



## Big Stone Lake Restoration Project: Better Water Quality Improves Fisheries, Recreation

Big Stone Lake is on the border between South Dakota and Minnesota. The lake occupies the valley of a glacial river that once drained historic Lake Agassiz. The surface area of the lake is 12,610 acres, and the lake extends southward for 26 miles from Browns Valley, Minnesota, to Ortonville, Minnesota, and Big Stone City, South Dakota.

Big Stone Lake and its fishery are the primary feature for Big Stone Lake State Park, Hartford Beach State Park, and several resorts. The lake is also an important recreational attraction for Ortonville, Big Stone City, and surrounding communities. The fishery of the lake has the potential to contribute substantially to local and state economies. Historically, the fishery has been managed primarily for walleye, with a secondary emphasis on yellow perch, bluegill, black crappie, northern pike, largemouth bass, and channel catfish. In samples taken in 1971 through 1985, walleye abundance, as measured by average gill net catch rates, was near the low end of the "normal" range for lakes with similar physical and chemical characteristics.

Agricultural, domestic, and municipal pollution have degraded fish habitat, reduced recreational opportunities, reduced the aesthetic quality of the lake, and increased the likelihood of more direct effects on the fisheries in the form of fish kills. Drainage and land use changes in the lake's watershed have contributed to increased sedimentation, nutrient loading, changes in tributary flows, increases in water level fluctuations, and direct destruction of aquatic habitats.

### Big Stone Lake partners

In the early 1980s citizens of South Dakota and Minnesota requested assistance from both states and EPA to begin an effort to restore Big Stone Lake. The primary concerns were poor water quality, excessive algae blooms, sedimentation, rooted aquatic vegetation, and reduced recreation potential.

A series of EPA section 314 and section 319 grants, beginning in 1983, have provided funding for lake and watershed restoration projects; the most recent 319 funding was awarded in 1996 and 1999. Currently, U.S. Department of Agriculture (USDA) and Environmental Quality Incentives Program funding is also being used to implement additional conservation practices in Roberts and Marshall Counties. The key partners in the Big Stone Lake Restoration Project are watershed landowners; lake residents; local counties, conservation districts, and municipalities; Upper Minnesota River Watershed District; Citizens for Big Stone Lake; South Dakota Department of Environment and Natural Resources; Minnesota Pollution Control Agency; EPA; Natural Resources Conservation Service; and U.S. Fish and Wildlife Service.

### Restoration project

Various conservation and restoration practices have been implemented through the Big Stone Lake Restoration Project. Conservation practices in the lake's watershed include the installation of more than 50 animal waste management systems, no-till planting of crops, construction of multiple-use wetlands, grassed waterways through cropland fields, stream buffer strips, streambank stabilization, and implementation of the USDA Conservation Reserve Program. In addition, six municipal wastewater treatment facilities in the watershed have been upgraded.

## BIG STONE LAKE

Restoration practices implemented at the lake include access road erosion control, shoreline stabilization, and upgraded wastewater treatment. In addition, a new lake outlet control structure and debris barrier were constructed at the south end of the lake. The main purpose of the structure is to divert the majority of flow from the Whetstone River away from Big Stone Lake. The Whetstone River was diverted into the lake in the 1930s to augment lake levels, but the diversion resulted in excessive nutrients and sediment being deposited in the lake. The new control structure diverts these contaminants away from the lake in accordance with the original river flow pattern.

### Improved water quality and recreational use

The results of the Big Stone Lake Restoration Project are beginning to be realized in improved water quality. Water sampling results have shown a gradual but steady improvement in recent years. The trophic status of the lake has changed from hypereutrophic (extremely nutrient-rich) to eutrophic (nutrient-rich). As a result, algae blooms are less extensive and shorter in duration.

The fisheries of the lake also have improved to the point that a national walleye circuit fishing tournament is held annually at Big Stone Lake. Attendance records at Big Stone Lake State Park on the Minnesota side and Hartford Beach State Park on the South Dakota side have documented substantial increases in recreational use of the lake, which correlate with improvements in water quality (see table below). Comments made by lake residents indicate appreciation of the water quality improvement that has occurred to date.

Year	Big Stone Lake State Park (MN)	Hartford Beach State Park (SD)
1986 to 1993 (avg.)	11,000 to 13,000	57,000 to 59,000
1994	15,500	55,000
1995	18,500	66,336
1996	25,000	61,994
1997	28,500	66,375
1998	33,700	72,000
1999	36,559	77,226

### Primary Sources of Pollution:

- Agriculture
- Urban Runoff
- Drainage and land use changes

### Primary NPS Pollutants:

- Sediment and Nutrients

### Project Activities:

- Agricultural BMPs (animal waste management systems, no-till planting, buffers)
- Construction of lake outlet control structure and debris barrier

### Results:

- Change of lake status from hypereutrophic to eutrophic
- Shorter algal blooms
- Increased state park attendance/recreational use of lake

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