

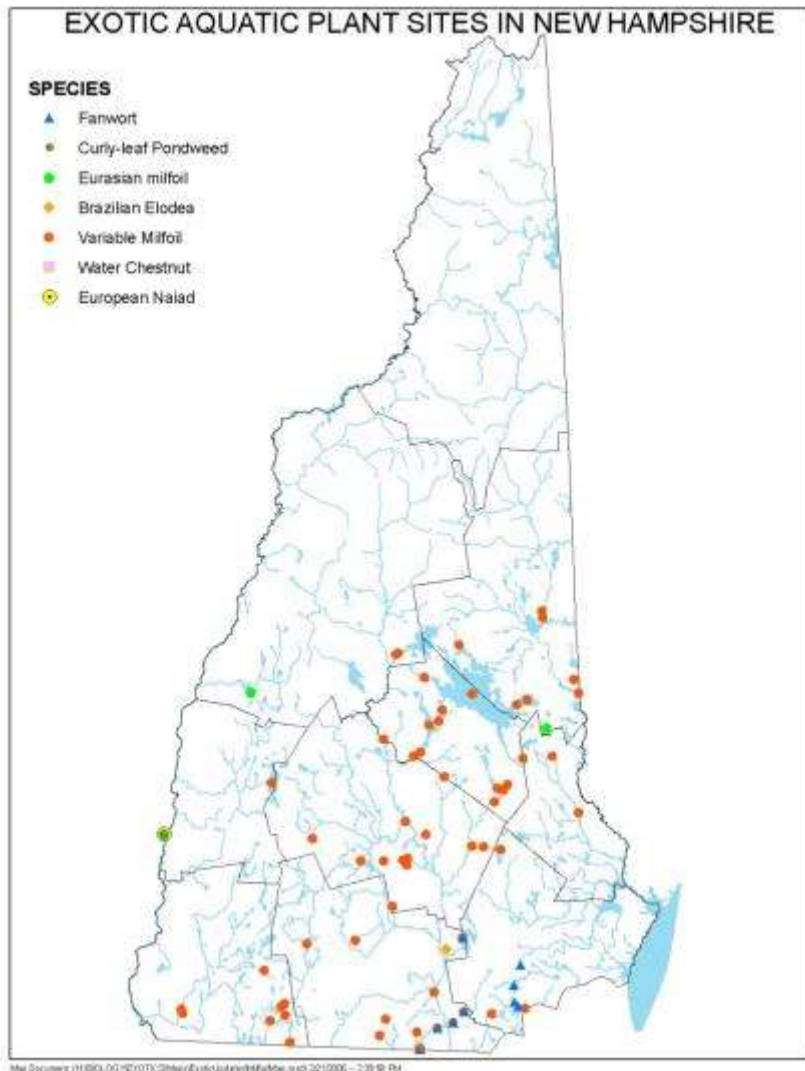


Aquatic Plants of Zephyr Lake



State Contact:
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Limnologist/Exotic Aquatic Plant Program Coordinator
603-271-2248 or Amy.Smagula@des.nh.gov

Current status of invasive aquatic plant infestations in New Hampshire



- 69 variable milfoil sites
- 5 Eurasian milfoil sites
- 9 fanwort sites
- 1 Brazilian elodea site
- 1 water chestnut site
- 4 curly-leaf pondweed sites
- 3 water naiad sites



Exotic + Nuisance = *Invasive*

Federal Executive Order 13112:

“A species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.”

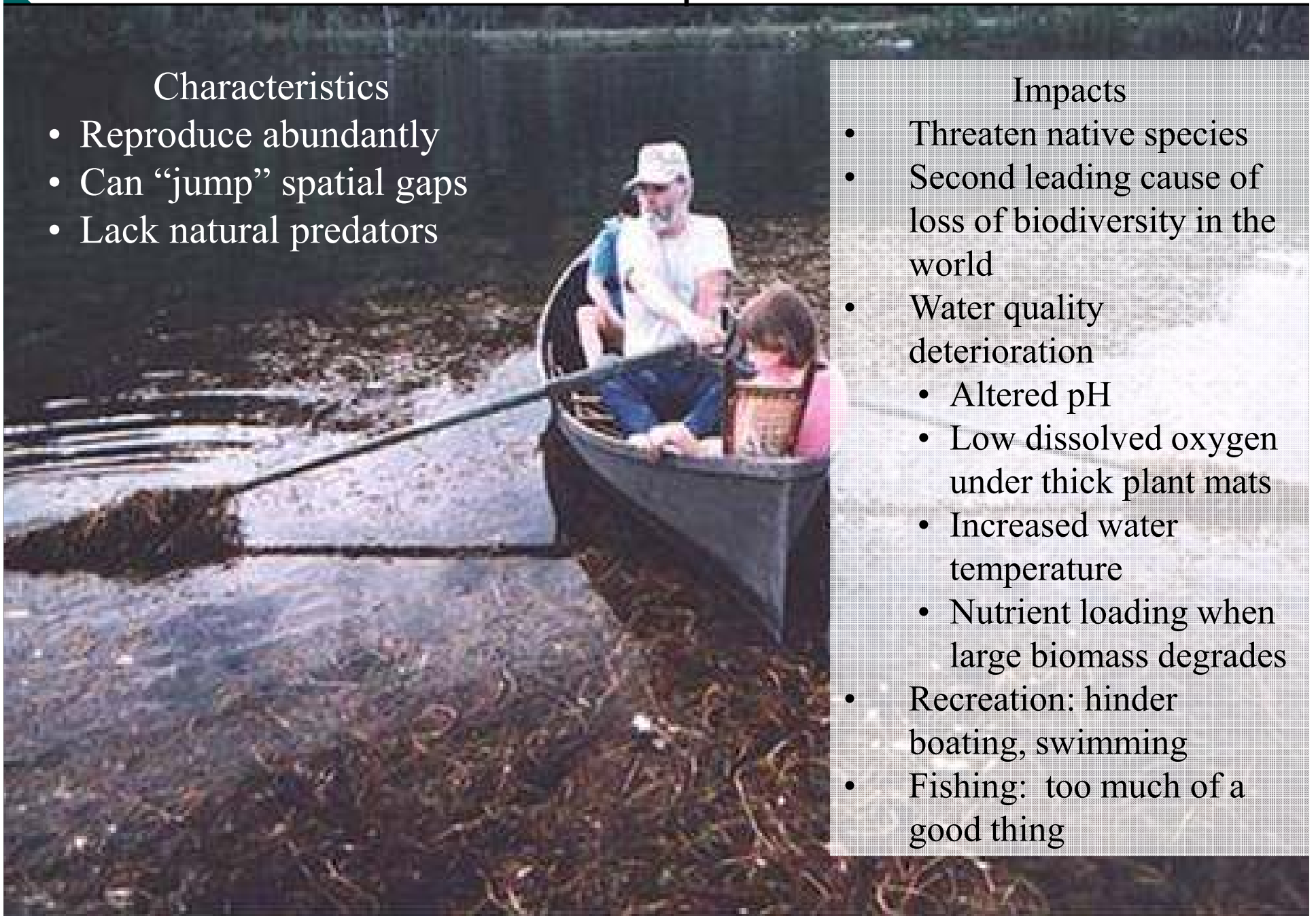
Invasive Aquatic Plants

Characteristics

- Reproduce abundantly
- Can “jump” spatial gaps
- Lack natural predators

Impacts

- Threaten native species
- Second leading cause of loss of biodiversity in the world
- Water quality deterioration
 - Altered pH
 - Low dissolved oxygen under thick plant mats
 - Increased water temperature
 - Nutrient loading when large biomass degrades
- Recreation: hinder boating, swimming
- Fishing: too much of a good thing





Facts About Infestations

- Most new infestations are found near a boat launch or other type of access point, but check anywhere, including all areas where sunlight penetrates to bottom sediments
- Motor boats are the primary vector of spread, BUT, other craft and gear can also spread invasive species
- Plant fragments, algae, and live animals (either adults or larvae) are introduced generally in small numbers from the vector and then drift or swim around the lake and reproduce and expand
- Spread prevention is critical, and should be paired with education, outreach, and early detection activities in a two-tiered program: Prevention (Lake Hosts) and Early Detection (i.e., Weed Watchers)

Early Detection: Volunteer Weed Watchers





Why Develop a Weed Watcher Program?

