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**Endangered and Threatened Plants of Wolf Lake and William
W. Powers State Fish & Wildlife Area, Cook County, Illinois**

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Illinois Natural History Survey

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Introduction

Wolf Lake is a natural body of water in southeastern Cook County, Illinois and northwestern Lake County, Indiana (Figure 1). The Illinois side of Wolf Lake is located within the William W. Powers State Fish & Wildlife Area, owned and managed by the Illinois Department of Natural Resources. The William W. Powers State Fish & Wildlife Area is approximately 235 hectares (580 acres) in size, including the 170 hectares (419 acres) of Wolf Lake on the Illinois side. The lake on the Illinois side is made up of five pools, separated by dikes (Figure 1). Wolf Lake was once well known as a significant natural area, with an unusually high diversity of aquatic and amphibious plants, many of them disjunct from their normal ranges (Peattie, 1925; 1930). Although the lake has been heavily disturbed and is not as diverse as in former times, it still provides habitat for several rare species of special concern. Before this study, five species of state threatened or endangered plants were thought to survive in or around the lake. In addition, historical records existed near the lake for several more plant species of special concern.

In recent years, Eurasian water milfoil (*Myriophyllum spicatum* L.) has become a conspicuous component of the aquatic flora of Wolf Lake. Eurasian water milfoil establishes dense stands, which create heavy mats of vegetation. These mats of vegetation can restrict boating, water-skiing, sailing, fishing and other forms of aquatic recreation (Engel, 1993). Because the lake is heavily used for recreational fishing, concern for the effects of the Eurasian water milfoil on fishing opportunities has increased. In addition, some concern has been expressed on the effects of the Eurasian water milfoil on the native aquatic flora of Wolf Lake. The surface mat-forming growth and aggressive nature of the plant allows it to out-compete and replace native aquatic vegetation (Smith and Barko, 1990). It has been proposed that the aquatic herbicide Sonar be applied to rid the lake of Eurasian water milfoil (Anne Mankowski, personal communication). Out of concern for the possible effects of herbicide on native aquatic plants, especially those that may be endangered or threatened, Anne Mankowski of the Illinois Department of Natural Resources asked the senior author to conduct a survey for endangered or threatened aquatic or amphibious plants at William W. Powers State

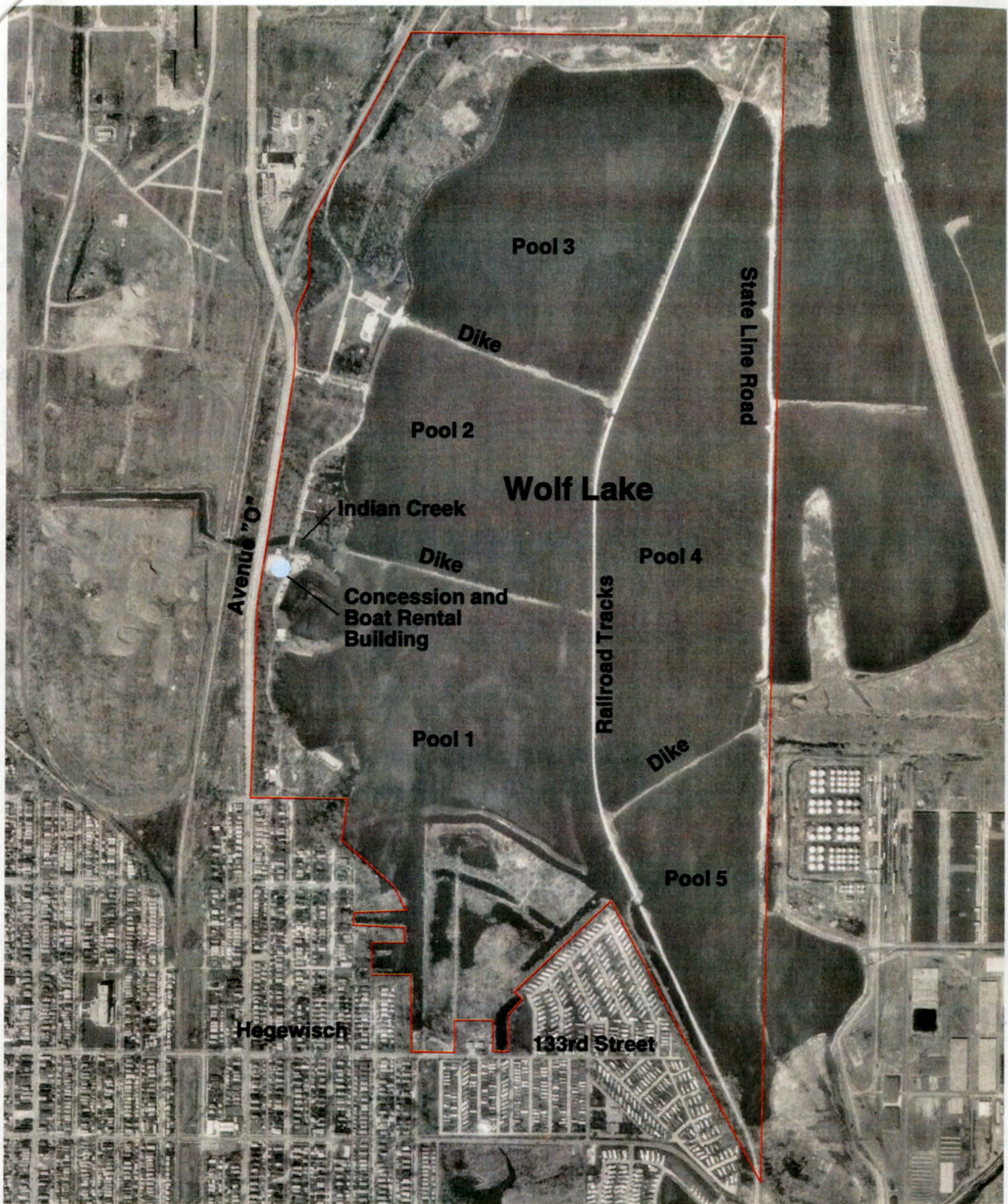
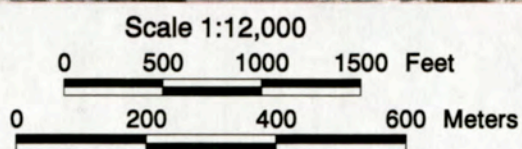


Figure 1



Source photo NAPP 4/12/1998
 Map design INHS 8/27/02

Fish & Wildlife Area. This report details results obtained from that study. In this report, all endangered or threatened plant species found within the area are discussed, as are all aquatic plants. It is hoped that information on current locations of plants of special concern will be useful in the decision making process regarding management of the site. It should be stated, however, that this survey is not exhaustive, and some species were undoubtedly overlooked.

