

## Chapter 1 : The Book of Swamp and Bog – awkward botany

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Duckweeds Obviously, a series about tiny plants must begin with duckweeds – a group of aquatic plants that holds records in a number of categories including smallest flowering plants, smallest vascular plants, and smallest fruits. Some species have one or a few tiny rootlets; others form no roots at all. However, what they lack in their hyper-diminutive size, they make up for in their ability to form massive colonies, creating dense mats that can take up serious square footage in a pond or lake. Five genera make up the duckweed subfamily Lemnoideae: Spirodela, Lemna, Landoltia, Wolffia, and Wolffia. This group used to be considered the family Lemnaceae, but has since been placed in Araceae – the arum family. While they are considered flowering plants, not all species of duckweeds produce flowers, and those that do, do so only rarely. They mainly reproduce asexually through a process called budding, in which growth occurs at the base of the thallus or frond and eventually splits off from the parent plant. This process happens fairly quickly, which is why duckweeds are able to create substantial colonies. Duckweed mats form atop the still waters of lakes and ponds, but can also form in very slow moving rivers and streams. Their presence is an indicator of high levels of minerals and nutrients, which is why they are commonly seen in agricultural and industrial wastewater ponds. Nutrients are absorbed through the underside of the thallus, so the rootlets of duckweeds likely function more for stabilization than for nutrient uptake. As duckweed mats expand and grow dense, they shade the environments below them. Eastman points out that for this to be the case, the duckweed may need to be accompanied by other surface dwelling plants in order to create dense enough shade. Duckweeds overwinter by forming turions , small buds that act as storage organs. Eastman explains the process: These tiny, kidney-shaped buds detach and immediately sink to the bottom, where they remain all winter. In the spring, each turion expels a gas bubble, which causes it to rise to the surface, where it rapidly develops into a new duckweed thallus. Turion formation requires a combination of bright sunlight and high water temperature. Duckweeds colonize new areas either by moving downstream if they have that option or by finding themselves attached to the fur, feathers, or feet of animals that unwittingly transport them. The common name, duckweed, is likely derived from the fact that it is a major source of food for waterfowl. It is high in protein and rich in nutrients, especially when you factor in all the tiny critters growing on and among it. Muskrats and beavers occasionally eat duckweeds as well. Despite losses from herbivory by these creatures, being made mobile by their moving bodies is a major boon. A collection of various duckweed species – photo credit: Frogs and other amphibians as well as various aquatic insects and microinvertebrates also consume duckweeds. The diversity of small animals and protists that use duckweeds and the environments they help create is incredible. Duckweed mats host a large variety of small fauna that feed, lay eggs, or shelter amid the plants. Many of them secure themselves to the thallus rootlets or undersides, where they snare and capture passing food organisms or particles. Protozoans, rotifers, insect larvae, and crustaceans are often abundant. Humans have also been known to eat duckweeds. Duckweed farming is not a simple procedure, but a highly nutritious food source is the result when it can be done. A simpler alternative is to use the harvest as animal feed. Duckweeds are also used in bioremediation and are being considered as a source of biofuel. Depending on the species, an individual duckweed can vary in width from 10 millimeters to less than 1 millimeter. They truly are tiny wonders of the plant world, and it is worth getting down to their level for a closer look hand lens recommended.

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