Aquatic Vegetation of

DAM LAKE

Aitkin County, MN
DOW 01-0096-00

Surveyed: June 28 and July 2, 2002: Donna Perleberg (MNDNR Ecological Services)

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INTRODUCTION

Dam Lake is located in Aitkin County, north central Minnesota, about 11 miles east of the town of Aitkin. The lake is approximately 642 acres with a maximum depth of about 48 feet and a mean depth of 19 feet. Public access includes a State owned public access on the west side of the lake and a private resort on the south side.

Objectives

The 2002 vegetation survey of Dam Lake was part of a larger evaluation of lake vegetation survey methods conducted by MNDNR Ecological Services Division. Dam Lake was selected because DNR Fisheries is working with the lake group to produce a lake management plan. Survey objectives included:

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

Historical vegetation data for this lake were also reviewed and are summarized in this report. Data from the 2002 survey can be used to monitor annual changes in the plant community.

METHODS

A Point-Intercept vegetation survey of Dam Lake was conducted on June 29 and July 2, 2002 following the methodology described by Madsen (1999). A total of 152 sample points were established using a 100 meter (N-S) by 100 meter (E-W) grid system (Figure 1). Each sample point was approximately one meter squared in area. Sampling was not conducted in water depths greater than 25 feet because initial sampling indicated no vegetation occurred in depths greater than 20 feet.

A Trimble GeoExplorer 3 GPS unit was used to navigate the boat to each sample point. 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 of eight feet or more. Surveyors recorded any plant taxa within the site that were visible from the boat surface. A double-headed garden rake, attached to a rope was used to survey vegetation not visible from the surface. When possible, taxa were recorded to the species level and nomenclature follows Crow and Hellquist (2000). Voucher specimens were collected and are currently stored at the DNR in Brainerd. Some specimens may be transferred to the University of Minnesota herbarium (St. Paul).

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 within the “vegetated zone” from shore to 20 feet (141 sample points).

Relative frequency for each species was calculated as the individual species frequency expressed as a percentage of the total plant frequency. Data were analyzed for three depth zones:

- shore to 6 feet (47 sites)
- 6.5 feet to 12 feet (43 sites)
- 12.5 feet to 20 feet (51 sites)

RESULTS

Secchi disc reading was recorded as 11 feet on June 28, 2002 and 8.5 feet on July 2, 2002.

Rooted vegetation was found to a maximum depth of 20 feet and vegetation occurred in 70% of the sample sites in the shore to 20 foot zone.

Since 1960, more than 40 aquatic plant species have been recorded in Dam Lake and the majority of these were relocated in 2002. During the 2002 survey, 19 species of submerged plants (Table 1), five floating (Table 2), 12 emergent (Table 3) and five wetland plant species (Table 4) were documented in Dam Lake.

Plant community composition

Combined, coontail (Ceratophyllum demersum) and flatstem pondweed (Potamogeton zosteriformis) made up 30% of the entire plant community (Figure 2). As a group, broad-leaved pondweeds [variable (Potamogeton gramineus), Robbin's (P. robbinsii), largeleaf (P. amplifolius), whitestem (P. praelongus), clasping (P. richardsonii) and Illinois (P. illinoensis)] made up another 30%. Other common species included narrowleaf pondweeds (Potamogeton spp), hardstem bulrush (Schoenoplectus acutus = Scirpus acutus), Canada waterweed (Elodea canadensis), and northern milfoil (Myriophyllum sp.), which each made up between six and eight percent of the plant community (Figure 2). Other species individually accounted for less than 5% of the entire plant community.

Abundance and Species Richness vs. Depth

Plant abundance and species richness (number of species) declined with increasing water depth (Figure 3).

In the zone from shore to six feet, vegetation occurred in 100% of the sites. Twenty-seven species were found within sample sites and the mean number of species per site was five. Hardstem bulrush was the most abundant species in this zone and was found in 55 percent of the sites (Figure 4a). Six other species that occurred in at least 40% of the sites in this zone included coontail, variable pondweed, flatstem pondweed, robbins pondweed, large-leaf pondweed, and Canada waterweed (Figure 4a). Yellow waterlily (Nuphar variegata) occurred at 23% of the sites (Figure 4a).

In the 6.5 foot to 12 foot zone, vegetation was still abundant and was found in 98% of the sites. However, only thirteen species occurred in this zone and the mean number of species per site

was three (Figure 3). Coontail and flatstem pondweed each were found at 70% of the sample sites followed by narrow leaf and whitestem pondweed which each occurred at 30% of the sites (Figure 4b).

