Life, whether we are aware of it or not, is dominated by cycles. The water cycle, the nutrient cycle, the cycle of life itself, are all natural processes, fundamental to life on earth, which essentially follow circular trajectories. One of the great joys of exploring the littoral zone is the discovery of the many ways in which nature’s cycles, grand and minute, elaborate and simple, are played out in these sun-filled watery places.

The annual cycle of the seasons is one of the most obvious--and most extraordinary--cyclical processes in the littoral zone. In Maine, where the environmental conditions vary so sharply from one season to the next, changes in these areas are especially dramatic and at no time are these conditions so extreme as in the winter. How do aquatic plant communities respond to the shortened days, the decrease in the intensity of the sun’s energy, the plummeting air and water temperatures, the transformation of the habitat from one that is warm and liquid, to one that encrusted under a thick layer of ice and snow?

Though each species has its own unique approach to preparing for and surviving through the hardships of winter, there are some common strategies employed. Since most aquatic plants evolved from terrestrial plants, it is not surprising that many of their over-wintering strategies are similar to those of their wild and cultivated upland kin; strategies you may already know well from observing the plants in your garden. Aquatic plants, just like garden plants, can be sorted into groups based up what they do in response to winter and how they provide for regeneration the following spring.

**Annuals:** Annual plants, in a manner of speaking, are those that have chosen not to bother with surviving the winter at all. As their name implies, annuals live for one growing season only and must produce viable seed by season’s end if they are to ensure a new generation the following year. This strategy has advantages and disadvantages. Seeds are more durable and mobile than rhizomes and rootstalks. They can disperse widely and settle into small openings in the plant cover. Many seeds are able to lie dormant in the sediments for many years awaiting favorable conditions. The product of sexual reproduction, seeds also provide genetic diversity, helping to ensure the “adaptability” of the species to environmental changes. Energy-wise, however, seed production is costly, and compared to roots and rhizomes, seeds pack away relatively little in the way of energy reserves.

The tiny “seedling-like” waterwort (*Elatine minima*) is a good example of a native annual. The miniature flowers and seed capsules of this plant are produced in the leaf axils (where the leaf meets the stem) during the warm summer months. The ripened seeds drop and settle onto the bottom sediments through the late summer and fall, and there they remain, in a state of dormancy, through the winter. Whereas some seeds of native annuals, like wild rice (*Zizania* spp.), germinate prolifically in disturbed sediments, the key to successful germination for waterwort is a stable, undisturbed bottom and good water clarity.

Of the eleven invasive aquatic plants listed on Maine’s watch list, only European naiad (*Najas minor*) is a true annual. The abundant seed production of this invader--tens of millions of *N. minor* seeds per acre have been counted--is a particular torment to those trying to control this plant. During the late summer or early fall, the stems of the naiads become brittle, and the profusely branched stem tips break into small fragments. Seeds remain attached in the leaf axils, and wind and water currents disperse the fragments.
Perennials: Most aquatic plant species found in Maine are perennials; plants capable of over-wintering, in whole or in part, and surviving three or more years. Some, indeed, are very long-lived; a water-lily bed may be hundreds of years old. Aquatic perennials often form extensive and overlapping rhizome systems, expanding every growing season. These persistent mat-like networks stabilize shoreline and bottom sediments throughout the year, making these plants critical components of the aquatic habitat and important allies in the effort to protect water quality.

Some perennials, like cattails (Typha spp.), send new shoots up from their rhizomes late in the growing season that remain dormant in the sediments until spring. Others, blue-flag (Iris verisicolor) for example, die back to the root or rhizome completely, waiting for spring to send up new growth. Several perennials persist as “evergreens” through the winter, and continue to photosynthesize at a reduced rate under the ice and snow. Our native common waterweed (Elodea canadensis) is a good example of an evergreen perennial. And though it may look rather ragged and drained come spring, the stems (and even stem fragments) of invasive variable-leaf milfoil (Myriophyllum heterophyllum) may also over winter in this manner, new growth ready, come spring, to unfurl from the growth tip of each blackened stem.

Most perennials that propagate primarily by root division have back up strategies for ensuring long-term success. For example, most produce seeds. Some develop compact vegetative structures called turions (also referred to as winter buds) or tubers, turion-like structures emerging from subterranean stems. These starchy, densely packed structures have the durability and mobility advantages of seeds, without the high-energy demand or the hit-or-miss nature of sexual reproduction. The highly invasive hydrilla (Hydrilla verticillata) sets abundant turions and tubers during the growing season, both structures helping to earn this plant its dubious title of the “perfect weed.” Hydrilla tubers, for example, are unaffected by aquatic herbicides and may remain dormant in the sediments for up to ten years.