- Proactive approach
 - Volunteer Weed Watchers are the first line of defense if an exotic is introduced
- Catch infestations early
- Facilitate a Rapid Response Action
- Prevent the further spread


What is Involved?

- **Volunteers are trained to monitor waterbodies for exotics, generally on-site at their own waterbody**
 - Once a month from May to September is recommended

- **NHDES provides resources:**

- **Weed Watcher Kit**
- **Pictures**
- **Fact sheets**
- **Maps of the subject lake/pond (bathymetric and historical plant maps with keys)**



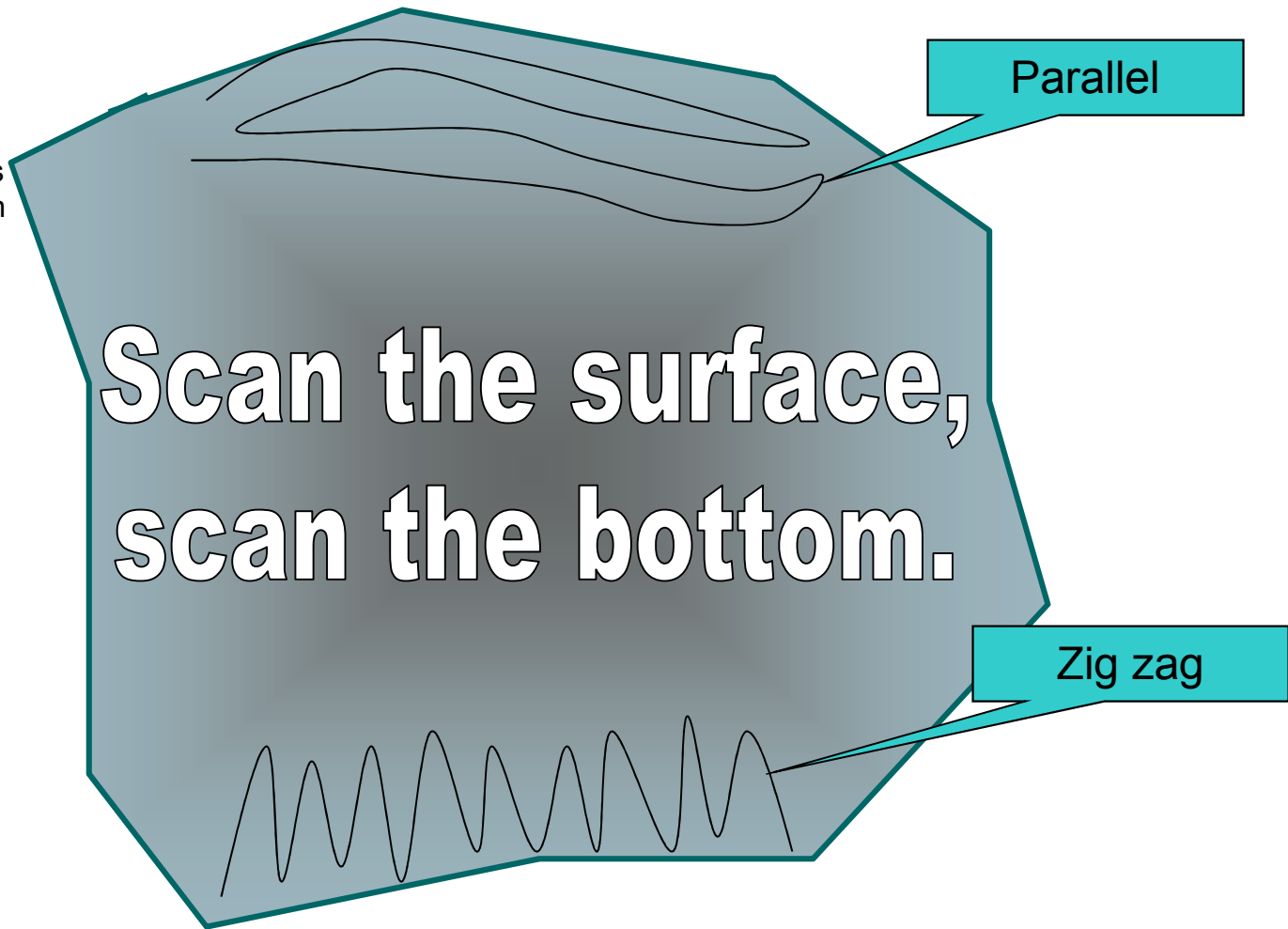


Equipment needs are generally minimal,
and easy to obtain.

- ✓ Small boat with short shaft motor, canoe, kayak, or row boat
- ✓ Driver and one or more observers
- ✓ Lake outline map, pens/pencils
- ✓ Plant identification keys/pictures
- ✓ Small long-handled rake or throw rake
- ✓ Zip-lock bags
- ✓ Polarized glasses or view scope (optional)

On the Water

- Break the shoreline into sections and have volunteers sign up for each section
- From shore move in a zig-zag or parallel pattern out to deeper water to maximize how much area you cover in your survey.
- Alternate methods each month to cross over areas for thorough checking.





What You Are Looking For?

- Anything in the water that is new or out of place (was not there last month, last year, etc)
- Anything that appears to be growing quickly and taking over, appearing bigger each month
- Anything very bright green in color
- There are 29 invasive aquatic plants of concern, but the biggest threats to most waterbodies are from variable milfoil, but some regional concerns



If You Find Something

- Mark it
 - With a buoy
 - With GPS
 - Triangulation
 - Notes on site (distance off shore, water depth, landmark)



After you find something and make note of location, collect a voucher specimen

- Carefully collect a voucher specimen
 - Collect a representative piece of the plant species, being sure to collect any broken fragments that may drift away when you make the collection
 - If there are fruits or flowers be sure to collect those, and if not, then a representative piece of stem



What to do with the voucher specimen(s)

○ Mailing

- ✓ Wrap suspect species in a moist (not dripping) paper towel
- ✓ Seal the species and moist paper towel in a Ziploc baggie
- ✓ Put baggie and a note with your name, waterbody name, and email and/or phone number in an envelope
- ✓ Mail to Amy Smagula at NH DES, 29 Hazen Drive, Concord, NH 03301
- ✓ Try not to mail specimens on a Thursday or Friday
- ✓ Keep refrigerated during holding time to NH DES for ID



What to do with the voucher specimen(s)

○ Emailing a voucher specimen photo

- ✓ Lay the specimen out on a piece of white paper or paper towel
- ✓ Put a coin or pen or other known object next to the specimen
- ✓ Take a digital picture of the specimen
- ✓ Email the photo(s) to Amy.Smagula@des.nh.gov and include a note in the email about waterbody name, and your name and contact information.
- ✓ Keep the sample until you hear back from NH DES, as we may need you to mail the specimen for accurate ID if the photo is not sufficient.