History of Study Site and Previous Botanical Work

The William W. Powers State Fish & Wildlife Area is located in the Northeastern Morainal Division of Illinois (Schwegman, 1973). The Northeastern Morainal Division is the region of most recent glaciation in Illinois, and all of its landforms and plant communities are greatly influenced by Wisconsinan glaciation. The site lies within the Chicago Lake Plain Section of the Northeastern Morainal Division. This section is a flat, poorly drained area of lakebed sediments deposited by glacial Lake Chicago (Schwegman, 1973). The original vegetation of the Chicago Lake Plain Section was mostly marsh and wet prairie. Wolf Lake is one of several natural lakes within the former lake plain.

The best historical description of the Wolf Lake area we have found is by Peattie (1925). The Wolf Lake of today only remotely resembles his depiction. Peattie describes an environment yet unspoiled by the growth of one of the nation's largest cities. Although, by the time of his publication, neighboring Hyde Lake, Lake George, Berry Lake and Lake Calumet had already been destroyed or significantly degraded. Peattie describes a natural lake with shores that are "low and reedy", with prairies that "sweep levelly to its very margins". The lake was fringed with "acres of bending rice-grass and bulrushes and filled with flowering aquatics". The aquatic flora was highly diverse, with "astonishing numbers of individual plants". Rowing a boat was "practically impossible on account of the sargasso of floating vegetation". Today, the shoreline is composed almost entirely of concrete fill, and rice-grass has been extirpated. Peattie claims that the eastern shore was composed of several acres of cattail. Today, cattail is confined almost entirely to small marshy areas around ponds and along roads. Almost no cattail is present along the shore of Wolf Lake. Several of the pools have very little aquatic vegetation to speak of. Although parts of the lake are still largely vegetated, much of the native aquatic growth has been displaced by the introduced Eurasian water milfoil (*Myriophyllum spicatum*) and curly pondweed (*Potamogeton crispus*). Although the Wolf Lake area has changed drastically since the time of Peattie, many of the plants he discussed can still be found there. Species found by Peattie and still present in Wolf Lake are discussed elsewhere in this report, under the accounts of the species that we found.

E. J. Hill (1927), in Pepoon's *An Annotated Flora of the Chicago Region*, briefly discussed Wolf Lake's drainage. In addition, Hill described the diverse aquatic flora of the lake and the genus *Salix* in the area. Pepoon (1927), in the same publication, makes mention of several species found in Wolf Lake, and includes an excellent photograph of the east shore. Peattie (1930) discusses the occurrence of disjunct species in the "Calumet District", mentioning that Wolf Lake was especially rich in plants of this sort.

He also mentions Wolf Lake in discussions of several plants in his systematic list. W. C. Allee (1926) briefly discussed the fauna of Wolf Lake and nearby Lake Calumet, noting the presence of snails such as *Pleurocera* and *Vivipara*, mussels in abundance, waterfowl, and several varieties of fish. Allee also notes that pond weeds were regularly removed by ice companies.

Wolf Lake was well known as an interesting place to find aquatic plants by early Illinois botanists. In addition to D. C. Peattie, E. J. Hill and H. S. Pepoon, Agnes Chase collected plants at Wolf Lake, including the type specimen of *Potamogeton strictifolius* A. Benn. More recently, Floyd Swink (1972), Ursula Rowlatt (1975 & 1978), D. Austen and J. Stepping (1989), and Loy R. Phillippe and Susan Post (1991) have collected plants from the area. During their short visit, Phillippe and Post were only able to collect in the northern part of the lake because of a severe algal bloom.

Wolf Lake has been significantly disturbed and reshaped by dredging and industrial activities. The dredging apparently occurred in the late 1940's, when fill was needed for the building of the Indiana East-west Toll Road, which crosses the lake on the Indiana side. At this time a series of dikes were built, dividing the lake into eight pools (Figure 1). The dikes were not intended to be permanent, but survive to this day. Many of the dikes have openings that allow for the limited flow of water from one pool to another. Five of the eight pools are on the Illinois side of the lake. An active railroad line runs along this dike system. Although dredging and other activities have undoubtedly disturbed the lakebed and altered the composition of the flora and fauna, some parts of the lakebed appear relatively undisturbed. The water depth is highly variable, with deep holes intermixed with shallow areas in a way that is unlikely to be natural. Aerial photographs of the lake reveal linear or angular submersed features that were undoubtedly created by dredging or other disturbance. Other areas of the lakebed appear to be largely undisturbed. Most of the deep holes probably correspond to dredge sites, with the shallow areas being relatively undisturbed. Our observations suggest that the composition of the aquatic plants may be influenced by features of the lakebed. The deeper, probably more highly disturbed areas, are dominated by the introduced Eurasian water milfoil and curly pondweed. Native species are more likely to be present in the shallower and probably less disturbed areas. While we did not systematically sample the shallow and deeper areas for quantitative differences, anecdotal evidence suggested a pattern was evident. We do not know if these observed differences in species composition are due to disturbance history, water depth, other factors, or a combination of all three.

The hydrology of the lake has changed drastically from presettlement times. At one time, Wolf Lake drained into nearby Lake Michigan (Hill, 1927). Today, water from Lake Michigan is pumped through aqueducts, apparently used for industrial purposes, and then emptied into Wolf Lake on the Indiana side. Water now flows through a channel under the Indiana East-west Toll Road, through openings in the dike system, and out of the lake through Indian Creek on the west side. From Indian Creek, in reality a ditch, it empties into the Calumet River and eventually flows back to Lake Michigan. The water of Wolf Lake is remarkably clear, undoubtedly a factor in the luxuriant growth of aquatic plants.

