

LESSON 10. BOTTOMLAND FORESTS, SWAMPS, AND BOGS

At one time Illinois was a very wet place to live with nearly 20 percent of the land being classified as wetlands. Wetlands are generally described as land where water is a key factor determining both soil development and the plant and animal communities living in the soil and on its surface. In wetlands the water table is usually at or near the surface of the ground. Sometimes, however, wetlands are in areas where sufficient moisture is available to fill depressions for extended periods of time. Also, the soils are hydric, wet for most of the year, low in oxygen, and covered with plants that are adapted to life in water or grow in hydric soils (hydrophytes). These transitional areas between terrestrial and aquatic systems are extremely variable and contain the highest diversity of plant and animal species in the state.

Many different and diverse community types are classified as wetlands. In the broad sense, wetlands include some areas that are mostly open water such as ponds and sloughs, as well as many grassland and forested communities that lack open water. The grasslands communities mostly lack a woody overstory and have a ground layer dominated by hydrophytes. Included among these wetlands are fens, gaminoid bogs, marshes, mudflats, pannes, sedge meadows, seeps, springs, and wet prairies. Wetland forested communities include floodplain or bottomland forest and swamps and have a definite canopy layer of trees or occasionally shrubs.

Wetland communities provide an important habitat to a diverse group of both plants and animals. Approximately 950 of the more than 3,000 species of Illinois vascular plants are wetland species. Also, about 108 of the 172 families of vascular plant species that occur naturally in Illinois contain species that thrive in aquatic or hydric soils. In 1987, wetland-dependent or wetland-related species comprise nearly 26 percent of the 109 federally listed endangered and threatened plant species in the United States. Presently more than 155 species of native vascular plants listed as state endangered or threatened are wetland species.

As plant diversity increases in wetlands the diversity of animal species commonly increases. Many amphibians, reptiles, birds, and mammals, along with large numbers of invertebrates, utilize or depend on wetlands for survival or successful reproduction. Many of these species are listed as endangered or threatened at both the state and federal levels. Nationally, 94 of the 209 animal species listed as federally endangered and threatened in 1986 were wetland-dependent or wetland-related species. In Illinois, of the 99 animal species listed, 75 percent either depended on or utilized wetlands for at least one stage of their life cycle or for specific functions, such as foraging.

Wetlands are among our most important ecosystems, and the full importance of wetlands to the environment is only just being realized. Wetlands filter and purify the water that flows through them. Also, wetlands slow and store water during floods providing natural flood control during times of high water levels. In the broad floodplains and swamps the velocity of the floodwaters is reduced. This decreased velocity causes sediments to settle out that otherwise would enter streams and rivers. Wetlands also contribute to increase the low flow in streams because they help recharge shallow aquifers that feed streams during low rainfall periods.

Since the arrival of European settlers wetlands have been exploited and greatly reduced in extent. A study using the Illinois Wetland Inventory conducted by scientists at the Illinois Natural History Survey in Champaign found some 371,000 hectares of "natural" wetlands remained in Illinois in the 1980s. This is less than a tenth of the original extent of wetlands during presettlement times based on Government Land Office (GLO) survey

records and on a quantitative analysis of soil types. Presently Illinois is one of the ten states in the United States that has lost more than 70 percent of their original wetland acreage. Many factors are responsible for this decline, the most important being the extensive acreage lost to agriculture and the alteration of the natural hydrological regimes by drainage, dams, channelization, and reservoirs. Also, sedimentation resulting from soil erosion of cropland, as well as urban construction and development has dramatically affected the extent and quality of wetlands.

The remaining natural wetlands cover only about 2.6 percent of the state's land area. Most of these remaining wetlands are associated with rivers and streams. Also, high concentrations of wetlands are found in northeastern Illinois, the region of most recent glaciation. Poor drainage, prairie potholes (kettle lakes), lakes, and bogs are in this region as well as many of the state's remaining marshes. Another concentration of wetlands is in the extreme southern part of Illinois in the Bottomlands Section of the Coastal Plain Natural Division. This division is associated with the Ohio and Mississippi river floodplains and terraces where numerous bottomland forests, oxbow lakes, and sloughs are common. This section also includes the remains of the once vast bald cypress/tupelo gum swamps of southern Illinois that extends south to the Gulf of Mexico.

The Illinois Natural Area Inventory (INAI) lists many different kinds of wetland communities. Most are open communities that lack a forest canopy. Some of these communities are extremely rare with only a few degraded examples presently known in the state. The forested wetlands are mostly more common. These include the bottomland forests bordering the many rivers and streams of Illinois and the extensive forested swamps of southern Illinois. Less common forested wetlands include the shrub and forested bogs and fens of the northern third of Illinois, and the shrub swamps that are mostly restricted to southern Illinois.

Floodplain Forests

Bottomland hardwood forests in North America are among the most productive and ecologically important wetlands in the world. These forests provide habitat for wildlife, are responsible for improving water quality, and help control erosion by slowing the rapid movement of water. Due to the constant threat of flooding, most people no longer build along unprotected sections of larger rivers, and farming at the river's edge is a tenuous proposition unless protected by levees. As a result these bottomland forests are some of our last remaining extensive woodlands. Many commonly exist as continuous narrow bands of timber along many of our larger rivers. On the larger rivers these wetlands are common between the river's edge and the man-made levees that have been constructed during the past century.

Forests associated with the many rivers and streams of Illinois generally contain a canopy composed of relatively few to many species of mesic and hydric trees. This diversity is related to the severity, extent, duration, and time of flooding and soil type and texture. In Illinois these forests are commonly subjected to annual or seasonal flooding, usually at or near the start of the growing season. Along with this flooding there is the deposition of a fresh layer of mineral sediments and the possible mechanical damage to trees, either from rapid water flow or ice.

Most of the streams and rivers of Illinois are slow moving and some have even been described as sluggish. During the last century many man-made dams have impounded sections of many rivers and streams, particularly the navigation dams along the Mississippi and Illinois rivers. These dams have created many backwater lakes along these rivers, have slowed river flow, increased the duration of flooding, increased the water table, and increased siltation. These hydrological changes have had a profound

affect on the vegetation of the floodplains.

