Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oregon

Stakeholders Implement Practices to Reduce Bacteria in the Tillamook River

Waterbody Improved

High bacteria levels from livestock and human sources caused Oregon's Tillamook River and several of its tributaries to violate water quality standards, prompting the Oregon Department of Environmental Quality (ODEQ) to add these waters to Oregon's Clean Water Act (CWA) section 303(d) list of impaired waters in 1998. With support from multiple organizations, landowners installed best management practices (BMPs) throughout the watershed. Data analyses show that bacteria levels declined significantly between 1999 and 2012. The downward trends are expected to continue; the Tillamook River and many of its tributaries should consistently meet recreation water quality standards for bacteria in the near future.

Problem

The 62-square-mile Tillamook River watershed flows into Tillamook Bay on Oregon's coast (Figure 1). The Tillamook River Basin includes 45 square miles (mi ^{2}) of forest, 13 mi^2 of agriculture and approximately 1.6 mi^2 each of rural residential and rural industrial land uses. The river offers salmon and trout habitat and feeds into shellfish waters. The public uses the river for swimming and wading.

Oregon's bacteria water quality criteria for recreational contact use and aquatic life requires that the 30-day log mean should not exceed 126 *Escherichia coli* counts per 100 milliliters (mL), based on a minimum of five samples; and no single sample shall exceed 406 *E. coli* counts per 100 mL.

Data collected at river mile 13 of the Tillamook River between 1986 and 1990 showed that 36 percent (8 of 22) of values violated the applicable bacteria water quality criteria in fall, winter and spring. Data collected from 1986 to 1989 showed that 80 percent (8 of 10) of values exceeded the criteria in the summer. As a result, ODEQ added an 18.5-mile segment of the Tillamook River (OR-1238834454692-0-18.5) to the CWA section 303(d) list in 1998 for bacteria. Because data showed that several Tillamook River tributaries (Killam, Simmons, Mill and Bewley creeks) also failed to meet bacteria standards, ODEQ added them to the 1998 CWA section 303(d) list as well.

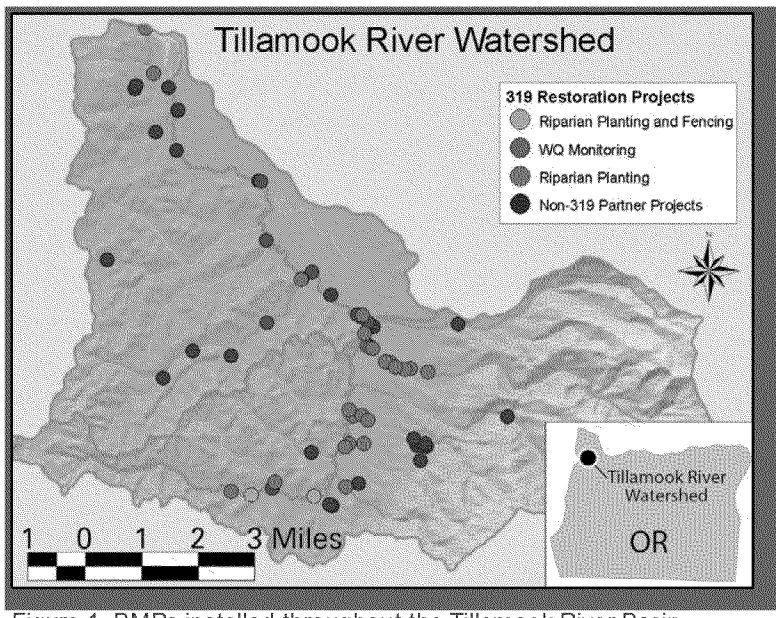

Figure 1. BMPs installed throughout the Tillamook River Basin (2002–2012).

Project Highlights

The Tillamook Bay National Estuary Program, now known as the Tillamook Estuaries Partnership (TEP), worked closely with community, state and federal entities to develop and implement the Tillamook Bay Comprehensive Conservation and Management Plan beginning in 1999. ODEQ completed a Tillamook Bay watershed total maximum daily load (TMDL) for temperature and bacteria in 2001 (addresses all Bay rivers, including the Tillamook River). Also in 2001, the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS) and the Tillamook Soil and Water Conservation District (SWCD) published a Watershed Plan/Environmental Assessment for the Lower Tillamook Bay watershed. The 2001 document identified agricultural practices and restoration activities that must be implemented to address TMDL-related issues.