Plant Refresher

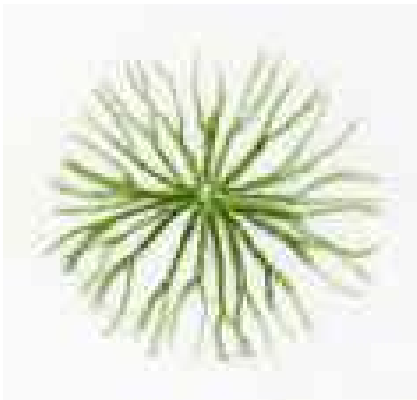
MORPHOLOGY

Structural Plant Characteristics

The Basics

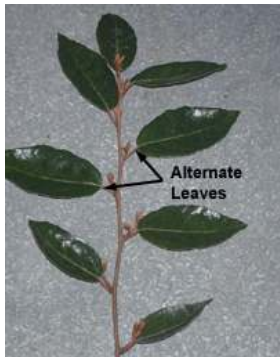
Leaf Type

- **Forked** - These leaves divide into two prongs, resembling the shape of a fork
- **Branched** - Branched leaves have many divisions, which continue to split until the edges are composed of many tiny prongs. This type of leaf resembles the branching pattern of a tree.
- **Feathered** - Feathered leaves have several divisions off of a central stalk. These divisions do not split again. These leaves, as the name implies, look much like a feather.
- **Entire** - These leaves do not split. Each leaf is one continuous unit without lobes or serrated edges.



Leaf Arrangement

- **Alternate** - the pattern of leaf arrangement in which leaves vary back and forth on the stem, with one leaf per node.
- **Whorled** - Leaves are arranged around the stem in a circular pattern. There can be three or more leaves per node.
- **Opposite** - Leaves are arranged in pairs on either side of the stem with two leaves per node.
- **Basal** - the plant lacks an erect stem. Leaves are attached around the a very short stem located just below the soil.
- **Rosette** - Able to move freely at or just below the surface of the water. Leaves are generally arranged in clusters attached to short stems



Leaf Margin

- Smooth: A leaf edge without bumps or points
- Serrated: A margin with tiny points all along the edge much like a serrated knife.
- Lobed: The leaf edge is split into subsection as with the maple leaf.



Types of Aquatic Plants

Emergent



Submergent



Floating



Algae





Plant Refresher

NATIVE
PLANTS

Zephyr Lake



Floating-leaved plants

- Includes both rooted and unrooted here

(also includes common natives that may not currently be in Zephyr Lake, or that were not documented during the last survey done by NH DES)



Yellow water lily

White water lily





Water shield

Floating heart





Emergent plants

- Plants that are rooted and have most of their biomass as erect vegetation above the water

(also includes common natives that may not currently be in Zephyr Lake, or that were not documented during the last survey done by NH DES)



Cattail

Bur-reed





Pipewort

St. John's -Wort





Grass Family (Gramineae)

Spike rush





Bulrush

© robert g. mears ~ silver plains project





Soft-stem Bulrush



Soft-stem bulrush

Scirpus validus

Photo by Vic Ramey

Copyright 2001 Univ. Florida

Water Lobelia



http://upload.wikimedia.org/wikipedia/commons/0/02/Water_Lobelia_-_Angle_Tarn_-_geograph.org.uk_-_203062.jpg



Pickerelweed

Sweet Gale





Swamp Candle



Submergent plants

- Rooted or unrooted
- Vegetative portion wholly underwater
- Flowers may be emergent

Bladderwort





Pondweed

Sterile Thread-Like Leaf



Waterweed

schmalblättrige Wasserpest (*Elodea nuttallii*)

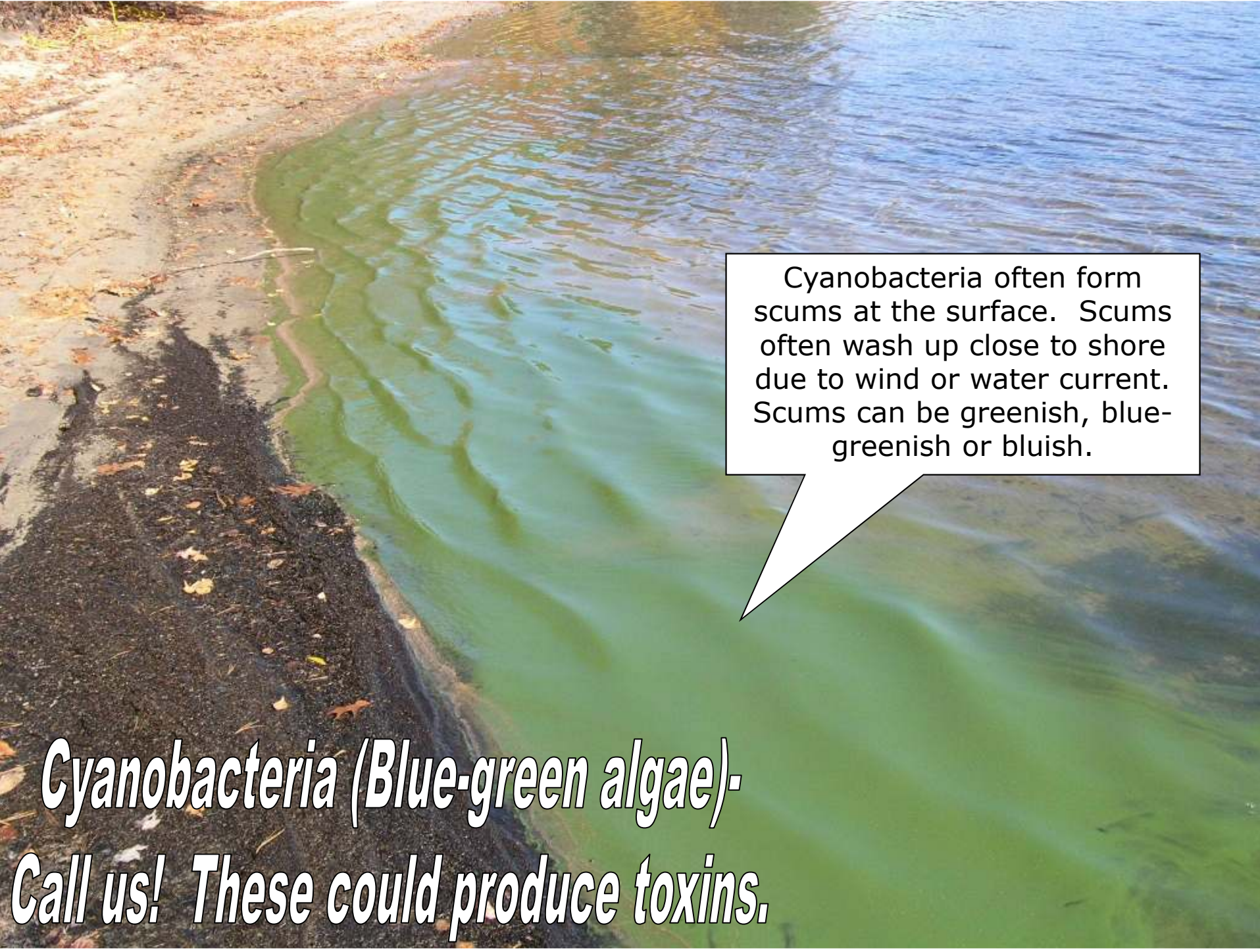
Algae

(also important to look at)

- Single celled to colonial
- Simple plants
- Base of the food chain



Green algae= OK



Cyanobacteria often form scums at the surface. Scums often wash up close to shore due to wind or water current. Scums can be greenish, blue-greenish or bluish.

