Aquatic Vegetation of

PLATTE LAKE

Crow Wing County, MN
DOW 18-0088-00

5 November 2003

Surveyed: June 16, 17, 19, 2003
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Introduction

Platte Lake is located in Crow Wing and Morrison Counties of north-central Minnesota, six miles northeast of the town of Harding and about six miles southwest of Mille Lacs Lake at the north end of the Mississippi River-Sartell Watershed (Fig. 1). The Platte River flows through the lake and provides a broad connection to Sullivan Lake. Platte Lake is approximately 1746 acres with a maximum depth of 23 feet (Fig. 2). The shoreline is highly developed except for the wetlands on the west, north and southeast shores. A DNR public access is located at the southwest end of the lake. An island, about 44 acres in area, is located in the center of Platte Lake and a smaller, approximately 6 acre, island occurs to its south. Platte Lake is described as eutrophic (high nutrients) with a mean summer Secchi Disk reading of about six feet (MPCA 2003).

Vegetation Survey Objectives

The goals of the 2003 Point Intercept vegetation survey of Platte Lake include:

1) Estimate the maximum depth of rooted vegetation
2) Estimate the percent of the lake occupied by rooted vegetation
3) Record the aquatic plant species that occur in the lake
4) Collect quantitative estimates of species abundance
5) Develop distribution maps for the common species

In addition to the Point-Intercept Survey, DNR Fisheries staff mapped areas adjacent to developed shoreline where curly-leaf pondweed formed surface mats. Data from the 2003 vegetation surveys can be used to monitor annual changes in the native and exotic plant species composition and will be used to guide vegetation management decisions.

Methods

A Point-Intercept vegetation survey of Platte Lake was conducted on June 16, 17 and 19, 2003 following the methodology described by Madsen (1999). Sample points were established within the lake using a 150 meter by 150 meter grid. This resulted in a total of 296 samples (Fig. 3).

A Trimble GeoExplorer 3 GPS unit was used to navigate the boat to each sample point. One side of the boat was designated as the sampling area. At each site, water depth was recorded using a measured stick in water depths less than eight feet and an electronic depth finder in water depths greater than eight feet. The surveyors recorded all plant species found within a one meter squared sample site at the pre-designated side of the boat. A double-headed, weighted garden rake, attached to a rope was used to survey vegetation not visible from the surface. If curly-leaf pondweed was present at a site, surveyors recorded whether or not it formed surface mats at that site. Nomenclature followed Crow and Hellquist (2000). Voucher specimens were collected for submerged plant species.

Data were entered into an Excel database spreadsheet and frequency of occurrence was calculated for each species as the number of sites in which a species occurred divided by the total

number of sample sites. Sampling points were grouped by water depth and separated into four depth zones for analysis: 0 to 5 feet, and 5.5 to 10 feet, 10.5 to 15 feet, and 15.5 to 19 feet *(note: although a maximum depth of 23 feet has been recorded in Platte Lake, 19 feet was the maximum depth sampled during this survey).*

Results and Discussion

Which plants grow in Platte Lake?

Thirty-nine different aquatic plants were recorded in Platte Lake during the 2003 survey (Table 1). These included emergent plants, such as wild rice, bulrush and cattails; floating leaf plants such as yellow waterlily and white waterlily; and submerged plants. The majority of the Platte Lakes aquatic plants are native to Minnesota with the exception of curly-leaf pondweed.

Where can aquatic plants grow in Platte Lake?

Aquatic plants can only grow where they receive sufficient sunlight. In many central Minnesota lakes, plants can usually be found in 15 to 20 feet of water, particularly if the lake is clear. In Platte Lake, plants were found growing in 19 feet of water and 90% of the sample sites contained vegetation. Plants were most common in from shore to the 10 foot depth where 99% of the sample sites contained vegetation; within the 10.5 to 15 foot depth zone, vegetation occurred in 65% of the sample sites; and in water depths greater than 15 feet, only 29% of the sample sites contained vegetation (Fig. 4). Since most of Platte Lake is shallow, aquatic plants can easily grow at most sites in the lake.

Curly-leaf pondweed in Platte Lake

Curly-leaf pondweed (*Potamogeton crispus*) is named for it's curly or wavy leaf edges (Fig. 5). It is closely related to native plants like large-leaf pondweed, white-stem pondweed and flat-stem pondweed but it is not native to North America and has a unique life history that provides a competitive advantage over native plant species.

1. Early spring growth. Unlike native aquatic plants that begin growth in late spring and reach maximum growth in mid-summer, curly-leaf pondweed starts new growth in late summer and continues into winter. At ice-off, curly-leaf stems begins to elongate more rapidly and reach the water's surface well before native species (Madsen and Crowell 2002).
2. Unique winter buds. Curly-leaf forms hard winter buds, called "turions", which break from the tip of the stem in mid-summer and float to new areas of the lake. These turions act like seeds and can be stored in the lake sediments for several years before they germinate into new plants. Therefore, even if a bed of curly-leaf is killed in one year, it may reestablish from its "seed-bank" in the following year, or turions from other areas of the lake may drift into that area and reestablish.
3. Dense mats. Curly-leaf is a submerged plant, but when it reaches the water surface the leaves may fan out and form a surface mat. These dense mats can act to shade out native plants and create problems for boaters.

Curly-leaf has been present in Minnesota since at least 1910 but was not officially recorded in Platte Lake until 1990 (MNDNR Fisheries Lake Files). DNR Fisheries staff typically conduct

vegetation surveys in mid-summer, after curly-leaf has died back and it is probable that it was present before 1990 but simply not detected.

