Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Idaho

Forestry, Agricultural and Urban Stormwater Best Management Practices Improve Reservoir's Water Quality

Waterbody Improved

Water quality in the Cascade Reservoir, 70 miles north of Boise in central Idaho, has been impaired by phosphorus loading from various sources, including forestry operations, agricultural activities and urban stormwater runoff. By upgrading forest roads and implementing a series of best management practices and drainage improvements, project partners have achieved 70 percent of the needed reductions in phosphorus. Although phosphorus levels do not yet consistently meet standards, data show that water quality is improving.

Problem

The U.S. Bureau of Reclamation (USBR) created Cascade Reservoir in 1949 for flood control and water storage. The reservoir averages 26.5 feet deep and is 21 miles long and 4.5 miles wide at the widest point. Approximately 65 percent of the reservoir's watershed is steeply sloped forestland, while the land adjacent to the reservoir and major tributaries is used predominantly for agriculture (22 percent). Urban and residential areas make up another 13 percent of the total land area. Two rivers (North Fork Payette and Gold Fork) and four creeks (Mud, Lake Fork, Boulder, and Willow) all discharge into the northern end of the reservoir (see Figure 1).

The Cascade Reservoir has been plagued with excessive algae blooms, which have degraded fish habitat and impaired swimming and boating uses in the reservoir. Eutrophication was especially apparent in 1993 and 1994 when dense mats of blue-green algae formed in the reservoir. In 1993 23 cattle died after ingesting toxins produced by the algae. A substantial fish kill occurred in 1994. Water quality studies identified phosphorus as the source of the problem. Idaho Department of Environmental Quality (IDEQ) added the reservoir to the state's Clean Water Act section 303(d) list of impaired waters for phosphorus and initiated a phased total maximum daily load (TMDL) in 1995.

Studies showed that point source pollution from wastewater treatment plants (WWTPs) and a fish hatchery contributed about 10 percent of the phosphorus loading to the watershed. Nonpoint source (NPS) pollution from forestry, agriculture, and urban areas contributed an estimated 84 percent, and poorly functioning or failing septic tanks were the source of the remaining 6 percent. The *Cascade Reservoir Phase II Watershed Management Plan* outlines a need to reduce by 37 percent (30 percent reduction, plus a 7 percent margin of safety) the total phosphorus loads entering the lake throughout the watershed to bring the reservoir into compliance with water quality standards. IDEQ completed an implementation plan for the Phase II TMDL in 2000.

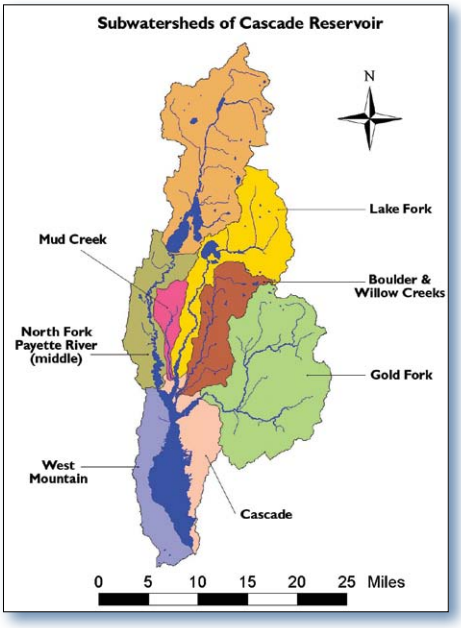

Figure 1. Watershed map delineating the Cascade Reservoir and its five main tributaries.

Project Highlights

The two primary point source implementation projects are complete. The Idaho Department of Fish and Game's (IDFG's) fish hatchery modified its food type and feeding practices and installed a sediment pond to treat discharge water, which allowed the hatchery to meet its phosphorus reduction goal. In 2001 the city of McCall completed a project to

remove 100 percent of its WWTP effluent from the watershed by instead using the effluent to supplement summer irrigation water.

