



DUCKWEED

MAY 2002

OVERVIEW

Duckweed is a tiny green floating plant capable of purifying water and supplementing feed for livestock and wildlife. The smallest flowering plant in the world, duckweed is fast growing and well-adapted to almost any environment, other than windy open areas. Duckweed can be found floating on most any quiet dugout or wetland throughout the world. The most common species is Lemna minor. Duckweed is often mistaken for algae and dismissed as a nuisance. When managed properly, it is an efficient and economical means of primary water treatment in a water body.

Duckweed has the ability to cover a dugout or wetland surface in a very short time. In fact, duckweed can double its mass in 16 hours under optimal growing conditions. Duckweed tolerates a wide range of environmental conditions, but prefers sheltered areas and water temperatures between 6 and 33°C at a pH of between 6.5 and 7.5. Water temperature, sunlight, and phosphorus concentration are the main limiting factors in duckweed growth. The higher any one of these factors, the faster duckweed multiplies.

Nutrients and water are taken up by the leaves of the plant. The purpose of the duckweed root is to act as an anchor. The root provides stability from overturning and slows the plant's movement when the wind blows across the water. The roots' sticky texture also aids in the plant's dispersal to other water bodies by waterfowl.

Duckweed survives the winter by developing a thick, fleshy bud called a turion. This turion sinks to the bottom and remains dormant until the water warms up, at which point it becomes plant and floats to the water surface.

BENEFITS

Nutrient Absorption

Like many aquatic plants, duckweed takes up and stores nutrients from the water so they can survive and multiply. Phosphate rich water - very common to the prairies - stimulates duckweed growth.

As duckweed turns yellow and dies, it must be removed from the water to prevent it from sinking to the bottom and decomposing. If allowed to decompose, it will release any nutrients it absorbed back into the water. Decomposition in an anaerobic condition will produce foul taste and odour.

Surface removal of duckweed is simple. Duckweed plants tend to bind to one another by their roots. This binding forms a dense, entangled mat that can be skimmed off by a homemade boom assembly, dried, and then used as supplemental feed for livestock and fish.



Caption

Natural Shade, Evaporation, and Algae Competition

In order to survive, algae and aquatic plants require sunlight for photosynthesis. A dense cover of duckweed can greatly diminish algae and aquatic plant populations by preventing light from penetrating the water surface. This is advantageous since plant and algae decomposition reduces dissolved oxygen levels in the water, often to the point of total oxygen depletion in a water body. An additional benefit of stopping light from reaching the water surface is an up to 33% reduction in evaporation from the water surface.

Another way duckweed keeps algae populations in check is through natural competition for vital nutrients. The fast growing nature of duckweed allows it to become dominant in a water body when sufficient levels of nitrogen and phosphorus are available. Simply put, algae can't compete with duckweed and will get choked out.

HARVESTING

The benefits of having duckweed are wasted if the plants are not harvested. Harvesting the plants whenever the populations get high is recommended. Harvesting is best accomplished by using a homemade, articulated boom assembly with ropes attached. One such assembly consists of several 4" x 4" wooden posts connected by flexible material, with a few sturdy ropes fastened along the length of the boom. The boom should be designed so that it is long enough to span the width of the dugout. Another articulated boom comprised of lighter components is also effective, not to mention far less cumbersome to operate. Experimenting with different designs is the way to find what works best for each water source.

The boom is placed into the dugout at one end and pulled slowly across to remove the duckweed from the surface. It is often necessary to periodically remove portions of the collected duckweed from the boom as it is pulled across to prevent duckweed from slipping over top of the boom. To avoid reintroducing nutrients back into the water body, the harvested duckweed should be kept away from the immediate watershed area. Once collected, if it is to be used for feed, the plants must be dried or they will quickly rot.

DUCKWEED SOUP?

Duckweed is a potentially high protein feed source for livestock, fish and wildlife. With optimum growing conditions and regular harvesting, duckweed can yield 10-30 metric tons of dry matter per hectare per year.

The dried duckweed is highly digestible and can contain up to 43% crude protein, only 5-15% indigestible fibre, and 5% fat. The plant is often provided as a high mineral (nitrogen & phosphorus) and protein supplement for animals and fish. Using duckweed as a supplement has been found to increase fish and duck production.

While not a replacement for traditional feed, using duckweed as an animal food provides a use for the harvested plants rather than burning or throwing them away.



Caption

CONTROLLING GROWTH

Duckweed growth can become excessive in nutrient-rich water under the right growing conditions. While there are chemicals available to control duckweed growth, this form of treatment often escalates the problem, and may initiate new problems in the process. Over-application of chemicals will kill most of the plants but will never be able to entirely eradicate them completely. Also, by removing

duckweed, algae's natural competitor, chemical application can stimulate rampant algae growth in place of duckweed.

Therefore, harvesting is a better alternative than chemical application and carries the added benefit of being more environmentally friendly. The bottom line is that duckweed has positive effects on water quality when managed properly, so why try to get rid of it?



Caption

THE BIG PICTURE

Duckweed is not the answer to every water quality problem. Practicing good watershed management, such as installing grass buffer strips and removing woody vegetation from water edges, is also important. Duckweed, however, provides a low-cost, environmentally safe method of improving water quality in a standing water source.

Always be sure to properly identify aquatic vegetation on your water source before attempting to eradicate it. If it is duckweed, consider management instead of elimination.

(for more info on good watershed management practices see the Water Quality Matters publications: Agricultural Best Management Practices; & Nutrient Management Planning)

For further information on rural water quality and treatment technology:

- read the other publications in PFRA's **Water Quality Matters** series;
- visit the PFRA Web site at www.agr.gc.ca/pfra ;
- read *Prairie Water News*, available from PFRA or on the Internet at www.quantumlynx.com/water ; or
- **contact your local Prairie Farm Rehabilitation Administration Office** (PFRA is a branch of Agriculture and Agri-Food Canada).

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