Some aquatic perennials have no roots or rhizomes to “die back” to at all. The duckweeds (Lemna spp.) are examples of free-floating native perennials. The tiny but prolific duckweeds are more cold tolerant than many other aquatic vascular plants, and can continue to grow at a normal rate in water temperatures as low as 7º C. In fact, solar radiation allows a dense mat of duckweed to generate its own microclimate (with temperatures up to 10º higher than ambient air temperatures). As temperatures approach freezing, the winter buds of the duckweeds sink to the pond bottom where they lay dormant until warmer conditions return. In the spring, the buds become buoyant and bob back to the surface, completing their seasonal cycle.

Some sources:

1. Through the Looking Glass A Field Guide to Aquatic Plants, Susan Borman et. al., Wisconsin Lakes Partnership, 1997
3. U.S. Army Engineer Research and Development Center (ERDC).website
You are out in your little boat exploring the “fertile fringe” of your lake or pond, the shallow areas where sunlight penetrates to the bottom sediments and the rooted aquatic plants create a blurry mosaic of form and color. You notice that within the littoral area, the plants are loosely arranged in distinct, though overlapping “zones” or “communities.” The emergent plants such as cattails, pickerelweed and arrowhead hug the shore. These plants are adapted to withstand wave action and fluctuating water levels. With stiff but buoyant leaves and heavy-duty interlocking roots, they form an excellent defense against shoreline erosion and important cover for nesting waterfowl.

Beyond the emergent plants you find the floating leaved plant community. This community is notable for the patches of circular or elliptical leaves floating on the surface and later in the season for the beautiful and often fragrant flowers that emerge among the leaves. Some (like the spatterdock and fragrant water lily) are anchored to the bottoms sediments by tough elastic stalks; some (like the tiny duckweeds) float freely among the rooted plants.

When you look very closely, down below the water’s surface, you notice a third community: the graceful and wondrously varied world of the submersed plants. This group includes the translucent leaved pondweeds, the tiny waterweeds, the delicate naiads and the free-floating, plankton-eating bladderworts. These plants are all well adapted to the buoyancy of life underwater and many lack the stiff cell structure needed for life at or above the surface. The leaves here are finely divided or long and wispy, like cellophane noodles. Some submersed plants also produce a set of different, more durable, leaves to accompany their flowering parts at or above the surface.

The best time to view the submersed community is when the air is very still and the sunlight is not directly overhead. Early morning and late afternoon usually provide the best viewing conditions. Under these conditions, and perhaps with a pair of polarized sunglasses, you can see through the surface of the lake as if it were polished glass, each plant fully revealed in exquisite detail. However, if the wind picks up and begins to ruffle the surface you will need a piece of equipment - a simple viewing scope - to continue your exploration. The 4 ½” scope used by VLMP water quality monitors generally will not provide a wide enough field of view for plant survey work. To the left is a diagram of an inexpensive, build-it-yourself “wide-angle” viewing scope. For complete instructions for constructing a simple bucket scope, please see page 3.2.1 or download it from the VLMP website www.mainevlmp.org/volunteer-info/invasive-plant-monitors/ipp-resources/#Survey
The Interactive Field Guide to Aquatic Invaders, based on the Maine Field Guide to Invasive Aquatic Plants, provides users with a number of enhancements, including:

- Photos, line drawings and scanned images including plants in situ (what one would see from a boat), close-up shots, micrographs of key structures such as fruits and bracts for the 11 invasive aquatic plants on Maine's watch list and their native "look-alikes"
- Easy cross reference links providing comparisons of the invaders and their native “look-alikes”
- Factual information for each of the featured plants including: habitat, species description, origin and range, annual cycle, value in the aquatic community (for native species) and potential impacts (for invasive species)
- Comparison Charts for quick identification of similar species
- A Plant Identification Key to help determine possible identification for plant specimens
- A dichotomous Quick Key to identifying (or ruling out) the eleven invasive species
- Botanical terms are hyperlinked to an illustrated glossary

Much work is being done at the state and local level to prevent the spread of invasive plants into Maine’s lakes, ponds and streams. Prevention of the spread of these organisms through raising public awareness and encouraging routine boat inspections is, as it should be, the primary focus of Maine’s effort at present. Experience in other states has shown, however, that prevention is not enough. Prevention efforts, no matter how comprehensive in scope, are never 100% effective. If and when an invader does slip though the cracks, the best hope for eradicating it, or at least managing it in an environmentally sound manner, is early detection. This is where the Interactive Field Guide comes in.