The most extensive bottomland forests of Illinois occur on the floodplains, terraces, sloughs, backwaters, and islands of the Upper Mississippi River valley (UMR). The UMR, which includes all of the river system above the confluence with the Ohio River at Cairo, Illinois, contains some of the largest continuous stretches of timber found anywhere in Illinois. It provides migratory routes and habitat for many animals. This river system is the northern mainstream of the Great River Flyway, one of the major routes for migratory waterfowl. The forests, sloughs, and backwaters of the UMR provide essential habitat for many species of ducks, geese, and other bird species. These forests are also fish feeding and spawning habitats during the spring flood pulse, and create crucial fish shelters during extreme floods. The UMR is also a major commercial waterway for barge traffic and is important for recreation and fishing.

During the past 150 years these bottomland hardwood forests and the Mississippi River itself has been extensively exploited. Examples of human alterations of the UMR valley include deforestation, agriculture, draining of wetlands, levee construction, urban expansion, and river impoundments. As early as 1824 the river was being cleared of local obstructions such as sandbars, shoals, and rocks to ensure safe passage for steamboats. As steamboat traffic increased a navigation channel 1.4 meters deep was maintained between St. Paul, Minnesota, and St. Louis, Missouri. By 1907 the Army Corps of Engineers deepened the channel to 1.8 meters, and again to 2.7 meters in 1927. Since 1926 an extensive levee system was built parallel to the mainstream UMR and its tributaries along with 27 dams to maintain the navigation system. Because of these modifications the UMR is locked into a fixed position. Consequently much of the floodplains in the impoundment areas behind the navigation dams are permanently inundated, and the annual flood pulses are reduced (Figure 10.1 and 10.2).

In Illinois the UMR valley have been so extensively modified that it is difficult to imagine the bottomlands as they appeared in early settlement times. While the hydrology of the UMR was changing so was the vegetation along the river's edge. The Mississippi River was a primary immigration route in and out of the Midwest because of the

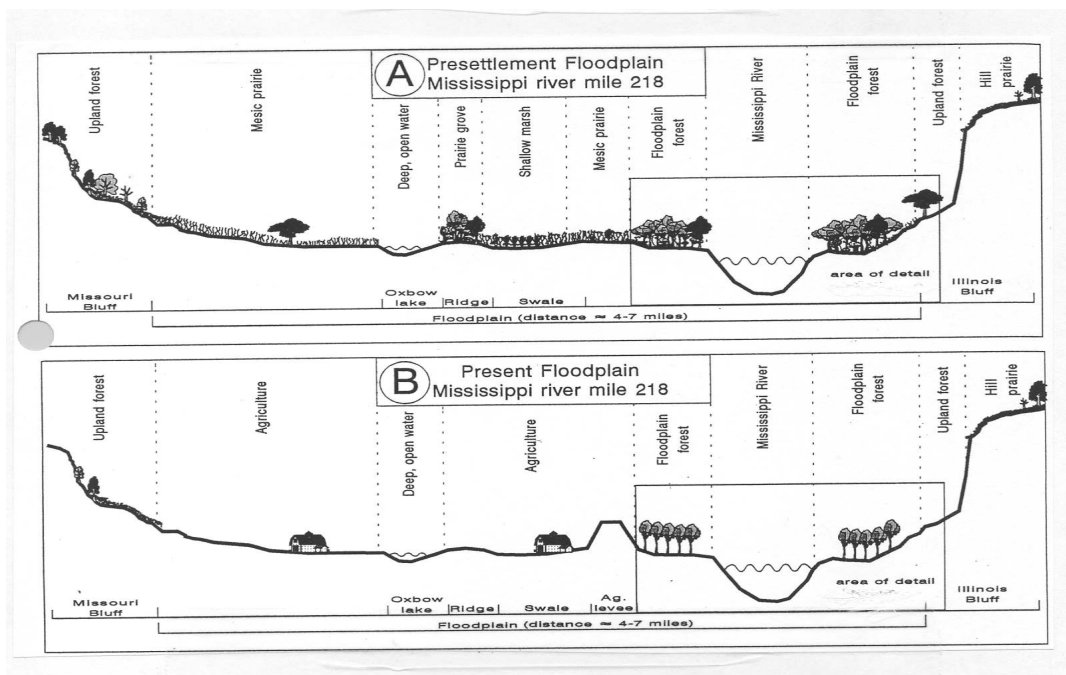


Figure 10.1. Two cross-section diagrams of the Upper Mississippi River at river mile 218 of an impounded reach near Grafton in central Illinois. Before European settlement (A), the floodplain was covered with marshes, mesic prairie and bottomland hardwood forest while at the present time (B) agricultural land has replaced the marshes and prairies, but some of the bottomland hardwood forests remain.