Water clarity can probably be partially attributed to the presence of a large population of zebra mussels (*Dreissena polymorpha*) in the lake.

Very little undisturbed soil, if any, occurs at the William W. Powers State Fish & Wildlife Area. The area's soils are mapped as the Urban land-Milford association (Mapes, 1979). This association includes built-up areas and deep, nearly level, poorly drained soils that have a silty and clayey subsoil. These soils were formed in glacial lake sediment. Most of the area around Wolf Lake is highly disturbed Urban land. The present day shoreline, at least on the Illinois side, appears to have been entirely shaped by the activities of man. A concrete-like fill, probably waste material such as building rubble, cinders and slag, forms the present day shoreline. This fill is eroded, somewhat unconsolidated, and has been largely colonized by vegetation. The fill is probably calcareous, at least in places, like the native soil it covers. Remarkably, several rare plants have managed to colonize, and even thrive, in this unnatural material. These will be discussed later in this report.

Methods

Initially, we intended to conduct fieldwork in 2001 and submit a report the same year. However, we did not receive funds for this project until 15 May 2002, leaving us with less than seven weeks to complete fieldwork before authorization to use the funds expired. Therefore, most of our fieldwork was conducted in May and June of 2002, after funding was obtained. However, we did visit the site twice in 2001, on August 3 and 17. Altogether, the site was visited on seven separate occasions, for a total of 11 days of fieldwork.

Terrestrial plants were collected and pressed using standard botanical techniques. Aquatic plants were collected from shore with a grappling hook, or by hand from boat. Plants were observed and collected from a canoe for three days in late June of 2002. A set of all specimens collected will be deposited in the herbarium of the Illinois Natural History Survey (ILLS). Duplicate specimens, when collected, will be deposited in the herbarium of the Morton Arboretum. Voucher specimens are cited (collector and collection number) in the accounts of species found. Nomenclature follows Swink and Wilhelm (1994). Location data was collected using a Garmin Global Positioning System III.

Collection data from prior work at the site was obtained from published sources, the Registry of Endangered, Threatened, Vulnerable and Rare Species of Illinois, and the collection database of the Illinois Natural History Survey herbarium.

Vegetation and Plant Communities

Presently, the William W. Powers State Fish & Wildlife Area is largely a recreational area, and much of the vegetation around the lake is maintained as lawn. Although closely mown, many of these lawn areas are dominated by native species, and a few harbor rare plants. Most lawn areas are relatively wet, at least in part. Few natural communities are

present, and all of these natural communities are of relatively low quality. Most communities are early successional. In addition to lawn, plant communities include wet bottomland forest, successional field, thickets, marsh, pond and lake (Wolf Lake). Waste areas occur along roads, dikes and railroad tracks. These waste areas are all small, linear, and heavily disturbed.

The wet bottomland forest community occurs in the northwest corner of William W. Powers State Fish & Wildlife Area, between Wolf Lake and Avenue O. This forest is approximately 11.3 hectares (28 acres) in size. Although now a forest community, this area was probably marsh or wet prairie in presettlement times. This community is dominated by cottonwood (*Populus deltoides*) in the tree layer, green ash (*Fraxinus pennsylvanica*) in the sapling layer, and green ash and European highbush cranberry (*Viburnum opulus*) in the shrub layer. Most of this forest was inundated for much of the spring and early summer, and little herb layer was present. In the drier portions of the community, starry false Solomon's seal (*Smilacina stellata*) was dominant. The tree and sapling layers of this forest community have few species other than the dominants mentioned above. The shrub layer is more diverse, although many of these species are introduced. A few small ponds, probably excavated when nearby roads were constructed, are present in the wet bottomland forest. These ponds are approximately 0.3-0.6 meter (1-2 feet) deep, and are probably inundated for most, if not all, of the growing season. Two notable aquatic species, forked duckweed (*Lemna trisulca*) and yellow water crowfoot (*Ranunculus flabellaris*) were only found in these ponds.

The successional field occurs on the south side of William W. Powers State Fish & Wildlife Area, between East 133rd Street and Wolf Lake. This community is abandoned industrial land, and consists of a mosaic of open, herb dominated areas, shrubby areas, and small areas with larger trees. Cottonwood (*Populus deltoides*) is the dominant tree and sapling, with pale dogwood (*Cornus obliqua*) and green ash (*Fraxinus pennsylvanica*) dominant in the shrub layer. The shrubs staghorn sumac (*Rhus typhina*) and blue-leaved willow (*Salix glaucophylloides*) are locally dominant. Purple loosestrife (*Lythrum salicaria*) is probably the most dominant herb, at least in the wetter parts. One notable area within this community is dominated by staghorn sumac and blue-leaved willow in the shrub layer, with blue joint grass (*Calamagrostis canadensis*) dominant in the herb layer. Several species of sedge (*Carex* sp.) are common in this area, including *Carex pellita* and *Carex sartwellii*. This area could be considered wet prairie, but the soils have been heavily disturbed and the area is certainly successional in nature.

The thicket community includes small, successional areas dominated by shrubs. Woody plants probably are periodically cut at these sites. Thickets occur mostly near the edge of Wolf Lake, and most are relatively wet. This community would be included in the successional field community, but are too small to be considered "fields". Several thickets certainly do occur within the successional field community. Dominants usually include pale dogwood (*Cornus obliqua*) and blue-leaved willow (*Salix glaucophylloides*). At least one of these thickets is highly diverse, relative to its small size. This thicket occurs on the west side of Wolf Lake, near the old concession and boat rental building. Although undoubtedly disturbed, this small site has a remarkable assemblage of plants,

including many rare, uncommon, and Illinois threatened or endangered species. Notable plants found in or around this thicket include golden sedge (*Carex aurea*), little green sedge (*Carex viridula*), few-flowered spikerush (*Eleocharis pauciflora*), Richardson's rush (*Juncus alpinus*), yellow-lipped ladies' tresses orchid (*Spiranthes lucida*), twig rush (*Cladium mariscoides*), bog lobelia (*Lobelia kalmii*), and green twayblade orchid (*Liparis loeselii*).

