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HEADING INLAND

The largest portion of the Lake Huron to Lake Erie Corridor lies inland from the open waters. Different ecosystems within this area are home to an astonishingly vast diversity of flora and fauna.

The Lake Huron to Lake Erie Corridor's land area includes a variety of wetlands and uplands. The wetlands include marsh, meadow, prairie fen, bog, swamp, natural pools and floodplain forest. Each is distinguished by its vegetation, hydrology and chemistry. The uplands are dominated by beech-maple and oak-hickory forests, and oak barrens, interspersed with patches of prairie grassland.

Wetlands

Wetlands are places with varied ecosystems that provide some of the most important life-support systems in the natural environment. The Corridor region boasts unique, biodiverse wetland ecosystems.

Wetlands of the Lake Huron to Lake Erie Corridor	
Wetland Type	Pr. Water Source
Coastal Marsh	Great Lakes Water
Marsh	Surface Water
Floodplain Forest	Surface Water
Hardwood Swamp	Precipitation
Wet Meadow	Precipitation
Bog	Precipitation
Wet Prairie	Precipitation
Vernal Pool	Precipitation
Fen	Groundwater
The dominant water source is one of several distinguishing features of wetland communities. Soil type and local topography also influence their development.	

ALLEN CHARTER



MELISSA DETLOFF



The marsh fern (*Thelypteris paulstris*) grows in the soft, wet soils of wetlands. Ferns are primitive plants that reproduce with spores rather than seeds.

Wetlands provide breeding habitat for twelve species of frogs that live in the Lake Huron to Lake Erie Corridor. Pictured is a northern leopard frog (*Rana pipiens*).



JOHN G. REGNIER

Exploring wetlands is a fun, family activity.

Marsh

Marshes are wet areas with standing or slow-moving water. They seldom dry out naturally, except in times of drought. Their vegetation is dominated by the common cattail (*Typha latifolia*). Other submersed aquatic plants include pondweed (*Polygonum spp.*), pickerel weed (*Pontederia cordata*), common water plantain (*Alisma subcordatum*), tall water parsnip (*Sium suave*), arrowhead (*Sagittaria spp.*) and common bur reed (*Sparganium eurycarpum*). Marshes also have emergent floating-leaved plants, such as duckweed (*Lemna minor*) and white water lily (*Nymphaea tuberosa*).

While coastal marshes are influenced by Great Lakes water level fluctuations; inland marshes are affected by surface water and groundwater inputs. These marshes can be found in gradually sloping, wind-protected

areas next to ponds, rivers, streams and inland lakes. Marshes also form in shallow depressions that receive drainage from the surrounding uplands. Some marshes might have sandy soils, but most have fine-textured, nutrient-rich soils with large amounts of organic matter. Marshes are highly productive ecosystems with nutrient-rich waters, lush and diverse vegetation, and vast arrays of invertebrate and insect life. Waterfowl,

shorebirds and songbirds find food and shelter in the aquatic vegetation. Marshes also provide food to many mammal species, such as raccoon, cottontail, rabbit and deer. Other fur-bearing animals, such as muskrat and mink, live in marshes. Reptiles and amphibians, such as leopard frogs, chorus frogs, snapping turtles, northern water snakes and ribbon snakes are prominent on marshes for breeding habitat.



LOUTERRY

The fragrant white water lily (*Nymphaea tuberosa*) floats in the open water along a marsh edge.

WETLANDS ARE VALUABLE

Wetlands...

- are diverse and biologically productive ecosystems. They are as ecologically significant as the tropical rainforests and coral reefs elsewhere on Earth;
- support many plant and animal species. It is estimated that more than half the species at risk in the United States are associated with wetlands. Protecting wetlands is essential to maintaining our native biodiversity;
- provide areas for hunting and fishing, scientific study, canoeing, nature photography and wildlife viewing;
- add revenues to local economies as tourists and residents spend money on food, lodging, and boating associated with hunting, fishing, and birdwatching.
- act like natural sponges by absorbing water and releasing it slowly. This provides neighboring areas with protection from floods and with a source of water during droughts. An acre (0.4 ha) of wetland can store 1 to 1.5 million gallons (3.8 to 5.7 million liters) of floodwater, which is equivalent of 36 to 55 in (90 to 137.5 cm) of rain per acre;
- recharge groundwater supplies as waters from wetlands seep into aquifers;
- filter sediment and pollutants carried in stormwater runoff, thereby improving water quality in rivers, lakes and streams. In fact, wetlands often are artificially created to treat stormwater and industrial wastewater.



