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Identification and control of DUCKWEED & WATERMEAL

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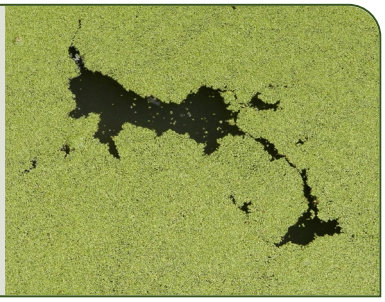
Introduction

Duckweed and watermeal species are classified as floating aquatic plants. Floating aquatic plants are completely free-floating, where no parts of the plant, including roots, are anchored to the pond bottom.

At a quick glance, duckweed and watermeal species may be confused for one another due to their green coloration, simplified leaves, and minute size. Both are very small, oval-shaped plants. Their main body portions, called fronds, are spongy, flat, and leaf-like. By taking a closer look, duckweed and watermeal species can be easily distinguished by size and the presence or absence of roots. Duckweeds are larger—about 0.25 to 0.4 inch compared to 0.02 to 0.1 inch for watermeal—and have at least 1 floating root associated with each frond. Watermeals are smaller and rootless with singular fronds. There are five species, consisting of three genera, of duckweeds commonly found in Texas that can be identified with the naked eye or magnifying glass. Identification of watermeal down to the species requires higher magnification and greater expertise; therefore, they are not discussed in this publication.

Quick Fact:
Watermeal species are the world's smallest flowering plants.



Quick Fact:
Duckweed and watermeal are commonly found together, along with another floating plant called azolla (the rust-red color in image to right), in calm waters.

Although most duckweed and watermeal species are native, they can be aggressive invaders of ponds and become problematic, especially in small ponds. During ideal conditions, populations can double in as little as 3 days. These small plants begin forming large mats, which from a distance can be mistaken for algae. These mats can eventually cover the water surface completely, creating lasting negative effects in the water system. Covering the water's surface limits light availability in the water column, which can reduce phytoplankton and native submerged plant species, lower photosynthesis rates, and disrupt oxygen transfer

from submerged plants and the atmosphere. These effects ultimately lower dissolved oxygen and can potentially cause fish die-offs.

Duckweed and watermeal grow in ponds, lakes, canals, lagoons, bayous, and sluggish streams. They are typically found in nutrient-rich waters, with little wind or wave action. Often more than one species of duckweed or watermeal will be associated together in these colonies.

Common duckweed

Common duckweed, *Lemna minor,* is the most widespread and well known of the duckweeds in North America. Fronds are bright green with a pale underside, in clusters of 1 to 3, and almost twice as long (± 0.14 inch) as they are wide (± 0.08 inch). Each frond contains one root nerve, which is characteristic of the genus, *Lemna.*

Dotted duckweed

Dotted duckweed, *Landoltia punctate,* is commonly misidentified due to its misleading name. Dotted duckweed fronds do not contain any pigmented dots, unlike giant duckweed. Instead, this species receives its common name from its dotted texture on each frond, which gives a dotted appearance in certain lighting. Fronds are bright green with a red to purple underside, oblong, oval-shaped, and almost twice as long (± 0.10 to 0.20 inch) as they are wide (± 0.06 to 0.12 inch). Fronds are usually in clusters of two or more and contain two to five roots per frond. Dotted duckweed is a non-native plant that should not be grown, as it is invasive and illegal to possess or transport in Texas.

Quick Fact:
Duckweeds are also referred to as "duckmeat."

Giant duckweed

Giant duckweed, *Spirodela polyrhiza,* true to its name, is the largest duckweed. Fronds are dark green with a red to purple underside, ribbed, almost as wide as they are long (0.12 to 0.39 inch), found in clusters of 2 or more, with 5 or more roots per frond. The leaves are pointed, giving a tear-shaped appearance, and usually have a singular red to purple dot near the narrow tip of the frond.

Least duckweed

Least duckweed, *Lemna minuta,* is the smallest species in the *Lemna* genus, only ranging from 0.04 to 0.10 inch long and up to 0.06 inch wide. Fronds are pale green to grey in color, almost translucent, thicker toward the center with a visible central vein, and usually found individually or in clusters of two.

Small duckweed

Small duckweed, *Lemna valdiviana,* looks similar to least duckweed, having pale-green fronds that are almost translucent with a visible central vein, and usually found individually or in clusters of two. However, small duckweed fronds are very oblong to elliptic in shape, being 0.08 to 0.20 inch long and 0.02 to 0.08 inch wide.

