

Johnson Creek: The State of the Watershed

Spring 2008



Stream Habitat Do fish have places to live?

Salmon have a complex life cycle, which requires special characteristics of the places they live. Side channels and backwater pools (refugia) provide areas of slow water connected to the main stream channel where salmon can escape strong current to rest. Channel complexity, in the form of boulders, downed logs and tree root wads in the channel, slows the current and provides shelter from predators as well as habitat for insects that juvenile salmon eat. Salmon also require gravel beds where they can spawn, and open passage up- and downstream.

A Works Progress Administration project in the 1930s widened and straightened most of the lower 15 miles of Johnson Creek's channel, and lined it with rock. This presents a serious challenge for salmon habitat, as much of the connection with the natural floodplain, its back channels and wetlands has been lost. Several recent projects have addressed this locally by removing the rock lining, re-introducing bends in the stream channel and adding back-channels and pools, as well as increasing channel complexity.

Meanwhile, other projects have been aimed at removing passage barriers for fish throughout Johnson Creek and its tributaries. Dams on the mainstem, Crystal Springs, and Kelley Creek have been removed or bypassed with fish ladders, and several culverts have been replaced or are targeted for replacement in the next few years.



Fish and Wildlife What lives in the watershed?

Surveys by the Oregon Department of Fish and Wildlife (ODFW), along with fish rescues done during restoration projects, have shown that fish populations in the Johnson Creek watershed are dominated by native species, particularly those tolerant of warm water. Salmonids, which are cold-water species, are present throughout the watershed; steelhead and cutthroat trout are found along most of the mainstem, while chinook and coho salmon are located primarily on the lower mainstem and in Crystal Springs¹. Coho were observed spawning in Crystal Springs in November 2006².

Information on amphibians, mammals, and other wildlife specific to the Johnson Creek watershed is largely anecdotal. Sensitive species in the watershed include long-toed, northwestern, and Columbia salamanders, red-legged frogs, and painted turtles³. Black-tailed deer and coyotes can be found in or near forested areas; sightings of cougar are occasionally reported.



Stream Flow How much water is in the stream?

Fish and other aquatic life need enough water to keep them alive, but not so much that they are swept downstream. People living by the creek also care about the quantity of water, since too much can cause flooding. Like many urban streams, Johnson Creek tends to be flashy—the rain dropped by storms moves very quickly over pavement and through pipes into the creek, causing water level and flow to increase and drop rapidly as storms move through the watershed.

Johnson Creek suffers on both extremes. During the summer, baseflow is often below the minimum established by ODFW for salmonids, especially upstream of Crystal Springs (which, being spring-fed, provides constant, year-round flow)⁴. Winter storms frequently cause flood damage, and contribute to erosion and bank scouring.

An understanding of baseflow and peak flow depends in part on understanding movement and recharge of groundwater; a report from the U. S. Geological Survey (USGS), currently in review, will provide information on these connections, as well as track trends in low and high flows in space and time.

(Endnotes)

¹ Tinus, E. S., J.A. Koloszar and D. L. Ward. 2003. Abundance and Distribution of Fish in City of Portland Streams: Final Report 2001-03. Oregon Department of Fish and Wildlife

² Johnson Creek Watershed Council. 2007. Within Your Reach Volume XV, No. 1

³ Johnson Creek Watershed Council. 2003. Watershed Action Plan: an Adaptive Approach <http://www.jcwc.org/actionPlan/TOC.htm>

⁴ United States Geological Survey online data (<http://or.water.usgs.gov/johnsoncreek/>; last accessed March 11, 2008)

⁵ City of Portland Bureau of Environmental Services. Online data (<http://www.portlandonline.com/bes/index.cfm?a=bagcdf&c=ddcbd>; last accessed April 4, 2008)

⁶ Meross, Sharon. 2000. Salmon Restoration in an Urban Watershed: Johnson Creek, Oregon. Prepared for the Portland Multnomah Progress Board



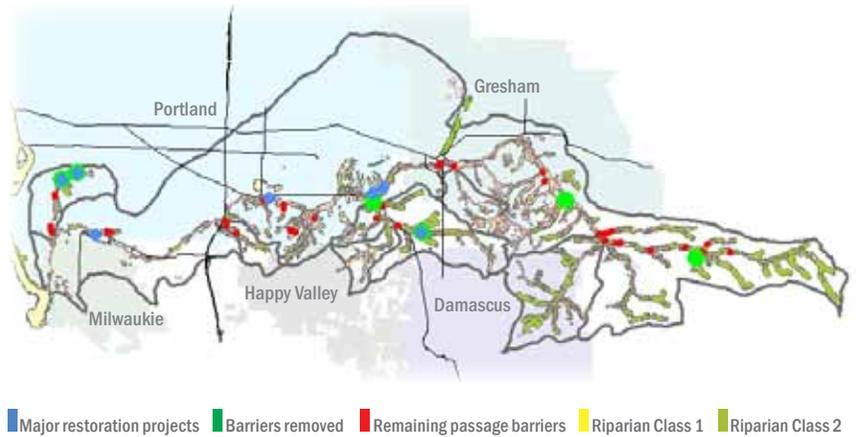
The Watershed at a Glance

Stream Habitat

- Recent restoration projects have added more than 800 boulders and pieces of large wood to Johnson and Kelley Creeks, as well as 3,500 feet of refugia habitat⁵. Watershed-wide data on channel conditions and complexity and floodplain connection need to be updated.