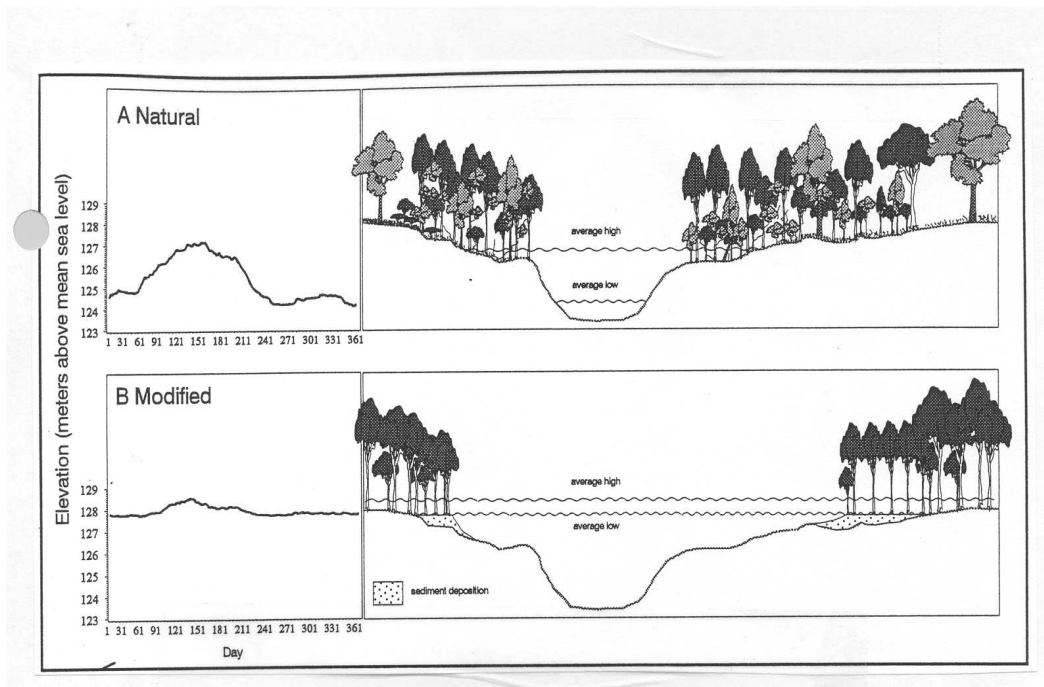


Figure 10.2. Natural and modified annual hydrographs and floodplain diagrams of the Upper Mississippi River at river mile 218 of an impounded reach near Grafton in central Illinois. Before European settlement (A), the natural river exhibited a distinctive annual flood pulse. At the present time (B) the magnitude of the annual flood pulse has been reduced because the dam at low flow raised water levels.

transportation network provided by the river and its tributaries. Intensive logging occurred in the UMR during the nineteenth and early twentieth centuries. At that time many of the natural floodplain prairies and some of the bottomland forests were converted to agriculture. By 1860 there were more than 300 steamboats that burned wood from the surrounding forests. Also, the increase in population created additional demands for lumber and soon much of the timber along the river was logged. Many of these logged forests grew back, but the tree species differed from those of presettlement times (Table 10.1).

Table 10.1. Tree species composition and importance values (relative frequency + relative basal area) encountered in bottomland hardwood forests behind the present-day levees and in the floodplain between the levee and the river in presettlement times and in 1993 along the Upper Mississippi River in southwestern Illinois.

Species	Floodplain Behind Levees		Floodplain Near River Edge	
	1809	1993	1809	1993
elms	28.5	14.8	15.4	7.5
hackberries	25.4	8.6	9.4	3.2
sweet gum	23.5	23.3	9.6	0.5
ashes	21.6	21.5	3.7	1.6
hickories	10.9	4.3	4.6	--
white oak	10.8	12.7	--	--

American beech	10.4	--	3.5	--
tulip tree	9.4	--	--	--
sycamore	7.4	4.3	51.2	11.8
silver maple	6.5	3.4	--	39.7
black oak	5.9	--	--	--
box elder	5.8	6.3	8.3	28.2
bald cypress	3.9	--	--	--
pumpkin ash	3.9	0.9	--	--
cottonwood	3.4	--	80.2	36.1
sugar maple	3.2	--	--	--
red mulberry	2.0	--	4.1	3.2
sassafras	2.0	--	1.6	--
walnuts	1.5	1.1	0.6	--
overcup oak	1.3	--	1.2	--
honey locust	1.3	1.3	--	--
<i>Quercus nigra</i>	1.2	--	--	--
pin oak	1.1	30.6	--	--
basswood	1.1	--	--	--
Kentucky coffee tree	1.0	--	--	--
willows	1.0	9.0	3.3	60.3
pawpaw	0.9	--	--	--
red oak	0.7	--	--	--
gums	0.5	5.4	--	--
southern red oak	0.3	13.8	--	--
redbud	0.1	--	1.2	-
red maple	--	8.8	--	7.1
hawthorns	--	1.0	--	--
persimmon	--	4.4	--	--
water locust	--	5.8	--	--
bur oak	--	3.2	--	--
Ohio buckeye	--	--	0.7	--
swamp holly	--	--	0.3	--
wild black cherry	--	--	0.3	--
Totals	196.5	198.2	199.2	199.2

In southwestern Illinois, the forests presently found along the UMR differ dramatically in extent and composition from that reported by the GLO surveyor. The presettlement forests that occurred on the terraces, areas that were only occasionally flooded, or flooded for only short periods of time (outside the present-day mainline levees), were dominated by *Ulmus* spp. (elms), *Celtis* spp. (hackberries), *Fraxinus* spp. (ashes), *Carya* spp. (hickories), *Liquidambar styraciflua* (sweet gum), *Quercus alba* (white oak), and *Fagus grandifolia* (American beech). In a survey conducted in 1993 in the same general area *Quercus palustris* (pin oak) dominated, followed by sweet gum, ashes, elms, and *Quercus falcata* (southern red oak) (Table 10.1).

In the riparian zone near the river's edge (between the river and present day mainline levees) the presettlement vegetation was dominated by *Populus deltoides* (cottonwood), while *Platanus occidentalis* (sycamore) was second and species of elm a distant third (Table 10.1). In contrast, *Acer saccharinum* (silver maple) was the dominant species of this floodplain in the 1993 survey, followed by cottonwood and *Acer negundo* (box elder). These extensive changes are attributed to timber harvesting, conversion of extensive acreage to agriculture, and the modification of the hydrology of the entire UMR system. Also, the ability of silver maple to exploit the new site conditions created

following extensive logging, and the impoundment of the river by dams, along with its fast growth and its intermediate shade tolerance, are the reasons for this species' dominance in the present day bottomland forests.

Table 10.2 Average diameter at breast height (cm) and importance values (relative density + relative dominance) of all stems ≤ 10.0 cm dbh in presettlement times (1817) and at the present time (1992) in the bottomland forests located at the confluence of the Illinois and Mississippi rivers.

