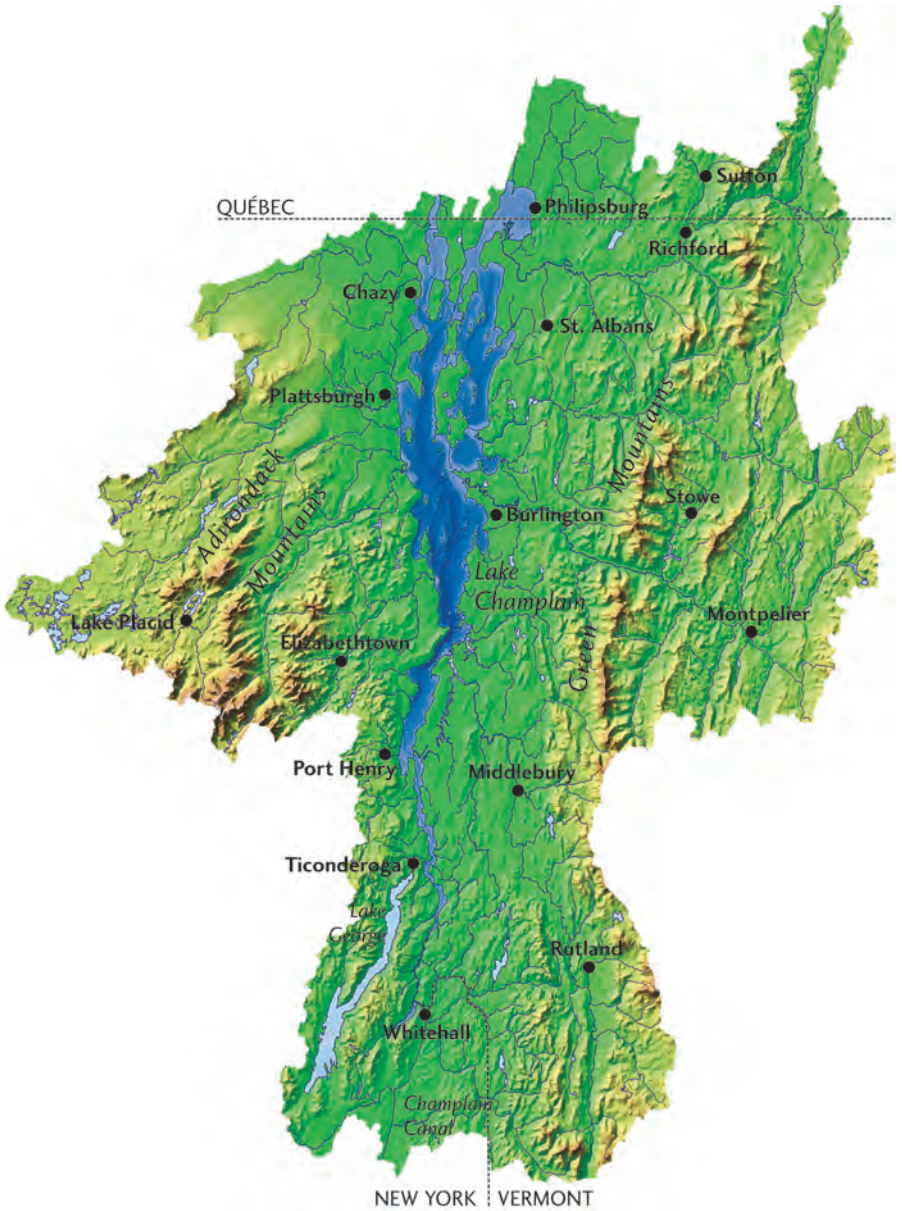


THE LAKE CHAMPLAIN BASIN  
**AQUATIC  
INVASIVE  
SPECIES  
GUIDE**



# The Lake Champlain Basin





# THE LAKE CHAMPLAIN BASIN AQUATIC INVASIVE SPECIES GUIDE

## Introduction

The Lake Champlain Basin is home to a number of invasive species that cause economic and ecological harm to our ecosystem. Federal, state, and provincial partners of the Lake Champlain Basin Program from New York, Vermont, and Québec have identified invasive species management as one of the four highest priorities in *Opportunities for Action*, a management plan for Lake Champlain.

Policy makers and scientists often use the term ecological integrity when describing threats or stresses to ecosystems. When sufficiently stressed, aquatic ecosystems may lose their ability to support important fisheries and recreational activities, serve as drinking water sources, or process nutrients. One threat to aquatic ecosystem integrity is the cumulative impact of non-native invasive species. Invasive plants, invertebrates, and fish may divert food resources from native species, reduce light penetration, change habitats, impair water quality, interfere with recreational activities and reduce property values. Invasive pathogens (not included in this guide) also threaten the health of native and sport fisheries in the region. Fortunately, most “invasions” by introduced, non-native species fail. However, there continue to be spectacular “successes” (e.g. zebra mussels, water chestnut, white perch, etc.) which produce widespread serious impacts that require significant resources and money to manage.

The Great Lakes have been colonized by over 184 non-native aquatic organisms. In comparison, Lake Champlain is home to approximately 50 non-native aquatic invasive species. Protecting the Lake Champlain Basin from the introduction and spread of invasive species is an enormous environmental, social, and political challenge. Invasive species are spread in a number of unseen ways that are mostly unintentional. Movement of aquatic invasive species by a variety of vectors such as boat trailers, recreational equipment, canal systems, ballast water, aquarium trade, and the baitfish industry will no doubt continue, but human awareness and actions can significantly reduce the probability that new invasive species will spread and become established. To ensure that additional colonizations of the Lake Champlain Basin fail, managers will rely on early detection, spread prevention, and rapid response eradication efforts.

While eradication is theoretically possible, the ecological and economic costs are almost always too high. Management or control is possible, but the costs are perpetual. The best “tool” with which to combat invasive species is avoidance—preventing their spread into areas not yet colonized. Anyone arriving at a lake with a boat trailer and equipment or purchasing live aquatic organisms may transport a new invasive species. Hence, use of spread prevention for aquatic invasive species management requires a knowledgeable public with the skills to identify potential problem organisms.

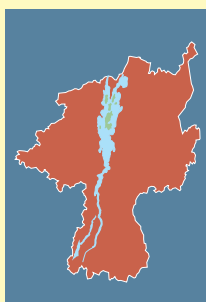
This guide highlights a number of high priority non-native invasive plants, animals, and invertebrates that are known to exist within the basin and introduces high-priority invaders that users should be on the lookout for when in the basin. Species inclusion in this guide was based on the Lake Champlain Basin Aquatic Nuisance Species Management Plan and does not include all known aquatic invasive species in or threatening the basin.

This booklet was developed to ensure that Lake Champlain stakeholders—such as law enforcement staff, lakeshore property owner groups, park managers and others—have the skills to recognize potentially harmful non-native species in the field. It was compiled by the Lake Champlain Basin Program Aquatic Nuisance Species Subcommittee Spread Prevention Workgroup. Funding for this guide was supported by the National Aquatic Nuisance Species Task Force.



Lake Champlain Basin Program

*Lake Champlain Boat Launch Stewards hand-harvest invasive water chestnut plants. South Lake Champlain, 2009.*



Species present  
in the Lake  
Champlain Basin



Species not yet  
found in the Lake  
Champlain Basin

### How to use the guide:

The aquatic invasive species guide is divided into two sections: one with fish, mollusks, and invertebrates, and one with plants. Fish and plant anatomical keys are located at the front of each section. The species' common and scientific names are listed in the index in the back of the guide. Each species' page has a Lake Champlain Basin icon on the top corner. The color of the icon represents species presence or absence in the basin. A red icon indicates species presence and a white icon indicates species absence in the basin. The common, scientific, and French names are provided for every species. The guide also includes the size of the species, defining characteristics, habitat description, and known distribution of the species within the basin or nearest to the basin. Multiple photos are provided to aid in species identification.

