1970

Aquatic Vascular Plant Communities of Illinois

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AQUATIC VASCULAR PLANT COMMUNITIES OF ILLINOIS

(TITLE)

BY

BENJAMIN LEE DOLBEARE

B.S. in Ed., Western Illinois University, 1965

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science in Botany

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1970
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

August 5, 1970
DATE

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8/5/70
DATE

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ACKNOWLEDGMENTS

The author wishes to thank Dr. John E. Ebinger for his advice, encouragement, and leadership in this study. The author is also indebted to Drs. Richard L. Smith, John Speer, and Wesley Whiteside for their helpful suggestions and encouragement and for critically reading the manuscript. Special thanks are due Dr. Glen S. Winterringer of the Illinois State Museum for giving the author a thorough background for this ecological study. Finally, the author wishes to express his sincerest appreciation to his wife, Debbie, whose patience, understanding, and encouragement rendered the completion of this study a most pleasant task.

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INTRODUCTION

Aquatic plants are rarely collected by most taxonomists and because of this, the distribution of many species in the State of Illinois is not well known. As a result, the counties in which these species have been reported [Jones and Fuller (1955); Winterringer and Evers (1960)] represent an incomplete picture of the distribution of these aquatic plants in the state. Recently, some work has been done on the distribution of aquatic vascular plants in Illinois by Fore, Stookey, and Parsons (1965), Meyer and Mohlenbrock (1966), Mohlenbrock (1959, 1967), Mohlenbrock and Richardson (1967), Mohlenbrock and Voight (1965), Schwegman and Mohlenbrock (1966, 1968), Voight and Mohlenbrock (1964), Weik and Mohlenbrock (1968), Windler (1966), and Winterringer (1966). The only floristic study of aquatic vascular plants that encompassed the entire state was that of Winterringer and Lopinot (1966) and their study was concerned mainly with distribution and taxonomy. During their study, employees of the Illinois Division of Fishery Management throughout the state sent specimens of the vascular aquatic plants of their work areas to Dr. G. S. Winterringer at the Illinois State Museum.

In the present study an attempt was made to determine the vegetational patterns that exist in the aquatic areas of Illinois. Attempts were also made to determine the range and habitat requirements. With a few exceptions,

no detailed analysis has been made of the various aquatic vascular plant communities in Illinois. The seventy-seven (77) aquatic areas included in this study during the growing seasons of 1966 through 1969 consisted of nearly all the state lakes, many public lakes of municipalities, some private lakes of fishing clubs, and farm ponds scattered throughout the state. In several cases, the areas were visited in successive summers in an effort to determine whether the communities were static or dynamic.

The vascular plants considered in this study are the free-floating forms, the submersed forms, the forms with both submersed and floating leaves, and a few emergent forms that appeared to be commonly associated with the other species. The free-floating forms include the genera of the Lemnaceae and Salviniaceae and Limnobium in the Hydrocharitaceae. As used here, the submersed forms are those species which grow beneath the surface of the water, with only the reproductive structure reaching the surface. The submersed forms are represented by Bidens beckii (Compositae), Elodea (Hydrocharitaceae), Peplis (Lythraceae), Potamogeton and Zannichellia (Potamogetonaceae), and the aquatic species of the families Ceratophyllaceae, Halorgaceae, Lentibulariaceae, Naiadaceae, and Ranunculaceae. The forms with both submersed and free-floating leaves include Bacopa rotundifolia (Scrophulariaceae), Heteranthera dubia (Pontederiaceae), and aquatic species of the families Cabombaceae, Callitrichaceae, Marsiliaceae, Nymphaeaceae, and a few species with floating leaves in the Potamogetonaceae. The emergent forms are those

that root beneath the surface of the water, but have a sufficiently strong stem to elevate most of the leaves and reproductive parts above the water surface. The few emergent species included in this study are Dianthera americana (Acanthaceae), Jussiaea repens (Onagraceae), Polygonum coccineum (Polygonaceae), Pontederia cordata (Pontederiaceae), Nelumbo lutea (Nelumbonaceae), and two species of Nuphar (Nymphaceae).

Wind and wave action largely determine the location of free-floating members of the Lemnaceae and Salviniaceae, and this usually results in a peripheral distribution of them in the lakes and ponds. Although floating species of either or both of the families Lemnaceae and Salviniaceae are found growing in association with almost all of the emergent and floating species present, their movement makes detailed discussion of the communities of these families pointless unless one is considering only areas which are well sheltered. Exceptions are Lemna trisulca and Wolffiella floridana which are normally submersed; almost all of the associations of these two species appear to be valid.

The species considered in this study are included in a checklist at the end of this paper. The authority of each species is given in this list and will not be repeated in the text. The nomenclature follows that of Jones (1963).

MATERIALS AND METHODS

The aquatic communities of the lakes and ponds were determined by two separate sampling methods. For ponds and other small areas, the investigator waded through the pond or around the area collecting representative species of each community. For larger areas such as lakes, a boat was used to cover the entire area except for the shallow portions; these were sampled by wading. Ecological data such as water depth, distance from the shoreline, and the general shape of each community was recorded. Specimens from nearly all communities were collected for laboratory identification. The specimens were pressed, dried, verified for identification, and deposited in the Eastern Illinois University herbarium or in the herbarium of the Illinois State Museum.

RESULTS AND DISCUSSION

The lakes of Illinois can be grouped in three basic categories--eutrophic lakes, dystrophic lakes, and oligotrophic lakes. The eutrophic lakes, which comprise the bulk of the study, are relatively shallow, rich in organic matter and nutrients, and highly productive. The dystrophic, or bog lakes, of northeastern Illinois are low in calcium carbonate, high in humus content, and very poor in nutrients. The oligotrophic lakes are deep lakes with very steep sides and have very little, if any, aquatic vascular plants (Smith, 1966). The oligotrophic lakes were not included in the present study because of their lack of vegetation. In addition to the study of these lakes and ponds, other areas of interest such as the Dead River in northeastern Illinois, and the sloughs and swamps in southern Illinois are discussed separately at the end of this section.

Eutrophic Lakes

Eutrophic lakes, rich in organic matter and very favorable for the growth of aquatic plants, have a rather wide littoral zone, in which one finds rooted hydrophytes. The lower limit of the littoral zone is about 18 feet, although this depth will vary with the turbidity of the water (Knight, 1965). Most of the eutrophic areas of Illinois are either state or federally

controlled areas, city reservoirs, watershed areas, or private farm ponds. Since the aquatic vegetation of the eutrophic lakes throughout Illinois have the same basic vegetation, they are discussed together.