Relatively few of Maine’s 6000+ lakes and ponds and thousands of miles of rivers have been screened for the presence of invasive plants. Developing, implementing and sustaining a comprehensive early detection team in a state with so much aquatic plant habitat is a daunting task. If Maine’s early detection program is to be effective, all Mainers who have an interest in the protection of our water resources, volunteers, professionals, agency personnel, students, lake association members, boaters, anglers, civic groups and others must be encouraged to participate in the effort, and be provided with the information and technical support needed to succeed.

Through its Invasive Plant Patrol Program (initiated in 2001) the Maine Volunteer Lake Monitoring Program has trained over 3500 volunteers to screen for and identify the eleven invasive aquatic plants on Maine’s watch-list and to distinguish them from harmless native “look-alike” plants. The new Maine Field Guide to Invasive Aquatic Plants and the Quick Key to Ruling out Maine’s Eleven Most Unwanted Invasive Aquatic Plants, provide handy, field-friendly resources for trained patrollers and the general public. The purpose of the Interactive Field Guide is to complement these publications with a widely accessible, easily revised and expandable resource.
A Key to Common Native Maine Aquatic Plant Species

Adapted by

VLMP
Maine Volunteer Lake Monitoring Program
# A Key to Common Native Maine Aquatic Plant Species

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How to Use this Key

In this key you are asked to make a series of choices between descriptions of different plants. Eventually, by observing the plant you are trying to identify and making these choices, you will arrive at an identification of the plant.

First, go to page 2.4.4, where you are asked to decide whether the plant has a submersed, floating-leaved, or emergent growth habit. By choosing one of these, the key then directs you to a page and number, where you will again make some choices. Each choice will be between two, three, or sometimes more options. In many cases you will need to look closely at the plant in order to be able to decide which description it fits.

There is a glossary on page 2.4.20 should you encounter an unknown term.

Thirty-seven of Maine’s common native aquatic plants are covered in this key. However, there are over 120 aquatic plant species in Maine, so it is possible you are trying to identify a plant not covered by this key. Should you have questions or want a confirmation on an identification you are encouraged to send a plant sample to the Volunteer Lake Monitoring Program. Detailed information on how to prepare your specimen for shipping is provided on page 3.1.10 and in the forms section of this handbook. This information can also be found online at www.mainevlmp.org/reporting-aquatic-species-6/

Please do not copy without proper credit. Additional copies of this key are available upon request from: Maine VLMP
24 Maple Hill Road, Auburn, Maine 04210
207-783-7733.

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All illustrations and information, except those noted below, were adapted with permission from A Key to Common Vermont Aquatic Plant Species by Susan Warren, Lakes & Ponds Unit, Water Quality Division, Vermont Department of Environmental Conservation.

CHOOSE BETWEEN 1A, 1B, or 1C BELOW:

1A. **Submersed:**
Plants are growing completely or largely beneath the water's surface. page 2.4.5

1B. **Floating-leaved:**
Plants having at least some leaves floating on the water's surface (surface of floating leaves shed water). page 2.4.14

1C. **Emergent:**
Plants are rooted on the pond bottom and extend upright above the water's surface. page 2.4.17
**SUBMERSED PLANTS**

2A. **Basal Leaves** –
All leaves emerge from a single point near the pond bottom......page 2.4.6, #4

2B. **Leaves on a Stem** –
Leaves are arranged along the stem
..................................................see #3 below

3A. **Leaves undivided, flattened, may be toothed**........................................page 2.4.7, #5

3B. **Leaves finely divided, or narrow round leaves (not flat)**.........................page 2.4.11, #8
4. Submersed Plants With Only Basal Leaves

4A. Pipewort (*Eriocaulon aquaticum*)
- Roots with light & dark striations
- In shallow water, Pipewort will grow an emergent “flower” resembling a button
- Plants are usually 1 ½ to 3 inches high

4B. Water Lobelia (*Lobelia dortmanna*)
- Base of plant resembles pipewort, but leaves are rounded at the tip
- Flowers are white to lavender

