

# 2017 LSPA



## Invasive Aquatic Species Updates

Laurie Callahan, *Aquatic Biologist*

- **IAS concerns & occurrences in NH & adjacent New England states**
- **Important role of Lake Hosts (spread prevention) & Invasives Watchers (early detection)**
- **Quick review of survey techniques & the NEW version of Quick Key**
- **Plant samples – an opportunity to become more familiar with IAS species & get some practice with using the NEW Quick Key**

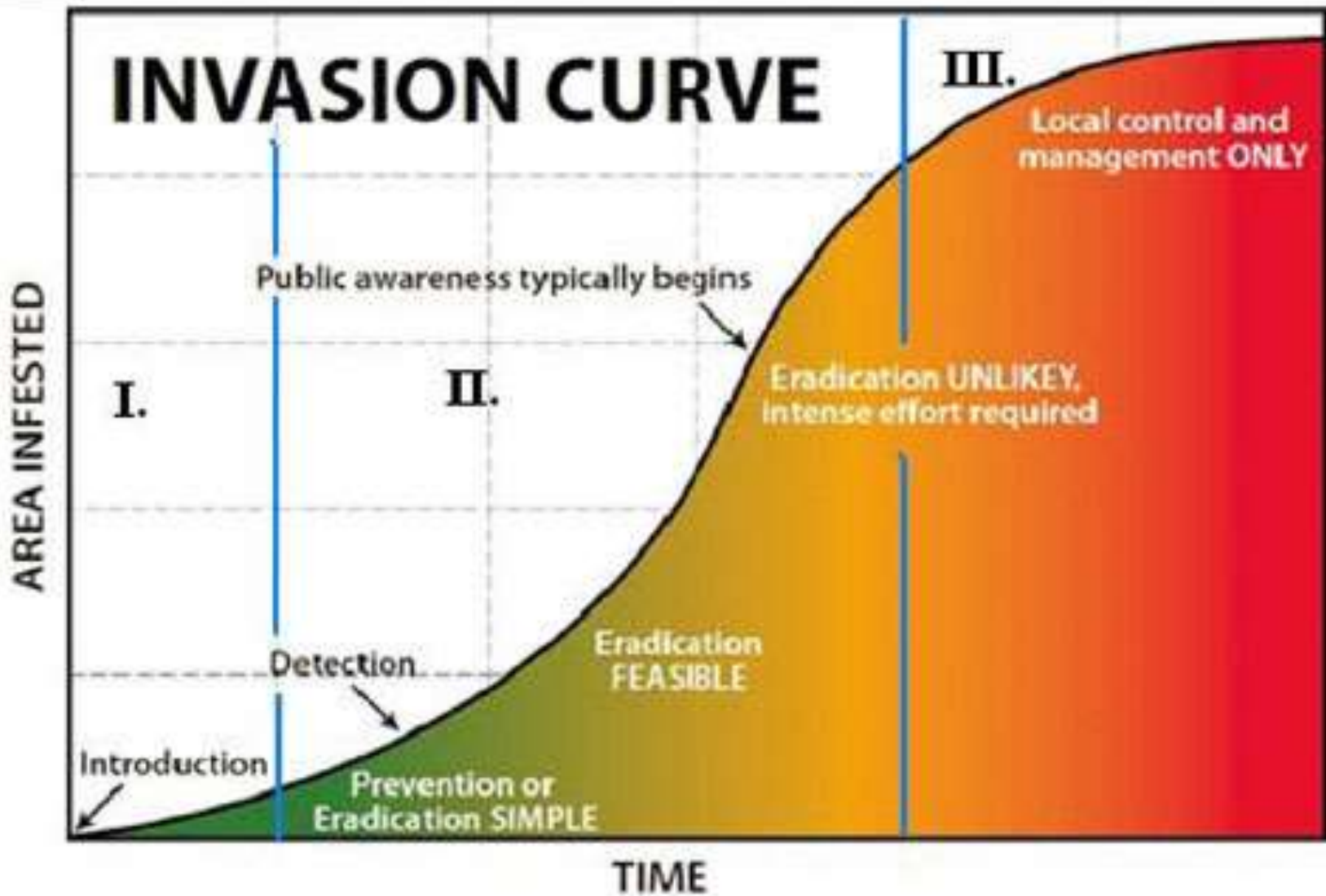
# ***Why are we concerned about aquatic invaders?***

- ❖ **IAS can have significant negative ecologic and economic impacts.**
- ❖ **They can also lessen aesthetic appeal and impede or ruin recreational activities**

# How do aquatic invaders spread?



Transport of species  
is a major way they are spread –  
through human activity and via other  
pathways.



The three typical phases of noxious weed invasion as the invasion progresses over time.

Image from: Southwest Montana Science Partnership's Module on Plants and Pollinators

***What can we do?.....***

**Raise Awareness,  
Participate in Early Detection &  
Spread Prevention Efforts**



# Early Detection, Spread Prevention & Education in NH

## Weed/Invasives Watchers Program & Lake Host Program



*(Photos from ME VLMP Center for  
Invasive Aquatic Plants )*



*(Photo from ME DEP)*

# CLEAN BOATS CLEAN WATERS

Before Launching  
AND Before Leaving Here:

## CLEAN

off any mud, plants and animals from boats, trailers and equipment.

## DRAIN

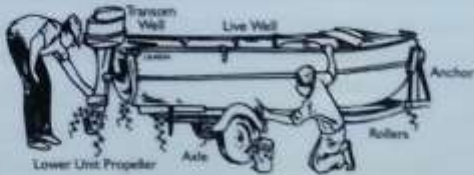
your boat and equipment away from the water.

## DRY

anything that comes into contact with the water.

*This applies to all watercraft, motorized and non-motorized.*

**Never** release plants, fish or animals into a body of water unless they came out of that body of water.

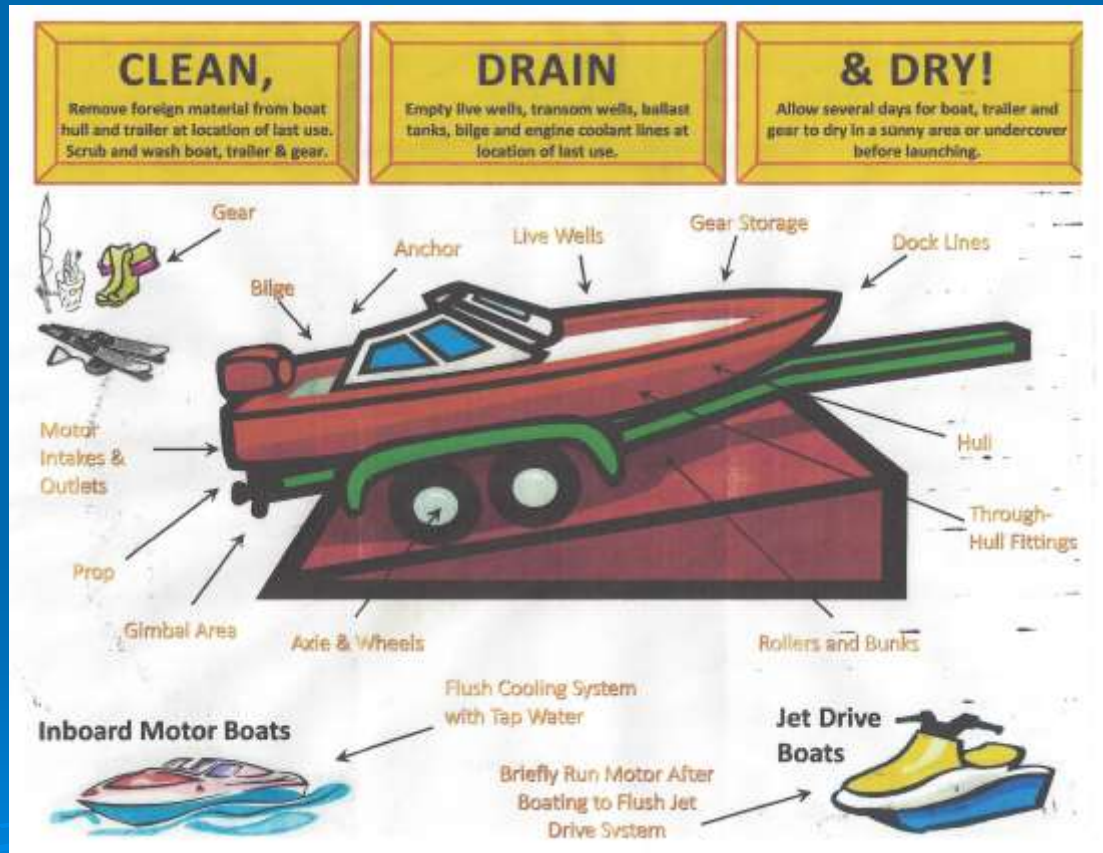


It is **ILLEGAL** to transport and introduce invasive aquatic species in New Hampshire. Violators are subject to fines.