Watermeal

Watermeal, *Wolffia spp.,* are the smallest flowering plants on Earth. Fronds are the size of a pinhead and barely visible to the naked eye. A microscope with high magnification is needed to distinguish between species in the *Wolffia* genus. Watermeal resembles tiny green seeds due to their oval to spherical shape—measuring ± 0.04 inch long and wide—and lack of roots.

Control

Management of duckweed or watermeal populations can be challenging for private pond owners. Due to their small size, these species can be continually reintroduced by multiples means. They can be transported very easily on the fur, feet, and feathers of domestic animals and wildlife from other locations, as well as accidental introductions by people who do not notice them when moving water due to their small size. Additionally, many species produce buds called turions, which sink to the pond bottom to overwinter in the sediment. As water temperatures increase, these turions will float back to the water's surface and begin to form a new population. Even though duckweed species and watermeal species can be distinguished from one another, prevention and control options are relatively similar.

Preventative control

Duckweed and watermeal are typically found in nutrient-rich waters, so it is important to reduce the number of nutrients entering the pond.

This can be done by reducing runoff from terrestrial fertilizers, creating a buffer of native vegetation around pond edges to absorb nutrients, and limiting livestock access to small areas. Limiting access can be achieved by placing 4- to 6-inch rocks at water entry points to reduce livestock wading time.

Due to their small size, duckweed and watermeal can easily spread to other water bodies by wildlife, livestock, and companion animals. It is important to identify the point of origin to reduce the chances of introduction and reintroduction.

Physical control

Physical control includes netting, seining, or raking duckweed and watermeal out of the pond. These methods are generally labor-intensive, have limitations due to the small plant size, and any plants missed during removal can recolonize very quickly. To make plants easier to reach for removal, the pond can be aerated to push plant material to the edges.

Biological control

Biological control is the method of introducing other organisms that naturally eat duckweed and watermeal. Mozambique tilapia are an effective form of biological control for duckweed and watermeal.

Mozambique tilapia are cold intolerant and will begin to die-off at water temperatures below 55° F. Therefore, tilapia will need to be stocked annually in the spring, after water temperatures have stabilized above 65°F, at a stocking rate of 15 to 20 pounds of mixed-sex per acre. Mozambique tilapia will not be an effective form of control if there is a large bass population due to predation. Many species of ducks and other birds will consume duckweed and watermeal, but effective control has not been proven.

Chemical control

Before discussing the chemical controls that work best for duckweed and watermeal species, the regulation of herbicides and pesticides must be addressed. Each state has its own agency or agencies that regulate the purchase, use, and application of pesticides and herbicides. Please consult with the appropriate state agency before attempting to purchase or apply aquatic herbicides or algaecides.

When choosing herbicides, they can be split into two classifications, contact and systemic, which can dictate treatment application. Contact herbicides cause immediate cell death at the point of contact. They are fast-acting and cause aboveground tissue death. When contact herbicides are applied to a dense population of aquatic vegetation, they can cause oxygen depletion due to large amounts of decomposing material. The decomposition process consumes oxygen and lowers dissolved oxygen levels within the water body. Therefore, contact herbicides need to be applied in sections of no more than 25 to 30 percent of the pond area at a time. There should be a waiting period of 7 to 10 days before treating the next section. Flumioxazin is an effective contact herbicide option for both duckweed and watermeal species, while carfentrazone and diquat are effective contact herbicide options for duckweed species only. Diquat should not be used in turbid or muddy waters. Diquat will bind with clay particles and sink to the pond bottom, making the application ineffective.

Quick Fact:

Mozambique tilapia will provide control for duckweed and watermeal species but will not be effective if there is a large bass population due to predation.

Systemic herbicides are translocated throughout the plant. They are slow-acting and cause total plant mortality. Due to plants dying slowly over a long period, systemic herbicides do not typically need to be applied in small sections like contact herbicides. Systemic herbicide options for both duckweed and watermeal species are Penoxsulam and Fluridone.

Repeated treatments may be necessary, and an aquatically labeled surfactant may be recommended with treatment to increase effectiveness. Check the label.

Chemical control options provided here are for private waters only. Treatment of flowing or publicly owned waters require permits that must be obtained from the state or federal regulatory agency tasked with managing the specific body of water. For Texas, these permits can be obtained from the Texas Parks and Wildlife Department by calling 512-389-4444. Some waters in Texas are managed by the United States Army Corps of Engineers (USACoE). The USACoE Fort Worth District Regulatory and Permitting Office can be reached at 817-886-1731, and the USACoE Galveston District Regulatory and Permitting Office at 409-766-3982.

Quick Fact:

More information on aquatic vegetation identification and management along with other publications can be found on https://aquaplant.tamu.edu/ and https://fisheries.tamu.edu/.

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More Extension publications can be found at AgriLifeBookstore.org