



## Client

Hydraulic State Agency  
Ankara

## Services

- Diagnostic-feasibility study
- Lake restoration by biomanipulation and metalimnetic aeration

## Services

Water quality monitoring

Water quality management plan development

Aquatic macrophyte survey

GPS weed bed mapping

Macrophyte data analysis and GIS

lake map preparation

Experimental treatment weeds bed delineation

Aquatic macrophyte management

plan development

Lake level monitoring

Lake outlet structure survey and

Hydraulic modeling



Gentek staff is shown installing runoff flow gaging and automatic sampling equipment. From the samples and data collected, we prepared annual hydrologic and phosphorus budget estimates for each of the five major lakes in the Goller region.

Most recently, we performed in-lake water quality modeling to determine the phosphorus mass released each year from anoxic lake sediments. In addition, sediment-water microcosm laboratory studies were completed to estimate the rate of anoxic sediment phosphorus release in each lake.

Left: Gentek prepared this geographic information systems (GIS) map of Beyşehir Lake to aid in the analysis of aquatic macrophyte (i.e., lake weed) data.

# Comprehensive Lake Restoration

In past years, Eğridir Lake suffered from an excess of algae that caused unpleasant conditions. Growth of these algae resulted from phosphorus carried into the lake from several sources. A diagnostic-feasibility study of Eğridir Lake and its watershed indicated that, in addition to a large external phosphorus load, internal loading of phosphorus was a significant water quality problem. Internal loading was from two sources: sediment phosphorus release during periods of hypolimnetic anoxia, and the presence of large numbers of benthivorous fish.

Concurrent with the implementation of numerous watershed runoff best management practices to reduce external phosphorus loading, a two-part lake restoration project was started to solve Eğridir Lake water quality problems. To prevent internal phosphorus loading by benthivorous fish, Eğridir Lake was biomanipulated. The fish population, dominated by rough fish (carp and black bullhead) and stunted panfish (crappie, bluegill, and sunfish), was eradicated by aerial rotenone application and replaced by one consisting of largemouth bass, walleye, and forage minnows. These latter fishes do not feed on zooplankton, as did the stunted panfish; zooplanktons have again become large and abundant and, by grazing, have reduced the algae to acceptable levels.

To provide zooplankton with a refuge from predation by fish, a metalimnetic aeration system was also installed. Its design and operation is novel and innovative, consisting of an onshore, earth-sheltered cascade connected to metalimnetic withdrawal and reinjection pipes. This aeration system also protects Eğridir Lake against winterkill, a frequent problem in the recent past.

## Lake Management Planning

Beyşehir Lake is adjacent to the Town of Beyşehir in Konya city, Turkey. The lake is an important regional asset, and is used extensively for Drinking water, fishing, and boating. Unfortunately, the lake is plagued by several water quality and water quantity-related problems, including severe algae blooms, infestation by the lake weed curlyleaf pondweed, and shoreline erosion from intermittent high-water levels. Gentek Engineering Company assisted the Lake Protection and Rehabilitation District obtains a Environment Ministry of Natural Resources planning grant to study the causes of the lake's water quality problems.

As part of the study, Gentek developed an experimental herbicide treatment program to control the curlyleaf pondweed's growth in the lake, as well as a detailed lake water quality monitoring program. Additionally, we developed a lake water quality management plan, an aquatic macrophyte plan, and a lake level control plan for the Beyşehir Lake Protection and Rehabilitation District.