In 2001 TEP began working with Oregon State University on a 3-year genetic marker study on bacteria in the watershed. The study found that bacteria in the upper Tillamook River came from ruminant (i.e., cattle, sheep, antelopes, deer) sources, while that in the lower Tillamook River came from both humans and ruminants. Using these data, watershed managers began targeting practices to reduce bacteria.

Between 2002 and 2012, the TEP and Tillamook County SWCD (funded through the CWA section 319 grant program and in cooperation with federal, state and local partners) worked with landowners to address bacteria sources by implementing projects such as removing invasive plants and restoring native plants in riparian and other sensitive areas (at 27 sites) and fencing out livestock and restoring native vegetation around streams (at two sites). Other partner projects included replacing or modifying 16 culverts to reduce flooding and erosion, adding one spillway to reduce flooding on agricultural lands, and decommissioning two roads to reduce sedimentation (see Figure 1). Both the TEP and SWCD conducted numerous education and outreach activities in the Tillamook River and greater Tillamook Bay watersheds, including distributing fact sheets, hosting field trips, holding workshops and classroom-based discussions, and publishing articles in local newspapers.

Results

Stakeholders' efforts to reduce bacteria pollution are working. Since 1997, TEP has collected monitoring data from 10 stations throughout the watershed (extending from the river's mouth to its headwater tributaries). ODEQ performed a Seasonal Kendall trend analysis test on the data from all 10 monitoring stations. This statistical test determines if the bacteria levels are generally increasing or decreasing over time (and assigns a confidence level associated with the trend). Although no stations consistently meet the bacteria water quality criteria for recreation, all stations but one show a significant decreasing trend in bacteria counts over time Table 1. A sample of site-specific data can be seen in Figure 2.

Partners and Funding

Watershed partners have included the Tillamook SWCD, TEP, NRCS, ODEQ, Oregon Department of Agriculture, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, Oregon Watershed Enhancement Board, Bureau of Land Management, EPA, city of Tillamook, Federal Emergency Management Agency, Oregon Parks and Recreation Department, Oregon Solutions, Tillamook Bay Watershed Council, Tillamook County, U.S. Fish and Wildlife Service, Tillamook County Creamery Association, the Northwest Oregon Restoration Partnership and private landowners.

The TEP and Tillamook SWCD and their partners have spent approximately $2.6 million restoring and protecting the Tillamook River watershed. Work included 29 projects (at a cost of $234,970) that used CWA section 319 as a portion of the funding source.

Table 1. Data analyses show that bacteria levels have dropped significantlyin the Tillamook River subbasin

Impaired Water	Monitoring Sites	Data Collection Period	Bacteria Reductions: Seasonal Kendall Test Confidence Level[1]
Tillamook River	TL0, TL1, TL2, TL4, TL7	1999–2012	99%
Tillamook River	TL10	2003–2012	99%
Killam Creek	TL11	2003–2012	95%
Fawcett Creek[2]	TL12	2003–2012	99%
Bewley Creek	TL13	2003–2012	80%

[1] The confidencelevel indicates the probability that the values are correctly showing a decreasing trend.

[2] Not listed as impaired for recreational use; however, this water is included in the TMDL. Data collected show periodic exceedances of the recreation water quality standard since 2003.

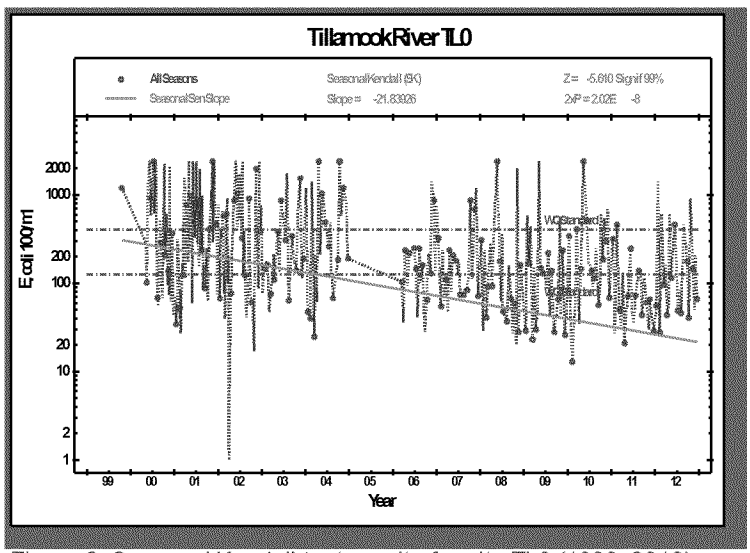

Figure 2. Seasonal Kendall test results for site TL0 (1999–2012) on the lower Tillamook River main stem.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-15-001V
April 2015

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