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AQUATIC VASCULAR PLANTS IN THREE BAYS OF EASTERN DOOR COUNTY, WISCONSIN

Aquatic macrophytes of the western shores of Lake Michigan have received little attention from Wisconsin botanists (Ross and Calhoun, 1951; Curtis, 1959), probably because few localities are available for study. Severe wave action and unstable bottom sediments prevent the establishment of such plants in many areas of the lakeshore and intensive shoreline development has eliminated most of the hardy species which were originally present. However, three bays in eastern Door County (Rowleys Bay, North Bay and Moonlight Bay) support a considerable number of aquatic plant because they are protected from severe storms and are relatively free from human interference. These bays (Map 1) were given only a precursory examination in the summer of 1976 (Salamun and Stearns, 1978). Travel funds provided by the UWM Center for Great Lakes Studies made it possible for me to initiate more detailed studies of these plants in the summer of 1978. This report is a brief synopsis of my observations of the diversity and density of these plants and their general distribution in relation to water depth, shoreline features and water movements in these bodies of water.

GENERAL FEATURES OF THE BAYS

These bays are oriented in northwest-southeast directions and are open to Lake Michigan at their southeastern edges. Their northern and western portions have extensive shallow waters, less than 1.0 meter deep. The western shores have sandy bottom sediments while the eastern shores are chiefly rocky with the underlying bedrock exposed in horizontal layers. These flat, rocky shorelines often have small pools of water which form during periods of high waves or

when lake levels recede. Streams or creeks discharge into these bays at their northern edges (Map 1). The underlying bedrock of Niagara dolomite contributes to the high alkalinity of the waters, but actual pH values of these waters vary slightly in different parts of the bays. Data for other chemical and physical properties were not evaluated for this report.

METHODS OF STUDY

A general survey of the distribution of the aquatic macrophytes in these bays was made by boat during three visits in the summer of 1978. Particular attention was given to areas where these plants appeared in greatest numbers. At selected sites a list of the species present was compiled together with their density, areal extent and state of development (vegetative growth and flowering or fruiting) in relation to water depth. An analysis of growth and biomass, using a $\frac{1}{4}$ m² grid of stainless steel, was begun with the June and July observations, but a severe storm which preceded the August observations did considerable damage to the plants in the study sites so the project was aborted for this year. Chemical analyses of the plants and the waters of the bays were not carried out during this phase of the study but, hopefully, will be included next year.

OBSERVATIONS AND DISCUSSION

The species tallied are listed, together with their abundance, in Table 1. The distribution of these species was observed in the following structural communities:

Emergent Aquatic Communities.

In waters up to 1.0 meter deep, the dominant plants are the Bulrush (*Scirpus validus*) and the Three-square Bulrush (*S. americanus*) with the Creeping Spike Rush (*Eleocharis palustris*) a co-dominant along the western edge of Rowleys Bay and in a few small areas along the southwestern shores of Moonlight Bay. These species spread vegetatively by rhizomes and readily reinvade areas where they have been physically damaged or the bottom substrate has been altered by the turbulence from strong waves produced by storms or high winds.

Cattails (*Typha latifolia*, *T. angustifolia* and possible hybrids) form extensive stands in the channels and adjacent shores at the mouth of the Mink River in Rowleys Bay, but are of only sporadic occurrence along the western shores of Rowleys Bay, North Bay and Moonlight Bay.

Other emergent aquatics, which occur chiefly in waters less than 0.3 meter deep, are the Narrow-leaf Arrowhead (*Sagittaria latifolia* f. *gracilis*), Bur Reed (*Sparganium eurycarpum*) and several species of Juncus (*Juncus* spp.) and spike rushes (*Eleocharis* spp.). Wild Rice (*Zizania aquatica*) was observed in only one locality near the mouth of the Mink River in Rowleys Bay. Seasonal aquatics and shorebank species were not recorded.

Submerged Aquatic Communities.

