



# NONPOINT SOURCE SUCCESS STORY

## Oregon

### Managing Stormwater and Restoring Streams and Riparian Areas Improved Columbia Slough

#### Waterbody Improved

In the mid-1990s, water samples showed that the Columbia Slough exceeded the applicable bacteria water quality standard, prompting the Oregon Department of Environmental Quality (DEQ) to add the slough to the 1998 Clean Water Act (CWA) section 303(d) list of impaired waters for failing to support its recreational designated use. Stakeholders implemented riparian restoration and revegetation projects to slow and filter water, added green infrastructure practices to reduce the volume of stormwater, educated residents to increase acceptance of environmental practices, and installed a “Big Pipe” project to reduce combined sewer overflows (CSOs). Bacteria levels dropped and now meet water quality standards, prompting DEQ to remove an 8-mile segment of the Columbia Slough from the impaired waters list for bacteria in the 2018/2020 Integrated Report.

#### Problem

The Columbia Slough is a 19-mile-long complex of narrow, shallow channels located on the southern floodplain of the Columbia River between Fairview Lake and the Willamette River (Figure 1). The slough was originally a series of wetlands and marshes; it is now a highly managed system with dikes and pumps that provide drainage and flood control for the lowlands surrounding it. The slough’s 32,700-acre watershed is 54% impervious and is home to industries, transportation corridors, residential areas, historic Native American settlement sites, the Portland International Airport, and many golf courses and vegetable farms.

In the mid-1990s, the Columbia Slough routinely exceeded the applicable bacteria water quality standard, prompting DEQ to add it to the 1998 CWA section 303(d) list of impaired waters for failing to support its recreational designated use. DEQ developed a total maximum daily load (TMDL) for bacteria and other pollutants in 1998. Columbia Slough was originally listed as impaired for fecal coliform bacteria, but DEQ developed the TMDL for the Columbia Slough for *Escherichia coli* to meet the updated contact recreation standard adopted in 1996. TMDL modeling efforts indicated that the primary sources of bacteria were combined sewer overflows (CSOs) in the lower slough, illicit connections and failing septic systems in the middle slough, and stormwater in the upper slough.

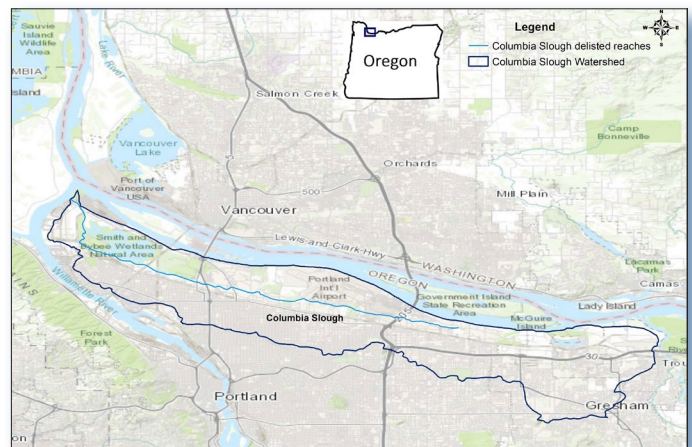


Figure 1. Columbia Slough is in northwest Oregon.

#### Story Highlights

In 1994, the City of Portland Bureau of Environmental Services (BES) began restoring and revegetating the canopy and understory on 15- to 150-foot riparian areas along the banks of the slough. BES partnered with several stakeholders on the effort, including the Multnomah County Drainage District (MCDD), which changed its operating procedures to allow stream-banks to be planted rather than mowed. BES developed partnership agreements with landowners along slough waterways to allow restoration projects to take place. BES has also purchased and restored some

larger parcels that support significant wetland areas or long slough frontage. Over the years, BES has added 1.4 million native trees and shrubs across 1,100 acres of natural areas in the slough watershed. In addition, the City has applied environmental conservation zones on sensitive ecological resources throughout the city to protect wetlands and riparian buffers.