The marshes at William W. Powers State Fish & Wildlife Area are all very small, narrow, and dominated by cattails (*Typha* spp.) and common reed (*Phragmites australis*). Marshes occur mostly around ponds and along roads. No species of particular interest were found in this community of low diversity.

Several man-made ponds occur at William W. Powers State Fish & Wildlife Area, between East 133rd Street and Wolf Lake. Some of these ponds are well vegetated, while others have few plant species. Two ponds have margins locally dominated by swamp loosestrife (*Decodon verticillatus*). Marshes occur along the periphery of some of the ponds. Water depth of the ponds varies; most are relatively shallow, but at least one appears to be rather deep. The aquatic flora of the ponds is similar to Wolf Lake. However, several aquatic species were only found in the ponds. A bladderwort (*Utricularia* sp.) was found to be common at the edge of one of these ponds. The plants were sterile, and could not be identified to species level. Also only found in the pond community was horned pondweed (*Zannichellia palustris*). Although the bladderwort and horned pondweed were not found in Wolf Lake, suitable habitat remains, and these species could be present there.

Endangered and Threatened Plant Species Found

This list includes endangered and threatened plant species found in Wolf Lake or the adjacent dry land.

Carex aurea Nutt. Golden Sedge. Listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999) where it occurs primarily in interdunal swales and wet meadows bordering Lake Michigan (Herkert, 1991). It is known from Cook, Lake, and Kane Counties, with questionable records from Menard County. This species is readily recognizable with its golden orange perigynia. It is common at William W. Powers State Fish & Wildlife Area, where it is found in disturbed low ground near Wolf Lake and in the successional fields on the south side of the site. Although fairly common, the colonies are small and scattered, usually with less than 20 plants. The largest colony found was in the shrub thicket on the west side of Wolf Lake, near the old concession and boat rental building. It also occurs in the mowed area to the west of this shrub thicket. In the successional fields south of Wolf Lake, it often grows at the edge of trails. This species seems to intergrade with *Carex garberi* Fern. (Swink and Wilhelm, 1994; Voss, 1972) and only one species is recognized in the group by Gleason and Cronquist (1991). We observed overlapping characters in the population at William W. Powers State Fish & Wildlife Area, and it is possible both species are present. However, most plants seemed to fit *Carex aurea* best, and we believe only one species should be recognized in this

group. *Carex aurea* was not known from William W. Powers State Fish & Wildlife Area prior to this study. Because this sedge is so common at William W. Powers State Fish & Wildlife Area, localities where it was found are not mapped. Ketzner # 3001

Carex viridula Michx. Little Green Sedge. Listed as threatened in Illinois (Illinois Endangered Species Protection Board, 1999) where it is known from Cook, DuPage, Lake and McHenry Counties. In Illinois, it occurs in dune swales near Lake Michigan and spring runs, marl flats, pannes, calcareous pond shores and disturbed calcareous sites (Herkert, 1991; Swink and Wilhelm, 1994). *Carex viridula* is common at William W. Powers State Fish & Wildlife Area, where it often occurs with *Carex aurea*. Both species appear to be somewhat disturbance adapted. At least six separate colonies occur, mostly near the edge of Wolf Lake (Figure 2). One colony of approximately 23 plants was found in the wet successional field to the south of Wolf Lake, far from the water's edge. This field is dominated by *Populus deltoides* in the tree layer, *Cornus obliqua* and *Fraxinus pennsylvanica* in the shrub layer, and *Lythrum salicaria* in the herbaceous layer. All plants were found within a few feet of a trail. It also occurs on the south edge of Wolf Lake, again along a trail, where 13 plants were found in an area dominated by *Salix glaucophylloides*, *Helianthus grosseserratus* and *Sorghastrum nutans*. *Carex viridula* also occurs in the shrub thicket and surrounding mown area near the old concession and boat rental building, where several dozen individuals can be found. The other three colonies were found close together, along State Line Road, in highly disturbed habitats. A very large colony was also found in recently disturbed soil just across the state line in Indiana. *Carex viridula* was first collected at William W. Powers State Fish & Wildlife Area by Floyd Swink in 1972. It was also collected in 1978 from the site by Ursula Rowlett, in "wasteland". Ketzner # 2828

Eleocharis pauciflora (Lightf.) Link Matted Spike Rush. Listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999), where it is known from Cook, Lake and McHenry Counties (Herkert, 1991). All of the Illinois counties with known populations of *Eleocharis pauciflora* have recent collections (Herkert, 1991). This species is local on calcareous shores, where it sometimes forms pure stands (Swink and Wilhelm, 1994). It also occurs in fens and calcareous dune swales (Herkert, 1991). Matted spike rush has been known from the Wolf Lake area since 1900, when it was collected from wet sand by E. J. Hill and Agnes Chase. At the William W. Powers State Fish & Wildlife Area we found it to be common in disturbed, relatively low, mown areas around Wolf Lake, usually close to the water's edge. Some plants were even found growing in disturbed gravelly soil, which appears to be derived from old concrete fill. Matted spike rush occurs around the shrub thicket on the west side of Wolf Lake, near the old concession and boat rental building, along with *Carex aurea*, *Carex viridula*, *Juncus alpinus* and *Spiranthes lucida*. A large colony also occurs near the parking area, east of the superintendent's residence, in a low, wet, mown area. Because matted spike rush is so common at William W. Powers State Fish & Wildlife Area, localities where it was found are not mapped on Figure 2. Ketzner # 2827

Juncus alpinus Vill. Richardson's Rush. Known from Cook, DuPage, Kane, Lake and McHenry Counties where it occurs in fens, wet sand prairies and interdunal swales near

