ABOUT DUCKWEED
Duckweed (scientific name Lemna) is a small bright-green plant, about the size of a fat flake of oatmeal, which floats on top of water bodies. It is commonly found in wetlands, wastewater ponds, or any body of water with high nitrogen and phosphorus nutrients in the water. Nobody knows exactly why, in two side-by-side seemingly identical ponds, one may have duckweed and the other does not. The best theory seems to be that the ratio of nitrogen to phosphorus in the water needs to be within a certain narrow range for duckweed to thrive.

Duckweed is usually spread from one body of water to another by wildlife, including ducks, geese, other birds, mammals, and reptiles such as alligators in the southern US. After duckweed is introduced into a pond, it often reproduces very quickly and can cover the entire surface of the pond in a few days. On windy days it may be blown over to one side of the pond, only to spread out and cover the entire pond the next day if the wind stops blowing.

The small leaf-like body of duckweed is rigid, has gas cells to give it flotation, and a small hair-like root, about 0.5 inches long, through which it pulls in nutrients from the water. Duckweed is very susceptible to being killed by toxins, so its presence generally indicates the water has no toxins.

THE PROBLEM IN WASTEWATER PONDS
Duckweed shades out algae, killing it entirely or else greatly diminishing the number of algae cells, and the amount of dissolved oxygen (DO) algae can produce in the water column. And the DO produced by the floating duckweed goes off into the atmosphere instead of into the water. To the degree that the pond is covered in duckweed, duckweed can convert a wastewater pond from aerobic, fast, odorless digestion of biochemical oxygen demand (BOD) substances to anoxic or anaerobic, slow, odorous digestion of BOD.

With low oxygen in the pond water, wind mixing of the pond, and even normal nightly convective mixing caused by evaporative cooling, especially at fall turnover time, can cause a release of odorous sulfides from the pond. Water pulled from the pond for irrigation will also probably have a sulfide odor. Finally, when the typical fall or winter duckweed die-off occurs due to lower sunlight and/or colder
temperatures, the duckweed falls to the bottom of the pond, decays there, and can cause a sharp rise in BOD, total suspended solids (TSS), and ammonium (NH4+) in the pond effluent, leading to discharge permit violations.

In short, because duckweed can cause so many problems in wastewater, the wastewater system operator should take steps to try to eliminate, or at least control, the duckweed in all ponds.

CONTROLLING DUCKWEED

The good news is that most operators do seem to eventually find an economical and effective way to eliminate or control duckweed in their ponds. The bad news is that there is no single answer that fits all situations, so some experimentation is often needed. The variability in results is probably due to differences between ponds regarding climate, wind, and the number of other infected ponds nearby which can increase the rate at which duckweed is being continually re-introduced to a pond by ducks or geese or other wildlife.

Below are several methods for controlling duckweed that have been used in the past, by wastewater operators, with varying degrees of success. Paragraphs in “quotation marks” are direct quotes from our employees or customers.

1. SolarBee Circulators. Our experience indicates that if we install a SolarBee circulator into a pond covered with duckweed, most likely the duckweed will not die out during that growing season. However, after the typical fall and winter die-off, usually the duckweed does not come back the following year. The likely reason is that, in the spring, diatom and green algae start growing as soon as the ice goes out and while it is still too cold for duckweed; so by the time it’s warm enough for the duckweed, the algae are keeping the nutrient levels too low for duckweed. Note, though, that in climates that are warm year-around, like in the southern U.S., there is no winter die-off of duckweed, so some other method must be used to control it.

2. Herbicides. Please consult a chemical applicator for your best information about herbicides. Generally, there are two types of herbicides that can be used on duckweed, “systemic” and “contact”.

Systemic herbicides are applied into the water, and when the duckweed ingests the water, the plant is killed from the internal effects of the herbicide. Examples are Sonar AS and copper-based products such as 2-4-D.

“Recently, Sonar AS has been shown to be a very effective herbicide for duckweed in wastewater ponds. One operator reported that just putting some Sonar AS into the influent of each pond eliminated duckweed throughout the entire pond.”

Note that for Sonar AS to work this well, you would likely need SolarBee or GridBee mixers to thoroughly mix the herbicide throughout the pond.

Contact herbicides are sprayed onto the plant leaf, and kill the duckweed from that external contact. Care must be taken to spray all of the leaves; otherwise the duckweed might make a comeback shortly after being sprayed. An example of a contact herbicide is diquat.

“One interesting note is that their duckweed is not as much of a problem. It has been mostly on the edges. When they get it mostly on the edges they apply a small dose of copper sulfate in solid form per the instructions on the bag.”

“Diquat is very effective but, (1) it must be sprayed on top of the leaves, and (2) sun activates the diquat, so it should be sprayed early in the a.m. or on a cloudy day so that the diquat can penetrate the plant before it gets activated, and (3) if we use a surfactant it should be of a cat-ion type and not an an-ion type, and (4) the diquat will bond with almost anything in the water so it will not be diquat any more if it comes in contact with water, so there should not be any discharge issues.”
3. Sprinklers. Some customers have set up lawn sprinklers on the bank of their pond, and the duckweed died back when they sprayed it with water.

“Spoke with Larry today, he made an interesting comment: the sprinklers he has running on cell three, see photo, have reduced his duckweed dramatically. Said what remains could fit in a 5-gallon bucket. Considering the first photo was taken about 5 weeks ago, and the duckweed is almost all gone - was it the season or the sprinklers? That’s quite a reduction.”

4. Domesticated Waterfowl. Geese, white ducks, or domesticated mallards eat duckweed and can prevent nuisance growth. However, in large quantities their fecal droppings could lead to fecal problems or excess nutrient loading and algae growth.

“I stopped by the XXXX County PSD yesterday - two 1-acre ponds on the best maintained site I’ve seen. They had six geese penned up inside the pond area. When I asked the operator about it, he stated that he used them to control duckweed. They’re domestic “Chinese” geese (the white variety with a fleshy knot between their eyes.) He swears by them - says wild geese will eat a little duckweed, but the Chinese geese keep his ponds clean. And, with the exception of a small amount of duckweed in one corner of his third cell, the ponds were free of duckweed.”

5. Grass Carp and Koi. Grass carp (white amur) will eat duckweed, but usually only after all other aquatic vegetation has been consumed since they prefer to eat more substantial plants. In most states, the Fish and Game department regulate placement of grass carp, and only sterile, triploid grass carp are legal for stocking. Koi are a smaller cousin to grass carp; they rarely exceed 12 inches in length. Koi can be effective in controlling duckweed if stocked early in the spring prior to duckweed appearing. But if the duckweed ever gets ahead of the Koi, usually the Koi will never catch up due to the fast reproduction rate of duckweed.

6. Manual Control. Duckweed can be physically removed from a pond using skimmers, nets, ropes, or other apparatus. For instance, long handled swimming pool nets work well for removing duckweed when it has been blown up against a shore. But because of duckweed’s explosive growth rate, the process must usually be repeated regularly to have a strong control effect.

Summary: This paper will be updated from time to time. If you have a good method for controlling duckweed, let us know! Thank you for your interest in Medora Corporation products and information.

About Medora Corporation

Medora Corporation, Dickinson, N.D., whose brands include GridBee® and SolarBee®, provide solutions for difficult problems in municipal and industrial wastewater treatment. Applications include energy savings, process improvement and odor control.