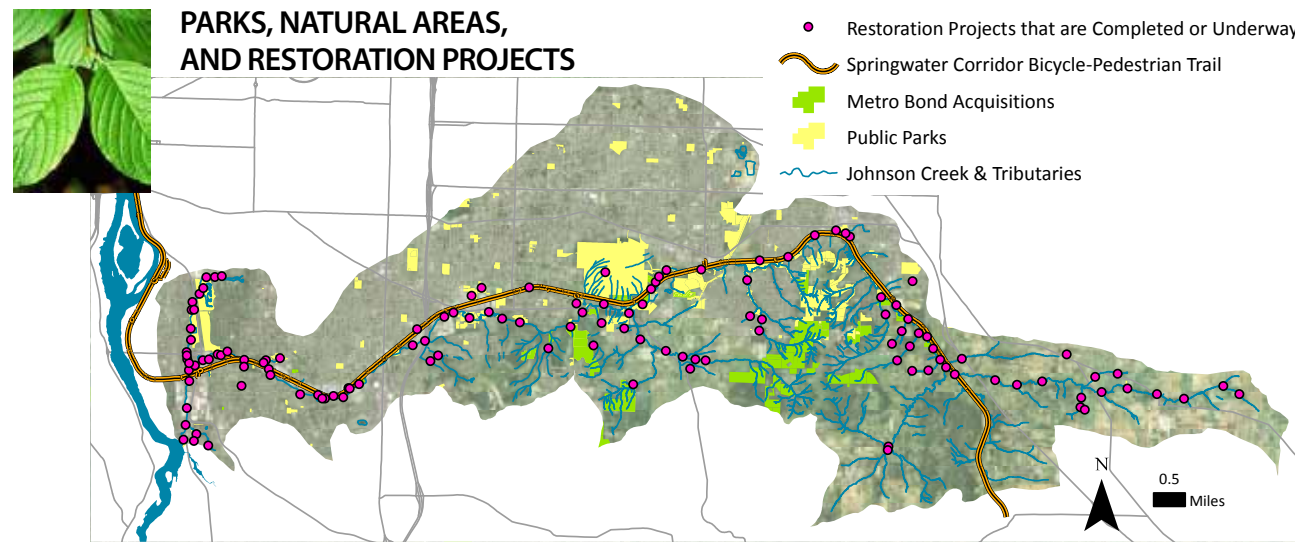
## 2020 VISION

### LONG-TERM WATERSHED GOALS:

- Healthy natural areas are protected and expanded through acquisition and restoration projects.
- Johnson Creek and tributaries are green corridors of connected tree canopy that extend to several forested upland areas.
- Pollution sources are addressed so that it's safe for children to swim and wade in Johnson Creek.
- Native fish species thrive and anadromous salmon and trout return in greater numbers each year.
- Johnson Creek becomes a regional icon for how people, fish, and wildlife can thrive together.

### THE COUNCIL'S FIVE-YEAR STRATEGIC PLAN:

- Implement restoration projects that improve ecological function and expand and connect healthy habitats.
- Collaboratively develop a scientific framework to guide land-use policy and restoration, and help us track progress over time.
- Be a well-known and trusted presence in the upper watershed.
- Increase the Council's long-term financial stability.
- Revitalize the Council's office as a community hub and center for environmental education.
- Effectively communicate the ecological, economic, and recreational value of the Johnson Creek watershed.



### JOIN US IN RESTORING JOHNSON CREEK



In 2011, over 1,100 volunteers dedicated a total of 5,500 hours serving Johnson Creek at 40 Watershed Council events. Thank you all. Our volunteer and support network continues to grow, which exemplifies the love and support community members have for Johnson Creek.

There are opportunities to get involved throughout the year, from restoration work parties, to mussel and salmon surveys, children's activities, paint-outs, bike tours, fundraisers, and more. Annual events include the Watershed-Wide Event on the first Saturday of March, now in its fourteenth year, the Council's Annual Meeting at Reed College in late May, and Johnson Creek Days during the month of September.

### ONLINE CONSERVATION REGISTRY



The Council, jurisdictional and agency partners, private landowners, and other non-profits have implemented over 120 restoration projects throughout the Johnson Creek Watershed. Descriptions and mapped locations for these projects are available at [www.jcwc.conservancyregistry.org](http://www.jcwc.conservancyregistry.org).