***Cyanobacteria (Blue-green algae)-
Call us! These could produce toxins.***



The Exotic Plants

(aka- plants you don't want)

Use these pictures to help you identify any new growth that may come in.

Report any sightings of these to:

Amy P. Smagula

NH DES

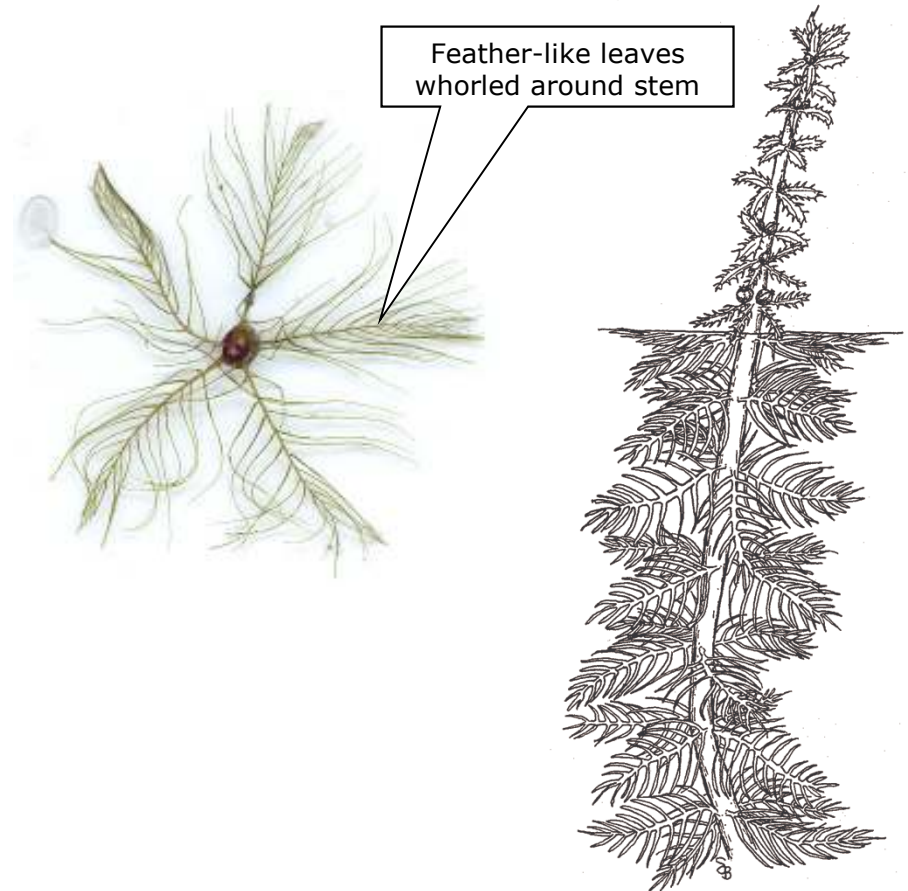
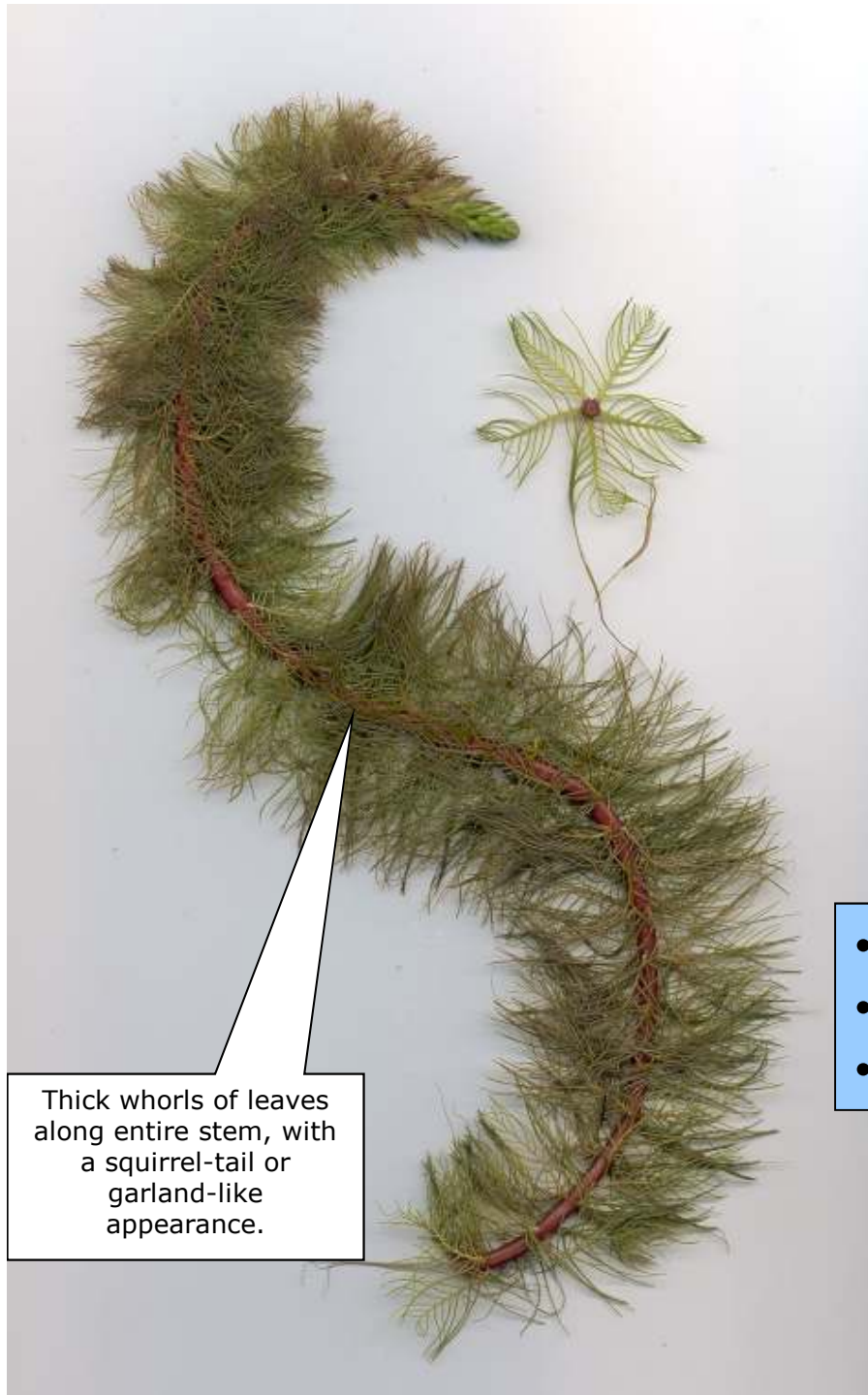
29 Hazen Drive

