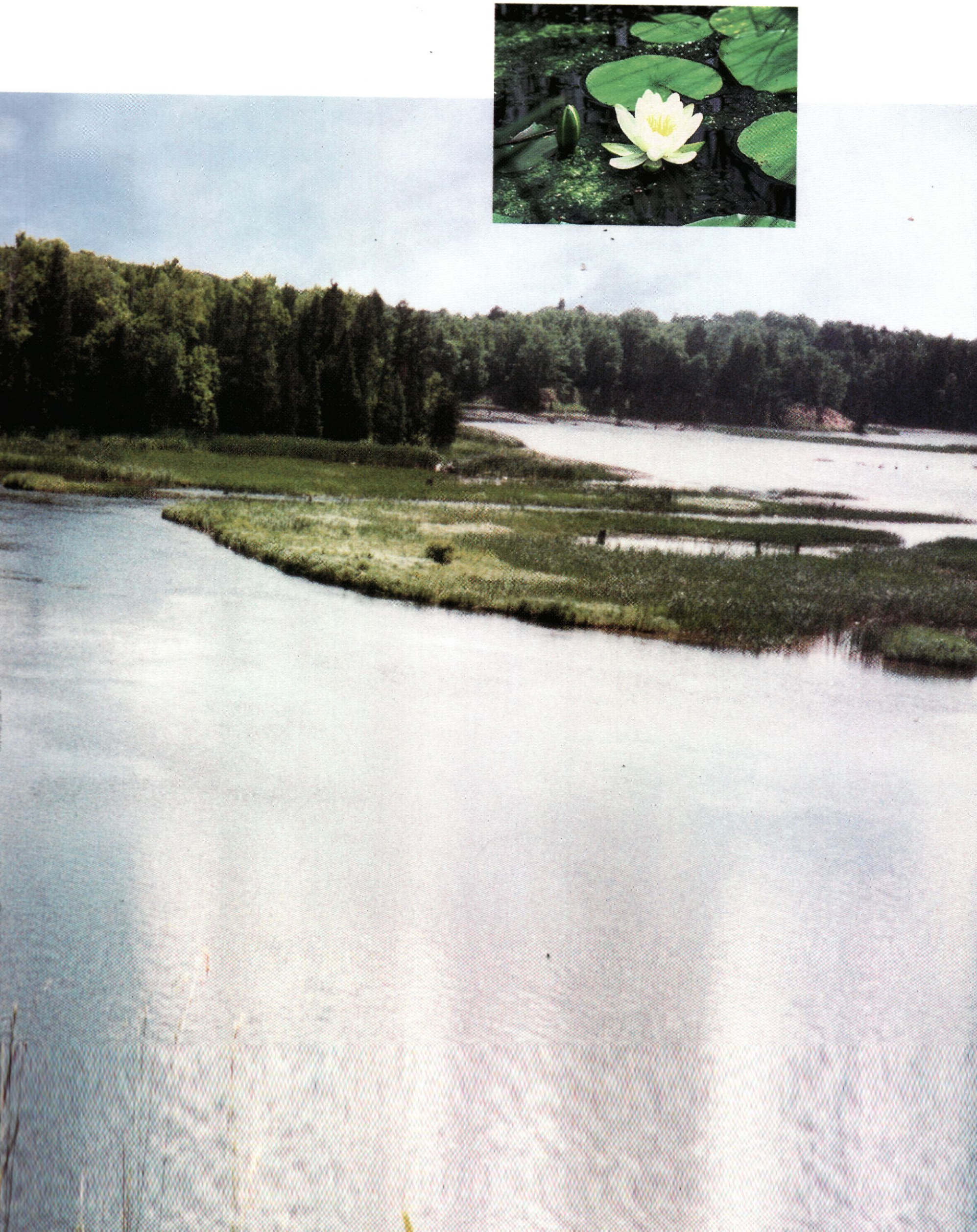
Great Lakes Wetlands, A Field Guide
Michigan State University
Michigan State University Extension
Walter J. Hoagman
Issued 1998
180 pages

Great Lakes Wetlands

A Field Guide

by Walter J. Hoagman



About the Author

Walter Hoagman grew up on the shores of Lake Erie, where his early interest in all things wet, or nearly so, developed into a career of research and teaching about the Great Lakes and oceans. After obtaining a teaching degree in biology from Easter Michigan University, he completed a master's degree in natural resources at the University of Michigan, then a Doctorate at the University of Wisconsin Center for Great Lakes Studies. He has written numerous technical and popular articles throughout his career at Indiana State University, the University of Virginia, and Michigan State University.

In his current position as District Michigan Sea Grant Extension Agent for northern Lake Huron, Hoagman continues to educate youth and adults on many aspects of Great Lakes resources. He resides in Tawas City with his wife, Athelia Marie, and enjoys boating, woodworking, golf, fishing, and raising a dog or two.

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A Field Guide

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Foreword

The intent of this book is to explain Great Lakes coastal wetlands in non-technical terms and to provide a field guide to the most common plants. The generalizations that appear here are my synthesis of many facts and theories. In a previous book, Great Lakes Coastal Plants, I discussed non-wetlands plants of the Great Lakes shores, with sections on beach dynamics and ecology.

The distinction between coastal and wetland ecosystems may not always be precise, but collectively these two volumes should allow readers to learn the basic characteristics of our Great Lakes shores and their dominant vegetation.

Walter J. Hoagman
July 1998

Credits

Funds for this publication were provided by:
Michigan Sea Grant College Program
Michigan Department of Environmental Quality
Coastal Zone Managment Program

Reviewers:
With grateful acknowledgement and thanks.

David Burgdorf, National Resource Conservation Service
Maureen Houghton, Michigan Department of Environmental Quality
Joyce Jakubiak, Michigan Sea Grant
Anton Reznicek, University of Michigan Herbarium

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Great Lakes Wetland Ecology

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Great Lakes Wetland Ecology

In ancient lore, bogs, fens, marshes, and swamps were dark, unwholesome places, filled with foul vapors and dangerous beasts.

As humans moved into agricultural and, later, industry-based lifestyles, these wet areas continued to be regarded as nuisance zones. They hindered access to shorelines, prevented full use of adjacent drier land for crops, complicated the development of transportation systems, and made it difficult for industry to locate next to water reserves or shipping docks. These and other rationales encouraged policies of wetland modification.

In the last 50 years, housing and recreational construction have placed an increased demand on shore frontage, leading to greater and greater modification of wetlands into dry land sites. Those of us living in the lower 48 states have now lost 50 to 60 percent of our wetlands. This loss continues piece by piece and parcel by parcel.

While this has been occurring, more and more people have begun to realize that wetlands are a unique and limited habitat type, not waste areas at all. Hunters, fishers, and birders see their cherished sports under siege from a silent opponent—shrinking habitat. Scientists have learned that many species of fish, birds, insects, amphibians, and plants depend wholly or in part on wetlands. City planners and government agencies have begun to accept evidence that wetlands are important as flood control areas. Gradually, local, state, and federal governments have adopted measures to help assure the protection of wetland areas.

Great Lakes Wetlands Defined

Wetlands are water-saturated areas, with soils that are neither truly aquatic nor entirely dry. Special plants live here, with unique physical and chemical adaptations, and a water budget that drives the entire system.

The generally-accepted definition of a Great Lakes wetland is one that is either contiguous to the main Lake or, if not actually touching, then in hydrologic connection. Thus, the water level in a Great Lakes wetland varies with Lake levels.

There also exist thousands of wetlands close to the Great Lakes but isolated from them. Their water levels do not follow lake levels. They are called coastal wetlands and can be considered inland wetlands rather than Great Lakes wetlands.

Some scientists, however, disagree with this definition. Herdendorf et al (1981) consider all coastal wetlands to be Great Lakes wetlands if they are within 1,000 feet of any shore, bay, river, harbor, or coastal lake.[1] (See Figure 1.)

This book adopts Wilcox's definition (1995) of a Great Lakes wetland, which excludes any wetland that is not influenced by the main Lake.[2]

Every wetland is characterized by a combination of factors, including vegetation type, soil type, and the amount and duration of soil saturation. In a wetland, abundant water fills soil pores, preventing oxygen from reaching plant roots. Unless plants have a special delivery mechanism to transport oxygen to their roots, they will become severely stressed and die. Some plant species are better than others at living in these hydric (oxygen-limited) environments. Collectively, these plants are called hydrophytes, or wetland plants.

Great Lakes wetlands and inland wetlands have virtually the same plant species. One major exception to this is that

[1] *This definition includes all diked wetlands, all wetlands along a coastal river if those wetlands are contiguous to an inland lake connected to a Great Lake, and all wetland ponds and swales isolated from the main lake.*

[2] *River wetlands are included to the elevation back from the Lake equal to the highest recorded water level of that Lake. Wilcox considers some dune and swale wetlands to be Great Lakes wetlands if the elevation of their bottom is below the highest Lake level recorded.*

Great Lakes shorelines lack acid-loving plants, typical of bogs, and have very few calcium-loving plants, typical of coastal fens.

A Great Lakes wetland ages very little compared to an inland lake. Peat build-up, a feature of inland wetlands, is usually limited in a Great Lakes wetland, for cycles of high and low water continually interrupt the steady advance of upland plants at the water's edge.

Great Lake wetland vegetation zones are also broader than inland zones, and the diversity of plants and animals greater. This means that the loss of Great Lake wetlands cannot be offset by increasing inland wetland acreage. Wetland types are so different hydrologically and ecologically that an acre of one does not equal an acre of the other.

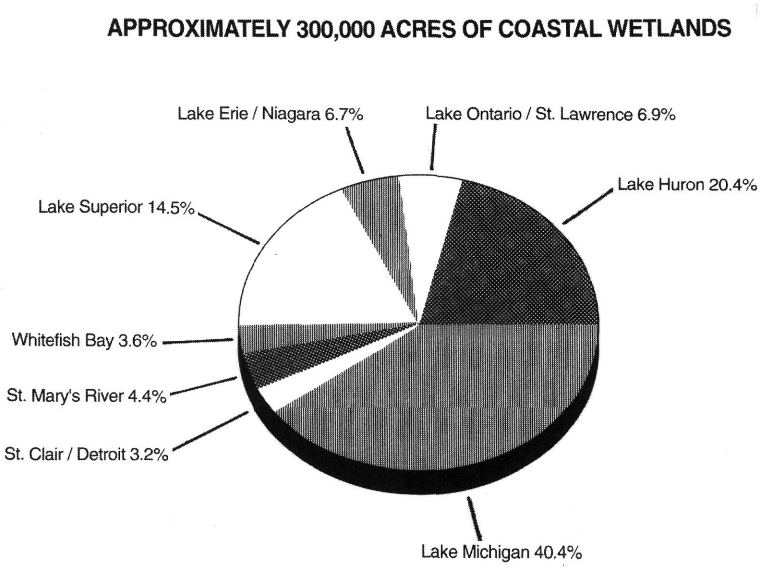


Figure 1. Great Lakes wetlands along the coast of the United States as of 1981. Diagram includes diked wetlands and others not directly connected to a Great Lake but within 1,000 feet. Also includes many riverine wetlands above the zone of impact by a Great Lake. See Herdendorf (1981) for details.

Water Dynamics in a Wetland

Water is at the heart of all wetlands. Wetland soil conditions range from occasionally-saturated to flooded, with distinct plant zones found across the range. When water levels change, and the change is short-term—a few days to a month—plants are usually not affected. But if the change continues for a season or more, die-back and readjustment of plant zones will take place.

Few factors are as essential to the life of a Great Lakes wetland as Lake level changes, and these changes can occur in three ways: short-term, seasonally, and long-term.

Short-term Variations

When a stiff wind blows across a Great Lake, water is pushed to the lee shore, causing a rise proportional to the force. This is called wind set-up. (See Figure 2.) At the other side of the lake, the water level falls. Lake Erie is famous for such changes, and a difference of six to 10 feet between

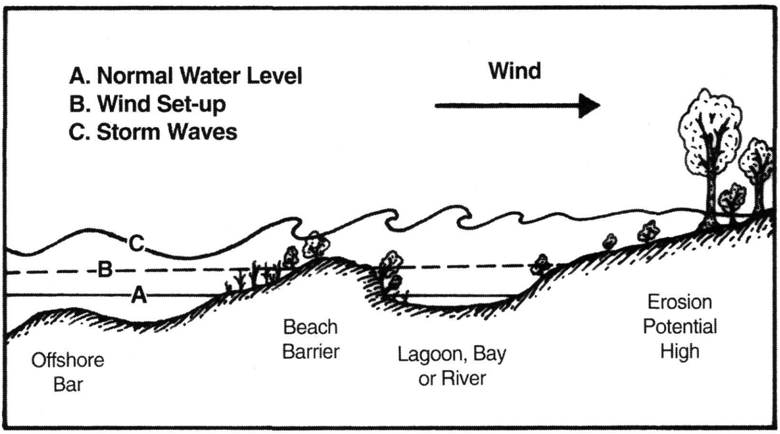


Figure 2. Generalized cross-section of the shore shows what happens when a strong wind blows to the land. The wind set-up causes an elevation in water level that inundates the marsh or beach barrier. If a violent storm follows, the waves can travel further inland, creating the potential for high erosion.

Toledo and Buffalo is common, with the record being 16 feet. Strong waves on the lee shore can cause severe flooding, coastal erosion and property destruction.

Another short-term variation occurs when a massive weather front passes across the Great Lakes basin accompanied by a barometric change. If the change in wind or air pressure is severe and rapid enough, a seiche is produced. A seiche is a standing wave that does not travel across the water but rather causes the surface to rock up and down. The effect is equivalent to pushing a board onto one end of a half-filled bathtub: the water is depressed at one end and rises at the other. If the board is removed, the water continues to rock up and down.

A large seiche caused by a summer squall occurred on Lake Huron in 1995. (See Figure 3.) As the pressure front pushed water down in the center of the lake, the water level rose 20 inches then later fell 51 inches. This initial rise and fall took less than two hours. Saginaw Bay wetlands were inundated with two to three feet of water, which then rushed out rapidly. Along the windward shores, water disappeared from cattail and bulrush flats only to rush back to four feet deep within an hour.

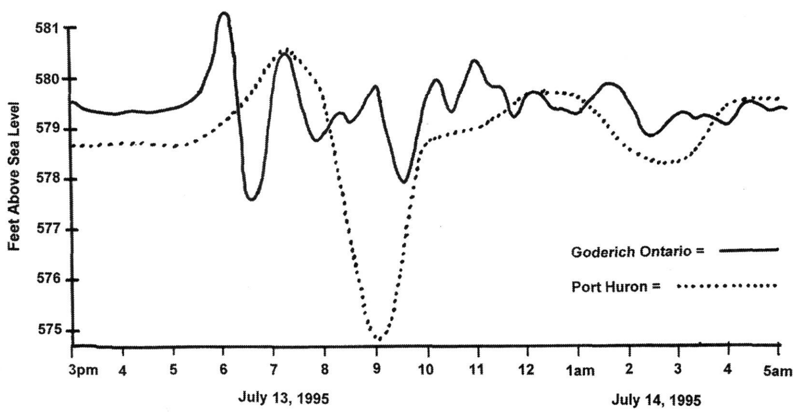


Figure 3. Sudden change in water level in southern Lake Huron on July 13, 1995, before, during and after a severe squall. Winds went from zero to 70 miles per hour in 30 minutes, with the storm front traveling approximately 50 to 60 miles per hour across the water. The lake oscillated for two days after this event.

Wind set-ups and seiches do not change the nature of wetlands. Rather, they flood wetlands with fresh water and flush organic sediment. This rise and fall of water keeps the wetlands healthy. Peat has a hard time building up, and the fresh, oxygenated water gives new life to stagnant pools, soils and organisms.

Seasonal Variations

Water levels in the Great Lakes also rise and fall each year, with highest levels occurring in the summer months and the lowest during the early winter months. (See Figure 4.)

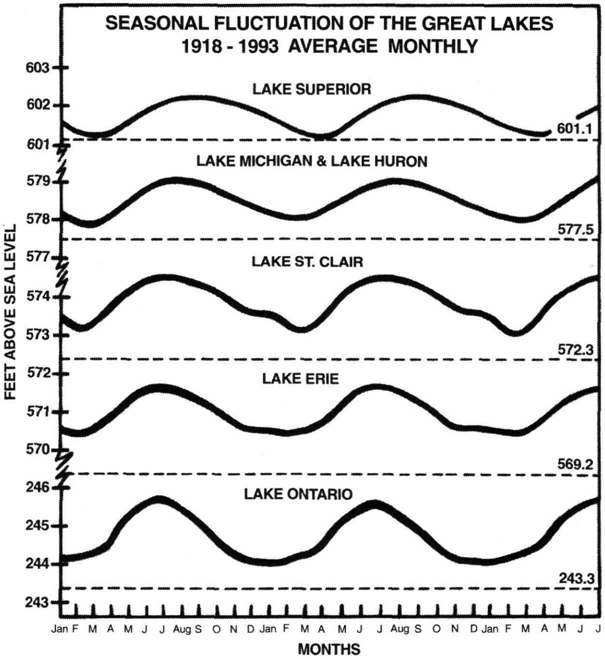


Figure 4. Annual variation in Great Lakes water levels averaged over 75 years. Chart datum (1985 base) is shown as the dotted line for each lake. All the lakes are highest in mid to late summer and lowest in the winter, with each lake being slightly different. Water levels in coastal wetlands are highest in June or July, barring storm activity. This summer maximum prevents annuals, shrubs and trees from sprouting, unless the overall water level is low that year.

In the spring, the land begins to release stored moisture. When this moisture is combined with the runoff produced by spring rains, the Great Lakes receive more water than they lose.

This spring pulse is expressed by increasing water levels well into late summer. Since there are only two outlets from the Great Lakes, a small one at Chicago and the other 100 times larger at the Niagara River, there is a several-month time lag between the spring filling and the subsequent lowering as summer wears into fall.

In winter, the Lakes lose tremendous amounts of moisture into the air, causing in part the nearly perpetual cloudy skies over the basin. Snow also traps considerable moisture, limiting runoff. This, and continued draining from the two Lake outlets, creates a pronounced low Lake level in midwinter.

Long-Term Lake Level Fluctuations

The Great Lakes also experience long-term fluctuations. Records exist from 1860, with reliable and comparable data since 1900. (See Figure 5.) While the lakes may stay high or low for several years, they have always returned to normal or

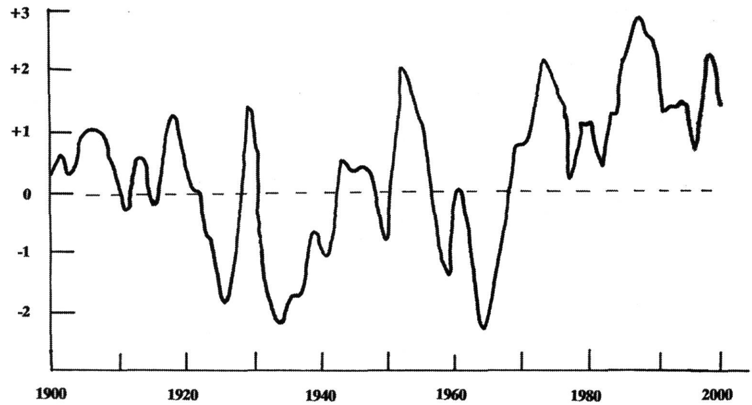


Figure 5. Long-term average water levels for Lake Michigan and Lake Huron (1985 base). Lakes Michigan, Huron and Erie have varied the most, although no predictable pattern has emerged. Prolonged high water can be followed by normal levels or low levels, and vice versa. Currently, Lake Superior and Lake Ontario are partially regulated.

continued their oscillations randomly. No pattern related to any other phenomenon has ever been proven, other than water supply and loss. When the lakes experience a few consecutive years of above-average precipitation, their levels rise because the outlets can only let so much out. When the lakes experience several consecutive years of below-average precipitation, the outlets continue to drain water, and the lakes fall below average.

In 1995, the International Joint Commission (IJC), a binational agency, studied the benefits of regulating the five Great Lakes with engineering devices and concluded that costs would be high and the environmental impact on the lakes would be largely negative.[3]

Effects of Water Fluctuation on Wetlands

At the center of the IJC reasoning was the effect regulation would have on coastal wetlands. Long-term fluctuations in Lake levels are essential to maintaining the coastal wetlands. High water levels flood wetlands along the drier upland, killing encroaching upland plants. Wetland plants expand into that zone. Flooding eliminates annuals, woody shrubs, and trees as the various zones within the marsh move inland. (See Figure 6.) Without such change, the diverse wet meadow zone would not exist, just as it does not exist in inland wetlands.

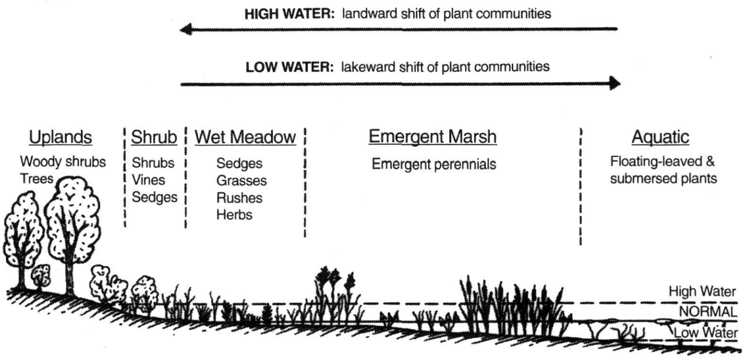


Figure 6. The zones of a coastal wetland show what happens when water levels change for prolonged periods (a few years at a time). High water kills shrubs and causes vegetation to move inland. Low water allows shrubs to spread lakeward.

[3] *IJC, 1993, p. 38-39]*

The shorter seasonal cycle also is ideal for coastal wetlands. During summer, when wetlands need all the water they can get, they have it. During fall and winter, when water is less vital, the wetlands tend to dry out.

Coastal wetlands thrive in spring and summer months. Being alternately flooded and drained in the short-term keeps them healthy and productive all season. Filled with water, wetlands trap littoral drift, build up root mats in the shallows, provide habitat for young fish and are abuzz with insects and birds.

When lake levels fall and stay low for several years, broad-leafed plants and shrubs, which are able to outgrow smaller wetland plants, begin their "march" to the shoreline. Cattails and bulrushes find themselves growing on the mud, where dehydration will kill them. They must expand lakeward to deeper water to survive. Once established offshore, cattails and bulrushes immediately begin to anchor the sediments and trap the littoral drift, often creating small islands or dense patches of bulrushes. This process increases wetland habitats and helps maintain lake productivity.

The middle zone plants of the sedge meadow are in the most advantageous position. Vast seed reserves shed over many previous years have sunk to the bottom, lying dormant there. As the soil dries, these seeds get the oxygen they need to sprout, quickly forming new areas of wet meadow on mud flats, spits, offshore islands and midchannel bars.

Whatever the length of the low-water period, the Lakes have always returned to normal. Upland woody plants and annuals that had established in the temporarily dry area are forced out. Plant beds established offshore may be washed away, or they may be able to withstand the higher water levels because of the increased amount of soil. Overall, when water levels rise, the wetland reclaims itself, and interior ponds and lagoons once again have plenty of water and open space for fish and birds, amphibians and reptiles.

Types of Great Lakes Wetlands

There are seven major types of Great Lakes wetlands. (See Figure 7.) Each type owes its presence and configuration to the geologic and hydrologic history of its particular location. The generalizations below are tempered by the reality that there are always exceptions; not all wetlands fit neatly into a category.

Lagoon and Barrier

This is the most common type of coastal wetland along Great Lakes shores. It is characterized by a prominent shoreline barrier, which protects a shallow lagoon with many side channels and/or flats that gently rise to higher ground. From the air, such a wetland resembles an inland marshy lake just inside a beach. The water level may be maintained by ground-

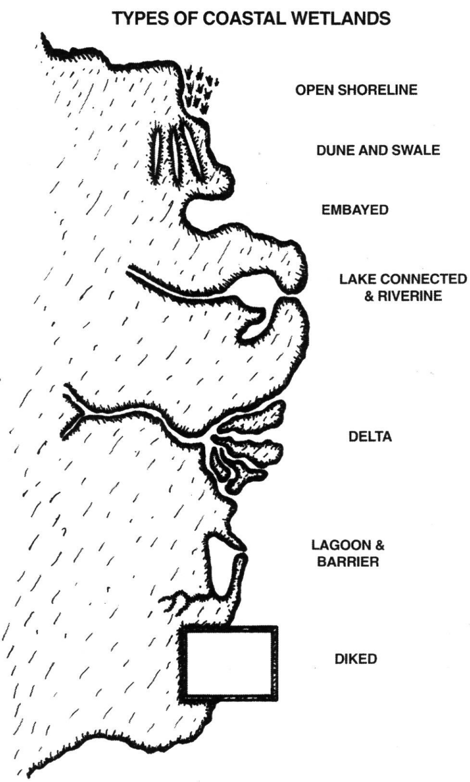


Figure 7. Seven types of coastal wetlands around the Great Lakes. Lagoon and barrier, riverine and embayed cover the most acreage. The types often intergrade at any specific site. Diked wetlands with water control structures are not always considered coastal because they do not follow natural lake levels. Delta wetlands are the rarest type. Fens are either open shoreline wetlands or inland wetlands.

water flow from the upland, small upland streams, direct connection to the Lake via a small opening in the barrier beach, and seepage from the Lake.

The breadth of this wetland type depends on how steep of a rise extends from the lagoon to the highland. At elevations of five to seven feet above the lagoon, wetland vegetation usually disappears. There may also be a continuous series of lagoons interspersed with higher ridges, a situation common in the northern parts of the Great Lakes.

Organic matter tends to accumulate in lagoon and barrier wetlands, which nourish a variety of plants including submerged, floating, emergent, and wet meadow flora. Heavy shrub zones often ring the depressions, grading into lowland forests and/or agricultural land.

Tobico Marsh in Saginaw Bay is a typical lagoon and barrier wetland. (See Figure 8.) Submerged and floating-leaved plants occupy the shallow lagoon, characteristically bordered by such emergents as cattail and bulrush. Between the emergents and the shrub zone, a profuse wet meadow can

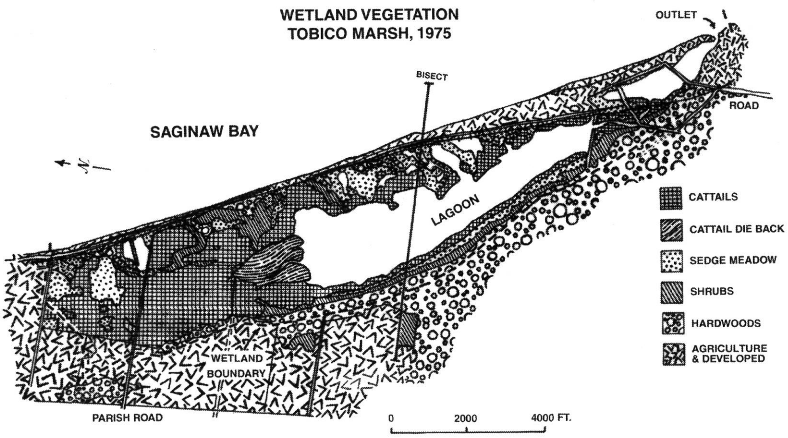


Figure 8. Tobico Marsh near Bay City, Michigan, is a typical lagoon and barrier wetland open to Saginaw Bay. It is a coastal depression nearly land-locked, surrounded by uplands. Offshore vegetation is absent. The wet meadow and shrub zone is very narrow, occurring on both sides of the lagoon. Details of bisect are shown on Figure 15.

usually be found, dominated by bluejoint, tussock sedge, and numerous other sedges and grasses. Lowland hardwoods may also form large bands, or they may be nearly absent due to road construction or agriculture.

Lagoons isolated from the main lake have fairly stable water levels, allowing the development of competitive plant zones. This wetland type can develop extensive peat deposits and may grow itself out of existence. On the other hand, lagoons that are a lateral part of a river system flowing into a Great Lake will have water levels closely following the Lake's level. These are dynamic systems and can change vegetation patterns quickly, usually within a year.

Protective barriers in the form of shallow offshore bars, beach extensions across deltas, or man-made structures serve to shield other types of Great Lakes wetlands. Barriers are one of the most characteristic features of a Great Lakes wetland. They are also a fluid feature. They may partially disappear in a day, only to be rebuilt the next week. Sediment cores reveal extensive layers of sand, rock, cobble, peat, muck, clay, and other deposits under most shore barriers, indicating a very dynamic system of change.