Mohlenbrock, Dillard, and Abney (1961); Fore, Stookey, and Parsons (1965); Stookey, Fore, and Mohlenbrock (1964); Fore and Mohlenbrock (1966); Hansen (1966); and Mohlenbrock (1967) have indicated that the basic community of the eutrophic lakes of southern Illinois consists of Ceratophyllum demersum, Jussiaea repens, Naias spp., Nuphar advena, and Potamogeton spp. The present study has shown the dominant species of southern Illinois to be Ceratophyllum demersum, Jussiaea repens, Naias guadalupensis, N. minor, Nelumbo lutea, Potamogeton diversifolius, P. foliosus, and P. pusillus. Other species that were commonly found associated with these were Elodea occidentalis, Potamogeton americanus, and P. pectinatus (Chart I).

In this table the number of times a particular species was observed growing in association with another species is based on the number of times the less common of the two species was observed. The most commonly observed associations were Nelumbo lutea - Jussiaea repens (67%), Nuphar advena - Potamogeton diversifolius (67%), Naias minor - N. guadalupensis (50%), Naias minor - Jussiaea repens (50%), Naias minor - Nelumbo lutea (33%), and Naias minor - Ceratophyllum demersum (25%).

In the eutrophic lakes and ponds of Illinois, Ceratophyllum demersum, Jussiaea repens, Myriophyllum spicatum, Naias guadalupensis, N. minor,

Potamogeton americanus, P. diversifolius, P. foliosus, P. pectinatus, and P. pusillus were observed growing in association with many different species. In contrast, Dianthera americana and Polygonum coccineum were usually in pure stands and seldom found growing in association with any other aquatic plants (Table 1).

The most common plant communities found in the eutrophic lakes are listed in Chart I. The subordinate species that were found on one or more occasions with this dominant species follow. In all communities observed in eutrophic lakes one species always dominated, making up usually more than 50% of the stand. The subordinate species were generally represented by a few individuals and were not always present in every community. Each of the dominant species was also observed occupying a minor position in some communities dominated by another species, with no single species found to occur only as a dominant species.

Jussiaea repens, Nelumbo lutea, Naias minor, and Potamogeton pusillus were dominant in eutrophic communities in the southern half of Illinois, but were either absent or uncommon in the northern half of the state. The other seven species are statewide in distribution.

TABLE I: SPECIES TO SPECIES ASSOCIATIONS IN EUTROPHIC LAKES*

	Ceratophyllum demersum	Dianthera americana	Elodea occidentalis	Jussiaea repens	Myriophyllum spicatum	Naias guadalupensis	N. minor	Nelumbo lutea	Nuphar advena	Polygonum coccineum	Potamogeton americanus	P. diversifolius	P. foliosus	P. pectinatus	P. pusillus	No. of lakes containing each species	Total associations per species
Ceratophyllum demersum	3		2	5		3	6	1		1	1	1	1	1	1	13	26
Dianthera americana		3							1		1					3	5
Elodea occidentalis	2		3											1	1	5	7
Jussiaea repens	5			5		7	6	4	1		1	2	4		2	21	37
Myriophyllum spicatum					1	2	1				1			1	1	2	7
Naias guadalupensis	3			7	2	4	6				1	1	3	3	5	15	35
N. minor	6			6	1	6	3	2			2	2	2	1	3	12	30
Nelumbo lutea	1			4			3	2				1				6	11
Nuphar advena		1		1			1		1			2				3	6
Polygonum coccineum	1									3						3	4
Potamogeton americanus	1	1			1	1					5		1		1	8	11
P. diversifolius	1			2			2	1	2			4			1	8	12
P. foliosus	1			2		3	2				1		12	1	2	17	24
P. pectinatus	1		1		1	3	1						1	3	3	7	14
P. pusillus	1		1	3	1	5	3				1	1	2	3	5	11	26

*The more common species in eutrophic lakes are listed in the left column with a duplicate listing across the top for cross reference as to the number of times interspecific associations were observed. A blank means that the two indicated species were not found growing together.

CHART I: Dominant and Subordinate Species in Eutrophic Lakes of Illinois

Dominant Species	Subordinate Species
Ceratophyllum demersum (3)*	Elodea occidentalis
	Jussiaea repens
	Naias guadalupensis
	N. minor
	Potamogeton americanus
	P. foliosus
	P. pusillus
Jussiaea repens (5)	Brasenia schreberi
	Ceratophyllum demersum
	Lemna minor
	Naias guadalupensis
	N. minor
	Nelumbo lutea
	Potamogeton pusillus
Myriophyllum spicatum (2)	Naias guadalupensis
	N. minor
	Potamogeton americanus
	P. pectinatus
	P. pusillus

Naias guadalupensis (5)	Elodea occidentalis
	Jussiaea repens
	Myriophyllum spicatum
	Naias minor
	Nelumbo lutea
	Potamogeton americanus
	P. foliosus
	P. pectinatus
	P. pusillus
Naias minor (6)	Bacopa rotundifolia
	Ceratophyllum demersum
	Jussiaea repens
	Naias guadalupensis
	Nelumbo lutea
	Potamogeton diversifolius
	P. foliosus
	P. pusillus
Nelumbo lutea (4)	Jussiaea repens
	Naias guadalupensis
	Potamogeton foliosus
	P. pusillus

Potamogeton americanus (2)	Ceratophyllum demersum
	Naias guadalupensis
	Potamogeton foliosus
Potamogeton diversifolius (2)	Ceratophyllum demersum
	Naias minor
	Nelumbo lutea
	Nuphar advena
Potamogeton pectinatus (2)	Naias guadalupensis
	Potamogeton foliosus
	P. pusillus
Potamogeton pusillus (3)	Elodea occidentalis
	Jussiaea repens
	Myriophyllum spicatum
	Naias guadalupensis
	N. minor
	Potamogeton americanus
	P. foliosus
	P. pectinatus

*( ) The number of communities within which this species was dominant.

Of the four eutrophic lakes of southern Illinois that had been previously studied by other investigators, three were examined by the author for verification and to determine whether the aquatic vascular plant community is dynamic or static. These three lakes are Lake Murphysboro, Lake Glendale, and Mermet Lake.

Lake Murphysboro. This lake (Jackson County, Illinois) has a shoreline of 7.5 miles, a surface area of 145 acres, and a maximum depth of 40 feet (Ill. Dept. Cons., 1967). Fore and Mohlenbrock (1966) found the dominant community of this lake to consist of Jussiaea repens, Naias flexilis, N. guadalupensis, N. minor, and Potamogeton americanus. The aquatic species were further discussed by Mohlenbrock (1967) who separated them into floating aquatics, submersed hydrophytes, and emergent plants. Lemna minor and Spirodela polyrhiza were the only two species of floating aquatics. The submersed hydrophytes of the littoral zone were Ceratophyllum demersum, Naias guadalupensis, Potamogeton americanus, and P. follosus. Nelumbo lutea, the only emergent species, was often found growing in extensive dense stands.

