Restoring Nonpoint Source-Impaired Waters

Achieving and Reporting Success in Oregon

Purpose of Call

- Review requirements for National Water Program Measures WQ-10 and SP-12.
- Review progress to date.
- Identify barriers that are preventing us from highlighting more successes in Oregon.

USEPA Strategic Plan - 2015 National Water Program Guidance Measures

- **WQ-10 Measure**: Primarily NPS-impaired waters that are partially or fully restored thanks to restoration.
- **SP-12 Measure**: Impaired waters that are improved by using the watershed approach.

For detailed descriptions of each measure, see http://water.epa.gov/resource_performance/planning/FY-2015-NWPG-Measure-Definitions-Water-Quality.cfm

How are the NPS Success Stories Classified for EPA's Web Page?

1. Fully or Partially Restored Waters
2. Waters Showing Measurable Progress
3. Waters Showing Ecological Restoration

View completed WQ-10 Success Stories at http://water.epa.gov/polwaste/nps/success319

WQ-10: What Qualifies as "Fully Restored?"

- Waters that were previously primarily NPS-impaired now meet **all** designated uses/water quality criteria
- Scale: Waterbodies/segments on the state's impaired waters list

WQ-10: What Qualifies as "Partially Restored?"

- After restoration efforts, either of the following two conditions are met:
  - A waterbody meets the criteria for one or more pollutants that had been identified as causes of impairment on the state's impaired waters list/section 303(d) list, **or**
  - A waterbody fully supports one or more uses that had been impaired (but remains impaired for other uses/pollutants).

WQ-10: Other Key Requirements Needed to Qualify

- Waters must be:
  - Moved from integrated report category 4 or 5 to category 1 or 2 as a result of primarily NPS restoration efforts.
  - Included on the state's impaired waters list in 1998 or after.
  - Either already removed from the impaired waters list, or data show the water meets standards and therefore the state intends to remove it during the next listing cycle.

If a Waterbody Doesn't Qualify as Fully/Partially Restored under WQ-10

You May Still Report Your Success:

1. Waters showing measurable progress
   - You have data showing improvement
2. Waters showing ecological restoration
   - Waterbody had water quality problems but was not listed as impaired (e.g., invasives)

SP-12: What Qualifies?

1. SP-12 documents water quality improvement on a 12-digit hydrologic unit code* level.
2. One or more waters in that HUC-12 must have been listed as impaired (in category 4 or 5).
3. Improvement is due to a watershed approach.

* May receive partial credit for smaller watersheds

What is a “Watershed Approach?”

- Is focused on hydrologically defined areas
  - May be smaller or larger than the HUC-12 level
- Involves key stakeholders
- Uses an iterative planning or adaptive management process to address priority water resource goals
- Uses an integrated set of tools and programs

SP-12: Reporting Options

Three options to report improvement:

1. **Option 1**: fully restoring one or more impaired uses on at least 40% of impaired waters in the HUC 12 watershed*, OR
2. **Option 2a**: statistical improvement, OR
3. **Option 2b**: weight of evidence of improvement

* As shown through the removal of the waterbody/ pollutant combination from categories 4 or 5.

Key Differences: WQ-10 vs. SP-12

	WQ-10	SP-12
Geographic Scale	A waterbody on state's impaired waters/section 303(d) list (segment size is defined by state's Integrated Report)	Watershed (HUC-12 geographic unit or regionally-defined area)
Water Quality Outcome	Waterbody is fully or partially restored*	(1) One or more impairment causes removed for at least 40% of impaired waters* **OR** (2) evidence of improvement

*as shown by moving or proposing to move waterbody/pollutant from category 4 or 5 based on data showing restoration.

Key Differences (cont'd)

	WQ-10	SP-12
Restoration Required?	Must be as a result of actual nonpoint source restoration efforts	Impairment removed due to: (1) restoration activities **OR** (2) new monitoring data show recovery.
How Restoration Occurred	Must primarily be a nonpoint source restoration activity	Watershed approach must be used and documented
Reporting/ Documentation	Requires a HQ-approved NPS Success Story to count as a success	Requires use of a reporting template
Listing Requirements	Waterbody must have been listed as impaired in or after 1998/2000 cycle.	One or more waters in the hydrologic unit must have been listed as impaired.