In 2003, curly-leaf dominated the Platte Lake plant community and was found in 39% of the sample sites (Table 1). Curly-leaf occurred at all depths and was the only plant found in water greater than 15 feet (Fig. 6). It was most abundant in depths of six to 15 feet where it occurred in about 54% of the sample sites. Within this zone, curly-leaf often formed dense mats that reached the water surface, particularly within the depth zone of eight to twelve feet (Fig. 7).

Native plants in Platte Lake

Despite the extensive growth of curly-leaf pondweed, Platte Lake supports one of the richest native plant communities in central Minnesota. Native vegetation is critical for a healthy lake because it provides habitat for fish and invertebrates, buffers the shorelines from wave action, stabilizes sediments and utilizes nutrients that would otherwise be available for algae. However, in Platte Lake, native plants are primarily restricted to water depths of ten feet and less. This probably occurs because by late spring when many native species are just beginning growth, curly-leaf pondweed already occupies the deep water zone. Even though curly-leaf dies back by mid summer, summer water clarity decreases in Platte Lake, which may prevent the deep water growth of many native plant species.

Coontail (*Ceratophyllum demersum*) is a submerged plant with closely spaced leaf whorls that resemble a raccoon's tail. In 2003, it was the most common native plant in Platte Lake and was found in 36% of the sample sites (Table 1). Coontail is better adapted to low water clarity than many natives and therefore was occasionally found to a depth of 15 feet, but it was most common in depths less than 11 feet (Fig. 6). Coontail is not strongly rooted and often drifts into protected bays. In Platte Lake, it was common in most shallow bays as well as the area north of the large island (Fig. 8).

Bushy pondweed (*Najas flexilis*) was the second-most common native species in Platte Lake and was found in 34% of the sites (Table 1). From shore to the five foot depth, bushy pondweed occurred in 51% of the sites but it declined to 36% of the sites in the six to 10 foot zone and was uncommon at deeper depths (Fig. 6). Bushy pondweed is the only submerged annual plant found in Platte Lake; it reestablishes only from seed and it's abundance and distribution may change greatly between years depending on seed set and germination. In 2003, it occupied many of the near shore, shallow sites where curly-leaf did not dominate (Fig. 8).

Other common native plants included flat-stem pondweed (found in 18% of the sample sites), Robbin's pondweed (15%), white-stem pondweed (15%) and large-leaf pondweed (11%) (Table 1). These native pondweeds were primarily restricted to depths of 10 feet and less but were common within the shallow zones. (Fig. 6, 9). All other submerged species occurred in less than 10% of the sample sites.

Control of curly-leaf pondweed

Because Platte Lake is primarily a shallow lake, curly-leaf inhabits an extensive portion of the lake and hinders recreational boat use. Management methods, such as herbicide application and mechanical harvesting can control curly-leaf growth but it cannot be eliminated from a

waterbody without destroying native habitat. Factors to consider for both the short-term and long-term management methods include effectiveness, cost and impact to native habitat. Control of curly-leaf pondweed in Platte Lake will not completely eliminate problems for recreational boaters. At least two native submerged species, coontail and bushy pondweed, were present in high abundance in 2003. While these species are native, they may also form dense mats. At the time of the survey, coontail and bushy pondweed were most abundant in water depths of ten feet and less which would not be the targeted depth for curly-leaf pondweed control.

Annual change in Platte Lake plant community

The 2003 vegetation survey gives a "snapshot" of the Platte Lake conditions. The plant community is likely to fluctuate annually depending on factors like weather conditions, water clarity and water level. For example, lack of snow cover during the 2002-2003 winter allowed more sunlight to enter the lake during the winter and probably allowed growth of curly-leaf under the ice. High water levels during the summer probably lessened the amount of curly-leaf that reached the water surface. As lake residents and managers plan for curly-leaf control, it is important to recognize that the exact locations and abundance of curly-leaf will change from year to year.

Monitoring changes in aquatic plant communities can help reflect changes in the overall water quality of the lake and watershed. Data collected during the 2003 survey can be compared to future quantitative surveys of Platte Lake to better estimate how the plant community may be changing. This information can also be used to guide aquatic plant control activities and focus efforts on areas where curly-leaf is creating the most problems for boaters and avoid areas of high native species diversity.

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Table 1. Aquatic plants of Platte Lake, MN 2003.

