**LEAVES**
- Four soft, feather-like leaves whorled around stem, widely spaced
- Each leaf has 12-15 leaflets and a blunt tip
- Loses shape out of water

**STEM**
- Can be reddish-brown to whitish-pink; highly variable, 3-9 ft long

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Very small, yellow, grow from spike above water
- In bloom mid-June to late-July
**Aquatic Invasive Species of the Lower Hudson Valley: Priority Species List**

**Plant (Submerged/Floating)**
- Eurasian watermilfoil
- Curly-leaf pondweed
- Brittle Naiad
- Variable-leaf milfoil
- Fanwort
- Brazilian Elodea
- Hydrilla
- Waterwheel
- Starry stonewort
- Water chestnut
- European frog-bit

**Animal (Small Invertebrate)**
- Zebra mussel
- Chinese mystery snail
- Rusty crayfish
- Spiny water flea/Fishhook water flea

**Using this Guide:**
At the top of each species page is the growth form, four-letter code provided by the USDA Plants database, and the LHPRISM tiered categorization number.

<table>
<thead>
<tr>
<th>Growth Form</th>
<th>Tiers</th>
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<tbody>
<tr>
<td>SAV: Submersed Aquatic Vegetation</td>
<td>1: Threat</td>
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<tr>
<td>ALVE</td>
<td>2: Emerging</td>
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<td>FLLF: Floating-leaf</td>
<td>3: Established</td>
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<tr>
<td>FRFL: Free-floating</td>
<td>4: Widespread</td>
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<tr>
<td>INV: Invertebrate Animal</td>
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</tbody>
</table>

This guide was created for the Lower Hudson PRISM to provide information on identifying aquatic invasive species of high priority and data collection protocols for volunteer surveyors.

**Curly-Leaf Pondweed**

*Potamogeton crispus*

**Identification**

**Leaves**
- Stiff, wavy leaves ~2-3 in. long
- Alternate arrangement along stem
- More dense toward end of stem
- Translucent, olive to red color
- Toothed/serrate margins

**Stem**
- Color varies, can grow up to 15 ft.

**Flowers & Reproductive Structures**
- Flowers grow from spike above water, in bloom mid-June
- Reproduces by turions (overwintering buds)
**BRITTLE NAIAD**

*Najas Minor*

**IDENTIFICATION**

**LEAVES**
- Stiff, thin, recurved; ~1-2 in. long
- Opposite arrangement, appear as whorled clusters
- Bright green to green-brown
- Toothed/serrate margins

**STEM**
- Highly branched, appears “bushy”
- Holds form out of water

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Flowers small, inconspicuous at leaf axils

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**FANWORT**

*Cabomba Caroliniana*

**IDENTIFICATION**

**LEAVES**
- Opposite, thin, vein-like, fan-shaped
- Two leaves attached by single petiole
- Secrete gelatinous mucous
- Occasionally has small emergent leaves
- Lose shape out of water

**STEM**
- Can reach up to 32 ft long
- Can survive free-floating for 6-8 weeks

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Small, white or yellow cupped flower
- In bloom May-September
**VARIABLE-LEAF MILFOIL**
*MYRIOPHYLLUM HETEROPHYLLUM*

**LEAVES**
- Has both submerged and emergent leaves
- Submerged: feather-like, whorls of 4-6, with 4-10 leaflets/leaf
- Emergent: lance-shaped, serrate, bract 10-15 cm above water
- Much fuller and close together than Eurasian watermilfoil

**STEM**
- Thick, reddish-brown

**GROWTH**
- Bottle-brush appearance

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**BRAZILIAN ELODEA**
*EGERIA DENSA*

**LEAVES**
- Bright green, very finely serrate, arranged in whorls of 3-6
- Looks similar to both native elodea and hydrilla, but leaves are much longer and more robust

**STEM**
- Dense, branching, up to 15 ft

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Small, white or yellow, 3 petals
- In bloom spring/summer
**HYDRILLA**

*HYDRILLA verticillata*

**IDENTIFICATION**

**LEAVES**
- Green, serrate, arranged in whorls of 3-5, typically 5
- Pointed/lance-shaped

**STEM**
- Dense, branching, up to 30 ft

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Has most reproductive potential;
- Turions (overwintering buds form in leaf axils), tubers (potato-like structures that grow in the sediment), fragmentation
- **HIGH ALERT**

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**WATERWHEEL**

*Aldrovanda vesiculosa*

**IDENTIFICATION**

**LEAVES**
- Arranged in whorls of 4-9
- Carnivorous, clam-like traps at the tip of each leaf, surrounded by 4-6 bristles

**STEM**
- Rootless, free-floating, air-filled for floatation

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Small, white, only opens for a short period of time
- **HIGH ALERT**
**Hydrilla | Brazilian Elodea | Native Elodea**

**Comparison Images**

Native elodea is common, has whorls of 3; neither Brazilian or native Elodea produce tubers.