Please report suspected invasive aquatic species sighting to NHDES at 603-271-3503

# Clean – Drain - Dry





# Northern Forest Canoe Trail IAS signs



## HELP STOP THE SPREAD OF AQUATIC INVASIVES!

THESE ARE NON-NATIVE PLANTS AND ANIMALS THAT CAN CLOG YOUR WATERWAYS, DISPLACE NATIVE SPECIES, CAUSE SERIOUS ECONOMIC AND ENVIRONMENTAL DAMAGE OR HARM HUMAN HEALTH.

AFTER TRAVELING

ON ANY WATERWAY:

### CLEAN



#### ALWAYS

**Remove** mud, plants, fish, and organisms from your boat and gear. Dispose of them in a proper trash container, or on dry land.

#### IF POSSIBLE

**Spray** boat and gear with hot and/or high pressure water such as at a car wash.

#### No hot water?

Wash surfaces using a garden hose.

### DRAIN



#### ALWAYS

**Drain** water from hatches, boat wells, bags, bailers, and containers while still at the river or lake you are leaving.

#### NEVER

**Release** plants, fish, or other animals into a waterway unless they came from that waterway.

### & DRY



#### ALWAYS

**Dry** your boat and gear. Aquatic invasives need moisture to survive. If you use a towel, stow it to be cleaned and dried later.

#### IF POSSIBLE

**Alternate** two pairs of shoes to give footwear time to dry (when transitioning between water bodies).

**Dry** your boat and gear thoroughly before next outing.

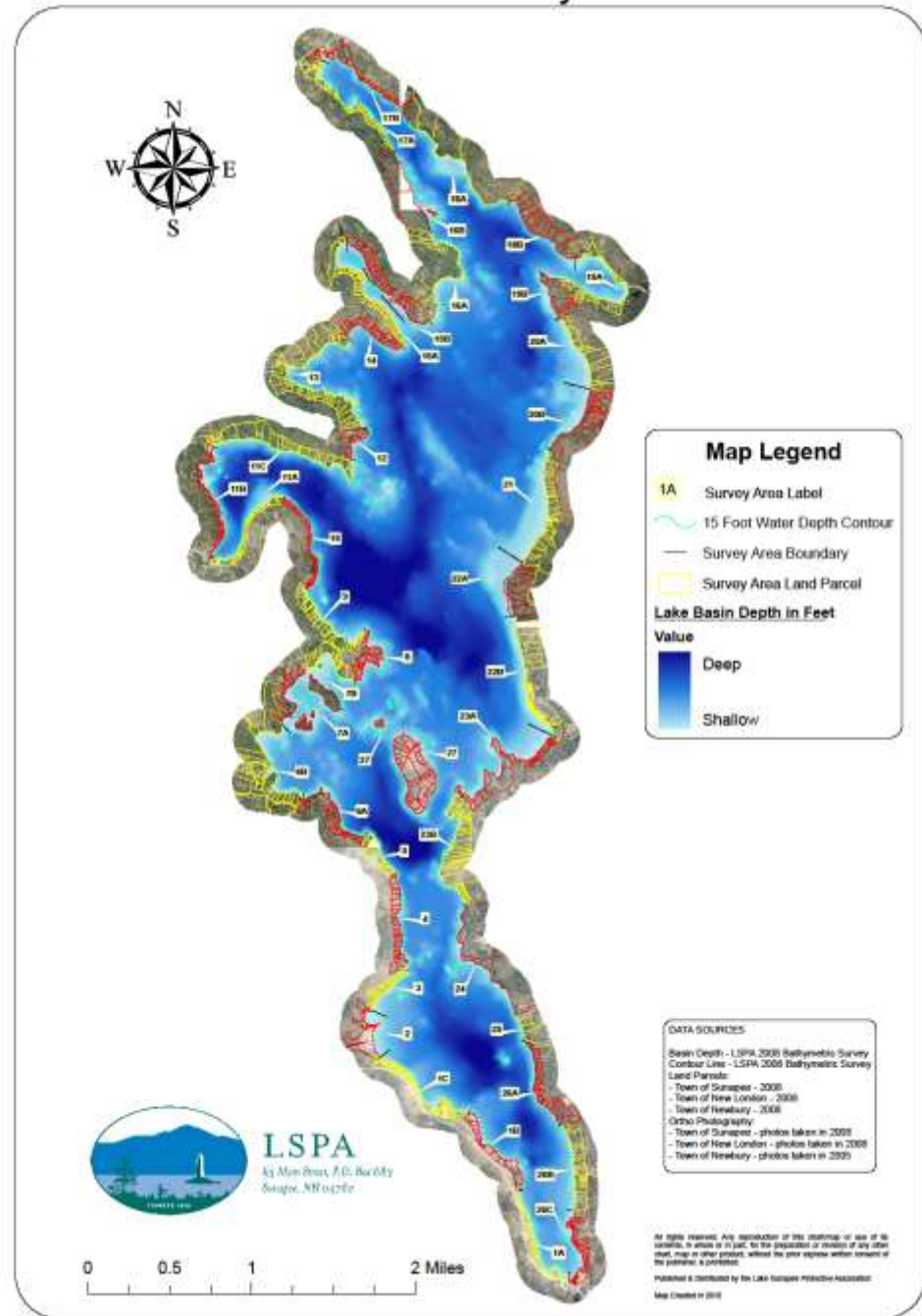


FOR MORE INFORMATION AND TRIP PLANNING SUGGESTIONS:  
[WWW.NORTHERNFORSTCANOETRAIL.ORG](http://WWW.NORTHERNFORSTCANOETRAIL.ORG)