Riverine Wetlands

Riverine wetlands are characterized by a permanent channel that meanders through a lateral flood plain. The flood plain may be flat and partially flooded, in which case extensive emergents develop along the open water; alternately, the flood plain may slope, causing wetland zones to be compressed along a relatively steep shore. Usually there are few floating-leaved aquatic plants in the main stream, and submerged aquatic abundance will depend on water clarity, current speed, and water depth. The Betsie River, which empties into Lake Michigan at Frankfort, has all the characteristic features of a riverine wetland. (See Figure 9.)

As with other Great Lakes wetlands, the riverine wetland type is subject to prolonged changes in water level that mirror the Lake. When Lake levels are high, the high water acts as a dam at the river mouth, and inflowing river water pools to that level, submerging the flood plain.

Distinct vegetative zones can be clearly seen in many riverine wetlands. Emergents such as softstem bulrush, cattail, sweetflag, nodding smartweed, arrowhead, burreed and spikerush start at the edge of open water. Landward, the typical wet meadow is dominated by tussock sedge, bluejoint, swamp rose, sedges, canary grass, boneset, and some nut-sedges. Willows, dogwoods, sweet gale, alder and swamp rose may form isolated clumps on higher mounds. Usually these and others—red ash, marsh fern, buttercup and other water-tolerant shrubs—form a more-or-less distinct line.

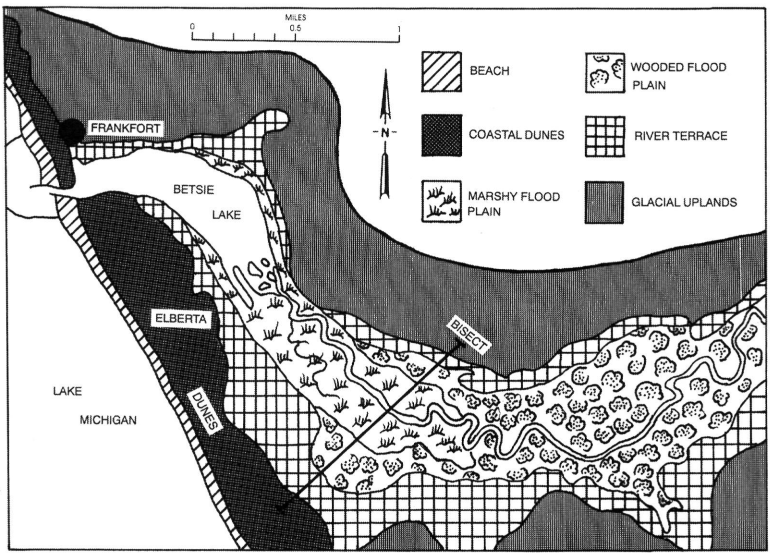


Figure 9. Betsie River near Frankfort, Michigan, August 1977. Upstream from the town of Elberta, the Betsie has all the characteristics of a riverine, lake-connected wetland. Large dunes and hills surround its valley. There is a large open marsh in the lower reaches, bordered by a wet meadow, shrub and upland zone. Further upriver, beyond Lake Michigan's influence, the forest grows to the river's edge. Bisect shown on Figure 15.

Trees tolerant of water-logged soils, such as cottonwood, ash, swamp oak, sycamore, and elm, grow near the bottom of the bank, and upland trees grow along the slope and at higher elevations.

Riverine wetlands often have numerous small islands covered with wetland plants. These islands are formed by sedimentation in areas of slower current and are quickly colonized, and thus stabilized, by vegetation. In years of low flow and low lake levels, extensive mudflats appear. These, too, are soon colonized by plants (first the annuals then the perennials). A few miles upstream from the river mouth, the channel becomes more distinct, with shrubs and trees growing to the bank. This usually marks the approximate location of the upstream limit of the effect of the Great Lake. Beyond this point, there will usually be an extremely thick forested flood plain, with large trees overhanging the mainstream.

Some riverine wetlands such as Old Women Creek in Ohio are located on small watersheds with low summer flows. As the Lakes recede during the summer, a bar may form across the mouth, isolating the wetland from its Great Lake. Whatever flows downstream, whether it be sediment or organic fiber, stays there and settles out. Then the wetland changes from a Great Lakes wetland to a temporary inland wetland. This inland lake of water lilies and other colorful plants can be beautiful, but it is susceptible to becoming anoxic, or deprived of oxygen, causing its fish to die.

Embayed and Shoreline Wetlands

Waves entering a bay mouth from any direction are spread out along the shore. This reduces wave energy compared to a wave that strikes a straight shore. Depending on geographic setting, one end of a bay may have calmer water than the other. This calm water is where wetland plants flourish.

Submersed, floating-leaved, and emergent wetland plants require relatively calm conditions to thrive. Most bulrushes do best in water six to 24 inches deep. Where these dominants occur, the shore is a low energy zone. The bulrushes have small stems, capable of bending, and thus withstanding punishing waves. Cattails, on the other hand, cannot tolerate much wave energy and will drown in water deeper than 15 to 18 inches, so they usually occur inside the bulrush zone.

Once established, offshore emergents bind the sediments with tough rhizomes and can grow dense in the shallows. Their presence reduces the effects of waves and erosion. Because the force of waves is lessened, sediments gradually increase, which in turn help protect emergents from washout. The occasional storm has a hard time destroying a dense cattail stand fringing a coastal marsh.

When water levels are high, and larger waves penetrate the shore zone, the offshore emergents can be eroded or killed by too much water. If the change is gradual enough, the offshore emergents can migrate, or move shoreward through rhizome development, to shallower water. Conversely, when water levels fall for several years, the offshore area of suitable depth and conditions expands lakeward, and the plants follow.

An offshore emergent marsh indicates shallow water across a very gently sloping bottom, which usually continues landward to a level lake plain. The barrier beach of the shoreline normally is a hummocky, low ridge of trees such as cottonwood, green ash, willows, dogwoods, grapes, and some shrubs. This ridge may be only 20 to 50 feet across, and only three to six feet high before the land slopes downward again, creating an inner marsh often of great size.

Oconto Marsh in Green Bay and Thomas Road Marsh in Saginaw Bay show the typical patterns of embayed wetlands and shoreline wetlands. (See Figures 10 and 11.) St. Martins Bay in northern Lake Huron, Humbug Marsh in western Lake Erie, Long Point on the Canadian side of eastern Lake Erie, Munuscong Bay in the St. Marys River, North Bay on the Door Peninsula, and Big Bay de Noc in northern Lake Michigan are all fine examples of embayed coastal wetlands. A canoe trip through any of these wetlands is a naturalist's delight. There are hundreds of other similar wetlands, large and small, scattered along every small opening and calm bay

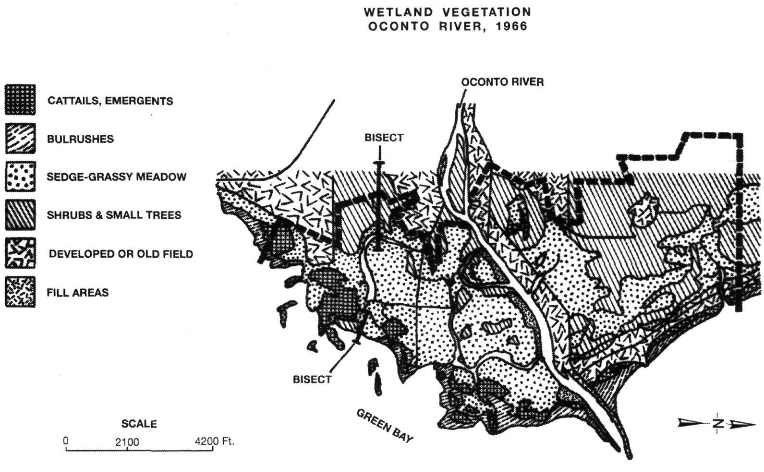


Figure 10. Oconto Marsh, on the western shore of Green Bay, Lake Michigan, July 1978. Diagram shows bulrushes growing offshore, with a beach barrier protecting a vast inner marsh of cattails, ponds, sedge meadows and canals. Uplands hug the western edge. Details of bisect shown on Figure 16.

throughout the Great Lakes. Most have high educational value because they can be reached by educators and groups from the land and from the water.

Great Lakes shoreline wetlands are perhaps the most valuable habitat type in the entire basin. These are prime nursery areas for dozens of fish species, and nesting cover for all the typical wetland birds.

Each year, the dead cattail stalks are cut by shore ice and other factors, and reduced to particles consumed by bacteria and fungi. This nutrient load, which includes all the cellulose and chemicals of the vegetative growth, is swept back into the Great Lakes, helping them to thrive.

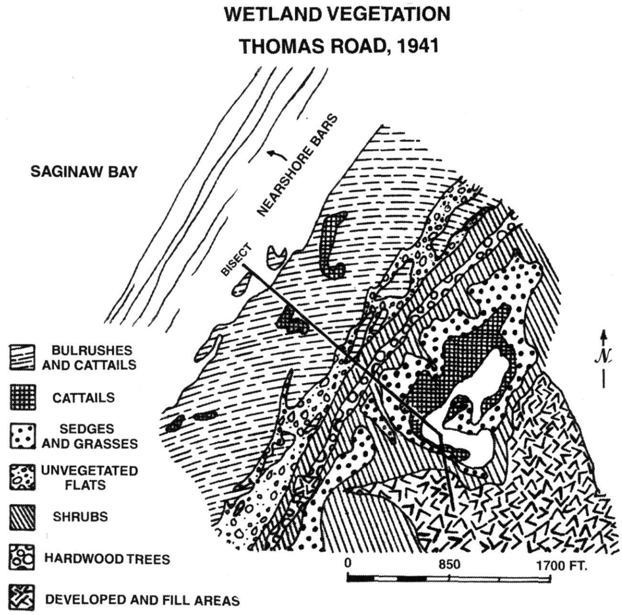


Figure 11. Thomas Road Marsh, on the south shore of Saginaw Bay, has a low energy shoreline with offshore emergents, a beach barrier with tall trees, then an inner marsh of the lagoon type, connected to the lake, with farmland to the south. Bisect details shown on Figure 16.

Delta Wetlands

A river delta forms when sediments flowing downstream settle out as the river slows near the mouth. The largest particles fall to the bottom first, followed by others of descending size as the water slows. Natural levees or banks form alongside the main river channels, and the sediments fan out across a coastal shelf.

As the sediments build up, they can form bars or islands that rise high enough to divert the main channel, or the river may cut a new channel through the adjacent levee. The result is a branched system of waterways, vegetation, shallow areas, mud flats, high banks, connectors and pools spreading seaward. Numerous islands and shoal areas provide shelter and feeding areas for wildlife. These areas are quickly colonized by

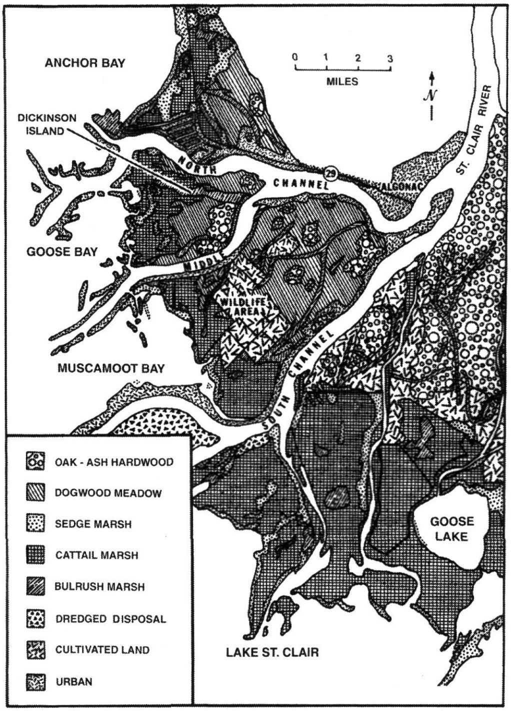


Figure 12. St. Clair River Delta where it empties into Lake St. Clair. A vast complex of meandering channels, flats, ponds, levees, sand bars and mud flats. Sediment carried from Lake Huron has created the largest delta in the Great Lakes. Some areas are diked.

cattails, reeds, bulrushes, sedges, and other soft-stemmed wetland plants. As the banks grow, shrubs and trees take root, further stabilizing the levees.

In the Great Lakes and around the world, the opportunity for delta formation is limited: most major rivers empty directly into a high energy zone, such as an open lake or ocean.

The largest delta formation in the Great Lakes is located at the mouth of the St. Clair River where it empties into Lake St. Clair. (See Figure 12.) The entire northern end of Lake St. Clair is one vast wetland complex of 13,000 acres. In Saginaw Bay, the Rifle River has formed a small delta marsh where it empties into Wigwam Bay. The alluvium has been quickly colonized by purple loosestrife, cattails, and willows.

Dickinson Island shows the complex pattern of vegetation zones formed when a delta island continues to grow on its upstream side. (See Figure 13.) The island has a gradual south-to-north upward slope, but the normal progression from emergents to upland plants is interrupted by banks, ridges, ponds, canals, levees, and flats.

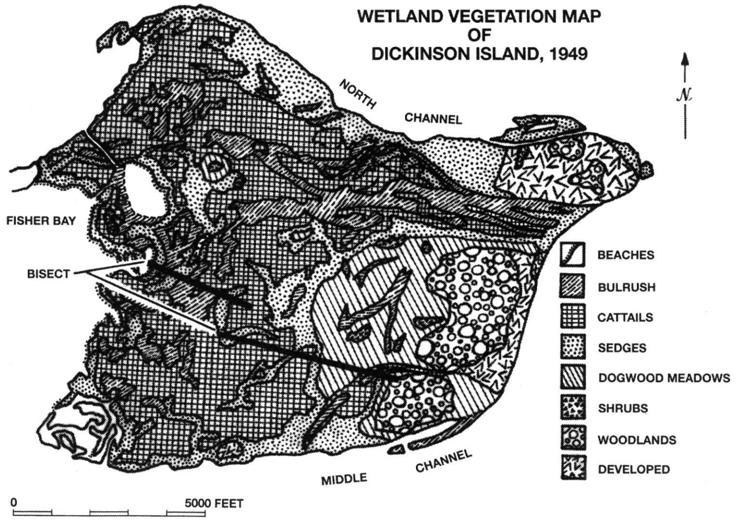


Figure 13. Dickinson Island, St. Clair Delta, Lake St. Clair. Vegetative patterns in 1949 are typical of several years of normal water levels. Many canals are too small to show.

Diked Wetlands

A diked wetland is an artificially-constructed inland lake surrounded by a bank of dredged sediments and other fill such as rubble and broken concrete. The original purpose of such wetlands was to provide a shallow lake that could have its water level manipulated to attract migrating waterfowl. In spring and summer, people pumped the internal area nearly dry and planted grain crops. Without harvesting the crops in the fall, they flooded the area to feed migrating ducks and geese. Waterfowl hunting was the primary use of such wetlands. Dozens of private gun clubs and many government tracts adopted this approach in Lake Erie, Green Bay, and Lake St. Clair.

Another reason for creating diked wetlands was to protect natural shoreside wetlands that were threatened by erosion during periods of high water. Artificial barriers saved the wetland but separated it from the main lake, unless provisions were made to preserve the connection.

There is disagreement about whether a diked wetland on the coast is a Great Lakes wetland. The source of contention is that diked wetlands are isolated from natural events that characterize other coastal wetlands, including the natural fluctuation of water levels. This isolation upsets the entire scheme of natural regression and expansion of vegetation zones. Diversity of plant species drops, and the mixed habitats crucial to coastal birds are severely allow decomposition.

The Woodtick Peninsula on Lake Erie is typical of a coastal wetland containing a diked portion. (See Figure 14.) The diked area has its water level managed independently of the main Lake, resulting in a large monotypic area of pure cattails, and almost no transition zone containing other plants. There is no meadow or low shrub zone. The dikes are all tree- and shrub-covered, with a weakly defined understory. The contained marsh has been filling up rapidly due to the containment of the vegetative biomass and the inability of the stagnant water to allow decomposition.

If all diked wetlands had their lakeside levees removed, there would be a considerable drop in available acres of open water for waterfowl during the fall migration. Fish species that depend on wetland spawning and nursery areas would have free access to the formerly diked marsh. After several decades, the wetland would be similar in vegetation patterns and functions to a non-diked shoreline wetland, assuming high water did not again cause erosion.

The immediate remedy for diked wetlands is to open small areas in the barrier and let the water follow the lake levels. Within the last 10 to 20 years, wetland managers have moved away from their fixation on waterfowl management and created diked wetlands with freeflowing culverts. These provide circulation with the main Lake and increase the overall value of the wetlands habitat.

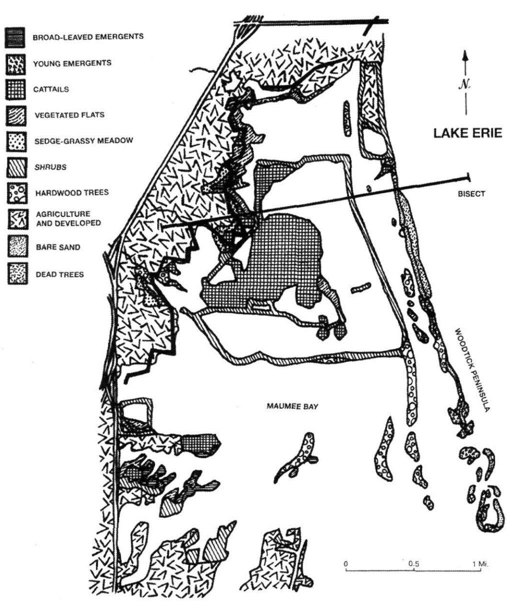


Figure 14. Woodtick Peninsula, western Lake Erie, near Ohio/ Michigan border, 1975. The diked portion is the central boxed-in area with the large cattail meadow. Many fringe wetlands around the islands and the peninsula itself have been eroded or drowned by five years of high water. Bisect on figure 17.

Fens

Fens are common coastal wetland areas that are not considered true Great Lakes wetlands because they occur isolated from a Great Lake, usually at an elevation above that reached by normal water level variation. Great Lakes fens resemble the wet meadow zone described previously. Most fens are flat, soggy areas between the backshore and a bluff that supplies groundwater rich with calcium and magnesium. This groundwater flows across the surface of the fen and evaporates, causing the mineral salts to become concentrated. A special group of plants, called calciphiles, can tolerate these minerals and high pH. Some typical plants found in fens include smooth sawgrass, pitcher plant, arrow grass, water horsetail, shruggy cinquefoil, grass-of-parnassus, horned bladderwort, marsh muhly, gentains, and several species of orchids.

Fens occur in the Great Lakes primarily along northern Lake Huron, eastern Lake Superior, parts of northern Lake Michigan and the Bruce Peninsula. For a full treatment of fens and plant communities see Charlton and Hilts (1988).

Dune and Swale Wetlands

Dune and swale wetlands also are not considered true Great Lakes wetlands because they are not influenced by water level variations of the main lake. However, they are a very common type of coastal wetland found along many shores of Lake Erie, northern Lake Huron and Michigan, and along parts of the south shore of Lake Superior.

Dune and swale wetlands are the result of ancient beach ridges formed as the Great Lakes receded during glaciation. Since the lakes did not recede continuously, but rather in abrupt stages, these changes created mounds of material parallel to the shore (dunes) interspersed with flat areas (swales). There may be anywhere from three to 20 dune and swale features in a regular series extending from the backshore to a few thousand feet inland. The swales are fed by surface runoff and groundwater. They are usually thickly overgrown with wetland vegetation (because they are very shallow or practically filled in) and may or may not be canopied by trees. An aerial view would show them as arcs or concentric rings parallel to shore.

Dune and swale plants are similar to those found in inland wetlands and Great Lakes wetlands. One difference is that usually the presence of distinct zones such as emergent, wet meadow, shrub and tree zones are blurred into a thick assemblage of plants with little open water. Dune and swale wetlands are a very interesting ecotype found nowhere else except in the coastal zone of the Great Lakes. For a full treatment, see Comer and Albert (1991) and Comer and Albert (1993).

Great Lakes Wetland Plant Zones

Beginning at a Great Lakes shore, a gradient or slope extends from the open aquatic area to the upland area. Along that gradient, physical and chemical conditions change, depending on the water's depth or soil saturation. Distinct plant zones tell an important story about the hydrodynamics of a particular wetland. (See Figure 15.)

Submerged Aquatics

The first zone that occurs in some Great Lakes wetlands contains submerged aquatic plants. These plants are weak-stemmed plants that can only survive where wave, ice and current forces are tolerable. Because of this, submerged aquatics seldom occur in Great Lakes wetlands, with the exception of sheltered bays, rivers, harbors and lagoons. Typical submerged aquatic plants include naiads, pondweeds, eel grass, muskgrass, and milfoils. In clear water, these plants can grow six to 12 feet below the surface.

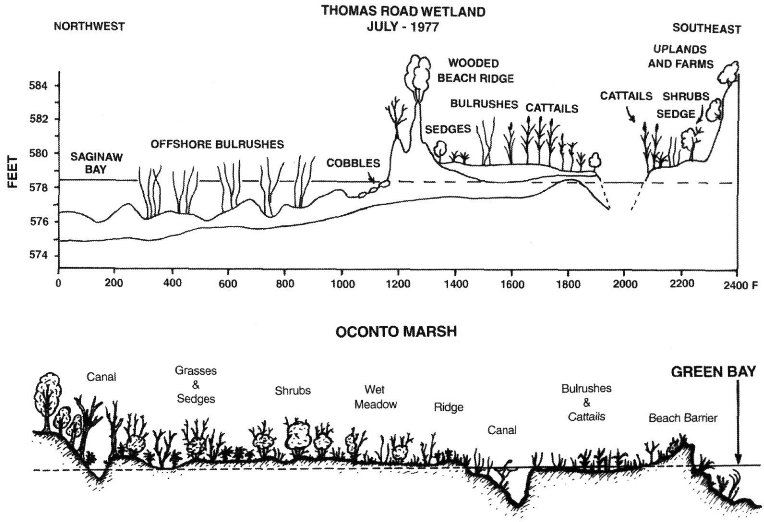


Figure 15. Thomas Road wetland (A) and Oconto Marsh (B) vegetation zones show a typical pattern for an open shoreline and embayed, low energy wetland. Location of bisects shown on figures 8 and 9.

Floating-leaved Plants

Inshore from the submerged aquatics to depths of three to six feet, floating-leaved plants dominate. These plants cannot withstand violent forces either. Water lilies, duckweed, water shield, and floating pondweed thrive in lagoon, embayed, and riverine environments. They can live in fairly turbid waters because their leaves are exposed at the surface.

Emergents

Continuing landward, the most noticeable and marsh-like zone of any wetland contains the emergents, plants with their roots below the water surface, and their vegetative parts above. The emergents have special respiratory systems that allow oxygen to travel freely to their roots.

Cattails are the most frequent emergent group in the southern half of the Great Lakes region; bulrushes with cattails are more common in northern regions. Other typical plants are bur reeds, arrowhead, smart-weeds and pickerel weed.

In most places where cattails occur, they dominate other plants in height and density, forming vast monotypic stands. Cattails and bulrushes have tough networks of interlocking roots and rhizomes that bind the soil and contribute to organic accumulation. They can propagate by their roots alone, and in that way do not have to depend on seeds to extend their range.

Wet Meadow, Shrub and Swamp Forest

On the landward side of the emergents, if the relief is low, three distinct zones will occur: the wet meadow, the shrub, and the swamp forest zone. These zones may be found as scattered patches within a wetland, or as bands that run roughly parallel to the upland. Their presence and their extent depend on their elevation in relation to the standing water, and the horizontal extent of these conditions. The Betsie River (Lake Michigan) bisect shows this pattern distinctly between the channels and the upland forest. (See Figure 16.)

The wet meadow zone has the greatest diversity of any of the wetland habitats and is typified by soft-stemmed plants of low to medium height, and a general lack of shrubs and trees. Bluejoint, cutgrass, tussock sedge, canary grass, spike rushes, swamp rose, and other sedges dominate. All are perennials,

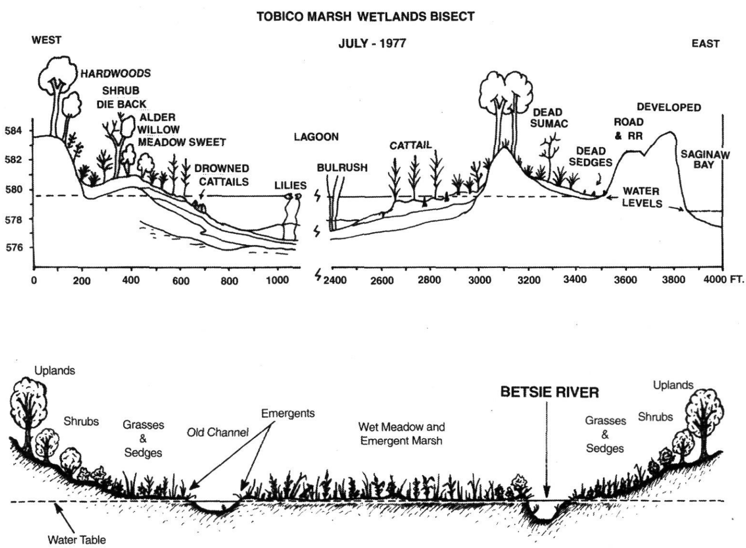


Figure 16. Tobico Marsh (A) and Betsie River (B) vegetation zones show a typical pattern for a coastal lagoon wetland and a riverine wetland. Location of bisects shown on Figures 10 and 11.

growing each year from buried rootstocks. Wet meadow plants can tolerate wet, spongy substrate, but not long-term total immersion. Other flowers such as boneset, king devil, some asters, pitcher plants, fringed gentians, meadowsweet, and asphodels make this zone one of the most interesting along the shore.

Interior to the wet meadow is the shrub zone. Here soil conditions are drier, the soil more oxygenated, and there is a general absence of shade trees over 20 feet. Understory grasses and woody shrubs can flourish, and are characterized by the dogwoods, alders, ninebark, sweet gale, elderberry, willows, green ash, some firs, white cedars, and grapes.

This zone often borders canals and other drainage features within a flat wetland, or occurs in patches adjacent to depressions, but it can also occur on upland mounds or other promontories. On the landward side, the shrub zone blends into the forested edge or swamp forest, so the transition based on height can be abrupt in some places and gradual in others.

The shrub zone is one of the most sensitive to changing water levels. A Lake rise of eight to 15 inches above its 100-year average can cause extensive shrub die-off. If Lake levels remain high for several years, the zone shrinks appreciably; roots decompose and standing vegetation withers. When this happens, plants more tolerant of hydric soils, usually wet meadow plants, will begin to take over and expand their range toward the upland. Conversely, if Lake levels fall below average for a number of years, the shrub zone will migrate lakeward.

The final wetland zone is the swamp forest or forested wetland. This zone requires up to half a century to develop, and occurs between the shrub zone and the highlands. A swamp forest may be inundated for only a few weeks a year, or not at all, but the soils are characteristically wet and soggy for most of the growing season. In many areas, this zone has been severely modified by road, marina, industrial and home construction.

Where this zone is present it is characterized by mature, water-tolerant trees such as cottonwood, green ash, black ash, hemlock, red maple, trembling aspen, willows, swamp white oak, and smaller varieties: chokecherry, grapes, and some vines. The forest floor is fairly void of grasses and flowers, but some sedges and ferns are common.

Many beach barriers, island shores, and river banks have species typical of the forested wetland. This zone is usually very narrow and changes abruptly to upland plants with only a few feet difference in elevation. Dickinson Island and the Woodtick Peninsula complex show these sudden changes. (See Figure 17.)

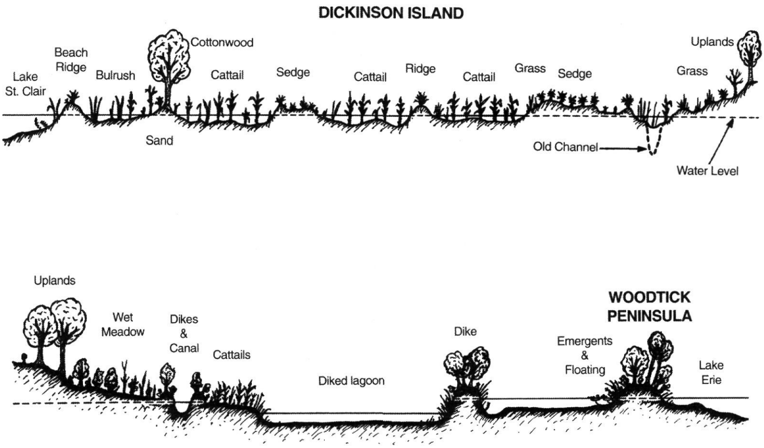


Figure 17. Dickinson Island (A) and Woodtick Peninsula (B) vegetation zones show a typical pattern for a delta wetland and a diked wetland. Note the deviation from classic zonation patterns shown by Dickinson Island, and water level lower than Lake Erie inside of Woodtick dike. See Figures 13 and 14.