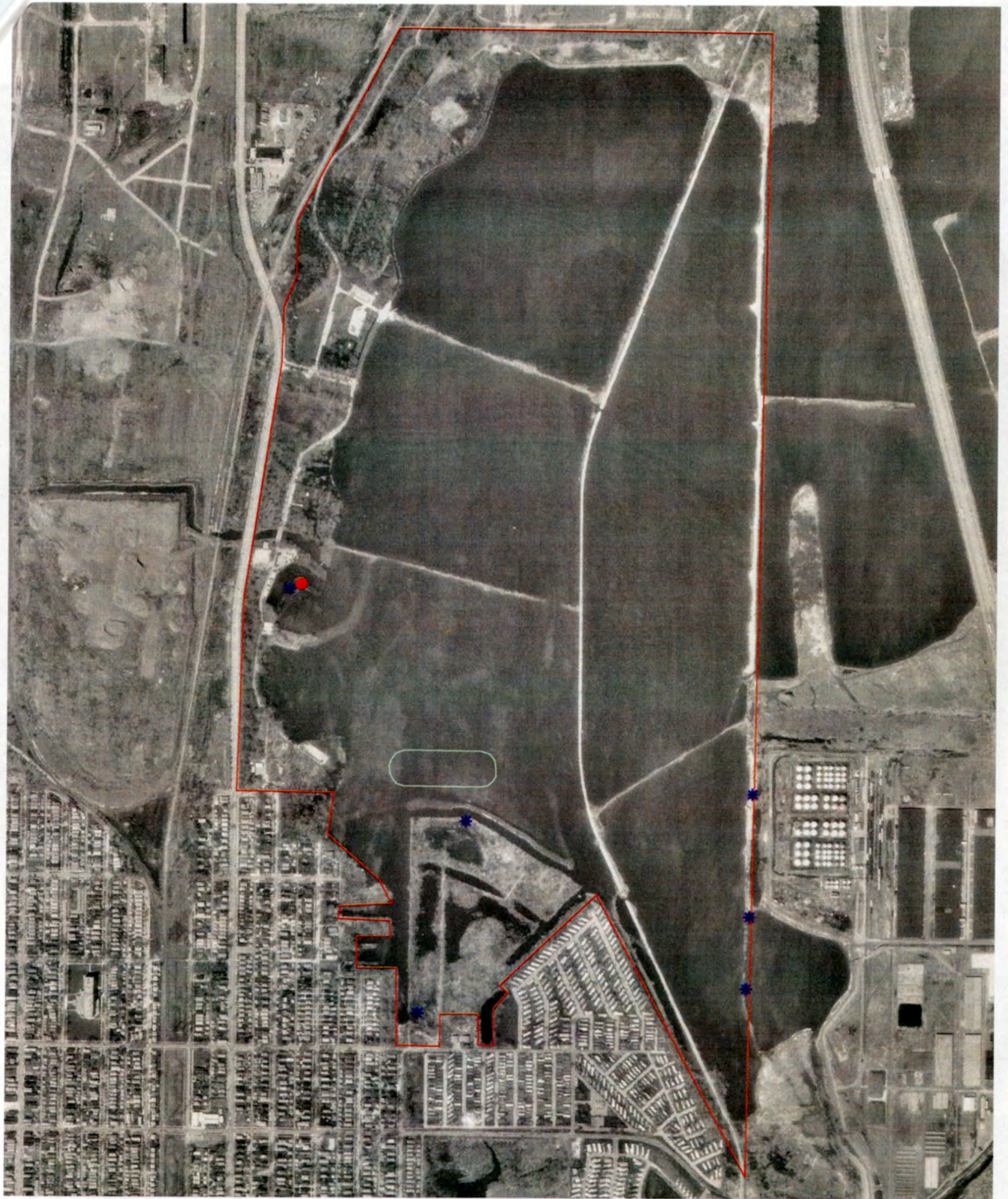
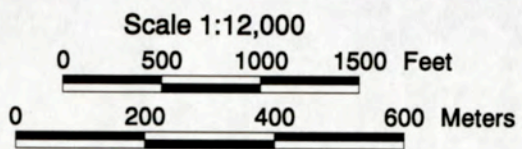


Figure 2

- * *Carex viridula*
- *Spiranthes lucida*
- *Potamogeton gramineus*
- Site boundary



Source photo NAPP 4/12/1998
Map design INHS 9/9/02

Lake Michigan (Herkert, 1991). It also occurs on moist calcareous pond shores and similar habitats (Swink and Wilhelm, 1994). Richardson's rush is listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999). It has been known from the Wolf Lake area since 1897, when it was collected by E. J. Hill from wet sand. It was also collected from the "gravel shore of Wolf Lake" by Agnes Chase in 1901. Swink and Wilhelm (1994) discuss its occurrence at Wolf Lake in disturbed low ground, and list associates. At the William W. Powers State Fish & Wildlife Area, we found *Juncus alpinus* to be common in disturbed, low areas near the shoreline of Wolf Lake. Here it is often found with *Eleocharis pauciflora*. It commonly occurs in the permanently wet soil where the lake's water meets the shoreline. Richardson's rush occurs in the disturbed, but remarkable site, around the shrub thicket on the west side of Wolf Lake, near the old concession and boat rental building. It also occurs near the parking area, east of the superintendent's residence, in the low, mown area discussed previously. Because Richardson's rush is so common at William W. Powers State Fish & Wildlife Area, localities where it was found are not mapped on Figure 2. Ketzner # 2826; Marcum # 953

Potamogeton gramineus L. Grass-leaved Pondweed. Listed as threatened in Illinois (Illinois Endangered Species Protection Board, 1999), where it is known only from Cook, Lake and McHenry Counties (Herkert, 1991). All of the Illinois counties with known populations of *Potamogeton gramineus* have recent collections (Bowles et al., 1991; Curtis, 1990). At Wolf Lake, a large population was found in Pool 1, in the southern part of the lake (Figure 2). Here, several hundred plants were growing in shallow water 0.6-0.9 meter (2-3 feet) deep. Few other aquatic plants were found with *Potamogeton gramineus* at this site. The areas where *Potamogeton gramineus* was found at Wolf Lake probably have never been dredged. This species was also collected in the northern part of Wolf Lake by Loy R. Phillippe and Susan Post in 1991. Although the exact collection site is unknown, we suspect the locale was Pool 4, where shallow water is relatively common. Phillippe and Post only collected in the northern part of the lake because of a severe algal bloom. Although, we did not locate *Potamogeton gramineus* in the northern part of Wolf Lake, suitable habitat appears to be present there and the plant could persist. Ketzner # 3091