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**Starry Stonewort**

*Nitellopsis obtusa*

**Identification**

**Leaves**
- Bright green, branch-like, arranged in whorls
- Appears plant-like; rootless macroalgae

**Stem**
- Can grow up to 7 ft.

**Flowers & Reproductive Structures**
- White star-shaped bulbils found at the base. May be in or on top of sediment
- ~size of a grain of rice

**High Alert**
**LEAVES**
- Triangular shaped, serrate, 2-4 cm
- Floating, arranged in a rosette
- Submerged leaves are feather-like

**STEM**
- Cord-like, buoyant, up to 16 ft

**FLOWERS & REPRODUCTIVE STRUCTURES**
- Sharp, four-horned nut, develops under water.
- Living seeds are green, while dead seeds are black

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**ZEBRA MUSSEL**

**DREISSENIA POLYMORPHA**

**SHELL**
- Triangular, sharp point at hinge
- Alternate banding, smooth or wavy
- Brown and white

**SIZE AND SHAPE**
- Very small; can grow to 5 cm but typically fingernail-sized
- Shaped like the letter D

**GROWTH AND BEHAVIOR**
- Attach to hard surfaces, including each other
**European Frog-bit**  
*Hydrocharis morsus-ranae*

### Identification

**Leaves**
- Heart-shaped, 1-2 in wide (small)
- Underside is dark purple/red
- Free-floating

**Stem**
- Arching stalks attached to the mid-vein of each leaf

**Flowers & Reproductive Structures**
- White, cupped, 3 petals

*Note the small size of the leaf. Looks similar to native water lily, but smaller and no gelatinous coating like the native.*

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**Chinese Mystery Snail**  
*Cipangopaludina chinensis*

### Identification

**Shell**
- Smooth, 6-8 rounded whorls
- Olive green, greenish brown, or reddish brown
- Has a “trap door” (operculum)

**Size and Shape**
- Large, up to 2.5 in long
- Rounded edges, deeply indented

**Growth and Behavior**
- Solitary, shells often found along the shore, on rocks
**Rusty Crayfish**

*Orconectes rusticus*

### Identification

**Color**
- Body: Olive green to greenish brown, rusty spots on either side
- Legs: greenish
- Claws: Gray-green to reddish brown, black band at the tips

**Size and Shape**
- Up to 10 cm long, robust claws

**Growth and Behavior**
- Can live in lakes, ponds and streams; prefer rocks, logs, debris

### Survey Protocol

- Safety first! Be sure you have a life jacket, whistle, and anything else you may need. Do not go into any body of water for which you do not have permission to enter.
- Be Prepared. Bring data sheets, pencils, a GPS unit, weed rake, and specimen bags
- When surveying, stick to the littoral zone (depth is 20’ or less). This is where most plants are able to grow.
- The distance between GPS points and sampling depends on the size of the waterbody (1 point/acre). Aim to take a point at least every 100 ft.
- Toss the weed rake twice at each location; once to the left and once to the right, being sure to hold on to the end of the rope! Pull the rope in very slowly as to not lose any plants found.
- Mark the time of the rake toss, species found using the 4-letter code and percent cover. The percent cover is regardless of species, and refers to how dense the overall vegetation is at each point, or how little of the sediment can be seen.
- Note the relative abundance of each species found on the rake using the following:
  - Z = zero (no plants)
  - T = trace (fingerful of plants on the rake)
  - S = sparse (handful of plants on the rake)
  - M = moderate (rake covered in plants)
  - D = dense (rake hard to pull out of water due to excess plants)
**Identification**

**Notable Traits**
- One black eye
- Egg pouch on its back
- Carnivorous

**Size and Shape**
- 10-15 mm (extremely small)
- Long, spiny tail

**Growth and Behavior**
- Tendency to clump into gelatinous mounds
- Two swimming antennae and four pairs of legs

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**Survey Protocol**

- Be sure to include the start and end time, location, your name, and your start and end data point.
- Voucher Specimens
  - If you collect a sample and are unable to identify it but believe it is one of the focal species:
    - Take pictures of the sample trying to include as many parts of the plant as possible (stem, leaf, leaf margin, flowers...). Take pictures with a white background when possible.
    - Put it in a plastic bag filled with water from the site. Label the bag with the time, location, and surveyor name.

*Always collect a voucher specimen for hydrilla, waterwheel, starry stonewort, and spiny water flea unless sampling a location with a known infestation.*