The brilliantly colored blue flag iris (*Iris virginica*) grows along the wet shorelines of inland marshes and other wetlands.

BRYAN KNOX/LES

ST. CLAIR REGION CONSERVATION AUTHORITY



The Wawanosh Wetlands in Sarnia, Ontario is a provincially significant marsh owned by the St. Clair Region Conservation Authority. A 1.5-mi (2.5-km) nature trail winds along the marsh, providing many opportunities to view wildlife.

The mink (*Mustela vison*) is a wetland mammal that lives along streams and lakes. It is sensitive to human disturbance and requires large tracts of natural habitat to survive.



WETLAND INVADER



ROBERT STEVART

It may look pretty, but the purple loosestrife (*Lythrum salicaria*) has destructive effects on the native plant diversity of freshwater wetlands. Each purple loosestrife can produce millions of seeds, quickly overtaking the vegetative surface cover of a wetland. Although some butterflies use it as a nectar source, purple loosestrife generally is not beneficial to wildlife because it overcrowds the native plants upon which they depend.



AMELIA HANSEN, CORVUS ART

The red-winged blackbird (*Agelaius phoeniceus*) is one of the most common marsh birds. It is highly territorial. Males spend much of their time defending large expanses of cattails where their female mates nest.

Great Blue Herons

The great blue heron (*Ardea herodias*) is one of the most elegant wetland creatures. This large bird can stand motionless, waiting for the right moment to strike the water to catch small fish, its favored prey. Although great blue herons feed in wetland habitats of various sizes throughout the region, they require large natural areas to successfully reproduce.

Great blue herons build nests communally in tall dead trees. These nest collections are called heron rookeries, or heronries. Herons are highly sensitive to

human activity and will abandon their nests if disturbed. Before 1900, nesting was widespread through the region including Wayne County, Michigan. But by the early 1900s, Wayne County had only two great blue heronries. A few herons returned to nest on islands in the Detroit River in the late-1990s.

Today, the Corridor's main heronries are located in inland marshes set within large natural areas. Great blue heron rookeries can be observed from a distance at Kensington Metropark and at the West Bloomfield Woods Nature Preserve in Michigan. Bickford Oak Woods in Lambton County, Ontario, also supports a heronry.

JONATHAN SCHECHTER, WEST BLOOMFIELD PARKS AND RECREATION



A great blue heron leaps from its nest at the West Bloomfield Woods Nature Preserve in Oakland County, Michigan. Surrounded by suburban development, this natural area is designated as an Urban Wildlife Sanctuary by the National Institute for Urban Wildlife. The preserve's mature oak-hickory forest, marsh and swamp are home to spring wildflowers, 100 species of birds, mammals, such as mink and red fox, and a great blue heron rookery.



The fawn damselfly (*Boyeria vinosa*) is named for the two white spots on the thorax that are reminiscent of a baby deer's spots. This dragonfly is common in every stream and creek in Michigan and Ontario. Naiads are found among debris dams and undercut banks with root tangles. Adults emerge in late summer. They usually are only seen flying along the banks, especially where fallen tree branches and roots extend into the water. Males are searching for females, while females are searching for egg-laying sites among the rotting wood. The flight season is July through September.

Dragonflies

Dragonflies and damselflies are among the most fascinating creatures found in wetland and aquatic habitats. Adults lay eggs on vegetation, mud or on the water surface. The eggs usually hatch a short time afterward. The aquatic naiad, or larval, stage ranges from three to four months for migratory species to a year for resident species. Adults may live a few weeks to several months, depending on the species. Most adult populations of dragonflies have reached their peak by early July. The

dragonfly's carnivorous and highly mobile naiads play an important role in aquatic ecosystems. They may be the highest-order aquatic predator in ponds where fish are absent. In flight, the adult dragonfly's average cruising speed is 25 mph (40 km/h.)

The eastern red damselfly (*Amphiargia saucium*) is a small red damselfly that is only found in seepage areas, such as at Ives Road Fen in Jackson County, Michigan.

In contrast, the common whitetail (*Plathemis lydia*), is found in almost any wetland habitat.

Most species of dragonflies and damselflies in the region are non-migratory. Some of the migratory species, such as green damselfly (*Anax junius*), black saddlebags (*Tramea lacerata*) and wandering glider (*Pantala flavescens*), can be seen flying in large numbers along the Corridor's lakeshores as they head south in the fall. In the spring, green darners fly north along the shore of Lake St. Clair.