If you think you have found an invasive plant, animal, or invertebrate please contact one of the following agencies or organizations:

### Contacts:

- Lake Champlain Basin Program . . . . . 1-800-468-5227
- Lake Champlain Sea Grant . . . . . 1-800-745-5520
- Vermont Department of Environmental Conservation . . . . . (802) 241-3777
- New York State Department of Environmental Conservation  
(Region 5) . . . . . (518) 897-1200
- Quebec Ministry of Environment . . . . . 1-800-561-1616

## Table of Contents

Introduction . . . . .	p.1
Guide to Aquatic Invasive Fish, Mollusks, and Crustaceans . . . . .	p.5
Fish Anatomic Key . . . . .	p.6
Guide to Aquatic Invasive Plants . . . . .	p.35
Plant Anatomic Key . . . . .	p.36
Aquatic Invasive Species Index . . . . .	p.54
Contributors . . . . .	inside back cover

### Help Prevent the Spread of Aquatic Invasive Species!

Aquatic invasive species – plants, fish, crustaceans, mollusks, amphibians, diseases, or pathogens – can be found in bilge water, bait buckets, and livewells and can adhere to boats, trailers, motors, paddles, hipwaders, apparel, and fishing tackle. Some species can survive for several days or weeks out of water. Small plant fragments, fish eggs, or microscopic organisms may hitch a ride unbeknownst to you.



In order to reduce the spread of all aquatic invasive species, please follow these procedures whenever you leave a body of water:

- Remove all visible mud, plants, fish, or animals from your boat or other gear. Use the Watercraft Check Points guide (right) to help you inspect your boat.
- Eliminate water from all equipment before transporting anywhere.
- Clean and dry anything that came in contact with the water.
- Never release plants, fish, or animals into a body of water unless they came out of that body of water.

**WATERCRAFT CHECK POINTS**

Hitch      Live Well      Transom Well

Rollers      Axle      Lower Unit/Propeller

**When you leave a waterway:**

- Check and remove any visible mud, plants, fish or organisms from boats, trailers, equipment, clothing, dogs, etc.
- Clean and eliminate water from equipment.
- Dry anything that comes into contact with water.

**Never release plants, fish or animals into a waterway unless they came from that waterway.**

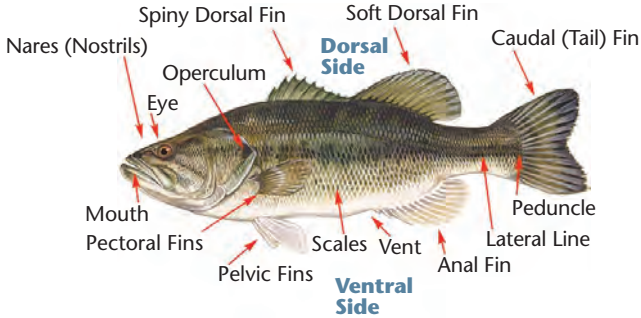
The diagram shows a boat on a trailer with arrows pointing to various parts: Hitch, Live Well, Transom Well, Rollers, Axle, and Lower Unit/Propeller. Below the diagram are three bullet points with icons of a mud puddle, a water drop, and a dry object, followed by a bold warning statement.



GUIDE TO  
AQUATIC INVASIVE  
FISH, MOLLUSKS,  
AND CRUSTACEANS



## Generalized Fish Anatomy



Bob Watterdoni/PWVC

## Glossary

### Fish

**Barbels** – a slender, whiskerlike tactile organ near the mouth. Fish that have barbels include catfish, carp, goatfish, sturgeon, and some species of shark. They house the taste buds of such fish and are used to search for food in murky water.

**Otoliths** – “ear bones” or hard structures in the inner ear. They resemble opaque white crystals.

**Viscera** – internal organs.

**Gill rakers** – bony or cartilaginous structures which protrude from the gill arch.

### Mollusks/Snails/Crustaceans:

**Byssal threads** - The long, fine, silky filaments excreted by several mollusks by which they attach themselves to the sea bed.

**Cardinal teeth** – primary “teeth” in bivalve shells, found as small projections on the hinge of the shell.

**Dextral** – a dextral, or right-handed snail can be distinguished from a sinistral, or left-handed snail, by looking at the shell opening: if a shell is dextral, a right hand could be placed inside the shell with fingers curled around the inside of the shell and the thumb pointed upward toward the spire. If the opening is to the left, the shell is sinistral.

**Sinistral** – see dextral.

**Opercula/operculum** – a lid that closes the opening of the shell in some gastropods.

**Carapace** – in crayfish, the largest segment of the shell around the forward part of the body.





Duane Raver/USFWS

## Alewife

(*Alosa pseudoharengus*)

French: *Gaspereau*

**Size:** 5-6 inches long (13-15 cm)

### Characteristics:

- Silvery scales with a blue/green luster on dorsal portion
- Large black spot behind gill cover
- Silver lining of viscera rather than black like the blueback herring
- Lower jaw protrudes past upper jaw
- Belly has a serrated edge where scales from each side meet and overlap
- No lateral line on body
- Deeply forked tail

**Habitat:** Deep, open waters of lakes for most of the year; move inshore to spawn in spring and early summer

**Distribution:** Lake Champlain, Lake St. Catherine (VT), and Green Pond (NY)



*Lake Champlain alewife die-off.*

Shawn Good, VTDFW

Gizzard  
Shad

Alewife



Shawn Good, VTDFW

## Gizzard Shad

(*Dorosoma cepedianum*)

French: *Alose à gésier*

**Size:** Up to 20 inches long (50 cm)

### Characteristics:

- No lateral line on body
- Deeply forked tail
- Dorsal fin has a whip like filament in the rear
- Juveniles have a large purple-blue spot just behind gill cover, faint or absent in adults
- Sides are silvery with blue, green or even red tints
- Rounded, blunt snout with a deep indentation in the center of upper jaw

**Habitat:** Fresh water near the bottom; can be found in brackish water

**Distribution:** Mostly found in southern Lake Champlain



NYS Museum



Duane Raver/USFWS

## Blueback Herring

(*Alosa aestivalis*)

French: *Alose d'été*

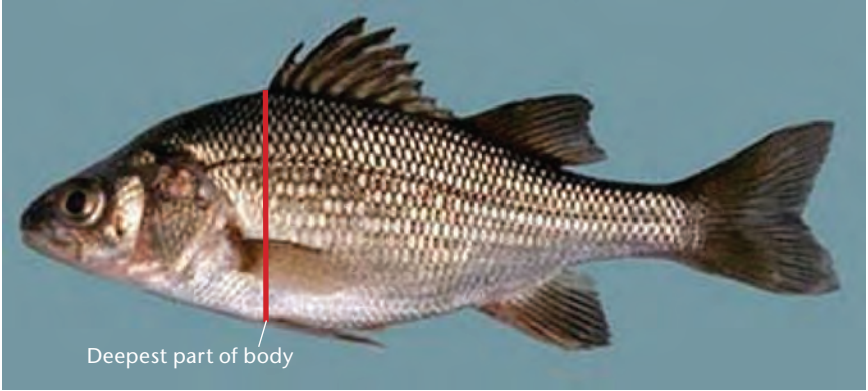
**Size:** 5-12 inches long (13-30 cm)

### Characteristics:

- Looks similar to alewife, but has smaller eyes and blue dorsal fin
- Black lining of viscera rather than silver like the alewife
- Approximately 41-51 gill rakers and a black spot behind the gill cover
- No lateral line on body
- Forked tail
- Anal fin is longer than the dorsal fin

**Habitat:** Deep, open waters of lakes for most of the year; move inshore to spawn in spring and early summer

**Distribution:** Mostly found in southern Lake Champlain and in the Champlain Canal



Douglas Facey

## White Perch

(*Morone americana*)

French: *Baret*

**Size:** 9-10 inches long (23-25 cm)

### **Characteristics:**

- Body is deepest just ahead of dorsal fin
- When the spiny dorsal fin is pulled upright, the soft dorsal fin will also become erect
- First and second dorsal fins are the same length
- Thick spines on first dorsal fin

**Habitat:** Shallower waters of lakes, bays, and inshore areas

**Distribution:** Throughout Lake Champlain and lower sections of tributaries



John Lyons

## Eurasian Ruffe

(*Gymnocephalus cernuus*)

French: *Grémille*

**Size:** Reaches 4-6 inches long (10-15 cm)

### Characteristics:

- Olive brown or golden brown color on its back; whitish yellow belly
- Fused dorsal fins with 12-19 spines
- Dark spots between spines on front dorsal fin
- Sharp spines on pelvic and anal fins
- Looks similar to young walleye and yellow perch but lacks scales on its head
- Mouth turns down



Gary Cholwek, USGS

**Habitat:** Turbid lakes with soft bottoms and little (or no) vegetation or rivers with slow-moving waters

**Distribution:** Not yet found in Lake Champlain Basin; present in the Upper Great Lakes



D. Jude, CLGAS, Univ. of Mich., 1998.

## Round Goby

(*Neogobius melanostomus* [*Apollonia melanostomus*])

French: *Gobie à taches noires*

**Size:** 4-9 inches long (10-23 cm)

### Characteristics:

- Typically gray with brown or black spots covering them; young gobies lack these spots
- In spring, may be black with yellow spots and fin margins
- Front dorsal fin has a black spot on it and sometimes bears green tints
- Often confused with sculpins, but round gobies have a single, round pelvic fin, instead of a slender pair
- Often caught by hook and line

**Habitat:** Shallow, rocky substrate; deep water in fall and winter

**Distribution:** Not yet found in Lake Champlain Basin; present in the Great Lakes, St. Lawrence River, and western Erie Canal



J. Ellen Marsden

Round goby (top) and native sculpin (bottom). Note: “fused” pelvic fins appearing as one disc-shaped fin on the ventral side of round goby.



