

Duckweed Control in Wastewater Ponds, 6 Considerations



A Duckweed Overview

Duckweed (scientific name Lemna) is a small, bright-green floating plant about the size of a fat flake of oatmeal. It has a rigid body with one to three leaves containing gas cells to give it flotation. Duckweed also has a small hair-like root about 0.5 inches long through which it pulls in nutrients from the water.

Duckweed is commonly found in wastewater ponds, wetlands or any other waterbody with high nitrogen and phosphorus nutrient loading.

From this point forward we will generally refer to the waterbody as a “pond”.

Duckweed is usually spread from one pond to another by wildlife (i.e. waterfowl, mammals, or alligators).

In some cases, one pond may have duckweed while another seemingly identical pond nearby does not. Nobody knows exactly why this happens. One working theory centers around the ratio of nitrogen to phosphorus in the water needing to be within a certain narrow range for duckweed to thrive.

After duckweed is introduced, 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 once the wind stops blowing.

Duckweed is very susceptible to toxins so its presence generally indicates the water is toxin-free.

The Problem in Wastewater Ponds

Significant duckweed cover can shade out good green algae. This decreases algal photosynthetic activity which in turn decreases vital dissolved oxygen production in the pond water column.

Duckweed also produces dissolved oxygen; however, most of its production goes into the atmosphere instead of into the water column.

Depending on the severity of duckweed surface cover, a wastewater pond can change from aerobic digestion (fast, odorless) to anaerobic digestion (slow, odorous) very fast.

With low to no dissolved oxygen in the water column, ponds are susceptible to sulfide accumulation. Odor events can be triggered by normal wind mixing or nightly convective mixing from evaporative cooling especially at fall turnover time.

Any water pulled from the pond for irrigation will likely have a stinky sulfide odor as well.

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Duckweed will usually experience a die-off in the late fall/winter due to lower sunlight and/or colder temperatures. The dead duckweed will fall to the bottom of the pond and begin to decay. This causes a sharp rise in BOD, total suspended solids (TSS), and ammonium (NH₄⁺) in the pond effluent which can lead to discharge permit violations.

In short, duckweed can cause many problems in wastewater systems. Wastewater operators should take steps to eliminate or least control duckweed in all their ponds.

6 Considerations For Controlling Duckweed

The Good News: Most operators eventually find an economical and effective way to eliminate or control duckweed in their ponds.

The Bad News: There is no “one size fits all” answer and trial & error experimentation is often needed

Variability in results are likely due to natural differences in hydrology and climate. Also the number of nearby duckweed infected ponds can increase the chances of continuous reintroduction via wildlife or other means.

The following are several methods for controlling duckweed used by wastewater operators in the past with varying degrees of success.

Paragraphs in “quotation marks” are comments from our employees or customers.

1. Circulation & Mixing. Active circulation/mixing (i.e. SolarBee, GridBee or AerationPlus equipment) may have variable effect on duckweed depending on a host of factors.

For Colder Climates: Circulation may not have much of an effect during the initial growing season after installation; however, after a typical fall/winter die-off, the duckweed may not come back as strong the following spring. One working hypothesis is that diatoms and green algae start growing as soon as the ice goes out in the spring. During this time it is still too cold for duckweed. By the time it is warm enough for duckweed to take hold, the diatoms and algae are keeping the nutrient levels too low for extensive duckweed proliferation.

For Warm Climates: In areas like the southern U.S. where there is no winter die-off, some other method or combination of methods should be considered.

2. Herbicides. Please consult a chemical herbicide applicator for the best up-to-date information.

There are generally two types of herbicides that can be used on duckweed: “systemic” and “contact”

Systemic herbicides are applied into the water for the plant to ingest. The plant is then 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: Active mixing and circulation (i.e. SolarBee, GridBee, AerationPlus) will better distribute systemic herbicides throughout the pond. This can make the application more effective at a lower dose.

Contact herbicides are sprayed directly onto the plant leaf and kill via 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.

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“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 consider the following:

- Diquat must be sprayed on top of the leaves.
- Diquat is “sun activated”. It should be sprayed early in the a.m. or on a cloudy day so it can penetrate the plant before it gets activated.
- If a surfactant is used, it should be of a cation type and not an anion type.
- 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.

“Spoke with Larry today and he made an interesting comment. The sprinklers he has running on Pond Three have reduced his duckweed dramatically. The question still remains though; was it the season or the sprinklers?”

4. Domesticated Waterfowl. Geese, white ducks, or domesticated mallards eat duckweed and can prevent nuisance growth. However, their droppings (especially in larger populations) can lead to fecal problems, excess nutrient loading and increased algae growth.

“I stopped by the 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. Consult your State Fish & Game Department (or equivalent) regarding all pertinent laws and regulations BEFORE the introduction of any non-native fishes.

Grass carp (white amur) will eat duckweed; however, they prefer to eat more substantial plants. Only after all other aquatic vegetation has been consumed will they consume duckweed.

Koi are a smaller cousin to grass carp and rarely exceed 12 inches in length. Koi can be effective in controlling duckweed if stocked early in the spring prior to duckweed appearing; however, if the duckweed ever gets ahead of the Koi, they will never catch up due to the fast reproduction rate of duckweed.

It is worth noting that these types of fish can often disrupt bottom sediments which can decrease clarity and cause nuisance algae issues.

6. Manual Control. Duckweed can be physically removed from a pond using skimmers, nets, ropes, or other equipment. Because of duckweed’s explosive growth rate, the process usually needs to 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 Ixom Watercare products and information.