In depths greater than 12 feet, vegetation was found in only 18% of sample sites; only six species were found and the mean number of species per site was less than one (Figure 3). Narrow leaf pondweed was the most abundant species in this zone but was found in only 10% of the sites; coontail occurred in eight percent and all other species were found in less than two percent of the sites (Figure 4c). This is the only depth where stonewort (Nitella sp.) was found.

Distribution Maps

Because data are entered into an ARCVIEW file, dot distribution maps for individual species or groups of species can be produced. Figure 5 displays the number of species per site and Figure 6 displays the sites with floating-leaved and/or emergent species vs. sites with only submerged species. Absence of a colored dot on these maps simply indicates that no sample was taken in that location. These maps are intended to provide a general overview of distribution, not to delineate plant bed borders.

DISCUSSION

Dam Lake supports an abundant and diverse native aquatic plant community. The near shore zone is dominated by hardstem bulrush, which is among the most valued plant for fish and wildlife habitat. These extensive emergent stands help protect the shoreline from erosion by breaking wave action and stabilizing the lake bottom. A high number of submerged species co-occur in the lake and provide a diversity of habitat types for fish, invertebrates and other wildlife. This is in sharp contrast to lakes that are dominated by dense monotypic stands of submerged plants that provide less habitat diversity and often interfere with recreational lake use.

Historical comparisons of the Dam Lake plant community can be difficult because early surveyors probably only recorded the most common species and used descriptive estimates that are subjective in nature. Nevertheless, some general comparisons can be made. In 1960, vegetation was commonly found to a depth of 11 feet and this remains the area of abundant vegetation today. In 2002, vegetation was documented to 20 feet but it occurred sparsely in depths greater than 12 feet. The plant species that were recorded in 2002 were likely present but missed in earlier surveys. Species that were recorded as common in 1960 remain common today including coontail, flatstem pondweed, muskgrass, yellow waterlily and bulrush.

While detecting some changes in plant communities can be difficult, other changes are quite obvious. Specifically, the extensive stands of bulrush around Dam Lake have likely been altered. The 1960 survey reports that bulrush ringed most of the east and west shoreline and that general description holds for the 2002 bulrush distribution as well (Figure 6). The 1994 survey describes “some cabins on the northeast side have wide (>50’) channels cut through the bulrush. A hand-drawn map from this survey shows the major plant beds and the approximate locations of such channels. During the 2002 survey, similar channels were observed at developed sites

around the lake and one resident on the west shore commented that he had cleared out an area in the bulrush bed and was surprised that it took several years for the plants to recover.

Better documentation of the bulrush and waterlily bed borders is now possible with GPS equipment and/or by remote sensing such as aerial photography. This was not done during the 2002 survey due to a lack of survey time.

Literature Cited

Crow, G.E. and C.B. Hellquist. 2000. Aquatic and wetland plants of Northeastern North America. Vol. 1-2. The University of Wisconsin Press, Madison.

Madsen, J. D. (1999). "Point intercept and line intercept methods for aquatic plant management." *APCRP Technical Notes Collection* (TN APCRP-M1-02). U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/aqua.

Myhre, K.M. 1995. Survey of the northwest shore of Dam Lake, Aiktin County, MN. September 1, 1995. Minnesota Dept. of Natural Resources. Ecological Services Division. Minnesota County Biological Survey Program.

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Table 1. Submerged aquatic plants of Dam Lake, Aiktin Co, 1960-2002.