- Jurisdictional efforts, such as Portland's Watershed Revegetation Program, along with the JCWC, schools, and "Friends of" groups, have planted well over 15,000 linear feet along streams in the watershed.

- No impassable culverts exist on the mainstem below 282nd Avenue. A more complete inventory of passage barriers on private property is needed.



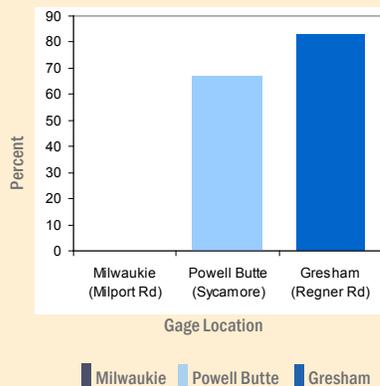
Stream Flow

- ODFW's recommended minimum baseflow varies by month from 2 to 25 cfs⁶. Actual summer baseflows are regularly below minimum at the Sycamore and Regner gages; summer flows at Milport are adequate⁴.

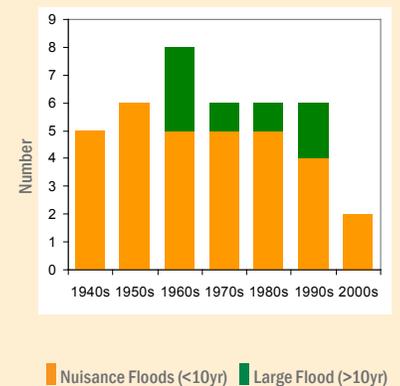
- There have been 39 flooding events along Johnson Creek since 1941; 32 of these have been classified as "nuisance" floods (expected at least once every 10 years)⁷.

- There are 32 surface diversions or impoundments on the mainstem of Johnson Creek; all but one predates the ODFW instream right. If all existing rights were exercised, the mainstem would go dry in the summer⁸.

Percent of Days Below ODFW Minimum Flow in Summer 2003-2007



Number of Flood Events in Johnson Creek by Decade



People

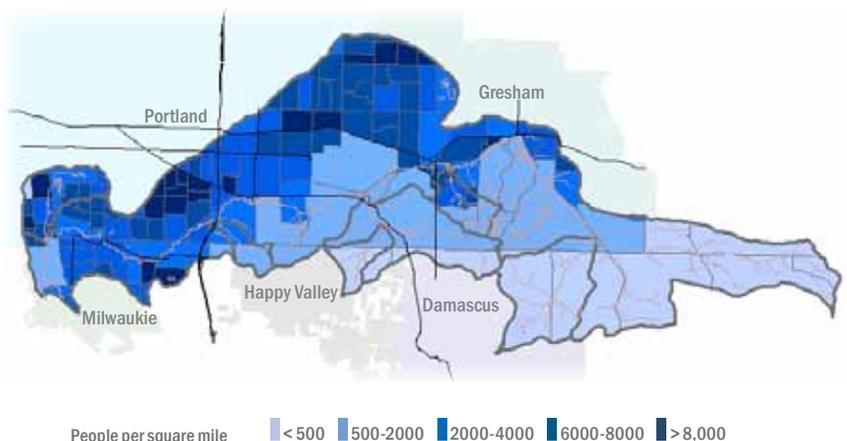
- Total population > 170,000¹².

- Total population density > 3,200 per sq. mi.

- Household income by census tract ranges from under \$30,000 to nearly \$80,000¹².

- The watershed is quickly becoming more ethnically diverse; the population of non-whites more than doubled from 1990 to 2000¹³.

- Only 3% of respondents to a 2003 survey were unfavorable toward water resource protection¹⁴.