# LSPA Invasives Watch Program – *over 15 years old!*

## *Started as Weed Watch.*

### Weed Watch Survey Areas



**NH DES**

*Map of  
Aquatic  
Invasive  
Species  
Infestations  
in NH*

*Current - As of  
October 2016*

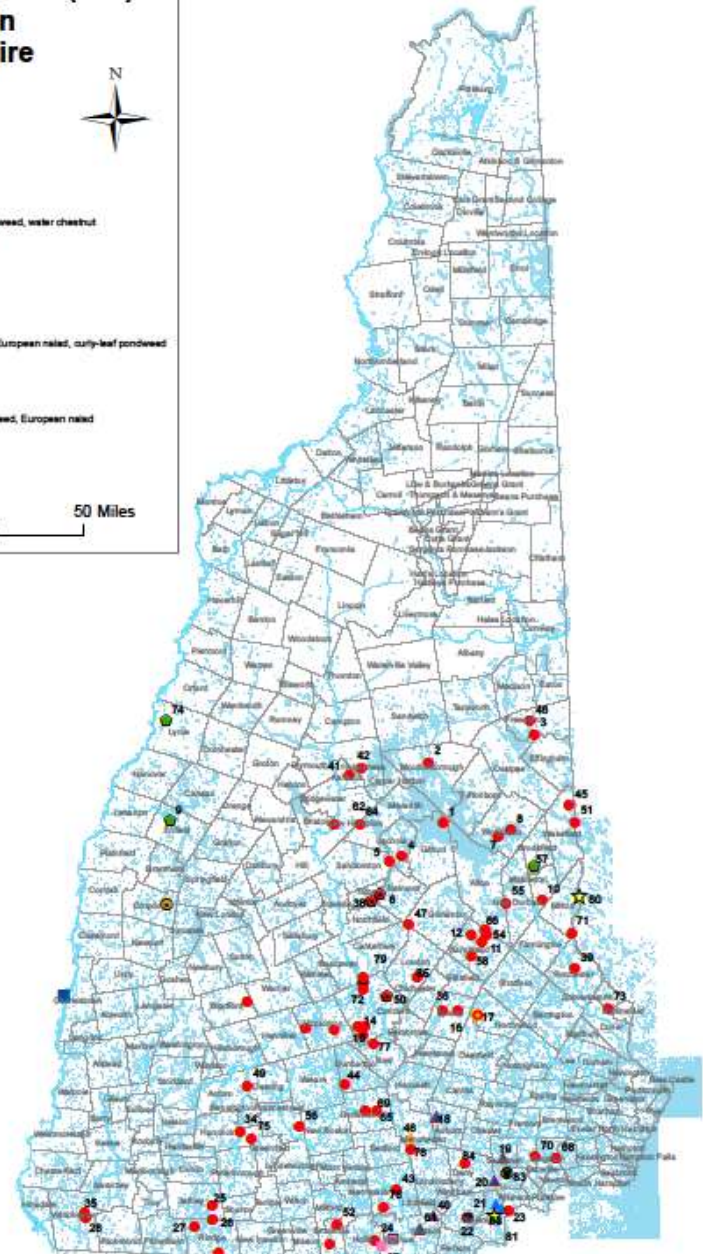
**Aquatic Invasive Species (AIS)  
Infestation in  
New Hampshire**

**Legend**

**AIS Infestations**

**Type**

- Aelen clam
- Brazilian elodea
- Curly-leaf pondweed
- Eurasian milfoil
- Eurasian milfoil, European naiad, Didymo, curly-leaf pondweed, water chestnut
- ★ European naiad
- ▲ Fernwort
- Variable milfoil
- Variable milfoil, Aelen clam
- Variable milfoil, Curly-leaf pondweed
- Variable milfoil, Eurasian milfoil, fernwort, water chestnut, European naiad, curly-leaf pondweed
- Variable milfoil, European naiad
- Variable milfoil, curly-leaf pondweed
- ▲ Variable milfoil, fernwort
- Variable milfoil, fernwort, Eurasian milfoil, curly-leaf pondweed, European naiad
- Town\_Boundaries\_polygon
- NH\_Hydrography\_polygon
- State\_Boundary



Map prepared by NH DES  
Exotic Species Program  
Updated October 2016

Numbers correspond to separate  
key which lists waterbody  
name and town.

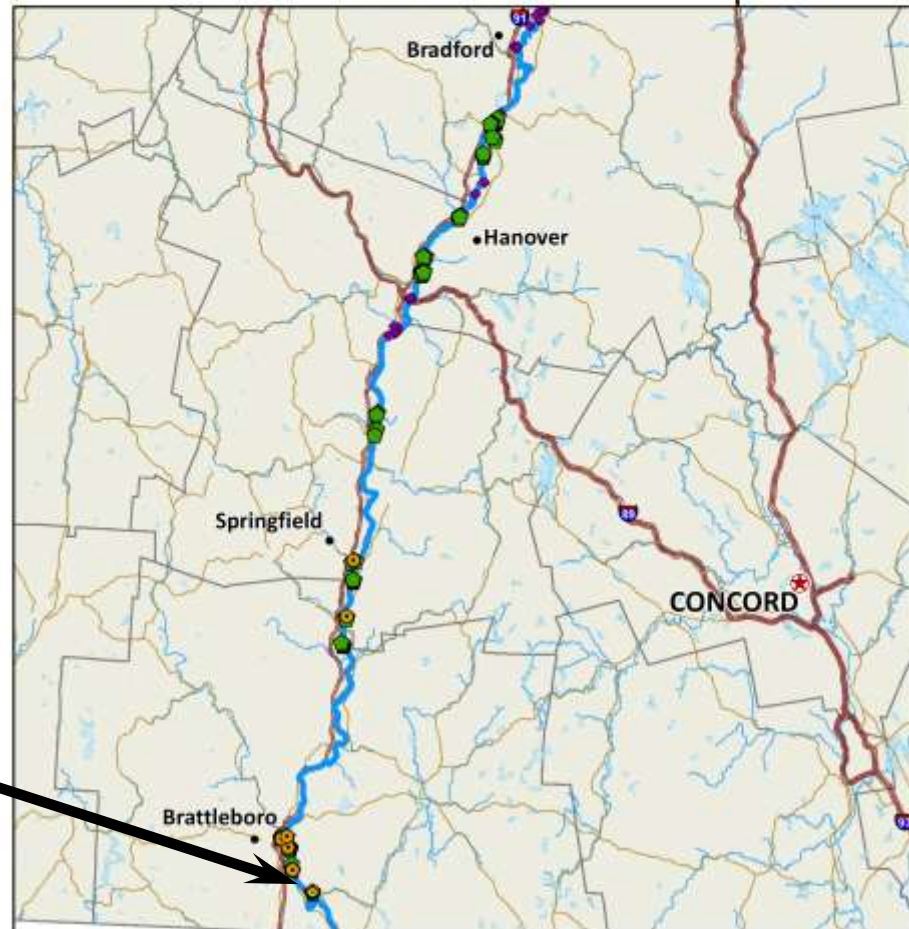
# Invasive Aquatic Plants\* along the Connecticut River in VT & NH

## Legend

- Invasive Aquatic Plant\* Species**
- European Naiad (*Najas minor*)
  - Curly-leaf Pondweed (*Potamogeton crispus*)
  - Eurasian Milfoil (*Myriophyllum spicatum*)
  - Site Visit
- Other Symbols:**
- ★ State Capital
  - Municipality
  - Connecticut River Corridor
  - Waterbody
  - River
  - Interstate
  - Highway
  - Counties

\* "Invasive Aquatic Plant" includes only submersed and floating leaved invasive aquatic plant species. It does not include algal, wetland or riparian species.

Data collected in 2006 & 2007 by Laurie Callahan for the Connecticut River Aquatic Invasive Plants Outreach and Survey Project sponsored by Sullivan County Conservation District and funded by grants from Connecticut River Joint Commissions, NH DSI Exotic Species Program Prevention Grant Program, Merrimack Ecology Fund, Connecticut River Coalition of Conservation Districts and Connecticut River Watershed Council. This mapping project was sponsored by New Rivers Council and funded in part by Connecticut River Watershed Council. Source data were obtained from NH GRANIT and VDOT data warehouses. Map created by Jennifer Holton, Streetscape Environmental, January 2008.