Concord, NH 03301

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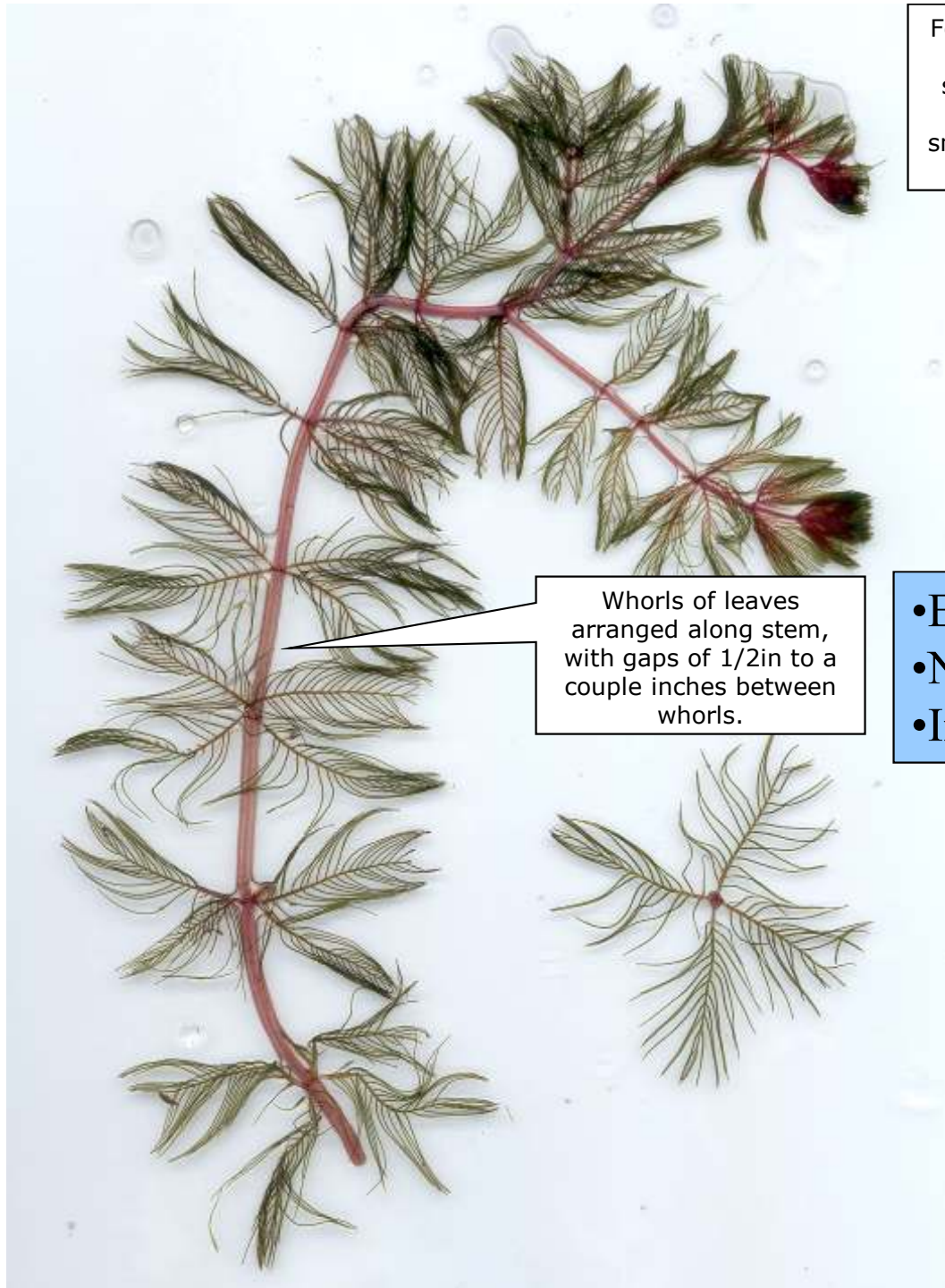
- Variable milfoil- *Myriophyllum heterophyllum*
- Native to southern and central U.S., not to NH
- In several waterbodies in NH



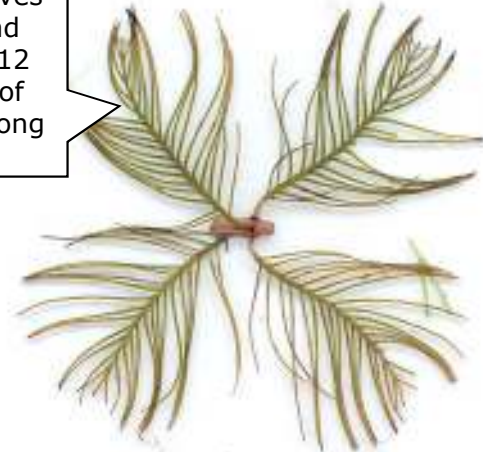
Variable milfoil flower



Eurasian milfoil (EXOTIC)



Feather-like leaves
whorled around
stem, at least 12
or more pairs of
small leaflets along
one leaf




Whorls of leaves
arranged along stem,
with gaps of 1/2 in to a
couple inches between
whorls.

- Eurasian milfoil- *Myriophyllum spicatum*
- Native to Asia
- In 5 waterbodies in NH





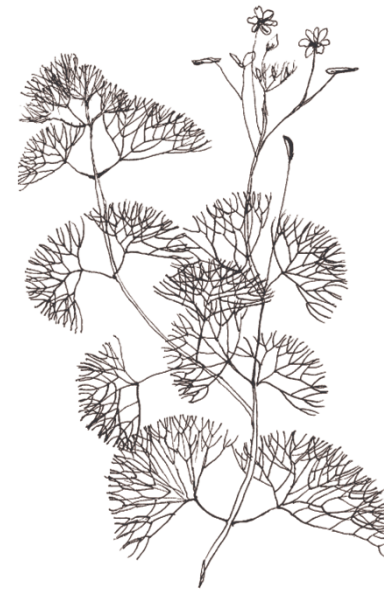
Fanwort (EXOTIC)




Branching leaves
arranged opposite along
stem. Note leaf is
attached by a short
stem to main stem of
plant.



- Fanwort- *Cabomba caroliniana*
- Native to Europe/Asia
- In 9 waterbodies in NH