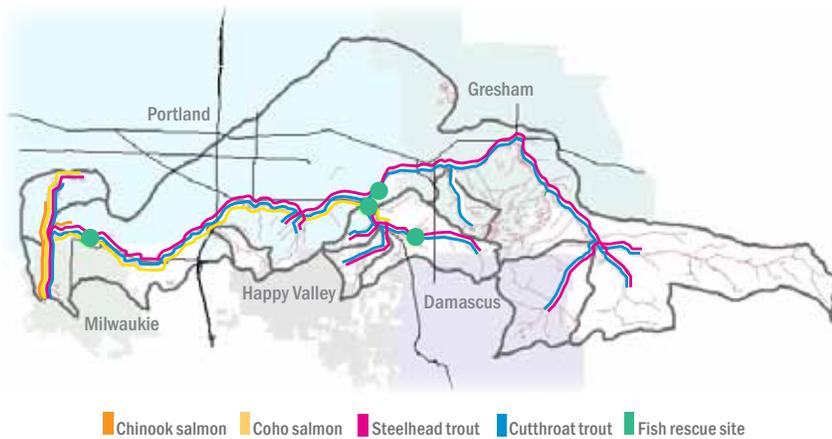


Fish and Wildlife

- ODFW fish surveys in 2001-2003 found steelhead and cutthroat trout throughout Johnson Creek, with coho and chinook salmon on the mainstem below Crystal Springs. Coho were also found in Crystal Springs, and Kelley Creek had significant populations of cutthroat trout¹.

- Data from recent fish rescues confirmed the presence of salmon as far upstream as Kelley Creek. Catches were dominated by native warm-water fish species; non-natives made up less than 2% of total finds.

- Other wildlife data are spotty or anecdotal.



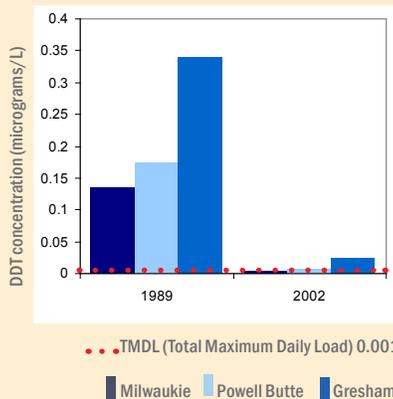
Water Quality

- DDT concentrations have dropped by 74% over the last decade⁹; dieldrin levels have also decreased¹⁰. Nonetheless, a further 78% reduction is required to meet TMDL requirements for urban stormwater, as is a 94% reduction from non-point sources⁹. PAHs and PCBs are also above permissible levels; TMDLs are being developed for these contaminants.

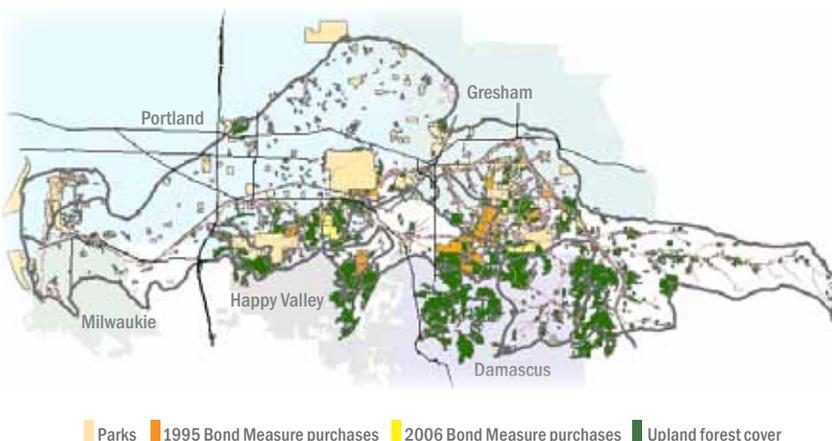
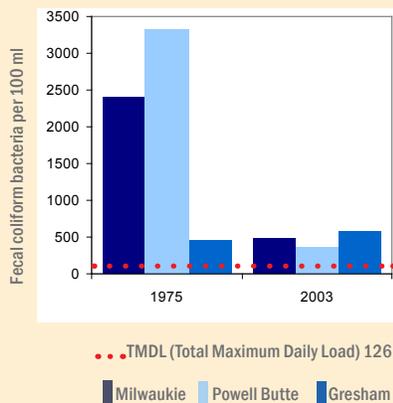
- Conversion from septic to sewers has decreased bacteria in parts of Johnson Creek by a factor of 10 since the 1970s^{11,9}; Oregon DEQ mandates a further 78% decrease to comply with TMDL requirements⁹.

- All parts of the watershed violate the 18°C (64°F) temperature TMDL during summer⁹; increased shading is necessary.

DDT
in Johnson Creek
1989 vs 2003



Bacteria
in Johnson Creek
1975 vs 2003



Land Use

- There are over 4,600 acres of parks and open space in the Johnson Creek watershed.

- Bond measure funds have allowed the purchase of nearly 900 additional acres.

- A total of 8,000 acres in the watershed are forested; most of this is on private land.

- More than 25% of the watershed in Gresham, Portland and Milwaukie is impervious surfaces. Much of the watershed above the Kelley Creek confluence is less than 10% impervious⁶.