4C. Quillwort (*Isoetes spp.*)
- Reproductive structures are below water’s surface and roots are white (not striated)
- Small spikey plant, may resemble the basal leaves of the pipewort plant

4D. Wild Celery, Eel Grass (*Vallisneria americana*)
- Seed Pod
- Leaves are ½ to 1 inch wide and up to 2 feet long
5. Submersed Plants With Blade-shaped, Entire Leaves

5A. Leaves in whorls of three or more around the stem.........see #6 below

5B. Leaves arranged oppositely or alternately along the stem....see page 2.4.8, #7

6. Whorled Leaves

6A. Waterweeds:

Common Waterweed (Elodea canadensis) & Slender Waterweed (Elodea nuttallii)

Leaves 3 in a whorl usually ½ to 1 inch long, plants can vary in height from less than 1 foot to upwards of 6 feet

The leaves of common waterweed are generally shorter, wider and more blunt at the tip, than the leaves of slender waterweed

6B. Slender Naiad (Najas flexilis)

Carefully pull a leaf off. Teeth are almost invisible, even with a hand lens.

Leaves are about 1 inch long.

Plants are usually 1 or 2 feet high with branching stems.

Leaves may also occur in pairs or loose clusters
7. Submersed Plants with Opposite or Alternate Blade-shaped Leaves

7A. Water Starwort (*Callitriche* spp.)

- There are 2 species of Water Starwort in Maine.
- Very fragile leaves about 1 inch long and 1/32 inch wide, in pairs.
- Generally a small plant growing in shallow water.
- Sometimes has a group of small round floating leaves at the surface.
- Tiny nutlets in leaf axils.

7B. Pondweeds (*Potamogeton* spp.)

- There are 22 species of pondweeds in Maine, varying between very small thin leaved species to those with large wide leaves.
- They are distinguished as a group by possessing a leaf mid-vein (look closely on the thin-leaves species). Also, pondweeds have small sheath-like structures (stipules) at the base of each leaf. In some species the stipule is fused to the leaf and is difficult to see.

Large-leaf Pondweed (*Potamogeton amplifolius*)

- Large arched leaves with wavy edges, often brown, 3 or 4 inches long, and up to 2 inches wide.
- This plant can be up to 6 or 7 feet high.
- Sometimes has floating leaves.
- Seed-head above water's surface.
7B. Pondweeds Continued - Some Common Pondweeds

**Floating-leaved Pondweed** (*Potamogeton natans*)

Narrow stem-like submersed leaves, up to 1/8 inch wide, usually brown, floating leaves are 2 to 3 inches long, usually growing in water 2 or 3 feet deep.

**Variable Pondweed** (*Potamogeton gramineus*)

Heavily branched, many leaves, leaves are ½ inch to 4 inches long and may have small floating leaves.

**Small Pondweed** (*Potamogeton pusillus*)

No floating leaves are produced. Submersed leaves are ½ to 3 inches long, linear and attached directly to the stem. Look for a pair of raised glands at the base of the leaf (Magnification may be needed.)
7B. Pondweeds Continued – Some Common Pondweeds

**Spiral Fruited Pondweed**  
(*Potamogeton spirillus*)

Submersed stems compact and highly branched. Linear leaves may have curly appearance. Stipules fused to the leaf blade for more than half their length. Floating leaves may occur.

**Clasping Pondweed**  
(*Potamogeton perfoliatus*)

Leaves clasp the stem. No floating leaves are produced.

**Fern Pondweed**  
(*Potamogeton robbinsii*)

Leaves are two-ranked, creating a feather or fern-like appearance.

**Ribbon Pondweed**  
(*Potamogeton epihydrous*)

Leaves are alternate. Submersed leaves are striped and floating leaves are supported by a slender leaf stalk.
8. Submersed Plants With Finely Divided Leaves Along A Stem. These plants must be examined closely to determine which kind of divided leaves they have.

8A. Watermilfoils (*Myriophyllum* spp.)

- Leaves are arranged radially around the stem; not always in strict whorls.
- There are 6 native species of watermilfoil in Maine.
- All leafy milfoils have feather divided leaves (One native milfoil species lacks true leaves).

8B. Common Bladderwort (*Utricularia macrorhiza*, aka, *U. vulgaris*)

- The leaves of common bladderwort are branch divided and alternately arranged along the stem.
- Maine has 8 species of bladderworts.
- Both species shown here have numerous small “bladders” attached to the leaves.