Part 2
Identifying Wetlands Plants

Part 2 Identifying Wetlands Plants

The National List of Midwestern Wetland Plants cites over 700 species. Plants selected for this guidebook are among the most often-appearing flora in censuses of wetlands dominants, subdominants, and their associates.

The Great Lakes Basin is a vegetative transition zone between plants with southern and plants with northern affinities. This means that some species will be common in some wetlands, and rare or entirely absent in others.

The following sections are based on growth form and major botanical differences. The divisions are artificial because plants may have characteristics of two or more groups, may be found in a zone not expected, or may have more than one body form. If you are in doubt as to a plant's identity, check several sections.

Some Helpful Plant Characteristics

The leaves on a plant are as distinctive as its flowers. They can usually be used to identify the plant when flowers are not present. Some books provide elaborate keys to identify any plant, however, in most cases comparing drawings will be sufficient. Always look closely at the leaf drawings and read the text. Many plants with the same color flowers have completely different leaves.

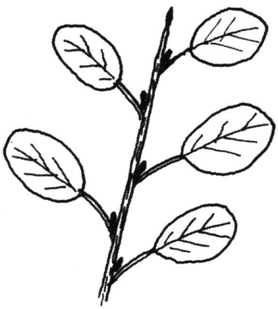
Types of Leaves: Compound leaves have several leaflets per leafstalk (the green part), often with a bud between the twig and the leafstalk. The two main types are shown. Simple leaves have one blade per leafstalk. Simple leaves on a woody plant will have a bud between the leaf and stalk, a flower will not have a bud. Simple leaves can be parallel-veined or net-veined.

Leaf Arrangements: If the leafstalks are across the stem from each other, they are called opposite. If they are not, they are alternate. On flowers, one must look closely because of crowding.

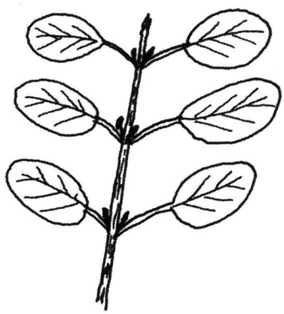
Types of Flowers: There are several dozen flower types. The two most basic types are called regular flowers and composite flowers. Regular flowers have a single spread of petals all of one color. Composite flowers have small flat petals surrounding a bushy center portion. Composite flowers usually have two colors, like the sunflower.

COMPOUND LEAVES

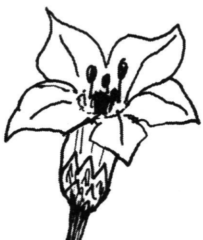
SIMPLE LEAVES



ALTERNATE



OPPOSITE



REGULAR FLOWER

COMPOSITE FLOWER

Submersed and Floating Leafed Plants

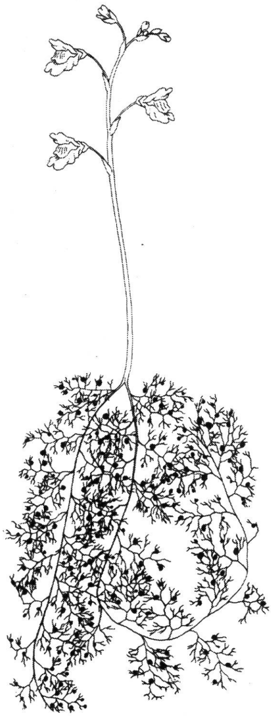
COMMON BLADDERWORT *Utricularia vulgaris*

A most interesting plant with small bladders that trap tiny insects. **Yellow flowers** are two-lipped, with prominent spur extending from beneath lower lip; flower stem extends above surface. Submersed foliage has two main divisions, with narrow leaves alternately branched.

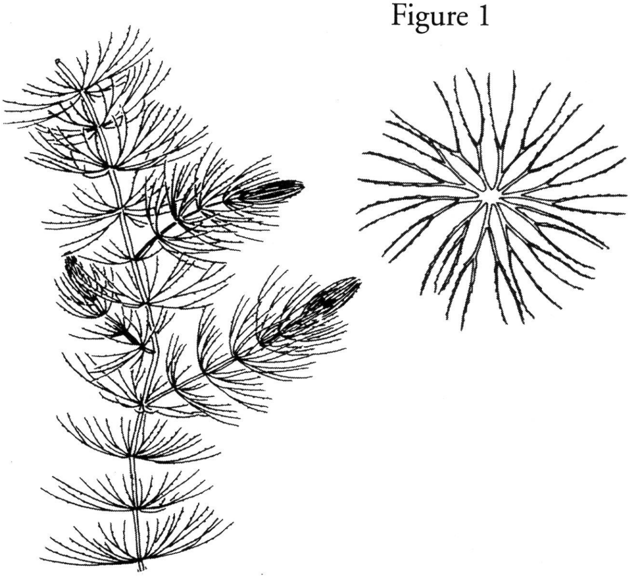
Occurs in shallow ponds, lakes, lagoons, and slow-moving water. Roots are weakly attached to water bottom and often become detached, making plant free-floating. Can cause heavy matting and obstruction of water. Many species occur in the Midwest.

COONTAIL *Ceratophyllum demersum*

Totally submersed and much branched. Finely divided leaves appear in whorls along stem. **Ends of branches tufted.** Resembles bladderwort, but without bladders or fattened stems. Occurs in shallow, still water to depths of light penetration, often blanketing bottom and mid-depths.



COMMON BLADDERWORT
Figure 1



COONTAIL
Figure 2

WATERWEED or ELODEA *Elodea canadensis*

Common submersed plant with 3/8-inch **leaves in whorls of three**, clasping stem. Leaves generally bunched toward tips. Rarely seen in flower, but tiny, white flowers on female plants when in bloom. Small, ovoid, closely-packed leaves make this a distinctive aquatic plant.

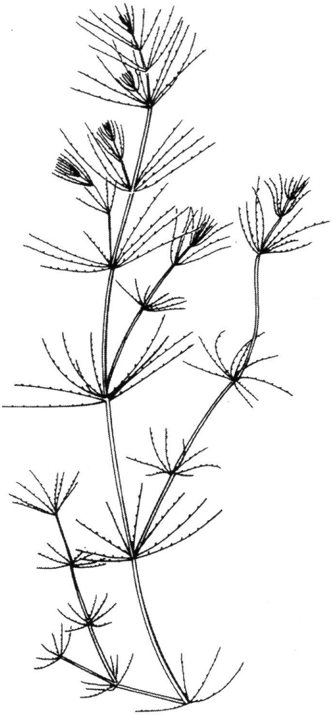
MUSKGRASS *Chara spp., Nitella spp.*

Two genera of multicellular algae that look similar. Incrustations of lime usually make them **hard and crusty to the touch**. Branches cylindrical and whorled around stem joints. *Chara* is rougher, *Nitella* smoother.

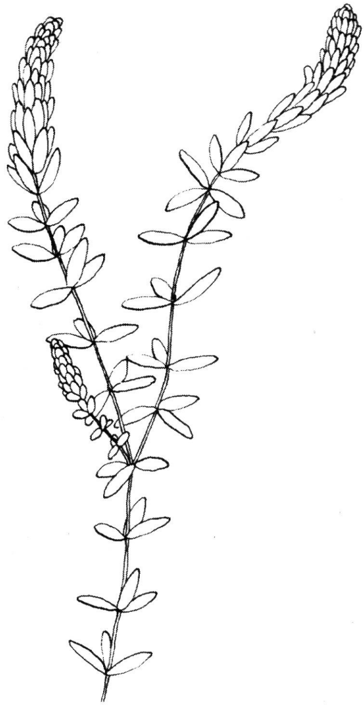
Also called stonewort.

EURASIAN MILFOIL *Myriophyllum spicatum*

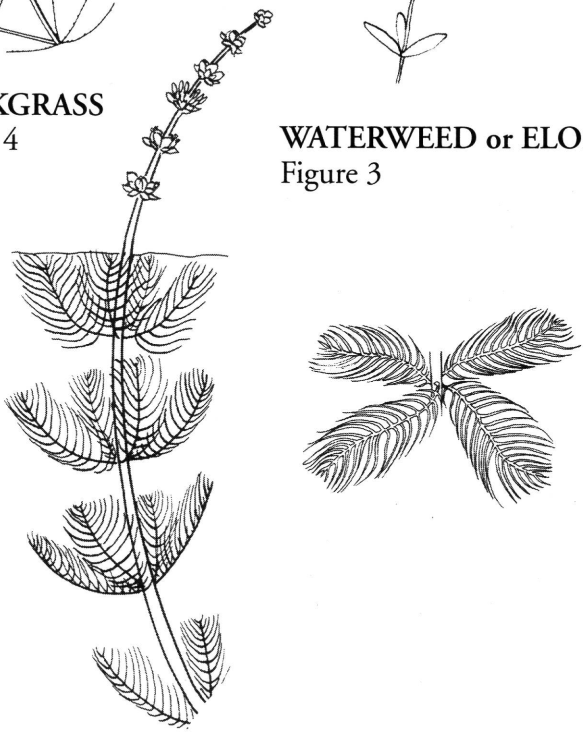
Finely divided leaves in whorls around stem; stem protrudes above water. Plant becomes limp when removed from water. Can grow extremely dense in shallows, covering entire surface of lake, shading out other plants and restricting surface recreation. Many species differ only slightly in leaf and flower structure. Eurasian species has 14 to 17 leaf segments per leaf, the most of any milfoil. Seeds readily eaten by waterfowl.



MUSKGRASS
Figure 4



WATERWEED or ELODEA
Figure 3



EURASIAN MILFOIL
Figure 5

WILD CELERY *Vallisneria americana*

Submersed plant of gently flowing water distinguished by long, minutely-toothed, **ribbon-shaped leaves growing to 3 feet**. Pollution intolerant: one of first submersed plants to disappear with increasing pollution and turbidity. Seeds and leaves eaten by geese and ducks.

Often called eelgrass or tapegrass.

SLENDER NAIAD *Najas flexilis*

Member of pondweed family. Naiads are difficult to distinguish to species. Slender naiad common in shallow, slow, or static waters. **Opposite leaves** are single on branches, each having small spinules along margin. These plants seldom reach water's surface.

WATER STARGRASS *Heteranthera dubia*

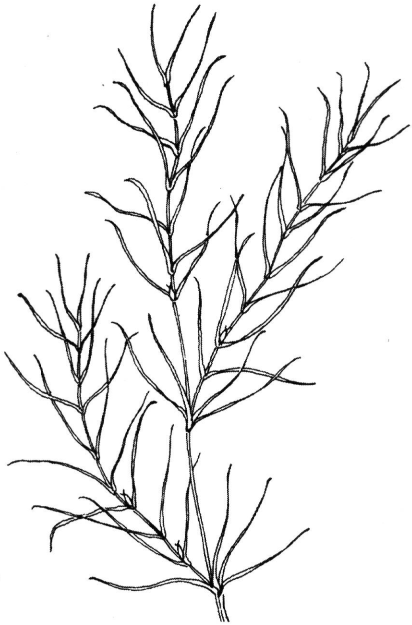
Submersed plant with long, slender leaves and **yellow, star-shaped flowers** protruding above surface when in bloom. Leaves without noticeable midvein; sheath around stem. Often found on mud flats and, in reduced but stouter form, on exposed mid-river bars.

WHITE CROWFOOT *Ranunculus longirostris*

Stout, smooth stems with fine branched leaves resembling tufts along stems. **Flowers white with five petals** and five sepals, borne above water on firm stalks. Several species have yellow flowers. Can be dense in some locations, making water appear white or yellow.

Often called water buttercup.

WILD CELERY
Figure 6



SLENDER NAIAD
Figure 7

WATER STARGRASS
Figure 8

WHITE CROWFOOT
Figure 9

PONDWEEDS
Potamogeton spp.

Except for a few members, this diverse group is difficult to identify as to species; many can be confused with other submersed aquatics such as *Myriophyllum, Ranunculus, Polygonum, Utricularia,* and *Ceratophyllum.*

Several pondweeds have oval floating leaves; others have the entire structure below the water. When in flower, plants send up compact spikes with **greenish to brownish flowers** above the water's surface.

Pondweeds grow densely to the limit of light penetration in slow streams and rivers, ponds, and lakes. They are often confused with the smartweeds. The pondweeds have sheaths around the stem where the leaves attach. Shown here are three of the dozens of species extant.

CURLY LEAF PONDWEED *P. crispus*

Pronounced **wavy leaves** long and lance-shaped, with small teeth along margin. Leaves often bunched near stem tips.

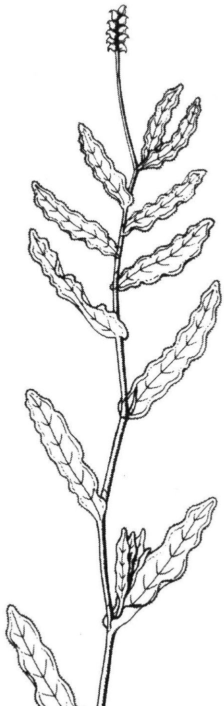
FLOATING LEAF PONDWEED *P. natans*

Oval leaves on or near water's surface; long, ribbon-shaped leaves below. Leaves can reach 4 inches, without teeth, on long leaf stalks. Submerged leaves to 8 inches are long, narrow, smooth.

SAGO PONDWEED *P. pectinatus*

Leaves narrow, less than 1/8 inch wide, alternate. Common in shallow water across the US.

FLOATING LEAF PONDWEED
Figure 11



CURLY LEAF PONDWEED
Figure 10

SAGO PONDWEED
Figure 12

WATER SHIELD *Brasenia schreberi*

Floating plant with **round and oval unnotched leaves** on long, slender stems attached to leaf middle. Flowers dull red, about 1 inch across, each flower coming from axil of alternate leaves. Perennial found throughout Great Lakes area in quiet lagoons and ponds, usually with water lilies and pondweeds. Note that water lilies have white or yellow large flowers, and leaves with notches.

DUCKWEEDS Lemna spp.

Among smallest flowering plants, 1/8 to 1/4 inch across, **floating on surface** of still water **as light green mat**. Flower too small to be noticed except under microscope. Often cover entire surface from bank to bank in late summer. All types of waterfowl gorge on this nutritious plant.

LESSER DUCKWEED *Lemna minor*

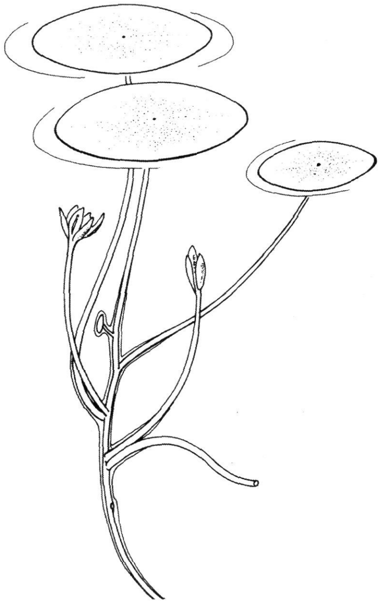
One of five small species about the same size. Oval to round leaves. May appear to have several leaves radiating from single point, but without leafstalks.

STAR DUCKWEED *Lemna trisulca*

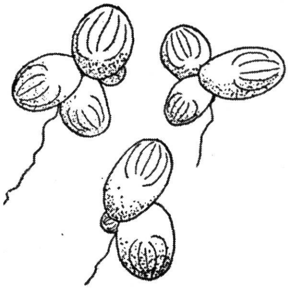
Several leaves on short stalks, most leaves deeply cut. **Roughly star-shaped.** Usually floats just under surface, often below lesser duckweed.

WATER MEAL *Wolffa spp.*

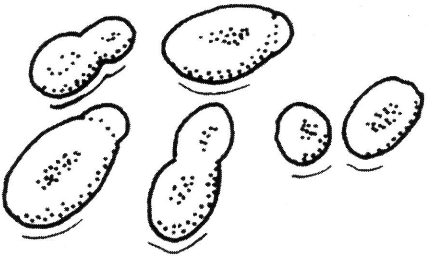
Smallest of small aquatic vascular plants. It is only a fraction the size of duckweed. Resembles rice grains, but smaller.



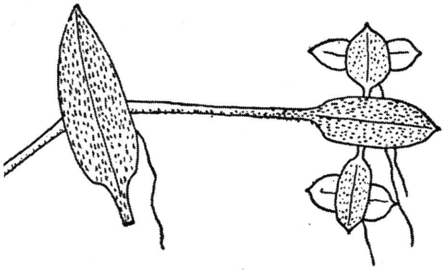
WATER SHIELD
Figure 13



LESSER DUCKWEED
Figure 14



WATER MEAL
Figure 16



STAR DUCKWEED
Figure 15

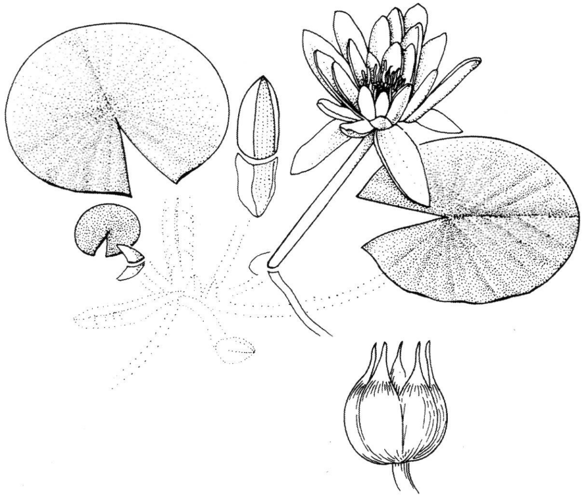
WHITE WATER LILY *Nymphaea tuberosa*

Floating rounded **leaves with notches and white or (rarely) pink flowers**, attached by long smooth stems. Flowers odorless to mildly fragrant; open in morning and close by early afternoon. Leaf veins mainly radiate from leaf center. Undersides of leaves green; stems have purple streaks.

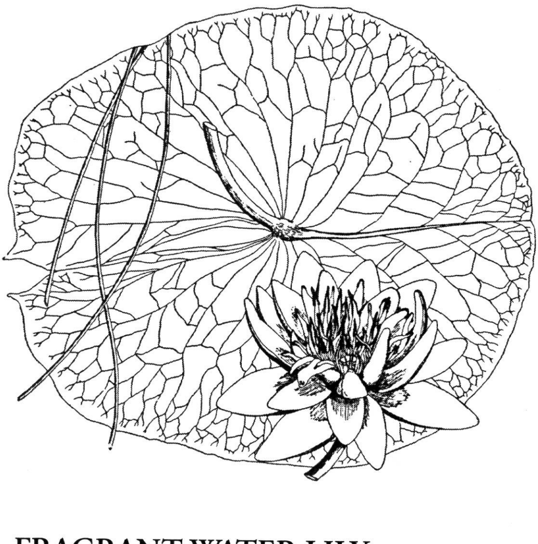
A perennial arising each year from stout rhizomes, this lily common along slow streams, shallow ponds, lakes. More common in southern portions of Great Lakes than following species.

FRAGRANT WATER LILY *Nymphaea ordorata*

Similar to white water lily above, but flowers are fragrant and smaller; petals blunt-tipped or pointed. Undersides of leaves usually purplish, stems without purple streaks. Fragrant lily appears more common in northern part of Great Lakes. Some botanists consider the two species of water lilly to be variations of the taxon *N. tuberosa.*



WHITE WATER LILY
Figure 17



FRAGRANT WATER LILY
Fugure 18

SPATTERDOCK *Nuphar advena, Nuphar variegata*

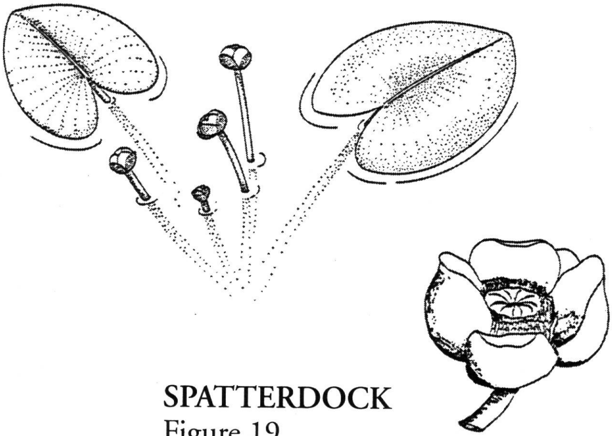
Yellow flowers 1 to 2 inches across with thick yellow sepals **appearing greenish from the side**, surrounding scale-like petals. Leaves more heart-shaped than white lilies; leaf veins radiate from along midvein rather than from center. *N. advena* holds its leaves above water, has round stems, is found only in southern half of Great Lakes Basin. *N. variegata* has floating leaves, flattened stems; occurs throughout the Basin.

Also known as cow lily.

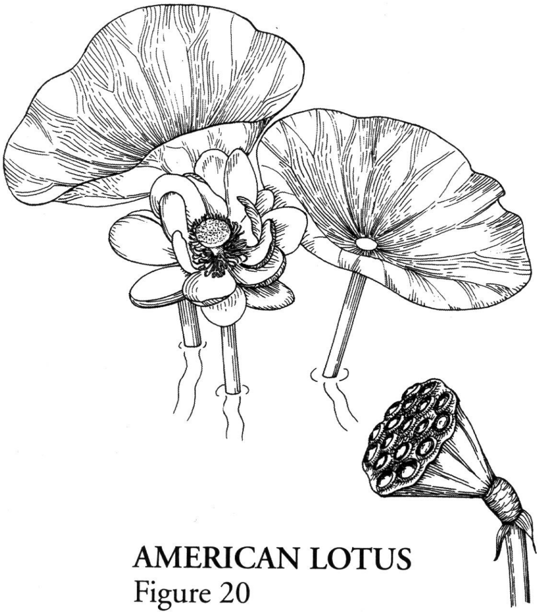
AMERICAN LOTUS *Nelumbo lutea*

Leaves large, 12 to 18 inches, mostly projecting above water as shallow bowls. **Yellow flowers up to 10 inches** across stand above water. Seeds in flat-topped receptacle.

PROTECTED THROUGHOUT ITS RANGE. Plant has southern affinity, but also occurs in Lake Erie, Lake St. Clair, and near Chicago. A bed of lotus, acre upon acre of huge leaves and giant flowers, is a sight to behold when canoeing any wetland.



SPATTERDOCK
Figure 19



AMERICAN LOTUS
Figure 20

SMARTWEEDS Polygonum spp.

Diverse and widespread group of aquatic plants may have much of its foliage floating or standing erect to 4 feet tall in shallow water or moist habitat. **Flowers pink, greenish, or white**, compacted in oval or elongated spike. Weakly-stemmed plants usually protected from strong winds by growing in thick expanses of emergents or shrubs.

WATER SMARTWEED
Polygonum amphibian

Submersed/floating-leaved variety and upright variety. Ovoid **red or pink flowerheads** generally less than 2 inches, erect several inches above water surface. A few large spikes at plant apex. Leaves floating on surface and below, smooth and dark green, alternate and simple, surrounded by bristly sheath.

LADY'S THUMB *Polygonum persicaria*

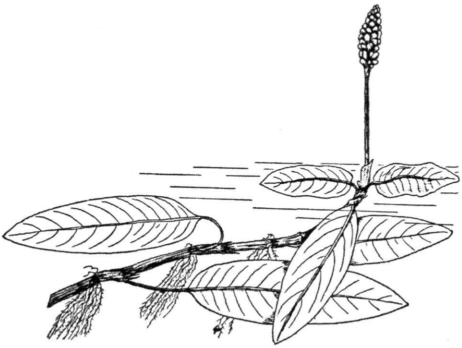
Similar to water smartweed, with **pinkish flowers** and pointed leaves. Flowers somewhat more spread along spike than water smartweed. Species has upright habit, seldom grows directly in water. Many leaves blotchy. Much-branched plants with numerous flower spikes.

NODDING SMARTWEED
P. lapathifolium

Leaves more elongated; **flowers (sepals) greenish**, whitish or pink and drooping, hence "nodding." Upright and very tall species found on moist ground crowded with other plants. Much-branched plant with numerous flower spikes.

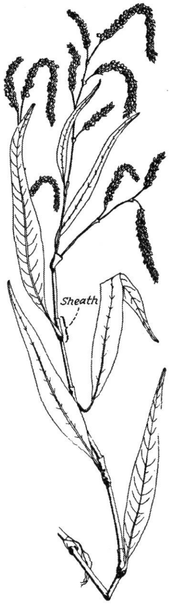
DOTTED SMARTWEED *P. punctatum*

Black dots on white sepals, bristles along tops of sheaths. Shorter plant than lady's thumb or nodding smartweed, usually less than 18 inches. Plants are much-branched, with numerous flower spikes.



WATER SMARTWEED
Figure 21

LADY'S THUMB
Figure 22



NODDING SMARTWEED
Figure 23

DOTTED SMARTWEED
Figure 24

Rushes, Sedges, and Grasses

HOW TO DIFFERENTIATE RUSHES, SEDGES, AND GRASSES

RUSHES:

There are very few true rushes, perhaps only 20 locally, compared to hundreds of sedges and grasses. Rushes can be common in a coastal marsh, however. Bulrushes and spikerushes are not true rushes, but are members of the sedge family *Cyperacea.*

round, solid stems
no nodes on stems (with a few exceptions)
ligule absent
flowers usually on sides of stem
many angular seeds per flower capsule
leaves (when present) thin and long
leaf sheath present and split
tiny regular flowers with 3 or 6 stamens

SEDGES:

Sedges are difficult to determine to species, and include bulrushes, flatsedges, spikerushes, and sedges.

stems solid, mostly triangular
no nodes on stem (with a few exceptions)
leaf sheaths closed on back
leaves in more than one plane, three-ranked
seeds single in each flowering scale
flowers in spikes with many scales

GRASSES:

See illustration for details of parts, compared. Plants in this section are grouped into the three categories above.

stems have nodes, are round and hollow
leaves in one plane
ligule present, sheath is open on back
fruits are grain-like seeds, smooth
flowers tiny, alternate in spikelet

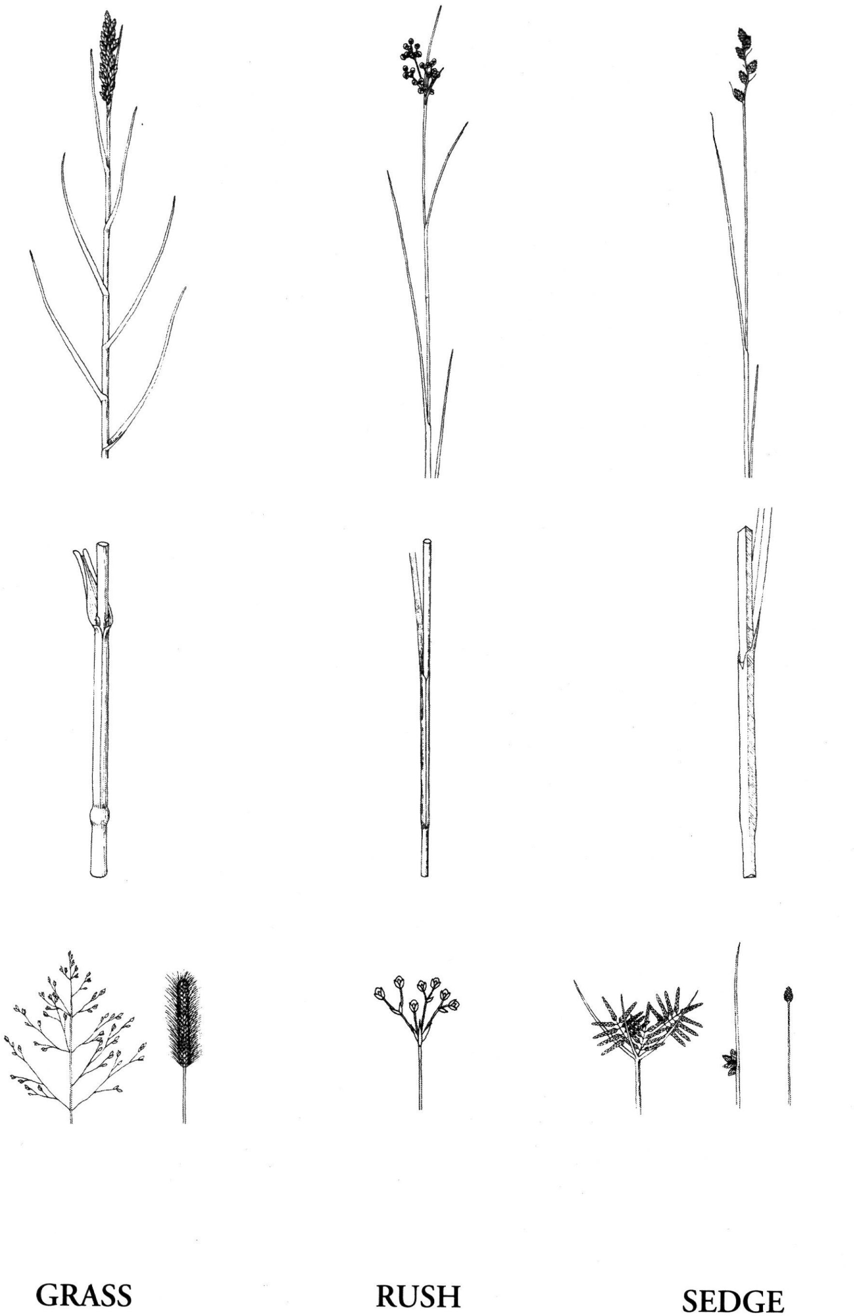


Figure 25

Rushes

BALTIC RUSH *Juncus balticus*

Common Great Lakes coastal rush. Approximate height: 18 inches in open wet sand or wet meadow. Leaves reduced to sheaths at base of stem; stem round, solid, unjointed (without nodes). Seeds triangular. Grows from perennial rhizome, **producing row of erect stems.**

SOFT RUSH *Juncus effusus*

Species widespread. As with bulrush and baltic rush, flower clusters grow laterally from below stem tip, actually a specialized leaf. Leafless sheaths at stem base. Occurs as clumps or tufts with up to 100 stems per group.