Species	Average Diameter (cm)		Importance Value		
	1817	1992	1887	1992	Change
hackberry	29.6	17.0	30.4	19.7	-10.7
pecan	49.1	48.9	30.0	9.1	-20.9
elms	50.1	17.5	22.1	8.7	-13.4
willows	24.5	30.5	20.7	12.9	-7.8
cottonwood	30.5	59.9	20.4	13.1	-7.3
silver maple	21.8	29.7	16.1	86.3	+70.2
pin oak	50.8	41.3	11.5	9.5	-2.0
ashes	36.4	32.9	11.0	17.9	+6.9
black oak	37.2	--	7.7	--	-7.7
box elder	19.7	23.6	5.8	14.7	+8.9
honey locust	23.7	22.1	5.2	0.3	-4.9
red mulberry	25.4	13.9	3.5	0.4	-3.1
white oak	38.1	--	3.1	--	-3.1
redbud	19.0	--	3.1	--	-3.1
sycamore	40.6	37.6	2.8	1.9	-0.9
hawthorns	30.5	12.9	1.8	1.1	-0.7
bur oak	25.4	49.9	1.7	1.1	-0.6
pawpaw	22.9	--	1.5	--	-1.5
river birch	20.3	29.2	1.4	0.6	-0.8
persimmon	--	18.5	--	1.9	+1.9
Osage orange	--	18.8	--	0.4	+0.4
black walnut	--	10.5	--	0.2	+0.2
Totals	--	--	199.8	199.8	0.0

A similar survey of the bottomland forests was conducted at the confluence of the Illinois and Mississippi rivers at the southern tip of Calhoun County, Illinois. Using the data from witness trees, and the plats of each township drawn by the surveyors, the GLO survey records were used to reconstruct the presettlement vegetation. These data were then compared with a similar survey conducted in 1993 to determine the changes in the composition, structure, and extent from the presettlement forests (Table 10.2). The results show that approximately 56 percent of the presettlement floodplain was forested while 41 percent was prairie. Most of the prairies were converted to agriculture during the 1800s and now occupy only 6 percent of the floodplain. Also, river impoundment in 1938 from dam construction reduced bottomland forests to approximately 35 percent of the floodplain.

Within the area studied the presettlement forests were mostly open with 86.8 stems/ha. This low density indicates that the presettlement forest was an open landscape with widely spaced trees and that some of the area was actually savanna. The GLO surveyors reported 19 tree species in the study area with eight being common forest components. Among these species the most common were hackberry followed by *Carya illinoensis*

(pecan), cottonwood, silver maple, pin oak, and various species of elm, willow, and ash (Table 10.2). In contrast, the present day forest is denser, with an average of 489 stems/ha, which is probably an indication of extensive past timber harvest, river impoundments, and reduced fire frequency. In 1993 this bottomland forest was dominated by silver maple, which now accounts for about one-third of the individuals present. This species had an increase in importance value of 70.2 from the presettlement forest. Silver maple and box elder were the only common species that increased in importance when compared with presettlement forests (Table 10.2).

Wet Floodplain Forests: Wet floodplain forests, as classified by the INAI, are present on the frontal flats of most large rivers between the man-made levees and the river's edge. These forests also occur at the river's edge along streams and small rivers throughout the state. In these forests the flooding is frequent. Flooding usually occurs as an early spring pulse that may last for a week to rarely five weeks in duration. Flooding is so frequent and prolonged in these forests that tree diversity is usually low with silver maple, cottonwood, elms, and ashes commonly being the only species present. Along the larger rivers, such as the Mississippi and Illinois rivers, tree density and species composition has undoubtedly changed since presettlement time. Along smaller rivers and streams, however, these wet floodplain forests have probably remained fairly constant in species composition and tree density.

The bottomland forests of Long Island were studied in 1994. This large island, which extends from river mile 332 to 340 in the Mississippi River, is located just north of Quincy, Adams County, Illinois. Along with several nearby islands, Long Island is part of the Mark Twain National Wildlife Refuge. Topographic relief on the island is minimal, varying from shallow erosional channels to low ridges that average 2-3 meters higher than the flood channels. Except for the forest vegetation of the ridges the bottomland forests of the island would be classified as wet floodplain forest with silver maple, elms, and cottonwood the dominant species. The vegetation of the ridges, however, is typical of that associated with wet-mesic floodplain forests. Though silver maple was present on these ridges, *Quercus macrocarpa* (bur oak), pecan, ash, and pin oak were also common.

Except for the ridges silver maple was the dominant overstory species on the island. This species usually accounted for more than 50 percent of the individuals present, and overall averaged 145 stems/ha in the forest communities examined. Sometimes silver maple was the only species encountered. Silver maple also accounted for more than half of the basal area at 23.162 m²/ha. Throughout the forests the subdominant species varied depending upon elevation, moisture, and soil characteristics. The overall tree density and average diameter of all species encountered in the vegetation surveys on the island in 1994 are given in Table 10.3.

Table 10.3. Density (stems/ha) and average diameter (cm) of the tree species encountered during the vegetation surveys on Long Island in the Mississippi River, Adams County, Illinois.

Species	Density (stems/ha)	Average Diameter (cm)
silver maple	145.2	39.7
American elm	58.5	17.3
cottonwood	20.7	62.4
box elder	14.5	22.5
green ash	13.2	42.5
hackberry	6.7	20.0
black willow	4.3	40.1
pecan	3.6	49.6
sycamore	3.4	46.4
kingnut hickory	3.3	32.4
bur oak	2.1	78.8
Kentucky coffee tree	1.8	29.5
pin oak	1.5	69.5
red oak	0.6	33.6
white mulberry	0.6	16.8
green haw	0.5	12.3
honey locust	0.5	62.3
river birch	0.1	32.9
Totals	281.1	

Wet floodplain forests dominated by silver maple are common at the margins of small rivers and streams throughout Illinois. Usually cottonwoods and sycamore were important components, while box elder, *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Betula nigra* (river birch), *Salix nigra* (black willow) and *Acer rubrum* (red maple), as well as a few other species, were occasionally encountered. Though it was not uncommon for 8 to 12 trees species to occur in these wet floodplain forests, silver maple was nearly always the dominant species and accounted for more than half on the individuals and basal area. The importance of the subdominant species changed depending on various factors such as soil structure, position on the floodplain, extent and duration of floods, and past disturbances.

