

Dissolved Oxygen

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By Stephen M. Meyer

Q. We recently tested the dissolved oxygen level in our pond and found that it was 5 ppm. Is that too low for the koi in the pond? If so, what kind of aeration system would raise the dissolved oxygen level?

A. A dissolved oxygen level of 5 ppm (parts per million) is far too low in a fish pond. With proper aeration, you should be able to keep the level above 7 ppm. There are many alternatives for artificially aerating the water. I will discuss four methods: waterfalls, streams, aeration jets and aeration towers.

Waterfalls are the most common form of aeration system found in ornamental ponds. Water is pumped outside the pond to a slope that rises several feet above the pond surface and then cascades down over the falls back into the pond. Aeration efficiency is a function of the number of steps in the cascade, not the height of the waterfall. The more steps, the better the aeration effect. This means that the very pretty "high" waterfalls where water drops from a great height over a single ledge directly into the pond is the least effective aerator. Instead, you should consider a waterfall that has as many descending steps as possible.

Extending the idea of a multi-step waterfall, you might consider an aerating stream bed. The stream should be long and slope gently toward the pond. The stream bed is easily constructed with a pond liner, and the stream is then lined with gravel. The stream width and water flow are adjusted so that the water just trickles over the surface of the gravel. In effect, this stream is a multi-step waterfall with thousands of tiny steps. An added benefit of this design is that the stream also acts as a small biological filter! Many people also plant iris in the stream for vegetative filtration.

If space is a serious constraint, you might consider placing an aeration (spa) jet on the outlet of a circulating pump. These jets are inexpensive and can be purchased at most pool or spa retail stores. The jet is placed in the pond about a foot below the surface. The pump forces water into the jet, where it is pushed through a narrow passage. As the water exits the passage it enters a larger chamber, causing a sudden pressure drop. Above the chamber is an air tube that extends above the pond surface. The pressure drop in the chamber causes air to be drawn down the air tube into the chamber, where it mixes with the water. This air-water mixture then sprays out into the pond, enhancing general aeration. The pumping rate should be at least one pond volume per hour, and most ponds require several jets for effective gas exchange.

Aeration jets create unattractive currents in the pond and they are noisy. Consequently, many folks shut them off for part of each day — often at night. This limits their usefulness, because aeration is most important after dark, when algae switch to respiration and take in oxygen. If there is a significant amount of algae in the pond, oxygen levels can drop rapidly. Aerating systems should run 24 hours a day.

The last alternative is an aeration tower. This can be a 6-foot length of 6-inch PVC pipe filled with any medium that has high void space (lots of open space): hair curlers, small lengths of PVC pipe cut in half, ceramic rings, plastic filter media — but not gravel. The column stands vertically on the ground and water is pumped so that it enters at the top of the tower. The water then trickles down through the medium, mixing with air as it goes, and finally flows back to the pond. This is a very effective aerator, although not very attractive near a pond.

Any of these methods will work. In order of preference, I would suggest stream, waterfall, aeration column and, lastly, aeration jets.