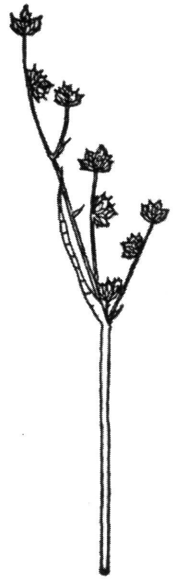
ALPINE RUSH *Juncus alpinus*

Common along Great Lakes in areas of sandy, moist, calcareous soils with open sun. Small rush reaches 12 inches. Branching stems.

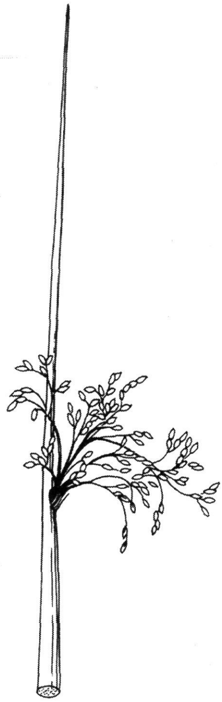
FLOWERING RUSH *Butomus umbellatus*

Not a true rush, but member of separate family *Butomaceae*. Reaches 36 inches. **Leaves long and ribbon-like.** No stem; flower stalk appears to be stem. **Flowers pink**, 3 petals and 3 sepals in clusters. Native of Europe.

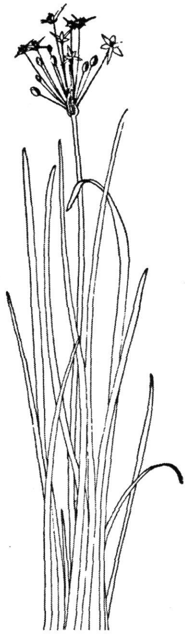
BALTIC RUSH
Figure 26



ALPINE RUSH
Figure 28



SOFT RUSH
Figure 27



FLOWERING RUSH
Figure 29

Sedges

Bulrushes

All bulrushes are sedges. Their spikelets have many flowers. Stems may feel soft and pliable to the touch, but are solid and round along the top 2/3 of the plant, becoming more angular below.

HARDSTEM BULRUSH *Scirpus acutus*

Spikelets borne below top in short-stalked cluster. **Stem firm.** Perennial herb can grow in water away from Great Lakes shores. Found in many semi-sheltered locations up to 2 feet deep.

RIVER BULRUSH *Scirpus fluviatilis*

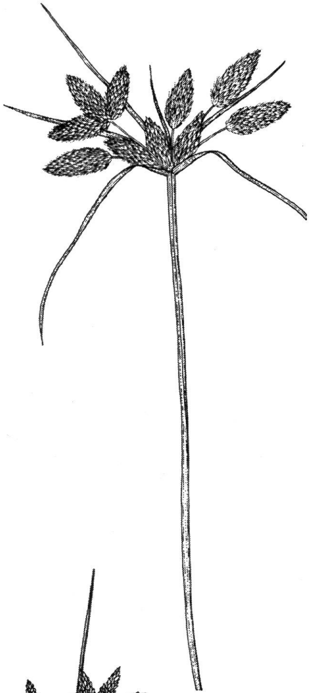
Spikelets oblong and cylindrical, leaves growing along **sharply triangular stem with flat sides.** Uncommon in open water; prefers edges and more sheltered locations.

SOFTSTEM BULRUSH *Scirpus validus*

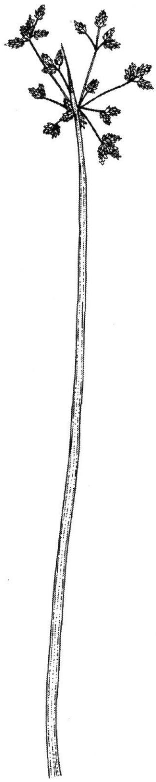
Common in bays and along rivers in northern Great Lakes areas. Tall (to 6 feet) robust plant with **round stem; pliable when pinched**. Single stout bract above spikelets. Drooping flowers. Often grows in water to 4 feet. Good reed for making mats or baskets.

CHAIRMAKER'S RUSH *Scirpus americanus*

Triangular stem with two concave and one flat side. Spikelets, usually few in number, do not have stems. Also called common three-square bulrush. Good plant for weaving.

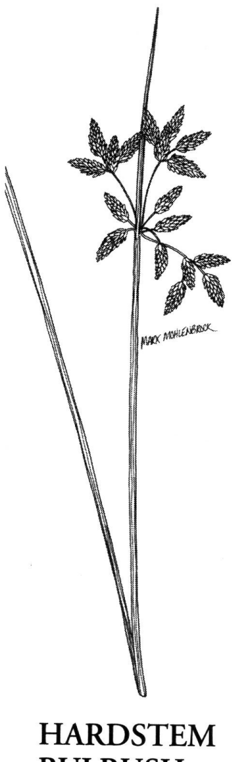


RIVER
BULRUSH
Figure 31



SOFTSTEM
BULRUSH
Figure 32

CHAIRMAKER'S
RUSH
Figure 33



HARDSTEM
BULRUSH
Figure 30

LAKEBANK SEDGE *Carex lacustris*

Thin male spikes above 2 to 4 separate short-stalked female spikes; female spikes larger and coarser. Leaves up to 3/4 inch wide, rough to the touch. **Triangular stems also rough to the touch.** Can grow in shallow standing water. Very common.

FOX SEDGE *Carex vulpinoidea*

Long bract under each cluster of spikelets. Leaves narrow and smooth. **Stems triangular, rough to the touch.** Stands 36 inches tall in large variety of wetland habitats.

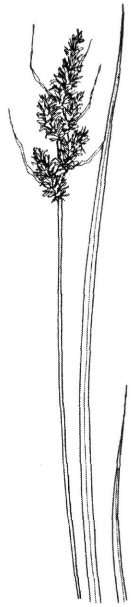
TUSSOCK SEDGE *Carex stricta*

To 36 inches tall. Leaves flat and soft; **stem triangular** holding multiple separate spikes, subtended by a bract. Leaves often curve out to touch water or soil surface. Tussock sedge forms dense, rounded mounds standing above wetland surface; may cover wet meadow with hundreds of mounds only feet apart. Elevated semi-dry mounds may allow growth of some plants not ordinarily found at that soil level.

BULL SEDGE *Carex lanuginosa*

Height to 36 inches. Thin male spikes above larger female spikes. Narrow smooth leaves, **sharply triangular stems**, hairy tiny fruits. Common along marly or sandy shores, wet meadows, riverbanks, and swales. Can tolerate standing in water.

LAKEBANK SEDGE
Figure 34



FOX SEDGE
Figure 35

TUSSOCK SEDGE
Figure 36

BULL SEDGE
Figure 37

FRAGRANT FLATSEDGE *Cyperus odoratus*

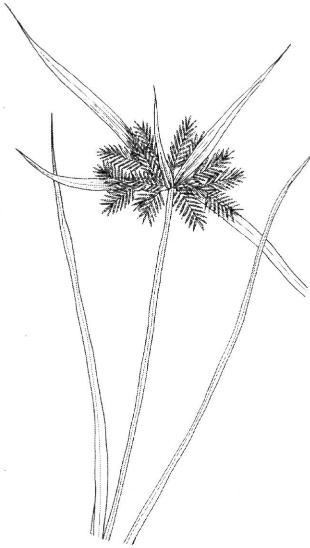
Height to 24 inches. Tiny cylindrical spikelets; **spikes radiate and flatten from a common axis.** Triangular stems; smooth leaves to 1/3 inch wide; gray or black *archenes* (seeds). Annual herb must germinate each year, thus found on muddy banks, river borders, and exposed flats.

SLENDER FLATSEDGE *Cyperus rivularis*

Small: 12 to 15 inches. Narrow leaves and unbranched stems mostly at base. Prefers sandy soils along rivers, shores, and wet meadows. Annual.

STRAWCOLORED FLATSEDGE *Cyperus strigosus*

To 36 inches. Fine-pointed straw-colored spikes appear loose on stem tip. Leaves narrow and rough along edges. **Stem triangular**, smooth. Perennial found in wet meadows, along rivers, in swales and exposed flats.



FRAGRANT FLATSEDGE
Figure 38

SLENDER FLATSEDGE
Figure 39

STRAWCOLORED FLATSEDGE
Figure 40

BLUNT SPIKERUSH *Eleocharis obtusa*

To 18 inches. Single, blunt, cylindrical spikes on top of slender, **leafless, round stems.** Annual. Found along streams, in wet flats, swales, and sandy or muddy shores. When Great Lakes recede, this species quickly spreads to new areas of moist soil.

CREEPING SPIKERUSH *Eleocharis smallii*

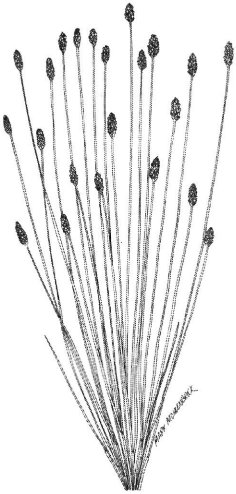
To 24 inches. Similar to blunt spikerush, but with creeping rhizomes and more pointed spikes. Leaves are reduced to sheaths at base of smooth stem. *Achenes* (seeds) are yellow. Very common perennial herb found in all wetland habitat types, including standing water along margins. Also called smalls spikerush or *Eleocharis palustris.*

NEEDLE SPIKERUSH *Eleocharis acicularis*

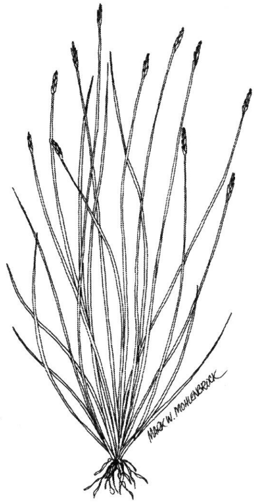
Low, thin stems to 6 inches high, **often matted and tangled**, with small, sharply-pointed 1/4-inch spikelets. Common as tufts on muddy shores, riverbanks, and open flats. Forms fine, green, hair-like mats in shallow water. Also called least spikerush.

SQUARESTEM SPIKERUSH *Eleocharis quadrangulata*

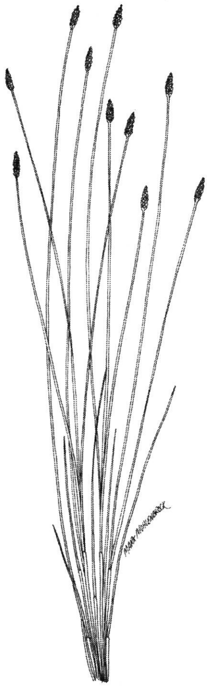
Found primarily in southern part of Great Lakes Basin. Reaches 24 inches. Distinctive **square stem**; spike same diameter as stem. Perennial in swamps, wet prairies, along shores.



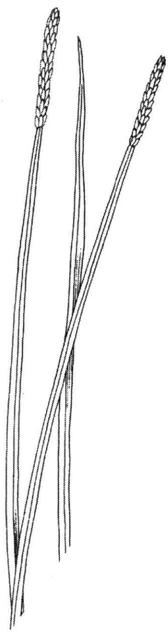
BLUNT SPIKERUSH
Figure 41



NEEDLE SPIKERUSH
Figure 43



CREEPING SPIKERUSH
Figure 42



SQUARESTEM SPIKERUSH
Figure 44

Grasses

All the grasses have nodes or joints, hollow stems, and leaves in one plane. Some species may be easily confused with the sedges.

BLUEJOINT *Calamagrostis canadensis*

Plant grows to 5 feet. **Narrow bluish leaves**; delicate open panicle; flowers borne singly in spikelets. Numerous stems and leaves. Grows in clumps; common in wet meadows and drier areas bordering wetlands.

FOWL MEADOW GRASS *Poa palustris*

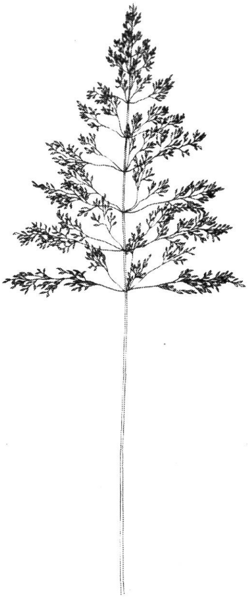
Has longer spikes on spikelets, golden tips. Very common across Great Lakes Basin, along banks, on damp ground, in swamps and swales.

CUT GRASS *Leersia oryzoides*

Grows to 4 feet. Leaves to 10 inches long, 1/2 inch wide, **minute saw teeth, rough to touch**. Sheaths also scratchy. Stem weak and slender; spikelets rough, flattened, overlapping on short stalks near tips. Often found in large colonies.

RATTLESNAKE GRASS
Glyceria canadensis, Glyceria stricta

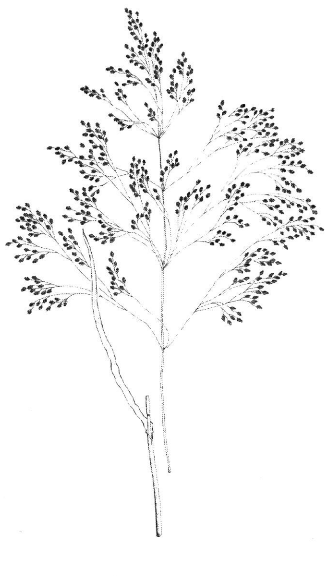
Singular spikelets on thin, drooping, open stalks. Usually found in peaty, wet environments: cedar swamps, swales, highly organic wet meadows. Related species: blunt manna grass *(G. borealis)* has compact heads resembling loose corn cobs. Also common in wetlands: fowl manna grass *(G. striata),* compact spikelets on short stalks.



BLUEJOINT
Figure 45

CUT GRASS
Figure 47

FOWL MEADOW GRASS
Figure 46



RATTLESNAKE GRASS
Figure 48

REED GRASS *Phragmites australis*

Very tall, to 12 feet. Bushy **purplish head** appears feathery when viewed close-up. Leaves grow to 2 feet. In moist environments, this distinctive species grows in dense colonies visible from a great distance. In fall, grass turns gold brown. Often referred to as *P. communis.* Popularly used for attractive decorating effects.

REED CANARY GRASS *Phragmites arundinacea*

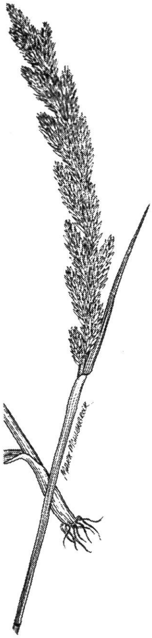
Grows in dense colonies to 6 feet; **grayish-green grass** with leaves to 12 inches by 3/4 inch, terminating in densely packed inflorescence. Flowering head may be whitish with purple undertones, or straw-colored. Found in ditches, along stream banks, on dikes, wet meadows. Often cultivated for its matted rhizomes and attractive form.

SMOOTH SAWGRASS *Cladium mariscoides*

A sedge, not a true grass. Grows to 36 inches in wet habitats across Great Lakes. Leaves long, narrow, rough-edged. Flowerheads in clusters. Stems weakly triangular.

WILD RICE *Zizania aquatica*

Leaves light green, backward-curving, delicate. Flowering head has upward-pointing female portion with male staminate portion below. **Grows in 2 to 3 feet of standing water** near bulrushes or cattails, in sheltered bays and lagoons. Rice grains form in female portion, traditionally are harvested by shaking plants as boat glides between stalks.



REED GRASS
Figure 49

REED CANARY GRASS
Figure 50

SMOOTH SAWGRASS
Figure 51

WILD RICE
Figure 52

Cattails

Cattails are the dominant vegetation of the emergent zone in all Great Lakes coastal marshes, particularly in the area's southerly portions. In the more northern portions, the cattail does not do as well, and is replaced by the bulrushes as the dominant emergent. All cattails do best in standing water, though they may also be found in wet ditches and on muddy banks.

BROAD-LEAF CATTAIL *Typha latifolia*

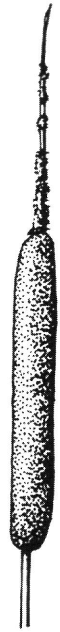
Grows to 7 to 9 feet. Leaves to 1 inch wide, pale green, flat. Yellow male staminate portion in near contact with 1-inch thick green female portion,

NARROW-LEAF CATTAIL *Typha augustifolia*

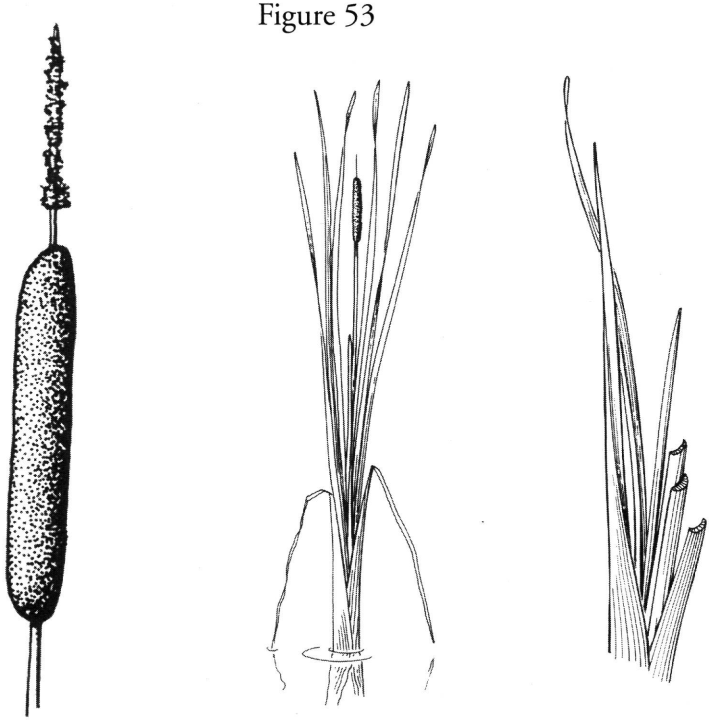
Overall height: 5 to 7 feet. Leaves 1/2 to 3/4 inches, dark green, concave. **Small space** between male and female flowering parts.

HYBRID CATTAIL *Typha x glauca*

May grow to 10 feet; characteristics intermediate between others. Brown, female flowering portion up to 16 inches long. Also called blue cattail because of **slight bluish shade** of leaves.



BROAD-LEAF CATTAIL
Figure 53



NARROW-LEAF CATTAIL
Figure 54

Herbaceous Wetland Plants

Excluding rushes, grasses, sedges, submergents, and floating leaved plants, and including the emergents and flowering herbs of the wet meadow, shrub, and forest zone.

Any plant whose stems do not survive the winter is called an *herb*. Annual and perennial herbs start life each spring from the ground up.

An herb's stems are usually green, as opposed to woody, though color is not always a reliable indicator of whether or not a plant is an herb. If in doubt, look for stem buds and cut the stem. An herb will have a pulpy, soft core without any growth rings.

This section is grouped by growth habit. If a plant sticks out of the water, consult the earlier pages. If it appears on soil, try the later pages. Since coastal wetlands vary in the degree to which they are flooded or exposed, this is only a general guideline.

ARROW ARUM *Peltandra virginica*

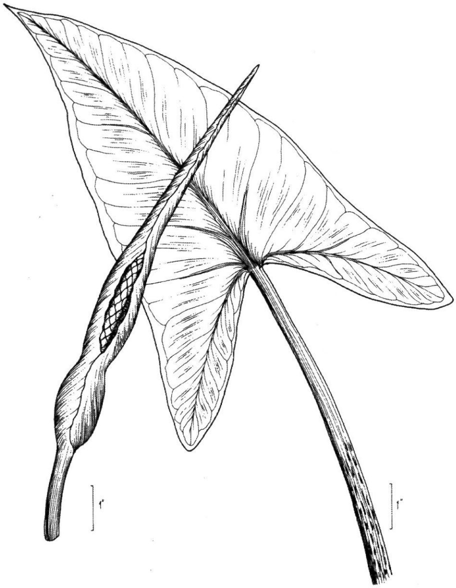
Bright green arrowhead-shaped leaves with veins extending from midrib (pinnately), ending near leaf margin. Leaf veins stop just before margin. Lance-shaped **spathe covering white flowers.** Stands 15 to 18 inches above water in dense colonies, usually along shore, but can surround mid-river bars. Easily confused with arrowhead.

DO NOT EAT ROOTS RAW BECAUSE CALCIUM OXALATE CRYSTALS WILL BURN MOUTH, THROAT, AND STOMACH. Roots may be eaten after thorough roasting, drying, then grinding into flour.

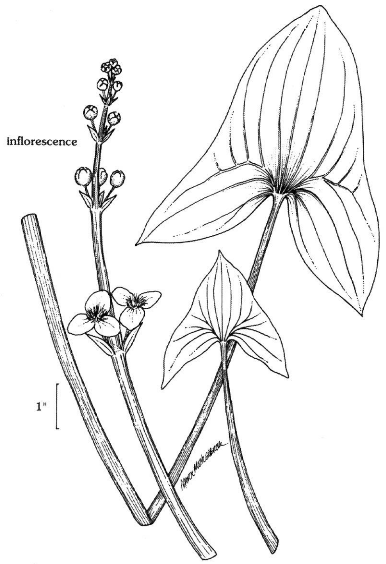
ARROWHEAD *Sagittaria latifolia*

Similar to arrow arum. Usually stands 2 to 3 feet above water on angular stem. **Flowers white but not enclosed,** in whorls of three around peduncle. Often showing very narrow, lobed leaves when young; rarely has floating or submersed ribbon-like leaves. Leaf veins radiate from central point of leaf (palmately); vein does not end abruptly in a line near margin. Northern Arrowhead, *S. cuneata:*, has leaves to 8 inches, often floating and thin submersed, leaf points more spread.

Tubers of this plant can be eaten safely raw, but are better when cooked like potatoes. Also called duck potato or wapato, an older Native American name.



ARROW ARUM
Figure 55



ARROWHEAD
Figure 56

PICKEREL WEED *Pontederia cordata*

Another arrowhead-shaped emergent, but with rounded lobes and **blue flowers on spike**. Leaves are **parallel-veined** and come from below flower spike on short stalks.

BLUEFLAG *Iris versicolor*

Beautiful marsh plant growing to 3 feet. Because of rhizome's spreading nature, often stands in groups in water. **Flower bright blue/violet**, with yellow blotches streaked with purple veins toward the center, about 3 inches across. Leaves are sword-shaped, shorter than round stem, parallel-veined.

Species is replaced by similar *Iris virginica* in southern portions of Great Lakes basin.

CARDINAL FLOWER *Lobelia cardinalis*

THIS SPECIES IS PROTECTED. Perhaps the Great Lakes' most striking wetland plant. **Flower is crimson red**, with two lips, standing tall and beautiful along the shore zone or in the water amongst green of sedges and bulrushes. Thus often appears alone in sea of green. Perennial with fibrous roots. Leaves are lanceolate, alternate, pointed, with small teeth. Stem is unbranched.

Also found in wet meadow, at edge of shrub zone, or along low river banks.

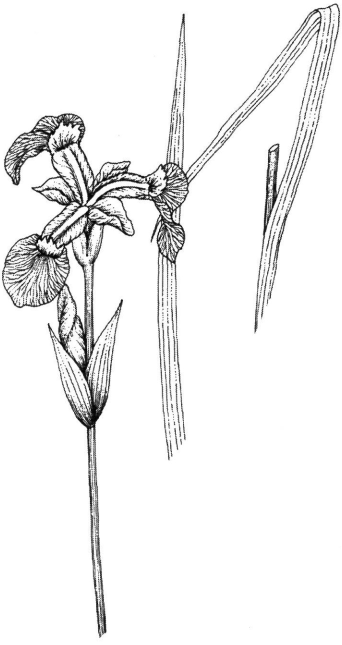
SWEETFLAG *Acorus calamus*

Without stem; leaves and flower stalk grow directly from tuberous rhizome in mud. **Flower spike yellowish-brown**, protruding to side. Often found in dense colonies in shallow water or on wet mudbanks. Grows to 5 feet, but generally around 3 to 4 feet in open locations. Resembles blueflag during non-flowering periods.

Richly aromatic. Squeezing any part and rubbing it on the skin will provide a natural marsh perfume.

PICKEREL WEED
Figure 57

CARDINAL FLOWER
Figure 59



BLUEFLAG
Figure 58

SWEETFLAG
Figure 60

BLUE VERVAIN *Verbena hastata*

Stiff-stemmed plant to 5 feet; **densely packed blue flowers** on pencil-sized terminal spikes. Opposite leaves are pointed, to 6 inches, toothed, pale green, rough to touch.

Can grow in thick cover near water or sometimes in water. Distinctive, as blue vervain is only plant in Great Lakes coastal wetlands with tiny blue flowers on thin spikes. Perennial herb with fibrous roots.

AMERICAN BUGLEWEED or WATER HOREHOUND *Lycopus americanus*

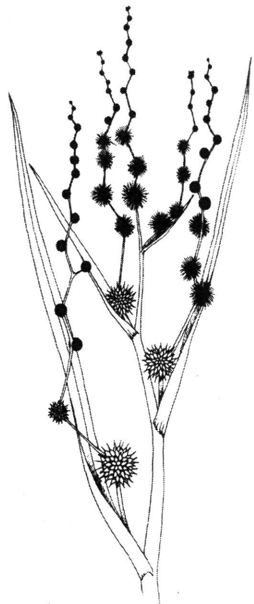
Though member of mint family, 12 to 18 inch plant **does not smell mint-like**. Squarish stems; finely divided leaves, especially near base. Very small **white flowers** located in leaf axils. Normally found in wet margins of rivers, ponds, sand flats, and beach swales among other small, scattered plants.

Another bugleweed *(Lycopus uniflorus)* also common in Great Lakes region. Flowers are smaller and plant arises from soft tuber, barely underground.