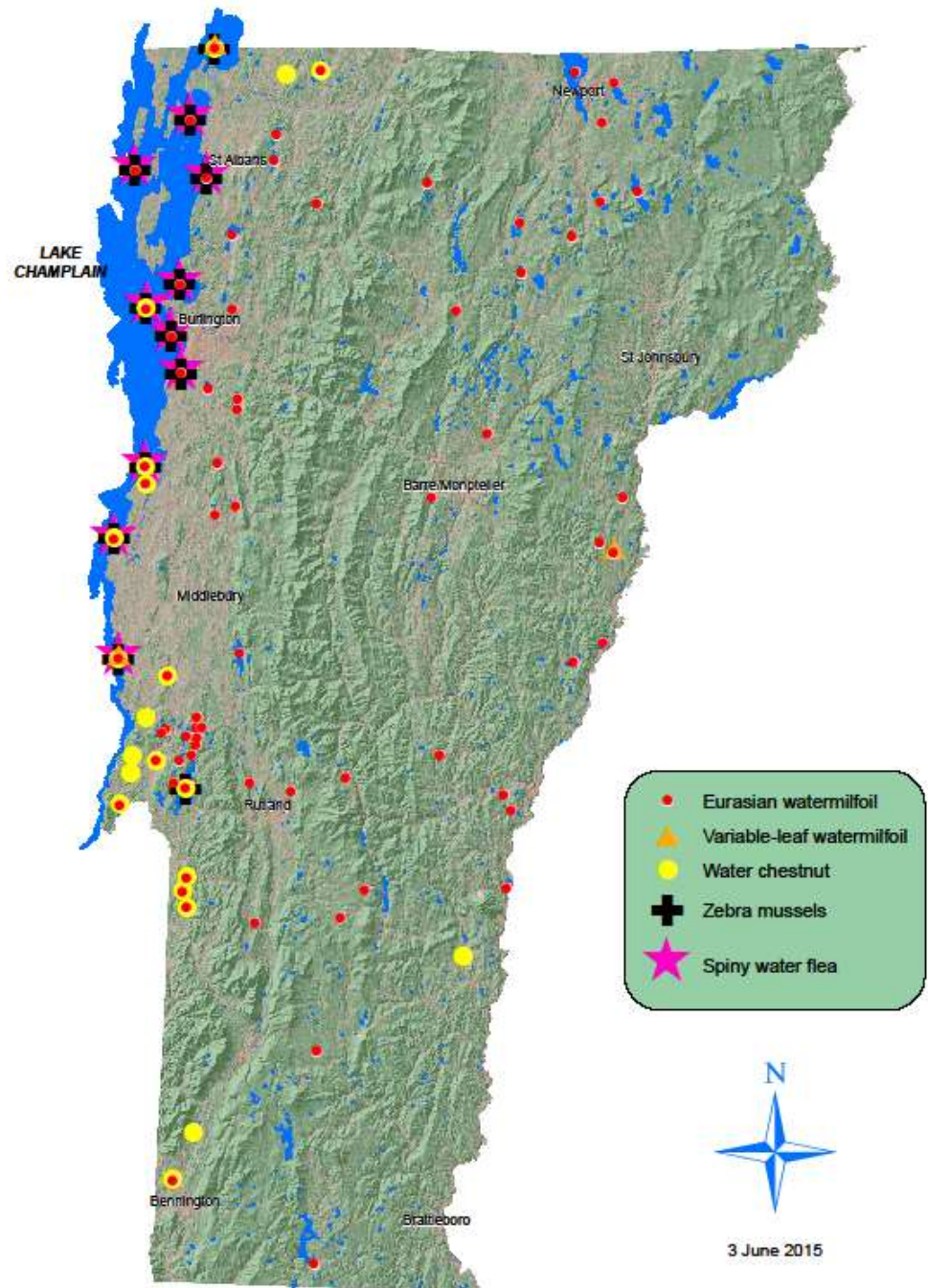
**Need to include Water Chestnut in Hinsdale**

(along with Eurasian milfoil, curly leaf pondweed and European water nymph)



**Vermont  
Documented  
Invasive Species  
Infestations  
in Lakes and Ponds:  
*Eurasian watermilfoil,*  
*Variable-leaf watermilfoil,*  
*Water chestnut,*  
*Zebra mussels &*  
*Spiny water flea***

**This map does not include  
occurrences of  
European water nymph,  
curly leaf pondweed,  
European frogbit or  
yellow floating heart;  
it also does not include  
occurrences in  
streams and rivers.**



# Invasive Aquatic Plants

Infested Maine Public Waters, January 2017

[www.maine.gov/dep/water/invasives/](http://www.maine.gov/dep/water/invasives/)

- Variable Leaf Milfoil (VLM)
- Eurasian Water Milfoil (EWM)
- ▲ Hydrilla (HYD)
- ★ European Naiad (EN)
- Curly Leaf Pondweed (CLP)

## Infested Systems

2 Annabessacook Lake Annabessacook Lake	VLM	14 Pickerel Pond Pickerel Pond	HYD
2 Arrowhead Lake Arrowhead and Little Ossipee River	VLM	15 Pleasant/Cobossee Pleasant Pond, Cobossee Stream, Horseshoe Pond and Purgatory Stream	VLM
3 Lake Auburn Lake Auburn and The Basin	VLM	16 Pleasant Lake Pleasant Lake	VLM
4 Balch Pond Balch Pond	VLM	17 Pleasant Hill Pond Pleasant Hill Pond	EWM
5 Bryant Pond Bryant Pond	VLM	18 Presumpscot Presumpscot River, Dundee Pond and North Gardam Pond	VLM
6 Cushman Pond Cushman Pond	VLM	19 Soco River Limerick Rip to Bonney Eagle Dam, Skelton Flowage and Bridgeford	VLM
7 Damariscotta Damariscotta Lake and Davis Stream	HYD	20 Sebago/Brandy Pond Brandy Pond, Sango River, Sebago Cove, Parmer Dam, Sebago Lake, and Sebago Basin	VLM
8 Great Pond Great Pond and Great Meadow Stream	VLM	21 Shagg Pond Shagg Pond	VLM
9 Hogan Hogan Pond and Little Androscoggin River	VLM	22 Salmon Falls River Northeast Pond, Spaulding Pond, Salmon Falls River Reservoir	EN, VLM
10 Legion Pond Legion Pond	EN, CLP	23 Thompson Thompson Lake and The Heath	VLM
11 Little Sebago Little Sebago Lake, Collins Pond and Mill Pond	VLM	24 West Pond West Pond	CLP
12 Messalonskee Messalonskee Lake, Belgrade Stream and Messalonskee Stream	VLM		
13 Ossipee Ossipee River in Water and Fortlandfield	VLM		