Project partners have either completed or initiated a variety of NPS pollution reduction projects. For example, several projects addressed forestry-related sediment runoff along more than 109 miles of forest roads by graveling 81 miles, closing 3.5 miles, paving 0.1 mile and installing road drainage upgrades on 24.7 miles. USBR created wetlands along Cascade Reservoir, which have reduced nutrient, bacteria and sediment loading from the surrounding areas. USBR also stabilized more than 3,000 linear feet of eroding shoreline since 2000.

Urban and suburban projects included improving drainage and adding stormwater filters in the cities of Donnelly and McCall. McCall created wetlands to indirectly treat stormwater and operates a street-sweeping program. Idaho Parks and Recreation added a sediment basin at a public boat launch and upgraded several vault toilets.

To reduce streambank erosion caused by cattle grazing on public land, nearly 100 percent of grazing allotments on public forested lands are now under grazing management plans. Other agricultural projects include improving irrigation and grazing management by excluding livestock from sensitive areas, planting trees and shrubs, and better managing wetlands and uplands for wildlife habitat. Valley Soil and Water Conservation District (SWCD) and IDEQ initiated an education outreach program, *Lake-A-Syst*, which teaches homeowners how to minimize impacts on the reservoir.

Results

The Phase II TMDL identified an overall reduction goal for point source loading of 4,455 kilograms per year (kg/year) total phosphorus. With the completion of the McCall WWTP project, estimated point source reductions from this project total 3,947 kg/year. When combined with the previous reductions accomplished by the IDFG fish hatchery, 100 percent of the total point source reduction goal has been achieved.

Additionally, the TMDL specified that total phosphorus loads from NPS pollution should be reduced by 11,141 kg/year. The total of measured and estimated NPS reductions of total phosphorus equals 6,421 kg/year (approximately 58 percent of the total NPS reduction goal). Overall, between point and NPS reductions, 70 percent of the load reduction goal has been met.

Median water column total phosphorus and chlorophyll a concentrations have consistently decreased in all years since 1994 except 2001 (an exceptional drought year). The improving water quality observed indicates that the magnitude of water quality impairment is decreasing. Although overall total phosphorus levels are declining, concentrations still routinely exceed the target level (0.025 milligram per liter). Figure 2 shows that, while the many areas in the Cascade Reservoir watershed are close to meeting standards, a few of the tributaries still have elevated phosphorus levels.

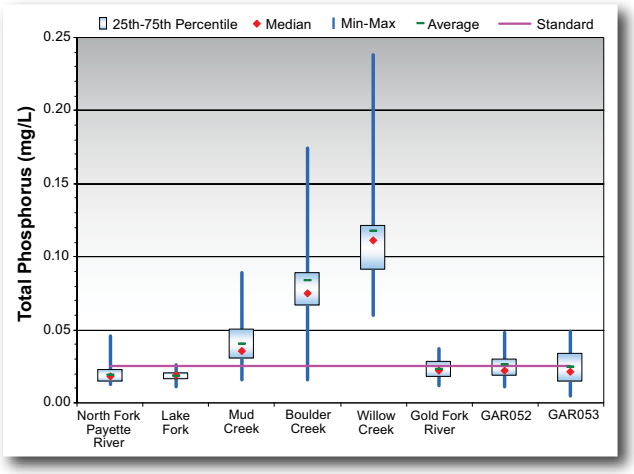

Figure 2. Total phosphorus concentrations in the Cascade Reservoir (sites GAR052 and GAR053) and its tributaries between May and September 2003–2007.

Partners and Funding

Project partners include local residents, IDEQ, IDFG, Idaho Department of Lands, Idaho Parks and Recreation, U.S. Department of Agriculture's Natural Resources Conservation Service and Forest Service, USBR, Boise Cascade Corporation, Valley SWCD and the cities of McCall and Donnelly. Several public groups, including the Cascade Reservoir Watershed Advisory Group and the Cascade Reservoir Technical Advisory Committee, have reviewed and assessed all phased TMDL documents. Since 1996, project partners have used approximately $2 million in section 319 grants to implement best management practices, including forest road upgrades, grazing management activities and stormwater treatment wetlands.

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