Identifying Candidates for WQ-10 and SP-12

- Need monitoring data
- Need information about best management practices or restoration efforts implemented in the watershed
- Most common pollutants highlighted in WQ-10 and SP-12 stories are:
  - Bacteria
  - Sediment/Turbidity
  - Nutrients

SP-12 Submissions

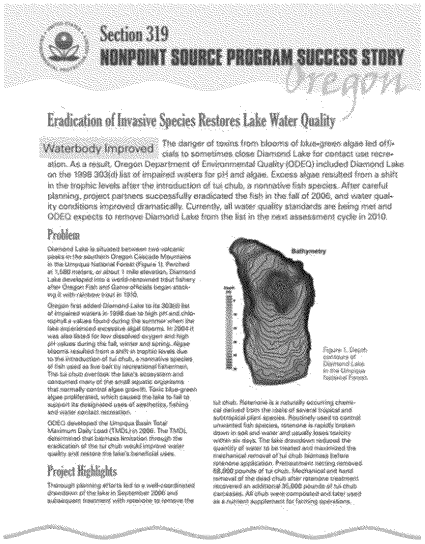
- Doing well with SP-12 because data exist that show improvement.
  - Wilson River (1 watershed, Jan 2010)
  - Bear Creek (6 watersheds, Oct 2010)
  - Tillamook River (2 watersheds, June 2011)
  - Tualatin River (20 watersheds, Feb 2012)
  - Kilchis River (1 watershed, April 2013)

Data for these were provided by outside parties:

- Wilson/Tillamook/Kilchis: Tillamook Estuary Partnership
- Bear Creek: Rogue Valley Council of Governments
- Tualatin River: Clean Water Services

WQ-10 Submissions

- Doing less well because waters are not being removed from the impaired waters list.
  - Diamond Lake (2008) is the only "Fully Restored" story.
  - Story said "to be removed from impaired waters list in 2010," but the assessment database still lists the water in category 4a (impaired but with a TMDL).
    - LASAR data is outdated.



Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oregon

Eradication of Invasive Species Restores Lake Water Quality

Waterbody Improved

The danger of toxins from blooms of blue-green algae led officials to sometimes close Diamond Lake for contact use recreation. As a result, Oregon Department of Environmental Quality (ODEQ) included Diamond Lake on the 1998 303(d) list of impaired waters for pH and algae. Excess algae resulted from a shift in the trophic levels after the introduction of tui chub, a nonnative fish species. After careful planning, project partners successfully eradicated the fish in the fall of 2006, and water quality conditions improved dramatically. Currently, all water quality standards are being met and ODEQ expects to remove Diamond Lake from the list in the next assessment cycle in 2010.

Problem

Diamond Lake is situated between two volcanic peaks in the southern Oregon Cascade Mountains in the Umpqua National Forest (Figure 1). Perched at 1,580 meters, or about 1 mile elevation, Diamond Lake developed into a world-renowned trout fishery after Oregon Fish and Game officials began stocking it with rainbow trout in 1910.

Oregon first added Diamond Lake to its 303(d) list of impaired waters in 1998 due to high pH and chlorophyll a values found during the summer when the lake experienced excessive algal blooms. In 2004 it was also listed for low dissolved oxygen and high pH values during the fall, winter and spring. Algae blooms resulted from a shift in trophic levels due to the introduction of tui chub, a nonnative species of fish used as live bait by recreational fishermen. The tui chub overtook the lake's ecosystem and consumed many of the small aquatic organisms that normally control algae growth. Toxic blue-green algae proliferated, which caused the lake to fail to support its designated uses of aesthetics, fishing and water contact recreation.