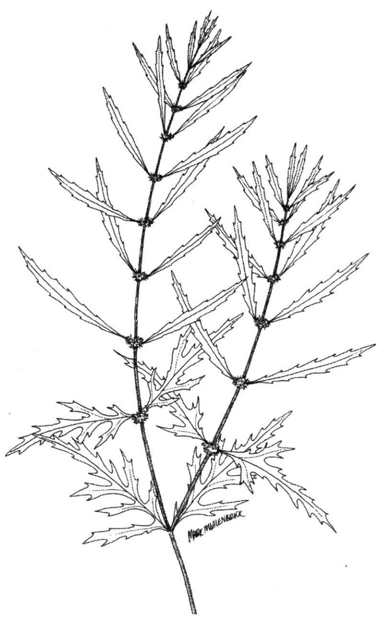
GIANT BURWEED *Sparganium eurycarpum*

Tall, robust plant, with part of foliage submersed or floating in water to 2 feet. Found especially along edges of thick vegetation. Spiny-looking flowers are separate sexes. Upper **male flowers dull and white**, in two styles. Lower **female flowers greenish**, grow to over 1 inch in diameter. Leaves are distinct: when held to light, numerous lines arranged like a brick wall visible.

BLUE VERVAIN
Figure 61



GIANT BURWEED
Figure 63



AMERICAN BUGLEWEED
Figure 62

BONESET *Eupatorium perfoliatum*

Stout-looking plant growing to 5 feet, shorter along shores. Strongly clasping **dark green/purplish leaves** arranged oppositely. Leaves are toothed, rough, with strong veins below. **Flowers white/gray** in flat top clusters on stem and branches ends. Usually found on moist soil and along riverbanks. Prefers full sun. Once identified, boneset can be recognized at a considerable distance.

MARSH FERN *Thelypteris palustris*

To 30 inches high, **bright green leaves**; without leaflets on lower half; stem entirely underground. Grows in groups on wet, muddy soil in sheltered locations away from strong winds and intense sun. Height determined by neighboring vegetation.

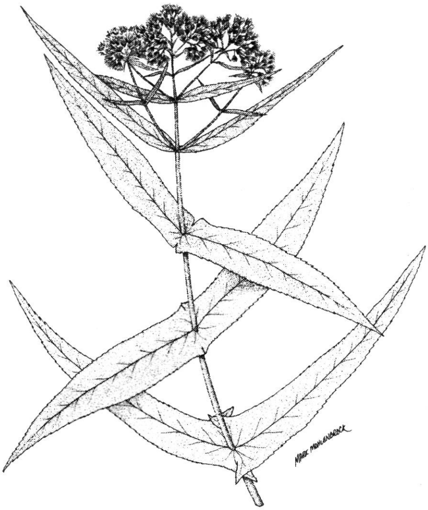
MARSH HORSETAIL *Equisetum fluviatile*

SCOURING RUSH *Equisetun hyemale*

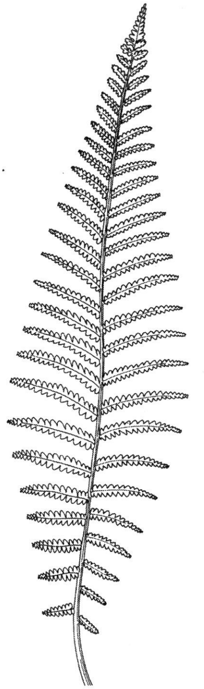
Both species have coarse green **ribbed stems with prominent nodes** producing segments. Marsh horsetail has fine, lateral side branches. Scouring rush taller (to 3 feet), without side branches. Stems of scouring rush, when tightly bound together, make excellent natural scouring pads for sooty coffeepots held to the open fire.

SWAMP MILKWEED *Asclepia incarnata*

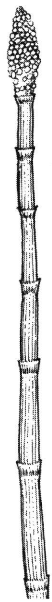
Grows to 4 feet. Narrow, opposite lanceolate leaves without petioles; **flowers pink to red**. Stems are finely hairy, **without milky juice** common to group. Fruit to 4 inches, containing numerous seeds with silky attachment. Only milkweed found in wet environments.



BONESET
Figure 64



MARSH FERN
Figure 65



SCOURING RUSH
Figure 66

SWAMP MILKWEED
Figure 67

PURPLE LOOSESTRIFE *Lythrum salicaria*

INVASIVE SPECIES. Erect, stout, with sessile opposite hairy leaves; hairy stems; **numerous purple flowers along stem.** Height to 6 feet in dense groupings or single plants, not normally standing in water, but can tolerate for a short period each spring.

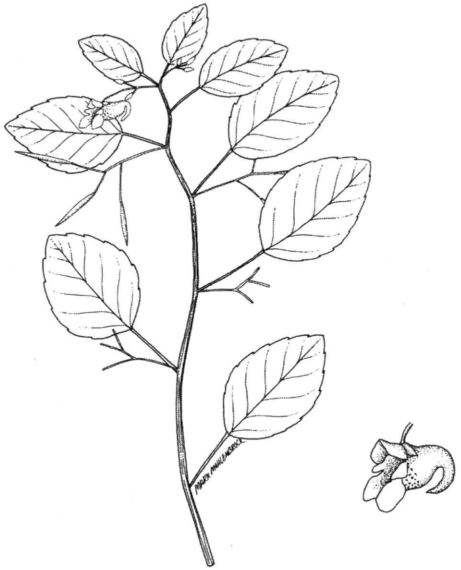
This plant exotic to Great Lakes and an aggressive colonizer of wetland habitats, often replacing entire tracts of native species. Many eradication programs under way to eliminate or at least control loosestrife densities. Generally not useful to birds and wildlife, though bees thrive on abundant nectar.

SPOTTED TOUCH-ME-NOT *Impatiens capensis*

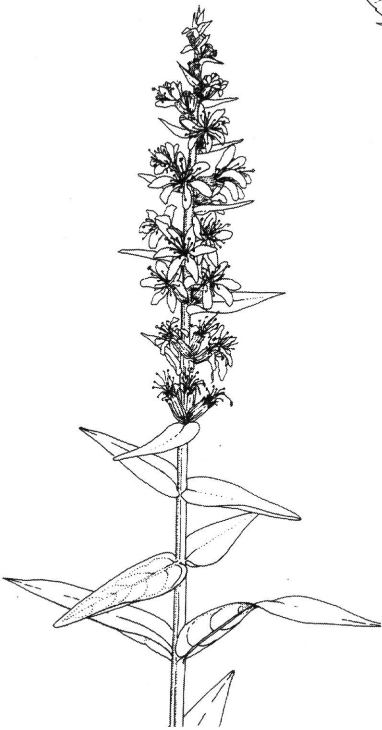
Delicate plant, erect to sprawling, with rounded leaves and **orange spotted flowers with two lips**. Can grow to 8 feet in protected environments along streams or ponds. Soft, watery stems. Often found near emergent line in wet meadow zone, with thick foliage of cattails, sedges, or reed grass.

GREAT WATER DOCK *Rumex orbiculatus*

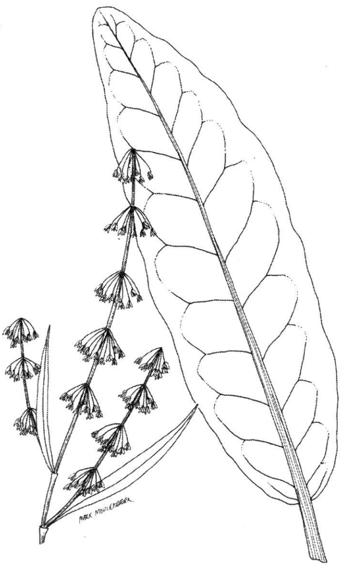
Height to 5 feet with multiple **greenish flowers** on thin stalks; drooping. **Long leaves** with veination stopping near edges to join other marginal veins. Stem usually unbranched and smooth. Can be found in standing water, but prefers wet soil.



SPOTTED TOUCH-ME-NOT
Figure 69



PURPLE LOOSESTRIFE
Figure 68



GREAT WATER DOCK
Figure 70

MARSH ST. JOHN'S WORT *Triadenum fraseri*

Plant grows to 2 feet, with single stem. Leaves opposite, rounded. **Pinkish or purple flowers** originate from upper leaf axils. Widespread plant of sandy shores, swales, marshes, bogs, and wet meadows. Previously assigned to genus *Hypericum.*

STICK-TIGHT *Bidens connata*

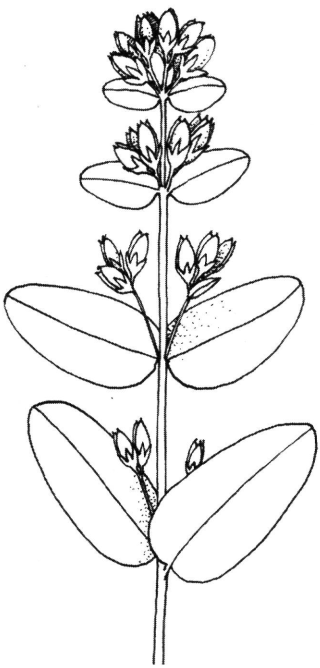
Annual found only in areas where seeds can keep dry enough to germinate in spring. Leaves to 5 inches, opposite and simple, with large separated teeth. Flower head brownish, occasionally with yellow, petal-like rays surrounding. Fruit a flattened nutlet with **four hooked spines**; catches easily on passing fabric and fur. Also called purple stem beggar's tick.

Another genus, *Desmodium*, has sticky seeds, but seed pod is flattened, resembling immature peapod.

BITTERCRESS, PENN. *Cardamine pennsylvanica*

Height to 30 inches, or submersed and trailing. Leaves deeply divided, grow to 4 inches, alternating along stem and at base in circular cluster. **Flowers white, small**, on stem tip and in leaf axils; become elongated, cylindrical pods (to 2 inches) in fall. This plant usually found in shallow margins of shaded streams or rivers, spring seeps, and other protected areas.

STICK-TIGHT
Figure 72



MARSH ST. JOHN'S WORT
Figure 71

BITTERCRESS, PENN.
Figure 73

WATERCRESS *Nasturtium officinale*

Similar to bittercress, but basal leaves absent. Leaves to 7 inches with 7 lobes; **flowers white**, tiny, only at stem tips, with elongated pods to 1 inch below. Usually found in large tangles in shaded, cool water, mostly submerged, but upper parts emergent. Introduced from Europe.

CREEPING JENNIE *Lysimachia nummularia*

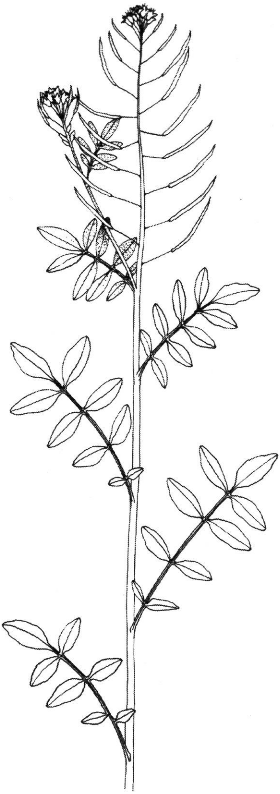
Distinctive plant with round, opposite leaves on creeping vine. **Yellow, star-shaped flowers along stem.** Found in wet woods, shrub zone, and riverbanks. Perennial herb that is always a pleasure to come across. Also called moneywort. Another introduction that has become a pest in some areas.

SILVERWEED *Potentilla anserina*

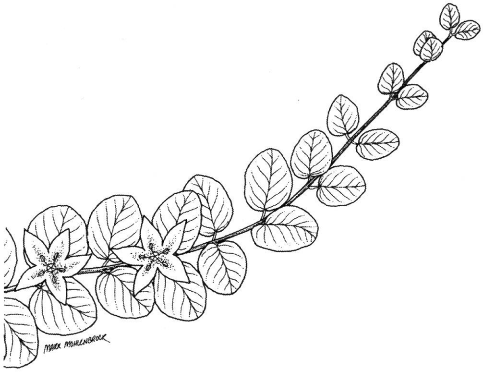
Low-growing, sprawling plant with prominent runners along ground, **bright yellow flowers. Leaves silver underneath**, to 7 inches, pinnately divided, dark green above. Very common on wet flats along Great Lakes.

MARSH CINQUEFOIL *Potentilla palustris*

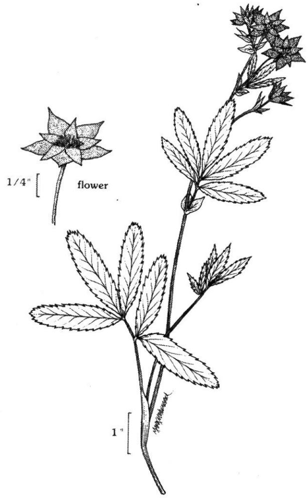
Resembles silverweed, but more erect (to 2 feet). **No silver color on leaf undersides; purple flowers;** trailing stems rooted in water or wet mud.



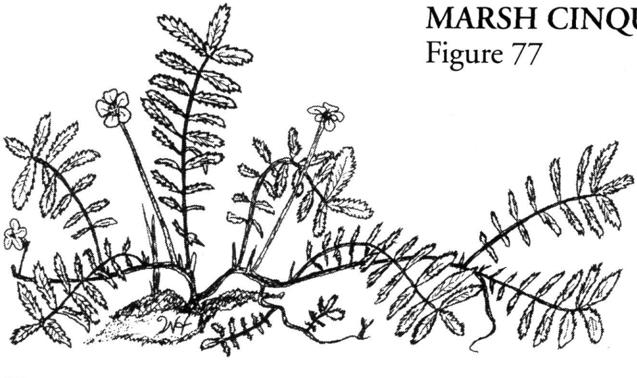
WATERCRESS
Figure 74



CREEPING JENNIE
Figure 75



MARSH CINQUEFOIL
Figure 77



SILVERWEED
Figure 76

JOE-PYE-WEED, SPOTTED *Eupatoriadelphus maculatum*

Height 4 to 6 feet. Unbranched stems with whorls of 4 or 5 toothed leaves, topped with flat inflorescence, **purple flowers. Stem is purple-speckled.** From a distance, resembles milkweed. Usually found growing in colonies in unshaded wet soils of marsh or wet meadow.

SWAMP ROSEMALLOW *Hibiscus moscheutos*

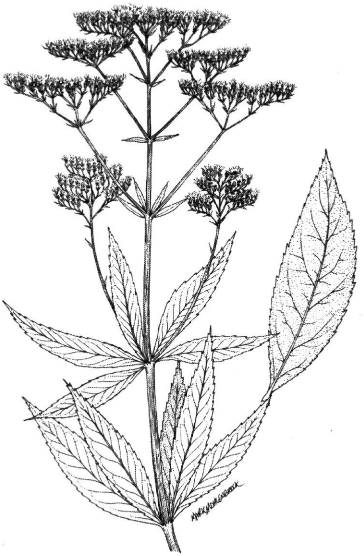
Plant grows to 7 feet in favorable conditions, scattered or in colonies, along shores, wet meadows, shrub thickets, marshes. Large pointed, toothed leaves to 7 inches, slightly hairy; may be lobed or not. **Flowers bright pink or rose**, to 3 inches, with yellow column in center, 5 petals.

Rosemallow equals the cardinal flower in striking beauty. Once identified, recognizable forever at a distance. Also called swamp rose, marsh-mallow, and mallow-rose.

Swamp rose *(Rosa palustris)* resembles this plant, but is a shrub with compound leaves and thorns.

CALICO ASTER *Aster lateriflorus*

Flowers of two parts—**white outer ray-flowers, yellow inner tube-flowers**—forming head about 3/4 inch across; numerous along stem. Leaves simple, alternate, with hairy midvein underneath, length 4 to 6 inches, smaller near top. Grows to 4 feet in swamps, wet meadows, lagoon borders, and riversides.



JOE-PYE-WEED, SPOTTED
Figure 78

SWAMP ROSEMALLOW
Figure 79

CALICO ASTER
Figure 80

WHITEFIELD ASTER *Aster lanceolatus*

Another aster with **white petals, yellow centers**. Species has 3/4-inch flowerheads, white bracts with green midvein, below and around white ray flowers. Leaves smooth. Height to 6 feet.

SWAMP ASTER *Aster puniceus*

Bluish, daisy-like flowers help distinguish this aster from others. Toothed, rough leaves clasp purplish hairy stem. Can grow in wetter conditions than others; thus often found standing in shallow water in low areas of wet meadow.

CANADA GOLDENROD *Solidago canadensis*

Dozens of goldenrods found in or near marshes because of vigorous growth in wide variety of habitats. Tough foliage and perennial rhizome allow goldenrods to tolerate extremes. Canada goldenrod has toothed leaves with three strong veins. Stems hairy with **yellow flowers** arranged along one side of widely-branched panicle. Several varieties of this species may grow in one area.

WHITEFIELD ASTER
Figure 81

SWAMP ASTER
Figure 82

CANADA GOLDENROD
Figure 83

LATE GOLDENROD *Solidago gigantea*

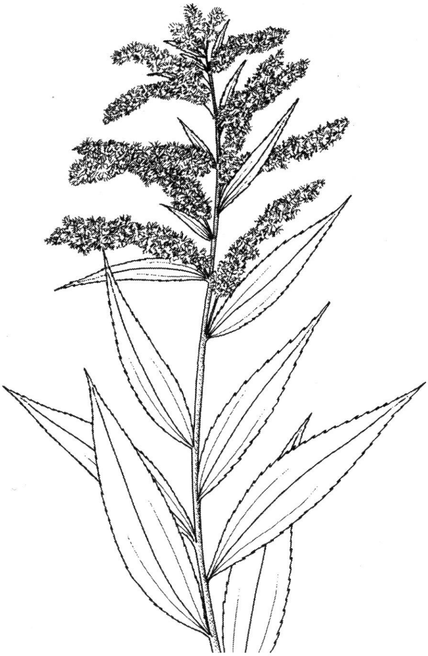
Resembles Canada Goldenrod except **stems not hairy**, teeth smaller, leaves somewhat smaller, can reach 6 to 8 feet tall. Usually last of goldenrods to bloom. Can tolerate widest range of wet conditions for this genus, thus sometimes called marsh goldenrod. Flowers yellow.

MARSH GOLDENROD *Solidago uliginosa*

Highly variable goldenrod much at home in wet meadow, fens, swamps, bogs. Basal leaves long, to 18 inches, with petioles nearly encircling stem. **Leaves and stems smooth**, leaf margins smooth or with a few teeth. Yellow, inflorescence may be broad pyramid with one-sided branches, or tall cylindrical flower head. Flowers in late summer.

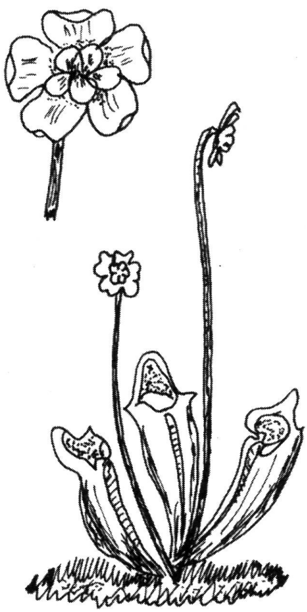
PITCHER PLANT *Sarracenia purpurea*

Interesting carnivorous plant. **Leaves urn-shaped and only basal**, resembling open-throated tubes, often red-striped. Usually filled with watery liquid that attracts insects; they crawl down throat, are trapped, drown. Plant digests them to supplement nourishment. **Flowers red, borne on stalks** about 12 to 15 inches tall, singular. Grows in open sun on wet, acidic soil. Common in northern Great Lakes areas, backshore swales, seepage areas below bluffs with cedar swamps and bog-like conditions. Does not tolerate shade or transplanting well.



LATE GOLDENROD
Figure 84

MARSH GOLDENROD
Figure 85



PITCHER PLANT
Figure 86

SUNDEW *Drosera rotundifolia*

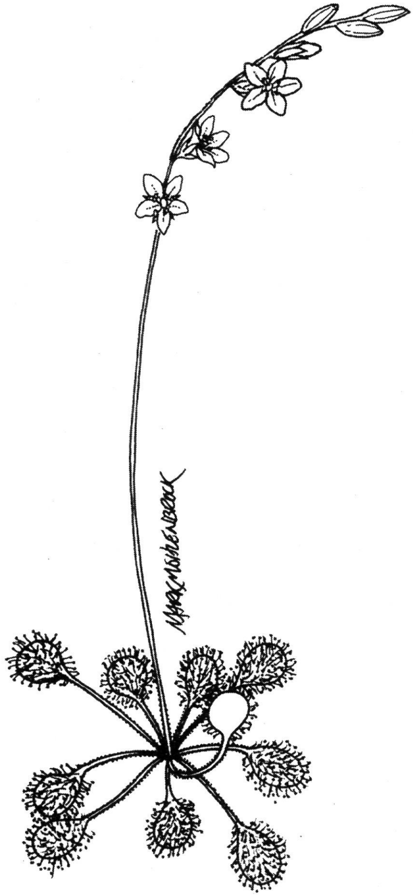
Another unusual wetlands plant. **Rounded basal leaves have resin-tipped hairs** resembling dew. Hairs close rapidly over any alighting insect; sundew then digests its catch slowly. Acid-loving plant, therefore uncommon in Great Lakes coastal wetlands, though sometimes found in small, mossy areas.

FALSE NETTLE *Boehmeria cylindrica*

Plant common to river sloughs, shaded beach barriers, wooded swamps, other damp soils with limited sun. Height to 3 feet, though usually less. Flowers in cylindrical spike-like inflorescence extending from leaf axils. **Stinging hairs absent.**

STINGING NETTLE *(Urtica dioica)* similar to above but with HIGHLY IRRITATING STINGING HAIRS. Hair is broken off upon contact with clothing or flesh; poison is squeezed onto skin. Running into a colony of these can be painful and ruin a fine day in the wetlands.

FALSE NETTLE
Figure 88



SUNDEW
Figure 87

Shrubs and Vines

Shrubs are woody plants generally less than 20 feet tall, and more often 4 to 10 feet. The hard, woody bark of these perennials is usually brown, with dots or cross stripes along the upper portions of the stems. All shrubs have a firm xylem core. Buds appear in the leaf axils and at the tips of the stems.

Shrubs usually grow in clusters, with many stems coming from one base. Several tree genera such as willows have low-growth forms, and these low-growing trees are included in this shrub category. The shrubs' extensive root structures are not well suited to prolonged submersion, and in a wetland environment, many trees and shrubs will be stunted.

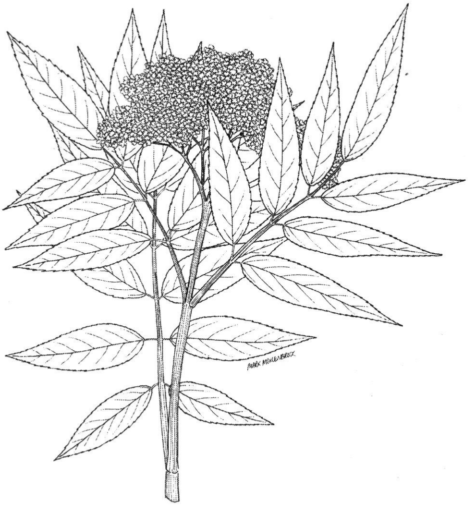
AMERICAN ELDER *Sambucus canadensis*

Erect to 10 feet, scarcely woody, with large, pinnately compound leaves, opposite and toothed. **Flowers white in large clusters**, over entire plant periphery, becoming densely-grouped 1/4 inch purple berries by fall. Berries make excellent jam or wine base. Found in wetlands at the border of trees and along streams.

MEADOW SWEET *Spiraea alba*

Flowers white, in dense panicles on ends of the stems and terminal, leaves alternate, simple, without hairs, green on both sides. Height to 5 feet, bark yellowish-brown. Common in wet open ground of shrub zone, along stream borders, and swales.

A related species, STEEPLE BUSH *(Spiraea tomentosa)*, has much wider densely wooly leaves. Stems also hairy. Flowering top conical and elongated, like a steeple.



AMERICAN ELDER
Figure 89

MEADOW SWEET
Figure 90a

STEEPLEBUSH
Figure 90b

BUTTONBUSH *Cephalanthus occidentalis*

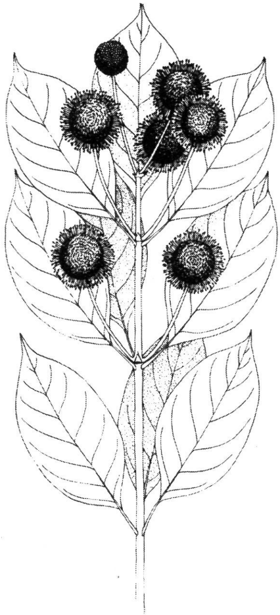
Simple leaves, smooth, without teeth, grow opposite or in whorls, pointed to 6 inches. **Flowers are creamy-white fuzzy balls** that emit a soft fragrance over the wetland. Shrub grows to 10 feet in clusters and tolerate very wet conditions. Fruit-ball at maturity contains hundreds of small seeds that feed wildlife and birds all winter. Most common in southern portions of Great Lakes; rare in northern regions.

CHOKECHERRY *Prunus virginiana*

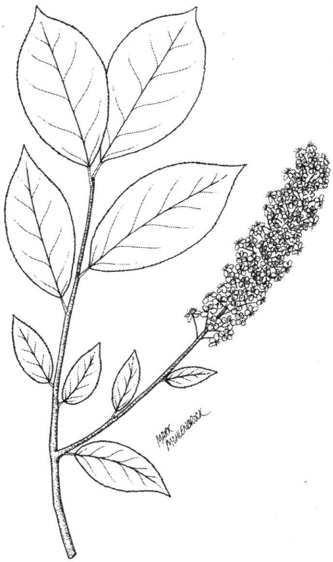
Shrub or small tree to 25 feet found along streams and riverbanks, also in dry woods and fields. **White flowers** clustered along terminal racemes become red to nearly black cherries up to 1/2 inch by August; very bitter, hence "choke." Leaves alternate and simple, finely toothed, smooth. Stem has numerous light-colored cross stripes *(lenticels).*

WINTERBERRY *Ilex verticillata*

Shrub or small tree with 1/4-inch **white flowers in leaf** axils; many bright red berries by autumn. Leaves alternate and simple, smooth with fine teeth, to 3 inches long. Leaves fall off throughout winter. Bark smooth, grayish. Also known as Michigan holly, can tolerate shade well.



BUTTONBUSH
Figure 91



CHOKECHERRY
Figure 92

WINTERBERRY
Figure 93

GRAY DOGWOOD *Cornus foemina*

Note: **All dogwoods have veins that follow leaf margins,** making them easy to identify to the genus *Cornus.*

Gray branches and pale **bluish fruits** when mature. Leaves simple and opposite, to 3 inches. **Flowers cream-white**, pith white, young branches angular and gray. Grows well in wetland habitats along streams, swamps, lagoons, and swales.

RED OSIER *Cornus stolonifera*

Similar to gray dogwood, but **red stems and branches** give it away in the field from 100 yards. Leaves opposite and simple, slightly hairy above and denser below, without teeth. **Fruits white.** Can grow dense thickets from own stolons below ground, hence species name.

SILKY DOGWOOD *Cornus amomum*

Brown lower stems, red upper branches, brown pith. Leaves to 5 inches, softly hairy, pale beneath, hence second name: pale dogwood. **Fruits dark blue**. Forms dense thickets along streams, swamps, other wet habitats. Silky and red osier are most wetland-loving dogwoods.

GRAY DOGWOOD
Figure 94

RED OSIER
Figure 95

SILKY DOGWOOD
Figure 96

RIVERBANK GRAPE *Vitis riparia*

Trailing or climbing vine with simple alternate leaves, usually three-lobed with jagged narrow teeth, non-hairy, climbing tendrils. Bark shreddy; branches greenish. **Flowers white or yellow**ish-green; grapes blue-black, acid, juicy; grow to 1/2 inch. Common grape of wet environments, often found on beach ridges and along riverbanks.

VIRGINIA CREEPER
Parthenocissus quinquefolia

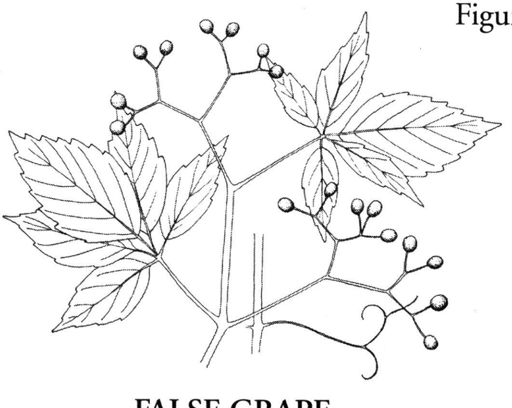
Distinct vine with five leaflets per compound leaf. **Tendrils have adhesive disks.** Leaves dull green, pale below, coarsely-toothed. **Flowers small, greenish**, in bunches. Berry is blue-black to 3/8 inch diameter. Main stem of plant can be over 2 inches thick. This common climbing vine found dangling from tall trees, giving wet woods jungle-like appearance.