Except for Naias flexilis, and N. minor, all of the species found by Fore and Mohlenbrock (1966) were observed in Lake Murphysboro during the present study. Naias flexilis and N. guadalupensis are very similar and easily confused, and it is very possible that the specimens of N. flexilis reported for Lake Murphysboro are actually N. guadalupensis. The only valid

specimens of N. flexilis for Illinois examined by the author were from the dystrophic lakes of the northeastern part of the state. Verification of the author's identifications of N. flexilis and N. guadalupensis was by Dr. G. S. Winterringer, Illinois State Museum, and Dr. E. G. Voss, University of Michigan. On the other hand, Naias minor is more easily identified and is common in the southern two-thirds of Illinois; it probably has become extinct in Lake Murphysboro or may have been collected at another location and inadvertently attributed to this lake.

A number of distinct plant communities were observed in Lake Murphysboro by the present author. Potamogeton foliosus was found growing in a pure colony along the shoreline as well as with Jussiaea repens in some localized areas near the shore. Zannichellia palustris was also found growing along the shoreline in three small pure colonies. Jussiaea repens was the dominant plant in a community of Naias guadalupensis, Nelumbo lutea, and Potamogeton americanus growing along the shoreline. In this same community at a distance over three feet from the shoreline, Naias guadalupensis is the dominant plant with Jussiaea repens no longer present. The other community observed consisted of a large colony of Nelumbo lutea with some Naias guadalupensis scattered throughout.

Lake Glendale. Another lake of southern Illinois that has been floristically examined several times is Lake Glendale in Pope County. This United States Forest Service Recreation Lake has a surface area of 82 acres, a shoreline

of 3.2 miles, and a maximum depth of 14 feet (Ill. Dept. Cons., 1967). Hansen (1966) interpreted the floristics of Lake Glendale from a vegetative map of the area as prepared by Harry K. Phinney in 1944. At that time, Nelumbo lutea, Nuphar advena, Potamogeton foliosus, and P. illinoensis grew in the lake. This lake was drained during October, 1950 in an effort to improve the fishing. A follow-up study revealed extensive colonies of Potamogeton foliosus throughout the lake in 1954 (Hansen, 1966). In the present study, Bacopa rotundifolia, Naias minor, Nelumbo lutea, Nuphar advena, and Potamogeton diversifolius were observed in the lake. The main community was a thirty-five foot wide fringe of Naias minor and Potamogeton diversifolius at depths of 0 to 4 feet along the north side of the lake in an area formerly occupied mostly by Nelumbo lutea (Hansen, 1966). Nelumbo lutea and Nuphar advena were observed growing throughout this littoral community. Bacopa rotundifolia, although not abundant, was found growing with Naias minor at a depth of 6 inches. These two studies indicate the disappearance of two species and the reappearance or immigration into the lake of three species. Observation of the lake one year later revealed no changes in the aquatic flora.

Mermet Lake. This lake has a surface area of 45 acres, a shoreline of 4.6 miles, and a maximum depth of 12 feet (Ill, Dept. Cons., 1967). Fore, Stookey, and Parsons (1965) found the dominant plant of the shallow water of Mermet Lake in Massac County to be Nelumbo lutea. In the present study, N. lutea was found in one small area along the shoreline. The dynamics of

the aquatic plant communities are more easily understood when one discovers that this lake is sprayed at five-year intervals to control the aquatic emergent vegetation.

Four communities were observed in Mermet Lake. Ceratophyllum demersum and Potamogeton diversifolius grew at depths of one-half to three and one-half feet with the latter species being the dominant plant. This community was found throughout approximately one-half of the littoral zone. Brasenia schreberi, Ceratophyllum demersum, Jussiaea repens, and Polygonum coccineum grew at a range in depth from 10 to 14 inches with the dominant species being Ceratophyllum demersum and Polygonum coccineum. The third community was a small colony of Potamogeton americanus which was found growing in one and one-half feet of water while the fourth community was a small colony of Nelumbo lutea growing on the shore.

Several other lakes are also discussed in detail because of their deviation from the basic community scheme of the eutrophic lakes of Illinois. These areas, and their unusual species, are Kinmundy Reservoir (Brasenia schreberi), Vevay Lake (Bacopa rotundifolia), Lake Charleston (Rumex verticillatus), and Paris East Lake (Heteranthera dubia).

Kinmundy Reservoir. Kinmundy Reservoir, in Marion County, has a surface area of 17 acres, a shoreline of 3.5 miles, and a maximum depth of 22 feet (Ill. Dept. Cons., 1967). Brasenia schreberi, a rare aquatic plant of Illinois, is the dominant plant throughout the lake. The main community of this

eutrophic lake contained E. schreberi, Potamogeton americanus, P. diversifolius, and Utricularia gibba; one smaller community of Ceratophyllum demersum and Potamogeton pusillus was also present.

Vevay Lake. Vevay Lake, in Cumberland County, has a surface area of 2 acres, a shoreline of .75 miles, and a maximum depth of about 10 feet as determined by the author. Bacopa rotundifolia grew along the shoreline with Lemna minor floating on the surface. Polygonum coccineum was very abundant in those portions of the lake with a depth range of six to ten inches and a gently sloping bottom.

Lake Charleston. Lake Charleston, in Coles County, has a surface area of 337 acres, a shoreline of 5.6 miles, and a maximum depth of 12 feet (Ill. Dept. Cons., 1967). Rumex verticillatus is commonly found in wet areas of central Illinois but is not often observed growing as an emergent as it was in Lake Charleston. Other plants of this community were Dianthera americana and Potamogeton americanus. This community was found in nearly all parts of the lake at a depth of four to nine inches. A colony of Nelumbo lutea was found in the center of the lake in about four feet of water with specimens of Lemna minor and Spirodela polyrhiza floating throughout the stand. These duckweeds were also found floating in large stands of Rumex verticillatus in the shallow peripheral areas of the lake.

Paris East Lake. Paris East Lake, in Edgar County, has a surface area of 176 acres, a shoreline of 7.8 miles, and a maximum depth of 30 feet (Ill. Dept. Cons., 1967). Heteranthera dubia was observed growing in association with Naias guadalupensis, Potamogeton pectinatus, P. pusillus, and in pure stands. Heteranthera dubia is not a common plant of central or southern Illinois. At Paris East Lake, however, it was the dominant plant of the above community and was found growing at depths of six to fifteen inches.

Dystrophic Lakes

Numerous dystrophic lakes, commonly referred to as bog lakes, are found in the glaciated area of the northeastern corner of Illinois. According to Ruttner (1968) the water of these lakes is strongly acidic, has an unusually low level of dissolved electrolytes, and a high content of organic materials which imparts a brownish color to the water. These dystrophic lakes are remnants of the coniferous forest that were left behind when this forest retreated northward at the close of the last ice age (Shelford, 1963). Evidence of this relationship to the coniferous forest of Canada is readily seen in the ubiquitous ring of larch [Larix laricina (DuRoi) K. Koch.] and other taxa that are commonly associated with coniferous forests.