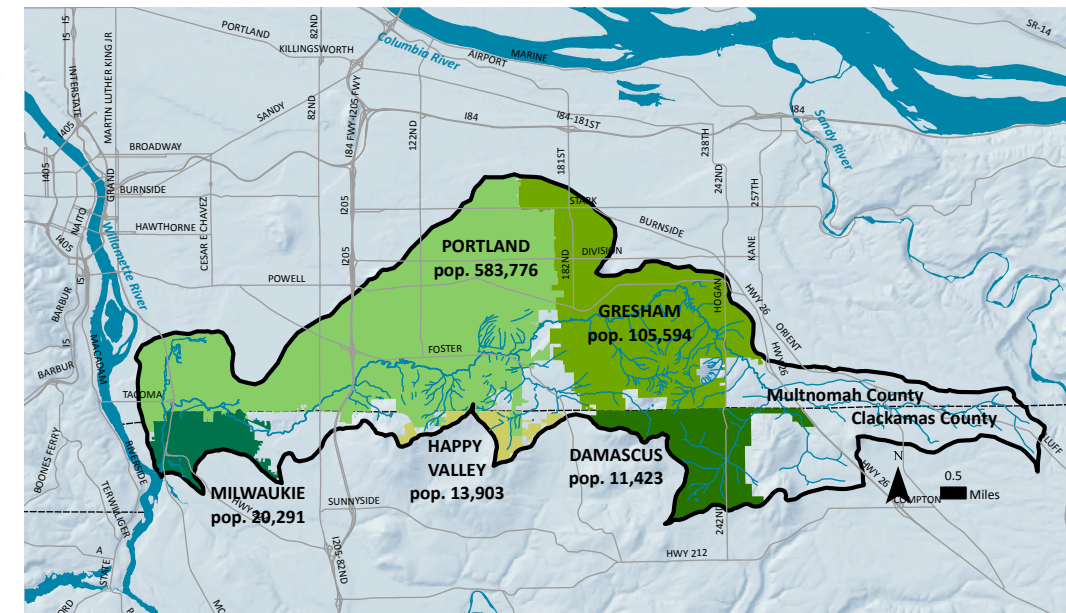
This online catalog of restoration projects enables ongoing monitoring of tree growth and maintenance needs. In addition, the compiled data allows us to begin exploring the effects of different types of restoration techniques on water quality, wildlife, and real estate values. Seeing these projects at a watershed scale, it's evident that a major effort is underway to improve livability for fish, wildlife, and people in the Johnson Creek watershed.



Johnson Creek flows west for 26 miles from the agricultural foothills of Mount Hood near Boring, Oregon, to enter the Willamette River just upstream of Portland. Numerous springs and 50 inches of annual rainfall over a 54-square-mile watershed provide streamflow to the creek and its tributaries. Salmon, trout, diverse wildlife, and 180,000 people live in the Johnson Creek watershed. The creek provides water for agriculture and a picturesque setting for recreation, supporting both people and natural resources.

Historically, Native Americans from the Molalla Band lived in the Johnson Creek area. In the 1800's, immigrants settled here, building several mill dams on the creek by 1852. By 1890, a railway ran alongside the stream. In the 1930's, the lower 15 miles of Johnson Creek were channelized and lined with rock, which cut off floodplains, eliminated gravel bars, and destroyed streamside forests. Many long-time residents have childhood memories of easy fishing and tasty crawdad feasts.

### JOHNSON CREEK WATERSHED BOUNDARIES AND JURISDICTIONS



The Johnson Creek watershed is located just south of the Columbia River, and to the east of the Willamette River.

### JOHNSON CREEK WATERSHED COUNCIL



*Our mission is to promote restoration and stewardship of a healthy Johnson Creek Watershed through sound science and community engagement.*

Oregon Watershed Councils are grassroots community groups of citizens who want to protect, restore and enhance their local watershed where they live, work, and play. Watershed Councils are voluntary, locally organized, non-regulatory organizations, and are intended to be broadly representative of their respective areas.

Contact us at 503-652-7477, browse our website [www.jcwc.org](http://www.jcwc.org), or visit our office at 1900 SE Milport Rd, Suite B; Milwaukie, OR 97222.

### POSITIVE SIGNS OF ECOLOGICAL RECOVERY



Over the past twenty years, major public and private investment has begun reconnecting Johnson Creek to its floodplain and protecting and restoring important fish and wildlife habitat. Furthermore, Metro's Title 3 and Title 13 zoning regulations now protect streams and wetlands as nearby areas are developed.

Thanks, in part, to several voter-approved bond measures, over 4,600 acres of parks and natural areas are protected in the watershed. In addition, a 21-mile bicycle and pedestrian path follows the creek for much of its length.

This report summarizes the best available information for fish, wildlife, habitat conservation, stewardship, streamflow, and water quality in Johnson Creek.

<sup>1</sup> Jenkins, N. and C. Mazzacano. 2011. "Freshwater Mussel Surveys in Johnson Creek; Volunteer Biological Monitoring." poster at UERC Symposium, Portland, OR; <sup>2</sup>Iwai, R. 2012. "Preliminary Results for Upper Johnson Creek Fish Surveys." Multnomah County Roads, Portland, OR; <sup>3</sup>City of Portland BES Fish Survey Results for 2010-2011; <sup>4</sup>Van Dyke, E.S. and A.J. Storch. 2009. "Abundance and Distribution of Fish Species in City of Portland Streams, 2008-2009 Surveys." ODFW, Clackamas, OR; <sup>5</sup>Tinus, E.S., J.A. Koloszar, and D.L. Wood. 2003. "Abundance and Distribution of Fish in City of Portland Streams, 2001-2003 Surveys." ODFW, Clackamas, OR.

Photos courtesy of City of Gresham, City of Portland BES, Eric Griswold, John Hamil, Bruce MacGregor ([www.brucemacgregorphotography.com](http://www.brucemacgregorphotography.com)), and the Wild Fish Conservancy. For more information, please read the "Johnson Creek Resources Management Plan," 1995, by the Johnson Creek Corridor Committee (precursor to the Watershed Council); the "Johnson Creek Restoration Plan," 2001, by the City of Portland BES; and the "Johnson Creek Watershed Action Plan; An Adaptive Approach," 2002, by the Johnson Creek Watershed Council.

The Johnson Creek Inter-jurisdictional Committee (IJC) provided technical assistance in the development of this report. The IJC includes representatives from the City of Portland, City of Gresham, City of Milwaukie, City of Damascus, Multnomah County, Clackamas County, Metro, East Multnomah Soil and Water Conservation District, Clackamas County Soil and Water Conservation District, Oregon Department of Environmental Quality, Oregon Department of Agriculture, U.S. Geological Survey, and the Johnson Creek Watershed Council.