CASE STUDY

Diffused Lake Aeration

Duck Valley

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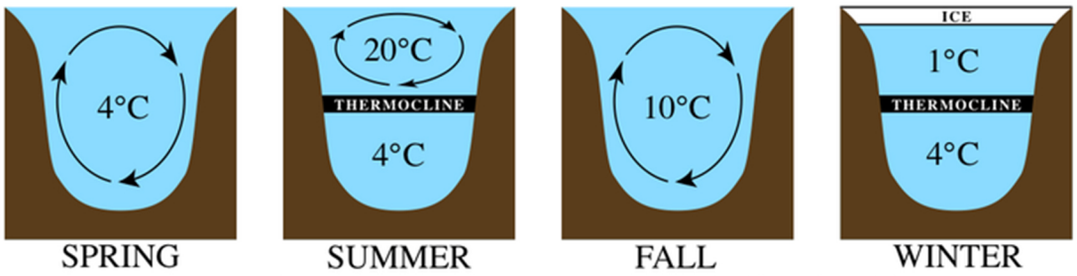
ROBUST-AIRE DIFFUSED AERATION SYSTEM AT DUCK VALLEY

Robust-Aire Aquatic Aeration was used by Mac McGraw of McGraw Wildlife to transform a 12-acre lake. The lake had developed a seasonal history of stratification during the summer and possessed a substantial ice cover during the winter. In May of 2009 and early June, baseline measurements were recorded for dissolved oxygen, temperature, and nitrogen and phosphorus measurements as nutrient indicators.



The lake was separated into layers by temperature, separating the lower portion from contact with the atmosphere. There was a difference in temperature of 8.9 degrees Celsius between the surface temperature and the temperature at 10 feet, indicating thermal stratification.

Oxygen levels at the bottom of the pond were depleted and unable to support any pond life requiring oxygen. At 10 feet of depth there was between 0.1 and 0.23 parts per million (PPM) oxygen present. When oxygen levels drop below 3 PPM, fish become stressed.

Nutrient levels in the pond were concentrated at the bottom of the pond. Oxygen starved bacteria were unable to process the ammonia nitrogen into less harmful by-products (Nitrate, NO3).
Phosphorus was concentrated near the bottom where it was prone to culture undesirable filamentous algae. While ever present in most pond systems, phosphorus can exist in many forms and aeration helps to tie phosphorus in the pond mud. Muds in aerated ponds contain higher oxygen levels (aerobic) and these muds effectively adsorb phosphate, the most common form of phosphorus.

When a lake is stratified, it is prone to a scenario of a partial or total fish kill. Weather conditions, such as a cloudy days followed by a windy rainstorm can mix water. The cooling of surface waters removes the temperature layers in the water and can, in some cases, cause what is commonly referred to as a turnover. This sudden mixing (because of removal of the temperature barrier) dilutes the amount of oxygen to levels that will not sustain fish and could result in a fish kill.

Some lakes may remain stratified for the entire season without mixing. Under these conditions, fish are stressed. They are stressed due to water chemistry and available food and habitat. Stressed fish will have limited growth, lower survivability of young, and be more prone to disease.

Aerating the lake was an obvious solution to the above situation. Robust-Aire was the choice for quality and effectiveness.

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The RA4, Robust-Aire aeration system consisting of 4 diffuser stations, was installed in June of 2009 after the 10-foot deep pond had thoroughly stratified.
After only 24 hours of operating the Robust-Aire system, the pond experienced dramatic improvement. Dissolved oxygen levels at the 10 foot bottom of the pond rose from a low of 0.1 to 7.5 parts per million. Temperature layers were eliminated with a difference of only 1.9 degrees Celsius between surface temperatures and bottom temperatures at 10 feet.

Nutrients levels and distribution were affected as well. Within 48 hours, phosphorus levels at the pond bottom were reduced by 59%, and total nitrogen was reduced by 53%. Ammonia nitrogen on the pond bottom decreased by 83% with increases in nitrate and nitrite levels indicating a stimulation of the healthy conversion of ammonia to less harmful by-products (Nitrite NO2 and Nitrate NO3 by aerobic bacteria (nitrification). Phosphorus and all nitrogen products (Total Nitrogen, Ammonia, Nitrite, and Nitrate) levels were distributed evenly from the surface to the pond bottom at 10 feet after 48 hours of operation of the Robust-Aire system.

Water quality and nutrient distribution changes after 48 hours of Robust-Aire system operation in Duck Valley.

Robust-Aire system operation	Temperatures C°		Dissolved Oxygen ppm		Phosphorus ppm		Total Nitrogen ppm	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
Before	19.7	10.8	11.5	0.1	0.3	1.3	0.6	6.3
48 hours	18.6	16.7	9.5	7.5	0.5	0.5	2.8	2.9

Robust-Aire supplied continuous support of water quality through the summer months.

During winter, each station produced a 30-40 foot diameter hole in the ice. This allowed harmful gases to escape and keep from building up under the cover of ice. The open water also attract waterfowl during the winter months.

Even temperature and nutrient distribution. Higher oxygen levels and protection from fish kills due to oxygen depletion. Healthier, faster-growing fish populations. These are benefits that you can expect when you install Robust-Aire.