p = present in lake but not in sample sites

	Common Name	Scientific Name	Frequency (% of sites in which species occurred)
SUBMERGED These plants grow primarily under the water surface. Upper leaves may float near the surface and flowers may extend above the surface.	Curly-leaf pondweed	Potamogeton crispus	39
	Coontail	Ceratophyllum demersum	36
	Bushy pondweed	Najas flexilis	34
	Flatstem pondweed	Potamogeton zosteriformis	18
	Whitestem pondweed	Potamogeton praelongus	15
	Robbin's pondweed	Potamogeton robbinsii	15
	Largeleaf pondweed	Potamogeton amplifolius	11
	Canada waterweed	Elodea canadensis	9
	Water marigold	Megaladonta beckii	5
	Variable pondweed	Potamogeton gramineus	4
	Northern watermilfoil	Myriophyllum sibiricum	3
	Greater bladderwort	Utricularia vulgaris	2
	muskgrass	Chara sp.	2
	Water stargrass	Zosterella dubia	1
	White water buttercup	Ranunculus sp.	1
	Narrowleaf pondweed	Potamogeton sp.	1
	Clasping leaf pondweed	Potamogeton richardsonii	1
	moss		1
	Illinois pondweed	Potamogeton illinoensis	<1
	Sago pondweed	Stuckenia pectinata	p
	Stonewort	Nitella sp.	p
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water	Yellow waterlily	Nuphar variegata	6
	White waterlily	Nymphaea odorata	3
	Floating leaf pondweed	Potamogeton natans	1
	Watershield	Brasenia schreberi	p
	Floating leaf smartweed	Polygonum amphibium	p
FREE-FLOATING These plants float on the water and drift with water currents.	Star duckweed	Lemna trisulca	13
	Greater duckweed	Spirodela polyrhiza	3
	Lesser duckweed	Lemna minor	1
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Wild Rice	Zizania palustris	14
	Bulrush	Scirpus sp.	7
	Broad-leaf arrowhead	Sagittaria sp	3
	Spikerush	Eleocharis sp.	2
	Narrow-leaf arrowhead	Sagittaria rigida	p
	River bulrush	Scirpus fluviatilis	p
	Giant Cane	Phragmites	p
	Burreed	Sparganium sp.	p
	Needlerush	Eleocharis acicularis	p
	Broad-leaf cattail	Typha latifolia	p

Figure 1. Location of Platte Lake in the Mississippi River – Sartell Watershed.

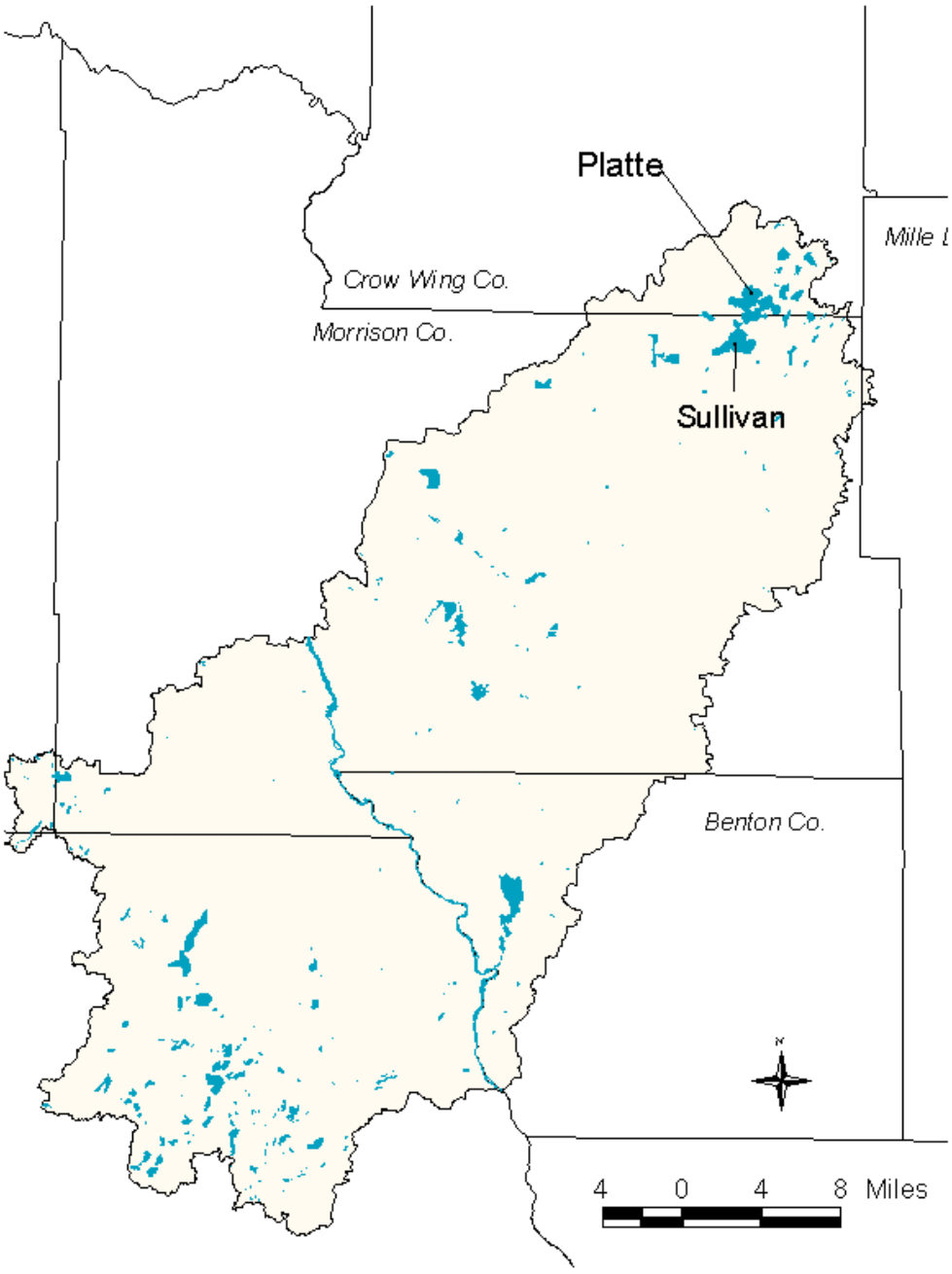

Figure 2. Depth zones of Platte Lake.