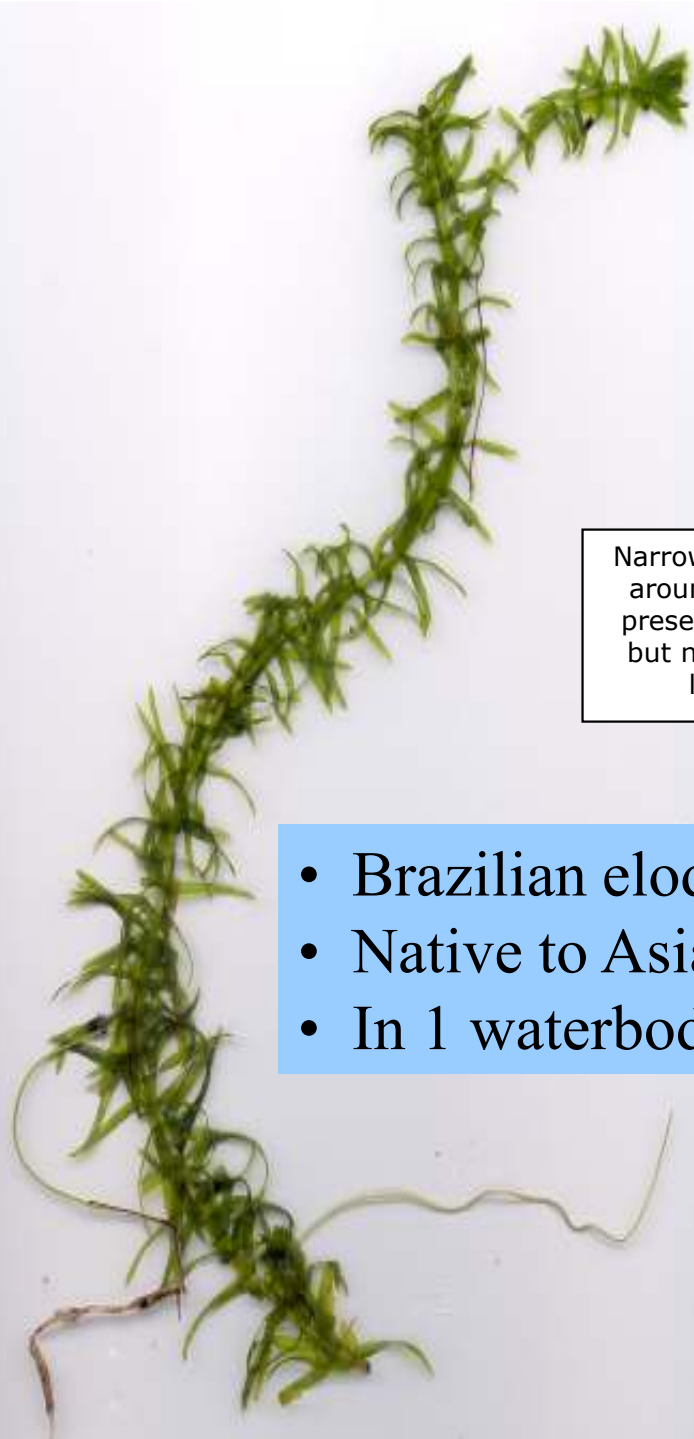




Small narrow leaves
whorled around stem.
Note teeth on leaf edge
for hydrilla.

- Hydrilla- *Hydrilla verticillata*
- Native to South America
- Not yet found in NH (but found in MA and ME)



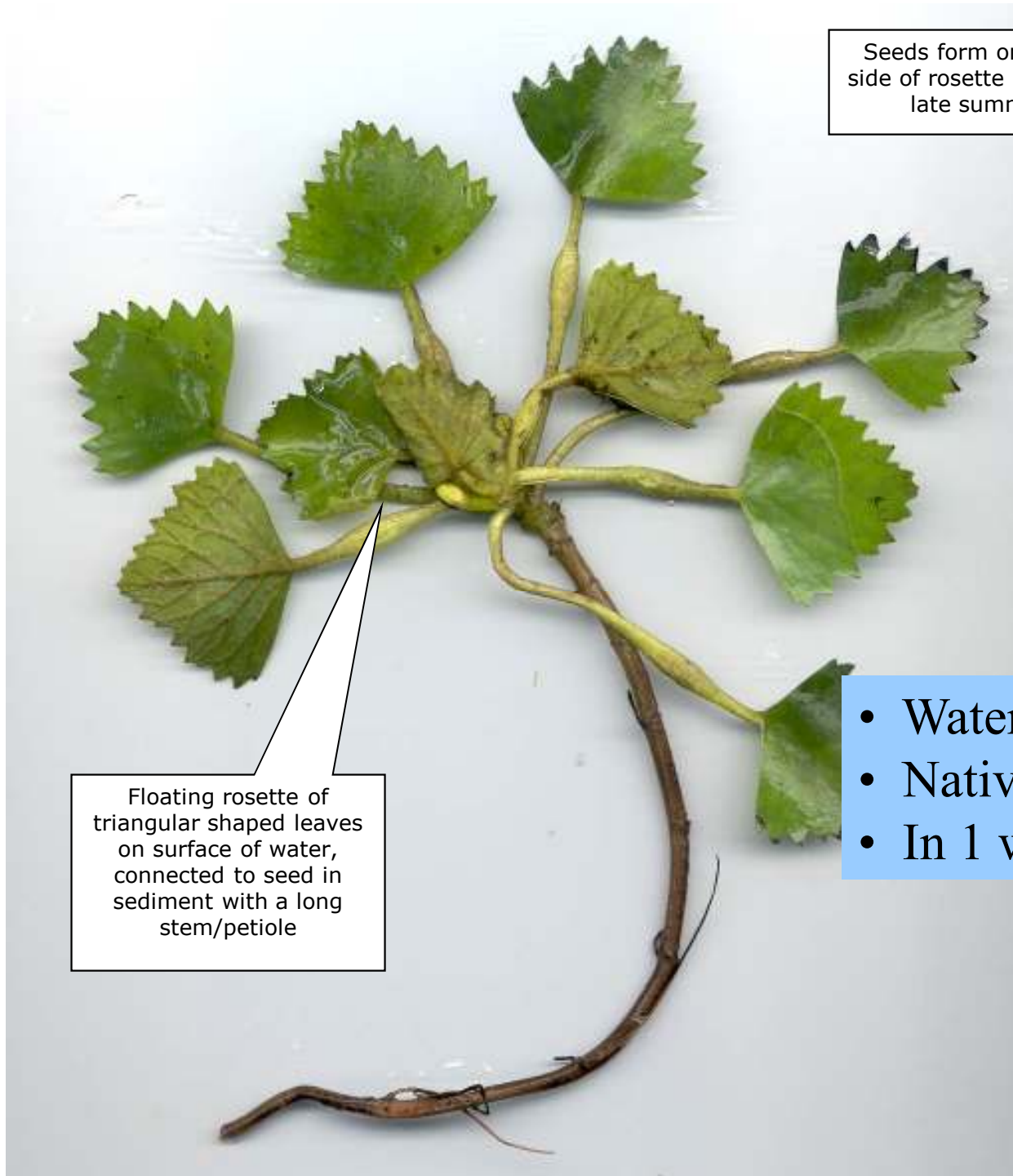


Narrow leaves whorled
around stem. Teeth
present on leaf edges
but need magnifying
lens to see.

- Brazilian elodea- *Egeria densa*
- Native to Asia and South America
- In 1 waterbody in NH

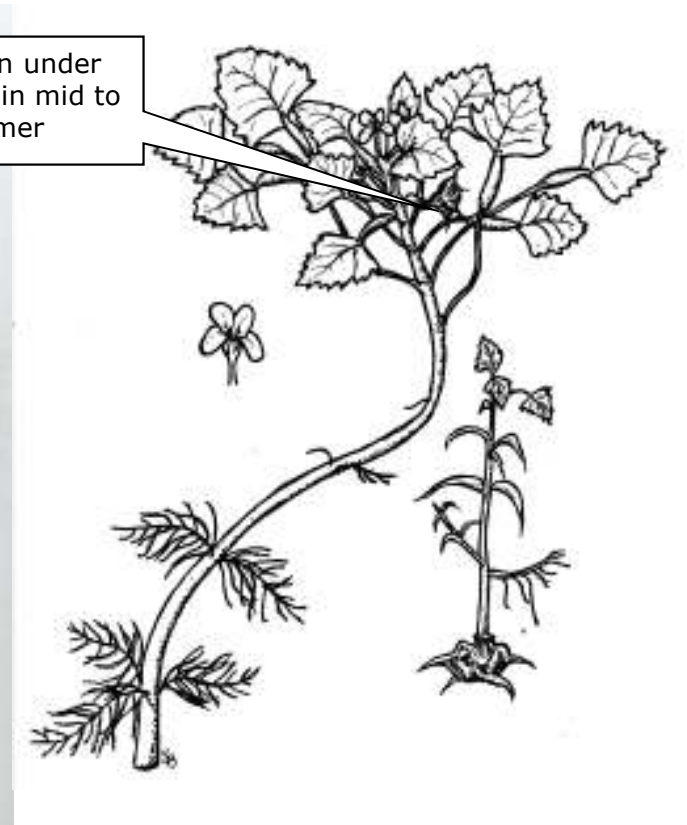


Water chestnut- EXOTIC



Floating rosette of triangular shaped leaves on surface of water, connected to seed in sediment with a long stem/petiole