Spiranthes lucida (H. H. Eaton) Ames Yellow-lipped Ladies' Tresses. Listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999). This very rare orchid is known from Cook, Hancock, Lake, Will and Woodford Counties (Herkert, 1991). The Hancock, Lake and Will County collections are old records, all dating from before 1910. The Woodford County collection was made in 1968 from a grazed shore bar along the Illinois River (Sheviak, 1974). This population was apparently buried by sand deposition, and is no longer extant. *Spiranthes lucida* was previously known from Cook County, where it was found in 1973 by Paul Strand at Sand Ridge Nature Center, near South Holland. Prior to this study, Strand's collection appears to be the last Illinois record for this orchid. This population, however, was not found during a search in the late 1980s (Bowles et al., 1991). At the William W. Powers State Fish & Wildlife Area, it occurs in the mown area surrounding the shrub thicket near the old concession and boat rental building, approximately 1.2 meters (4 feet) from the edge of Wolf Lake (Figure 2).

Here, eight plants were found on 14 June 2002. Six of the plants were in flower, and two were developing fruit (Figures 3, 4 & 5). The plants were growing in disturbed gravelly soil, which appears to be derived from old concrete fill. This location is very near colonies of *Carex aurea*, *Carex viridula*, *Juncus alpinus* and *Eleocharis pauciflora*. Unlike these species, however, *Spiranthes lucida* was only found in one location at William W. Powers State Fish & Wildlife Area. Since so few plants were found, we did not make a collection. However, photographs will be deposited in the herbarium of the Illinois Natural History Survey.

Additional Aquatic Plants Found

The following aquatic plants were found in Wolf Lake, the excavated ponds to the south of the lake, or in other aquatic habitats. Aquatic species found in Wolf Lake, arranged by their presence in pools, can be found in Table 1.

Ceratophyllum demersum L. Coontail. Common in the Chicago region, where it is found in lakes, streams, and ditches. Coontail is apparently able to withstand habitat degradation (Swink & Wilhelm, 1994). It is rare at Wolf Lake, where we found it only in Pool 1, in fairly shallow water. Ketzner # 3080

Chara spp. Stoneworts. Two species of the green alga genus *Chara* were found in Wolf Lake. We were unable to identify either to species level. *Chara* species # 1 is common in shallow water, and was found in all five pools. *Chara* species # 2 is much smaller and rare; it was found in shallow water, only in Pool 1.

Elodea canadensis L. C. Rich. Common Waterweed. Frequent in lakes and somewhat stagnant streams in the Chicago region (Swink & Wilhelm, 1994), and common at Wolf Lake. We found common waterweed in every pool of the lake. Ketzner # 2834

Heteranthera dubia (Jacq.) MacMill. Water Star Grass. Local on mudflats along streams and ponds in the Chicago region (Swink & Wilhelm, 1994). Water star grass usually only produces normal flowers when stranded on mudflats or in shallow water where the foliage floats on the surface. However, cleistogamous flowers are often produced on submersed stems (Crow and Hellquist, 2000). We have not seen it flower at Wolf Lake, where it is usually found in fairly deep water. It is hard to determine the abundance of this species at Wolf Lake, since it is difficult to distinguish it from *Potamogeton zosteriformis* at a distance. However, it is probably fairly common. We found water star grass in Pools 2, 3, 4 and 5. Marcum # 952

Lemna trisulca L. Forked Duckweed. Frequent throughout the Chicago region (Swink and Wilhelm, 1994). At the William W. Powers State Fish & Wildlife Area, we found forked duckweed only in a shallow pool in the wet bottomland forest in the northwest corner of the site. This pool is well separated from Wolf Lake. It was occasional at this site, and was growing with *Ranunculus flabellaris*. This pool, and several others similar to it, was probably excavated when the road around the lake was constructed. Although



Figure 3. Yellow-lipped Ladies' Tresses (*Spiranthes lucida*) at William W. Powers State Fish & Wildlife Area, 14 June 2002. Photograph by Paul B. Marcum.



Figure 4. Yellow-lipped Ladies' Tresses (*Spiranthes lucida*) at William W. Powers State Fish & Wildlife Area, 14 June 2002. Photograph by Paul B. Marcum.



Figure 5. Yellow-lipped Ladies' Tresses (*Spiranthes lucida*) at William W. Powers State Fish & Wildlife Area, 14 June 2002. Photograph by Paul B. Marcum.

Table 1. Aquatic species found in Wolf Lake by pool.

	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5
<i>Ceratophyllum demersum</i>	X				
<i>Chara</i> sp. # 1	X	X	X	X	X
<i>Chara</i> sp. # 2	X				
<i>Elodea canadensis</i>	X	X	X	X	X
<i>Heteranthera dubia</i>		X	X	X	X
<i>Lythrum salicaria</i>	X	X			
<i>Myriophyllum exalbescens</i>					X
<i>Myriophyllum spicatum</i>	X	X	X	X	X
<i>Najas guadalupensis</i>	X	X		X	
<i>Nuphar advena</i>	X				
<i>Nuphar variegatum</i>	X				
<i>Nymphaea tuberosa</i>	X	X			
<i>Potamogeton amplifolius</i>	X	X		X	X
<i>Potamogeton crispus</i>	X	X		X	
<i>Potamogeton gramineus</i>	X				
<i>Potamogeton illinoensis</i>	X	X	X		
<i>Potamogeton pectinatus</i>	X	X	X	X	X
<i>Potamogeton richardsonii</i>	X	X		X	X
<i>Potamogeton zosteriformis</i>	X	X			
<i>Scirpus validus</i>			X		
<i>Vallisneria americana</i>	X	X	X	X	X
Totals	18	14	8	10	9

not found in Wolf Lake, suitable habitat for *Lemna trisulca* probably remains there. This submerged and inconspicuous aquatic could easily be overlooked.

Lythrum salicaria L. Purple Loosestrife. This introduced weed is common in the Chicago region, and abundant in wet ground around the periphery of Wolf Lake. Although not usually thought of as an aquatic plant, we found it growing in fairly deep water in several places. Some of the plants were in water at least 4 feet deep. We noticed it in Pools 1 and 2, but it probably occurs in all pools.