# Aquatic Invasive Species (AIS) Infestation in New Hampshire

## Legend

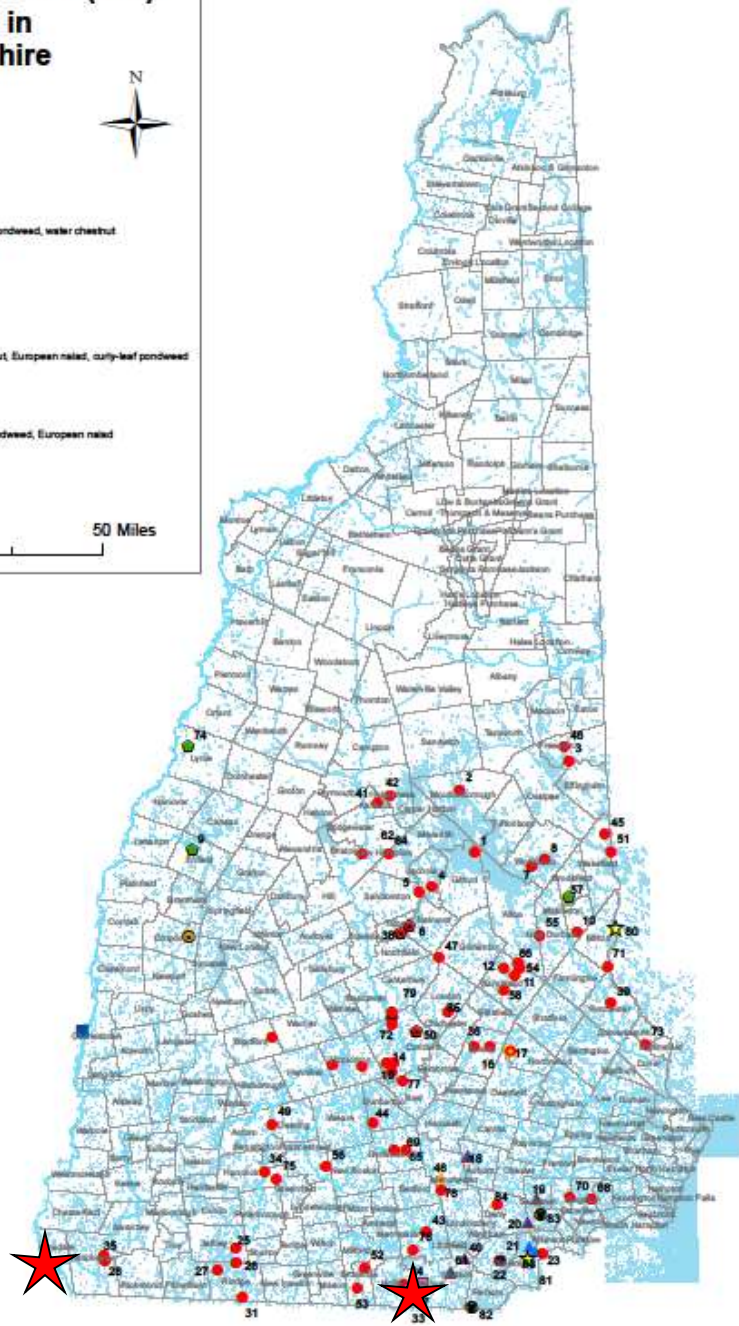
### AIS Infestations

#### Type

- Asian clam
- Brazilian elodea
- Curly-leaf pondweed
- Eurasian milfoil
- Eurasian milfoil, European naiad, Oclayra, curly-leaf pondweed, water chestnut
- ★ European naiad
- ▲ Fernwort
- Variable milfoil
- Variable milfoil, Asian clam
- Variable milfoil, Curly-leaf pondweed
- Variable milfoil, Eurasian milfoil, fernwort, water chestnut, European naiad, curly-leaf pondweed
- Variable milfoil, European naiad
- Variable milfoil, curly-leaf pondweed
- ▲ Variable milfoil, fernwort
- Variable milfoil, fernwort, Eurasian milfoil, curly-leaf pondweed, European naiad
- Town\_Boundaries\_polygons
- NH\_Hydrography\_polygons
- State\_Boundary



0 12.5 25 50 Miles



Map prepared by NH DES  
Exotic Species Program  
Updated October 2016

Numbers correspond to separate  
key which lists waterbody  
name and town.

**Variable milfoil**



**Water chestnut**



# Nashua River

Nashua, NH

**Curly leaf pondweed**



**Fanwort**



**Eurasian milfoil**



**European water nymph**







**Eurasian milfoil**



**Curly leaf pondweed**

# Connecticut River

Hinsdale, NH



**Water chestnut**



**European water nymph**

# *What was new in NH for IAS reports in 2016?*

- **Variable milfoil:**
  - Crooked Pond, Loudon
- **European naiad:**
  - Spaulding Pond, Lebanon
- **No new reports of Asian clams during 2016**
- **No previously undocumented species of IAS in NH in 2016**

# ***NH's "Frightful 14"***

***prohibited exotic aquatic plant species –  
it is illegal to transport or introduce  
exotic aquatic plants in NH:***

***11 aquatic species & 3 wetland species***

**Variable milfoil**

**Hydrilla**

**Eurasian milfoil**

**Parrotfeather**

**Curly leaf pondweed**

**European frogbit**

**Fanwort**

**Yellow floating heart**

**Water chestnut**

**Purple loosestrife**

**European water nymph**

**Common reed**

**Brazilian waterweed**

**Flowering rush**



**Submersed**



**Floating-leaved**



**The remaining 3 species of  
NH's "*Frightful Fourteen*"  
are Wetland or Riparian Plants**



**Purple  
loosestrife**

**Common  
reed  
(Phragmites)**



*(Photos from NH DES & IPANE)*

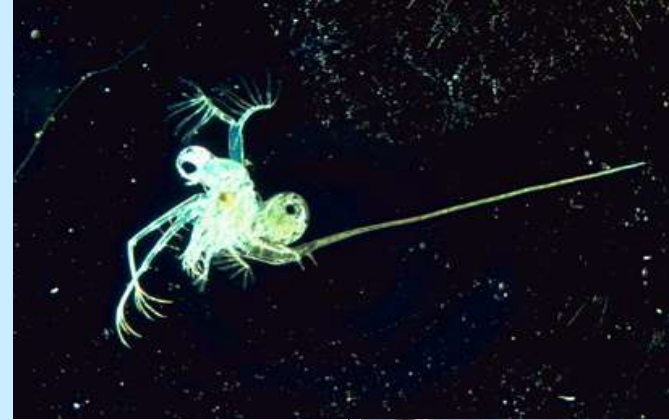


**Flowering  
rush**

# Other Aquatic Invasive Species of Concern in NH & New England



**Asian clam**



**Spiny water flea**



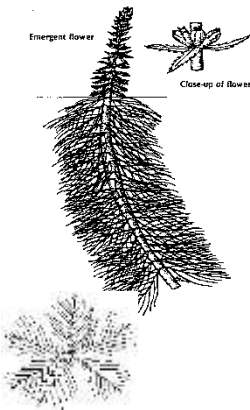
**Zebra mussel**



Zebra mussel veliger with copepods, diatoms, and rotifers.  
Charles Ramcharan  
Wisconsin Sea Grant

**A Closer Look at  
a Few of  
NH's "Frightful Fourteen"**





# Most Prevalent **IAP** Species in NH, ME & VT (and MA, too!)

*(Photos by L. Callahan)*



## **Variable milfoil** – NH, ME

*NH – approximately 80 waterbodies*

*ME – 19 lakes/ponds, 11*

*rivers/streams*

*[VT - 2 lakes]*

## **Eurasian milfoil** – VT

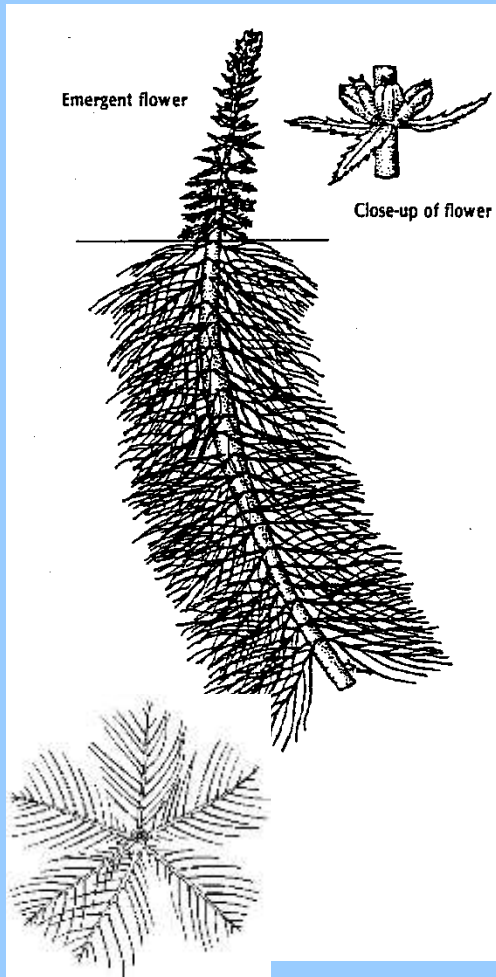
*VT - 66 lakes/ponds, 27 other*

*[NH – 3 lakes/ponds, 2 rivers]*

*[ME – 2 lakes/ponds]*



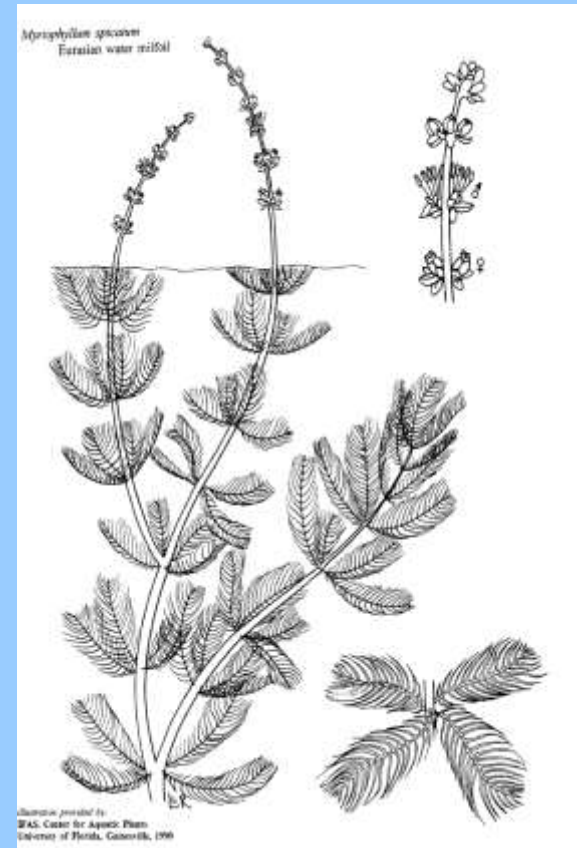
# ***Submersed: Variable milfoil*** ***(Myriophyllum heterophyllum)***



