NONPOINT SOURCE SUCCESS STORY

Iowa

Removing Carp Restored the Big Wall Lake Ecosystem

Waterbody Improved

Common carp, a nuisance species, entered Iowa's Big Wall Lake during the early 1990s. The fishes' feeding behavior continuously stirred up bottom sediment and eliminated much of the lake's beneficial aquatic vegetation. The resulting water turbidity blocked light and prevented the growth of new aquatic plants. As a result, the Iowa Department of Natural Resources (DNR) added Big Wall Lake to the 2002 Clean Water Act (CWA) section 303(d) list due to degraded aquatic habitat caused by the presence of common carp. To address the problem, local and state partners installed a new outlet structure to draw down the lake's water level, and then treated the lake with rotenone. This eliminated the carp population and allowed preferred types of submersed and emergent aquatic vegetation to become re-established, which led to an overall improvement in water quality. After the renovation, DNR re-assessed the lake and found that it fully supported its overall designated use. As a result, DNR removed Big Wall Lake from the state's list of impaired waters in 2012.

Problem

Big Wall Lake is a 978-acre shallow glacial lake in southeastern Wright County, in north-central Iowa (Figure 1). At its deepest, the lake is only about 6 feet deep, with an average depth of less than 2 feet. Surrounding the lake is a nearly level, 1,205-acre agricultural watershed.

In 1974 the lake level was raised 6 inches by an agreement between the DNR, the Wright County Board of Supervisors and private landowners. The goal was to maintain an artificially high water level that would provide additional surface area and a deeper pool for boaters. However, the agreement hindered the ability of the DNR to lower the water level as part of proper shallow lake management.

In 1993 a large population of common carp moved into the lake during high-water events. When feeding, the carp uprooted and eliminated the lake's existing submerged aquatic vegetation (SAV) and continuously stirred up bottom sediment, which caused turbidity that blocked light and prevented the growth of new plants on the lake bed. Because the loss of SAV can degrade habitat and allow undesirable aquatic species to dominate the ecosystem, the suppression of SAV constitutes a violation of Iowa's narrative water quality criteria protecting against undesirable or nuisance aquatic life. A site assessment in October 2000 by staff from DNR and U.S. Environmental Protection Agency (EPA) Region VII showed that the lake was impaired by the damage caused by the common carp. As a result, DNR added the lake (segment IA 02-IOW-00860-L _ 0) to the state's list of impaired waters in 2002.

Figure 1. Big Wall Lake is in north-central Iowa.

Once introduced into Big Wall Lake, the carp population thrived because the lake level was maintained at a higher and more stable water level, based on the 1974 agreement. The local DNR wildlife biologist recommended that, to restore the lake's water quality, the lake's outlet would have to be rebuilt in a fashion that would enable DNR to manipulate the water level to dewater the lake, thus killing the carp population and allowing re-establishment of the beneficial in-lake vegetation.

Project Highlights

Partners collaborated with the local drainage district and agreed upon a lake renovation plan that replaced the 1974 lake management agreement. Using an EPA CWA section 319 grant and state funds, the DNR and the Wright County Soil and Water Conservation District (SWCD) worked together to redesign the existing Big Wall Lake dam to include a new outlet in 2006. A stoplog structure was installed to enable the DNR to manipulate the lake's water level. Next, the DNR conducted a complete drawdown of the lake from the fall of 2006 through the spring of 2007. In June and August 2007 DNR applied rotenone to eradicate the remaining carp in the lake.

Results

A wetland assessment guidelines document released in 2003 by the Upper Mississippi River Conservation Committee's (UMRCC's) Water Quality Technical Section notes that an average total suspended solids (TSS) concentration during the growing season of less than 30 milligrams per liter (mg/L) is necessary to provide sufficient water clarity to support the growth of beneficial SAV in wetlands and shallow lakes.

The results of water quality monitoring at Big Wall Lake during the post-project period (from 2008 to present) show that the average levels of TSS during the growing season have been 10 mg/L or less—well below the UMRCC guideline of 30 mg/L necessary to protect growth of beneficial SAV. The removal of common carp and the return of SAV have allowed the water clarity to improve; as a result, the shallow lake system now meets the narrative water quality criteria and fully supports its designated aquatic life use. DNR removed Big Wall Lake from the state's list of impaired waters in 2012.

Big Wall Lake is now populated with beneficial wetland vegetation, including SAV as well as emergent vegetation such as softstem bulrush, smartweed, arrowhead, pond lily and rice cutgrass (Figure 2). In addition to improving water quality, the renovation improved waterfowl habitat. During the spring migration of 2008, roughly 10,000 waterfowl used the lake during the northward spring migration. To ensure that invasive species such as common carp do not degrade water quality in the future, the DNR will continue to manipulate the lake's water levels as needed.

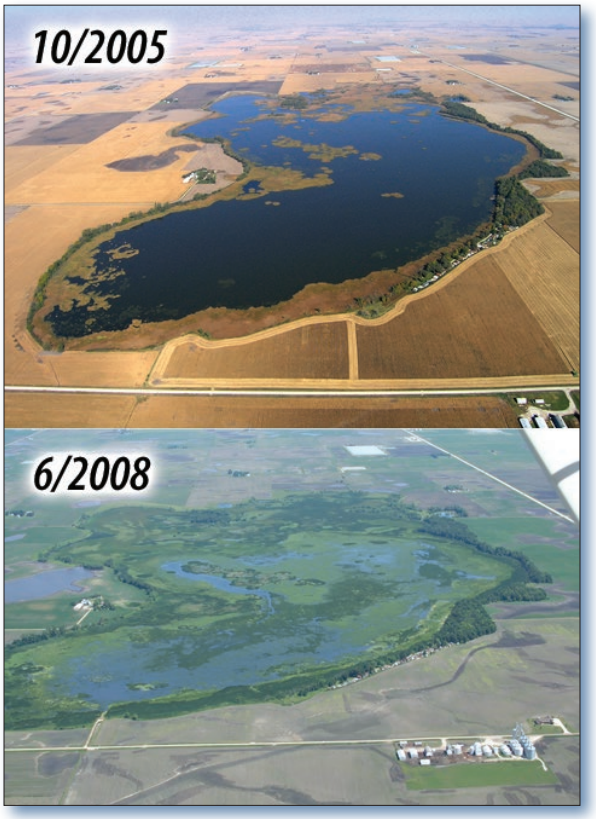

Figure 2. Before the project, rooting invasive carp had eliminated the lake's vegetation and continuously stirred up bottom sediment (top). After carp removal, the lake's natural aquatic vegetation returned (bottom), restoring Big Wall Lake's ecosystem.

Partners and Funding

The Wright County SWCD received a $10,000 Watershed Development Grant from the Iowa Department of Agriculture and Land Stewardship to evaluate all potential causes of watershed degradation of Big Wall Lake. The SWCD then collaborated with local landowners and lake users, the local DNR wildlife biologist, and the Wright County Supervisors (representing the local drainage district), to agree upon a lake renovation plan. In 2005 the SWCD was awarded an EPA CWA section 319 grant through the DNR Watershed Improvement Section to fund 75 percent of project costs ($120,070). The DNR Wildlife Bureau, the entity responsible managing the lake, contributed the additional funding to cover the remaining 25 percent of the project's costs ($38,508).

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