Common name	Scientific name	7/ 25 **1960**	7/ 6 **1977**	7/25-29 **1990**	8/19 **1994**	9/1 **1995**	7/28, 8/2 **2002**
Coontail	Ceratophyllum demersum	P	C	A	C	X	42
Muskgrass	Chara sp.	P					25
Canada waterweed	Elodea canadensis		O	P		X	17
Quillwort	Isoetes sp.						5*
Water marigold	Megaladonta beckii					X	1
Northern watermilfoil	Myriophyllum exalbescens		C	C	C		15*
	Myriophyllum sibiricum					X	
	Myriophyllum sp.					X	
Bushy pondweed	Najas flexilis				C	X	3
Stonewort	Nitella sp.						1
Large-leaf pondweed	Potamogeton amplifolius			A		X	16
Illinois pondweed	Potamogeton illinoensis					X	1
Narrow leaf pondweeds	Potamogeton pusillus			A		X	20*
	Potamogeton freisii			A			
	Potamogeton strictifolius			A			
Variable pondweed	Potamogeton gramineus				C	X	18
Whitestem pondweed	Potamogeton praelongus			C		X	16
Clasping-leaf pondweed	Potamogeton richardsonii		A	A	C	X	11
Robbin's pondweed	Potamogeton robbinsii			A		X	16
Flatstem pondweed	Potamogeton zosteriformis	P	C	A	C	X	36
Bladderwort	Utricularia vulgaris			O		X	X
Wild celery	Vallisneria americana			A		X	1
Water stargrass	Zosterella dubia						9
	Mean Secchi disc reading	8 ft	4 ft	10 ft	---	---	10 ft
	Max rooting depth	11 ft	11 ft	20 ft	---	---	20

* indicates tentative identification – need to verify by reviewing voucher specimens

Table 2. Floating aquatic plants of Dam Lake, Aiktin Co, 1960-2002.

Common name	Scientific name	7/ 25 **1960**	7/ 6 **1977**	7/25-29 **1990**	8/19 **1994**	9/1 **1995**	7/28, 8/2 **2002**
Star duckweed	Lemna trisulca					X	2
Yellow waterlily	Nuphar variegata	P	A	C	C	X	8
White waterlily	Nymphaea odorata		O	C		X	1
Floating leaf smartweed	Polygonum amphibium			P			X
Floating-leaf pondweed	Potamogeton natans			P		X	X

Table 3. Emergent aquatic plants of Dam Lake, Aitkin Co., 1960-2002.

Common name	Scientific name	7/ 25 **1960**	7/ 6 **1977**	7/25-29 **1990**	8/19 **1994**	9/1 **1995**	7/28, 8/2 **2002**
Spikerush	Eleocharis sp.				C		5*
Needlegrass	Eleocharis acicularis						1
	Eleocharis smallii					X	
Horsetail	Equisetum fluviatile						1
Blue flag iris	Iris versicolor	P					
Arrowhead	Sagittaria latifolia			P		X	X
Stiff wapato	Sagittaria rigida			O	C	X	2*
Hardstem Bulrush	Schoenoplectus acutus	P	A	A	A/C	X	19
Three square bulrush	Schoenoplectus pungens					X	1
River bulrush	Scirpus fluviatilis			O			X
Floating leaved burreed	Sparganium minima						X*
Giant burreed	Sparganium eurycarpum			O			
Green-fruited burreed	Sparganium chlorocarpum			P			
Broad-leaf cattail	Typha latifolia		P	O			X
Narrow-leaf cattail	Typha angustifolia						X
Wild rice	Zizania aquatica		O	P			1

* indicates tentative identification – need to verify by reviewing voucher specimens

Table 4. Wetland plants of Dam Lake, Aitkin Co., 1960-2002.

Common name	Scientific name	7/ 25 **1960**	7/ 6 **1977**	7/25-29 **1990**	8/19 **1994**	9/1 **1995**	7/28, 8/2 **2002**
Water plantain	Alisma sp.						X
Swamp milkweed	Asclepias incarnata					X	
Aster	Aster sp.					X	
Beggar-Tick	Bidens sp.					X	
Nodding bur-marigold	Bidens cernua					X	
Blue-joint	Calamagrostis canadensis					X	
Bottlebrush sedge	Carex comosa					X	
Sedge	Carex sp.						X*
Bulb-bearing water-hemlock	Cicuta bulbifera					X	
Joe-Pye weed	Eupatorium maculatum						X
Jewelweed	Impatiens capensis					X	
Northern bugleweed	Lycopus uniflorus					X	
Common mint	Mentha arvensis var. glabrata					X	
Reed canary grass	Phalaris arundinacea		C			X	X
	Phragmites communis			O			X
Willow	Salix sp.					X	
Peach-leaved willow	Salix amygdaloides					X	
Sow-thistle	Sonchus uliginosus					X	
Prairie cordgrass	Spartina pectinata					X	
Meadowsweet	Spiraea alba					X	

* indicates tentative identification – need to verify by reviewing voucher specimens