In Horseshoe Bottoms Nature Preserve, Vermilion County, the wet floodplain forest was dominated by silver maple, which accounted for more than half of the importance value (IV). Box elder, sycamore, and American elm followed in IV (Table 10.4). In an erosional channel on this floodplain of the Middle Fork of the Vermilion River, the tree species composition varies from what was found in the wet floodplain forest. In this depression *Fraxinus lanceolata* (green ash) and *Fraxinus nigra* (black ash) ranked second and third in importance followed by *Quercus bicolor* (swamp white oak). In this erosional channel silver maple was still the dominant species while sycamore, American elm, and cottonwoods were present but in lower numbers.

Table 10.4 Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in a wet floodplain forest and a wet floodplain forest in an erosional channel along the Middle Fork of the Vermilion River in the Horseshoe Bottoms Nature Preserve, Vermilion County, Illinois.

Species	Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Wet Floodplain Forest						
silver maple	138	20.75	47.9	64.1	112.0	39.5
box elder	62	1.75	21.5	5.4	26.9	17.5
sycamore	18	5.08	6.3	15.7	22.0	57.1
American elm	28	0.83	9.7	2.6	12.3	17.1
hackberry	18	0.65	6.3	2.0	8.3	19.8
cottonwood	6	2.40	2.1	7.4	9.5	70.6
green ash	14	0.74	4.9	2.3	7.2	23.9
others	4	0.18	1.3	0.5	1.8	
Totals	288	32.38	100.0	100.0	200.0	
Wet Floodplain Forest (erosional channel)						
silver maple	166	13.40	33.9	34.6	68.5	27.8
green ash	112	9.93	22.9	25.7	48.6	30.4
black ash	116	6.99	23.7	18.1	41.8	25.5
swamp white oak	22	2.60	4.5	6.7	11.2	33.4
sycamore	10	2.43	2.0	6.3	8.3	53.9
American elm	24	0.33	4.9	0.9	5.8	13.1
cottonwood	6	0.93	1.2	2.4	3.6	43.2
others	34	2.06	6.9	5.3	12.2	
Totals	490	38.67	100.0	100.0	200.0	

Similar results were obtained in a study of wet floodplain forests along the Wabash River in Crawford County, Illinois, and adjacent Sullivan County, Indiana, but species diversity was lower (Table 10.5). The wet floodplain forest along the Wabash River was closer to the river and adjacent to an erosional channel. Wet soils, and prolonged flooding in this forest probably account for the lower species diversity. In contrast, the differences in species composition of the erosional channel were related to differences in species distribution. Pecan is a southern species that is rare north of the terminal moraine of Wisconsin glaciation and would not be expected as far north as Vermilion County. Black ash, in contrast, is a northern species that is rare in the southern half of Illinois.

Few woody species occur in the understory of wet floodplain forests, and seedlings and saplings of the overstory species are generally not abundant. Except of the numerous seedlings of silver maple and cottonwoods that were common under the few canopy openings and at the forest edge, few other woody seedlings are found. In a study of six wet floodplain forests along the Embarras River in east-central Illinois woody seedling density varied from 144.8 to 545.1 seedlings/ha (averaged 231.3). Woody saplings and shrubs were less common ranging from 174.5 to 532.5 individuals/ha (average 289.8).

Table 10.5 Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in a wet floodplain forest and a wet floodplain forest in an erosional channel along the Wabash River in Crawford County, Illinois, and adjacent Sullivan County, Indiana.

Species	Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Wet Floodplain Forest						
silver maple	343.7	15.15	81.4	53.1	134.5	22.1
cottonwood	74.9	12.97	17.8	45.5	63.3	45.5
black willow	1.7	0.23	0.4	0.8	1.2	42.4
box elder	1.7	0.17	0.4	0.6	1.0	33.5
Totals	422.0	28.52	100.0	100.0	200.0	
Wet Floodplain Forest (erosional channel)						
silver maple	51.4	24.10	61.9	72.5	134.4	46.2
green ash	21.6	6.61	26.1	19.9	46.0	37.6
swamp white oak	6.0	1.66	7.2	4.8	12.0	32.3
pecan	2.4	0.67	2.9	2.0	4.9	35.6
American elm	1.4	0.18	1.6	0.4	2.0	21.3
cottonwood	0.3	0.13	0.3	0.4	0.7	
Totals	83.1	33.35	100.0	100.0	200.0	

Woody shrubs and vines are occasionally encountered in wet floodplain forests, but density and species diversity is usually low. Common shrubs included *Sambucus canadensis* (elderberry), *Salix interior* (sandbar willow), *Cephalanthus occidentalis* (buttonbush), *Toxicodendron radicans* (poison ivy), *Staphylea trifolia* (bladdernut), *Lindera benzoin* (spicebush), and *Euonymus atropurpureus* (wahoo). Most of these shrubs are rarely found, but in east-central Illinois wet floodplain forests elderberry averaged 62 individuals/ha and was scattered throughout the forest with high concentrations in open areas. Sandbar willow, in contrast, was only present on sand bars near the river's edge and in full sunlight, its dense growth the result of root suckers. Common vines included *Campsis radicans* (trumpet creeper), *Menispermum canadense* (moonseed), *Parthenocissus quinquefolia* (Virginia creeper), along with various species of *Vitis* (grape).

The most abundant herbaceous species of the wet floodplain forest was *Laportea canadensis* (wood nettle). Wood nettle occurs throughout the floodplains and commonly forms dense stands of vegetation to about one meter tall. By midsummer this dense vegetation is nearly impossible to walk through due to the numerous stinging hairs present on the nettles. Scattered among the dense stand of wood nettle are a few other herbaceous species including *Ambrosia trifida* (giant ragweed), *Antennaria pennsylvanicum* (Virginia knotweed), *Aster ontarionis* (Ontario aster), *Cryptotenia canadensis* (honestwort), *Impatiens capensis* (spotted touch-me-not), *Rudbeckia laciniata* (goldenglow), and *Viola pratensis* (common blue violet). The distribution of most herbaceous species seems to be dependent on moisture availability and the amount of sunlight penetrating the canopy.