According to Shelford (1963) the dystrophic lakes of northeastern Illinois and those of the coniferous forests of Canada have a similar vegetation. He indicated that Nuphar variegatum, Nymphaea odorata, Potamogeton natans, and Sparganium americanum are characteristic plants of both areas. In the present study Nuphar variegatum was observed in nearly all the dystrophic

lakes, but Nymphaea tuberosa (instead of N. odorata) was found to be a characteristic species. Potamogeton natans was observed in two lakes while Sparganium americanum, an emergent species, was not included in this study.

The eleven dystrophic lakes observed in this study are in Lake and McHenry Counties in northeastern Illinois. As far as can be determined, no previous detailed study has been made of the aquatic vascular flora of these lakes. Present studies have revealed that these dystrophic lakes contain a flora vastly different from that of the other lakes and ponds of Illinois. Nearly half of the twenty-five species of aquatic vascular plants found were not in the eutrophic lakes of Illinois, and of these, Bidens beckii, Naias marina, Nuphar variegatum, Potamogeton robbinsii, and P. strictifolius are extremely rare, having been reported from no other part of Illinois.

The uniqueness of these dystrophic lakes was illustrated by Dolbeare (1967) who reported the occurrence of Bidens beckii and other rare plants for Gray's Lake in Lake County. The main community of this lake contained Bidens beckii, Elodea canadensis, Myriophyllum spicatum, Naias flexilis, N. guadalupensis, N. marina, Potamogeton friesii, P. pectinatus, P. robbinsii, P. strictifolius, P. zosteriformis, and Ranunculus longirostris. The dominant plants were Naias flexilis, N. guadalupensis, and Potamogeton robbinsii. A total of seventeen species was observed in

Gray's Lake, with this being the only area in Illinois in which Bidens beckii, Potamogeton gramineus, P. robbinsii, P. strictifolius, and P. zosteriformis were found. No other aquatic area of Illinois was observed to have such a diverse flora as was present in Gray's Lake.

Nine major communities were observed in the dystrophic lakes (Chart II). Potamogeton pectinatus occupied the dominant position of the most commonly encountered community. Other species found in these communities were Potamogeton crispus, P. pusillus, and Ranunculus longirostris. Potamogeton pectinatus also occurred in all three communities that contained Ranunculus longirostris. Potamogeton pectinatus was the only species with which Potamogeton pusillus was found. About one-half of the communities occupied by P. crispus also contained P. pectinatus. Ceratophyllum demersum is another common dominant of aquatic plant communities. All of the communities dominated by C. demersum contained Potamogeton crispus and two-thirds of them contained Elodea canadensis and Naias guadalupensis. Myriophyllum spicatum occupied the dominant position in two lakes. Ceratophyllum demersum was the only species present in both communities. Pontederia cordata was often found in pure colonies but Potamogeton illinoensis, P. natans, and P. richardsonii were occasionally found mixed into these communities.

No associated species were observed in three different types of aquatic communities. Nuphar variegatum and Nymphaea tuberosa are normally

found in the deeper parts of the littoral zone in areas in which no other aquatic species grow. Potamogeton gramineus was observed in one lake and it shared the dominant position with P. illinoensis. Potamogeton foliosus and P. friesii shared the dominant position in a shallow area of Bear Valley Hunting Club Lake that also contained Myriophyllum spicatum in the deeper parts of the littoral zone. Small patches of Potamogeton friesii were also observed in Turner's Lake and Gray's Lake.

One can now readily see that some of the dominant plants of Chart II were found on more than one occasion. Also, not all of the associated species were always present in every community observed.

In addition to the above communities, some plants were found growing in pure colonies. These plants were Ceratophyllum demersum (2), Myriophyllum spicatum (1), Nuphar variegatum (2), Pontederia cordata (1), Potamogeton crispus (4), P. friesii (1), and P. pectinatus (5).

CHART II: Dominant and Subordinate Species in Dystrophic Lakes of Illinois

Dominant Species	Subordinate Species
Ceratophyllum demersum (3)*	Elodea canadensis
	Naias guadalupensis
	Potamogeton crispus
Myriophyllum spicatum (2)	Ceratophyllum demersum
	Naias guadalupensis
	N. marina
	Potamogeton illinoensis
	P. natans
	P. pectinatus
	P. richardsonii
Nuphar variegatum - Nymphaea tuberosa (2)	No associated species
Pontederia cordata (2)	Potamogeton illinoensis
	P. natans
	P. richardsonii
Potamogeton crispus - Elodea occidentalis (1)	Lemna trisulca
	Potamogeton pectinatus
	Ranunculus longirostris

Potamogeton foliosus - P. friesii (1)	No associated species
Potamogeton gramineus - P. illinoensis (1)	No associated species
Potamogeton pectinatus (4)	Potamogeton crispus P. pusillus Ranunculus longirostris
Naias flexilis - N. guadalupensis - Potamogeton robbinsii (1)	Bidens beckii Elodea canadensis Myriophyllum spicatum Naias marina Potamogeton friesii P. pectinatus P. strictifolius P. zosteriformis Ranunculus longirostris

*( ) The number of communities within which this species was dominant.

Sloughs of Southern Illinois. A slough is a shallow depression that normally contains water from late fall until mid-summer. Since sloughs dry up for a short time during the late summer, the vegetation associated with them is very unusual. Common woody plants associated with these areas are Cephalanthus occidentalis L. and a few species of Acer, Populus and Salix. Herbaceous plants commonly invade the area during the dry season, with species of Cyperaceae being the most common. Since water is present for only a part of the year, the aquatic plants present must complete their reproductive cycle before the slough dries up. The length of time the water is present, or absent, eliminates many species, and makes the aquatic flora of sloughs unique.

In most cases the plant communities observed were similar to those found in the eutrophic lakes of southern Illinois, although some unusual plants were observed. Both Peplis diandra and Utricularia gibba, extremely rare in Illinois, were observed in these sloughs. Also, extensive communities of most members of the Lemnaceae and Salviniaceae were extremely common in many of the sloughs examined.

A slough four miles south of Mt. Vernon in Jefferson County contained four species of aquatic vascular plants and several woody species. The aquatic community of this slough contained Jussiaea repens, Nuphar advena, Potamogeton diversifolius, and the uncommon Peplis diandra. The dominant plant of this community was Nuphar advena. This community was found throughout the entire slough at depths of one-half to two feet.

A slough at the east edge of Vienna in Johnson County contained two aquatic species and no woody plants. The absence of woody vegetation is probably best explained by the average water depth of three to four feet. This slough is also much deeper during the spring when Cache Creek backs up into this area. By late summer the slough drains into Cache Creek. The aquatic species present were Ceratophyllum demersum and Nymphaea tuberosa.