Myriophyllum exalbescens Fern. Spiked Water Milfoil. In the Chicago region, this native water milfoil is found in quiet ponds and lakes that are often calcareous (Swink and Wilhelm, 1994). In Wolf Lake, this species is apparently rare, or at least it was in 2002. Although it is difficult to distinguish from *Myriophyllum spicatum* in the field, we are certain that *M. exalbescens* is relatively rare and *M. spicatum* is abundant. We found it with certainty only from Pool 5. Marcum # 951

Myriophyllum spicatum L. Eurasian Water Milfoil. This introduced species is common in the Chicago region (Swink & Wilhelm, 1994). It is abundant at Wolf Lake, occurring in every pool. At Wolf Lake, this species appears to occur most abundantly in deeper water, possibly in areas that were dredged. It is often found with *Potamogeton crispus*, another exotic. These species appear to be much less common in the shallower waters of Wolf Lake. Marcum # 961

Najas guadalupensis (Spreng.) Magnus Southern Naiad. Common at Wolf Lake, where we found it in Pools 1, 2 and 4. We were unable to locate *Najas flexilis* (Willd.) Rostk. & F. W. Schmidt, which is more frequently found in the Chicago region (Swink & Wilhelm, 1994). Ketzner # 2815

Nuphar advena (Aiton) W. T. Aiton Yellow Pond Lily. Frequent in quiet waters of lakes and streams in the Chicago region (Swink & Wilhelm, 1994). Yellow Pond Lily is rare at Wolf Lake, where it was only found in Pool 1, in a bay near the mouth of Indian Creek. Ketzner # 2831

Nuphar variegatum Engelm. Bullhead Lily. This aquatic is less common than *Nuphar advena* in the Chicago region (Swink and Wilhelm, 1994). At Wolf Lake, it is uncommon, where we found it only in Pool 1. It was also located in one of the ponds south of Wolf Lake. Ketzner # 3064

Nymphaea tuberosa Paine White Water Lily. Locally frequent in shallow water in the Chicago region (Swink and Wilhelm, 1994). In Wolf Lake it is occasional in Pools 1 and 2, but seems to flower infrequently. Ketzner # 3074

Potamogeton amplifolius Tuck. Large-leaved Pondweed. This pondweed is common in lakes in the Chicago region (Swink and Wilhelm, 1994) and locally common at Wolf Lake. We found it in Pools 1, 2, 4 and 5. Large-leaved pondweed was first found at Wolf Lake by Agnes Chase in 1901. Ketzner # 3077; Marcum # 949

Potamogeton crispus L. Curly Pondweed. This introduced species is becoming more common in the Chicago region (Swink and Wilhelm, 1994). At Wolf Lake, it is fairly common, where it usually occurs in deeper water, often with *Myriophyllum spicatum* L. We found it in Pools 1, 2 and 4. This introduced species was known from Wolf Lake prior to 1925 (Peattie, 1925). Ketzner # 3075

Potamogeton illinoensis Morong Illinois Pondweed. Occasional in lakes in the Chicago region (Swink and Wilhelm, 1994). Illinois pondweed is morphologically quite variable, with the leaf shape greatly influenced by water depth. In Wolf Lake, it is occasional, where we found it in Pools 1, 2 and 3. Ketzner # 2817, # 2837 and # 3079

Potamogeton pectinatus L. Sago Pondweed. Very common in lakes in the Chicago region (Swink and Wilhelm, 1994). It is also common at Wolf Lake, where we found it in all pools. Ketzner # 2816 and # 3076; Marcum # 950

Potamogeton richardsonii (A. Benn.) Rydb. Richardson's Pondweed. Local in calcareous waters in the Chicago region (Swink and Wilhelm, 1994). Occasional and scattered in Wolf Lake, where it is usually found in shallow water a few feet from shore. We found it in Pools 1, 2, 4 and 5. Ketzner # 2833

Potamogeton zosteriformis Fern. Flat-stemmed Pondweed. Frequent in lakes and streams in the Chicago region (Swink and Wilhelm, 1994). Probably occasional, but locally abundant in Wolf Lake. We found it in Pools 1 and 2. It is hard to accurately determine the abundance of this species at Wolf Lake, since it is difficult to distinguish it from *Heteranthera dubia* at a distance. Ketzner # 3078

Ranunculus flabellaris Raf. Yellow Water Crowfoot. Locally common in quiet shallow ponds in the Chicago region (Swink and Wilhelm, 1994). Yellow water crowfoot was found in a shallow pool in the wet bottomland forest in the northwest corner of William W. Powers State Fish & Wildlife Area, well separated from Wolf Lake. It was abundant and dominant in this pool. This pool, and several others similar to it, was probably excavated when the road around the lake was constructed. It seems unlikely *Ranunculus flabellaris* would occur in the deeper waters of Wolf Lake, but could occur in the shallow water around the periphery.

Scirpus validus Vahl Great Bulrush. Common in marshes in the Chicago region (Swink and Wilhelm, 1994). A large colony of this tall, emergent bulrush was found in fairly deep water of Pool 3, where it can easily be seen from shore. The plants are in water at least 1.5 meters (5 feet) deep. Great bulrush has apparently declined in recent years at Wolf Lake, where it was once common (Joe Herod, personal communication).

Utricularia sp. Bladderwort. This insectivorous aquatic plant was not found in Wolf Lake, but occurs in one of the ponds to the south. Here, bladderwort is fairly common in shallow water at the periphery. The plants were not in flower and we were unable to identify this *Utricularia* to species level. This plant is inconspicuous when not in flower,

and could be present in Wolf Lake where we overlooked it. Peattie (1925) reported *Utricularia vulgaris* L. var. *americana* Gray from Wolf Lake, and our plants may be this taxon.