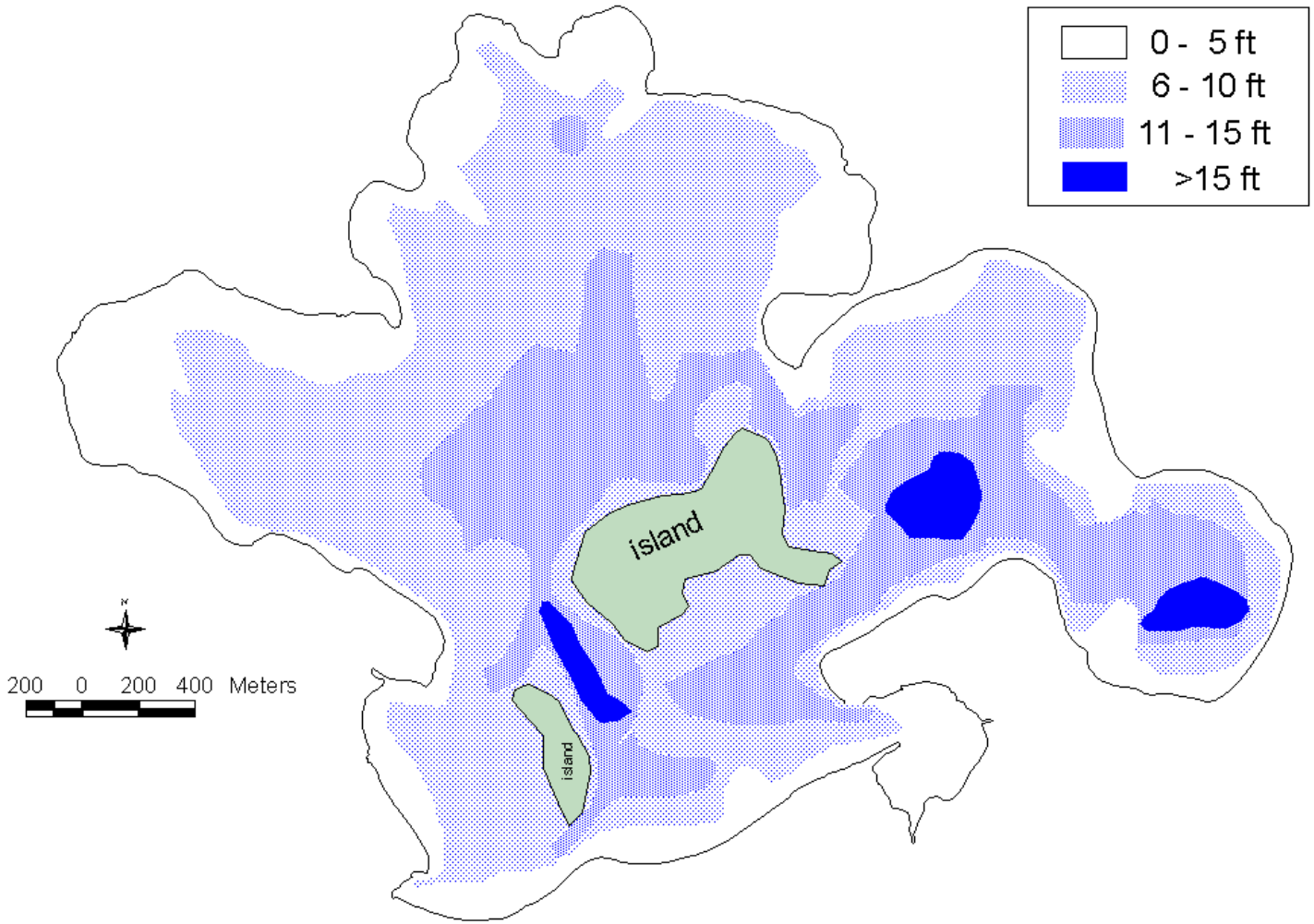

Figure 3. Vegetation sample points on Platte Lake, 2003.