State of the Watershed Summary

Restoration and protection efforts, such as revegetation and the removal of fish passage barriers, are making a difference in the Johnson Creek watershed, but there is more to be done to meet provisions of the Clean Water Act and improve other aspects of watershed health. Many jurisdictions and agencies collect a substantial amount of information on Johnson Creek and its tributaries; analysis of this information is painting a clearer picture of how the watershed functions and what challenges are the most important to address. There are several forthcoming reports that will increase our understanding of watershed processes. Working with private landowners—particularly in the upper watershed and areas slated for development—to encourage stewardship and awareness of watershed resources will be an important role for the Johnson Creek Watershed Council in the coming years. Continued and new partnerships with jurisdictions, schools, and “Friends of” groups will also be vital to the work of restoring watershed health.



Water Quality What's in the water?

Johnson Creek, like many urban streams, violates several federal Clean Water Act (CWA) standards. Temperature, pesticides (DDT and dieldrin), bacteria, PCBs, and PAHs are above permissible levels in the Johnson Creek watershed⁹. Temperature is most directly important to aquatic life, since warm water makes it difficult for some species, such as salmon, to survive. The other factors are of concern to everyone; polluted water is dangerous for wildlife, pets, and people.

To comply with the CWA, the Oregon Department of Environmental Quality (DEQ) developed Total Maximum Daily Load (TMDL) standards for temperature, pesticides, and bacteria in 2006. The jurisdictions of Johnson Creek submitted TMDL implementation plans, intended to bring the stream into compliance with the CWA, to DEQ in spring 2008. DEQ is currently developing TMDLs for PCBs and PAHs.

While water quality in Johnson Creek is consistently rated “Very Poor” on DEQ’s Water Quality Index⁹, there has been an improvement in DDT and dieldrin levels¹⁰, as well as in bacteria and nutrients in some areas of the creek^{11,9}. DDT is closely linked to suspended sediments¹⁰, making it possible to reduce levels of this contaminant by preventing erosion. A USGS report due in 2009 will provide more detailed information on sediment sources and how land use may affect them. A separate USGS study will analyze summer stream temperature relative to air temperature.



People Who lives in the watershed?

The Johnson Creek watershed is home to over 170,000 people¹². Density varies from a few hundred people per square mile in the far eastern part of the watershed to over 8,000 people per square mile in parts of Portland in the lower watershed¹². Income also varies considerably, with both high- and low-income neighborhoods located throughout the watershed¹².

Though less diverse than the Metro region overall, the watershed saw a more than two-fold increase in populations of people of color in the decade from 1990 to 2000¹³.

A 2003 survey of watershed residents found widespread support for water resource and habitat protection. However, many residents were unfavorable toward regulations and taxes as means of achieving these goals¹⁴.



Land Use How is land used?

Johnson Creek and its tributaries provide much of the wildlife habitat and recreational opportunities for residents of the watershed. Overall, there are roughly 4,600 acres of parks and open space in the watershed. Voter-approved bond measures for the purchase of open space are continually adding to this total, with nearly 900 acres acquired since 1995.

Just over 8,000 forested acres remain in the watershed; most of this is on private land. Agriculture and rural residential areas dominate the eastern part of the watershed, characterized by less than 10% impervious surface⁶. The western part of the watershed is heavily urbanized, with single- and multi-family residential and commercial/industrial uses dominating, and generally more than 25% impervious surface⁶.

The Pleasant Valley and Springwater planning areas, as well as the City of Damascus, will be undergoing development in the next several years. This has the potential to change the character of the upper watershed considerably.

(Endnotes)

⁷ City of Portland Bureau of Environmental Services. 2001. Lents 2040 Technical Memorandum #1

⁸ Oregon Water Resources Department: Online data (<http://apps2.wrd.state.or.us/apps/wr/wrinfo/Default.aspx>, last accessed March 11, 2008)

⁹ Oregon Department of Environmental Quality. 2006. Willamette Basin TMDL

¹⁰ Tanner, D. Q., and K. K. Lee. 2004. Organochlorine Pesticides in the Johnson Creek Basin, Oregon, 1988-2002: United States Geological Survey Scientific Investigations Report 2004-5061. <http://pubs.er.usgs.gov/usgspubs/sir/sir20045061>

¹¹ Oregon Department of Environmental Quality. 1975. Water Quality in Johnson Creek

¹² United States Census Bureau. Online data (<http://www.census.gov>; last accessed March 15, 2008)

¹³ Coalition for a Livable Future. 2007. Regional Equity Atlas

¹⁴ Larson, K. and M. Santelman. 2007. An Analysis of the Relationship between Residents’ Proximity to Water and Attitudes about Resource Protection. *The Professional Geographer* 59:3 316-333