Vallisneria americana Michx. Eelgrass. Local in shallow water of lakes and streams in the Chicago region (Swink and Wilhelm, 1994). Common in both shallow and deep water of Wolf Lake. Eelgrass forms a zone in shallow water around the periphery of the lake. We found it in all five pools. Ketzner # 2818

Zannichellia palustris L. Horned Pondweed. Local in shallow, usually calcareous water in the Chicago region (Swink and Wilhelm, 1994). Horned pondweed was not found in Wolf Lake, but occurs in a pond to the south of the lake, where it is common in shallow water. This inconspicuous plant is easily overlooked, and probably also occurs in Wolf Lake.

Additional Aquatic Plants Historically Known from Wolf Lake

The following aquatic plants were previously reported from Wolf Lake, many of them by Peattie (1925). We were unable to locate them in the limited amount of time available for fieldwork. Almost all of our fieldwork was conducted over a four and a half-week period in late spring/early summer. Some of these plants are only conspicuous late in the growing season, and therefore, they may have been overlooked. Many of these plants undoubtedly still grow in Wolf Lake.

Brasenia schreberi J. F. Gmel. Water Shield. A species of clear, quiet lakes and ponds (Swink and Wilhelm, 1994) that is probably now uncommon in the Chicago region. Water shield was reported from Wolf Lake by Peattie (1925).

Najas flexilis (Willd.) Rostk. & Schmidt Slender Naiad. Local in ponds and slow, often calcareous streams (Swink and Wilhelm, 1994). Slender naiad was reported from Wolf Lake by Peattie (1925). It was probably overlooked and likely remains extant in the lake.

Nelumbo lutea (Willd.) Pers. Lotus. Local in lakes and ponds in the Chicago region (Swink and Wilhelm, 1994). Pepoon (1927) mentions a small colony from the Indiana side of Wolf Lake. Peattie (1925) claimed it once was abundant in the lake, but apparently was exterminated by commercial picking by 1925. It is very unlikely we would overlook this conspicuous plant, and it is undoubtedly extirpated on the Illinois side.

Potamogeton foliosus Raf. Leafy Pondweed. Frequent in creeks, ditches, and lakes in the Chicago region (Swink and Wilhelm, 1994). Leafy pondweed was reported from Wolf Lake by Peattie (1925). It was probably overlooked, and likely remains extant in the lake.

Potamogeton natans L. Common Pondweed. Fairly common in lakes in the Chicago region (Swink and Wilhelm, 1994). Common pondweed was reported from Wolf Lake by Peattie (1925). This conspicuous species is probably extirpated from the Illinois side of Wolf Lake.

Potamogeton nodosus Poir. Long-leaved Pondweed. Frequent in streams, lakes, and ditches in the Chicago region (Swink and Wilhelm, 1994). Reported from Wolf Lake by Peattie (1925) as *Potamogeton americanus* Cham. & Schlecht. This pondweed is probably extirpated from the Illinois side of Wolf Lake.

Potamogeton pusillus L. Small Pondweed. Frequent in calcareous waters in the Chicago region (Swink and Wilhelm, 1994). This species was not located during this survey, but was found in Wolf Lake by Ursula Rowlett in 1975 (specimen in herbarium of the Illinois Natural History Survey). It was probably overlooked, and likely remains extant in the lake.

Potamogeton robbinsii Oakes Fern Pondweed. Local in shallow lakes in the Chicago region (Swink and Wilhelm, 1994). Fern pondweed is listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999). According to the Natural Heritage Database, fern pondweed is known from Wolf Lake at Pool 1, just offshore near the parking area, east of the superintendent's residence. We do not know details of this report. This site was searched, but *Potamogeton robbinsii* could not be relocated. However, suitable habitat probably still remains, and fern pondweed could still be present.

Potamogeton strictifolius A. Benn. Stiff Pondweed. Swink and Wilhelm (1994) state that this species is local in calcareous waters of a few of the cleanest lakes in the Chicago region. Stiff pondweed is listed as endangered in Illinois (Illinois Endangered Species Protection Board, 1999). Wolf Lake is the type locality for this species, where it was collected by Agnes Chase in "water 3 ft. deep" in 1900 and 1901. Although we did not relocate this inconspicuous species, it could still occur in Wolf Lake.

Ranunculus longirostris Godr. White Water Crowfoot. This aquatic buttercup is apparently declining in the Chicago region (Swink and Wilhelm, 1994). Peattie (1925) reported white water crowfoot from Wolf Lake (as *Ranunculus circinatus* and *R. aquatilis* var. *capillaceus*). This species is quite conspicuous when in flower and it is unlikely we would overlook it. *Ranunculus longirostris* is probably extirpated from the Illinois side of Wolf Lake.

Utricularia vulgaris L. Great Bladderwort. Reported from Wolf Lake (as var. *americana*) by Peattie (1925). Great bladderwort is locally frequent in shallow water in the Chicago region (Swink and Wilhelm, 1994). According to Peattie, Wolf Lake supported "acres" of *Utricularia vulgaris*, along with associate *Myriophyllum exalbescens*. The unknown *Utricularia* sp., mentioned above, may be this species.

Zizania aquatica L. Wild Rice. Local in shallow water in the Chicago region (Swink and Wilhelm, 1994). Peattie (1925) claimed acres of wild rice grew in Wolf Lake, in water two to four feet deep. Wild rice is probably extirpated from the Illinois side of Wolf Lake.

Summary

A survey for endangered or threatened plant species was conducted at the William W. Powers State Fish & Wildlife Area, with emphasis on the aquatic species of Wolf Lake. Six plants of special concern were found: *Carex aurea*, *Carex viridula*, *Eleocharis pauciflora*, *Juncus alpinus*, *Potamogeton gramineus* and *Spiranthes lucida*. One of these plants, *Potamogeton gramineus*, is an aquatic found in Wolf Lake. Twenty-four additional aquatic plant species were found at the site, with 21 of these present in Wolf Lake (Table 1). Two aquatic plants of special concern (*Potamogeton robbinsii* and *Potamogeton strictifolius*), with historical records from Wolf Lake, could not be relocated. Pool 1 has the highest diversity of aquatic plants, with 18 species (Table 1), and Pool 3 is the least diverse, with only 8 species present. Eurasian water milfoil (*Myriophyllum spicatum*) is abundant in the lake and was found in every pool. *Myriophyllum spicatum* appears to occur most abundantly in deeper water, possibly in areas that were dredged.

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