The Union County Refuge is about two miles southeast of Ware in Union County and was established in 1950 for the protection of overwintering Canada Geese. The sloughs of this refuge were constructed by damming some of the low areas of the refuge. Most of them are less than five feet deep and are periodically drawn down by the refuge manager. These sloughs vary from a few to over 25 acres. Most of these areas have open water as well as inundated regions of forest. Common trees found in these sloughs are Acer drummondi H. & A., A. rubrum L., Celtis laevigata Willd., Fraxinus pennsylvanicum Marsh., Populus heterophylla L., Salix nigra L., and Taxodium distichum (L.) Rich. The sloughs of the refuge are quite different from the nearby lakes and ponds of southern Illinois. They are sheltered from wind action and have little water movement.

Most of the sloughs lack submersed aquatic plants and are covered from shore to shore with free-floating forms. The lack of submersed aquatic plants is probably due to the excessive fluctuation of water level.

Some of the sloughs are drained during the summer months and millet is then planted in these areas for the migratory geese. In one slough, an association of Azolla mexicana, Lemna minor, and L. valdiviana was observed while in another, Lemna minor, L. valdiviana, and Spirodela polyrhiza were observed to form a layer about four inches thick. Another slough, one without any submersed aquatic plants, was heavily covered with a layer of Spirodela polyrhiza and Wolffia columbiana. The only pure stand in the sloughs was a layer of Lemna minor about three inches thick.

In some of the larger open sloughs (or small lakes) of the refuge the water fluctuation is not great enough to inhibit the growth of submersed or emersed aquatic forms. In one slough, Azolla mexicana, Spirodela polyrhiza, and Wolffia papulifera were found floating in association with Jussiaea repens and Nelumbo lutea on the surface while Ceratophyllum demersum and Naias minor were growing in a submersed association. In a partially shaded slough, Lemna minor, Spirodela polyrhiza, and Wolffia columbiana were observed floating over a submersed association of Ceratophyllum demersum and Utricularia gibba.

Southern Illinois Swamps. A few taxonomic studies have been conducted in the deep swamps of southern Illinois. In 1959, Mohlenbrock did a floristic study of Larue Swamp in Union County. Schwegman and Mohlenbrock (1966)

undertook a study of the aquatic flora of the swampy portions of Mermet Wildlife Refuge; Voight and Mohlenbrock (1964) made a detailed study of the various aquatic deep swamp communities that exist in southern Illinois.

As treated by Voight and Mohlenbrock (1964), the deep swamps of southern Illinois are freshwater, woody communities with surface water throughout most or all of the growing season. The common trees in these areas are Acer drummondi H. & A., Carya aquatica (Michx. f.) Nutt., Fraxinus tomentosa Michx. f., Gleditsia aquatica Marsh., Nyssa aquatica L., and Taxodium distichum (L.) Rich., and the woody shrubs are Cephalanthus occidentalis L., Decodon verticillatus (L.) Ell., and Rosa palustris Marsh.

In general, the free-floating species reported were Azolla mexicana, Lemna minor, L. perpusilla, L. trisulca, L. valdiviana, Limnobium spongia, Spirodela polyrhiza, Wolffia columbiana, W. papulifera, and Wolffiella floridana. The submersed aquatic plants found in these deep swamps were Cabomba caroliniana, Ceratophyllum demersum, Naias flexilis, Potamogeton diversifolius, Ranunculus flabellaris, Utricularia gibba, and U. vulgaris while the emergent aquatic plants were Brasenia schreberi, Hottonia inflata, Jussiaea repens, Nelumbo lutea, Nuphar advena, Nymphaea odorata, Pontederia cordata, and Proserpinaca palustris.

Random observations of the aquatic plant communities of the swamps of extreme southern Illinois were made during the present study. Of the fourteen species of aquatic vascular plants found, Callitriche palustris, Ceratophyllum echinatum, Limnobium spongia, Ranunculus flabellaris, and

Wolffia floridana were observed only in these swamps, while ten of the twenty-five species reported by Mohlenbrock (1959), Schwegman and Mohlenbrock (1966), and Voight and Mohlenbrock (1964) were not observed. These obeervations were all made near the edge of the swamps and no exploratory trips were made into their interiors. A total of twelve communities was observed (Chart III), with no pure stands being noted.

CHART III: Dominant and Subordinate Species of Southern Illinois Swamps

Dominant Species	Subordinate Species
Ceratophyllum echinatum (5)*	Hottonia inflata
	Ranunculus flabellaris
Jussiaea repens (1)	Brasenia schreberi
	Ceratophyllum demersum
Lemna trisulca - Wolffiella floridana (1)	No associated species
Limnobium spongia - Azolla mexicana (4)	Ceratophyllum echinatum
	Jussiaea repens
	Nuphar advena
	Utricularia gibba
Ranunculus flabellaris (4)	Callitriche palustris
	Hottonia inflata

*( ) The number of communities within which this species was dominant.

Dead River. The Dead River, which is located in northeastern Illinois, drains the swamps of the Illinois Beach State Park into Lake Michigan. This stream, which is about two miles long and forty feet wide, has an average depth of 2 to 3 feet and a very slow current. Due to the unique characteristics of this stream and its diverse and abundant aquatic flora, it is treated separately.

A total of twelve species of aquatic vascular plants were found growing in the Dead River. Most of these (Ceratophyllum demersum, Elodea canadensis, Myriophyllum heterophyllum, M. verticillatum, Naias flexilis, Nuphar variegatum, Nymphaea tuberosa, Potamogeton amplifolius, P. illinoensis, and Utricularia vulgaris) were found growing together throughout most of the stream. This association was found from bank to bank in all areas exceeding six inches in depth. Although the species remained the same, their abundance varied with local conditions throughout the length of the stream. Most of this variation is probably the result of water depth. At the edge of the stream the composition of the community changed. Here, Heteranthera dubia and Potamogeton foliosus were found, usually associated with Utricularia vulgaris. Both Heteranthera dubia and Potamogeton foliosus are shallow-water species that are rarely found far from shore. Utricularia vulgaris, in contrast, was not uncommonly found at depths up to eight feet in the Dead River. As a result, this latter species was a common member of the community that filled most of the river.

Of the twelve species of aquatic vascular plants found in the Dead River, four (Myriophyllum heterophyllum, M. verticillatum, Potamogeton amplifolius, and Utricularia vulgaris) were not found in the dystrophic lakes of northeastern Illinois. Furthermore, most of these twelve species were not common in any of the aquatic areas studied in Illinois, although Ceratophyllum demersum and Potamogeton foliosus occurred commonly enough to be listed in Table I. During the present study, Myriophyllum heterophyllum, M. verticillatum, and Potamogeton amplifolius were found only in the Dead River.

Distribution and Abundance of Aquatic Vascular Plants in Illinois

That ninety-eight new county records are reported in this paper illustrates how little is actually known regarding the distribution of the aquatic vascular plants in Illinois. Previous studies are few and were not comprehensive. The work of Winterringer and Lopinot (1966) represents the only attempt to delimit aquatic plant distribution in Illinois. Many parts of the state are still relatively unexplored in terms of aquatic vascular plants.