FALSE GRAPE *Parthenocissus inserta*

Another creeper found in coastal zone. Similar to above, but has shiny upper leaf surfaces; usually **does not have adhesive disks on tendrils.**

RIVERBANK GRAPE
Figure 97

VIRGINIA CREEPER
Figure 98



FALSE GRAPE
Figure 99

SPECKLED ALDER or TAG ALDER *Alnus rugosa*

Generally shrub to 10 feet, but may resemble tree reaching 20, growing close to water's edge along any aquatic border, swamp, other moist ground. Leaves alternate and simple, dark green, many teeth, to 5 inches. **Bark has numerous white cross stripes**, giving plant speckled appearance, hence its common name.

Male flowers resemble dark, dangling caterpillars Form in autumn and release pollen early in the spring when stocky female catkins are ripe. Seeds eaten by waterfowl and other wildlife. Forms thick tangles.

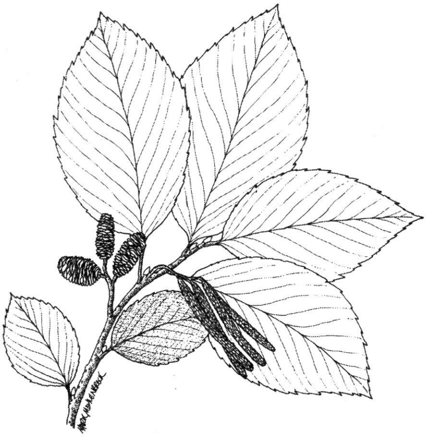
SWAMP ROSE *Rosa palustris*

Sprawling or erect shrub with greenish stems and stout recurved thorns. **Flowers bright pink** to 3 inches across. Leaves compound, alternate, with seven leaflets. Height to 7 feet. Common in wetland habitats, this beautiful rose adds color to green wet meadows and shrub zones.

SWEET GALE *Myrica gale*

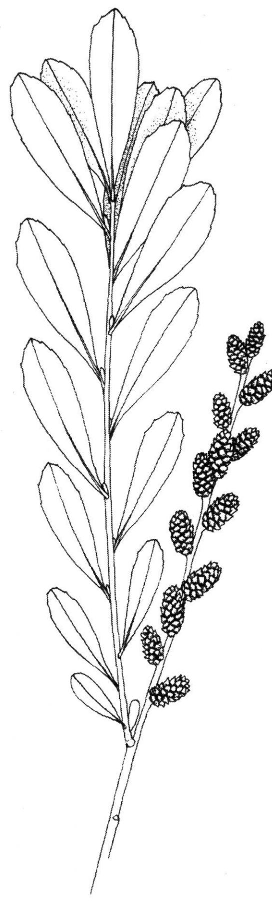
Distinctive shrub to 6 feet growing in thick colonies at marsh edges, riverbanks, or any open area of saturated soil. **Leaves have numerous resin dots** visible when leaf is held to light, as do stems. Leaves alternate, toothed around top, tapered to stalk. Fruits clustered toward end of previous years' branches, very resinous.

Buds especially fragrant when crushed, may be boiled down slowly into perfume for pot pourri.



SPECKLED ALDER or TAG ALDER
Figure 100

SWAMP ROSE
Figure 101



SWEET GALE
Figure 102

WILLOW

The willows are a confusing group with many similar species and intergrades. In Michigan there are 21 species of willow classified as shrubs, with most being water-loving. They are the most common wetland shrub likely to be encountered.

The willow trees are treated in the TREE SECTION. **All willows, and only willows, have a single scale over each side bud.** The related poplars have two bud scales.

WATER WILLOW *Decodon verticillatus*

Striking water willow is not a true willow. Found in water amidst bulrushes, or back from shore on moist soil. **Dense pink-rose or purple flowers** packed in leaf axils. Leaves opposite or whorled, to 6 inches, without teeth or stalks. Stems woody below, but green and herb-like above, somewhat angular.

Also known as swamp loosestrife because it belongs to the loosestrife family *Lythraceae.* Primarily a tropical group with 350 species, this is the only representative in the Great Lakes region. One of the most beautiful and unforgettable wetland plants, often standing several feet above all other vegetation.

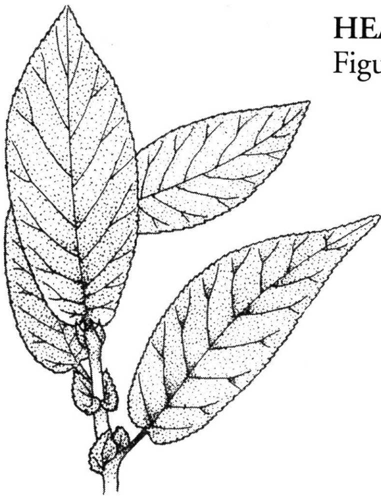
HEARTLEAF WILLOW *Salix eriocephala*

Toothed, **thin leaves without hairs**; stipules nearly round and hiding leaf stem, dark green above, paler beneath. Height to 12 feet, along water course and all forms of wet habitat. One of most common willows of swamps and coastal marshes.

Salix cordata is similar except **with soft, unmatted hairs on young branches and leaves.** This latter variety prefers more northern Great Lakes basin range.

WATER WILLOW
Figure 103

HEARTLEAF WILLOW
Figure 104a



SALIX CORDATA
Figure 104b

SLENDER WILLOW *Salix petiolaris*

Shrub to 10 feet, with slender green twigs; much-branched; finely divided stems. Leaves simple, alternate, smooth, slightly toothed, silky when young. Common in coastal wetlands and water courses. Like all willows, usually found in thick clumps and thickets. Often confused with silky willow, *S. sericea,* which is silkier, has narrow leaves, longer flowering parts.

SANDBAR WILLOW *Salix exigua*

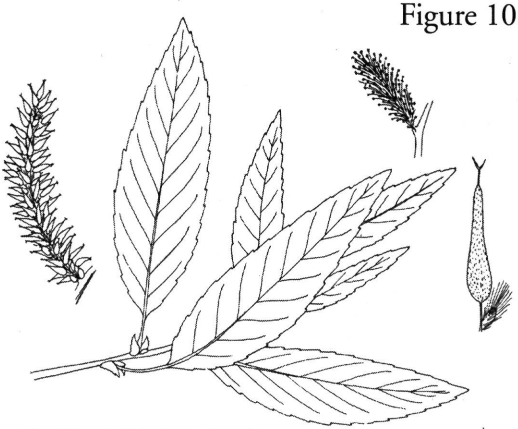
Very narrow, long leaves with few teeth, **smooth and green on both sides**; stipules lacking; bark grayish. Grows to 10 feet in intense clumps, prefers outwash deposits of rivers and streams, thus the name. Also found commonly on beach ridges.

PUSSY WILLOW *Salix discolor*

Common shrub alongside streams, rivers, ditches, other Great Lakes wetland locations. Leaves with large teeth, smooth on both sides, stipules large, sharply rounded. Flowering parts appear well before leaves and are an indication of spring to come. Gathered extensively for indoor arrangements.

SLENDER WILLOW
Figure 105

SANDBAR WILLOW
Figure 106



PUSSY WILLOW
Figure 107

SHINING WILLOW *Salix lucida*

Shrub to 10 feet, usually 5 to 7. Somewhat scaly brown bark, **yellowish twigs, glossy leaves.** Leaf margins finely toothed, leaves thick, smooth, shiny on both sides. This willow striking in appearance because of its reflectance.

SHEEPBERRY *Viburnum lentago*

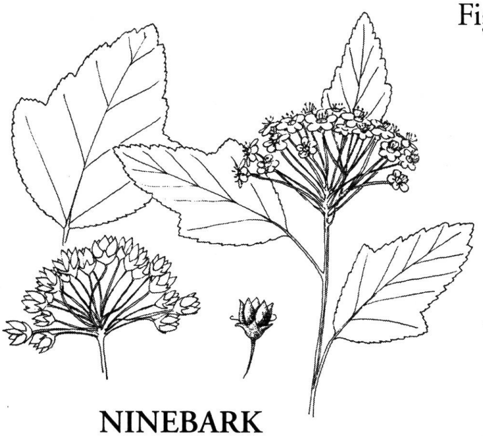
Compact shrub or small tree to 18 feet. Found in swampy soil, wet woods, river margins. Leaves simple and opposite, oval and rounded at base, short-stalked, thick, dull-looking. Axillary buds long and narrow, to 3/4 inch. **Flowers white in flat-topped clusters**. Berries to 1/2 inch, blue-black.

NINEBARK *Physocarpus opulifolius*

Tall spreading shrub in thick clusters in wettest environments, but not directly in water. Leaves alternate and simple, with teeth, **distinct shape of rounded bases becoming a side lobe**, then tapering to a muted point. Bark loose and separating into flaky layers on lower stems, hence its common name. **Flowers white**, small in rounded clusters, many clusters per plant. Produces plentiful seeds for wildlife and birds.

SHINING WILLOW
Figure 108

SHEEPBERRY
Figure 109



NINEBARK
Figure 110

RASPBERRIES and BLACKBERRIES *Rubus spp.*

With few exceptions, raspberries and blackberries **have prickly stems** and three-part leaves. Growth form is sprawling or rambling erect with stout greenish-to-brown stems. They grow in many varieties and in a large variety of habitats. When near water, plants become especially dense and fruit profusely. Fruit is black or reddish, juicy and delicious, **flowers are white.**

Stems die back after fruiting, with new stems arising in the Spring from underground roots. First-year stems are unbranched and bear no fruit. Second-year stems branch, fruit, and die in the fall. Raspberries are common along beach barriers, near dune and swale complexes, and at drier edges of wet meadows. They prefer full sun. Blackberries are more common in shaded, moist habitats.

RASPBERRY
Figure 111

Trees

Because trees need abundant oxygen for seeds to sprout and roots to function, of the hundreds of North American tree species, only a fraction can live in saturated soils, and fewer yet (the bald cypress, for instance) can live as emergents.

Most tree roots, however, are shallow, only a few inches below the soil surface near the active tips. Consequently, the roots of water-tolerant species (some oaks, poplars, elms, maples, ashes, and most willows) can gather oxygen from semi-saturated soils, provided the environment offers enough days of oxygen availability.

Along the coast, fluctuating water levels upset the critical time period trees need for minimum life support. Thus the wooded swamp is not common along the coast, although it represents the majority of Michigan's inland wetlands.

When one or another of a tree's parts are unavailable for examination, identifying tree species is a challenge. Bark, live or dead leaves, stems, flowering parts, and tree silhouette are all useful clues in pinpointing species.

AMERICAN ELM *Ulmus americana*

Once common on floodplains and wooded swamps of the Great Lakes basin, this beautiful, tall, spreading tree of lowland forests was also planted throughout America to border streets. High-rising, open crown made elm perfect for shading yards, sidewalks, and roads. Now all but exterminated by Dutch elm disease. Leaves are slightly rough, soft below, buds hairless; gray bark deeply fissured into interlacing scaly ridges.

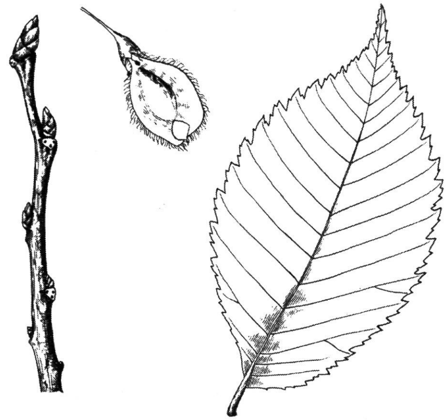
SLIPPERY ELM *Ulmus ruba*

Alternate simple **sandpapery leaves,** 4 to 7 inches long, half as wide, double-toothed with prominent veins, fragrant when crushed, on short stalks. Twigs stout, light to dark brown or gray, bundle scars 3. Bark reddish-brown, shallow fissures, large loose plates. Medium-sized tree to 60 feet with few low branches. Ascending branches spread into large flat-topped crown. Inner bark contains slippery, gooey substance, hence its common name; this substance used by pioneers as throat soother and thirst-quencher. Fruit is a samara, with hairs over the seed. Winter buds hairy.

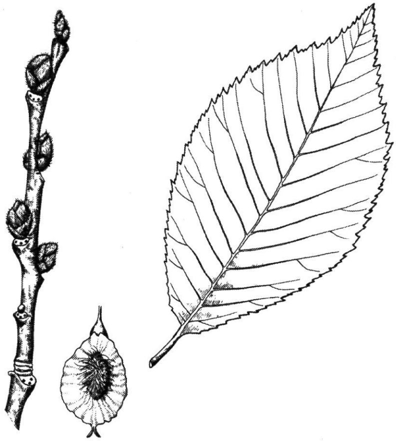
In Great Lakes basin, slippery elm reaches northern extent of its range. Absent in northernmost areas, occasional around upper portions of Lake Huron and Michigan, common in southern Michigan and Ohio.

BASSWOOD *Tilia americana*

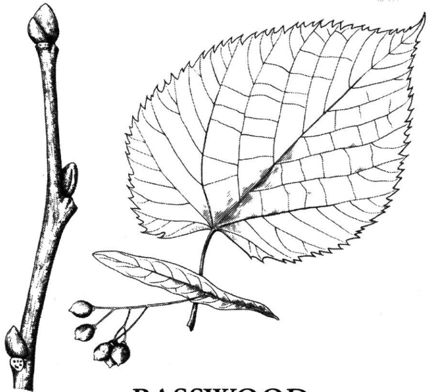
Large tree to 75 feet. Bark thick, dark gray, with long, narrow, deeply-furrowed flat-topped ridges nearly parallel. Leaves alternate and simple, heart-shaped with unequal lobes, coarsely toothed, thin, dull dark yellowish-green above, pale below. Bud scales two, not hairy. Fruit a pea-sized seed, dark and fuzzy, **attached to thin, leafy bract**; fruit persists into winter. Basswood found in damp, bottomland environments, alongside streams and lakes. Tolerant to shade, often found in deep forest.



AMERICAN ELM
Figure 112



SLIPPERY ELM
Figure 113



BASSWOOD
Figure 114

RED ASH *Fraxinus pennsylvanica*

Dark brown bark, vertical shallow furrows, irregular with interlacing ridges, somewhat scaly. Leaves to 12 inches long, **leaflets on short stalks**, smooth and only slightly toothed. Leaflet stems and all twigs hairy. Samara long and thin. This is common ash of Great Lakes wetlands. Black ash (below) tolerates wetter environments, but grows more inland. A variety with smooth twigs and stems is called green ash.

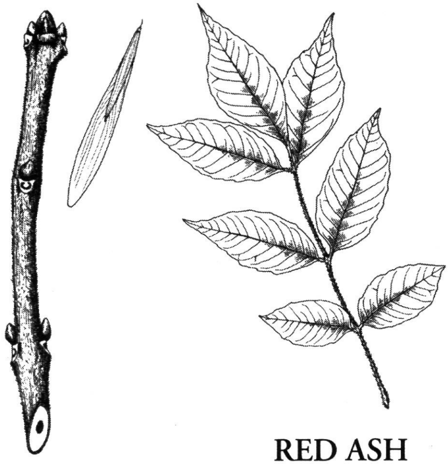
BLACK ASH *Fraxinus nigra*

Medium-sized tree, often crooked, with coarse, upright branches leading to open crown (in sunny sites) or restricted crown in swamp habitats. Bark is thin, soft, ashy gray, scaly, easy to flake with hand. Leaves opposite, pinnately compound with 7-11 leaflets, toothed, dark green above, paler below. **Leaflets stalkless, the only ash such**. Fruit a single winged samara, hanging in bunches after ripening. Bundle scars numerous and tiny. Only ash with male and female flowers on the same tree. Seldom found in dry environments, preferring moist to semi-saturated soils along rivers, lagoons, beach barriers, swales, and wooded swamps. Heartwood separates into sheets when pounded, allowing the cutting of thin strips excellent for basket weaving.

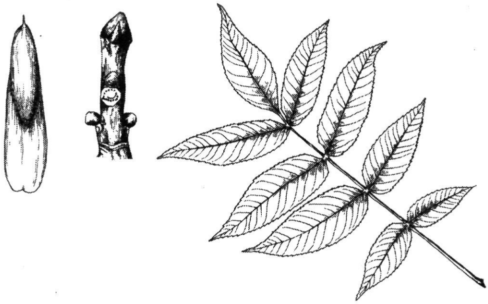
COMMON HACKBERRY
Celtis occidentalis

Medium tree to 55 feet, much-branched if in open location, forming zigzagged upper limb crown. Shallow roots. Bark light gray or silver, deep short furrows, corky. Leaves alternate, simple, toothed, long-pointed, light green to bluish, with **conspicuous lacelike network when held to light**. In fall, fruit dark purple puckered drupe on slender stalk.

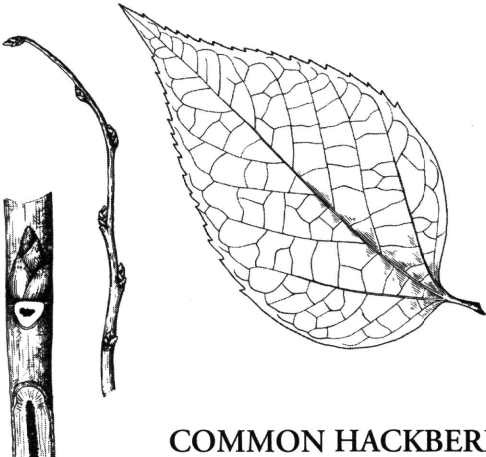
Hackberry common in bottomland habitats and high water table locations, but cannot withstand substantial flooding or root emersion. Does best on highly calcareous soils.



RED ASH
Figure 115



BLACK ASH
Figure 116



COMMON HACKBERRY
Figure 117

COTTONWOOD *Populus deltoides*

True water-lover, cottonwood is perhaps most characteristic coastal wetland tree, a pioneering species found almost anywhere growing conditions are harsh and wet: shore lines, nearly standing in water, on beach barriers, alongside lagoons, swales, rivers, and on mounds within wet meadow or shrub zone. If location is too wet, can live in stunted form, resembling shrub.

Bark thick, deeply furrowed, ashy-gray, fissures straight with broad flat-topped ridges. Leaves wider than long, deeply toothed, teeth incurved, flattened stalks, dark green above, paler below. Fruit a capsule borne in furry, drooping catkins. **End bud is stout, large, sharply-pointed, non-resinous, yellow, shiny.**

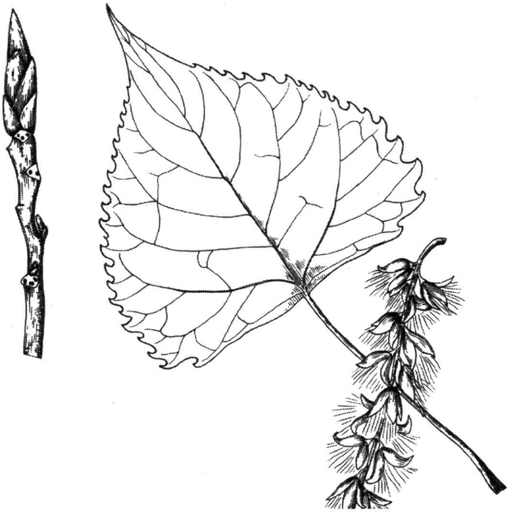
Grows to 80 feet tall with thick trunk. Cottonwood absent in Great Lakes northern reaches, but plentiful in warmer southern areas.

BALSAM POPLAR *Populus balsamifera*

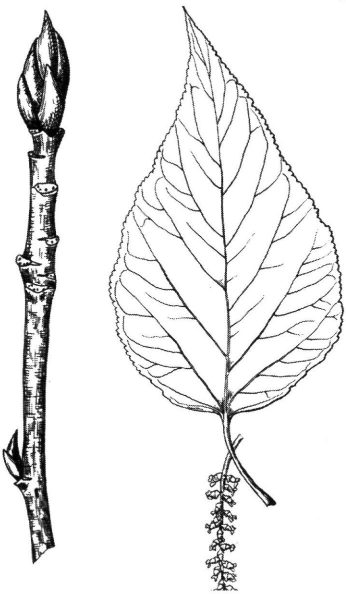
Similar to cottonwood, but leaves not coarsely toothed. Leaf stalk round, undersides of leaves brownish, **end buds sticky and fragrantly resinous.** This is poplar of the north, not as tolerant of moist soils, but still found in moist habitats along shore and in dry environments. Common back from beach as stunted tree.

SYCAMORE *Platanus occidentalis*

Distinctive large tree with **bark-forming large plates and plate-like scales; reddish color lower, greenish or cream-colored higher.** Mottled appearance resembles skin of huge snake. Leaves alternate, simple, shallow-lobed and sharp-toothed, similar to maple leaf. Fruits dense, round brown balls on slender stalks. Sycamore found in river floodplains and bottomlands. Southern Michigan represents northernmost extension of sycamore's range, though present in some coastal wetlands of Lake Erie and southern Lake Michigan.



COTTONWOOD
Figure 118



BALSAM POPLAR
Figure 119

SYCAMORE
Figure 120

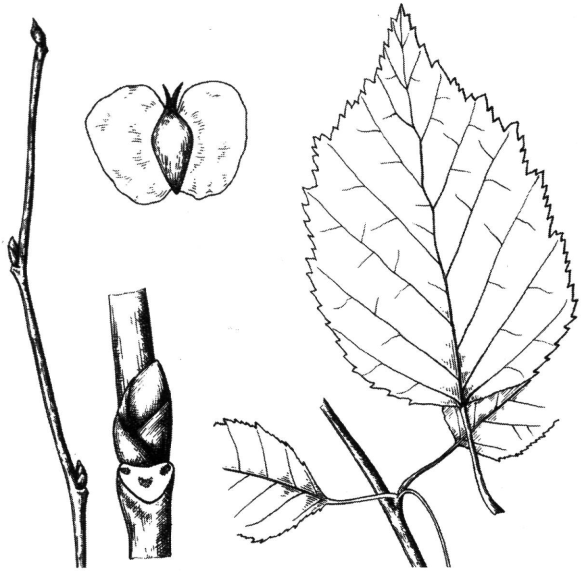
WHITE BIRCH *Betula papyrifera*

Only coastal wetlands tree with **white flaky bark and dark cross stripes**, this tree has northern affinity; seldom seen in wild below mid-Michigan. Leaves alternate, simple, double-toothed, dark green above, paler below, smooth, few veins, stalks yellowish. Fruit a samara with wide wings, from drooping catkins. Medium-sized tree to 60 feet, often growing in clumps when smaller. White birch is highly shade-tolerant, often found along riverbanks, floodplain forest, swales, beach lagoons, and at shores near water line.

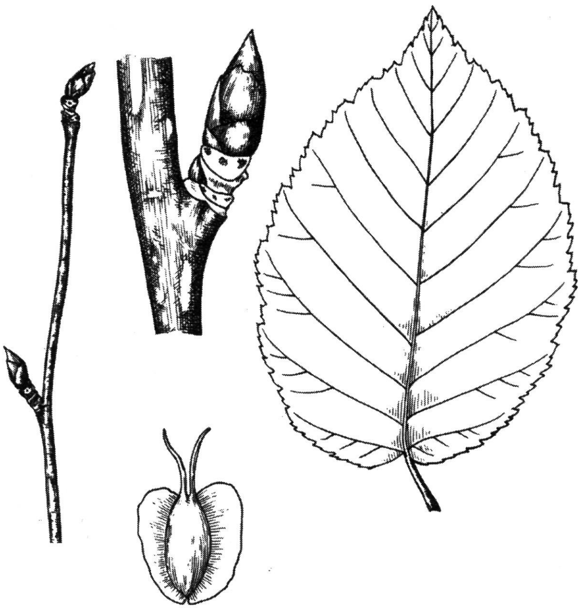
YELLOW BIRCH *Betula alleghaniensis*

Bark yellowish to gray or even black, breaking into **narrow strips curled at edges**, large thin plates on lower trunk, with conspicuous cross pattern. Leaves alternate, simple, 3 to 5 inches, double-toothed, yellowish-green beneath, on very short stalks. Found at lake and stream margins, northern swamps, coastal lagoon or swale edges, other hummocky locations in shrub/tree zone, but not tolerant of excessive water.

Gray Birch *(Betula populifera)* is similar, but a more North-eastern species. Rarely found in Great Lakes except for some portions of eastern Lake Erie and Lake Ontario.



WHITE BIRCH
Figure 121



YELLOW BIRCH
Figure 122

RED MAPLE *Acer rubrum*

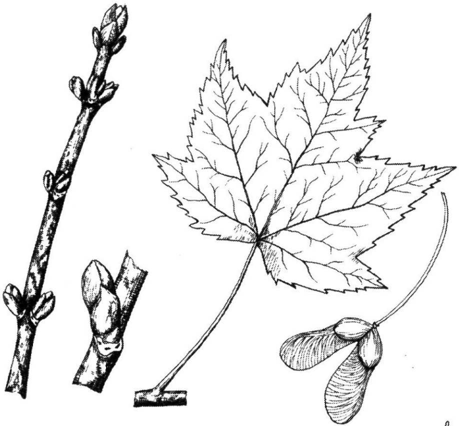
Medium-sized tree to 60 feet. Bark smooth when young, thin, and gray, changing to very dark gray, furrowed with long platelike scales on older trunks. **As with all maples, leaves opposite**, simple, deeply-lobed, sharp-pointed, coarsely-toothed, green above, pale green to whitish below, smooth. **Twigs bright red**. Buds dark red. Fruit a double-winged samara that helicopters to the ground in early summer. Red maple widespread throughout Great Lakes basin, found in lowland forests, bottomlands, deciduous swamps, moist habitats. Not common on stream banks.

SILVER MAPLE *Acer saccharinum*

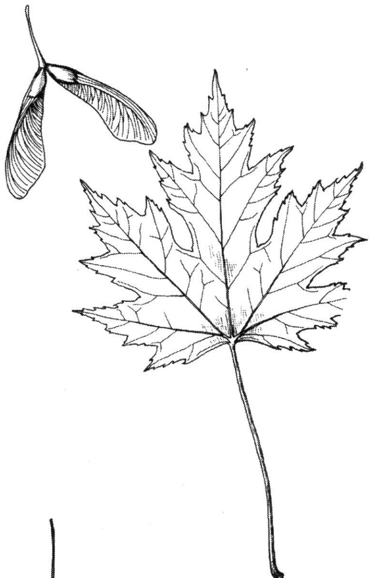
Most water-tolerant maple. Tall, to 75 feet, shade-intolerant, thus uncommon in deep swampy forests, but plentiful along margins of streams and rivers. Leaves opposite and simple, deeply-lobed, sharply-toothed, on long, slender stalks. **Leaves bright silvery below, appearing white from a distance**, hence its common name. Twigs are reddish-brown, smooth, shiny with sour smell when broken. Fruit a two-winged samara. Silver maple is common in southern portions of Great Lakes, uncommon or absent in northern half.

ASH-LEAF MAPLE or Box Elder *Acer negundo*

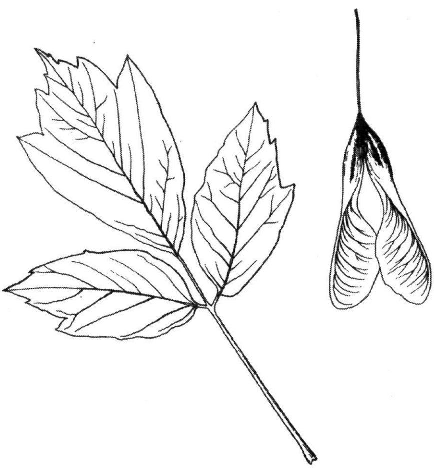
Height to 40 feet. **Pinnately compound opposite leaves** with few shallow lobes near tip, smooth edges. Bark pale gray or light brown, turning deeper brown with age, deeply fissured into narrow ridges. Twigs stout green to purple or brownish, shiny, coated with waxy substance. Fruit a two-winged samara with deeply scalloped wings. Rare in northern portions of Great Lakes, occasional-to-frequent in southern portions. Prefers stream banks, pond margins, coastal lagoons, swales, lower tributaries and floodplains, swamp edges.