University of Michigan Museum of Zoology



David J. Jude

## Tubenose Goby

(*Proterorhinus marmoratus* [*P. semilunaris*])

French: *Gobie à nez tubulaire*

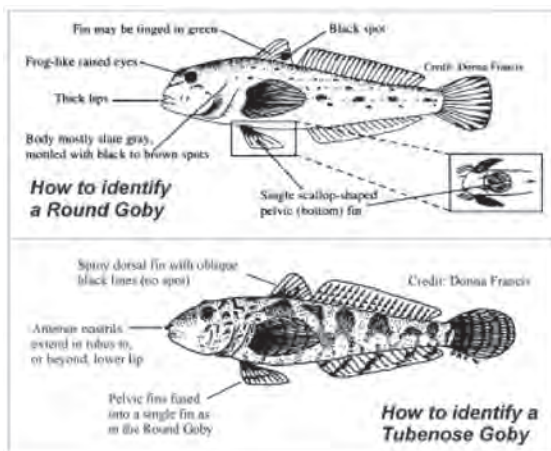
**Size:** Up to 4.5 inches long (11.5 cm)

### Characteristics:

- Often confused with round gobies, but tubenose gobies have long anterior nostrils that extend beyond lower lip and light black stripes rather than a black spot on dorsal fin
- Brown in color
- Has a single, round pelvic fin, instead of a slender pair

**Habitat:** Shallow, rocky substrate; deep water in fall and winter

**Distribution:** Not yet found in Lake Champlain Basin; present in Lake Erie and Lake St. Clair



Donna Francis (line art)



## Northern Snakehead

(*Channa argus*)

French: *Poisson à tête de Serpent*

**Size:** Up to 33 inches long (84 cm)



### Characteristics:

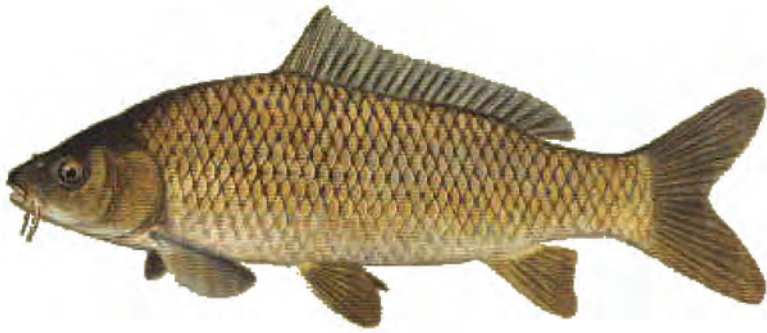
- Sharp teeth, like a pike
- Pelvic fins are close to pectoral fins and gills
- Anal fin extends from middle of body almost to the tail
- Light brown with dark brown patches covering the body
- Capable of breathing out of water (in moist environments) for up to seven days while searching for other bodies of water

**Habitat:** Shallow, vegetated waters

**Distribution:** Not yet found in Lake Champlain Basin; present in the Delaware River







Maynard F. Reece, Iowa Department of Natural Resources

## Common Carp

(*Cyprinus carpio*)

French: *Carpe*

**Size:** Up to 4 feet long (1.2 m) and 80 pounds (36 kg)

### Characteristics:

- Two barbels on each side of the mouth
- Serrated first dorsal and anal fin spines
- Goldish yellow color with a white belly

**Habitat:** Warm estuaries, lakes, water courses, or wetlands rich in organic matter to feed on; prefers water bodies with stagnant and slow-moving waters with sand and/ or silt bottoms

**Distribution:** Throughout Lake Champlain and lower sections of tributaries



John Lyons, WISG



Steffen Zeinert



Mark Malchoff, Lake Champlain Sea Grant

## Tench

(*Tinca tinca*)

French: *Tanche*

**Size:** Range from 8-25 inches long (20-64 cm)

### Characteristics:

- Resembles carp but has smaller scales
- Flat stocky body covered with numerous deeply embedded scales which are smaller than pupil of eye
- Covered in thick coating of mucus
- Single pair of barbels at mouth, instead of two like the common carp
- Fins are dark and rounded
- Olive colored with red eyes

**Habitat:** Bottom feeder that lives in slow-moving waters that are rich in organic matter

**Distribution:** Mostly found in northern Lake Champlain



Ellen Marsden, UVM



David Riecks, University of Illinois, IN Sea Grant

## Bighead Carp

(*Hypophthalmichthys nobilis*)

French: *Carpe à grosse tête*

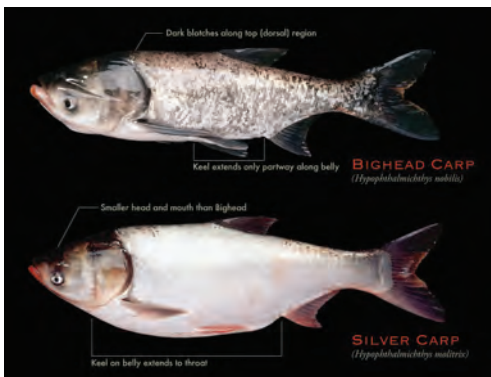
**Size:** Typically identified by weight, up to 100 pounds (45 kg) and 4 feet long (1-2 m)

### Characteristics:

- Deep bodied, laterally compressed fish
- Top of fish is dark gray which fades into an off-white color on the lower sides and belly
- Dark splotches cover body unlike the silver carp
- Scales are small like a trout, while head lacks scales
- Lower jaw protrudes past upper jaw
- Hooked anal fin

**Habitat:** Prefer large rivers but can live in ponds and lakes

**Distribution:** Not yet found in Lake Champlain Basin; present in the Illinois River



USGS

David Riecks, University of Illinois, IN Sea Grant



David Reicks, University of Illinois, IN Sea Grant

## Silver Carp

(*Hypophthalmichthys molitrix*)

French: *Carpe argentée*

**Size:** Up to 3 feet long (0.9 m)

### Characteristics:

- Up to 85 pounds (38.5 kg)
- Deep body that is laterally compressed
- Olive colored back and upper sides which fade to silver below the lateral line
- Small scales like a trout
- Eyes point downward and are positioned far forward along the midline
- Stiff, serrated pectoral fins
- Dorsal fin is hooked and not serrated
- Lower jaw lacks teeth
- Swims upstream to spawn and allows eggs to float downstream

**Habitat:** Prefers rivers and streams where it swims close to surface and jumps out of water when startled

**Distribution:** Not yet found in Lake Champlain Basin; present in the Illinois River



Department of Fisheries & Wildlife Sciences, Virginia Tech

## Grass Carp

(*Ctenopharyngodon idella*)

French: *Amour blanc* or *carpe herbivore*

**Size:** Up to 39 inches long (100 cm); typically reaches 65-85 pounds (30-39 kg)



NYDEC

### Characteristics:

- More slender than other carp
- Resembles common carp, but lacks a sucker-like mouth and barbels at the corner of its mouth
- Silvery white instead of yellowish brown like the common carp



Noel M. Burkhead

**Habitat:** Vegetated areas; reproduces in swift-moving, well-oxygenated waters

**Distribution:** Not yet found in Lake Champlain Basin; sterile population stocked in Auger Lake (NY)



NYSDEC, Bureau of Habitat

## European Rudd

(*Scardinius erythrophthalmus*)

French: *Rotengle* or *gardon rouge*

**Size:** 12-18 inches long (30-45 cm)

### Characteristics:

- Stout, deep bodied fish with a forked tail and large scales
- Keel-like belly has 6-9 scales, unlike naked belly of the golden shiner
- Lower lip is sharply angled with a protruding lower jaw
- Back is a dark olive brown color
- Sides are brassy yellow, which fade into a silvery belly
- Pectoral, pelvic, and anal fins are a vivid reddish orange color
- Dorsal and caudal fins are reddish brown
- Young rudd often resemble golden shiners, but adults reach larger size than golden shiner