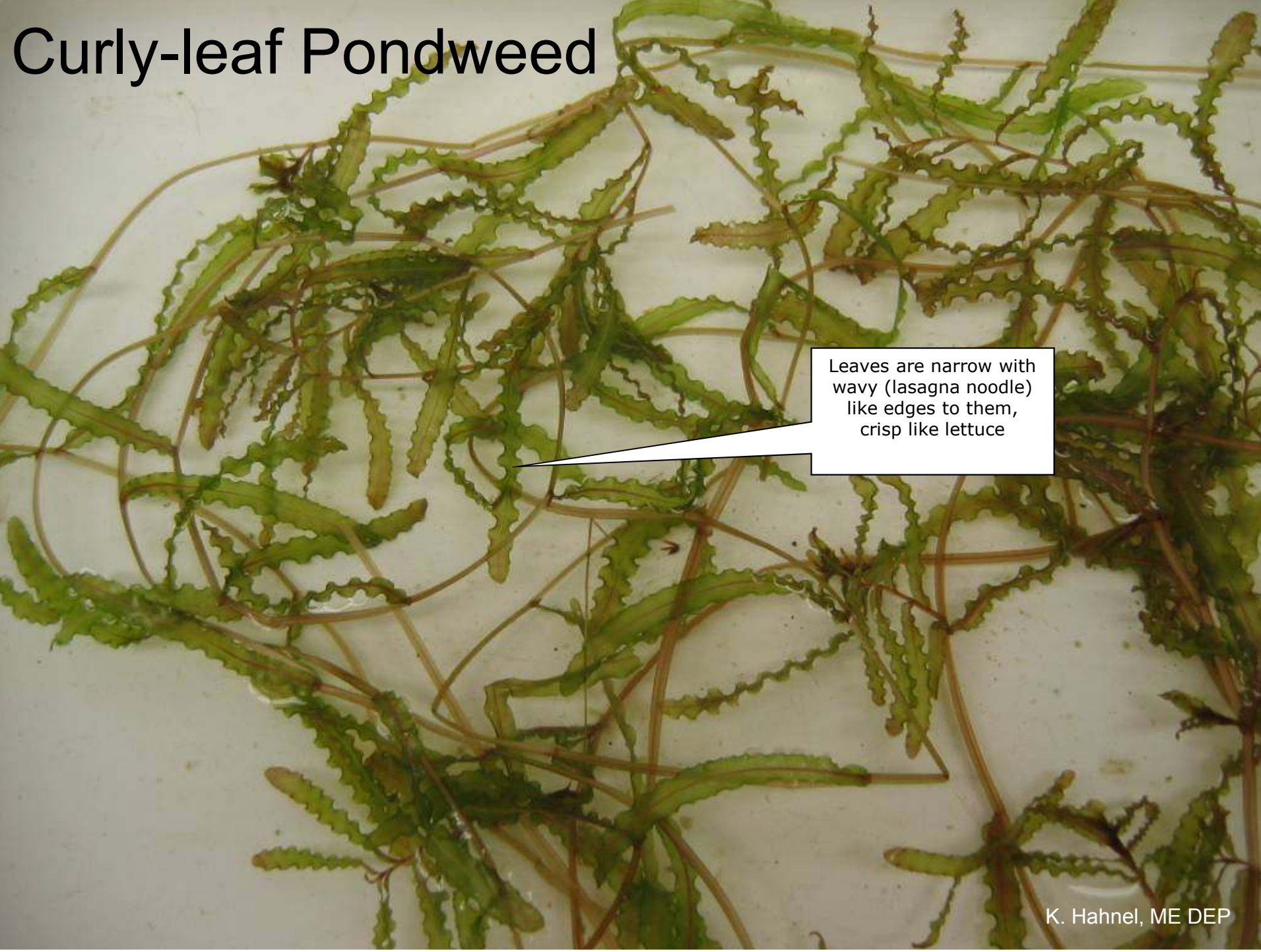
Seeds form on under side of rosette in mid to late summer



- Water chestnut- *Trapa natans*
- Native to Asia
- In 1 waterbody in NH



Curly-leaf Pondweed

A photograph of a Curly-leaf Pondweed plant. The plant consists of numerous thin, reddish-brown stems that branch out. The leaves are narrow, elongated, and have a distinct wavy or ruffled edge, giving them a curly appearance. They are a vibrant green color. The plant is shown against a plain, light-colored background.

Leaves are narrow with wavy (lasagna noodle) like edges to them, crisp like lettuce

K. Hahnel, ME DEP

Water Naiad



Leaves narrow with
teeth on edges, very
brittle and low growing
plant





Stalks of small purple flowers form in July and persist until September. One plant can produce up to 2.5 million seeds.

Leaves opposite or whorled on a square stiff stem, rooted in moist, not wet or standing water soils

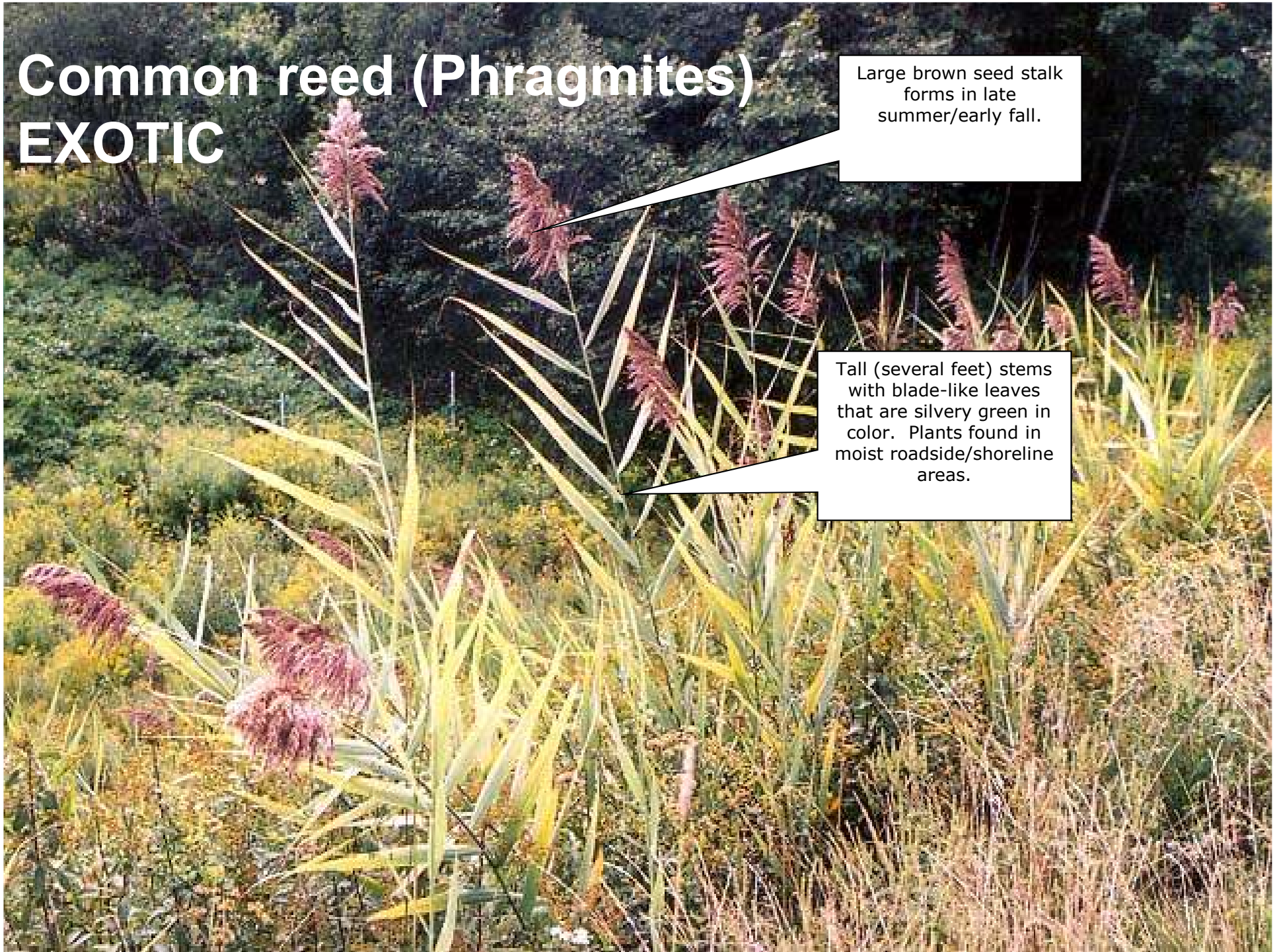
Purple loosestrife (EXOTIC)