8C. Large Purple Bladderwort (*Utricularia purpurea*)

- The leaves of large purple bladderwort are branch divided and arranged in whorls, spaced loosely along the stem.
8D. **Water Crowfoot** (*Ranunculus* spp.)

There are 2 species of water crowfoot in Maine.

This plant is usually a few feet long, sometimes trailing just below the water surface. Leaves are branch divided and alternately arranged along the stem. The base of the leaf stem is thickened and clasps around the main stem.

8E. **Water Marigold** (*Bidens beckii, aka Megalodonta beckii*)

Occasionally has a yellow flower above the water’s surface.

Two branch-divided leaves, oppositely arranged and loosely spaced along the stem. The broadly-branching leaves have no leaf stem. As a result, the pair may resemble a whorl of six smaller leaves on short leaf stems.
SUBMERSED PLANTS — CONTINUED

8F. Coontail (*Ceratophyllum demersum*)

Leaf whorls are clustered at the ends of the branches, giving the plant the appearance of a raccoon’s tail.

Maine is home to one other *Ceratophyllum* species.

Leaves, minutely serrated

8G. Stoneworts (*Chara spp.* or *Nitella spp.*)

These are actually large upright forms of algae. Stoneworts usually grow in tangled masses along the bottom.

*Chara* is brittle and coarse, covered with a mineral scale

*Nitella* is smooth and flexible

When fresh, *Chara* gives off a distinctive skunk-like odor.
FLOATING LEAVED PLANTS


9A. Plants with both floating leaves, and submersed leaves on a stem.

9B. Very small floating plants, not rooted to the pond bottom. Each plant has a small root or roots hanging from underneath.

9C. Plants with only floating leaves on stems which are rooted in the pond bottom.

If it looks like any of these page 2.4.8, #7B

If it has thin leaves in pairs, and tiny round leaves at the surface........page 2.4.8, #7A.

This is Water Starwort.

Duckweed (*Lemna minor*)

[actual size]

Big Duckweed (*Spirodella polyrhiza*)

[actual size]

Broad floating leaves........ page 2.4.15, #10

Long, narrow, grass-like leaves........ page 2.4.16, #11
10. **Broad Floating Leaves On A Stem Which Is Rooted In The Pond Bottom.** Choose between 10A through 10D below.

10A. Large elongated floating leaves with round lobes and large yellow ball-shaped flowers. *Spatterdock, Yellow Water-lily* (*Nuphar variegata*)

10B. Large rounded floating leaves with pointed lobes and white flowers. *Fragrant Waterlily* (*Nymphaea odorata*)

10C. Elliptical-shaped leaves with stem attached at the center of the leaf. *Watershield* (*Brasenia schreberi*)

Leaves are usually 2 or 3 inches long. The stem and underside of the leaf is often covered with a clear, jelly-like material.
10D. Little Floating Heart (*Nymphoides cordata*)

- Small white flowers
- Leaves are the size of silver dollars. Stems are rooted in pond bottom.
- Bunch of banana-like "roots" on stem just below water's surface

11. Long Narrow, Grass-like Floating Leaves
Burreed (*Sparganium spp.*)

- Maine has 7 species of aquatic burreeds, some with floating leaves and others with erect emergent leaves
- Hard, burr-like seed heads
- Leaves reach the surface and float horizontally along it
EMERGENT PLANTS

12. Plants Which Are Rooted On The Pond Bottom And With Leaves and/or Stems That Extend Upright Above The Water’s Surface.

12A. Leaves long and narrow, may be round in cross-section.....page 2.4.18, #14

12B. Leaves broad....#13 below.

13A. Arrowhead (Sagittaria spp.)
- Leaves with pointed lobes.
- Leaf size is variable.
- Small white flowers with 3 petals
- There are 5 species of arrowhead in Maine some erect emergents, others with floating leaves

13B. Pickerelweed (Pontederia cordata)
- Leaves with rounded lobes.
- Small purple flowers in cluster.
- Plants are usually 1 or 2 feet tall.

14A. Cattail (Typha latifolia)

There is one other species of cattail in Maine

Leaves up to 5 feet tall.
Dark brown “catkins”, 5-6 inches long.

14B. Horsetail (Equisetum spp.)

Round, hollow stalks, often 1-2 feet high, rough in texture

Stalk in segments

Some species branch at each segment

14C. The following three emergent species may produce dense patches of fine, hair-like submersed leaves.