**Habitat:** Variety of habitats: slow streams, rivers, and vegetated areas of lakes and ponds

**Distribution:** Throughout Lake Champlain and several other lakes in the basin



U.S. Geological Survey Archives, U.S. Geological Survey, [www.forestryimages.org](http://www.forestryimages.org)

## Zebra Mussel

(*Dreissena polymorpha*)

French: *Moule zébrée*

**Size:** Less than 2 inches long (5 cm)



USGS

### Characteristics:

- Small shellfish with a striped pattern on shells
- Color patterns can vary greatly: light to dark colored shells with many or no stripes at all
- Usually attached to objects, surfaces, or other zebra mussels using thread on the bottom of shell
- Often confused with the quagga mussels, but the zebra mussel is stable on a flat surface, while the quagga mussel will topple over when laid down

**Habitat:** Inhabit inland lakes and streams, avoiding direct sunlight

**Distribution:** Lake Champlain, Lake George (NY), and Lake Bomoseen (VT)



USGS



Ellen Marsden, UVM



Bill Tate

## Quagga Mussel

(*Dreissena bugensis*)

French: *Moule quagga*

**Size:** Up to 1.5 inches long (4 cm)

### Characteristics:

- Small freshwater bivalve, often confused with zebra mussel
- Topples over when placed on flat surface because of its convex ventral side, unlike the zebra mussel
- Rounder than zebra mussel
- Color bands vary from black, cream, to white
- Typically has dark rings over its shell that lighten near hinge

**Habitat:** Inland lakes and streams, avoiding direct sunlight; overlaps with and extends below depths preferred by zebra mussel

**Distribution:** Not yet found in Lake Champlain Basin; present in the Erie Canal and St. Lawrence River





## Mud Bithynia, Faucet Snail

(*Bithynia tentaculata*)

French: *Bulime* or *Bithynie impure*

**Size:** Up to 0.5 inches long (13 mm)

**Characteristics:**

- Smooth shells that taper to a point
- Shell has five whorls

**Habitat:** Shallow waters, often attached to rocks and other objects; commonly found in freshwater ponds, shallow lakes, and canals

**Distribution:** Throughout Lake Champlain and Arrowhead Lake (VT)



Example of right handed spiral (i.e. dextral)

USGS



USGS

### Chinese Mysterysnail

(*Cipangopaludina chinensis malleata*)

French: *Vivipare chinoise*

**Size:** Can reach 2.5 inches (64 mm)

**Characteristics:**

- Shell has up to seven whorls
- Females are livebearers giving birth to crawling young

**Habitat:** Slow-moving freshwater rivers, streams, and lakes with soft, muddy or silty bottoms

**Distribution:** Lake Champlain Basin in both New York and Vermont



USGS

## Banded Mysterysnail

(*Viviparus georgianus*)

French: *Vivipare géorgienne*

**Size:** 0.75 to 1.75 inches long (1.9-4.4 cm) and approximately 0.75-1.5 inches wide (1.9-3.9 cm)

### **Characteristics:**

- 0-4 dark red spiral bands on shell
- Shell color varies from yellow to olive in color
- Bear live young instead of eggs

**Habitat:** Flowing water or in proximity to flowing water, such as river mouths

**Distribution:** Throughout Lake Champlain Basin



# Mollusks



USGS



USGS

Dr. Harry G. Lee, Jacksonville, FL

## Asian Clam

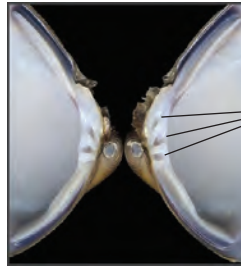
(*Corbicula fluminea*)

French: *Petite corbeille d'Asie*

**Size:** Up to 2 inches long (5 cm)

### Characteristics:

- Shells are typically greenish-yellow or brown with thick concentric rings running around them
- Inside of shell is smooth and polished with a light purple tinge
- Three cardinal teeth (see photo) in each valve (native unionid mussels have none)
- Thick symmetrical shell



Cardinal teeth

**Habitat:** Large rivers and lakes



Mark Malchoff

**Distribution:** Not yet found in Lake Champlain Basin; present in the Great Lakes



D.L. Gustafson

## New Zealand Mudsnail

(*Potamopyrgus antipodarum*)

French: *Nase de Nouvelle-Zélande*

**Size:** 0.2-0.3 inches long (5-8 mm)

### Characteristics:

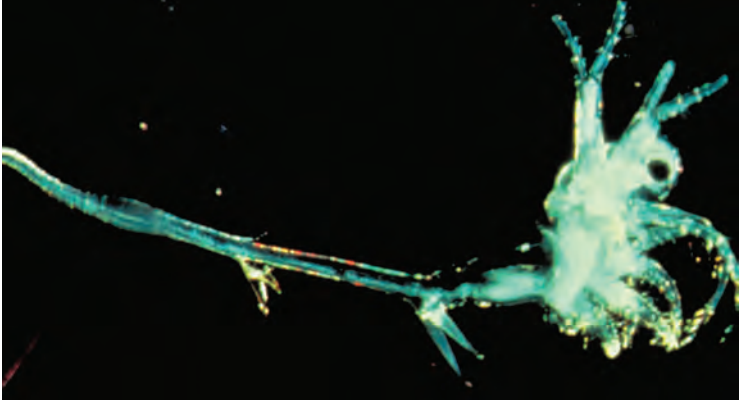
- Right-handed spiral with 7-8 whorls in shell
- Light to dark brown shell

**Habitat:** Slow-moving, fresh water

**Distribution:** Not yet found in Lake Champlain Basin; present in Lake Erie and Lake Ontario



USGS



US EPA

## Spiny Waterflea

(*Bythotrephes cederstroemi/longimanus*)

French: *Cladocère épineux*

**Size:** Less than 0.5 inches at maturity (12 mm)

### Characteristics:

- Spiny waterflea is a crustacean, not a flea
- Long barbed tail filament which makes up 70% of total body length
- Tail can have between 1-4 pairs of barbs running down it
- Four pairs of legs, the first being the longest
- Often collect on fishing lines and downrigger cables (see photo)

**Habitat:** Cold, open (pelagic) waters

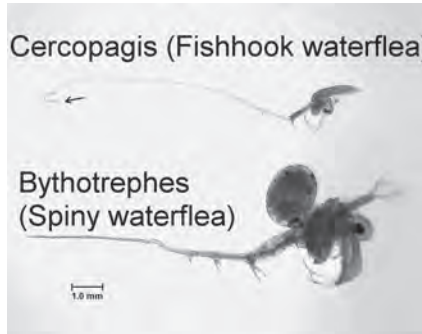
**Distribution:** Not yet found in Lake Champlain Basin; present in Lake Ontario



Jeff Gunderson, Minnesota Sea Grant



Ontario Ministry of Natural Resources



NOAA, Great Lakes Environmental Research Laboratory

## Fishhook Waterflea

(*Daphnia lumholtzi*)

French: *Daphnie*

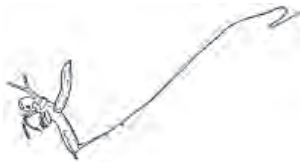
**Size:** Less than 0.5 inches at maturity (12 mm)

### Characteristics:

- Long barbed tail filament which makes up 80% of total body length
- Tail can have between 1-4 pairs of barbs running down it
- Four pairs of legs, the first being the longest
- Often collect on fishing lines and downrigger cables
- Unique loop at the end of the tail

**Habitat:** Cold, open (pelagic) waters

**Distribution:** Not yet found in Lake Champlain Basin; present in Lake Ontario



Washington Department of Fish and Wildlife



©2005 Dale E. Westaby

## Rusty Crayfish

(*Orconectes rusticus*)

French: *Écrevisse à taches rouges*

**Size:** Up to 5 inches long (13 cm)

### Characteristics:

- Dark reddish spot on either side of the carapace distinguishes rusty crayfish from other crayfish
- Strong, smooth claws, which are larger than most other species
- Claws can be a brownish olive color or a reddish brown color with black tips
- Claws have an oval gap when closed
- Very hardy creature that can live in both fast and slow-moving waters

**Habitat:** Debris-covered bottoms that provide cover

**Distribution:** Lake Champlain Basin in Lake Carmi (VT) and the Winooski drainage (VT)



University of Minnesota Sea Grant Program





©1998 Keith A. Crandall

## White River Crayfish

(*Procambarus acutus acutus*)