Common reed (Phragmites)


EXOTIC

Large brown seed stalk forms in late summer/early fall.

Tall (several feet) stems with blade-like leaves that are silvery green in color. Plants found in moist roadside/shoreline areas.







Invasive Aquatic Animals

(aka- critters you don't want)

Report any sightings of these to:

Amy P. Smagula

NH DES

29 Hazen Drive

Concord, NH 03301

Amy.Smagula@des.nh.gov

603-271-2248

Asian Clam



Roughly the diameter of a dime,
sometimes a quarter



Chinese Mystery Snail



Zebra Mussel



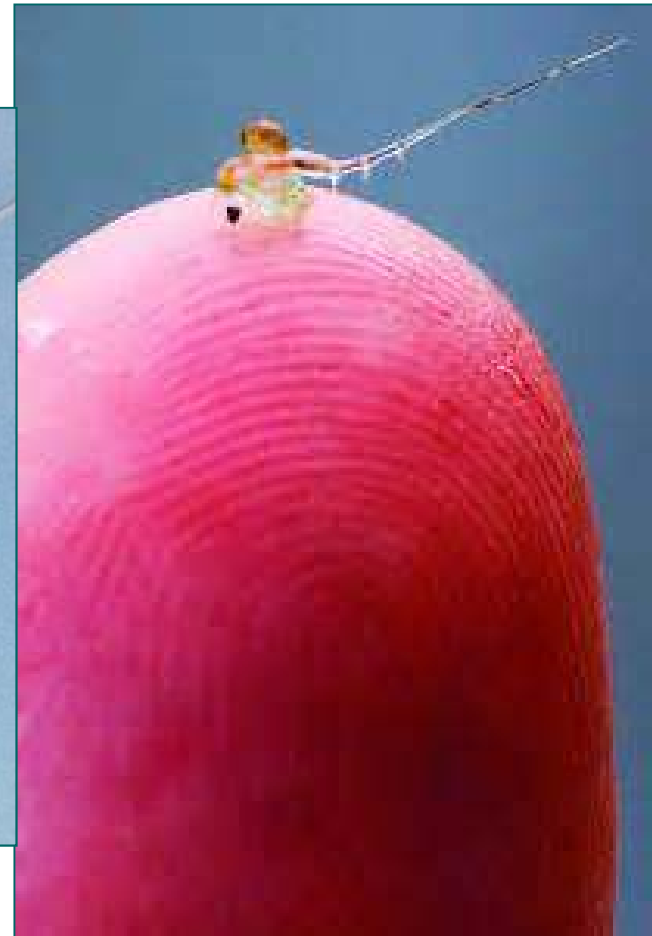
Roughly the size of a pistachio nut



Spiny Water Flea

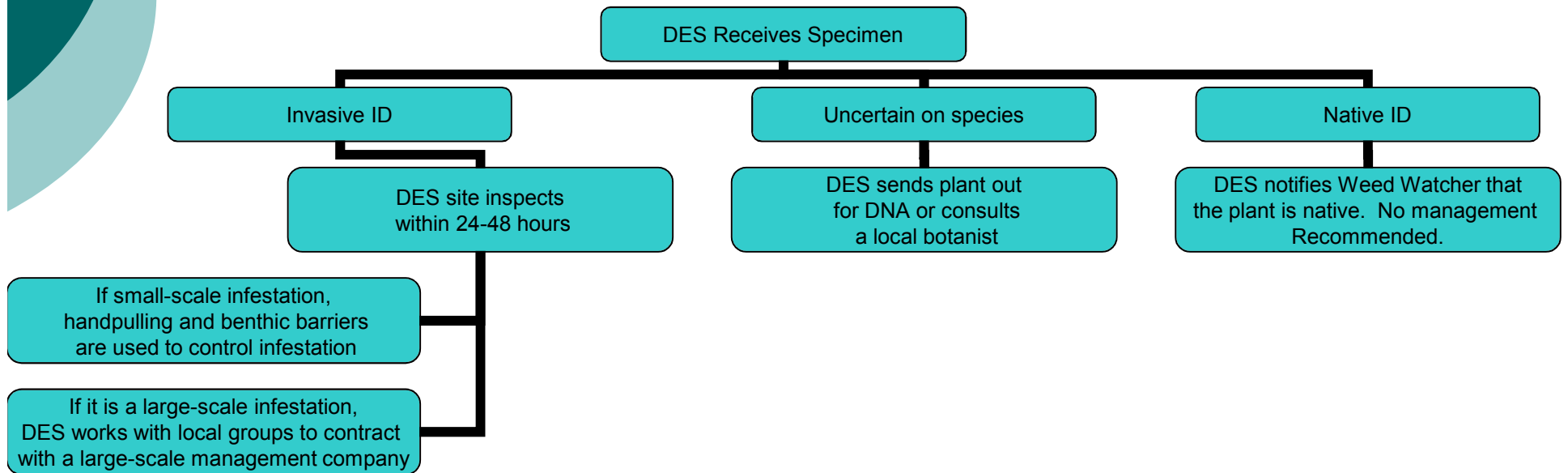


Several spiny water fleas on fishing line



Spiny water flea on fingertip

State Response





The Exotic Species Mantra

- Prevention
- Early Detection
- Rapid Response
- Control/Management

Control/Management



Plant Management



- When a new infestation is detected, reporting it immediately can increase the odds of a rapid response, quick containment, and possible eradication
- If an infestation is very large when it is found, more intensive management is needed, and the chances of eradication can be lower
- Integrated plant management techniques are varied and effective when well planned, and DES will guide management based on site-by-site conditions if an infestation is found.

✓ **HAND PULLING**



✓ **BOTTOM MATS**



✓ **APPLY HERBICIDES**



Management

& Control

✓ **HARVESTING**



✓ **BIOLOGICAL CONTROL**





Resources

DES Exotic Species Website

www.des.state.nh.us/wmb/exoticspecies

Aquatic Plants and Algae of NH's Lakes and Ponds

<http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-05-30.pdf>