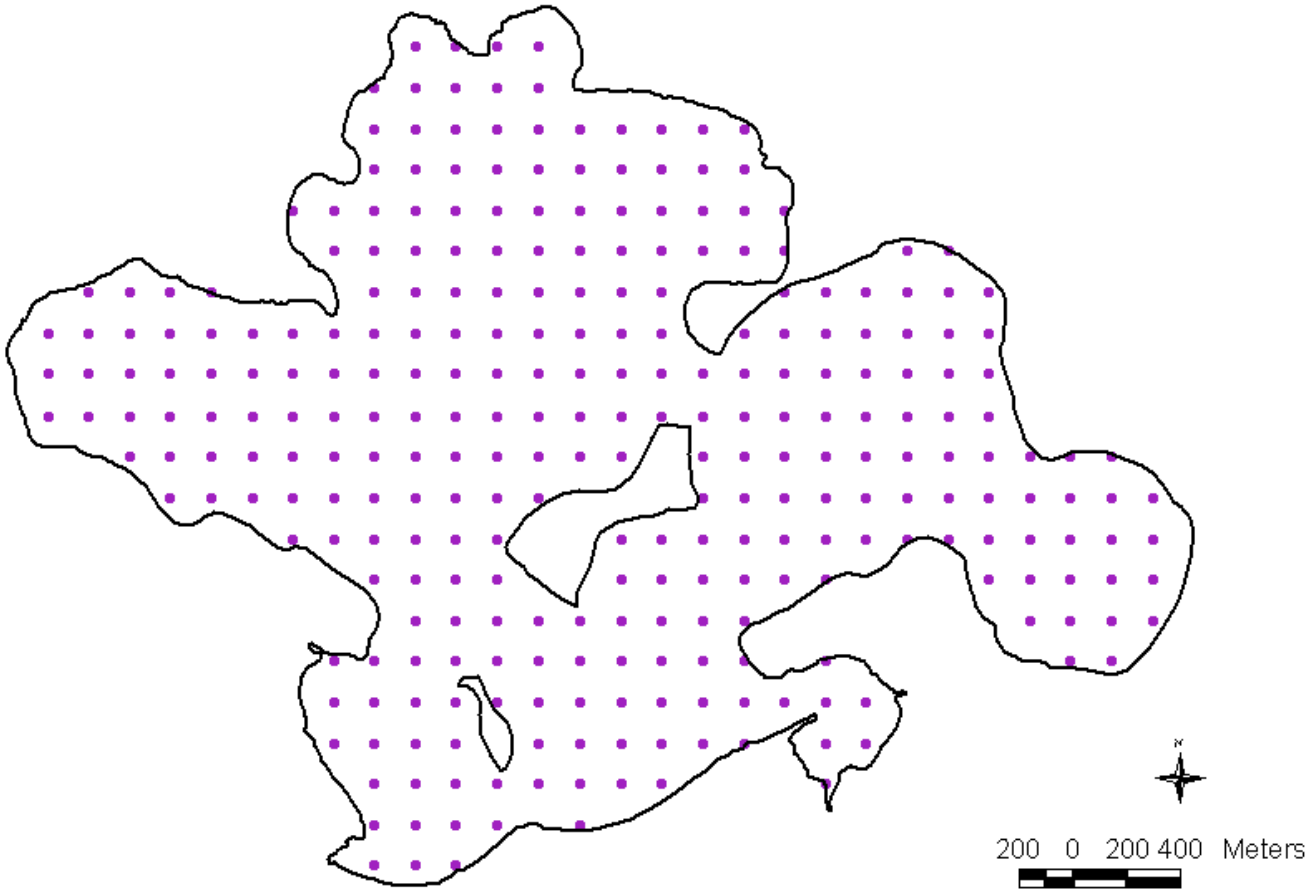

Figure 4. Platte Lake 2003 aquatic plant abundance

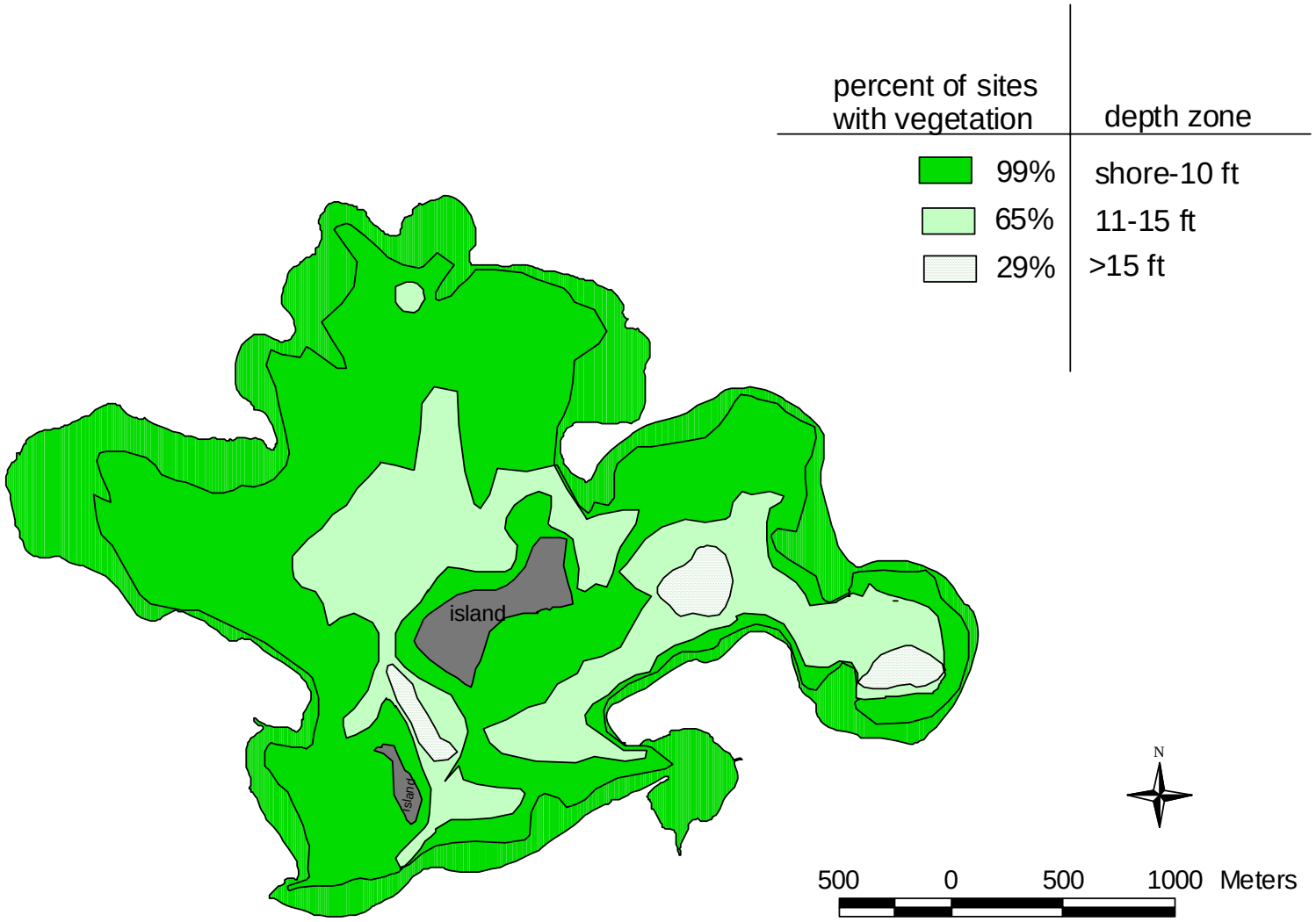

Figure 5. Curly-leaf pondweed plant.