French: *Écrevisse blanche de rivière*

**Size:** Adults are 3-4 inches long (7.5-10 cm)

### Characteristics:

- Black V-shaped stripe on abdomen
- Dark red or burgundy color
- Juveniles are gray with dark spots spread over carapace
- Rough carapace is split in middle by a gap called the areola
- Long, slender claws

**Habitat:** Shallow, well-vegetated fresh waters

**Distribution:** Not yet found in Lake Champlain Basin; present in the Hudson River drainage and Maine



Matt Scott



Greg Ruiz, Marine Invasions Research Laboratory at the Smithsonian Environmental Research Center

## Chinese Mitten Crab

(*Eriocheir sinensis*)

French: *Crabe chinois à mitaine*

**Size:** Up to 3 inches long (7.5 cm)

### Characteristics:

- Dense patches of hair on white tipped claws
- Claws are equal in size
- Shells have four spines on each side
- Legs are typically twice as long as width of carapace
- Light brown

**Habitat:** Juveniles are born in brackish water in late spring and move to fresh water

**Distribution:** Not yet found in Lake Champlain Basin; present in the Hudson River and St. Lawrence River



Lee Mecum, California Game and Fish



Greg Ruiz, Marine Invasions Research Laboratory at the Smithsonian Environmental Research Center



NOAA, Great Lakes Environmental Research Laboratory

## Bloody-red Shrimp

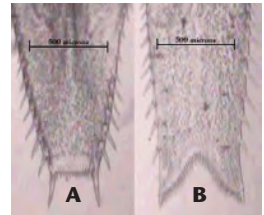
(*Hemimysis anomala*)

French: *Hemimysis anomala*

**Size:** Generally less than 0.5 inches (1.2 cm)

### Characteristics:

- Very similar in appearance to native opossum shrimp (*Mysis diluviana*)
- Telson or 'tail' has flat end with two prominent terminal spines (photo A), unlike telson of native *M. diluviana* which is forked (photo B)
- Spends daylight hours hiding in rocky crevices, but occasionally swarms near the surface



NOAA, Great Lakes Environmental Research Laboratory

**Habitat:** Slow moving water over hard substrates, including rocks and shells; usually found near shore (unlike native *M. diluviana* which is found in pelagic environments) but can be found to depths of 165 feet (50 m)

**Distribution:** Not yet found in Lake Champlain Basin; present in Lakes Michigan and Ontario



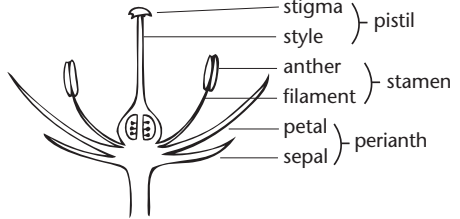
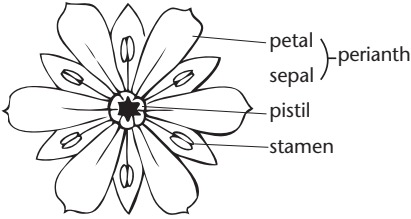


# GUIDE TO AQUATIC INVASIVE PLANTS

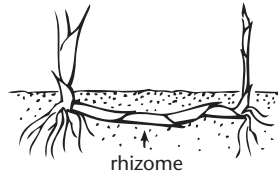
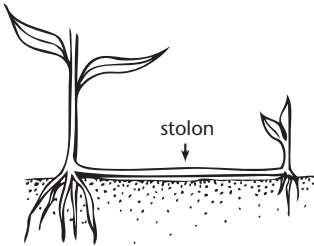
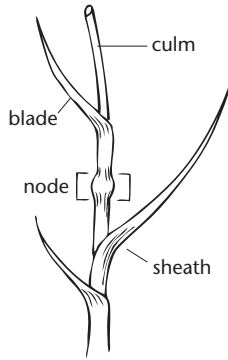
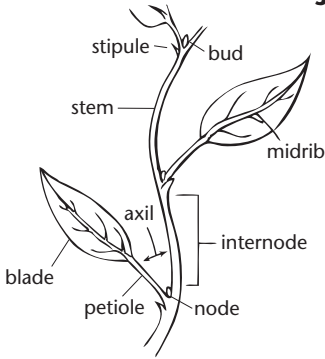


Plant Parts

Flower Parts



Stems



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Carol Treadwell



Hilary Smith

## Purple Loosestrife

(*Lythrum salicaria*)

French: *Salicaire pourpre*

### Characteristics:

- Erect perennial plant, 1.5-5 feet tall (0.45-1.5 m)
- Magenta flowers blossom in spikes 4-16 inches long (0.1-0.4 m) from July to September
- Lance shaped leaves up to 4 inches long (10 cm)
- Leaves are simple, entire, opposite and in whorls of three
- Stem is square
- Each flower has 5 to 7 petals arising from a cylindrical green tube
- Spreads primarily by seeds, can re-sprout from broken roots following incomplete removal of stem

**Habitat:** Grows in moist or marshy areas, along river banks, wetlands, or lake edges

**Distribution:** Throughout Lake Champlain Basin





Alison Fox, University of Florida



## Eurasian Watermilfoil

(*Myriophyllum spicatum*)

French: *Myriophylle à épi*

### Characteristics:

- A submersed, aquatic perennial plant
- Feather-like leaves grouped in 3 to 6 whorls around the stem
- Each leaf is divided into paired leaflets, generally 10-20 pairs per leaf; native watermilfoils typically have fewer leaflet pairs
- Blunt ends of leaf look as though they were snipped by scissors
- Individual stems branch several times as they near the surface
- Shoots are reddish brown near surface
- Small reddish flowers blossom in July and August
- Plant will go limp when removed from water
- Spreads primarily by rooting of plant fragments

**Habitat:** Grows in lakes, rivers, and ponds at depths of 3 feet (0.9 m) or more

**Distribution:** Throughout Lake Champlain and many water bodies in the basin

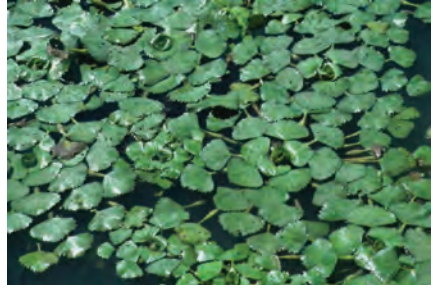


Ann Bove, VTDEC





VTDEC



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## Water Chestnut

(*Trapa natans*)

French: *Châtaigne d'eau*

### Characteristics:

- Rooted annual aquatic plant with both submerged and surfacing leaves
- Surfacing leaves are waxy and triangular with toothed edges
- Submersed leaves are feathery and whorled around the leaf stalk
- White flowers blossom from July until first frost
- Nut-like fruit that bears 4 sharp, barbed points
- Stems branch and can grow up to 16 feet long (4.8 m)
- Reproduces by over-wintering seeds



VTDEC

**Habitat:** Grows in slow-moving, nutrient-rich waters

**Distribution:** Southern Lake Champlain and its tributaries, Lake Bomoseen (VT), Missisquoi National Wildlife Refuge (VT), and several other lakes and ponds in the basin

Copyright 2012 University of Florida  
Creative Commons Attribution-NonCommercial-ShareAlike licenseTrapa natans  
Illustration



Above: Steve Manning, Invasive Plant Control, Bugwood.org  
 Left: Tom Heutte, USDA Forest Service, Bugwood.org

## Japanese Knotweed

(*Polygonum cuspidatum*)

French: *Renouée japonaise*

### Characteristics:

- Large, hardy perennial
- Forms dense thickets
- Stems are hollow, stout, reddish brown, and between 4-9 feet tall (1.2-2.7 m)
- Leaves are 2-6 inches long (5-15 cm) and about 2/3 as wide as long
- Egg-shaped leaves come to a point at tip
- Small flowers vary from creamy-white to greenish-white
- Flowers appear in elongate clusters in late summer
- Shiny black fruit is 3-sided
- Reproduction is primarily vegetative with new shoots developing from extensive rhizomes (underground stems) and by seeds



**Habitat:** Often found in yards, roadside ditches, and river banks

**Distribution:** Throughout Lake Champlain Basin



Ann Bove, VTDEC



Les Merhoff, University of CT

## Flowering Rush

(*Butomus umbellatus*)

French: *Butome à ombelle*

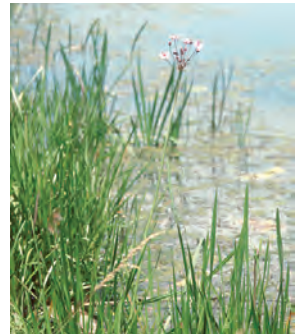
### Characteristics:

- Emergent or submersed plant
- Can grow three feet high on land (0.9 m) and up to 10 feet in water (2.7 m)
- Flowers grow in umbrella-shaped clusters, each flower has three pinkish-white petals
- Green stems are triangular in cross section
- Leaf tips are spirally twisted
- Leaves are grass-like on land, and ribbon-like underwater
- Dark brown, beaked fruits are 0.4 inches long (1 cm)
- Reproduction occurs by seeds or vegetative spread of rootstocks

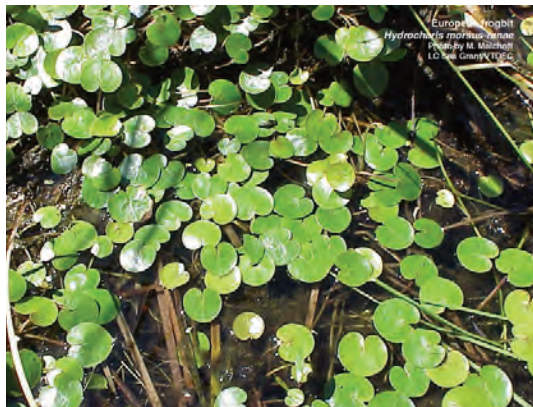


**Habitat:** Grows in lakes and rivers as submerged plant; on lakeshores and riverbanks as emergent

**Distribution:** Throughout Lake Champlain Basin



Nick Proulx, MNDNR



## European Frogbit

(*Hydrocharis morsus-ranae*)

French: *Hydrocharide grenouillette*

### Characteristics:

- Free-floating aquatic plant of open water marshes and standing pools of swamps
- Small white flowers with three white petals open just above the water surface
- Well developed root system that tangles around other plants or themselves to form dense patches
- Round heart-shaped leaves float on surface and are 0.5-2.5 inches long (1.3-6.3 cm)
- Resembles native American frogbit (*Limnobium spongia*), but the native species has a convex layer of spongy, gelatinous, red tinged tissue beneath the leaf
- Reproduction is most often vegetative via spreading stems and winter vegetative buds (turions)



**Habitat:** Grows in lakes, rivers, and marshes

**Distribution:** Documented in southern Lake Champlain, the islands region, Missisquoi Bay, the Winooski River delta, and Shelburne Pond; may be more widely distributed in Lake Champlain than documentation reflects



Ann Murray, University of Florida

## Common Reed

(*Phragmites australis*)

French: *Roseau commun*

### Characteristics:

- Large perennial grass that grows up to 15 feet tall (4.5 m)
- Large stalk can be 1 inch thick (2.5 cm)
- Large feathery plumes of flowers that change from a purple-brown color in July to tan or grey later in the season
- Long, sharp, bluish-green leaves grow up to 2 feet long (61 cm) and 2 inches wide (5 cm)
- Feathery, plume-like flower heads with individual clusters of small purple-brown flowers that change to tan or grey at the end of the season; flowers less than 1 inch long (2.5 cm)
- Difficult to distinguish from native genotype  
Any new populations should be reported
- Spreads mainly by fragmentation and elongation of rhizomes (underground stems); occasional establishment of new populations may occur from seed



Meg Modley, Lake Champlain Basin Program



**Habitat:** Grows in lakeshores, marshes, bogs, fens, wet meadows, and roadside ditches

**Distribution:** Throughout Lake Champlain Basin



Mark Matchoff, Lake Champlain Sea Grant

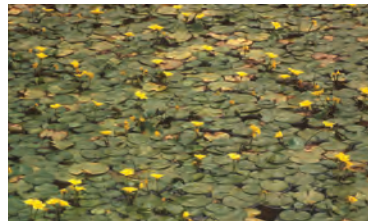
## Yellow Floating Heart

(*Nymphoides peltata*)

French: Fauz-nymphéa à feuilles peltées

### Characteristics:

- Rooted perennial aquatic plant
- Bright, yellow flowers, approximately 1 inch wide (2.5 cm)
- 2-5 flowers from each stalk
- 5 petals per flower that are fringed on the edges
- Petal arrangement resembles the spokes of a wheel
- Heart-shaped floating leaves with fringed edges and purple undersides
- The fruit is a 1-inch long (2.5 cm) beaked capsule filled with flat seeds
- Creates dense patches in slow-moving waters
- Reproduces by seed and vegetatively by broken stems (w/ leaves) and by stolons



Ann Bove, VTDEC

**Habitat:** Grows in shallow, quiet bays of lakes, ponds, and rivers

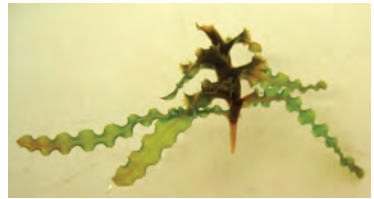
**Distribution:** Limited areas of southern Lake Champlain



Theodore Webster, USDA Agricultural Research Service



Both photos: Karen Hähnel, MEDEP



## Curly-leaf Pondweed

(*Potamogeton crispus*)

French: *Potamot crispé*

### Characteristics:

- Submersed, perennial, aquatic plant
- Leaves reddish-green, waxy with finely-toothed margins and wavy edges, translucent with 3 main veins
- Leaves alternate along stem, 1.5-4 inches long (4-10 cm) and 0.2-0.4 inches wide (5-10 mm)
- Flattened branching stems grow up to 6 feet long (1.8 m)
- Tiny, inconspicuous flowers arranged in spikes
- Spreads by turions (burr-like, vegetative winter buds); one plant may produce hundreds of new plants

**Habitat:** Grows in lakes, ponds, rivers, and streams

**Distribution:** Lake Champlain and many other water bodies in the basin





All photos NHDES

## Variable-leaved Watermilfoil

(*Myriophyllum heterophyllum*)

French: *Myriophylle à feuilles variées*

### Characteristics:

- Rooted, submersed and emergent perennial aquatic plant
- Leaves finely divided, resembling a feather; arranged in whorls of 4 to 6 around the stem
- Emergent leaves are long and slender with serrated margins
- Flowers grow from the base of the emergent leaves and form an erect spike
- Spreads through fragmentation, roots, winter buds, and seeds (but to a lesser extent)
- Looks like a bottle brush

**Habitat:** Grows in ponds, lakes, and streams

### Distribution:

Northern Lake Champlain and several lakes in the Adirondack Park, southern Maine, and New Hampshire



(Crawford Hallquist 1982. Aquatic Plants of New England Series. *Myriophyllum heterophyllum*. Illustration by Paul Bruns)





Vic Ramey, University of Florida



NHDES



NHDES



## Hydrilla

(*Hydrilla verticillata*)

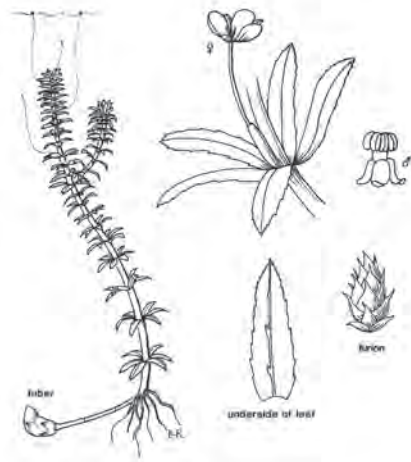
French: *Hydrilla*

### Characteristics:

- Submersed, rooted perennial
- Whorls of 3-8 slender leaves
- Undersides of leaves may have spines; leaf edges have serrations or small spines
- Midrib of leaf is reddish
- Small, inconspicuous white flowers
- Can be distinguished from Brazilian elodea (*Egeria densa*) and American water weed (*Elodea canadensis*) by its tubers, which are off-white to yellowish, potato-like structures buried in the sediment, 0.2-0.4 inches long (0.5-1 cm)
- Stems grow up to 25 feet long (7.6 m), branch heavily, and form thick mats on the water surface
- Reproduces mainly by re-growth of stem fragments; also reproduces by growth of vegetative buds (turions) and subterranean tubers

**Habitat:** Grows in lakes, rivers, ponds, canals, and drainage ditches

**Distribution:** Not yet found in Lake Champlain Basin; present in a limited number of ponds in Maine, Connecticut, and Massachusetts





NHDES



NHDES

## Fanwort

(*Cabomba caroliniana*)