RED MAPLE
Figure 123



SILVER MAPLE
Figure 124



ASH-LEAF MAPLE
Figure 125

BUR OAK *Quercus macrocarpa*

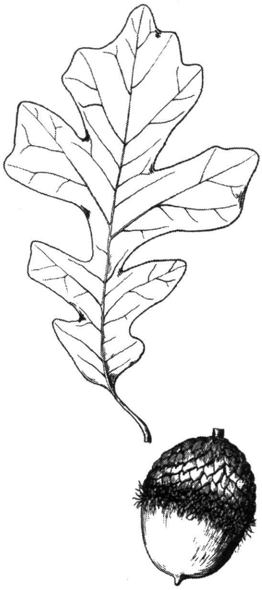
Large tree to 110 feet with thick, dark, grayish bark; deeply-furrowed scaly ridges. Leaves alternate and simple, 6 to 10 inches long, **massively lobed with center nearly cut to midrib**; dark green, shiny above, pale and slightly fuzzy below, on short stalks. Acorn is large, over 1 inch, retained by cap with conspicuous furry margin. Twigs stout, woolly, yellowish- or gray-brown. Bur oak can grow on dry or wet soils. Often found in floodplains, and bordering rivers, swamp forests, bottomlands, coastal lagoon margins, and other seasonably wet habitats. In Great Lakes basin, diminishes in frequency south to north; very rare above Mackinac Bridge.

SWAMP WHITE OAK *Quercus bicolor*

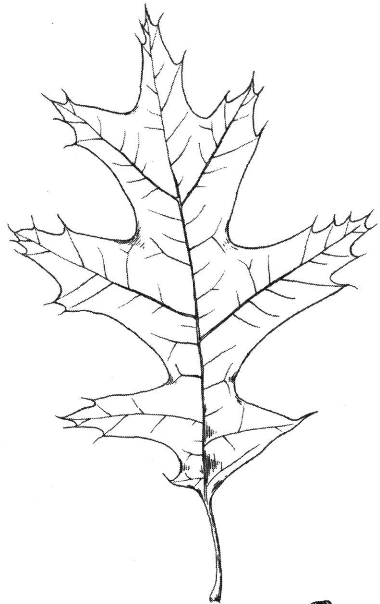
Medium-sized tree to 65 feet. Bark pale gray, thickly fissured into broad, flat-topped ridges. **Leaves alternate, simple, oblong,** with regular lobes along margin, tapering toward stalk, dark green, shiny, fuzzy below. Buds fuzzy. Acorn about 1 inch, cap barely fringed, occurs in pairs on stalk. Moderately shade-tolerant, occurs in virtually same habitats as bur oak, but more southerly in distribution.

PIN OAK *Quercus palustris*

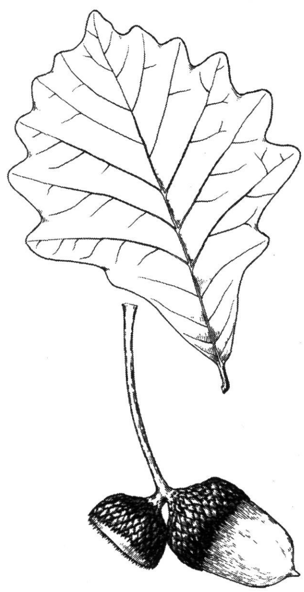
Medium-sized, to 60 feet. Thin, smooth bark when young, changing to shallow, narrow ridges when old. Leaves simple and alternate, smooth, **sharply-pointed lobe tips**, with deep, open sinuses, giving pin oak a light, thin look compared to other oaks. Twigs dark red, woolly when young, stout. Acorns small, to 1/2 inch, cap covers only upper quarter, very bitter to humans. Does best in seasonally wet habitats; can withstand spring and early summer ponding of water around trunk. A tree of southern Michigan and equivalent latitudes.



BUR OAK
Figure 126



PIN OAK
Figure 128



SWAMP WHITE OAK
Figure 127

TAMARACK or LARCH *Larix laricina*

Conifer of medium height to 60 feet, more often 30 to 50, that drops its needles in fall. Bark thin, reddish brown, scaly. **Needles 8 or more per cluster**, about 1 inch long, on short shoots. Trunk is straight, without major divisions, numerous lateral branches diminishing in size to form tall, conical spire.

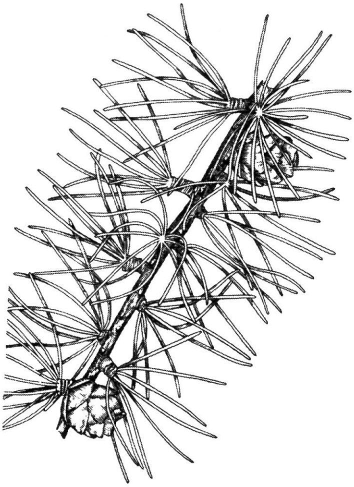
Shade-intolerant, tamarack is found in open swamps and other high water table environments: bog edges, swale openings, wet meadows edges, marsh hummocks. Delicate-looking conifer, detectable at a distance by its form and bright green foliage. Common in the north.

EASTERN HEMLOCK *Tsuga canadensis*

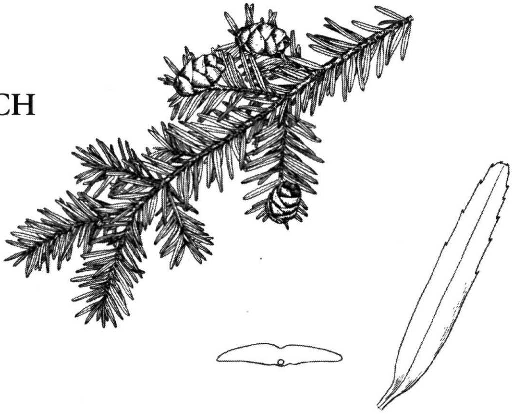
Tall conifer to 90 feet, with slender, dense, lateral branches tapering to conical point. **Extreme top of tree drooping.** Leaves are flat needles about 1/2 inch, arranged spirally around branch, notched near tip, with white band on either side of midrib. Leaves remain throughout the winter. Hemlock prefers cool, wet sites with abundant acid. Found in highly organic, water-logged soils throughout Great Lakes basin, but more frequently in north. Shade-tolerant, usually stands alone because decaying needles make soil very acid around itself, thus precluding invaders.

NORTHERN WHITE CEDAR *Thuja occidentalis*

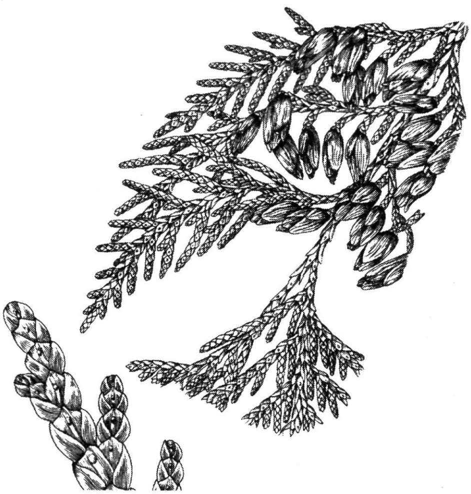
Medium conifer to 50 feet, with **flattened sprays of scale-like leaves hugging twigs**. Bark light reddish-brown, scaling off in long, narrow strips. Leaves in opposing pairs along stem, one row having glandular spots. Very common in northern portions of the Great Lakes, along streams, in swales, on beach barriers, river floodplains. Not the cedar used for cedar closets or cedar hope chests, because wood is only mildly aromatic. Buds, however, are aromatic and can be used to add pleasant cedar odor to drawers and closets. Red cedar *(Juniperus virginiana)* is the aromatic cedar and is seldom found in wetlands.



TAMARACK or LARCH
Figure 129



EASTERN HEMLOCK
Figure 130



NORTHERN WHITE CEDAR
Figure 131

BLACK WILLOW *Salix nigra*

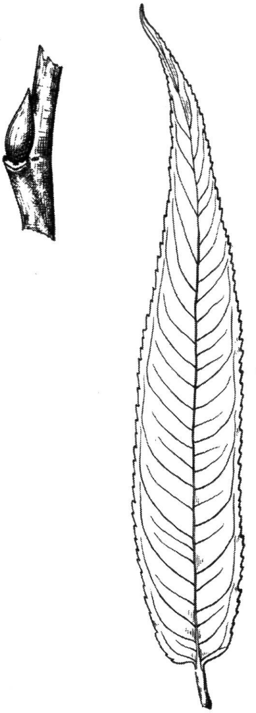
Medium tree to 50 feet, often crooked, much-forked near ground. Bark close to black, deeply divided, long flat-topped connecting ridges, often shaggy. Leaves alternate, simple, long (to 6 inches), fine-toothed, green on both sides, curved at tip; hairy veins below, stalks short. Twigs slender, bright reddish-brown, with heart-shaped stipules covering base of leaf stalks. This willow tolerates root submersion well, often growing right at water line along streams, beach barriers, swales, lagoons. Abundant in southern area, becoming rare or absent above 44 degrees north latitude.

PEACHLEAF WILLOW *Salix amygdaloides*

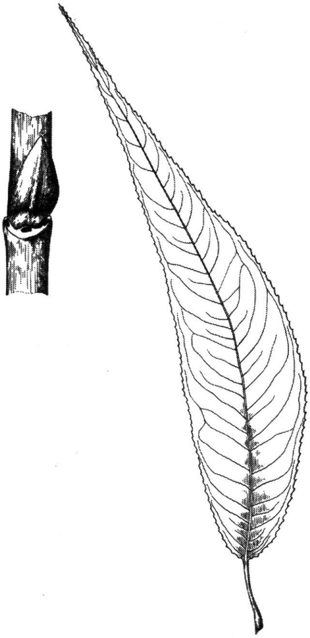
Medium tree to 35 feet, narrow, rounded crown. Leaves to 6 inches, 1 1/2 inches wide, fine-toothed, long pointed, alternate; stipules not present at base of leaf stalks. Bark thin when young, later thick and brown, flat connecting ridges. Twigs lustrous, yellow or orange to reddish-brown. This tree often encountered as shrub of 8 to 15 feet. Common in southern half of basin, rare in north.

WEEPING WILLOW
Salix babylonica or *Salix alba var. tristis*

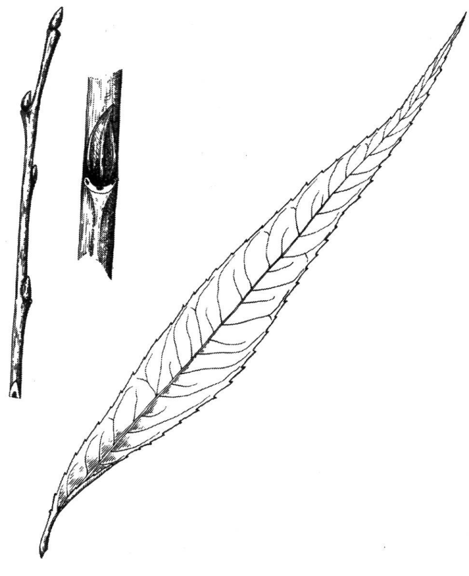
Most distinctive of all willows. Medium tree to 60 feet has long, **dangling, thin branches** growing from stout lateral and ascending limbs, **giving appearance of drooping, green veil of swaying leaves and branches.** Branches will grow to ground if not clipped. Leaves are very narrow and long, to 7 inches, with widely spaced small teeth, dark green above, paler below, stipules usually absent. Plant imported from China as ornamental, now firmly established in southern portions of the Great Lakes. Common along riverbanks and shallow areas near marsh.



BLACK WILLOW
Figure 132



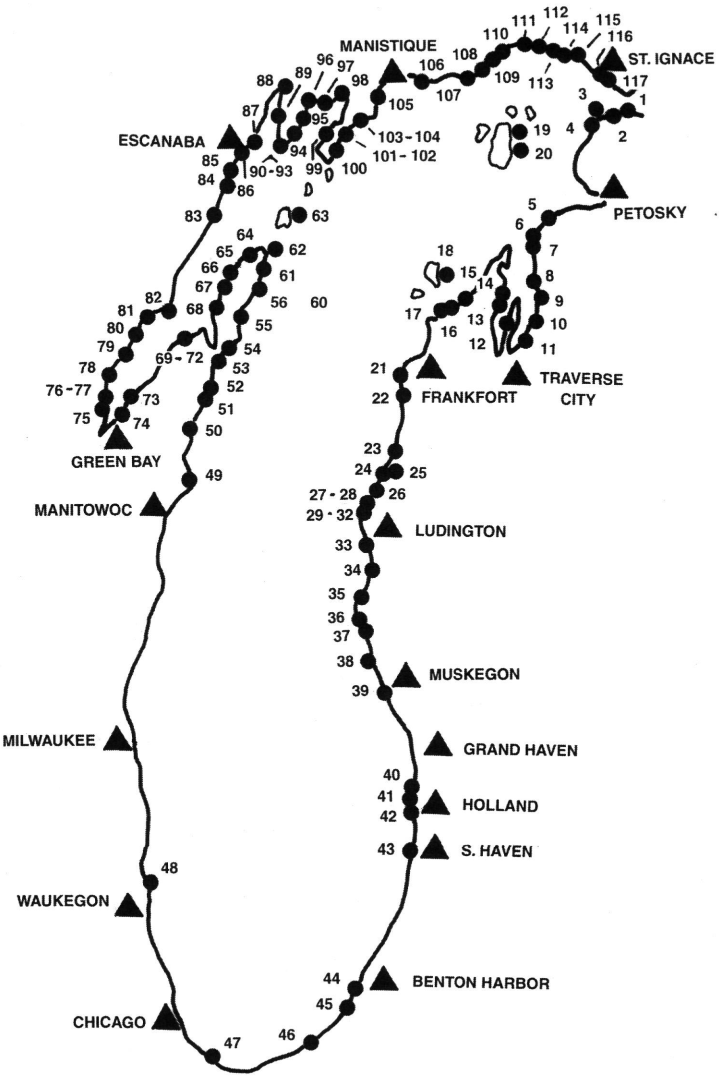
PEACHLEAF WILLOW
Figure 133



WEEPING WILLOW
Figure 134

Appendix A

United States coastal wetlands Over 40 acres in the Great lakes



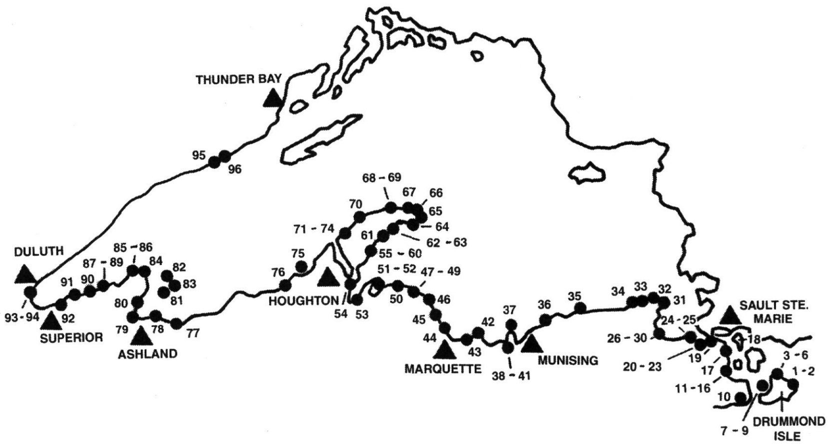
U.S. Coastal Wetlands of Lake Michigan

Table 1. Lake Michigan Coastal Wetlands.
Adapted from Herderndorf (1981).

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
1	Mackinaw City	139	45:46:40	84:44:25
2	Trails End Bay	369	45:44:40	84:47:40
3	Big Stone Pond	185	45:44:20	84:53:40
4	Little Sucker Creek	259	45:44:20	84:56:40
5	McGeach Creek	534	45:17:40	85:18:40
6	Whisky Creek	573	45:14:40	85:22:20
7	Banks Township Complex	86	45:09:00	85:22:20
8	Torch Lake Township #3	642	45:03:00	85:22:00
9	Milton Township #2	224	45:58:00	85:22:40
10	Paradine Creek	87	45:57:00	85:23:00
11	Traverse City Complex	184	45:44:30	85:31:40
12	Bowers Harbor	68	44:54:00	85:31:20
13	Lee Point	59	44:55:40	85:36:30
14	Suttons Bay	105	44:57:23	85:38:00
15	Good Harbor Bay #1	88	45:56:42	85:48:20
16	Good Harbor Bay #2	165	45:56:10	85:49:40
17	Port Oneida	272	45:56:40	85:56:00
18	North Manitou Island Complex	68	45:05:53	86:04:25
19	Beaver Island Complex (North)	77	45:42:50	85:29:50
20	Beaver Island Complex (South)	3695	45:37:50	85:30:50
21	Betsie River	380	44:36:35	86:12:25
22	Arcadia Lake	360	44:29:20	86:13:30
23	Bar Lake Complex	1186	44:19:13	86:16:38
24	Manistee River	9156	44:15:30	86:15:00
25	Little Manistee River	243	44:12:30	86:16:00
26	Filer/Grant Townships	146	44:10:30	86:23:00
27	Big Sable Point	68	44:02:40	86:30:40
28	Rupert Bayou	272	44:04:40	86:27:30
29	Big Sable River	350	44:05:10	86:21:45
30	Hamlin Lake Complex	107	44:03:28	86:27:10
31	North Bayou	175	44:02:40	86:25:58
32	Piney Ridge Area	107	44:01:30	86:28:20
33	Pere Marquette River	6256	43:55:00	86:20:00
34	Bass Lake Complex	165	43:48:40	86:24:50
35	Pentwater River	272	43:45:30	86:24:15
36	Stony Creek	389	43:34:20	86:27:30

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
37	Flower Creek	78	43:28:25	86:27:17
38	White River	3902	43:27:00	86:17:19
39	Muskegon River	6052	43:16:40	86:09:20
40	Little Pigeon Creek	42	43:57:53	86:12:56
41	Pigeon River	90	42:54:11	86:10:54
42	Sloan Pond	66	42:07:59	86:12:26
43	Black River	68	42:24:35	86:16:12
44	Grand Mere Lakes Complex	254	42:00:14	86:32:41
45	Galien River	441	41:48:15	86:43:52
46	Indiana Dunes	404	41:37:30	87:00:00
47	Lake Calumet Complex [1]	1057	41:40:46	87:33:58
48	Illinois Beach State Park Complex	2092	42:26:47	87:48:40
49	Point Beach State Forest	1490	44:13:00	87:31:40
50	Carlton Township	40	44:22:30	87:31:20
51	Kewaunee River Complex	360	44:28:30	87:30:50
52	Threemile Creek	160	44:34:30	87:27:20
53	Rocky Point Complex	1390	44:47:20	87:20:10
54	Lilly Bay	420	44:50:10	87:27:40
55	Whitefish Bay Complex	152	44:55:10	87:12:50
56	Kangaroo Lake Complex	163	45:00:50	87:09:20
57	Baileys Harbor-Ephraim Swamp	5050	45:06:10	87:06:20
58	Toft Point	100	45:04:00	87:05:10
59	Cana Island Complex	80	45:06:10	87:03:20
60	North Bay	2150	45:09:40	87:04:00
61	Rowleys Bay Complex	540	45:13:30	87:02:20
62	Europe Lake Complex	82	45:17:00	86:58:40
63	Washington Island Complex	270	45:24:10	86:53:20
64	Sister Bay	60	45:11:30	87:07:00
65	Tennison Bay	60	45:10:00	87:13:50
66	Juddville Bay	80	45:04:10	87:16:40
67	Horseshoe Point Complex	272	45:00:20	87:20:20
68	Egg Harbor Township	130	44:57:00	87:22:30
69	Sand Bay Area	120	44:51:40	87:28:10
70	Sand Bay Complex	70	44:51:10	87:29:50
71	Little Sturgeon Bay Complex	315	44:49:40	87:32:20
72	Keyes Creek	70	44:49:50	87:34:20
73	Point au Sable	112	44:34:40	87:53:50
74	Whitney Slough	457	44:31:25	87:57:00
75	Atkinson Marsh Complex	509	44:33:30	88:02:10
76	Dead Horse Bay Complex	322	44:36:00	88:01:00

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
77	Long Tail Point Complex	163	44:36:40	88:00:05
78	Little Tail Point Complex	210	44:40:30	88:59:50
79	Charles Pond Area Complex	170	44:45:30	87:56:10
80	Pensaukee River Complex	490	44:49:00	87:54:30
81	Oconto Marsh	9370	44:54:30	87:51:00
82	Peshtigo River	5040	44:59:30	87:41:00
83	Cedar River Complex	1556	45:24:00	87:20:00
84	Henderson Lakes	253	45:36:30	87:13:30
85	Ford River Complex	389	45:40:20	87:09:40
86	Portage Marsh	1302	45:42:30	87:06:20
87	Escanaba City	49	45:43:50	87:03:50
88	Whitefish River Complex	641	45:55:10	86:57:20
89	Squaw Point	729	45:48:50	86:58:40
90	Deepwater Point Complex	265	45:42:50	86:58:50
91	Peninsula Point	58	45:41:20	86:57:10
92	Wedens Bay	49	45:42:40	86:54:00
93	Granskog Creek Complex	729	45:43:40	86:51:00
94	Sand Bay Complex	181	45:46:30	86:49:40
95	Martin Bay Complex	514	45:47:50	86:47:50
96	Ogontz Bay Complex	1759	45:50:30	86:45:40
97	Sturgeon River	6697	45:52:20	86:40:20
98	Big Bay De Noc Complex	9555	45:55:20	86:33:00
99	South River Bay	112	45:44:10	86:37:50
100	Sucker Lake	292	45:40:44	86:35:40
101	Portage Bay Complex	1068	45:45:00	86:32:00
102	Delta County Border	107	45:45:50	86:29:00
103	Point O'Keefe Complex	107	45:45:50	86:27:00
104	Little Harbor Complex	138	45:47:35	86:22:40
105	Stony Point Area	4355	45:56:50	86:17:40
106	Seul Choix Point Complex	5835	45:56:40	85:55:52
107	Seiners Point Complex	57	45:58:24	85:49:45
108	Point Patterson Complex	1481	45:59:20	85:39:30
109	McNeil Creek	369	46:04:00	85:33:42
110	Garfield Township Complex	202	46:06:50	85:28:40
111	Lower Millecoquins River Area	104	46:05:00	85:28:40
112	Millecoquins Point Complex	87	46:05:30	85:27:40
113	Mattix Creek	1469	46:06:00	85:23:10
114	Pacquin Creek	415	46:04:10	85:13:40
115	Epoufette Complex	91	46:03:22	85:11:40
116	Pointe Aux Chenes Complex	3038	45:55:00	84:51:00



U.S. Coastal Wetlands of Lake Superior

Table 2. Lake Superior Coastal Wetlands, U.S. only.
Adapted from Herderndorf (1981).

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
1	Sitgreaves Bay # 2	130	45:59:41	83:30:53
2	Glen Cove Complex	101	46:00:02	83:31:32
3	Raynolds Bay Area	78	46:05:26	83:36:44
4	Dawson Lake	367	46:05:41	83:38:40
5	Grand Marais Lake	170	46:05:48	83:40:36
6	Northwest Drummond Island Complex	140	46:04:58	83:42:41
7	Paw Point-North Scott Bay	450	46:04:01	83:39:48
8	Potagannissing River Mouth	73	46:02:13	83:40:24
9	Stringham Lake	50	46:00:32	83:50:22
10	Maud Bay Area	90	46:01:11	83:57:16
11	Raber Bay	1595	46:06:58	84:03:24
12	Munuscong Lake # 1	95	46:08:32	84:06:20
13	Gogomain River	982	46:09:52	84:07:22
14	Roach Point	946	46:09:59	84:10:18
15	West Munuscong Lake Complex [1]	1849	46:13:25	84:15:02
16	Neebish Island Complex	2010	46:14:18	84:07:55
17	Lake Nicolet West Shore	252	46:20:36	84:13:15
18	Sugar Island Complex [2]	3257	46:22:42	84:11:58
19	Izaak Walton Bay Complex	195	46:27:26	84:25:10
20	Birch Point Area	65	46:25:38	84:31:08
21	Back Bay	85	46:26:34	84:35:56
22	South Pond	120	46:26:53	84:35:54
23	North Pond	57	46:27:47	84:36:46
24	Nodaway Point	175	46:28:56	84:40:31
25	Pendills Creek Complex	160	46:27:08	84:44:58
26	Naomikong Point	83	46:29:10	84:56:30
27	South Tahquamenon Bay	1200	46:28:12	84:59:51
28	West Tahquamenon Bay	1110	46:31:42	85:03:35
29	Tahquamenon River	2545	46:35:09	85:03:22
30	Whitefish Bay	1442	46:39:38	85:02:37
31	Whitefish Point	230	46:45:59	84:59:20
32	Weatherhogs Creek	715	46:45:28	85:07:26
33	Whitefish Township	75	46:45:35	85:11:02
34	Brown Creek	235	46:45:11	85:12:30
35	Sucker River	266	46:40:05	85:55:48
36	Pictured Rocks Area Complex	886	46:30:08	86:30:48
37	Grand Island Complex	705	46:31:37	86:49:56

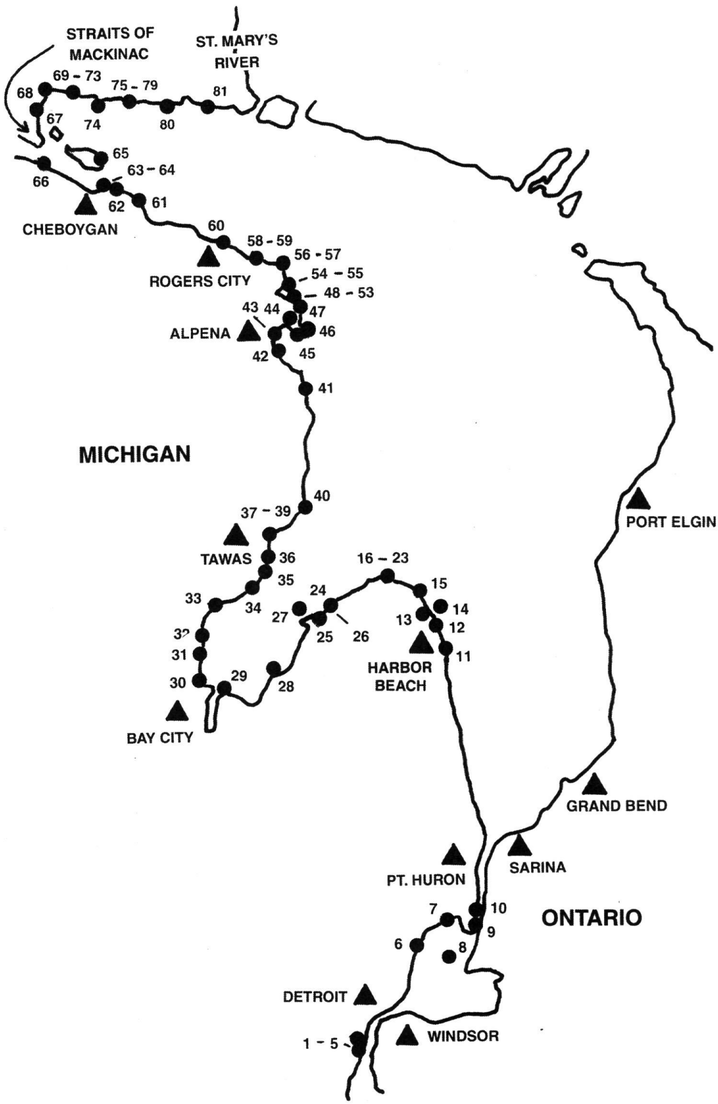
Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
38	Powell Point	535	46:26:08	86:40:45
39	Fivemile Point	75	46:28:36	86:44:47
40	Au Train Point Area	55	46:28:26	86:46:20
41	Au Train Bay Complex	575	46:27:20	86:48:10
42	Laughing Fish Point Area Complex	167	46:31:02	87:03:53
43	Shot Point	360	46:29:44	87:10:01
44	Middle Bay	225	46:30:55	87:25:09
45	Big Garlic River	450	46:42:04	87:33:59
46	Yellow Dog Point Area Complex	155	46:47:20	87:36:38
47	Iron River	95	46:49:00	87:39:50
48	Big Bay Complex	405	46:49:28	87:42:34
49	Salmon Trout River	1480	46:51:15	87:47:09
50	Huron Mountains Area Complex	185	46:54:30	88:02:30
51	Lightfoot Bay	385	46:54:00	88:11:19
52	Reeds Point Area Complex	85	46:54:38	88:12:17
53	Keweenaw Bay Complex	1190	46:51:15	88:22:25
54	Sturgeon River-Snake Delta	8155	47:00:06	88:29:39
55	Pike River	90	47:01:06	88:31:41
56	Oskar Area	270	47:11:01	88:38:12
57	Torch Lake	1180	47:08:40	88:25:08
58	Dollar Bay	202	47:07:36	88:28:48
59	White City Area Complex	70	46:58:40	88:26:00
60	LeChance Creek	475	47:01:52	88:22:57
61	Grand Traverse Bay	685	47:10:54	88:13:27
62	Oliver Bay Complex	475	47:20:42	87:57:16
63	Lac Labelle Complex	2110	47:22:40	87:58:44
64	Big Bay	325	47:24:02	87:47:08
65	Manitou Island	80	47:25:10	87:36:27
66	Lake Lily	147	47:28:04	87:49:24
67	Agate Harbor Complex	203	47:27:59	88:02:48
68	Cedar Swamp Area Complex	525	47:27:23	88:08:40
69	The Marshes Area Complex	658	47:26:39	88:11:58
70	Mud Lake	350	47:21:31	88:25:06
71	Gratiot River	105	47:20:30	88:26:51
72	Brewery Creek Area Complex	200	47:18:31	88:28:34
73	Sevenmile Creek Complex	128	47:14:21	88:34:43
74	Bear Lake	175	47:13:40	88:35:57
75	Fourteen Mile Point	130	46:59:22	89:07:18
76	Flintsteel Mile River Area Complex	355	46:54:34	89:13:32
77	Graveyard Creek	125	46:34:21	90:29:30

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
78	Chequamegon	9510	46:38:10	90:41:42
79	Fish Creek	780	46:35:14	90:56:07
80	Sioux River	202	46:44:43	90:53:19
81	Madeline Island Complex	980	46:48:25	90:41:19
82	Stockton Island Complex	333	46:55:15	90:33:16
83	Michigan Island Complex	193	46:53:07	90:28:57
84	Raspberry Bay	140	46:55:49	90:49:30
85	Sand River	235	46:55:50	90:56:13
86	Sand Island	126	46:59:12	90:56:20
87	Siskiwit River	250	46:51:09	90:06:50
88	Bark Bay	680	46:50:54	91:11:48
89	Cranberry River	85	46:49:36	91:16:00
90	Bibon Lake - Flag River	930	46:47:10	91:22:58
91	Bois Brule River Area Complex	70	46:44:50	91:36:40
92	Allouez Bay	365	46:40:52	91:58:57
93	Nemadja River Complex	97	46:41:38	92:01:57
94	St. Louis River Complex [3]	1084	46:39:57	92:11:35
95	Hovland Area	10	47:50:43	89:56:31
96	Paradise Beach Area Complex	45	47:47:46	90:07:06

[1]Eleven parcels around the bay

[2]Eight parcels around the island

[3]A diverse complex of 25 parcels near the St. Louis River.