ODEQ developed the Umpqua Basin Total Maximum Daily Load (TMDL) in 2006. The TMDL determined that biomass limitation through the eradication of the tui chub would improve water quality and restore the lake's beneficial uses.

Project Highlights

Thorough planning efforts led to a well-coordinated drawdown of the lake in September 2006 and subsequent treatment with rotenone to remove the tui chub. Rotenone is a naturally occurring chemical derived from the roots of several tropical and subtropical plant species. Routinely used to control unwanted fish species, rotenone is rapidly broken down in soil and water and usually loses toxicity within six days. The lake drawdown reduced the quantity of water to be treated and maximized the mechanical removal of tui chub biomass before rotenone application. Pretreatment netting removed 68,000 pounds of tui chub. Mechanical and hand removal of the dead chub after rotenone treatment recovered an additional 30,000 pounds of tui chub carcasses. All chub were composted and later used as a nutrient supplement for farming operations.

Bathymetry

Figure 1. Depth contours of Diamond Lake in the Umpqua National Forest.

WQ-10 Making Progress Stories

- We've developed several "Making Progress" stories based on data showing improvement:
  - Wilson River (2010)
  - Bear Creek (2011)
  - Tualatin River (2012)
- These can be used for education/outreach.
  - Bill Meyers from DEQ said in a January 2014 email:

"The 3 years since we worked on this have just flown by but the usefulness of success stories has done nothing if not increase. I still use the Bear Creek story in discussions all the time."

Bear Creek Makes Progress

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oregon

Stakeholders' Watershed Approach Reduces Phosphorus Levels

Waterbodies Improved Urban, forested and agricultural areas contributed nutrients and other pollutants to Oregon's Bear Creek, prompting the Oregon Department of Environmental Quality (ODEQ) to add 26.3 miles of Bear Creek and some of its main tributaries to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1998. To address the problem, watershed stakeholders upgraded a wastewater treatment plant (WWTP), educated landowners, and implemented numerous agricultural and urban best management practices (BMPs). Phosphorus levels have dropped steadily over time in Bear Creek and in four tributaries, showing that ongoing watershed-wide nonpoint source (NPS) pollution-reduction efforts are improving water quality. Although the data indicate measurable progress toward achieving water quality goals, these waterbodies do not yet meet water quality standards and remain on Oregon's list of impaired waters for phosphorus and/or other pollutants.

Problem

Bear Creek (Figure 1) empties into the Rogue River in southwest Oregon. The 362-square-mile Bear Creek watershed includes approximately 290 miles of streams. Another 250 miles of irrigation canals transport water to farms across the watershed. Land use in the watershed is approximately 18 percent urban, 35 percent agriculture and 46 percent forest.

Pollutants from numerous sources have contributed to problems in the Bear Creek watershed for decades. NPS pollution (irrigation return flows and runoff from agricultural and developed areas) have contributed nutrients, sediment and fecal coliform to surface waters. A WWTP along Ashland Creek, a headwaters tributary of Bear Creek, also contributed high levels of nutrients in its effluent.

A combination of point and NPS pollution sources led to low pH, low dissolved oxygen levels, excessive amounts of aquatic weeds, and high levels of fecal coliform in numerous waterbodies in the Bear Creek watershed. As a result, ODEQ added 26.3 miles of Bear Creek and numerous tributaries to the state's CWA section 303(d) list of impaired waters in 1998. The pollutants of concern for Bear Creek include phosphorus, dissolved oxygen, chlorophyll *a*, pH, ammonia, temperature and fecal coliform. ODEQ listed Ashland Creek as impaired in 1998 because of fecal coliform, ammonia and phosphorus. Other tributaries were added to the state's list of impaired waters the same year for a variety of pollutants, including fecal coliform, temperature and dissolved oxygen.

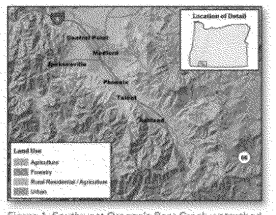


Figure 1. Southwest Oregon's Bear Creek watershed includes a mix of urban, agricultural, rural residential and forested areas.