French: *Cabombe de Caroline*

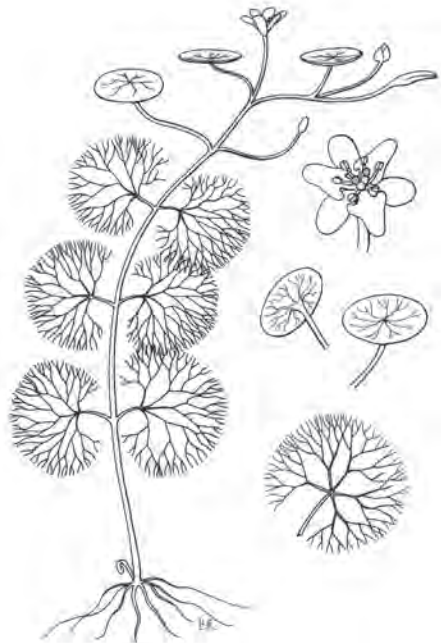
### Characteristics:

- Rooted perennial with submersed opposite (but appearing whorled) leaves
- Submersed leaves are finely divided and fan-like
- Also has inconspicuous oblong floating leaves
- Stems are tubular, long and multi-branched, 6 to 30 feet long (2-9 m)
- White or pink flowers 0.5 inches long (1.3 cm) reach above water surface
- Spreads primarily by stem fragments or rhizomes

**Habitat:** Grows in ponds, lakes, and quiet streams

**Distribution:** Not yet found in

Lake Champlain Basin; present in various lakes in New Hampshire, the Adirondack Park, Massachusetts, and Connecticut





All photos NHDES



## Brazilian Elodea

(*Egeria densa*)

French: *Elodée du Brésil*

### Characteristics:

- Submersed rooted perennial
- Leaves are less than 1 inch long (2.5 cm) and can be slender or oblong; occur in whorls of 3-6 and margins have minute serrations
- Flowers are inconspicuous, with 3 white petals and 3 green sepals; reach to or above the water surface
- Stems reach 6 feet (2 m) in length and branch profusely at the water surface, forming thick mats
- Often confused with hydrilla (*Hydrilla verticillata*), but lacks conspicuously toothed leaf margins and tubers
- Spreads from stem fragmentation

**Habitat:** Grows in lakes, rivers, and streams

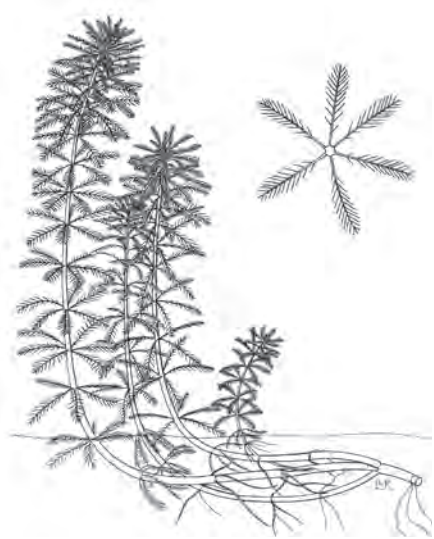
**Distribution:** Not yet found in Lake Champlain Basin; present in New Hampshire, Massachusetts, and New York





Vic Ramey, University of Florida

Ann Bove, VTDEC



## Parrot's Feather

(*Myriophyllum aquaticum*)

French: *Myriophylle aquatique*

### Characteristics:

- Submersed, rooted perennial
- Emergent grey-green, stiff leaves, arranged in whorls of 4-6
- Submersed leaves are limp and feather-like, divided into 24-36 thread-like leaflets, often appear to be decaying
- Flowers white to pinkish
- Stems are brownish and rarely branch; can grow to 7 feet (2.1 m) and protrude up to 8 inches (20 cm) above the water surface
- Forms thick mats at the surface of the water
- Spreads from stem fragmentation

**Habitat:** Grows in lakes, ponds, and rivers

**Distribution:** Not yet found in Lake Champlain Basin; present in New York and Connecticut



## Salvinia

(*Salvinia auriculata*, *Salvinia molesta*, *Salvinia biloba*, *Salvinia herzogii*)

French: *Salvinie auriculée*

### Characteristics:

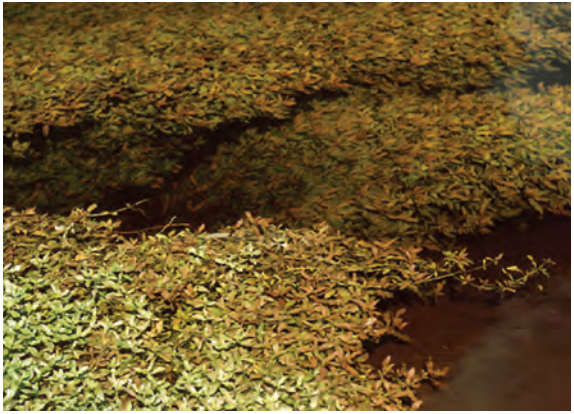
Four species comprise the *Salvinia auriculata* complex. All are illegal in Vermont. The four species are distinguished by subtle differences in the sporocarp (spore case). Characteristics below apply to all four salvinia species, except where noted.

- Floating, rootless aquatic fern
- Stems bear leaves in whorls of 3 (2 leaves floating, 1 submerged)
- Floating leaves are round to ovate, 1.5-2 cm long and 1.8-2.5 cm wide (except for *S. molesta*, which are larger, potentially reaching 4 cm long and 5 cm wide)
- Floating leaves are covered in tiny white, bristly hairs that resemble egg beaters
- Submerged leaves resemble roots and grow very long
- Forms thick, dense mats at water surface
- Spreads via buds on stems that fragment easily



**Habitat:** Grows in lakes, ponds, slow-flowing streams and rivers, ditches, swamps, and marshes

**Distribution:** Not yet found in Lake Champlain Basin; widely distributed in the southeastern United States



Ann Murray, University of Florida, <http://plants.ifas.ufl.edu/photos.html> (left and right)

## Indian Swamp Grass

(*Hygrophila polysperma*)

French: *Hygrophila polysperma*

### Characteristics:

- Rooted, rhizomatous perennial, submersed to slightly emergent
- Simple leaves opposite and sparsely hairy; reddish, brown, or light green
- Emersed leaves are elliptic or somewhat obovate (elliptical), lacking leaf stalks
- Submersed leaves are larger and thinner than emergsed leaves, broadly elliptic, and may have stalks
- Bluish-white or white flowers form in leaf axils, up to 3/8 inch long (9 mm)
- Fruits are slender capsules filled with flat circular seeds, 0.2-0.3 inches (6-7 mm) long
- Emersed stems squarish; submersed stems round
- Stems are 6 feet (1.8 m) or longer and creep laterally, seldom upright, to form dense mats on the water surface
- Plant is brittle
- Spreads primarily from stem fragmentation; may also reproduce from seed



**Habitat:** Grows in ditches, marshes, and lakes

**Distribution:** Not yet found in Lake Champlain Basin; populations exist in Texas, Florida, Virginia, and Delaware



Amy Smagala, NH DES



Ann Bove, VT DEC

## Didymo (a.k.a. “Rock Snot”)

(*Didymosphenia geminata*)

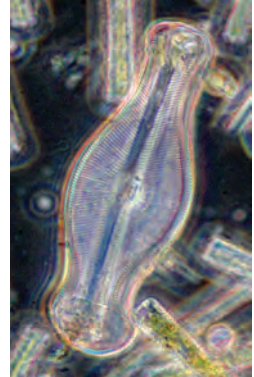
French: *Didymo*

### Characteristics:

- Microscopic, single-celled algae (diatom) that produces visible, thick stalk material
- Tan, light brown or brown clumps or ropy strands
- Feels rough, cottony or fibrous is *not* slimy to the touch
- Can form thick solid mats (1-4 inches) on rocks or stream bottoms, or may appear clumpy or feathery
- Dried stalk material on shore may look like dried cardboard or toilet tissue

**Habitat:** Grows in clear, swift-flowing rivers and streams with rocky bottoms; occasionally found in large lakes with continuous wave action

**Distribution:** A few rivers/streams in Lake Champlain Basin; present in several other rivers in northeastern North America



*Didymosphenia geminata* cell,  
400x magnification,  
Photo: Leslie Matthews, VT DEC