*Photo from CIAP & image from NHAES Bulletin*

# ***Submersed:*** **Eurasian** **milfoil**

***(Myriophyllum spicatum)***



***(Image from University of Florida)***



***(Photo by L. Callahan)***

# There are several species of *native* leafy milfoils that are similar to invasive milfoil species:

*These native species found in L. Sunapee:*

Low water milfoil

Farwell's milfoil

Alternate flowered milfoil

*Additional native species found in New England:*

Whorled water milfoil

Northern water milfoil

Source: UFL/Center for Aquatic & Invasive Plants  
Gainesville, Florida



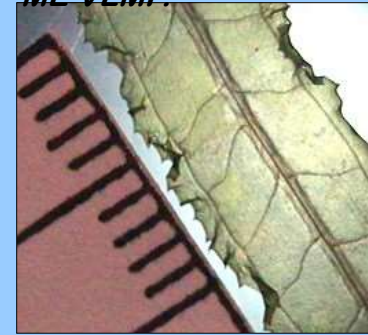
Source: Crow and Hellquist © 1982/3

# *Submersed:* Curly Leaf Pondweed

*(Potamogeton crispus)*

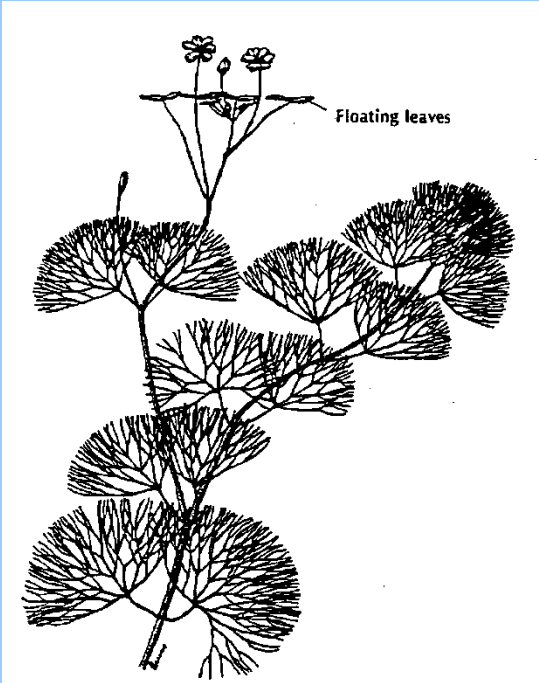


*Image bottom right by Ann Bove, VT DEC. Photo at far left by L. Callahan. Other images from ME VLMP.*



Curly leaf pondweed  
Potamogeton crispus  
Jermain, USA  
Photo by A. Bove  
Copyright 2002 Ann Bove

# ***Submersed:*** **Fanwort** (*Cabomba caroliniana*)



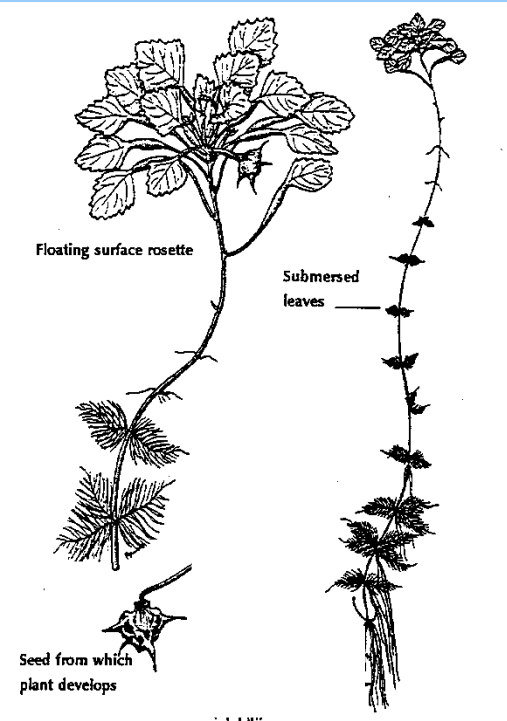
*Photo top, left from University of Florida.*