Bayonet Rush (Juncus militaris)

Tall, erect, segmented stems rise above water surface. Flowers and fruits emerge on a spray of branching stems below the tip. Thin, hair-like, submersed leaves rise from the base. Tip: squeeze the emergent stem between fingers and pull firmly, to feel the “pop” of the internal segments.
14C. continued

**Robbins Spikerush** (*Eleocharis robbinsii*)

Stems are stiff, slender and triangular. They are tipped with a small spikelet that is often difficult to see.

Fine, hair-like underwater stems are sterile.

**Water Bulrush** (*Schoenoplectus subterminalis*)

Leaves sheath one another at the base. Leaf tips may float at the water surface.

Only the tips of fertile stems poke out of the water. Solitary spikelets emerge from fertile stems, below the tip.

Hair-like leaves arise from the base.
GLOSSARY

axil - the junction between a stem and a leaf or branch

divided leaf - a leaf that is cut into multiple smaller divisions

fruit - the seed bearing portion of a plant

lobe - a partial division of a leaf

midvein - the main or central vein of a leaf; not all plants have leaves with midveins

nutlet - dry fruit having a hard shell which usually contains only one seed

sheath - a portion of the leaf that wraps around the stem of the plant

stipule - a small sheath-like structure borne in the axil of the leaves in some species

whorl - a circle of three or more leaves radiating from the same point on a stem
REFERENCES FOR AQUATIC PLANT IDENTIFICATION


VLMP Interactive Field Guide to Aquatic Invaders website: www.mciap.org/herbarium

Northeast Aquatic Nuisance Species Panel website: www.northeastans.org
Identification resources for non-native species: www.northeastans.org/identification-resources.html
Geographic information about non-native species: www.northeastans.org/geographic-resources.html

University of Wisconsin Herbarium website: www.botany.wisc.edu/wisflora/

University of Florida Center for Aquatic and Invasive Plants website. http://plants.ifas.ufl.edu/

Aquatic Plant Information System Compact Disc. Department of the Army. Engineer Research and Development Center, Corps of Engineers. Waterways Experimental Station. CEERD-EE-A. 3909 Halls Ferry Road, Vicksburg, MI 38180-6199.

URL: http://www.ipane.org
Tips for Taking Underwater Photographs

When we wrote to Dennis Roberge to ask if he would be willing to share some of his tips for taking great underwater photographs, he replied, with characteristic humility, that he did not object to the idea in the least, but would have to pass as he did not really have much to say on subject other than he uses a good camera and takes lots of photos. Later, when we met to select the photos for an article featuring Dennis’ work, Dennis began to elaborate upon his newfound passion, and tips began to emerge. We have presented Dennis’ tips here in the hope of inspiring others to discover and capture similarly wonderful sights below the surface of their own favorite watery places.

1. Use a good quality camera. Dennis uses a Sea and Sea DX-8000/8000G housing and digital camera with a 0.6x wide-angle conversion lens (28mm – 80mm macro zoom). The camera takes very high resolution (8.2 mega pixel) images, and comes with lots of bells and whistles including settings to adjust light input, and the ability to take 30 minute videos.

2. Take lots and lots of photos. With digital photography, there is no reason to hold back. Each summer Dennis typically shoots several thousand photos, deleting those he is not happy with.

3. If you are not a SCUBA diver and/or don’t have a good flash system, stick to depths of less than six feet where natural light is sufficient to get excellent photographs and the subject matter is easily accessed with snorkeling equipment. All of the shots you see here were taken while snorkeling.

4. Be safe! Let boaters know where you are. Dennis swims with a six-foot-long, day-glow orange, inflatable raft in tow. The 50-foot tether provides a convenient place to lash a mesh bag for collecting plant samples.

5. Don’t think you have to have special training or an artist’s eye to get good photos. When asked about this, Dennis casually revealed that in fact he really can’t see much of anything when he is in the water. He can’t wear his glasses under his mask and until next year when he gets his prescription dive mask “everything is pretty much a blur.” (We can hardly wait to see what Dennis will do with his craft when he can actually see what he is doing!)

6. Feed two fish with one worm. In the process of scouring the shallows for new subjects to photograph, Dennis, a Certified Plant Patroller, conducts screening surveys on many Maine waterbodies.