Widespread species in the shallow waters are Crimped-leaf Pondweed (*Potamogeton crispus*), Sago Pondweed (*P. pectinatus*), Variable Pondweed (*P. graminifolius*), Waterweed (*Elodea canadensis*), Eel Grass (*Vallisneria americana*) and Water Milfoil (*Myriophyllum exalbescentis*). Most of these species occur in association with the emergent plants, but the Sago Pondweed (*Potamogeton pectinatus*) and Berchtold's Pondweed (*P. berchtoldi*) form large masses in the open areas at the mouth of Reiboldt Creek in Moonlight Bay and in several channels at the mouth of the Mink River in Rowleys Bay. In the usual zonation pattern of aquatic communities, the submerged species are in the deeper waters while the emergent plants are near the shore. In these bays the submerged species are afforded more protection from wave action in the zone occupied by the emergent species.

Because I am not a skin diver, it was impossible to carry out any studies of the submerged plants in the deeper portions of these bays. However, following a mid-August storm, some uprooted and broken plants of the Claspingleaf Pondweed (*Potamogeton richardsonii*) were collected along the north shore of Moonlight Bay. Some of these plants or portions of plants were over six feet in length and it is assumed they could have been growing in water depths to fifteen feet.

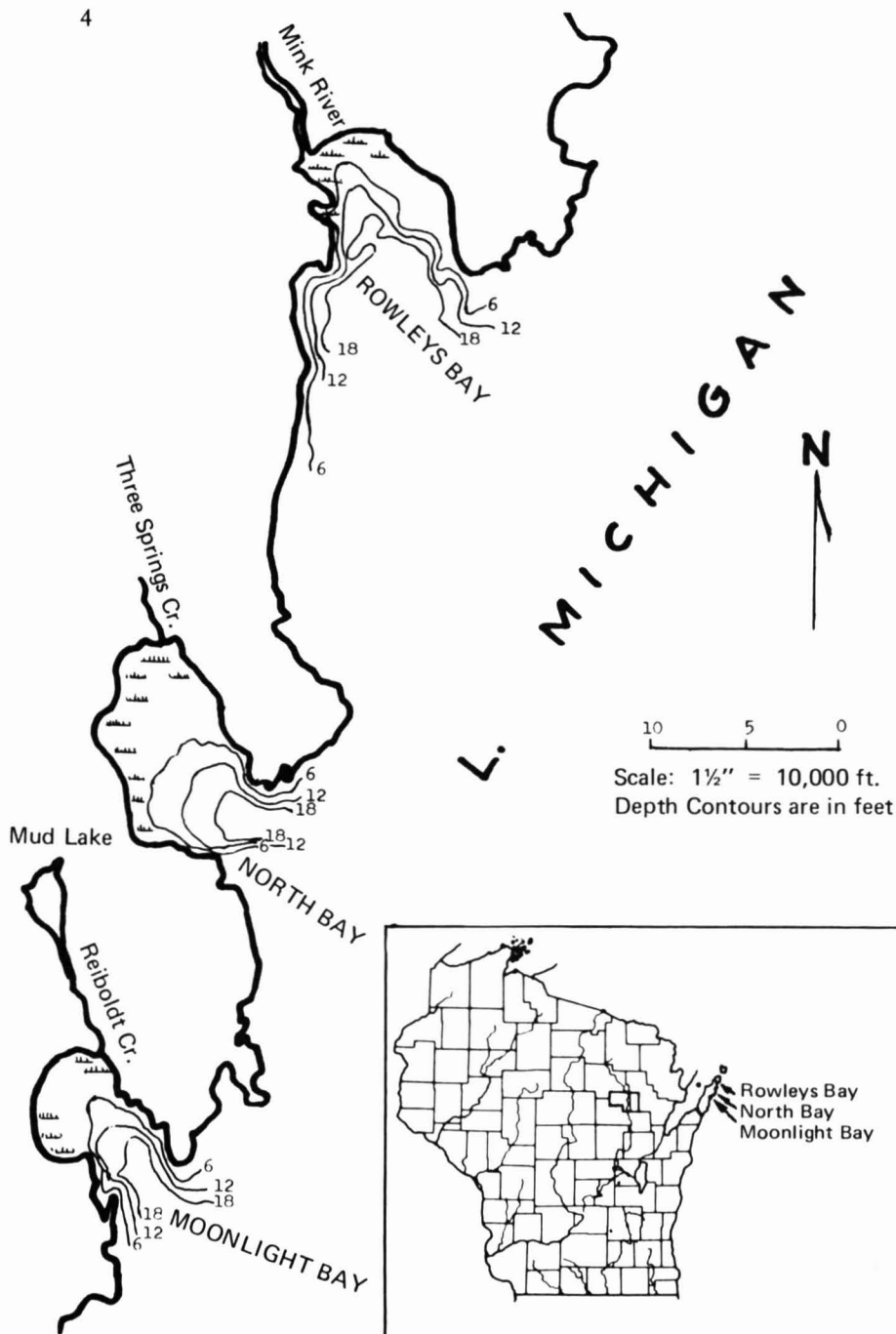
Floating Aquatic Communities.