a. early spring growth with less distinct “curly” leaves
b. late spring growth with distinct “curly” leaves
c. flower
d. seed
e. hardened stem tip (winter bud, or turion)
g. fine serrations along leave edge

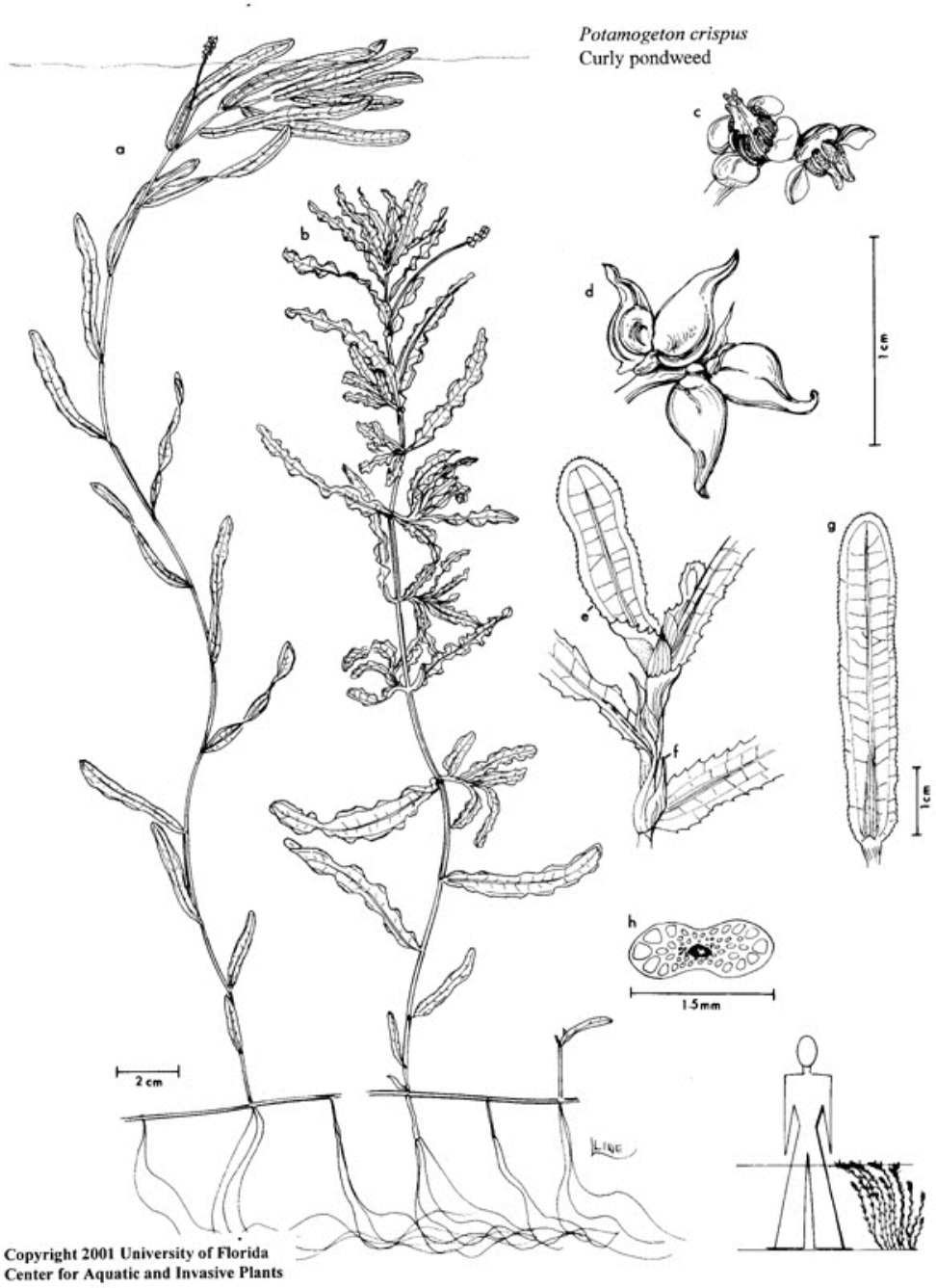

Illustration courtesy of University of Florida, Center for Aquatic and Invasive Plants.