# Aquatic Invasive Species Index

<b>Alewife</b> , <i>Alosa pseudoharengus</i> . . . . .	7
<i>Alosa aestivalis</i> , <b>Blueback Herring</b> . . . . .	9
<i>Alosa pseudoharengus</i> , <b>Alewife</b> . . . . .	7
<b>Asian Clam</b> , <i>Corbicula fluminea</i> . . . . .	26
<b>Banded Mysterysnail</b> , <i>Viviparus georgianus</i> . . . . .	25
<b>Bighead Carp</b> , <i>Hypophthalmichthys nobilis</i> . . . . .	17
<i>Bithynia tentaculata</i> , <b>Mud Bithynia or Faucet Snail</b> . . . . .	23
<b>Bloody-red Shrimp</b> , <i>Hemimysis anomala</i> . . . . .	33
<b>Blueback Herring</b> , <i>Alosa aestivalis</i> . . . . .	9
<b>Brazilian Elodea</b> , <i>Egeria densa</i> . . . . .	49
<i>Butomus umbellatus</i> , <b>Flowering Rush</b> . . . . .	41
<i>Bythotrephes cederstroemi/longimanus</i> , <b>Spiny Waterflea</b> . . . . .	28
<i>Cabomba caroliniana</i> , <b>Fanwort</b> . . . . .	48
<i>Channa argus</i> , <b>Northern Snakehead</b> . . . . .	14
<b>Chinese Mitten Crab</b> , <i>Eriocheir sinensis</i> . . . . .	32
<b>Chinese Mysterysnail</b> , <i>Cipangopaludina chinensis malleata</i> . . . . .	24
<i>Cipangopaludina chinensis malleata</i> , <b>Chinese Mysterysnail</b> . . . . .	24
<b>Common Carp</b> , <i>Cyprinus carpio</i> . . . . .	15
<b>Common Reed</b> , <i>Phragmites australis</i> . . . . .	43
<i>Corbicula fluminea</i> , <b>Asian Clam</b> . . . . .	26
<i>Ctenopharyngodon idella</i> , <b>Grass Carp</b> . . . . .	19
<b>Curly-leaf Pondweed</b> , <i>Potamogeton crispus</i> . . . . .	45
<i>Cyprinus carpio</i> , <b>Common Carp</b> . . . . .	15
<i>Daphnia lumholtzi</i> , <b>Fishhook Waterflea</b> . . . . .	29
<b>Didymo</b> , <i>Didymosphenia geminata</i> . . . . .	54
<i>Didymosphenia geminata</i> , <b>Didymo</b> . . . . .	54
<i>Dorosoma cepedianum</i> , <b>Gizzard Shad</b> . . . . .	8
<i>Dreissena bugensis</i> , <b>Quagga Mussel</b> . . . . .	22
<i>Dreissena polymorpha</i> , <b>Zebra Mussel</b> . . . . .	21
<i>Egeria densa</i> , <b>Brazilian Elodea</b> . . . . .	49
<i>Eriocheir sinensis</i> , <b>Chinese Mitten Crab</b> . . . . .	32
<b>Eurasian Ruffe</b> , <i>Gymnocephalus cernuus</i> . . . . .	11
<b>Eurasian Watermilfoil</b> , <i>Myriophyllum spicatum</i> . . . . .	38
<b>European Frogbit</b> , <i>Hydrocharis morus-ranae</i> . . . . .	42
<b>European Rudd</b> , <i>Scardinius erythrophthalmus</i> . . . . .	20



.....

<b>Fanwort</b> , <i>Cabomba caroliniana</i> . . . . .	48
<b>Fishhook Waterflea</b> , <i>Daphnia lumholtzi</i> . . . . .	29
<b>Flowering Rush</b> , <i>Butomus umbellatus</i> . . . . .	41
<b>Gizzard Shad</b> , <i>Dorosoma cepedianum</i> . . . . .	8
<b>Grass Carp</b> , <i>Ctenopharyngodon idella</i> . . . . .	19
<i>Gymnocephalus cernuus</i> , <b>Eurasian Ruffe</b> . . . . .	11
<i>Hemimysis anomala</i> , <b>Bloody-red Shrimp</b> . . . . .	33
<b>Hydrilla</b> , <i>Hydrilla verticillata</i> . . . . .	47
<i>Hydrilla verticillata</i> , <b>Hydrilla</b> . . . . .	47
<i>Hydrocharis morus-ranae</i> , <b>European Frogbit</b> . . . . .	42
<i>Hygrophila polysperma</i> , <b>Indian Swamp Grass</b> . . . . .	51
<i>Hypophthalmichthys molitrix</i> , <b>Silver Carp</b> . . . . .	18
<i>Hypophthalmichthys nobilis</i> , <b>Bighead Carp</b> . . . . .	17
<b>Indian Swamp Grass</b> , <i>Hygrophila polysperma</i> . . . . .	51
<b>Japanese Knotweed</b> , <i>Polygonum cuspidatum</i> . . . . .	40
<i>Lythrum salicaria</i> , <b>Purple Loosestrife</b> . . . . .	37
<i>Morone americana</i> , <b>White Perch</b> . . . . .	10
<b>Mud Bithynia</b> or <b>Faucet Snail</b> , <i>Bithynia tentaculata</i> . . . . .	23
<i>Myriophyllum aquaticum</i> , <b>Parrot's Feather</b> . . . . .	50
<i>Myriophyllum heterophyllum</i> , <b>Variable-leaved Watermilfoil</b> . . . . .	46
<i>Myriophyllum spicatum</i> , <b>Eurasian Watermilfoil</b> . . . . .	38
<i>Neogobius melanostomus</i> , <b>Round Goby</b> . . . . .	12
<b>New Zealand Mudsnail</b> , <i>Potamopyrgus antipodarum</i> . . . . .	27
<b>Northern Snakehead</b> , <i>Channa argus</i> . . . . .	14
<i>Nymphaoides peltata</i> , <b>Yellow Floating Heart</b> . . . . .	44
<i>Orconectes rusticus</i> , <b>Rusty Crayfish</b> . . . . .	30
<b>Parrot's Feather</b> , <i>Myriophyllum aquaticum</i> . . . . .	50
<i>Phragmites australis</i> , <b>Common Reed</b> . . . . .	43
<i>Polygonum cuspidatum</i> , <b>Japanese Knotweed</b> . . . . .	40

.....

<i>Potamogeton crispus</i> , <b>Curly-leaf Pondweed</b> . . . . .	45
<i>Potamopyrgus antipodarum</i> , <b>New Zealand Mudsnaill</b> . . . . .	27
<i>Procambarus acutus acutus</i> , <b>White River Crayfish</b> . . . . .	31
<i>Proterorhinus marmoratus</i> , <b>Tube-nose Goby</b> . . . . .	13
<b>Purple Loosestrife</b> , <i>Lythrum salicaria</i> . . . . .	37
<b>Quagga Mussel</b> , <i>Dreissena bugensis</i> . . . . .	22
<b>Round Goby</b> , <i>Neogobius melanostomus</i> . . . . .	12
<b>Rusty Crayfish</b> , <i>Orconectes rusticus</i> . . . . .	30
<i>Salvinia auriculata</i> ( <i>molesta</i> , <i>biloba</i> , and <i>herzogii</i> ), <b>Salvinia</b> . . . . .	52
<b>Salvinia</b> , <i>Salvinia auriculata</i> ( <i>molesta</i> , <i>biloba</i> , and <i>herzogii</i> ) . . . . .	52
<i>Scardinius erythrophthalmus</i> , <b>European Rudd</b> . . . . .	20
<b>Silver Carp</b> , <i>Hypophthalmichthys molitrix</i> . . . . .	18
<b>Spiny Waterflea</b> , <i>Bythotrephes cederstroemi/longimanus</i> . . . . .	28
<b>Tench</b> , <i>Tinca tinca</i> . . . . .	16
<i>Tinca tinca</i> , <b>Tench</b> . . . . .	16
<i>Trapa natans</i> , <b>Water Chestnut</b> . . . . .	39
<b>Tube-nose Goby</b> , <i>Proterorhinus marmoratus</i> . . . . .	13
<b>Variable-leaved Watermilfoil</b> , <i>Myriophyllum heterophyllum</i> . . . . .	46
<i>Viviparus georgianus</i> , <b>Banded Mysterysnail</b> . . . . .	25
<b>Water Chestnut</b> , <i>Trapa natans</i> . . . . .	39
<b>White Perch</b> , <i>Morone americana</i> . . . . .	10
<b>White River Crayfish</b> , <i>Procambarus acutus acutus</i> . . . . .	31
<b>Yellow Floating Heart</b> , <i>Nymphoides peltata</i> . . . . .	44
<b>Zebra Mussel</b> , <i>Dreissena polymorpha</i> . . . . .	21

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