Figure 1. Dam Lake 2002 vegetation sample site locations

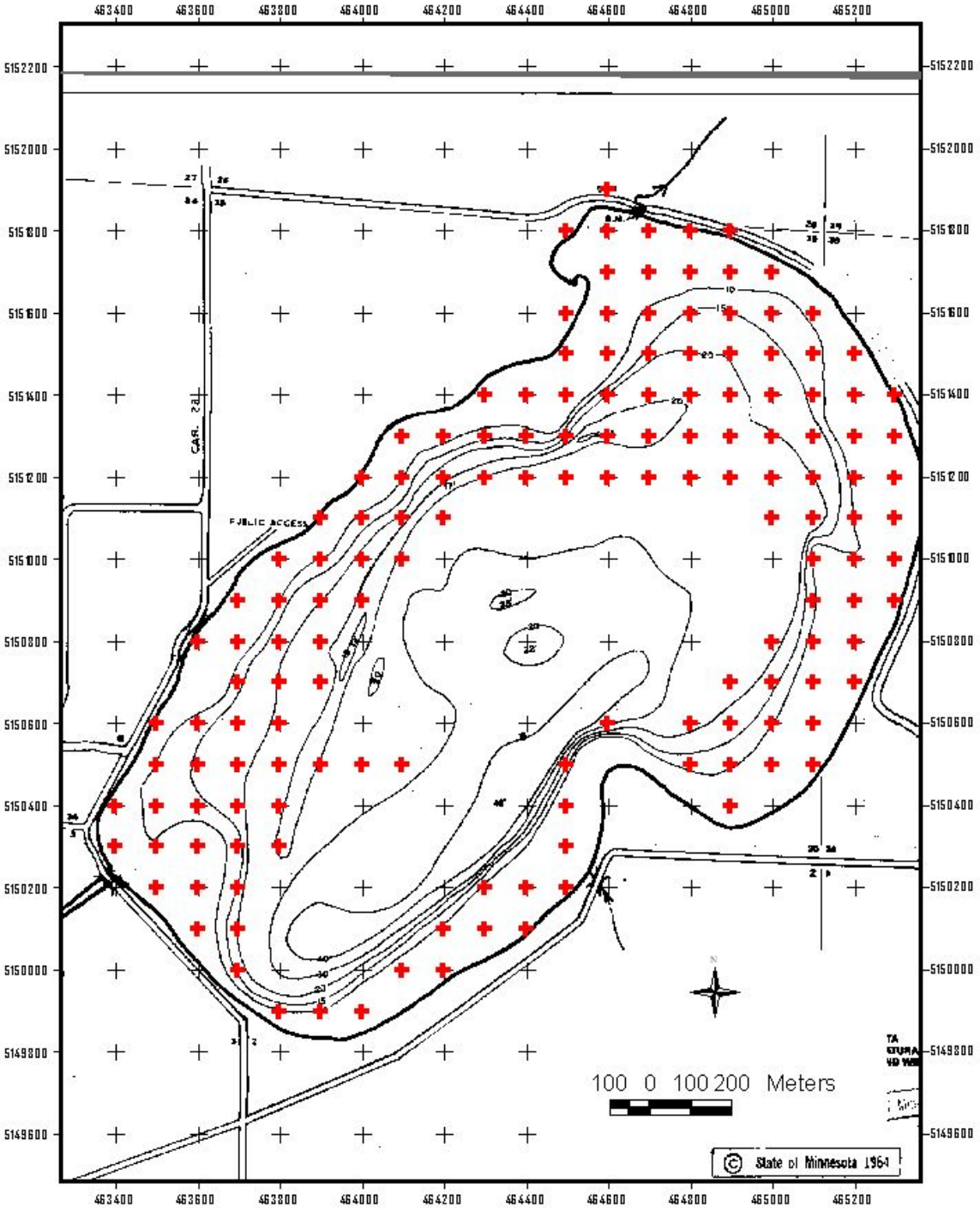


Figure 2. Dam Lake, Aiktin Co. 2002. Relative Frequencies of Plant Species