Fig. 6. Submerged Plants of Platte Lake 2003

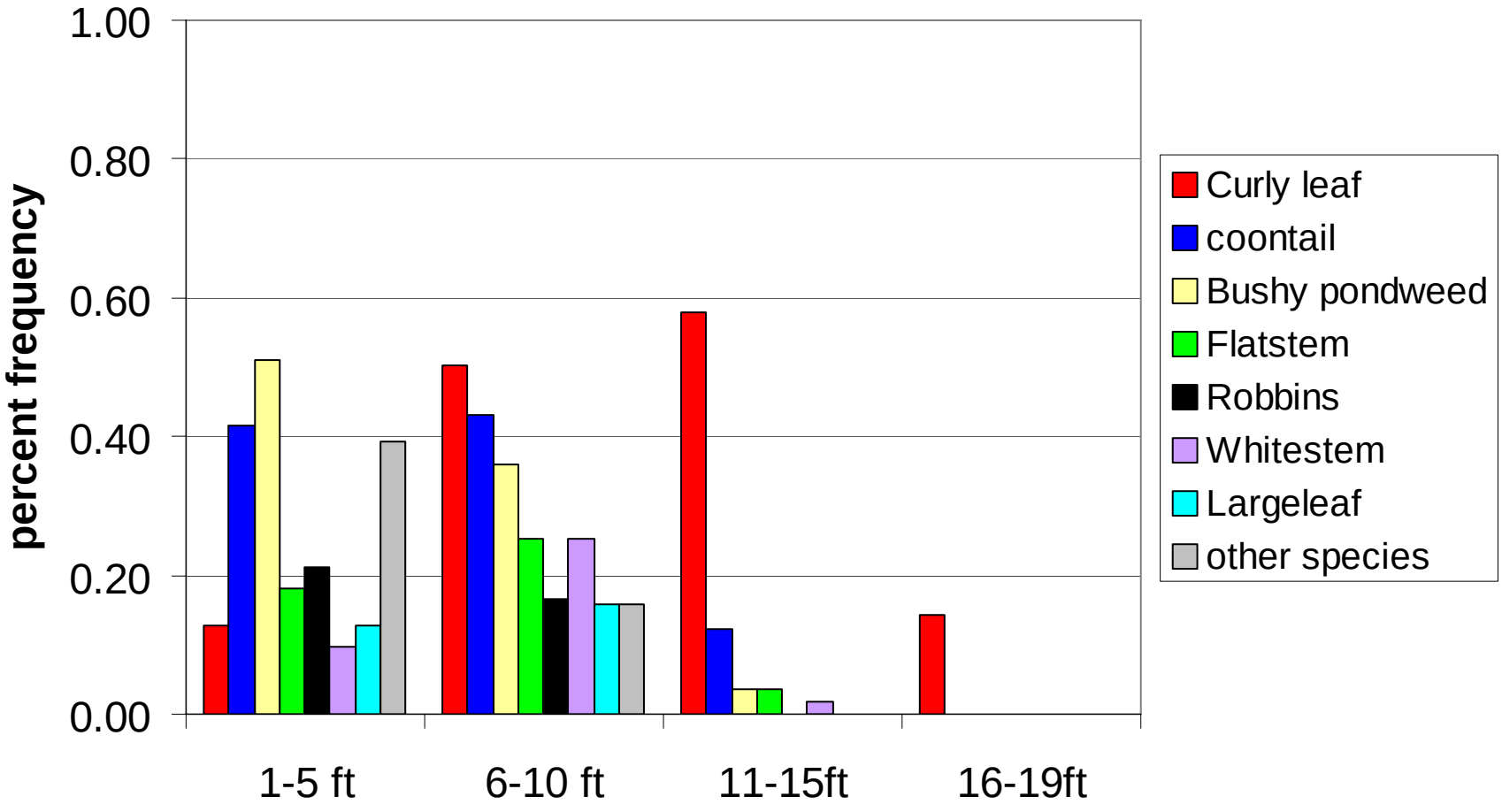

Figure 7. Curly-leaf pondweed in Platte Lake, 2003

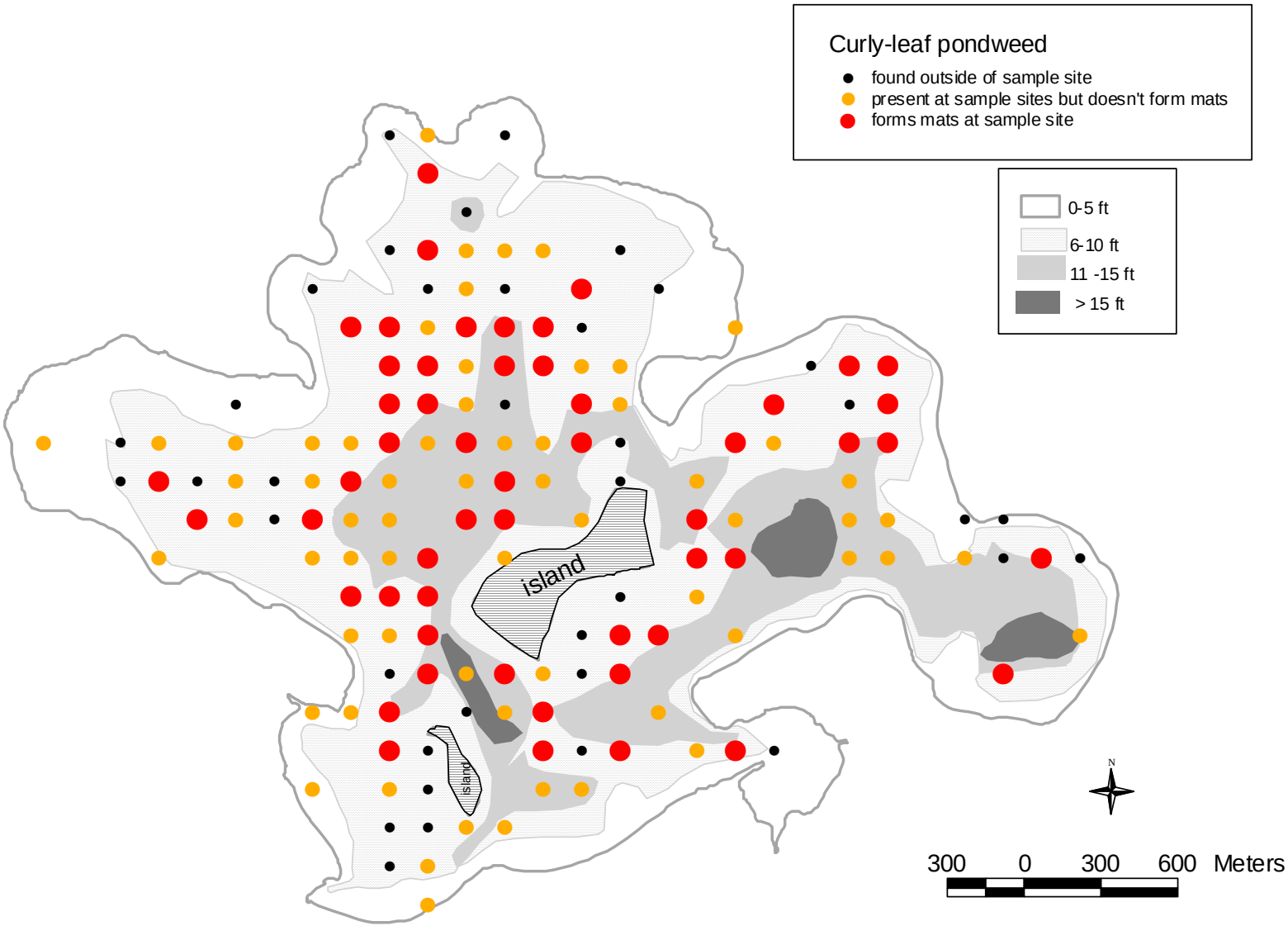