Littorally Speaking

Wonders Below the Surface

By Roberta Hill

Photos and captions by Dennis Roberge

It was almost forty years ago since those first complete, full-color portraits of planet earth floating in the vast sea of space were beamed back to earth by Apollo astronauts. The photos had an instant and dramatic effect on many of us who saw them. They helped us to see, as if for the first time, the wonder, beauty, and fragility of the planet we thought we knew so well. Not surprisingly, this collective sense of awe inspired by the Apollo photos is now largely credited for kick-starting the environmental movement here in the United States and around the globe.

Dennis Roberge’s photos of the littoral life in Maine lakes have the ability to elicit a similar experience. As lake monitors and plant patrollers we know, perhaps better than most, the remarkable nature of shallow, sun-filled areas of Maine’s lakes, ponds and streams. But one’s sense of the beauty, intricacy, wonder and fragility of these areas is suddenly intensified when one gets a chance to see these areas as a fish, or a turtle, or a diving bird may see them. As we saw in the 1970’s, such an experience has the power to inspire not only awe, but action. And though it is too early to know for certain what kind of “movement” may result from the release of Dennis’s amazing photographs, there is little doubt the potential for a positive and lasting impact is here.

So please sit back for a moment to view these lovely images of life in the “fertile fringe.” Each glimpse is unique, and each, as you will soon see, speaks eloquently for itself. Words have been kept to a minimum on these pages in order to allow more space for the images. And one last thing . . . what you see here is a very small sampling of the thousands of photos Dennis shot during the summer of 2007. Please click on www.MaineVolunteerLakeMonitors.org/LakeLife to see the photos printed here—all larger, and all in full color—as well as dozens more. Enjoy!
HOW TO PRESS AND MOUNT AQUATIC PLANTS

Adapted with permission from Washington State Department of Ecology
http://www.ecy.wa.gov/encyhome.html

Materials Needed:

**Plant Press** * - may be purchased or built. It consists of alternate layers of corrugated cardboard, absorbent (blotting) paper or newspaper, and equal-sized pieces of plywood with straps or some other method of applying even pressure.

**Pencil and Waterproof Paper** - for making notes on site.

**Herbarium Paper** * - acid-free, 100 percent rag paper is best. If you would rather buy paper locally, try to use heavy stock, relatively acid-free paper with a high rag content. High grade thick typing paper will work and is usually found at quality stationary stores, or university bookstores generally sell "biology paper" which is good quality 8 ½ by 11 inch white paper.

**Packets** * - for extra plant structures (like seeds), use small envelopes or a piece of folded paper (2 x 3 inches).

**Herbarium Paste** * - available from biological supply companies. White glue can also be used (should have a polyvinyl acetate base).

**Linen Tape** - book binders tape is best. Cellophane tapes should be avoided.

**Labels** * - See the sample label at the end of the article for an example of a completed label. They should be sized to fit in the lower right corner of the herbarium paper.

* These items are available from biological supply companies.

**Collect the Plant**

1. Collect as much of the plant as possible: include roots, stems, leaves, flowers, and fruits. Plants may be collected by hand pulling, or using a weighted rake to gather plants in deeper water.

2. Write as much information about the plant as possible on the notepaper (the information will be used later for aid in plant identification and for labeling the plant). Include the date; collector's name and address; location (name of waterbody as well as the location of the waterbody); depth of water; flow rate of water; substrate (sediment) description; whether leaves and/or flowers are submerged (below the water surface), floating, or emergent (above the water surface); color and odor of flowers; and names of the plant species associated with the collected plant.

3. Wash the plant in clean water to remove algae, debris, and sediment. Keep the plants moist until they can be pressed.
Press the Plant:

Note: It is easiest to identify aquatic plants before pressing. If this is not possible, press the plant while it is fresh, then send it to an aquatic plant expert as instructed below.

1. Prepare the plants for pressing:
   - For delicate submersed plants, the best method is to float the plant onto a sheet of paper (newspaper or a heavy stock paper will work, or you can float the plant directly onto the herbarium paper). This is accomplished by placing the plant in a pan of water with the paper below it. Position the plant on the paper and hold it in place with a finger. Slowly lift the paper and plant from the water. The water flowing from the paper should separate the leaves while the plant adheres to the wet paper. Cover the plant with newspaper or absorbent paper. (If the plants tend to stick to the paper, they can be covered on one side with wax paper).
   - When pressing plants with whorled or finely divided leaves, it is useful to separate one node (the stem section where the leaves are attached) and float that onto a small portion of the paper. This yields a cross section showing the leaf pattern.
   - For plants with large bulky stems, roots, or leaves, the bulky portion can be split before pressing to facilitate drying and to prevent uneven pressure in the press.
   - If extra flowers, fruits, or vegetative parts are collected, these should be pressed, dried, and later placed in the packets and glued to the herbarium paper.

