RI Department of Environmental Management
Office of Water Resources

Guide to Understanding

Freshwater Aquatic Plants

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Understanding Freshwater Aquatic Plants

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Why are there plants in my lake?

Top five benefits of aquatic plants (macrophytes)

1. **Provide habitat and protection for:**
    - Waterfowl (geese, ducks, wading birds)
    - Fish (cold and warm-water species)
    - Frogs, salamanders and turtles
    - Insects and other microscopic organisms

2. **Act as food sources for:**
    - Mammals (otter, beaver, muskrat, moose)
    - Birds (geese, ducks, songbirds)
    - Fish
    - Turtles
    - Invertebrates (such as insects)

3. **Help recycle oxygen and carbon dioxide (CO_2):**
   Plants maintain the balance in ponds by taking up CO_2 and releasing oxygen in the water, vital for fish survival and maintaining a healthy pH level.

4. **Prevent shoreline erosion**
   Plants that float on the surface of the water, or emerge from the water near shore, act to buffer destructive wave action that could lead to erosion.

5. **Help improve water clarity**
   Aquatic plants may act as filters to trap particles and absorb the organic particles in tea-colored (tannic or humic) water.

How do aquatic plants grow?

Four things aquatic plants need to grow

1. Sunlight

Plants acquire their energy from the sun, through a process known as photosynthesis. Clear, shallow lakes (5-10 ft deep) provide the most sunlight, and may support high abundances of plants. In deeper lakes, where you cannot see the bottom, it is harder for rooted plants to receive sunlight; therefore fewer plants grow in these areas. However, free-floating and submerged plants that do not require root systems for growth will be found on the surface of ponds where they can obtain sunlight.

2. Water

Aquatic plants live in water by nature and often grow more quickly than plants on land that are limited by water. Also, because aquatic plants rely on water for structural support by floating, they use less energy maintaining supportive tissues.

3. Nutrients (in the water)

Some types of plants (free floating or submerged plants) receive most of their nutrients directly from the water. Lakes with high nutrient (Phosphorus and/or Nitrogen) loads may have a large abundance of plants. Nutrient loading may be due to non-point pollution, such as leaking septic systems or water-run off from roads, lawn or agricultural fertilizers.

4. Nutrients (in the soil)

Rooted plants grow best in nutrient-rich, dark soils, rather than sandy or rocky areas. Often beds of decaying leaves or other aquatic plants (detritus) provide ample nutrients for promoting aquatic plant growth. Shallow man-made lakes or reservoirs (impoundments) developed by river dams frequently support such detritus and soils that would otherwise be washed downstream. **Note: not all aquatic plants are rooted, some only uptake nutrients from the water, therefore, they do not require nutrients in the soil to grow.

How do aquatic plants spread?

Three ways aquatic plants can spread

1. **Fragmentation:**
   Some plants can reproduce when just a portion of the plant is cut off (fragmented) and carried by wave or wind action to other areas in a lake. The plant fragment will grow roots for nutrient uptake and resettle in another area to grow. Fragments can also become attached to birds, animals and/or boats to be transported to other water bodies. Some plant fragments will last several days out of the water, thus it is imperative that boats and boat motors be inspected for hitch-hiking aquatic plants.
   Examples are milfoil and bladderwort

2. **Root systems (rhizomes, stolons and tubers):**
   Aquatic plants may branch out and expand through rhizomes (underground stems) or stolons (above ground stems). These stems may develop tubers, or dormant buds that will survive in lake sediments for years, and can eventually produce new plants. As this occurs over time, plants may accrue very hardy, complex root systems.
   Examples are Hydrilla and Curly leaf pondweed

3. **Seed banks:**
   In flowering plants, a pollinated flower will produce seeds (fruits) that often overwinter to germinate the next year. Seeds that do not germinate may stay in the sediment for as many as ten years before germinating. When this occurs over time, a supply of seeds may build up and produce what is called a seed bank to ensure plant reproduction. Birds and other animals that eat the fruits (seeds) may also transport the plants to other areas when intact fruits pass through their digestive tract.
   Example: water chestnut

How does a plant become an invasive?

It is important to monitor your lake and keep an eye on plants that may become invasive. The chart below describes how plants colonize a lake.

STAGES OF AN INVASION

STEP 1:

ARRIVE
Plant is introduced to waterbody via wind, water, animal or human transport

STEP 2:

ESTABLISH
If conditions are right for the plant (pH, light, water chemistry) it will begin to grow

STEP 3:

GROW & SPREAD
Once the plant is established and conditions are good for its growth, it will start to grow and reproduce, extending its distribution

STEP 4:

DISPLACE NATIVES
Here the plant will become an invader. If the plant spreads well, grows and reproduces quickly, with few to no predators or competitors, it may begin to replace native plant species

STEP 5:

DOMINATE PLANT COMMUNITY
Once the plant replaces native species, it will continue to grow until proper management can effectively control it.