The checklist which follows is a listing of the seventy-nine species of aquatic vascular plants of Illinois (Jones, 1963). Of these seventy-nine species, sixty-two species were observed during the present study. Following each species is a general statement as to its distribution in the state and the ecological conditions under which it normally grows. Under each species is a list of the counties in which it was found by the author but not previously

reported, the location in the county, the author's collecting number, and the herbarium in which the specimen is deposited (ISM for Illinois State Museum herbarium and EIU for the Eastern Illinois University herbarium).

CABOMBACEAE

Brasenia schreberi Gmel. Submersed with floating leaves and emergent flowers in lakes, slow streams, and swamps. Scattered localities throughout the state.

Marion Co., Kinmundy Reservoir, 1 1/2 miles south of Kinmundy, 3185 (EIU).

Cabomba caroliniana A. Gray. Submersed in lakes and swamps. Scattered localities in southern two-thirds of state.

CALLITRICHACEAE

Callitriche heterophylla Pursh. Submersed with floating leaves in ponds and shallow water. Statewide.

Pope Co., Woodland pool, 2 miles southeast of Eddyville, 2753 (EIU).

Callitriche palustris L. Submersed with floating leaves. Locally throughout the state.

CERATOPHYLLACEAE

Ceratophyllum demersum L. Submersed in ponds, lakes, and slow streams. Statewide.

DeWitt Co., Weldon Springs State Lake, 2 miles southeast of Clinton, 3240 (EIU).

Effingham Co., Lake Sara, 6 miles northwest of Effingham, 2937 (EIU).

Massac Co., Mermet Lake, 1/2 mile southwest of Mermet, 948 (EIU).

Moultrie Co., Walter Brewer Farm Pond, 3 miles southwest of Lovington, 3138 (EIU).

Ceratophyllum echinatum A. Gray. Submersed in ponds, slow streams, and swamps. Scattered localities throughout the state.

COMPOSITAE

Bidens beckii Torr. Submersed with emergent flowers. Dystrophic lakes of the northeast.

HALORAGACEAE

Myriophyllum heterophyllum Michx. Submersed in ponds and slow streams. Scattered localities throughout the state.

Myriophyllum humile (Raf.) Morong. Submersed in shallow water or on exposed mud flats. Probably extinct in Illinois.

Myriophyllum pinnatum (Walt.) BSP. Submersed in slow streams and on mud flats. West-central and northeastern Illinois.

Myriophyllum spicatum L. Submersed in lakes and slow streams. Northern two-thirds of the state.

Clark Co., Lincoln Trail State Lake, 2 1/2 miles south of Marshall, 2995 (ISM).

Coles Co., Lincoln Log Cabin State Pond, 10 miles south of Charleston, 3258 (EIU).

Vermilion Co., Vermilion County Fishing Club Lake, 5 miles north of Oakwood, 3064 (EIU).

Myriophyllum verticillatum L. Submersed in lakes and slow streams. Scattered localities throughout the state.

Proserpinaca palustris L. Submersed in ponds and slow streams. Locally throughout Illinois.

HIPPURIDACEAE

Hippuris vulgaris L. Emergent in ponds and streams. Rare in the northeast.

HYDROCHARITACEAE

Elodea canadensis Michx. Submersed in lakes and slow streams. Statewide.

Henderson Co., Bay of Mississippi River, 2 miles south of Lomax, 542 (ISM).

Elodea densa Planch. Submersed in ponds and lakes. Rarely escapes from aquaria and does not naturally occur in Illinois.

Elodea occidentalis (Pursh) St. John. Submersed in ponds, lakes, and slow streams. Statewide.

Clark Co., Lincoln Trail State Lake, 2 1/2 miles south of Marshall, 2558 (EIU).

Hamilton Co., L. P. Dolan State Lake, 8 miles southeast of McLeansboro, 2295 (EIU).

Moultrie Co., Farm pond, 2 miles southwest of Lovington, 3150 (EIU).

Stephenson Co., Lake Le-Aqua-Na, 2 miles north of Lena, 1169 (EIU).

Limnobium spongia (Bosc) Steud. Emergent in shallow water or on mud flats. Southern one-quarter of the state.

Vallisneria americana Michx. Submersed in ponds and slow streams. Northern half of the state.

LEMNACEAE

Lemna minor L. Floating on surface of ponds and lakes. Statewide.

Cumberland Co., Strong farm pond, 7 miles northeast of Greenup, 3079 (EIU).

Douglas Co., Douglas Co. Lake, 3 miles northwest of Oakland, 2835 (EIU)

Effingham Co., Lake Sara, 6 miles northwest of Effingham, 2951 (EIU).

Fayette Co., Ramsey Lake, 1 mile north of Ramsey, 572 (ISM).

Lemna perpusilla Torr. Floating on surface of ponds and streams. Locally in southern two-thirds of the state.

Lemna trisulca L. Submersed in ponds, lakes, and swamps. Local throughout the state.

Lemna valdiviana Phil. Submersed in ponds and swamps. Rare in southern Illinois.

Spirodela oligorhiza (Kurz.) Hegelm. Floating on lakes and swamps. Alexander and Union Co. in the extreme southern part of the state.

Spirodela polyrhiza (L.) Schleid. Floating on ponds and lakes. Statewide.

Coles Co., Lake Charleston, 2 miles southeast of Charleston, 2659 (EIU).

Cumberland Co., Montrose Lake, 1/2 mile north of Montrose, 2936 (EIU).

Effingham Co., Lake Pauline, 1 mile northwest of Effingham, 3077 (EIU).

Wolffia columbiana Karst. Floating somewhat beneath the surface of lakes and swamps. Statewide.

Clark Co., Farm pond, 3 miles northeast of Marshall, 3317 (EIU).

Coles Co., Lake Oakland, Oakland, 2990 (EIU).

Edgar Co., Paris East Lake, Paris, 3025 (EIU).

Wolffia papulifera C. H. Thompson. Floating on permanent pools of stagnant water. Rare throughout the state.

Wolffia punctata Griseb. Floating on stagnant water. Rare central and north.

Wolffiella floridana (J. D. Sm.) C. H. Thompson. Submersed in stagnant water. Rare throughout the state.

LENTIBULARIACEAE

Utricularia cornuta Michx. Submersed along lake shores and in peat bogs. Rare in northeast of the state.

Utricularia gibba L. Submersed along lake shores or in shallow water. Locally throughout the state.

Marion Co., Kinmundy Reservoir, 1 1/2 miles south of Kinmundy, 1042 (ISM).

Utricularia intermedia Hayne. Submersed in shallow water. Rare in the north part of the state.

Utricularia minor L. Submersed along lake shores or in stagnant water. Rare in northeast.