Project Highlights

Many partners have cooperated to identify and implement pollution-reduction efforts. ODEQ developed total maximum daily loads (TMDLs) for Bear Creek in 1992 (for pH, dissolved oxygen and aquatic weeds/algae) and in 2007 (for temperature, sediment and fecal coliform). The Rogue Valley Council of Governments (RVCOG) and the Bear Creek Watershed Council completed a Watershed Assessment and Action Plan for Bear Creek (in 1995) and for its tributaries (in 2001). In 2005 the Oregon Department of Agriculture (ODA) and the Bear Creek Local Advisory Committee developed an agricultural water quality management area plan to address agriculture-related water quality issues.

The Medford and Talent irrigation districts reduced sediment and nutrients from irrigated lands by converting flood irrigation to sprinkler irrigation and adding protective liners along canals or replacing the canals with pipes to reduce erosion. The Jackson Soil and Water Conservation District (SWCD) and the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) are helping farmers to implement agricultural BMPs such as nutrient management, exclusion fencing (typically to prevent livestock from accessing riparian areas), pesticide management, pasture fencing and pasture management.

The RVCOG facilitates the local communities' efforts to conduct regional stormwater management planning; it also implements demonstration projects, educates watershed residents about water quality issues, and encourages participation in corrective actions. In 2002 Ashland upgraded its WWTP by adding a tertiary treatment phosphorus removal system that operates from May until November each year. Municipalities installed stormwater control practices, including adding a large stormwater treatment wetland in Ashland.

Results

Water quality has measurably improved since 1996. The 1992 Bear Creek TMDL established that the in-stream concentration of total phosphorus must be less than 0.08 milligram per liter (mg/L) from May 1 through November 15 to meet water quality standards. Although Bear Creek and its tributaries do not yet meet this goal consistently, significant progress had been made.

Data from monitoring stations in the Bear Creek watershed (main stem and tributaries) show that phosphorus levels are steadily declining. At Bear Creek river mile 10 in Medford, for example, phosphorus levels have declined from an average high of 0.33 mg/L in July/August 1996–1998 to an average low of 0.08 mg/L in September/October 2008–2009 (Figure 2). In Ashland Creek, upgrading the WWTP contributed to large phosphorus decreases in Ashland Creek and the upper main stem of Bear Creek (Ashland Creek joins Bear Creek at river mile 24). Declines in phosphorus levels in other, NPS pollution-dominated Bear Creek tributary watersheds such as Neil Creek (which joins Bear Creek at river mile 27), indicate that efforts to reduce NPS pollution are also contributing to lower phosphorus levels seen in Bear Creek. Data show that Neil Creek's phosphorus levels have declined from an

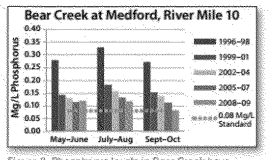


Figure 2. Phosphorus levels in Bear Creek have declined over time and almost meet water quality standards.

average high of 0.23 mg/L in May/June 1996–1998 to an average low of 0.07 mg/L in September/October 2008–2009. Other NPS-dominated Bear Creek tributaries showing declining phosphorus levels include Griffin Creek and Jackson Creek.

Partners and Funding

Many agencies and organizations, including the RVCOG, the Bear Creek Watershed Council and Local Advisory Committee, ODEQ, ODA, Oregon Department of Forestry, Oregon State University, USDA's NRCS and Farm Service Agency, Jackson SWCD, local irrigation districts (Talent, Medford and Rogue River Valley), Rogue Valley Sewer Services, and local municipalities, are working to restore the Bear Creek watershed. Jackson County and the cities of Medford, Ashland, Phoenix, Central Point, Jacksonville and Talent provide financial support to the RVCOG for the ongoing Bear Creek water quality monitoring program.