Wet-mesic Floodplain Forests: This common bottomland forest type is found farther back from the river's edge where flooding is less severe and of shorter duration. In some years the spring pulse is not high and these wet-mesic floodplain forests do not flood. Generally species diversity is higher than in the wet floodplain forest, and there is usually a distinct shift in species composition and density from the wet floodplain forest. Also, though silver maple is present in this forest type it is not the dominant. Generally no clear dominant exists; instead there is a mixture of species being of nearly equal importance. Commonly encountered species include *Carya laciniosa* (kingnut hickory), pecan, silver maple, sweet gum, pin oak, bur oak, swamp white oak, American elm, slippery elm, hackberry, green ash, river birch, and *Gleditsia triacanthos* (honey locust).

In the southern part of Illinois, particularly in the bottomlands at the juncture of the Ohio and Mississippi rivers, a number of additional oak species are commonly found in these floodplain forests. These include *Quercus lyrata* (overcup oak), *Quercus michauxii* (basket oak), *Quercus pagoda* (cherrybark oak), *Quercus phellos* (willow oak), and *Quercus shumardii* (Shumard's oak). In these hardwood bottoms the wet mesic floodplain forests are dominated by red maple, green and red ash, sweet gum and American elm along with few to many of these oak species.

Another species associated with these southern bottomland forests is *Arundinaria gigantea* (giant cane). Giant cane is a true bamboo and is the only bamboo native to Illinois. Its stems were commonly 4 to 9 meters tall. In presettlement times giant cane was common in southern Illinois along the Wabash, Ohio, and Mississippi rivers where it grew as an understory species in bottomland forests. This species commonly formed dense stands, the GLO surveyors recorded canebrakes more than a mile wide along the Cache River in Pulaski County. Large stands of giant cane no longer exist in Illinois.

Chauncey Marsh Natural Area is an extensive wetland about 6 km east of Chauncey, Lawrence County, Illinois. The marsh is located on an old ox-bow lake of the Embarras River, and is the largest marsh complex remaining in the Illinois portion of the Wabash River basin. This natural area contains an outstanding example of marsh and bottomland forest that was typical of this region at the time of European settlement. Though subjected to some disturbances, including attempts at draining, this natural area still contains a high diversity of plant and animal life.

The wet-mesic floodplain forest at Chauncey Marsh occurs on poorly drained soils that are periodically flooded. The Embarras River is located nearly 1 km to the west and the flooding is not severe, usually occurring for less than a week or two in the early spring. Tree species diversity was high with 24 species present, 20 of which were capable of reaching the canopy. Tree density averaged 353 stems/ha with a basal area of 28.46 m²/ha (Table 10.6). Of these species, kingnut hickory ranked first with an IV of 44.9 (possible 200), and accounted for 27 percent of the density but only 17 percent of the basal area. Six other species had IV's that exceeded 10, sweet gum, pin oak, silver maple, American elm, swamp white oak, and hackberry, while green ash, bur oak, honey locust, redbud, pecan, and red maple were scattered (Table 10.6).

Table 10.6. Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in wet-mesic floodplain forests at Chauncey Marsh Natural Area, Lawrence County, Illinois.

Species	Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
kingnut hickory	97.6	4.93	27.7	17.2	44.9	20.3
sweet gum	30.8	5.45	8.7	19.2	27.9	45.0
pin oak	21.6	6.13	6.1	21.5	27.6	56.6
silver maple	23.4	3.24	6.6	11.4	18.0	34.2
American elm	44.2	0.87	12.5	3.1	15.6	13.5
swamp white oak	21.6	1.70	6.1	6.0	12.1	24.0
hackberry	29.8	0.68	8.4	2.4	10.8	13.8
red ash	17.4	1.37	4.9	4.8	9.7	26.2
bur oak	16.4	1.21	4.7	4.3	9.0	22.6
honey locust	4.8	1.02	1.4	3.6	5.0	49.1
redbud	15.6	0.14	4.4	0.5	4.9	9.9
pecan	9.0	0.41	2.6	1.4	4.0	18.7
red maple	4.8	0.54	1.4	1.9	3.3	27.1
others	16.2	0.77	4.5	2.7	7.2	
Totals	353.2	28.46	100.0	100.0	200.0	

Few woody species occurred in the very open understory of the wet-mesic floodplain forest at Chauncey Marsh Natural Area. Though many tree seedlings were common, they were mostly scattered among the herbaceous layer and were not obvious. The sapling layer was dominated by kingnut hickory, which accounted for nearly half of the sapling density of 1540 stems/ha. Shrubs were not very common, but buttonbush, elderberry, and spicebush were occasionally found, while the common woody vines included trumpet creeper, poison ivy and grapes. The herbaceous layer was dominated by *Aster lanceolatus* (panicked aster), *Aster ontarionis* (Ontario aster), *Cryptotaenia canadensis* (honewort), *Geum canadensis* (white avens), *Laportea canadensis* (wood nettle), *Leersia virginica* (white grass), *Pilea pumila* (clearweed), *Sicyos angulata* (bur cucumber), *Solidago gigantea* (late goldenrod), and *Ziza aurea* (golden Alexander). Wood nettle, though present, only rarely formed large clumps; mostly this species did not dominate the herbaceous layer.

Wet-mesic floodplain forests are also common in the Momence Wetlands along the Kankakee River in north-central Illinois near the Illinois/Indiana border (Table 10.7). In the Momence Wetlands Nature Preserve the wet-mesic floodplain forest is commonly flooded for extended periods of time in the early spring. The forest community in this preserve was dominated by silver maple that accounted for an IV of 75.2 (possible 200), and was common in very shallow erosional channels. The remaining dominants, pin oak, red ash, swamp white oak, and American elm occurred on the slightly higher and drier sites. Nearby at the Momence Wetland Land and Water Reserve the extent and duration of flooding is less pronounced and the importance of the tree species was reversed, silver maple being fifth in IV.

Table 10.7. Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in wet-mesic floodplain forests at the Momence Wetlands Land and Water Reserve and the Momence Wetlands Nature Preserve, Kankakee County, Illinois.