Utricularia vulgaris L. Submersed in ponds, lakes, and slow streams. Statewide.

LYTHRACEAE

Peplis diandra Nutt. On mud flats or submersed in shallow water. Uncommon throughout Illinois.

Jefferson Co., Slough, 2 1/2 miles south of Mt. Vernon, 1336 (ISM).

NAIADACEAE

Naias flexilis (Willd.) R. & S. Submersed in lakes and ponds. Northeast.

Naias gracillima (A. Br.) Magnus. Submersed in ponds and lakes. Southern one-third of the state.

Naias guadalupensis (Spreng.) Magnus. Submersed in lakes and ponds. Common throughout the state.

Clark Co., Lincoln Trail State Lake, 2 miles south of Marshall, 2554 (EIU).

Coles Co., Fox Ridge State Lake, 7 miles south of Charleston, 2548 (EIU).

Cumberland Co., Toledo Lake, Toledo, 2964 (EIU).

DeWitt Co., Weldon Springs State Lake, 2 miles southeast of Clinton, 3243 (EIU).

Edgar Co., Paris East Lake, Paris, 2874 (EIU).

Effingham Co., Lake Sara, 6 miles northwest of Effingham, 2948 (EIU).

Fayette Co., Ramsey State Lake, 1 mile north of Ramsey, 3182 (EIU).

Marion Co., Kinmundy Lake, 1 1/2 miles south of Kinmundy, 3191 (EIU).

Moultrie Co., Farm pond, 2 miles southwest of Lovington, 3128 (EIU).

Washington Co., Washington Co. Lake, 5 miles south of Nashville, 881 (EIU).

Naias marina L. Submersed. Dystrophic lakes of northeast.

Naias minor All. Submersed in lakes and ponds. Southern two-thirds of state.

Alexander Co., Horseshoe Lake, 1 mile south of Olive Branch, 768 (EIU).

Clark Co., Lincoln Trail State Lake, 2 miles south of Marshall, 2552 (EIU).

Edgar Co., Paris East Lake, Paris, 2866 (EIU).

Effingham Co., Lake Sara, 6 miles northwest of Effingham, 2946 (EIU).

Fayette Co., Ramsey Lake, 1 mile north of Ramsey, 3180 (EIU).

Marion Co., Stephen Forbes State Lake, 4 miles southeast of Kinmundy, 3232 (EIU).

Richland Co., Wayne Raylor farm pond, 7 miles northeast of Olney, 1553 (ISM).

Washington Co., Washington Co. Lake, 5 miles south of Nashville, 885 (EIU).

NELUMBONACEAE

Nelumbo lutea (Willd.) Pers. Emergent in lakes, ponds, and rivers. Statewide.

Coles Co., Lake Charleston, 2 miles southeast of Charleston, 2652 (EIU).

Fayette Co., St. Elmo Old Reservoir, St. Elmo, 3225 (EIU).

Pope Co., Lake Glendale, 3 miles south of Glendale, 1098 (ISM).

NYMPHAEACEAE

Nuphar advena Ait. Emergent in lakes, ponds, and slow streams. Statewide.

Coles Co., Ashmore Lake, 8 miles east of Charleston, 2534 (EIU).

Nuphar variegatum Engelm. Emergent. Dystrophic lakes of the northeast.

McHenry Co., McCullom Lake, 1 mile east of Greenwood, 1198 (EIU).

Nymphaea odorata Ait. Emergent flowers and floating leaves in lakes. Far south and far north.

Nymphaea tuberosa Paine. Emergent flowers and floating leaves in lakes. Statewide.

Johnson Co., slough, east edge of Vienna, 1135 (ISM).

Tazewell Co., Spring Lake, 3 miles south of Peoria, 60 (ISM).

Union Co., Larue Swamp, 3 miles north of Wolf Lake, 985 (ISM).

ONAGRACEAE

Jussiaea repens L. Shoreline of lakes and ponds. Southern two-thirds of state.

Coles Co., Lake Charleston, 2 miles southeast of Charleston, 2654 (ISM).

Cumberland Co., McMechan farm pond, 8 miles northeast of Greenup, 3089 (EIU).

DeWitt Co., Weldon Springs State Lake, 2 miles southeast of Clinton, 3242 (EIU).

Fayette Co, Ramsey State Lake, 1 mile north of Ramsey, 570 (ISM).

Johnson Co., Lake of Egypt, 9 miles south of Marion, 1029 (ISM).

POLYGONACEAE

Polygonum coccineum Muhl. Grows on wet ground or as an emergent in shallow water of lakes. Statewide.

Edgar Co., Paris East Lake, Paris, 2841 (EIU).

Vermilion Co., Lake Vermilion, Danville, 3048 (EIU).

Polygonum fluitans Eaton. Emergent in shallow water. Northern two-thirds of the state.

PONTEDERIACEAE

Heteranthera dubia (Jacq.) MacM. Submersed in shallow water or on muddy shorelines. Northern two-thirds of the state.

Edgar Co., Paris East Lake, Paris, 2876 (EIU).

Hancock Co., Bay of Mississippi River, 3 miles north of Hamilton, 355 (ISM).

Heteranthera limosa (Sw.) Willd. Submersed in ponds and sloughs. Southern one-half of the state.

Heteranthera reniformis Ruiz & Pavon. Submersed in shallow water or on muddy shorelines. Southern one-fourth of state.

Pontederia cordata L. Emergent near shoreline of lakes, ponds, and streams. Statewide.

POTAMOGETONACEAE

Potamogeton americanus C. & S. Submersed with some floating leaves in lakes, ponds, and streams. Statewide.

Clark Co., Lincoln Trail Lake, 2 1/2 miles south of Marshall 3001 (EIU).

Cumberland Co., Strong farm pond, 7 miles northeast of Greenup, 3082 (EIU).

Marion Co., Kinmundy Lake, 1 1/2 miles south of Kinmundy, 1041 (EIU).

Moultrie Co., Walter Brewer farm pond, 2 miles southwest of Lovington, 3143 (EIU).

Union Co., Slough of Union Co. Refuge, 2 miles southeast of Ware, 3289 (EIU).

Potamogeton amplifolius Tuckerm. Submersed with some floating leaves in lakes and slow streams. Northeast.

Potamogeton berchtoldi Fieber. Submersed in ditches. Northeastern part of the state.

Potamogeton crispus L. Submersed in lakes, ponds, and streams. Statewide.

Cumberland Co., Massie farm pond, 3 miles northwest of Toledo, 3085 (EIU).

Hancock Co., bay of Mississippi River, 3 miles south of Hamilton, 352 (ISM).

McHenry Co., Crystal Lake, Crystal Lake, 274 (ISM).

Macoupin Co., Beaver Dam State Lake, 7 miles southeast of Carlinville, 195 (ISM).

Potamogeton diversifolius Raf. Submersed in lakes. Southern two-thirds of the state.