MARK O'BRIEN

The common whitetail (*Plathemis lydia*) is one of the most common dragonflies. It thrives in man-made settlement ponds and stormwater runoff ponds, which usually are oxygen-poor and contain excessive concentrations of nutrients due to contaminated sediments, fertilizers, herbicides and other materials. Adult males develop a white waxy coating on the abdomen as they mature. They establish mating territories and chase off rival males. Females have banded wings and lack the white abdomen. Their naiads are voracious eaters of mosquito larvae and other small aquatic invertebrates. Adults are active from mid-May to September.



MARK O'BRIEN

The arrow clubtail (*Stylurus spiniceps*) is a long, black dragonfly with green eyes and light green markings. It can be found in most rivers in southern Michigan and southwestern Ontario. They are known as a "hanging clubtails" because the adults often are seen hanging from overhanging branches along the river. They are exciting to watch as they fly swiftly over the center of a river, sometimes skimming the water surface. Naiads come out of the water and crawl onto the riverbanks in early July. When the adults emerge, they quickly disperse to the woods for several days. After they have sexually matured, they return to the river to feed and mate. The flight season is from July through August.



MARK O'BRIEN

The eastern pondhawk (*Erythemis simplicicollis*) is a voracious dragonfly that inhabits a variety of marshy and well-vegetated pond edges where duckweed and mats of algae are found. Both males and females are grass-green with black stripes on the abdomen as they begin their adult stage. As they mature, the female retains this coloring but the male becomes a blue-green color with a whitish cast to the abdomen. Adults eat larger insects, including other dragonflies. They perch on plants or other objects and quickly dart out to seize their prey. This species is quite common in southern Michigan and southwestern Ontario from late-May into September.

Wet Meadow

Wet meadows are wetland communities mixed wildflowers, grasses and sedges that grow on saturated loam or muck soils with high water-retention capability. They often are not immediately recognized as wetlands because surface water tends to be visible only during spring flooding, when water depths reach a maximum of about six inches (15 cm) even when the water level is at its lowest. Usually in summer, it remains at or near soil surface.

Wet meadows depend on a consistently high water table and generally are located within large wetland complexes. They often function as transition zones, or ecotones, from deeper water wetlands to upland. Wet meadows usually form near the base of a hill where percolating springs and seeps emerge and provide a constant source of water to saturate the soil.

The presence of grass-like plants called sedges (*Carex* spp.) defines wet meadows. Tussock sedge (*Carex stricta*) is the most common species and grows in large tussocks, or clumps. Tussock sedge will appear if ground water levels are reduced by two to four feet (0.6 to 1.2 m).

Many wildflowers and grasses also live in wet meadows. Grass species include blue joint, reed canary (*Phalaris arundinacea*), blue stem and prairie cord grass. Wildflower species include joe-pye weed (*Eupatorium maculatum*), panicled aster (*Aster simplex*), swamp milkweed (*Asclepias incarnata*), swamp thistle (*Scirpus muticum*) and marsh bellflower (*Campanula aparinoides*).

A variety of animals find habitat in wet meadows. Many butterflies, including the monarch, skipper, mulberry wing and eyed viceroy, depend on sedges as their major food plants.

Reptiles, such as the Eastern Massasauga rattlesnake, Blanding's turtle and spotted turtle, find nesting habitat and food in wet meadows. A wet meadow's springtime flooding provides a productive area for frogs, whose



On Grosse Ile, a wet meadow is protected by the Grosse Ile Land Conservancy's Nature Area. During spring floods, the distinctive clumps of tussock sedge (*Carex stricta*) protrude from the water's surface.

mating calls enliven the grassy meadows with musical croaking.

Rare bird species, such as sedge wren, northern harrier, short-eared owl and American bittern, live in wet meadow habitats. The northern harrier, formerly known as marsh hawk, requires large, open wet meadows with tall, dense grassy vegetation and shallow inland marshes to nest. It feeds primarily on small mammals such as mice and voles.

Wet meadows are fire-dependent. In the absence of fire or flooding, all but the wettest wet meadows typically convert to shrub swamp or swamp forest, which causes shade-intolerant

species to decline. This reduces the meadow's diverse plant composition, a change that subsequently affects all insects, birds, reptiles and amphibians dependent upon this unique habitat.

Extensively used, and threatened, by agriculture, wet meadows have been ditched, tiled, drained, mined for peat and converted to pasture or cropland. Mowing of blue joint grass, as a source of hay, was widely practiced before 1950 and is still done at St. Johns Marsh and Harsens Island in Michigan.