Since 1997, stakeholders have spent more than $39.5 million on water quality improvement projects within the Bear Creek watershed. Ashland upgraded its WWTP for $33.6 million. The Oregon Watershed Enhancement Board provided more than $715,000 for restoration and watershed management projects by the Jackson SWCD, the RVCOG and the Bear Creek Watershed Council. Support for irrigation system upgrades was provided by the Bureau of Reclamation (more than $1.575 million) and Talent and Medford irrigation districts (more than $2.2 million). Landowners contributed more than $1 million to support irrigation upgrades. ODEQ's Water Resources Department provided more than $430,000 in CWA section 319 funding to support a variety of NPS pollution-reduction projects.

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For additional information contact:

Bill Meyers
Oregon Department of Environmental Quality
541-776-6272 • meyers.bill@deq.state.or.us

Heather Tugaw
Oregon Department of Environmental Quality
541-776-6091 • tugaw.heather@deq.state.or.us

Tualatin River Makes Progress

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oregon

Watershed Approach Reduces Pollution in the Tualatin River

Waterbodies Improved

Nonpoint and point sources of pollution caused water quality problems in Oregon's Tualatin River basin. As a result, between 1998 and 2002 the Oregon Department of Environmental Quality (ODEQ) added 31 segments to the state's Clean Water Act section 303(d) list of impaired waters for one or more of the following pollutants: temperature, bacteria, dissolved oxygen, chlorophyll *a*, toxics (arsenic, iron and manganese), biological criteria and low pH. Using a watershed-based approach, stakeholders have upgraded wastewater treatment plants, restored riparian areas, and implemented agricultural and urban best management practices (BMPs). Data show that levels of many pollutants have declined significantly.

Problem

The Tualatin River drains 27 sub-basins across a 712-square-mile area and empties into the Willamette River in the northwest corner of Oregon (Figure 1). The basin is fairly evenly divided among forest (39 percent), agriculture (35 percent) and urban (26 percent) land uses.

Wastewater treatment plant discharge and runoff from agricultural, forested and urban areas contributed multiple pollutants to the Tualatin River. Low dissolved oxygen, elevated pH and high chlorophyll *a* levels in the river prompted ODEQ to develop total maximum daily loads (TMDLs) for ammonia and phosphorus in 1988. In 2001 ODEQ revised those TMDLs and developed new TMDLs for additional parameters (temperature, bacteria and dissolved oxygen). By 2002, 31 segments across 27 Tualatin River sub-basins had been identified as impaired for one or more parameters.

Photo by M.O. Stevens

Figure 1. The lower Tualatin River, near Sherwood, Oregon.

Project Highlights

Efforts to improve water quality have been underway over the last few decades. The Tualatin River Watershed Council (TRWC), a local watershed stewardship organization, has been working with landowners to implement restoration projects since 1993. In 2001 ODEQ and other watershed stakeholders developed the *Tualatin River Water Quality Management Plan*, which outlined a strategy for achieving the load allocations outlined in the basin's TMDLs.

The Oregon Watershed Enhancement Board (OWEB), a state agency led by a 17-member citizen board, uses funds from the Oregon Lottery, federal programs and salmon license plate revenue to provide watershed restoration grants. Between 2004 and 2009, the OWEB grant program supported 186 Tualatin River basin projects to restore and protect stream channels and riparian, upland, wetland and urban areas.

In 2004 Clean Water Services (CWS), a special service district that provides wastewater and stormwater services to more than 520,000 people, was issued a watershed-based National Pollutant Discharge Elimination System (NPDES) permit. The permit provides unique opportunities for CWS to improve the water quality in the Tualatin River basin by allowing the trading of carbonaceous biological oxygen demand and nitrogenous oxygen demand within and between the four wastewater treatment plants (WWTPs).