Cumberland Co., Toledo Lake, Toledo, 2965 (EIU).

Potamogeton epihydrus Raf. Submersed with some floating leaves in lakes and ponds. Rare in northern half of state.

Potamogeton foliosus Raf. Submersed in lakes, ponds, and slow streams. Statewide.

Alexander Co., Horseshoe Lake, 1 mile south of Olive Branch, 156 (ISM).

Cumberland Co., Toledo Lake, Toledo, 2966 (EIU).

Douglas Co., Villa Grove City Lake West, Villa Grove, 2894 (EIU).

Edgar Co., Paris East Lake, Paris, 2851 (EIU).

Effingham Co, Lake Sara, 6 miles northwest of Effingham, 2950 (EIU).

Fayette Co., Ramsey Lake, 1 mile north of Ramsey, 3184 (EIU).

Hancock Co., bay of Mississippi River, 2 miles south of Nauvoo, 367 (ISM).

Marshall Co., farm pond, 4 miles south of Wenona, 3238 (EIU).

Moultrie Co., Walter Brewer farm pond, 2 miles southwest of Lovington, 3147 (EIU).

Potamogeton friesii Rupr. Submersed. Dystrophic lakes of northeast.

McHenry Co., Bear Valley Hunting Club Lake, 3 1/2 miles northeast of Woodstock, 1380 (ISM).

Potamogeton gramineus L. Submersed with some floating leaves in lakes, ponds, and slow streams. Scattered localities throughout the state.

Potamogeton illinoensis Morong. Submersed with some floating leaves in lakes and ponds. Statewide.

Potamogeton natans L. Submersed with some floating leaves in lakes, ponds, and ditches. Scattered localities throughout the state.

Potamogeton pectinatus L. Submersed in lakes and ponds. Statewide.

Clark Co., Lincoln Trail State Lake, 2 1/2 miles south of Marshall, 2563 (EIU).

Douglas Co., farm pond, 3 miles southwest of Camargo, 2885 (EIU).

Hancock Co., bay of Mississippi River, 2 miles south of Nauvoo, 366 (ISM).

Henderson Co., bay of Mississippi River, 2 miles south of Lomax, 547 (ISM).

LaSalle Co., take pit, 1 1/2 miles south of Utica, 3254 (EIU).

Moultrie Co., Walter Brewer farm pond, 3 miles southwest of Lovington, 3141 (EIU).

Stephenson Co., Lake Le-Aqua-Na, 2 miles north of Lena, 1172 (EIU).

Potamogeton praelongus Wulfen. Submersed. Dystrophic lakes of northeast.

Potamogeton pulcher Tuckerm. Submersed with some floating leaves in shallow water. Central.

Potamogeton pusillus L. Submersed in lakes. Statewide.

Coles Co., Lake Oakland, Oakland, 2985 (EIU).

Cumberland Co., Hoosengay Pond, 4 miles south of Greenup, 3114 (EIU).

Edgar Co., Paris East Lake, Paris, 2863 (EIU).

Effingham Co., Lake Sara, 6 miles northwest of Effingham, 2949 (EIU).

Fayette Co., St. Elmo New Lake, St. Elmo, 3172 (EIU).

Henderson Co., bay of Mississippi River, 2 miles south of Lomax, 548 (ISM).

Marion Co., Kinmundy Reservoir, 1 1/2 miles south of Kinmundy, 1031 (EIU).

Union Co., Winter's Pond, 3 miles north of Wolf Lake, 1049 (ISM).

Potamogeton richardsonii (A. Benn.) Rydb. Submersed. Dystrophic lakes of northeast.

Potamogeton robbinsii Oakes. Submersed. Dystrophic lakes of northeast.

Potamogeton strictifolius Benn. Submersed. Dystrophic lakes of northeast.

Lake Co., Gray's Lake, Grayslake, 1442 (ISM).

Potamogeton vaseyi Robbins. Submersed with some floating leaves. Northeast.

Potamogeton zosteriformis Fern. Submersed in lakes. Northeast.

Zannichellia palustris L. Submersed in lakes, ponds, and slow streams. Scattered localities throughout the state.

PRIMULACEAE

Hottonia inflata Ell. Emergent in shallow, non-moving water. Rare in the south.

RANUNCULACEAE

Ranunculus flabellaris Raf. Submersed in lakes, ponds, and swamps. Statewide.

Ranunculus longirostris Godr. Submersed in ponds and slow streams. Northern three-fourths of the state.

Moultrie Co., Walter Brewer farm pond, 3 miles southwest of Lovington, 3139 (EIU).

Ranunculus trichophyllus Chaix. Submersed in lakes, ponds, and slow streams. Northern two-thirds of the state.

SALVINIACEAE

Azolla mexicana Presl. Floating on surface of still water. Scattered localities throughout the state.

SCROPHULARIACEAE

Bacopa rotundifolia (Michx.) Wettst. Margins of ponds and submersed in shallow water of lakes. Southern two-thirds of the state.

SUMMARY

The objectives of this study were (1) to determine the composition of the aquatic vascular plant communities of Illinois, (2) to analyze and compare the communities in different types of aquatic environments, and (3) to clarify and expand the known distribution of aquatic vascular plants in the state.

Each aquatic community observed in this study had at least one dominant species. Eleven different plants were found to dominate the eutrophic communities. In contrast, fifteen species were found to dominate the nine commonly observed dystrophic communities. The eutrophic lakes commonly have one dominant species whereas the dystrophic communities often have two or three species dominating each community observed. Seven different species were observed as dominant species in the swamps of southern Illinois and some communities contained more than one dominant species.

Floristically, a great difference exists between the eutrophic and dystrophic lakes of Illinois. Of the thirty-one species found in the dystrophic lakes, eleven species were observed only in these lakes. Eleven of the thirty-two species found in the eutrophic lakes were observed only in eutrophic lakes. Only one species observed in the study was limited to

sloughs. Five species were found to be limited to swamps, and the Dead River was the only location in which three other species were observed.

The distribution of the aquatic vascular plants in this study is limited not only by climate but also by aquatic ecological conditions. In other words, some species are in northeastern Illinois because they can exist only in dystrophic lakes, which are found only in that region. On the other hand, some aquatic vascular plants of Illinois appear to be limited in their distribution primarily by climatic conditions. As a result, some aquatic vascular plants are found in the eutrophic lakes of either southern or northern Illinois. Cabomba caroliniana, Lemna valdiviana, and Limnobium spongia were observed only in extreme southern Illinois, whereas Bacopa rotundifolia, Jussiaea repens, Naias minor, and Potamogeton diversifolius were found throughout the southern two-thirds of Illinois. Heteranthera dubia, Myriophyllum spicatum, and Ranunculus longirostris were observed only in the northern two-thirds of the state. The remaining species observed in eutrophic lakes were found to occur throughout the state.

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