JAMES H. HARDING

The Blanding's turtle (*Emydoidea blandingii*) lives in a variety of unpolluted aquatic habitats in Michigan and Ontario, including marshes, sloughs, and ponds. They require wetlands with abundant vegetation and soft bottoms. During the mating and nesting season, they can be found moving through uplands that are open and sunny. Maintaining small and large wetlands that are connected to upland habitats is critical for the survival of this species.

The yellow lady's-slipper (*Cypripedium calceolus*) grows among sedges in a variety of alkaline habitats, such as wet prairies, wet meadows and fens.



JESSICA PITELKA OFFER

Swamp milkweed (*Asclepias incarnata*) is a common wildflower of marsh edges and wet meadows. Its bright pink blossoms provide nectar for many pollinators, including the monarch butterfly (*Danaus plexippus*). Swamp milkweed and common milkweed are the larval host plants for the monarch. The butterfly lays its eggs on the milkweed. The hatched caterpillars feed on the leaves, then attach themselves to the plant for their pupal stage before they emerge as adult monarchs.

Sedge Wren

The sedge wren (*Cistothorus platensis*), once known as the short-billed marsh wren, is the least known of the five species of wren that nest in the Corridor. Its breeding range is central to southeast Canada and the northern U.S. It winters in Florida and parts of Mexico.

Sedge wrens require wet meadows or sedge wetlands for nesting. They once were common or even abundant in parts of the region but they have been uncommon or rare since about 1900, due to habitat loss.



JIM SINICK NATURE'S IMAGES



Summer wildflowers bloom profusely in a prairie fen in Springfield Township, Michigan.

Prairie Fens

Prairie fens are wetlands that typically occur next to lakes, rivers and streams in glacial outwash areas or on coarse-textured glacial moraines. Because they occur on relatively flat topography, their presence in the Lake Huron to Lake Erie Corridor is restricted to the erllobate regions of southeastern Michigan and southwestern Ontario.

Prairie fens occur where water from springs seeps moves slowly up through the silty, calcareous soil, bringing calcium-rich water to the surface. This makes the soil and water somewhat alkaline and leaves white deposits on the soil surface. Because the soil is waterlogged and low in oxygen, a fen has a low rate of decomposition. This allows peat to accumulate. The peaty, alkaline soils distinguish fens from similar-looking wetlands, such as wet meadows.

The vegetation of a fen commonly occurs in three related phases, each with distinct dominant and characteristic species: sedge flats, sedge meadow and wooded fen.

Sedge flats are the wettest part of a fen. These areas are located in flooded depressions where water flows from springs or streams. Up to 12 in (30 cm) of water might lie here during springtime. These flats are dominated by sedges and other water and alkaline tolerant vegetation, such as golden-seeded spike rush (*Eleocharis elliptica*), wicket spike rush (*Eleocharis rostellata*), hard-stemmed



Grass of Parnassia (*Parnassia glauca*) is an indicator species of prairie fens. The subtle green lines on its white petals serve as nectar guides for pollinating insects.



The showy lady's-slipper (*Cypripedium reginae*) is a large, beautiful native orchid that grows in open areas of fen and swamp habitats. Early settlers used roots of this plant as a soothing medicine for nerve problems.

bulrush (*Scirpus acutus*) and twig rush (*Cladium mariscoides*).

Sedge meadows are the largest part of a fen. These areas are saturated, but not inundated, and have slightly sloping soil with peat deposits. Dominant plants include shrubby cinquefoil (*Potentilla fruticosa*), tussock sedge and fen star sedge (*Carex sterilis*.) In addition, plants common to tallgrass prairies, such as little bluestem and Indian grass, often are present in a prairie fen.

Wooded fens are elevated portions located around the fen's upland edges. They support shrubs and shrub trees, chiefly tamarack (*Larix laricina*), poison sumac (*Rhus vernix*), gray dogwood (*Cornus racemosa*), red-osier dogwood (*Cornus stolonifera*), and pussy willow (*Salix discolor*).

Fens support rare plant species, such as tuberous Indian plantain (*Cacalia plantaginea*), Richardson's sedge (*Carex richardsonii*), white lady's-slipper

THE MICHIGAN NATURE ASSOCIATION PROTECTS RARE HABITATS

The Michigan Nature Association (MNA) is the oldest land conservancy in Michigan. Officially incorporated in 1952, with roots in the Detroit area, the MNA protects many natural areas in southeastern Michigan including prairie fens. The Calla C. Burr Memorial Plant Sanctuary and Lambs Fairbanks Plant Preserve are located in Rose Township, Oakland

County, and protect fen, bog and oak woods habitats in a relatively small area.