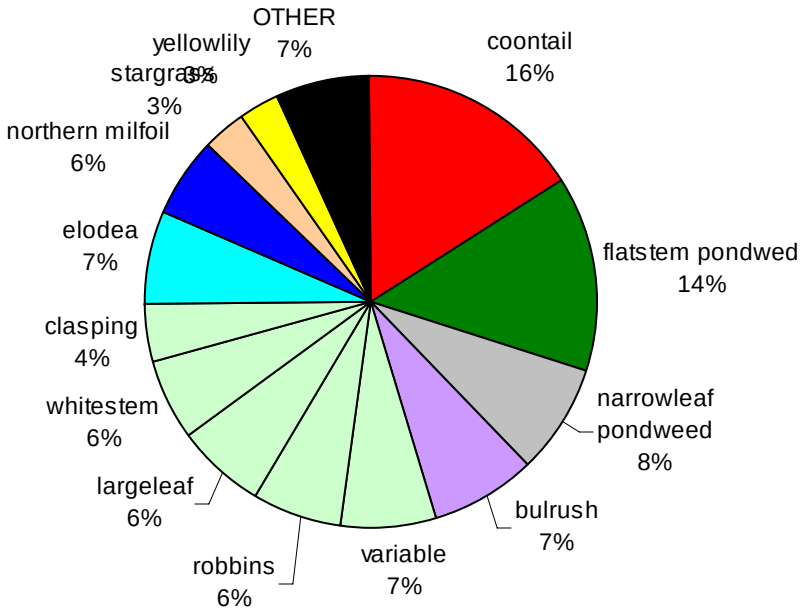
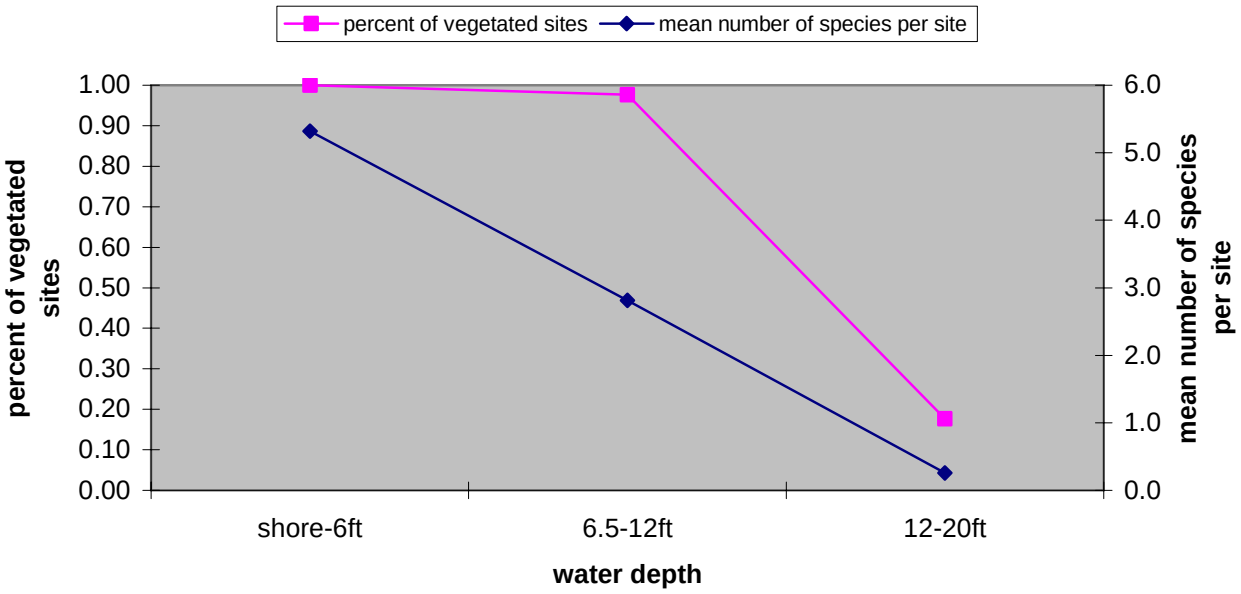
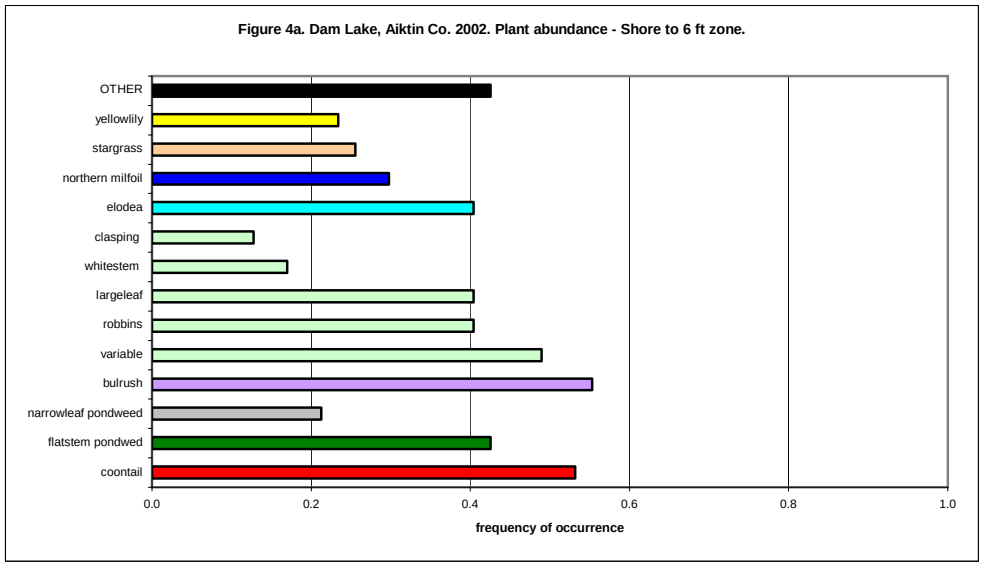
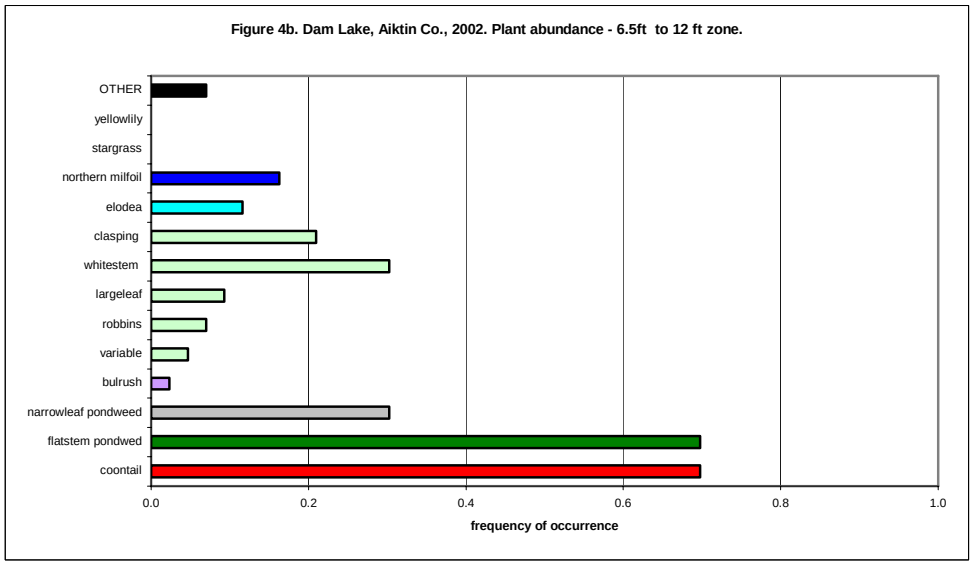


