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News from CART

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I am a botanist with a specialization in aquatic and wetland plant biology. Wetlands are a legally protected natural resource in Massachusetts, and a wetland is defined largely by the array of plant species found within it. In order to protect our wetlands, we must be able to identify them with accuracy, and we must understand how one wetland differs from another. Procedures for the identification and delineation of these areas necessitate the correct recognition of plant species.

The delicate ecosystems generally termed “wetlands” (including bogs, marshes and swamps) are low-lying areas of land covered with shallow water that support hydrophytic vegetation—plants adapted to life in saturated soils. Wetland ecosystems provide significant natural resources to a region, including pollution abatement, flood and erosion control, groundwater recharge, and critical wildlife habitat. Because the intrinsic values of these areas were largely under-appreciated in this country, there has been a significant loss of wetlands from wetland alteration and destruction since colonial times. It has been estimated that Massachusetts lost 28% of its wetland acreage between 1780 and the mid-1980s.

Fortunately, wetlands are now legally protected in this country. In Massachusetts, the first state to regulate wetlands, protection is afforded through local and state permitting requirements under the Wetlands Protection Act. Explicit wetland plant communities and water conditions are specified in the Act, and it is these two defining features—plants and water—that are protected by the Act. Wetland identification and delineation (boundary demarcation) procedures are outlined in the state’s delineation manual. These procedures rely largely on identification of vegetation to recognize wetland areas and their boundaries for regulatory purposes.

Since the overall success of wetland protection efforts relies on accurately identifying wetlands—hence accurate plant identification—proper recognition of the flora is paramount. The common use of wetland plant species in wetland delineation and restoration efforts in the U.S. has created a demand for people knowledgeable in their identification. Plant identification skills are now emphasized in wetlands science training.

One of the courses I teach is “Wetlands Biology,” an elective for juniors and seniors in our department’s Environmental Concentration. Fortunately, there are numerous marshes (freshwater and saltwater) and bogs within an hour’s drive of Bridgewater, so that my students can examine the local plant life first-hand. Among the wetlands we have explored are the salt marsh near Duxbury Beach, the Pine-Hill Cemetery bog in West Bridgewater, and even a cattail marsh here on campus.

However, I soon discovered that, although field guides and manuals on wetland plant identification are plentiful, none was appropriate for my students. Either they were too highly technical and therefore burdensome for people untrained in plant identification or too elementary, often lacking an explicit method of plant identification. In addition, most of the manuals currently on the market embrace a broad geographic range (e.g., the entire northeastern U.S.), including an unwieldy number of plant species not found in Massachusetts.

Another drawback to all the manuals I found was that they identify the plants only as they look in summer, with leaves and flowers, creating a major drawback for their use, since conservationists (as well as my students) sometimes have to identify wetlands during the winter season. I found only one field guide devoted exclusively to identifying plants found in Massachusetts, and it was inadequate—little more than a pamphlet. Thus, I conceived the idea of writing a non-

News from CART
(Center for the Advancement of Research and Teaching)

The Center for the Advancement of Research and Teaching (CART) offers grant support for both small and large-scale faculty research projects, as well as for travel to professional conferences. Among the recent grant recipients is Professor Donald Padgett of the Department of Biological Sciences, who is preparing a field guide to woody wetland plants in Massachusetts. He explains his project below.

WOODY PLANTS IN WETLANDS OF MASSACHUSETTS AND ADJACENT REGIONS: A MANUAL TO TREES, SHRUBS AND VINES

Donald Padgett

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I officially began work on the manual during the summer of 2002. With support from a CART grant, I identified 92 species of trees and shrubs inhabiting Massachusetts’ wetlands. Some of these are very common (such as red maple) and others (such as swamp birch) are endangered. I also constructed taxonomic keys (discussed in more detail below) to lead users to the correct identification. I constructed separate keys to accommodate plants in summer and winter stages.

I am currently working on illustrations and maps for the field guide. Accurate and detailed illustrations of each plant species are critically important if the guide is to be useful. I’ve been fortunate enough to interest an accomplished and award-winning natural history author/illustrator, David M. Carroll, in the project, and he has agreed to do the illustrations. His unique expertise and familiarity with the wetland plant species will contribute tremendously to the overall effectiveness of the book.

Another important component of the field guide will be the distribution maps for each of the 92 plant species. A small map of Massachusetts will accompany the description and illustration of each kind of plant. The maps will graphically illustrate the geographic extent of each species’ range in the state, a useful tool because many plants are limited to specific regions, such as western Massachusetts or Cape Cod.

To get an idea of how the taxonomic identification key system works, take a look at the illustration (right) of rhodora, a wild rhododendron (Latin name: Rhododendron canadense), which is widespread in Massachusetts. Its brilliant floral display—the flowers are a bright pinkish-purple—has been greatly admired by gardeners. Rhodora was also admired by the philosopher and poet Ralph Waldo Emerson, who dedicated a poem to this flower whose beauty, he wrote, “is its own excuse for being.” Of course, if you are trying to identify this plant in winter, the flowers will be of no help and you will have to rely on characteristics of rhodora’s twigs, bark, buds and fruit.

To make it easy, let’s say you have a specimen consisting of a summer branch and a leaf belonging to a mystery plant resembling the one in the illustration. The taxonomic key offers a series of two-way choices, each of which narrows the possibilities of what kind of plant this branch and leaf might belong to. As it turns out, the leaf is the critical component. The questions are formulated as follows:

- Does the specimen have (a) needle-like, scale-like or strap-like leaves? Or (b) broad leaves? Clearly, as the illustration shows, this plant has broad leaves.
- Are the leaves (a) opposite or whorled? Or (b) alternate? In this specimen, the leaves are alternate, as you can see by looking at their arrangement on the winter stem, in the middle of the illustration.
- Are the leaves (a) compound (i.e., having more than one blade) or (b) simple? Simple, that is, with just a single blade.
- Are the leaves lobed (i.e., blade edges with lobe-like indentations) or not lobed? Not lobed.
- Are the leaf margins curled under or not curled under? Not curled under.
- Is this plant a climbing vine or erect shrub or tree? Shrub.
- Are the leaf blades thin or thick and leathery? Thin.
- Are the leaves aromatic when crushed or not aromatic? Not aromatic.

A few more steps lead the investigator to the “rhododendron” genus, where four species are described and keyed to, of which rhodora is one.

I’ve been field-testing the guide with my students and getting valuable feedback from them. Once it’s been completed, I anticipate that it will be a useful tool for region regulatory professionals, conservation agents, naturalists and students of wetland and botanical sciences.

—Donald Padgett is Assistant Professor of Biological Sciences.