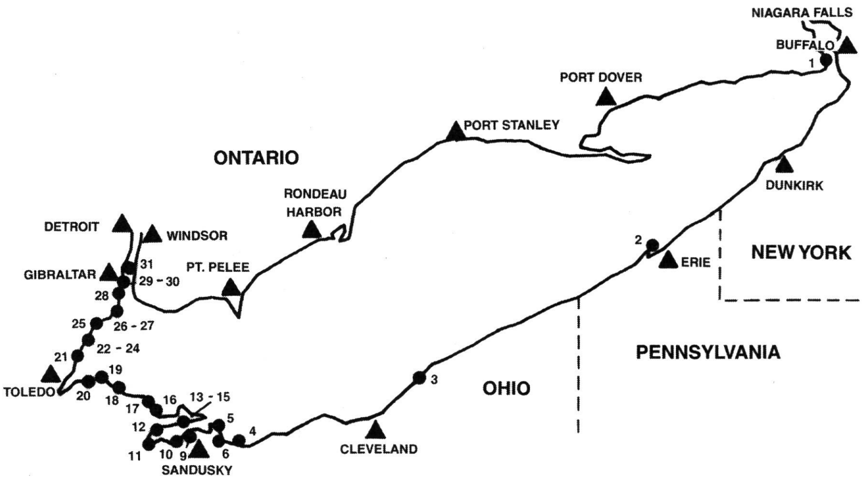
U.S. Coastal Wetlands of Lake Huron

Table 3. Lake Huron Coastal Wetlands, U.S. only.
Adapted from Herderndorf (1981).

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
1	Trenton Channel	45	42:10:28	83:09:24
2	Elba Island	80	42:06:04	83:09:02
3	Stony Island	65	42:07:32	83:07:56
4	No. 2 Drain	110	42:06:26	83:11:20
5	Grassy Island	48	46:13:22	83:08:04
6	Clinton River Complex	585	42:34:56	82:48:00
7	Swan Creek	77	42:41:07	82:39:30
8	St. Clair Flats Complex	8096	42:36:07	82:39:12
9	Point aux Tremble	60	42:37:26	82:35:14
10	Algonac	260	42:38:25	82:31:32
11	Purdy Bay	65	43:45:36	82:37:01
12	Old Shore Road Area	105	43:52:05	82:39:27
13	St. Margaret Mission	75	43:52:53	82:40:34
14	Hardwood Point	195	43:55:04	82:41:31
15	Gore Township	167	43:58:11	82:43:30
16	Whiskey Harbor	40	43:59:35	82:44:47
17	North Gore Township	235	44:00:15	82:45:49
18	Bald Eagle Point Area	120	44:01:48	82:49:07
19	Willow Creek	272	44:02:09	82:50:18
20	Burnt Cabin Point	245	44:03:54	82:55:31
21	Pointe aux Barques	360	44:03:21	82:58:25
22	Flat Rock Point Area	97	44:02:06	83:01:43
23	Hat Point	865	43:59:44	83:07:17
24	Albert Sleeper State Park	1730	43:58:17	83:13:58
25	Caseville Township	1640	43:54:39	83:18:18
26	Wildfowl Bay	317	43:52:28	83:20:25
27	North Island	60	43:52:45	83:25:39
28	East Saginaw Bay Coastal	16730	43:40:58	83:34:04
29	Alpin Beach	97	43:39:09	83:51:53
30	Tobico Marsh	585	43:41:45	83:55:39
31	Linwood Area	85	43:44:05	83:56:49
32	Nayanguing Point Wildlife Area	2135	43:49:50	83:55:04
33	West Saginaw Bay	7235	44:00:50	83:45:05
34	Schnitzelbank Creek	2640	44:04:06	83:37:27
35	Whitestone Point Area	537	44:06:53	83:34:20
36	Pine Wood Park Area	85	44:10:25	83:33:46

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
37	Benson Park Area	45	44:12:28	83:33:18
38	Lake Huron Beach Area	65	43:14:22	83:32:45
39	Tawas Point	820	44:17:10	83:25:55
40	Au Sable point	130	44:20:08	83:20:56
41	South Thunder Bay	7241	44:51:22	83:20:34
42	Squaw Bay	777	44:59:21	83:24:34
43	South Alpena Area	385	45:01:12	83:27:10
44	Whitefish Bay	180	45:04:38	83:22:18
45	North Thunder Bay Complex	47	45:02:30	83:20:15
46	Sugar Island	40	45:02:43	83:13:22
47	Misery Bay	1885	45:04:33	83:19:22
48	El Cajon Beach #1	45	45:05:49	83:18:26
49	Morris Bay	45	45:08:34	83:20:14
50	Long Lake Creek	110	45:09:16	83:21:16
51	Middle Island	45	45:11:32	83:19:42
52	Rockport Area Complex	80	45:10:40	83:22:29
53	Ferron Point Area Complex	47	45:13:13	83:23:57
54	Black Lake State Forest	522	45:13:51	83:25:18
55	Bell River	335	45:16:10	83:25:00
56	Wreck Point	200	45:18:05	83:26:12
57	Presque Isle Harbor	65	45:20:05	83:28:58
58	Thompsons Harbor	82	45:20:53	83:34:37
59	West Thompsons Harbor	240	45:21:18	83:36:13
60	Swan Lake Area	770	45:23:24	83:43:27
61	Mulligan Creek Area	360	45:35:49	84:10:40
62	Ninemile Point Area Complex	50	45:37:58	84:13:10
63	Cheboygan Point	830	45:39:22	84:24:43
64	Cheboygan Area Complex	242	45:39:15	84:28:10
65	Bois Blanc Island Complex	2128	45:46:50	84:29:44
66	Edgewater Beach Area Complex	98	45:45:51	84:43:17
67	Hiawatha National Forest	no data	no data	no data
68	Charles	86	46:01:10	84:42:02

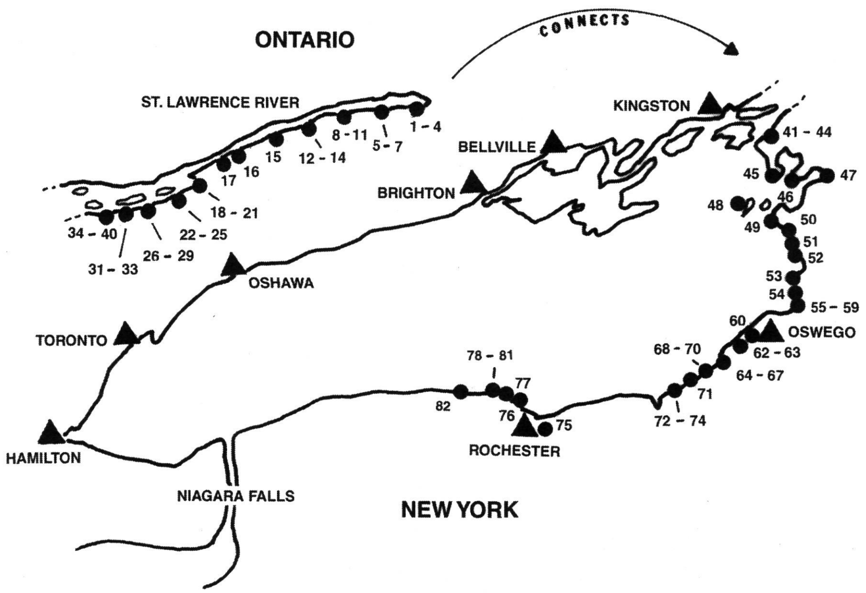
Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
69	St. Martin Bay	4109	46:01:12	84:30:47
70	St. Martin Point	240	45:58:41	84:31:25
71	Big St .Martin Island	no data	no data	no data
72	St. Martin Island	100	45:58:44	84:34:15
73	Mismer-Hessel Bay Complex	460	46:00:46	84:28:29
74	Marquette Island Complex	244	45:56:55	84:23:14
75	LaSalle Island Complex	71	45:59:13	84:20:52
76	Flowers Creek	40	45:59:44	84:19:05
77	Bush Bay	45	45:59:09	84:15:08
78	Prentiss Bay	90	45:59:26	84:13:43
79	Scotty Bay	40	45:58:52	84:12:12
80	St. Vital Bay Complex	28	45:58:20	83:57:08
81	Drummond Isle Complex	177	no data	no data



U.S. Coastal Wetlands of Lake Erie

Table 4. Lake Erie Coastal Wetlands, U.S. only.
Adapted from Herderndorf (1981).

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
1	Grand Island Complex	357	43:03:38	78:59:20
2	Presque Island Complex	374	42:10:04	80:05:40
3	Mentor Area Complex	726	41:43:56	81:18:56
4	Old Woman Creek	158	41:22:32	82:30:50
5	Sawmill Creek Complex	84	41:24:55	82:35:48
6	Plum Brook Area Complex	92	41:25:43	82:37:40
7	Hemming Ditch	177.5	41:26:06	82:39:22
8	Big Island Complex	256	41:26:47	82:40:12
9	Bay View	640	41:27:30	82:48:18
10	Willow Point Complex	215	41:26:19	82:52:39
11	Muddy Creek Bay	3122	41:26:58	83:00:33
12	Port Clinton	150	41:28:30	82:56:58
13	Lockwood Road	72	41:29:19	82:53:33
14	Portage	70	41:29:51	82:51:30
15	Bay Point	45	41:29:50	82:42:40
16	Ottawa Wildlife Refuge	559	41:31:54	82:59:28
17	Toussaint River Complex	2660	41:35:10	83:04:43
18	Ottawa Complex	3858	41:37:18	83:12:56
19	Cedar Point Natl Wildlife Refuge	1591	41:40:48	83:19:14
20	Otter Creek	70	41:41:06	83:27:30
21	North Maumee Bay Complex	1419	41:46:15	83:26:20
22	Luna Pier	55	41:48:13	83:26:50
23	Toledo Beach	310	41:49:42	83:25:35
24	Otter Creek	165	41:50:48	83:25:13
25	River Raisin Complex	134	41:53:36	83:21:10
26	Stony Point	54	41:56:39	83:16:16
27	Enrico Fermi	65	41:57:18	83:15:46
28	Mouille Marsh	1367	42:01:03	83:11:55
29	Rockwood Road	180	42:03:55	83:11:48
30	Cherry Isle	120	42:04:33	83:11:40
31	Celeron Island	80	42:04:43	83:10:18



U.S. Coastal Wetlands of Lake Ontario

Table 5. Lake Ontario Coastal Wetlands, U.S. only.
Adapted from Herderndorf (1981).

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
1	East St. Lawrence State Park	150	44:59:38	74:47:48
2	West St. Lawrence State Park	125	44:59:10	74:51:02
3	Robinson Creek Area	40	44:58:22	74:50:22
4	Hopsons Bay	60	44:59:04	74:53:32
5	Croil Islands Complex	64	44:58:08	74:59:38
6	Wilson Hill-Bradford Island Complex	67	44:55:26	75:03:12
7	Willard Road	55	44:55:18	75:00:40
8	Coles Creek	72	44:53:38	75:06:34
9	Brandy Brook	80	44:52:04	75:09:32
10	Little Sucker Brook	140	44:51:44	75:10:30
11	Sucker Brook Area	40	44:51:05	75:13:34
12	River Road	40	44:50:52	75:15:25
13	Whitehouse Bay	45	44:50:30	75:16:08
14	Sparrowhawk Point	152	44:47:56	75:19:56
15	Ogdensburg East Area	43	44:42:31	75:28:18
16	Cartier State Park Complex	145	44:34:26	75:39:40
17	Point Comfort Area Complex	72	44:32:30	75:42:38
18	Blind Bay Area Complex	85	44:28:06	75:46:30
19	Chippewa Creek Marsh	680	44:28:24	75:44:00
20	Oak Island Marsh	140	44:25:32	75:47:45
21	Crooked Creek	850	44:22:47	75:48:48
22	Goose Bay Marsh	140	44:22:34	75:50:50
23	Goose Bay-Cranberry Creek Marsh	375	44:21:22	75:52:08
24	Point Vivian Marsh	40	44:18:46	75:57:00
25	Swan Bay Marsh	72	44:18:18	75:57:52
26	Westminster Marsh	150	44:20:28	75:56:48
27	Densmore Area	100	44:19:46	75:57:28
28	Barnett Marsh	175	44:19:32	75:58:22
29	Barnett Area	50	44:18:18	75:57:50
30	Eal Bay Marshes	170	44:19:30	76:00:46
31	Flatiron Marsh	85	44:19:25	76:02:30
32	Wellesley Island Interior	100	44:18:42	76:00:50
33	Rift Area	120	44:20:45	76:58:30
34	Mullet Creek Area Complex	86	44:15:58	76:00:18
35	Blind Bay Complex	95	44:15:50	76:01:04

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
41	Wilson Bay Marsh	170	44:05:38	76:20:28
42	Mud Bay Marsh	233	44:04:50	76:18:56
43	Fox Island Complex	170	44:02:18	76:19:40
44	Little Fox Creek Marsh	50	44:03:02	76:17:28
45	Point Peninsula Marsh	330	43:59:05	76:15:43
46	Chaumont Bay Complex	192	44:00:48	76:16:52
47	Black River Bay Complex	778	43:58:38	76:04:06
48	Galloo Island	200	43:54:26	76:24:14
49	Ray Bay Complex	238	43:50:46	76:16:06
50	Black Pond Complex	439	43:47:46	76:11:52
51	Southwick Beach Marshes	240	43:45:54	76:12:18
52	Cranberry Pond Marsh	78	43:41:18	76:11:26
53	Little Sandy Creek Marsh	75	43:38:16	76:09:52
54	Deer Creek Complex	1350	43:35:48	76:11:08
55	Grindstone Creek Marsh	65	43:32:52	76:12:42
56	Ramona Beach Marsh	80	43:31:58	76:13:24
57	Sage Creek Complex	97	43:31:44	76:13:50
58	Little Salmon River Marsh	65	43:31:10	76:15:14
59	Butterfly Swamp Complex	406	43:30:48	76:16:54
60	Rice Creek Marsh	40	43:26:28	76:33:54
61	Snake Creek Marsh	135	43:26:00	76:35:00
62	Health Camp-Camp Road Marsh	40	43:25:04	76:36:38
63	Moon Beach Complex	139	43:23:00	76:38:42
64	Sterling Creek Complex	911	43:21:02	76:41:08
65	Blind Sodus Bay Area #1	87	43:19:54	76:44:18
66	Black Creek	508	43:18:34	76:44:52
67	Red Creek	344	43:18:02	76:46:48
68	North Wolcott Township Complex	223	43:17:32	76:48:54
69	Port Bay	414	43:15:48	76:49:18
70	Beaver Creek	405	43:16:56	76:50:44
71	Brush Marsh	90	43:17:25	76:52:05
72	East Bay	1253	43:16:17	76:54:10
73	Root Swamp	180	43:16:34	76:55:54
74	Sodus Bay	740	43:14:10	76:56:40
75	Irondequoit Bay	165	43:11:08	77:31:30
76	Round Pond	225	43:16:23	77:39:13
77	Buck Pond	355	43:16:58	77:40:20

Number	Name of Wetland	Acreage	Latitude Deg., Min., Sec	Longitude Deg., Min., Sec.
78	Braddock Bay-Cranberry Pond	200	43:17:55	77:42:40
79	Braddock Bay	392	43:18:20	77:43:26
80	Payne Beach Area	125	43:19:39	77:44:04
81	Lighthouse Beach Complex	70	43:20:07	77:45:26
82	Sandy Harbor	75	43:21:30	77:56:02

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Acknowledgments

Part 1

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Part 2

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Glossary

Adventive taxa. Plants non-native to an area, arriving after European settlement.

Affluent. The water flowing into a lake from a river.

Aging (of a lake). The enrichment of waters, prolific growth of aquatic vegetation, and sedimentation which accelerate *aging*, shortening a lake's life.

Alluvion. Detritus and sediments deposited by streams or the action of waves and currents. Alluvion contributes to the gradual accretion of land.

Alluvium. The sediments (or detrital matter) carried by inflowing streams, and deposited on lake bottoms.

Anoxic. Without oxygen; anaerobic.

Aquatic plants. Plants whose seeds germinate in water or in lake bottom soil. Usually refers to submersed or floating leaved types.

Backshore. That part of the shore from the first beach crest landward.

Barrier beach. A strip of land built up by the action of the waves, currents, and winds. The barrier beach protects inner areas.

Bay (embayment). A recess in the shoreline, not restricted to a single form or shape. A bay may be a lobe of water extend ing deeply inland and enclosed by headlands, or it may be half-moon shaped. Coves are small bays.

Bay head. That portion of a bay which lies farthest from the main water body. It is usually the calmest portion of the bay.

Bay mouth. That portion of the bay in contact with the main water body, serving as a connection with it; the entrance to a bay.

Beach. Commonly composed of sand and gravel, though it can be any material, beach from the water line back to the ordinary high water mark.

Beach berm. One or more ridges running parallel to the beach, formed by the deposition of material from storm waves and blowing sand. If the beach berm is large and undulating, it is usually called a dune.

Beach crest. A ridge or berm that marks the landward limit of normal wave activity. The first beach berm is the beach crest. Often a temporary feature.

Beach pool (or swale). A small incidental body behind the beach shoreline, or a shallow lagoon behind a beach ridge.

Beach ridges (ancient). Ridges of beach material left by falling lake levels. As the Great Lakes rose and fell after glaciation, they left many old, stranded beaches, far from today's waterline.

Bulrush. Common name given to several species of *Scirpus.* It is not a true rush, but rather a sedge.

Coast. Land bordering seas, oceans, and the Great Lakes. Not used for inland lakes.

Cove. A small bay on inland lakes. Not usually used with Great Lakes.

Delta. The low—nearly flat—alluvial tract of land deposited at or near a river's mouth, commonly forming a fan-shaped plain of considerable area enclosed and crossed by many distributaries of the main river.

Detritus. Minute particles of decaying plant and animal remains. Detritus may include inorganic material.

Dike. An embankment built to protect land from inundation or erosion, or to control wetlands water levels.

Distributary channels. A system of divergent streams flowing away from the main stream, and not returning to it, as in a delta or alluvial plain.

Drawdown. Process of partially or completely dewatering a wetland with pumps or other mechanical devices. The purpose of a draw down is to manage vegetation and wildlife.

Drowned valley lakes. Lakes, usually at the mouths of rivers, formed when the water level rises, and a narrow outlet drains the water shed to the main lake. If the outlet closes, the lake is landlocked.

Dune. A sand formation of large mounds and valleys adjacent to a coast. May go back to a mile inland, but several hundred yards is more typical.
Ecotone. A zone of mixed vegetation formed by a transition from one vegetative type to another.
Effluent. Water flowing out of a lake or river.
Emergent aquatic plants. Rooted plants growing in shallow water with a portion of their stems and leaves growing above the water surface.
Fill. Sand, gravel, spoil from dredging, or other material placed on submerged land or low shore land.
Fetch. The distance wind can blow unobstructed over water. The greater the fetch, the larger the waves for a given wind speed.
Flats. Low-lying, exposed land of a lake delta or of a lake bottom, composed of unconsolidated sediments, usually mud or sand.
Floating-leaved plants. A free-floating plant such as the duckweeds; or one that is rooted to the bottom but has floating leaves such as the white water lily.
Floodplain. That part of a lake or river basin lying between the shoreline and the uplands, subject to submergence during a high water stage.
Habitat. A place where a plant or animal species lives and grows; an organism's natural abode and immediate surroundings.
Hummock. A mound standing above the soil level of the immediate area, usually overgrown with vegetation.
Hydrophyte. Any plant growing in water or on a substrate that is at least periodically saturated with water. The term includes wetland plants.
Interdistributary bay. An embayment formed between two adjacent distributary channels and their levee deposits on the open water face of a delta.
In the lee. Being sheltered by an island, sandspit or beach barrier. Wind and/or waves are interrupted at this point.
Lacustrine. Pertaining to, produced by, or formed in a lake. Lacustrine wetlands are those that extend into a lake and are subject to waves and currents.

Lagoon. A shallow body of still water, normally separated from a larger body of water by a narrow barrier, but occa sionally having a connection.

Lake plain. The nearly flat bed of an extinct lake, or the flat lowland bordering an existing lake.

Lake senescence. The aging process of a wetland or lake resulting from sediment deposition and filling of vegetation.

Lee shore. As viewed from a boat, the shore which lies in the same direction as the prevailing winds are blowing to. It is not protected from strong wave action, but has breakers. Compare with In the lee.

Leeward. The direction toward which the wind is blowing.

Limnology. The study of the physical, chemical, geological, meteorological, biological, and ecological conditions of lakes. Oceanography is the study of the same specialities for marine (salt) waters.

Littoral drift. The sedimentary and detrital material moved along the coast or the littoral zone by waves and alongshore currents.

Littoral zone. The shallow, near-shore region from zero depth to the outer edge of the rooted plants, or approximately 10 feet deep.

Macrophytes. All visible plants in any habitat, not the microscopic algae or bacteria.

Marl. A mixture of clay and the carbonates of calcium and magnesium, from precipitation, shells, and limestone. Common substrate of the Great Lakes littoral zone, especially in the north.

Marsh. A wetland dominated by herbaceous (non-woody) vegetation. A marsh does not have a canopy of large trees, is open to the sun, and is dominated by grasses, emergents, sedges, and reeds.

Mud. Organic and inorganic bottom deposits that are colloi dal in nature, black or brown, soft, mushy, or slimy.

Mud flats. The bare flat bottoms of lakes and wetlands exposed by a drop in water level. A mud bar is exposed by accretion of sediments.

Native taxa. Plants that grew in an area before European settlement.

Natural levee. A long, low ridge of sand and silt built by a river or stream on its banks during flood times.

Onshore wind. Blowing to the beach or shore. Wind can use its full fetch, thus building large waves.

Palustrine wetlands. A wetland not a part of a main lake and not subject to the main lake's intensive wave or current affects.Peat. Undecomposed plant material which has built up to considerable depth in bogs, swamps, or other wet lands.

Pocket beach. A beach at the head of a bay. Here wave energy is lowest and deposition highest. A pocket bay often has fringe wetlands.

Pondweeds. A popular name applied to nearly any species of wetland plant that is wholly or partly submerged.

Raised beach. An old beach at an elevation above the present beach. The terrace represents a former higher lake level.

Recession. Lowering of the lake's water line, with a corresponding exposure of the lake bottom.

Reeds. Tall, thin wetland plants of the genus *Phragmites* and *Sparganium.* This term is applied incorrectly to bulrushes.

Reliction. The exposure of lake bottom by natural recession of the shoreline. A relicted shore is usually devoid of vegetation.

Relief. The difference in elevation between the highest and lowest land in a particular region.

Riparian. A person with rights to water usage and perhaps the water bottom by virtue of owing property along a shore.

Riverine. Pertaining to or formed by a river.

Rivermouth. The opening where a river empties into a lake.

Sapropel. A gaseous product of decomposition from organi cally rich bottom sediments. Sapropel is formed under *anaerobic* conditions and has the fetid odor of hydrogen sulfide. It is common in marches.

Seiche. A rapid and often violent fluctuation in water level within a lake or embayment usually due to sudden changes in barometric pressure.

Set-up (wind). The pushing of water to one side of a lake due to wind, with a corresponding drop in water level on the other side. A wind set-up can be several feet. See storm surge.

Shoreline. The point where the water meets the land. A shoreline can change often due to water level variations.

Storm surge. Preceding and during a storm, an abnormal, sudden rise in lake level along the coast caused primarily by strong onshore winds or atmospheric pressure changes.

Submergent vegetation. Plants that have their stems and leaves below the water surface. They may have some flowering parts above.

Substrate. A general term used to refer to the soil or sediments, whether submerged or not. Substrate may be composed of any material.

Swale. A wet depression between beach ridges, fed by ground water and runoff. A swale is rarely influenced by lake level changes.

Swamp. A shady wetland dominated by woody plants, shrubs, and trees tolerant of water-logged soils. A swamp may or may not have standing water most of the year, but it always has moist soil.

Swash. Water carried up the slope of a shore by the advancing breaking waves. Same as a run-up.

Swash marks. A shoreline feature of concentrated debris running parallel to thewater, marking the furthest advance of swash or the last high tide.

Swash zone. The area on a beach or any shore above the water line, covered and uncovered by uprushing water (swash).

Transgressive beach. A new beach deposited during the advance or encroachment of the water over the land. High water or storms often destroy old beach and make a new barrier further inland, or old beach may be overtopped by a new beach of fresh material, more inland.

Watershed. The entire surface drainage area that contributes water to a creek, stream, river, or lake.

Weeds. A common term for various types of submerged and emergent plants in shallow water.

Wet beach. An area of a beach covered by ordinary wave water. It is usually flat, firm, and devoid of plants.

Wetlands. An area where saturation or inundation with water is the dominant factor determining the nature of the soil's development, and the plant and animal communities found there. The term *wetlands* includes marshes, swamps, bogs, wet meadows, potholes, lake and river margins, sloughs, bayous, and often river flood plains.

Windward. The direction from which the wind is blowing.

Windward shore. As viewed from a boat, the shore from which the prevailing winds are blowing. It is thus protected from strong wave action until the wind changes direction. A boat will be in the lee of such a shore; that is, downwind from it. Compare with leeshore.

Zooplankton. Animal microorganisms, such as small crusta ceans, rotifers, and protozoans floating in the water. They graze on phytoplankton and each other.

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The Michigan Sea Grant College Program is a joint effort of the University of Michigan and Michigan State University, funded by the National Oceanic and Atmospheric Administration, to conduct research, outreach and education on Great Lakes issues.

This project was funded in part under the Coastal Zone Management Act of 1972, as amended, with funds provided through the office of Ocean and Coastal Resource Management, the National Oceanic and Atmospheric Administration, US Department of Commerce, and the Michigan Coastal Management Program, Michigan Department of Enironmental Quality.

Printed on Recycled Paper

Sea Grant
Michigan

MICHU-SG-98-506
ISBN: 1-885756-09-07