In the protected channels at the mouth of the Mink River in Rowleys Bay and in several small coves of western Rowleys Bay and North Bay, wave action is minimal and floating aquatics were observed. The three common plants in these sites are the White Water Lily (*Nymphaea odorata*), Yellow Water Lily or Spatter Dock (*Nuphar advena*) and the Water Smartweed (*Polygonum coccineum*). Floating Pondweed (*Potamogeton natans*), Big-leaf Pondweed (*P. amplifolius*) and Flat-stemmed Pondweed (*P. zosteriformis*) were also observed at the Mink River site.

GENERAL CONCLUSIONS

The densest growth of the aquatic plants is along the northern portions of these bays where streams discharge into them. These streams probably contribute some nutrients into these bodies of water and deposit sediments which facilitate rooting of these plants. The presence of aquatic plants in the western and southwestern portions of these bays may be partially explained by the protection received from wave action and the additional nutrients which may be incorporated into the sands and sediments deposited there (Jupp and Spence, 1977).

Because of their orientation, these bays are subjected to greater wave action from southeastern winds which blow over a longer fetch than winds from other directions. Further, this intense wave action would result in alteration or destruction of bottom sediments and inhibit rooting of aquatic plants.



Map 1. Location, orientation and bathymetric features of the three bays of eastern Door County.

Table 1. Species of Aquatic Vascular Plants in Three Door County Bays.

	Rowleys Bay		North Bay		Moonlight Bay	
	Western Shore	Mouth of Mink R.	Western Shore	Mouth of Three Springs Cr.	Western Shore	Mouth of Reiboldt Cr.
<i>Emergent Aquatics</i>						
Scirpus validus	+++	+++	+++	+++	+++	+
Scirpus americanus	+++	+++	+	+	++	
Eleocharis palustris	+++				++	
Typha latifolia & T. angustifolia	+	+++	+		+	
Sagittaria latifolia f. gracilis		+		+	+	
Sparganium eurycarpum		+		+		
Zizania aquatica		+				
Juncus spp.	+		+		+	
Eleocharis spp.		+		+		+
<i>Submerged Aquatics</i>						
Potamogeton amplifolius		+				
P. berchtoldi		++				+
P. crispus	+	+	+		+	
P. graminifolius			+		++	
P. natans		+				
P. pectinatus		++				++
P. richardsonii	+					+ ¹
P. zosteriformis		+				
Najas flexilis	+					
Vallisneria americana	+	+	+		+	+
Elodea canadensis	++	+	+		+	+
Myriophyllum exalbescens	++	++	+	+	+	+
<i>Floating Aquatics</i>						
Nymphaea odorata	++	++	+			
Nuphar advena	+	++	+			
Polygonum coccineum		++	+		+	

¹ Washed up on shore

+++ Abundant, dominant

++ In large numbers, not dominant

+ One or few, in isolated patches

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SOUTHEASTERN WISCONSIN CHAPTER OF THE BOTANICAL CLUB OF WISCONSIN

On September 13, 1978, this organization was formed to enable botanists of this area of the state to meet periodically to hear lectures on botanical topics, exchange botanical information and encourage an interest in plant science in their communities. The level of programs is designed for professional as well as non-professional persons and will include the fields of education, research, conservation and public information.

At the Foundation Meeting on the UWM campus, fifty-four persons were present to form the charter membership. The following were elected to the executive committee: President, Martyn Dibben; Vice President, William Millington; Secretary-Treasurer, Larry Janquart; Members-at-large, Gary Loos, Lorrie Otto and James Reimer.

A second meeting was held on November 15, 1978 and the members heard a talk by Mr. James Kuhns of the U.S. Forest Service on the project RARE II.

Persons interested in joining this group may contact Mr. Larry Janquart, Milwaukee Area Technical College, 1015 North 6th Street, Milwaukee, Wis. 53203.