*Image, above, from NHAES Bulletin.*

# *Floating Leaved:*

## Water Chestnut

*(Trapa natans)*



*Top, left image from  
University of FL*

*Top, middle & right  
photos from VT DEC*

*Bottom, left & right  
photos by L. Callahan*



# Submersed: **Hydrilla**

*(Hydrilla verticillata)*

*(Photos from ME VLMP & Cornell University Cooperative Extension)*



*Cayuga Inlet, Ithaca, NY*



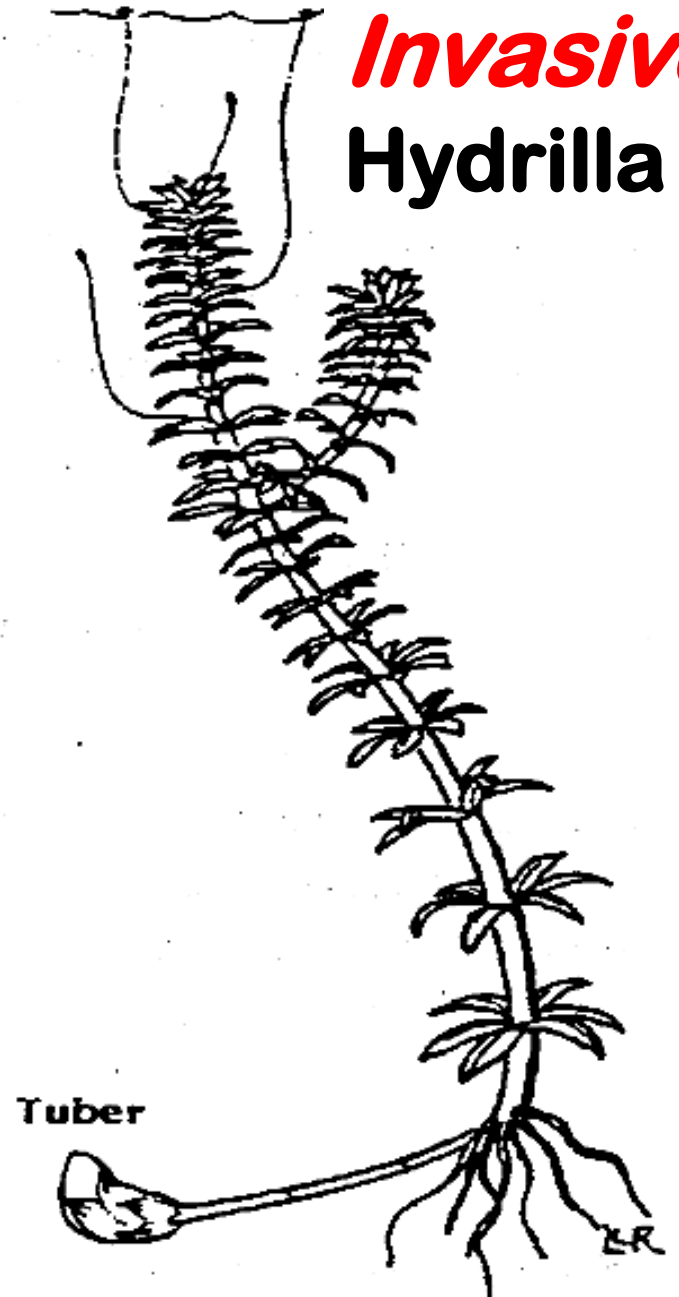
*Pickerel Pond, Limerick, ME*



***Native***  
**Elodea**

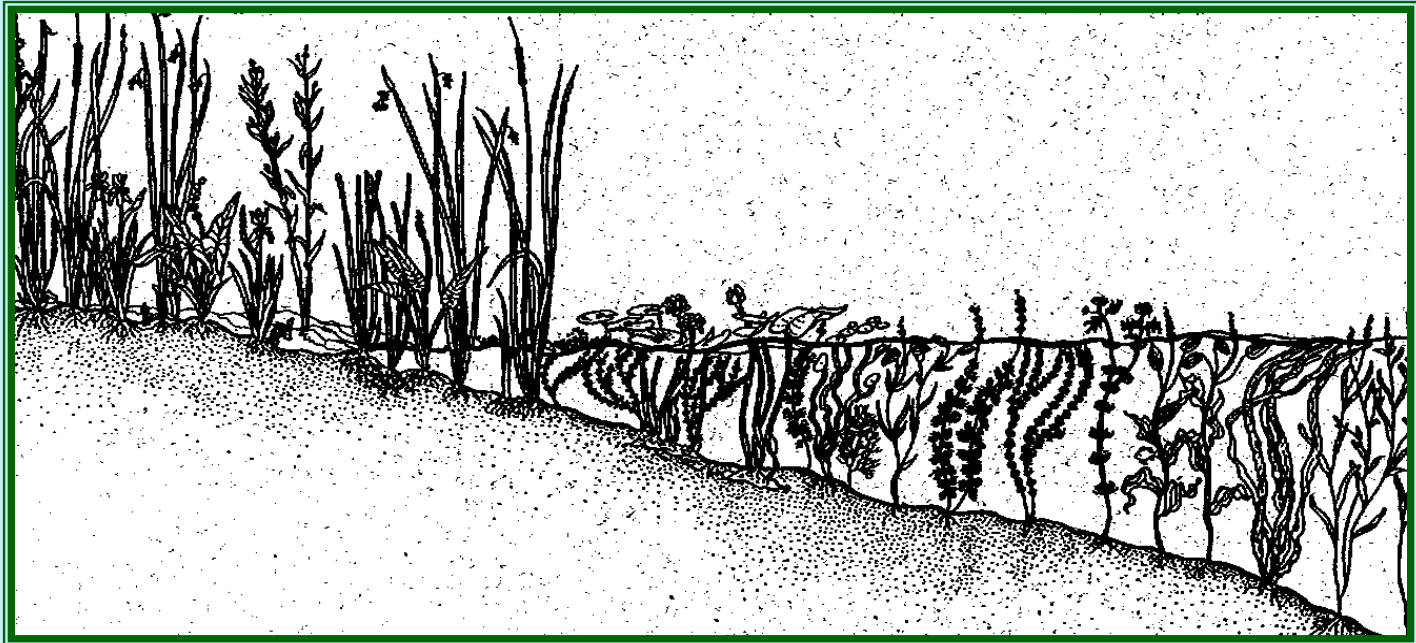


***Invasive***  
**Hydrilla**





# Surveying Aquatic Plants in the Littoral Zone

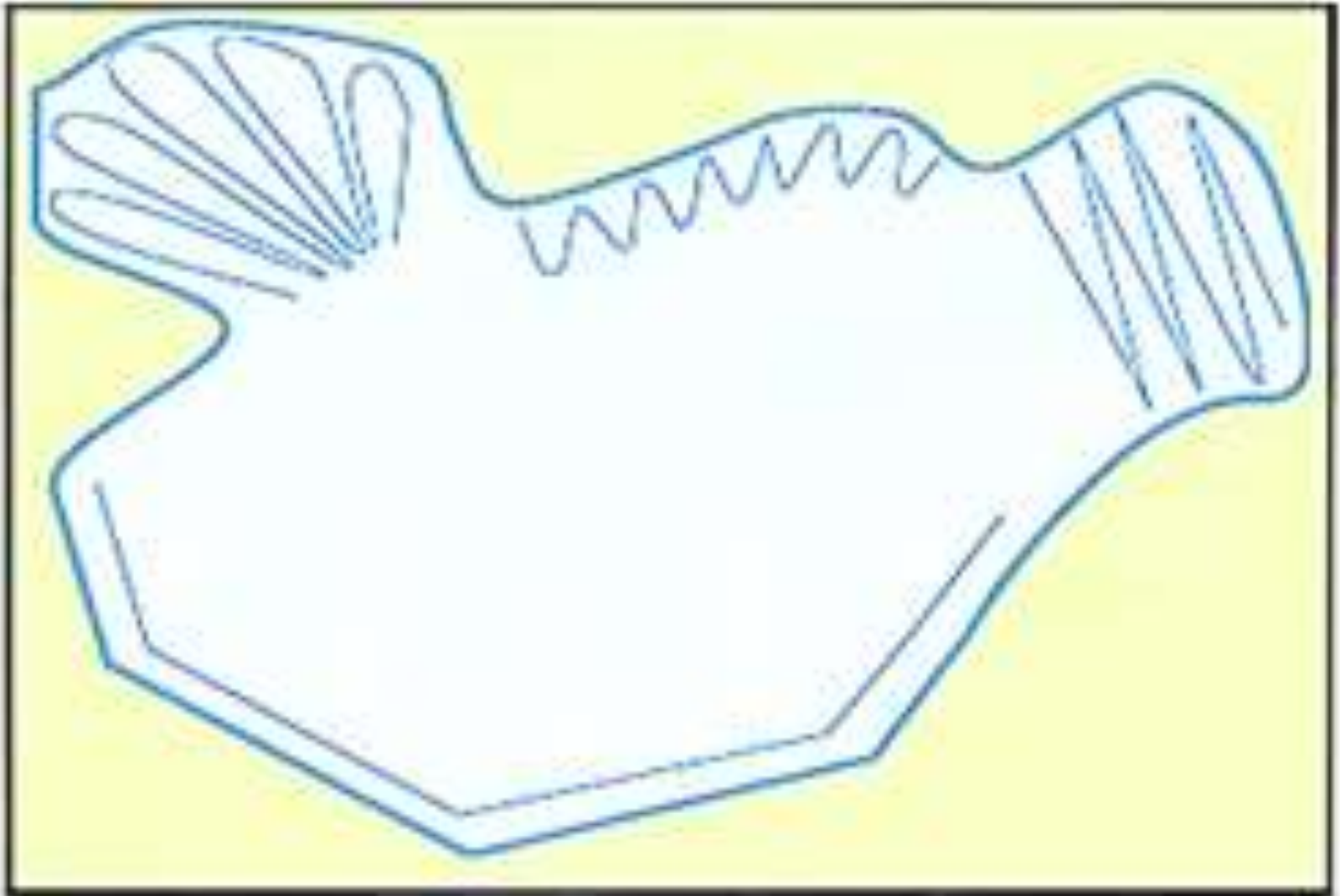


*Emergent*

*Floating Leaved*

*Submersed*

# How to cover the littoral area to be surveyed



# When and How to Survey:

- **General timeframe: Early June - September**
- **Calm conditions are best**
- **When water is clear**
- **Use viewing aids – polarized sunglasses, view scopes or goggles/snorkel & mask**
- **Sign-up for a section to “watch” or patrol**
- **Once you get to know what is “normal” for your section, then you will recognize when something seems unusual or “out-of-place**
- **Report your findings – negative or suspicious**
- **If you find something suspicious, mark it or record location and take photo(s)**

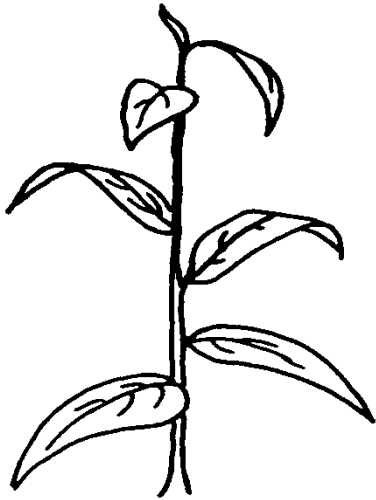
***Using the NEW Quick Key  
for a plant identification  
exercise.***



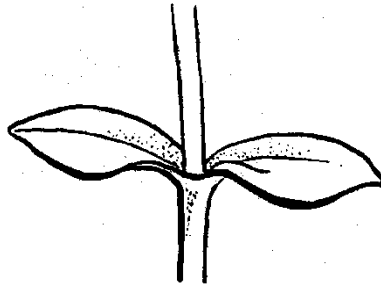
***Thanks for all you do  
as Lake Hosts  
&  
Invasives Watchers!***