Are the plants in my lake invasive?

First, plants must be identified to determine effective management options!

- Not all “weeds” are alike! What is the plant’s name?
- Do the leaves float on the water or lurk under the surface?
- How does it reproduce? Fragment, seed or root system?
- If it has flowers, when do they come out?
- Is it listed as an invasive plant in your area?
- Is it common in the state or rare, or a new species?
- All of this kind of information is important to know!

Use online guides to identify your plants or consult a pro – check online here:
http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/aisplant.htm

Reasons why invasive aquatic plants are a problem

- **Impede recreation**
  - Reduce aesthetic quality of lake
  - Tangle around outboard motors
  - Obstruct access to boat ramps/ boat lanes
  - Infest swimming areas
  - Snag fishing lines
  - Generate poor conditions for fish
  - Reduce visibility in the water

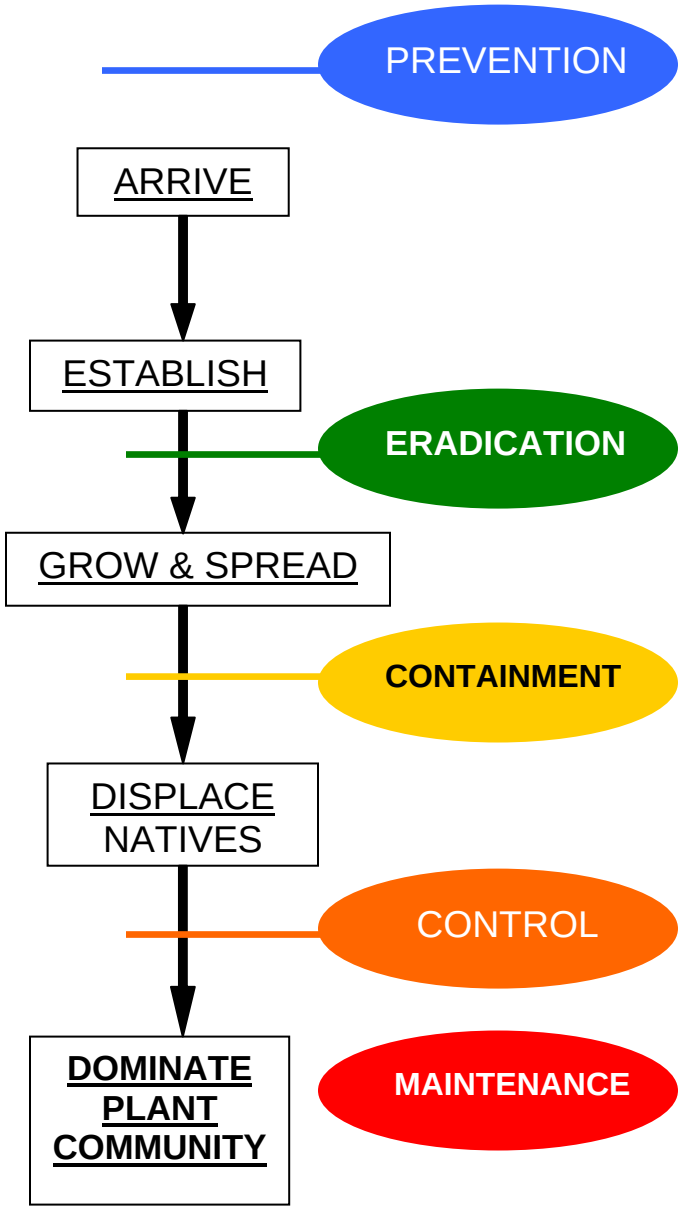
- **Limit ecological function of a lake**
  - Out-compete beneficial native plants
  - Decrease biodiversity
  - Reduce water quality
  - Decompose slowly and reduce O_2

- **Cause economic harm**
  - Devalue waterfront property
  - Require substantial funds to manage
  - Diminish recreational tourism and revenues

What are the methods of managing nuisance species?

Strategies for Managing Nuisance Species

Depending on the identified plant species and its stage of invasion (see page 5) different management strategies can be employed to avoid a problem with a known nuisance plant species:



The best form of management is to prevent the spread of nuisance aquatic species. This is done with monitoring and education. Put up signs at boat ramps, and encourage the inspection of boats before they enter the water, and after taken out

At sites where aquatic plants have just established, it is important to remove them before they can grow

If possible, small patches of nuisance plants should be enclosed with nets or other barriers to keep them from spreading

For large infestations of nuisance plants there are several control options to consider. Many are best used in combination with another method, and it is essential to evaluate the most cost-effective strategies for control and maintenance of the plant by constructing a lake management plan specific to plant management

How can Invasive Plants be Controlled?

