RI Department of Environmental Management
Office of Water Resources

Guide to Understanding

Freshwater Aquatic Plants

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DEM Office of Water Resources
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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.

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 invader?

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 a nuisance?

Nuisance aquatic plants

Common terms for problem aquatic plants

Nuisance	Introduced	Exotic
Invasive	Alien	
Weeds	Non-native	

(Please note that not all non-native plants become problems and not all native plants are non-invasive.)

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

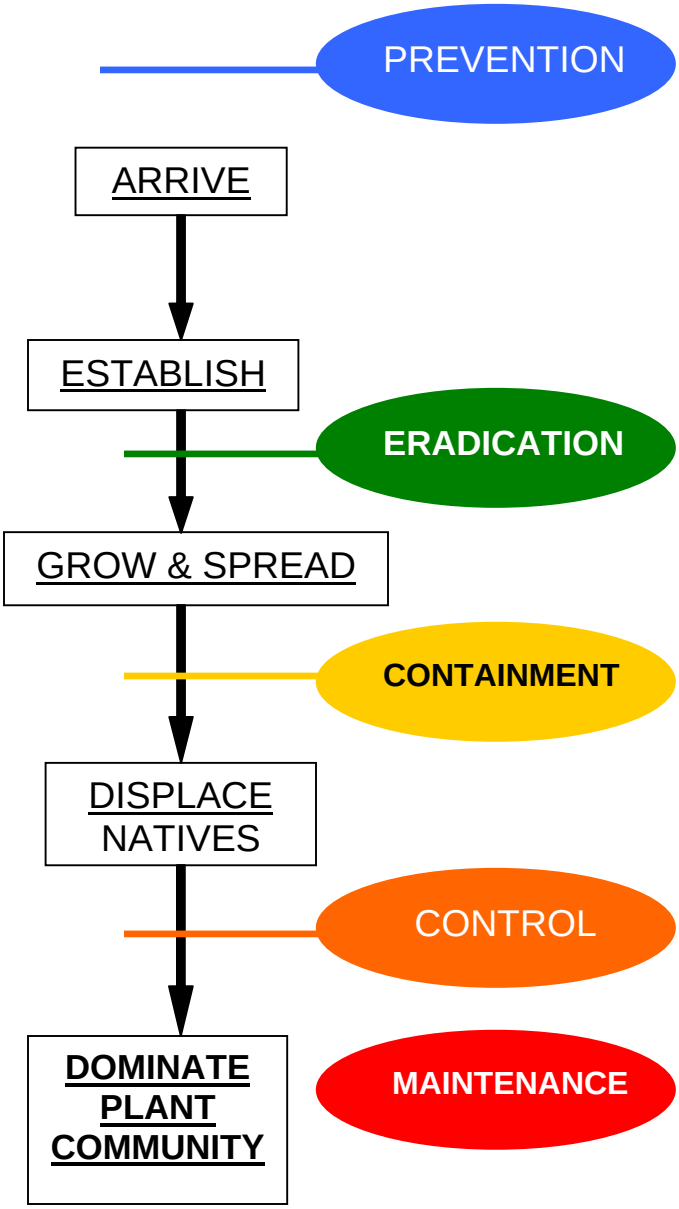
- **Limit ecological function of a lake**
  - Out-compete beneficial native plants
  - Decrease biodiversity
  - Reduce water quality
  - Decompose slowly and reduce O_2

- **Cause economic harm**
  - Devalue waterfront property
  - Require substantial funds to manage

What are the methods of managing nuisance species?

Strategies for Managing Nuisance Species

Depending on the 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 nuisance plant invasions be controlled?			
Management Strategy	Advantages	Disadvantages	Permitting
Eradicate	**Effective at individual sites for removing a few individual plants; highly specific to target plant species.**		
Hand-pulling	Completely removes nuisance plant	Can be labor intensive; depending on size of area to be treated a DEM issued permit may be required.	DEM Wetlands permit required if area to be cleared is more than 15 feet from existing docks, beaches, and swimming areas.
Contain	**Effective in small areas of plant growth; not specific to target (impact all plant species within barrier or net).**		
Benthic Barriers	(Black screen secured to lake bottom like a carpet) Blocks sunlight and prevents growth, impedes fragmentation	High maintenance, effects non-target plant and soils below barrier	Projects need to be reviewed by DEM's wetlands program.
Floating nets	Enclose small area (cove or inlet) to inhibit spread of plant fragments	Requires proper anchors, can impede boating, swimming, & fish movement	
Control & Maintain	**Effective for larger areas and infestations; Cost depends on method chosen.**		
Chemical			
Herbicide Treatment	Can control large areas, chemical may be specific to plant species, results mat be seen rapidly and one application may work for 1-3 years, but more may be required	High initial cost; requires state permit; use of waterbody for swimming and drinking often limited for period of time after application	Permit required from DEM's Division of Fish & Wildlife/Division of Agriculture
Physical			
Mechanical/suction Harvesters Hydro-raking	Large machinery quickly covers large areas and removes plants	High cost for short-term solution; requires follow-up maintenance; may cause plant to fragment; removes all beneficial plants; disturbs soils & habitat, causes turbidity	Projects that involve harvesters and hydro-raking require a wetlands permit from DEM's wetlands program
Habitat Manipulation			
Water Drawdown	Lowering water level may be manipulated in the fall to allow sediments and plants to freeze, and dry out	Will effect all (including beneficial) plant species and wildlife (fish, frogs, mussels); may effect access to water supplies; increase post-drawdown nutrient levels & turbidity	Drawdowns require approval from DEM's wetlands program

Dredging	Total removal of plants and associated sediments	Completely alters lake ecology, will impact all plants and wildlife, may cause water quality problems	Projects that involve dredging will require a wetlands permit from DEM's wetlands program
<u>Biological Controls</u>	Introduction of natural prey (insects, fish) into lake to control plant population; often highly specific for plant target	Introduction of new species may be problematic (or unethical); highly experimental and may require permit	Projects that involve the introduction of new species, such as certain species of fish or weevils, to control weeds must be reviewed and approved by DEM's Division of Fish & Wildlife

Where can I find more information?

Rhode Island Invasive Species Council
http://www.uri.edu/ce/rinhs/invasives/index.htm

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://invasives.eeb.uconn.edu/ipane/

Connecticut Department of Environmental Protection
Non-native invasive plant species program
http://www.dep.state.ct.us/cgnhs/invasive.htm

Massachusetts Department of Conservation and Recreation
Lakes and Ponds Program
http://www.mass.gov/dcr/waterSupply/lakepond/exotics/exotic1.htm

New Hampshire Department of Environmental Services
Exotic Species Program
http://www.des.state.nh.us/wmb/exoticspecies/

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 Plants
http://www.maine.gov/dep/blwq/topic/invasives/

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

Wisconsin Department of Natural Resources
Aquatic Plant Management and Protection Program
http://www.dnr.wi.gov/org/water/fhp/lakes/aquaplan.htm

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