Figure 8. Coontail and bushy pondweed in Platte Lake, 2003

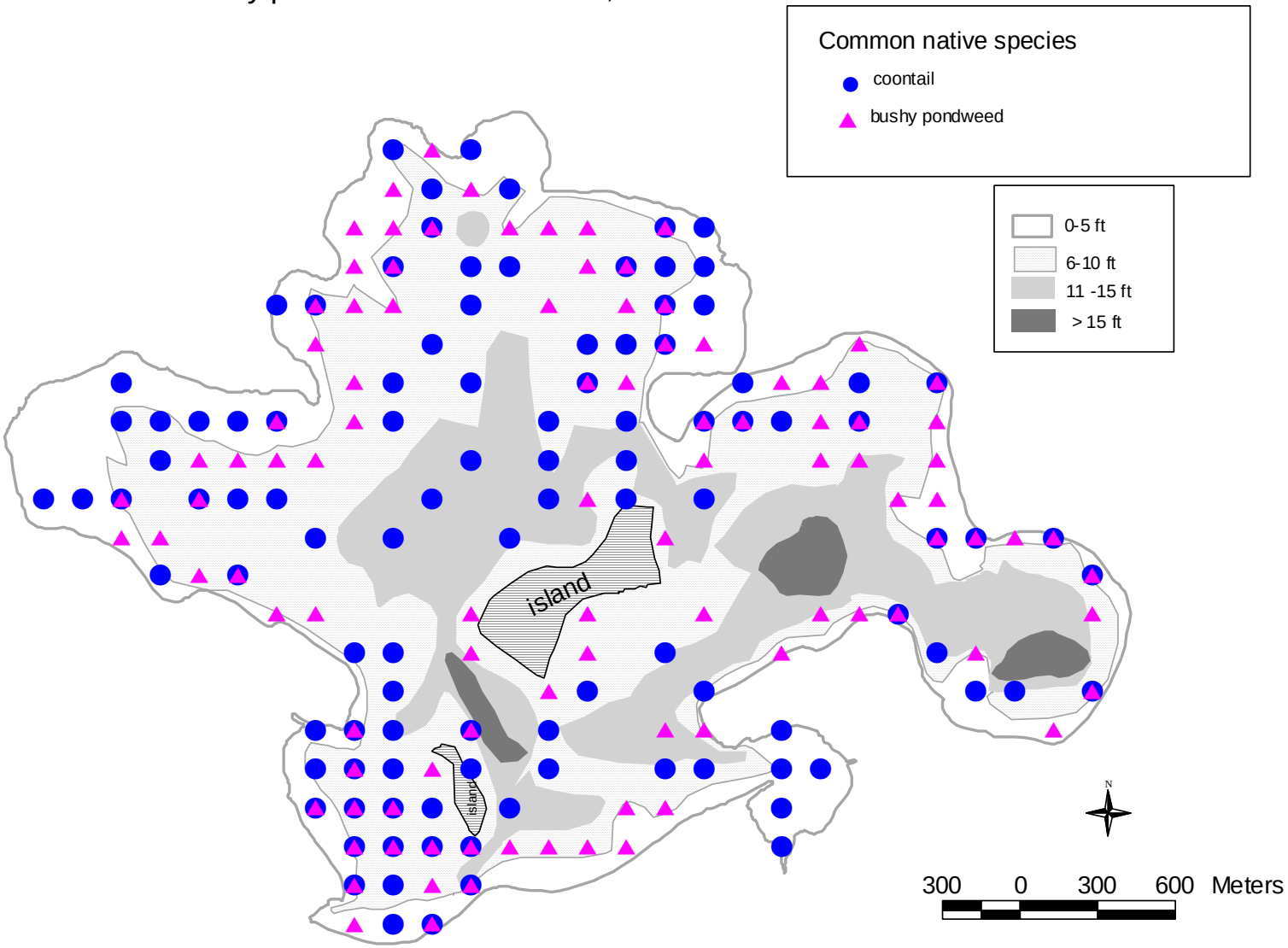

Figure 9. Other native pondweeds in Platte Lake, 2003