Figure 3. Dam Lake, Aiktin Co. 2002. Plant abundance and diversity vs. water depth







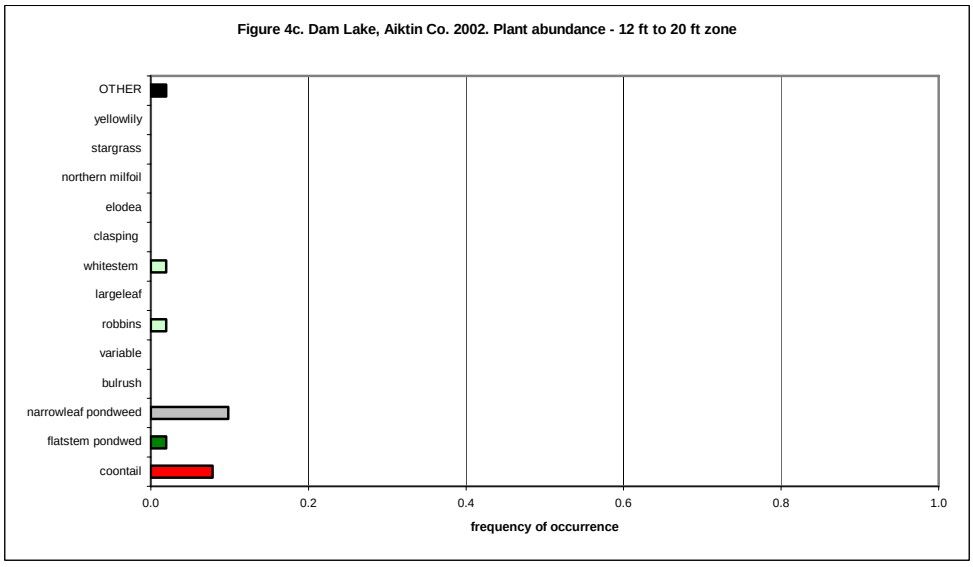


Figure 5. Dam Lake 2002. Number of species per site.