Species	Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Nature Preserve						
silver maple	141	11.94	36.2	39.0	75.2	27.2
pin oak	82	9.95	21.2	32.5	53.7	35.7
red ash	64	3.28	16.7	10.7	27.4	23.9
swamp white oak	41	2.98	10.6	9.7	20.3	26.2
American elm	54	1.92	14.0	6.3	20.3	19.9
river birch	4	0.34	1.0	1.1	2.1	31.0
honey locust	1	0.10	0.2	0.3	0.5	44.5
cottonwood	--	0.13	0.1	0.4	0.5	73.0
<i>Totals</i>	387	30.64	100.0	100.0	200.0	
Land and Water Reserve						
swamp white oak	68	9.62	20.1	36.2	56.3	38.2
pin oak	78	6.83	23.0	25.7	48.7	30.1
American elm	69	3.06	20.4	11.5	31.9	21.9
red ash	68	2.59	20.1	9.8	29.9	19.9
silver maple	28	1.39	8.3	5.2	13.5	21.4
river birch	10	1.53	2.9	5.8	8.7	42.4
bur oak	7	1.28	2.0	4.8	6.8	46.0
wild black cherry	7	0.11	2.0	0.4	2.4	13.6
red oak	4	0.17	1.2	0.6	1.8	21.2
<i>Totals</i>	339	26.58	100.0	100.0	200.0	

Wet-mesic floodplain forests were also examined in south-central Illinois at Beall Woods Nature Preserve in Wabash County. Located on Coffee Creek, a tributary of the Wabash River the bottomland forests of the floodplain and terraces are subjected to varying flooding regimes depending on topographic relief and distance from the river. The wet floodplain forest along Coffee Creek was dominated by silver maple, which accounts for about 75 percent of the importance value. Here flooding occurs for three weeks to a month in early spring and additional floods of a week or more sometimes occur during the early summer. On the higher ground of terraces, where flooding is less severe, is an extensive wet-mesic floodplain forest. In this forest overstory tree density averaged about 290 stems/ha with a basal area close to 29 m²/ha. Hackberry, sweet gum, kingnut hickory, silver maple, American elm, and Shumard's oak shared dominance. Shumard's oak averaged 98.5 cm dbh; some individuals exceeded 125 cm dbh.

Beall Woods is known for its many large trees. Several state champion trees occur in this preserve, including *Celtis laevigata* (sugarberry), *Carya tomentosa* (mockernut hickory), *Nyssa sylvatica* (black gum), and pecan. The famous nineteenth century naturalist and ornithologist, Dr. Robert Ridgway wrote extensively about the large trees of the Wabash

River floodplain.

Mesic Floodplain Forests: In presettlement times mesic floodplain forests were common on the high terraces along the major rivers in Illinois. These extensive forests have mostly been converted to agriculture. Most of the remaining mesic floodplain forests in Illinois are associated with narrow terraces along smaller rivers and streams or on the flat narrow valley floors of tributaries associated with larger rivers. In these forests the soils are mostly well drained, either because of their coarse texture or high elevation. Flooding is at irregular intervals, not extensive, and of short duration. Except for local floods of the tributary, flooding only occurs during major flood events.

The dominant species of the wet floodplain forests, such as silver maple and cottonwood are rare in mesic floodplain forests. Overstory species diversity, however, is high with many mesic species entering the canopy. Dominant species of this forest type are *Acer saccharum* (sugar maple), red maple, box elder, white oak, bur oak, *Quercus muhlenbergii* (yellow chestnut oak), *Quercus rubra* (red oak), American elm, slippery elm, hackberry, sycamore, *Aesculus glabra* (Ohio buckeye), kingnut hickory, *Carya cordiformis* (bitternut hickory), *Tilia americana* (basswood), black walnut, and *Fraxinus americana* (white ash).

Mesic floodplain forests are still relatively common in the bottomland forests near the junction of the Ohio and Mississippi rivers in southern Illinois. The bottomland forests of Horseshoe Lake Nature Preserve, located on the Mississippi alluvial plain in Alexander County, contain one of the best remaining examples of a mesic floodplain forest in Illinois. Horseshoe Lake is an ancient ox-bow lake of the Mississippi River and the old-growth forest occupies about 35 hectares on a floodplain island in the lake that is presently about 5 km east of the Mississippi River channel. The important species associated with the shallow ridges are sugar maple, sweet gum, slippery elm, red oak, basswood and the dominant understory tree pawpaw. This forest is associated with well-drained soils and infrequent flooding. On moderately heavy soil and poorly drained sites with intermediate flooding, pawpaw, sweet gum, basket oak, yellow chestnut oak, American elm, cherry bark oak, and Shumard's oak were the dominants.

One small mesic floodplain forest was examined in a narrow valley at Fox Ridge State Park, Coles County, Illinois. The forest occurs on both sides of a small tributary that enters the Embarras River about 300 meters to the west. Tree density averaged 433 stems/ha with a basal area of 23.30 m²/ha, with 21 tree species occurring on the study site (Table 10.8). Sycamore is the leading dominant with an importance value of 37.1 followed by Ohio buckeye (IV of 23.3 is of the opening), hackberry (IV of 23.1), sugar maple (IV of 21.1), box elder (IV of 20.6), and basswood (IV of 11.7). All other species have an IV of less than 10. Except for sycamore, all of the species have good size class distribution, and their importance in the woods should increase. Sycamore, in contrast is well represented only in the higher diameter classes, and its importance will probably decrease as the veteran trees die. Numerous understory trees and shrubs are an important feature of this forest with *Carpinus caroliniana* (musclewood tree) and *Cercis canadensis* (redbud) being extremely common in the 10-20 cm diameter class. Pawpaw was the common tree of the understory along with the shrubs *Staphylea trifolia* (bladdernut), *Hydrangea arborescens* (wild hydrangea), *Viburnum prunifolium* (black haw), elderberry, and wahoo. Numerous ephemeral spring flowering species are present in the ground layer and herbaceous species diversity is also high during the summer months.

Table 10.8. Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in a mesic floodplain forest on a valley floor at Fox Ridge State Park, Coles County, Illinois.