The permit enables CWS to generate water quality credits by planting riparian areas in the rural and urban portions of the basin and augmenting stream flow. The credits are used to offset the excess thermal loads from the WWTPs. Between 2004 and 2010, CWS implemented 44 projects (covering 17.1 stream miles) in urban areas. The projects included riparian planting and stream enhancement activities. In rural areas, CWS contracted with the Tualatin Soil and Water Conservation District (SWCD) to provide incentives (rental payments and restoration assistance teams) that encouraged landowners to enroll in a modified version of the U.S. Department of Agriculture's (USDA's) Conservation Reserve Enhancement Program and Vegetated Buffer Areas for Conservation and Commerce Program. Between 2004 and 2010 CWS and the Tualatin SWCD used those programs to implement 33 riparian planting projects in rural areas, which revegetated 19.3 stream miles, thereby reducing in-stream temperature and generating 329 million kilocalories of shade credit. The riparian planting efforts also help to filter stormwater runoff and reduce erosion, thereby reducing the levels of phosphorus, sediment and bacteria reaching surface waters.

From 2007 to 2011, the Tualatin SWCD worked with landowners to complete 30 farm water quality plans covering almost 1,500 acres. The USDA Natural Resources Conservation Service (NRCS), Tualatin SWCD, Metro Regional Government, and the U.S. Fish and Wildlife Service (USFWS) implemented more than a dozen wetland restoration projects covering more than 1,000 acres.

Results

Thanks to a basin-wide restoration effort, water quality in the Tualatin River watershed has significantly improved since the first TMDLs were adopted in 1988. The incidence of algae blooms in the lower river has decreased, as demonstrated by lower chlorophyll *a* concentrations, no pH violations and higher minimum dissolved oxygen levels. These improvements coincide with lower total phosphorus concentrations, which now meet the 2001 TMDL phosphorus targets in the mainstem Tualatin River. In 2011 CWS performed trend analyses on total phosphorus, bacteria and chlorophyll *a* data collected from 1992 through 2011. A seasonal Kendall trend test showed significantly improving trends (at a 90 percent confidence level or greater) in one or more pollutants contributing to impairments in 20 of 27 Tualatin River sub-basins (Figure 2). Data show that some segments listed as impaired now meet TMDL targets or water quality standards for one or more parameters. Oregon will begin investigating whether these parameters may be removed as sources of impairment from listed segments in an upcoming assessment cycle.

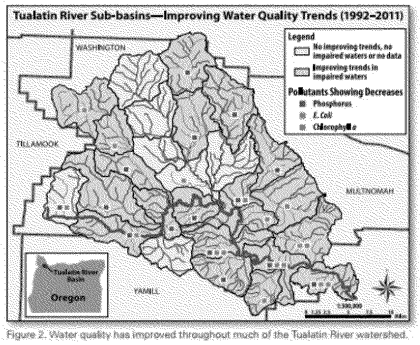

Figure 2. Water quality has improved throughout much of the Tualatin River watershed.

Partners and Funding

Many agencies and organizations have contributed to the restoration of the Tualatin River basin, including the ODEQ; CWS; NRCS; OWEB, USFWS, Tualatin SWCD; TRWC; Tualatin Riverkeepers; Oregon Department of Agriculture; Oregon Department of Forestry; Multnomah, Clackamas and Washington counties; and the cities of Portland, West Linn and Lake Oswego. Between 1991 and 2001, ODEQ provided more than more than $300,000 in section 319 funds to support BMP implementation and education projects. Between 1996 and 2009, OWEB partnered with basin groups, federal and state agencies, and landowners to invest $7 million (plus another $870,000 in-kind matching funds) in restoration projects. CWS spent $325 million to upgrade its WWTPs (in response to the 1988 TMDL), and spent an estimated $10 to $12 million to implement restoration projects between 2005 and 2009.

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For additional information contact:
Avis Newell
Tualatin Basin Coordinator
Oregon Department of Environmental Quality
503-229-6018 • Newell.Avis@deq.state.or.us

Barriers to Reporting Success?

- Lack of data? Data collection/analysis barriers?
- Policy-related barriers? Why are waters not being delisted?
- Is it difficult to match up water quality improvement with restoration work?
- Hesitant to declare success because watershed stakeholders might think work is done?
- Afraid that future data might show problem has reoccurred?

Next Steps?

- How can we move forward?