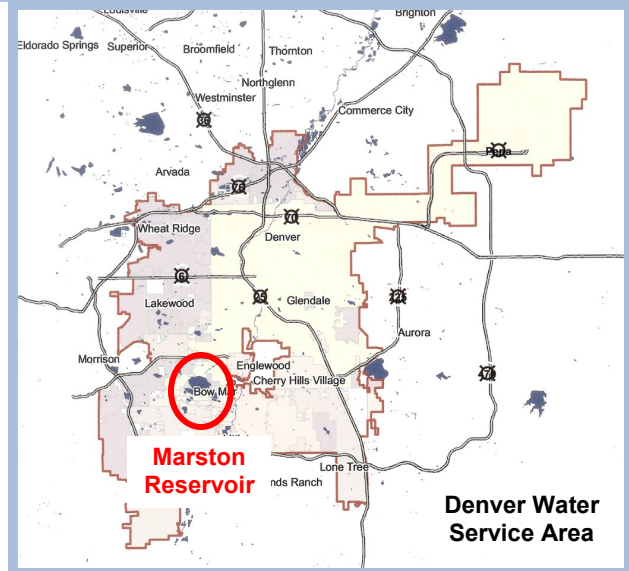


## DENVER WATER—MARSTON RESERVOIR Denver, Colorado

### *D.O. Supplementation of Reservoir*

Design Performance: Maintain 5 mg/l minimum D.O. in water at intake pipe of reservoir

Reference: Sarah Dominick  
Denver Water  
303.628.6446



### *Project Background*

Denver Water supplies water to over 1 million people using water diverted from multiple locations including the Marston Reservoir. The reservoir, constructed over 110 years ago, stores 250 million gallons per day of water diverted from the South Platte River and piped 12 miles to the site with ultimate final treatment at the Marston Water Treatment Plant.

The reservoir's 66 foot depth results in a thin 20 to 30 foot hypolimnion which becomes anoxic after stratification from June through September of each year. The reservoir has only one low level intake which results in anoxic water being piped to the Marston WTP during peak summer water usage. Water quality issues included organic taste and odor, elevated manganese levels, algae blooms and periodic taste and odor complaints from customers.

Denver Water prides itself on the high-quality drinking water it provides to its customers and began evaluating strategies to improve water quality while maintaining optimum water temperature and reducing nutrient loadings on the water treatment system. After studies conducted over a period of fifteen years, oxygenation using ECO<sub>2</sub>'s Speece Cone was selected based on performance efficiencies, silent operations and economic considerations.

## Dissolved Oxygen Supplementation of Lakes, Rivers, Reservoirs



3939 Priority Way South  
Drive, Suite 400  
Indianapolis, IN 46240  
317.706.6484

[www.eco2tech.com](http://www.eco2tech.com)

The ECO<sub>2</sub> SuperOxygenation technology is an innovative, economical and environmentally friendly solution for Dissolved Oxygen (TMDL) supplementation in lakes, rivers and reservoirs. Applications include D.O. discharge compliance, supplemental oxygenation below powerhouse dams, and injection into the hypolimnion of reservoirs to improve fish habitats and reduce algae blooms. The proprietary ECO<sub>2</sub> technology has been proven at locations including the Logan Martin Dam in Alabama, the Camanche Reservoir in California, and the Savannah Harbor ReOx Demonstration. Visit our website at [www.eco2tech.com](http://www.eco2tech.com) to read more about our technology

## Design Considerations and Selection of ECO<sub>2</sub> SuperOxygenation

Studies over the past fifteen years suggested that aeration or oxygenation of the reservoir could address the problems of elevated metal levels, algae blooms and odor associated with the seasonal anoxic conditions.

Denver Water, working with Alex Horne Associates and CDM, conducted an analysis of hypolimnetic treatment options that would fit the specific conditions of the Marston Reservoir. Oxygenation, using the [Speece Cone developed by ECO<sub>2</sub>](#), was selected based upon several important considerations.



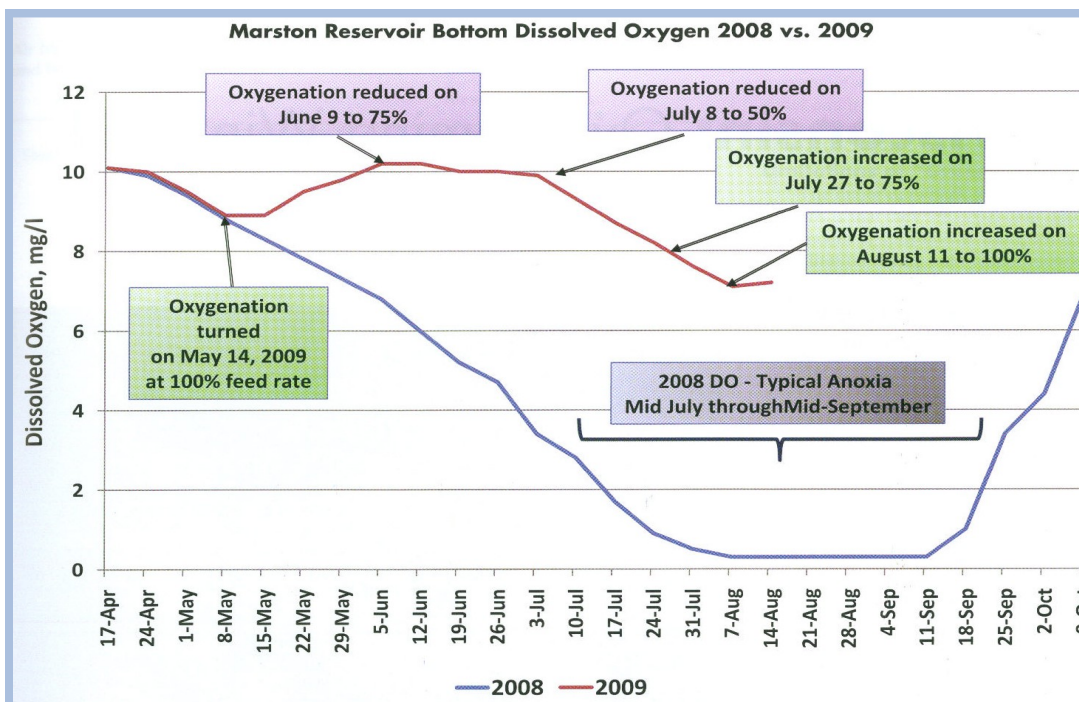
Installation of ECO<sub>2</sub>'s Speece Cone in Marston Reservoir

- Production and maintenance of high D.O. levels
- Little effect on temperature gradient in the hypolimnion
- Efficient oxygen transfer rates (90-95%), even at the high Denver elevation
- Silent operations that would not disturb the surrounding community
- Small footprint and few pipelines
- Ability to continue horizontal water flow over the sediments with a low turbulence methodology

The [ECO<sub>2</sub> SuperOxygenation System](#) is sized for a maximum oxygen feed rate of 2,000 lb/day and is designed to run from May, prior to the first turnover, through fall.

The System is attached to a concrete pad set on a base of rock and gravel at the reservoir bottom. The project was installed over a five month period and began operation in May 2009.

### Results



**ECO<sub>2</sub>**