Method	Advantages	Disadvantages
If ERADICATION is the plant management goal: Methods are effective at individual sites for removing a few individual plants; highly specific to target plant species.		
Hand-pulling	• Completely removes plants • Generally low-cost • Avoids use of chemicals & machinery	• Labor-intensive • Practical only in small areas
If CONTAINMENT is the plant management goal: Methods may be effective in small areas; not specific to target species (affects all plants within barrier or net).		
Benthic Barriers	• Benthic barriers are screens or tarps secured to the lake bottom like a carpet to block sunlight and smother growth • Impedes fragmentation	• High maintenance (keep barrier clear of soil and secured to lake bottom) • Affects all plants (even native, non-target species), animals and soils below the barrier
Floating nets	• Enclose small area (cove, inlet, outlet) to inhibit spread of floating plant fragments	• May impede boating, swimming and fish movement
If CONTROL AND MAINTENANCE is the plant managemtent goal: Methods may be effective for larger areas and infestations; can be costly		
Chemical Herbicide Treatment	• Can control large areas • Chemical may be selective to target species • Results often seen rapidly • One application may work for 1-3 years	• High cost for chemicals & licensed application • Use of water body for swimming & drinking may be limited for period of time after application • Multiple treatments often necessary for long-term control
Physical Mechanical harvesters and hydro-raking	• Heavy machinery quickly covers large areas, cutting and removing large quantities of plants	• Short-term solution requires follow-up maintenance (mowing) • May spread plant fragments with cutting action • Removes all non-target plants • Disturbs soils, wildlife (frogs/mussels) & habitat • Increases turbidity • Requires extensive machine decontamination
DASH (Diver Assisted Suction Harvesting)	• SCUBA divers hand pull target plant species and feed them into a suction "vacuum" onto barge or large container • Reduces spread of fragments • Avoids use of chemicals	• Labor intensive; SCUBA costs may be high • May only be practical in smaller areas • May require large area to dry and/or compost plants
Habitat Manipulation Water Drawdown	• Where there is a dam or structure to control water levels, water may be lowered in the winter to allow sediments and plants to freeze and dry out	• Affects wildlife (fish, frogs, mussels) & all plants (non-target/native species) in entire dewatered area – area is then highly susceptible to new colonization by aggressive invasive plants • May affect access to water (low/no water) • May increase post-drawdown nutrient levels, turbidity and erosion (resuspension) • Not effective for floating or seed bearing plants • Efficacy highly weather dependent, may not affect root systems/rhizomes
Dredging	• Complete removal of lake sediment to remove associated plants	• Recreation/drinking limited during project • Completely alters lake ecology • Will affect all plants and wildlife • May cause water quality problems • High cost
Biological Controls	• Introduction of natural prey (insects, fish) into lake to control plant population • Often highly specific to target species	• Introduction of new species may cause new unforeseen problems • Experimental procedure – may not work • Success rate and amount of control varies (ability of prey to adapt, food preference of prey, reproductive success of prey, prey climate tolerance…)

Where can I find more information?

Rhode Island Department of Environmental Management
http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/aisindex.htm

Rhode Island Invasive Species Council
http://rinhs.org/invasive-species-portal/riisc/

Northeast Aquatic Nuisance Species Panel
http://www.northeastans.org/

National Invasive Species Council
http://www.invasivespecies.gov

National Invasive Species Information Center
http://www.invasivespeciesinfo.gov/

Invasive Plant Atlas of New England
http://www.eddmaps.org/ipane/

Connecticut Department of Energy & Environmental Protection
Aquatic Invasive Species
http://www.ct.gov/deep/cwp/view.asp?a=2696&q=322690&deepNav_GID=1630

Massachusetts Department of Conservation and Recreation
Aquatic Invasive Species in Lakes and Ponds
http://www.mass.gov/eea/agencies/dcr/water-res-protection/lakes-and-ponds/aquatic-invasive-species.html

New Hampshire Department of Environmental Services
Exotic Species Program
http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/index.htm

Vermont Department of Environmental Conservation
Aquatic Nuisance Species in Vermont
http://www.anr.state.vt.us/dec/waterq/lakes/htm/ans/lp_ans-index.htm

Maine Department of Environmental Protection
Invasive Aquatic Species Program
http://www.maine.gov/dep/water/invasives/

New York State Department of Environmental Conservation
Nuisance and Invasive Species
http://www.dec.ny.gov/animals/265.html

Wisconsin Department of Natural Resources
Aquatic Plant Management and Protection Program
http://dnr.wi.gov/topic/invasives/prevention.html

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