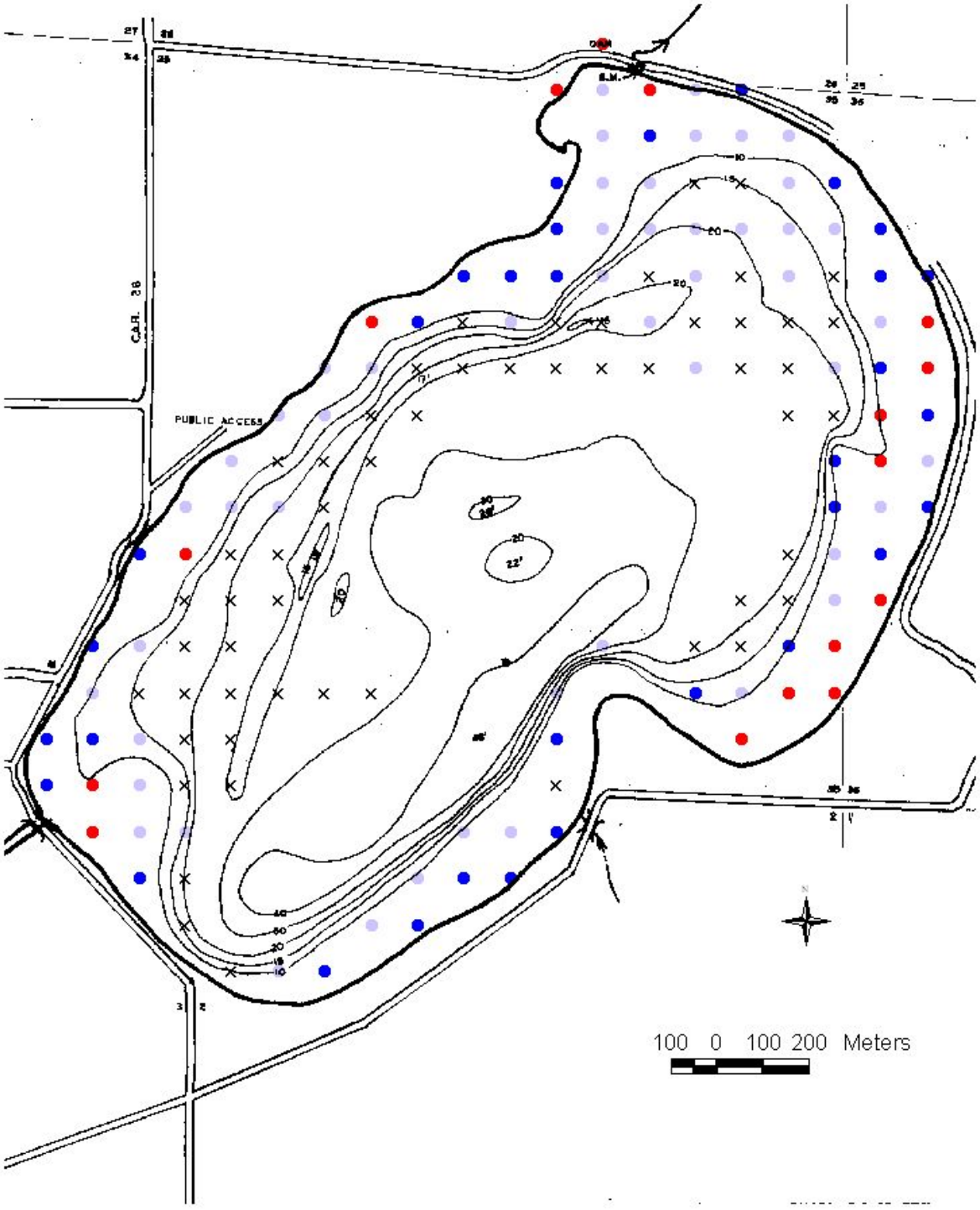


Figure 6. Dam Lake 2002. Locations of floating, emergents and submergents.