Species	Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
sycamore	47	6.09	10.9	26.2	37.1	39.0
Ohio buckeye	64	1.95	14.9	8.4	23.3	18.0
hackberry	51	2.64	11.8	11.3	23.1	24.0
sugar maple	52	2.13	12.0	9.1	21.1	20.0
box elder	55	1.85	12.7	7.9	20.6	20.0
basswood	26	1.33	6.0	5.7	11.7	23.0
black walnut	13	1.24	3.0	5.3	8.3	33.0
bur oak	12	1.08	2.8	4.6	7.4	29.0
American elm	18	0.57	4.2	2.4	6.6	18.0
slippery elm	13	0.77	3.0	3.3	6.3	26.0
bitternut hickory	13	0.76	3.0	3.3	6.3	25.0
musclewood	18	0.21	4.2	0.9	5.1	12.0
red ash	8	0.75	1.8	3.2	5.0	28.0
yellow chestnut oak	10	0.42	2.3	1.8	4.1	21.0
redbud	11	0.16	2.5	0.8	3.3	13.0
others (6 species)	22	1.35	4.9	5.8	10.7	
Totals	433	23.30	100.0	100.0	200.0	

Forested Swamps and Shrub Swamps

Forested swamps: Swamps are tree or shrub communities associated with permanent or semi-permanent bodies of water. Forested swamps are uncommon in Illinois, being limited to extreme southern parts of the state and south to the Gulf of Mexico. This distribution exists since nearly all of the tree species capable of surviving in permanent bodies of water only occur in southern Illinois and south. The dominant tree species of these forested swamps are *Taxodium distichum* (bald cypress) and *Nyssa aquatica* (tupelo gum) with only a few other species rarely present. These species include red maple, green ash, *Fraxinus profunda* (pumpkin ash), and *Populus heterophylla* (swamp cottonwood)(Table 10.9). Only a few shrubby species are adapted to this continuous flooding with buttonbush being the most common. Other shrub species occasionally seen include *Itea virginica* (Virginia sweetspire) and *Rosa palustris* (swamp rose).

Both bald cypress and tupelo gum, along with a few of the other tree species that grow in swamps, have swollen or buttressed bases. Bald cypress also has another interesting feature, structures that develop from the roots that are called “knees.” These “knees” grow upward from the roots producing an elongated stump-like structure that in southern Illinois swamps rarely reach a meter tall. The buttressed bases and “knees” probably develop in response to aerated water, the greatest swelling occurring where aerated water is present for the longest period of time. The buttresses and “knees” form a habitat for many species of mosses, liverwort, and occasional herbaceous plant to grow just above the water line. Shrubs are occasionally found on these buttresses, but are more commonly found on decaying logs and stumps.

Table 10.9. Basal area of the tree species encountered in two bald cypress/tupelo gum swamps at Heron Pond-Little Black Slough Nature Preserve, Johnson County, Illinois.

Species	Little Black Slough	Goose Pond
water tupelo	24.27	28.30
bald cypress	10.13	39.28
swamp cottonwood	5.15	1.11
red maple	4.94	0.20
red ash	2.77	0.04
pumpkin ash	2.38	0.03
pin oak	0.19	0.14
sweet gum	0.14	--
American elm	0.10	0.14
overcup oak	0.04	0.29
sycamore	--	0.12
Totals	50.11	69.65

The most extensive swamps in Illinois occur in the Cache River Basin of Johnson County. This basin was referred to in the original GLO survey records as “inaccessible, a drowned land.” Here were the vast bald cypress/tupelo gum swamps of southern Illinois. Bald cypress over 100 feet tall and one thousand years old were common. The original extent of these swamp forests in Illinois was about 101,000 hectares. Extensive timber cutting during the mid- to late-1800s and land clearing and drainage for agriculture have altered most of the original beauty of the area (Post 1997). Presently much of the Cache River basin is protected in the Cache River State Natural Area.

Shrub swamps: Using the classification system of the INAI a shrub swamp must have at least 50 percent cover by shrubs and have less than a 20 percent tree canopy. Shrub swamps are often associated with shallow ponds and small ox-bow lakes of rivers and are found throughout Illinois. Commonly buttonbush is the dominant shrub of these swamps, but *Cornus sericea* (red-osier dogwood), *Salix discolor* (pussy willow), *Salix interior* (sandbar willow), and *Alnus incana* (speckled alder) are also sometimes present. At the Momence Wetland Nature Preserve the shallow backwater sloughs and old cut-off meanders that formed shallow ox-box lakes were dominated by dense stands of buttonbush. Scattered trees occurred in these shrub swamps with silver maple, green ash, red ash, pumpkin ash, pin oak, and swamp cottonwood occasionally present. Many herbaceous hydrophytes were present, the most common being *Hibiscus laevis* (halberd-leaved rose mallow), *Leersia oryzoides* (rice cut grass), *Leersia virginica* (white grass), *Penthorum sedoides* (ditch stonecrop), *Pilea pumila* (clearweed), *Rumex verticillatus* (swamp dock), *Sagittaria latifolia* (common arrowleaf), and *Saururus cernuus* (lizard’s-tail).

Forested Bogs

Forested bogs are very uncommon in Illinois, being restricted to the Morainal Section of the Northeastern Morainal Natural Division. This section encompasses the glacial moraines and morainic system of the late advances of the Woodfordian substage of Wisconsin glaciation and contains most of Illinois’ glacial lakes and bogs. Bogs usually occur in kettle-lakes that were formed when the rapidly receding glacier left behind large blocks of ice that later melted leaving kettle-like depressions. Some of these shallow depressions, in which the drainage was restricted, accumulated low-nutrient peaty deposits that were acidic due to the stagnant water and the growth of dense mats of

Sphagnum (various species of moss). Extensive amounts of organic matter accumulate over time as the acidic conditions prevent bacterial decay. In time this peat forms dense mats and could completely fill the basin of the old kettle lake.

Volo Bog Nature Preserve is the only site in the Illinois Nature Preserve system that contains all stages of classic bog succession. Located on the Valparaiso Moraine the wetland communities present include graminoid bog, low shrub bog, forested bog, and tall shrub bog.

The forested part of the bog is dominated by *Larix laricina* (tamarack or American larch), which is usually the only tree species present. The important shrubs are *Ilex verticillata* (winterberry), *Toxicodendron vernix* (poison sumac), *Cornus sericea* (red-osier dogwood), and *Vaccinium corymbosum* (high-bush blueberry). Many interesting and endangered plant species occur in bogs, including a few carnivorous species.