2. Press the plant material by placing the plant between two sheets of newspaper or absorbent paper then sandwiching this between two sheets of corrugated cardboard. Several prepared specimens can be stacked in this manner (label or number the plants so you know which plant matches which field note). Then, put the stack between two firm pieces of wood and apply an even pressure using straps, bolts, or a heavy weight. Place in a warm, dry area. To avoid mildew, change the newspaper periodically until the plants are dry. The plants will dry faster if placed over a heat register, fan, or incandescent light bulbs.

Mount the Plant:

Note: If identification of the specimen needs to be verified, send a duplicate pressed, but unmounted specimen with a complete label to an authority on aquatic plants. They will keep this specimen for their collection and notify you of the plant’s name. Be sure the two specimens are of the same species.

1. Once the plant has dried and is identified, it is mounted and kept for future reference:
   - Arrange the plants on a piece of herbarium paper. If the plant is too long, it may be cut into several sections and placed lengthwise on the paper.
   - Either glue or tape the specimen to the paper (the use of glue or paste will sometimes tend to cause delicate submersed plants to curl; tape may be preferable in such cases).
Complete a label with the plant's Latin (scientific) name, location, site description, name of collector, and the date collected. Attach the label to the lower right corner of the paper.

- If additional reproductive parts (seeds, fruits, flowers) or vegetative parts have been collected, these are placed in the packet. This is glued to the top of the herbarium paper so the contents may be accessed.

2. Care should be taken to ensure that the specimens are not damaged by insects. Mounted plants should be stored with an insecticide or repellent (moth balls) to prevent colonization by insects.

Example of a Sample Label:

<table>
<thead>
<tr>
<th>MAINE VOLUNTEER LAKE MONITORING PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Name</strong></td>
</tr>
<tr>
<td><strong>Site Description</strong></td>
</tr>
<tr>
<td><strong>Collector's Name and Date collected</strong></td>
</tr>
</tbody>
</table>

HOW TO BUILD YOUR OWN PLANT PRESS

By Fred Cummings, Invasive Plant Patroller for Casco and Otisfield

Sources for materials:

- Fat Andy’s, Yarmouth, Maine (low prices on hardwood; buy short board ends and then rip them down on a table saw. Get boards as wide as you can.)
- Foster and Company (on the internet for rivets)
- Herbarium Supply Co. ([www.herbariumsupply.com](http://www.herbariumsupply.com) for straps)
- Hardware store

Materials List:

- 8 hardwood strips 1/2" x 1" x 18"
- 12 hardwood strips 1/2" x 1" x 12"
- 32+ 3/16" x 1 1/8" alum rivets (either single end or double end rivets)
- 16 small size wood screws 3/4" long
- Carpenters wood glue
- Sand paper
- Polyurethane
- 2 straps
- Blotters and cardboard

Steps to Construct:
- Cut wood strips from boards at least 18" long. Rip 20 strips to the dimensions given above. Be as precise as possible.
- Sand the strips.
- Drill holes. The size depends on size of rivets. Check with vendor when you order rivets. Drill all holes on centerline of ½" width.
  - For four of the 18" strips: Measure from each end, ½" then drill 4 holes spaced 3 3/8" apart.
  - For the other four 18" strips: Measure in ½" from each end and drill holes.
  - For four of the 12" strips: Measure in ½" from each end then drill 2 holes 3 3/8".
  - For the other eight 12" strips: Measure in ½" from each end and drill holes.
- To keep the frames square as you rivet them together, you might want to make a jig.
- Put a dab of glue where each rivet will be, then start to put rivets in. I did the four corners first to make sure it was square.
- Finish putting all the strips together then drill holes at cross-sections of rest of frames. Do not drill all the way thru, just slightly into bottom piece, and then countersink the top to fit screw flush with top when tightened.
- When construction is complete, put a couple of coats of polyurethane or varnish to finish.

Quite a lot of work goes into making the press, but if you like to work with wood it is a lot of fun. If you have any questions, or would like some help in making these you can call me Fred Cummings 627-3234. Hope to see you out on the water, collecting plants.