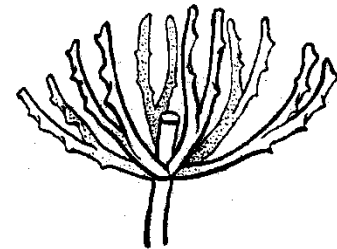
# ***Leaf Arrangement on Stem***



***Alternate***



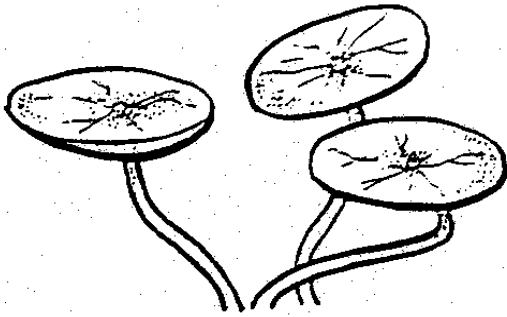
***Opposite***



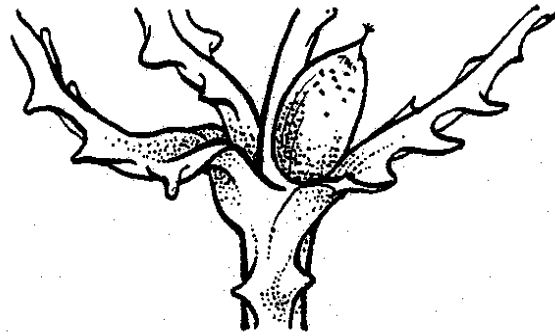
***Whorled***

- **Floating leaved plants**
- **Blade- or strap-shaped leaved plants**
- **Divided leaf plants**
  - **branch divided**
  - **fork-divided**
  - **feather divided**
- **Xxx xx xxxxx**

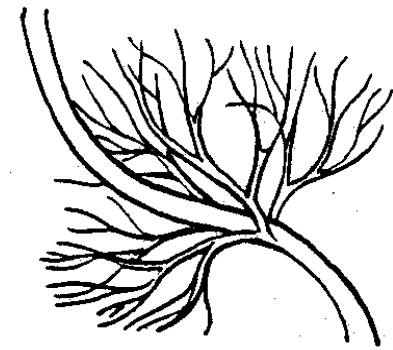
# *Leaf Type*



*Entire*



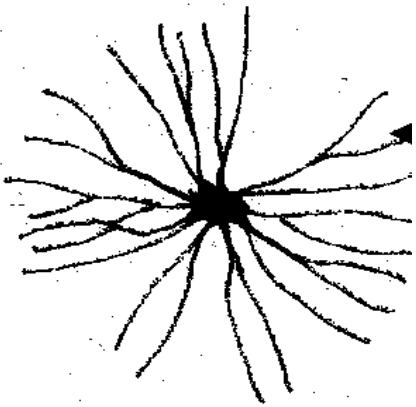
*Serrate  
or  
Toothed*



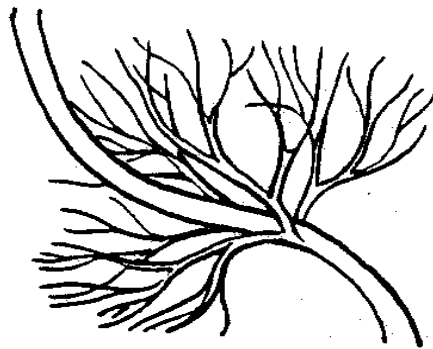
*Divided*



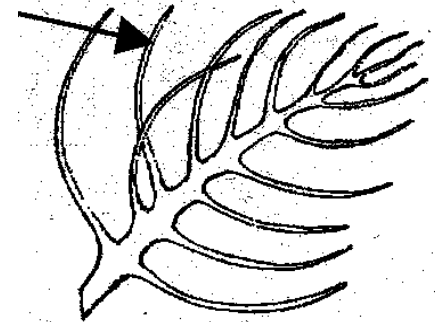
# ***Divided Leaf Patterns***



***Forked***



***Branched***



***Feathered***

***Before you leave this morning –  
Take a look at the plant samples  
& use the NEW Quick Key  
for a plant identification  
exercise.***



***Thanks for all you do  
as Lake Hosts  
&  
Invasives Watchers!***







**A single Asian Clam can self-fertilize, can reproduce up to twice a year and can produce 2,000 – 4,000 juveniles per year. Densities can reach up to 6,000 or more clams per square meter.**



# *Submersed:*

## Egeria or Brazilian Waterweed

*(Egeria densa)*



# Native aquatic plants in Lake Sunapee







**Pipewort**



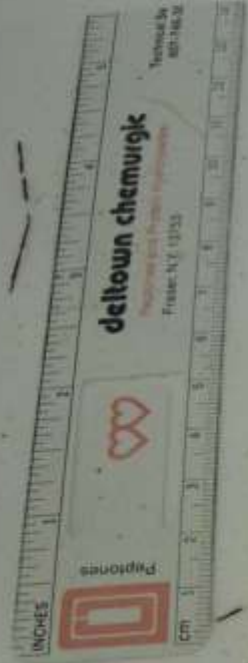
**Water lobelia**



**Awlwort**



**Arrowhead,**



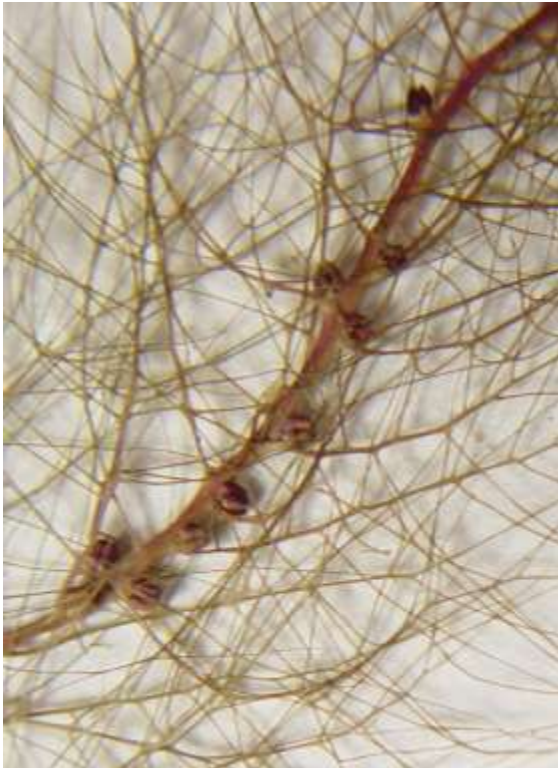
**One species of native milfoil  
in the northeast U.S. is not leafy –  
*Native:* dwarf water milfoil**

This specimen is  
approx. 2 inches tall.



**Low water milfoil**

– a **native** milfoil  
that occurs in Lake  
Sunapee



**Eurasian milfoil** –  
an **invasive** milfoil



**Variable milfoil** –  
an **invasive** milfoil  
(also has been found  
in L. Sunapee)



# Bladderwort - *Native*

“Free-floating”



*Photos by Don Cameron, MNAP*

Floating leaved *Native* plants –  
Spatterdock & White water lily





*Native:*

**Little  
Floating Heart**

SARGENT-WELCH SCIENTIFIC COMPANY

RUBBER STOPPERS

METRIC 1

2

3

4

5

6

7

8

9

00

2

4

6



*Native:*

**Little Floating Heart**



A close-up photograph of a pond filled with numerous green lily pads. The leaves are mostly round and have a slightly waxy texture. In the center of the frame, a single pinkish-red flower is in bloom, showing its stamens and pistil. The water is dark, and the overall scene is a natural, serene aquatic environment.

*Native:*  
**Watershield**



***Native:***  
**Wild  
celery**



***Native:*** submersed burr reed



# How to cover the littoral area to be surveyed