For the past two decades, the City's downspout disconnection program has removed stormwater from the combined sewer system, thereby reducing CSOs into local waters. This program also helped to educate community members. Portland has also added many green infrastructure practices (e.g., swales, planters, rain gardens) to infiltrate stormwater onsite. In 2018, the Columbia Slough Watershed Council worked with willing homeowners to install eight rain gardens in the Cully Neighborhood in northeast Portland. Youth workforce crews helped install the gardens, which captured runoff from 5,950 square feet of impervious surface (approximately 133,527 gallons annually).

These projects reduce the amount of stormwater runoff flowing into the city's combined sewer system; these work in combination with the City's Big Pipe project, which was completed in 2011. In the Columbia Slough portion of the Big Pipe project, a 3.5-mile-long underground pipe collects excess volume from the combined sewers and stores it until it can be transported to the wastewater treatment plant, thereby reducing the volume of CSOs reaching the slough's waters by 99 percent.

The Port of Portland, which manages three airports, four marine terminals and five business parks, supports watershed protection efforts through multiple programs. The Airport Futures Natural Resource Enhancement (AFNRE) Program and the Port Mitigation Management Program both support watershed enhancement projects (e.g., healthy habitat, riparian areas, wetlands). In 2000–2004, the Port used resources from its Port Revegetation Program to revegetate 73.5 acres along the slough, which it continues to monitor and maintain. Numerous riverbank vegetation and stabilization projects, conducted through the Port's Riverbank Management Program, are coordinated and implemented by the Port's natural resources staff, Port landscape maintenance staff and volunteers.

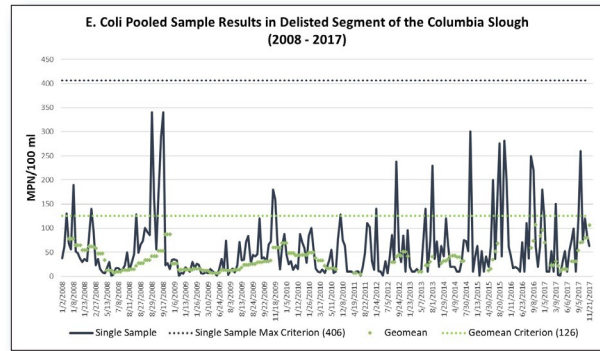


Figure 2. Data show that bacteria levels remained below both the single sample criterion (dotted gray line) and the geomean criterion (dotted green line).

## Results

The riparian restoration, stormwater control and CSO reduction measures have led to reduced bacteria levels in Columbia Slough. The applicable freshwater contact recreation standard requires that samples not exceed a 90-day geometric mean of 126 *E. coli* organisms per 100 milliliters (mL), based on a minimum of five samples. No single sample may exceed 406 *E. coli* organisms per 100 mL. Data collected in 2008–2017 indicate that the Columbia Slough has consistently met both parts of the water quality standard (Figure 2). As a result, DEQ removed the bacteria impairment from an 8-mile segment (OR\_WS\_170900120201\_02\_104554.1) on the Columbia Slough in DEQ's 2018/2020 Integrated Report.

## Partners and Funding

Partners include the City of Portland's planning division and BES; Verde, a local nonprofit group supporting low-income communities; MCDD, Port of Portland; local homeowners and youth groups; and the Columbia Slough Watershed Council (a diverse group of neighbors, property owners, businesses, environmental groups, recreation advocates and government agencies). The Council received a CWA section 319 grant in 2018 (\$10,000 plus a \$7,978 nonfederal match) to implement the Cully Neighborhood rain garden project. The City of Portland has invested \$1.4 billion into the Big Pipe project over the past 20 years and approximately \$500,000 in State Revolving Loans for revegetation work. The Port of Portland's AFNRE Program dedicates \$50,000 every year to fund Columbia Slough watershed projects.



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## For additional information contact:

Andrea Matzke  
Oregon Department of Environmental Quality  
503-229-5350 • [andrea.matzke@deq.state.or.us](mailto:andrea.matzke@deq.state.or.us)