The Lakeville Swamp Sanctuary in Oakland County is a larger preserve that is easier to visit, although first-time visitors usually require a guide. It can also be enjoyed from the

perimeter roads where fen and conifer swamp communities can be viewed at a distance. The largest American plum tree in Michigan is found at this sanctuary as well as the federally endangered eastern massasauga rattlesnake.



Lakeville Swamp Sanctuary



The Calla C. Burr Memorial Plant Sanctuary

orchid (*Cypripedium candidum*), mat muhly (*Muhlenbergia richardsonii*), prairie dropseed (*Sporobolus heterolepis*), Ohio goldenrod (*Solidago ohioensis*), Riddell's goldenrod (*Oligoneuron riddellii*) and fringed gentian (*Gentiana crinita*), which are adapted to the fens' alkaline environment. Several rare insect species also are associated with prairie fens. These include the tamarack tree cricket, Mitchell's satyr, powersheik skipper and swamp metalmark butterflies.

Protecting the surrounding natural water systems is the best way to preserve fens. Drains and wells used in agriculture and residential development have disrupted groundwater flow and destroyed many prairie fens, along with other wetlands. Fens' cool, alkaline water has also been negatively affected by warm, nutrient- and sediment-laden runoff from farms and yards.

Absence of fire is another threat. Before European settlement, prairie fens in the Corridor were adjacent to dry, open upland communities, such as mixed oak barrens or oak savannas. These communities and prairie fens were



Blanchard's cricket frog (*Acris crepitans blanchardii*) is a small member of the tree frog family. It does not climb and lives year-round in aquatic habitats. Blanchard's cricket frog prefers early successional wetlands, ponds, and streams with open, usually muddy, shorelines. This frog has a large native range in North America; however, perhaps in part because of sensitivity to polluted habitats, populations have been declining in Michigan and Ontario.

maintained by fire that burned surface vegetation and inhibited shrub invasion. In more recent times, fire suppression has caused prairie fens to convert to shrub and conifer swamps.



A species at risk, Mitchell's satyr (*Neonympha mitchelli*) is a butterfly often found in the open edges of wooded fens where tamarack and poison sumac are scattered within a sedge meadow. Loss of habitat is responsible for this butterfly's decline.



Proud Lake Recreation Area near Wixom, Michigan, has a deep kettle depression that houses a large lake with a quaking mat. A conifer swamp with tamarack and poison sumac surrounds the open sedge and sedge community. Hardwood swamp with black ash, swamp white oak, basswood and sycamore trees surrounds the bog. Sedges and skunk cabbage grow in the understory. Oak-hickory forest and open meadows grow on the adjacent hilly uplands.

Bogs are unique wetland communities that derive their water from rainfall. They form in lakes, old lake depressions, and other low-lying areas. The water in bogs is often acidic and adds few nutrients to the bog environment. Poor drainage creates waterlogged soil and anaerobic conditions. This slows the activity of decomposing bacteria, allowing organic matter to accumulate over time and form a layer upon layer of peat.

Plants that live in bogs are adapted to these acidic conditions. They are known as bog plants or, in some cases, as bog specialists. The most prominent example is sphagnum moss (*Sphagnum* spp.), which forms a thick mat over a bog's surface.

Sphagnum moss builds thick peat soils and its decomposition actually contributes to the bog's acidity over time. The absorbent quality of sphagnum moss has been useful to humans in various ways, including applications as bandages in World War I battlefield hospitals and as a soil conditioner in modern-day gardens.

Shrubs, grasses and wildflowers that can live in a bog's saturated, nutrient-poor, acidic soils include native large and small cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*), highbush blueberry (*Vaccinium corymbosum*), poison sumac, leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), cotton grass (*Eriophorum* spp.), wintergreen (*Gaultheria procumbens*), sedges and orchids.

Trees that grow on the fringes of bogs are tamarack, white cedar (*Thuja occidentalis*), black spruce (*Picea mariana*) and occasionally white pine (*Pinus strobus*).

Some bog plants have adapted to the soil's nutrient deficiency by becoming carnivorous. They obtain their nutrients by catching and digesting insects. Examples include pitcher plants (*Sarracenia* spp.) and sundews (*Drosera* spp.).

Acidic conditions result in a low diversity of plant species in a bog. Plants that do thrive tend to be restricted to bog habitats. Unfortunately, these plants are becoming rare as bogs are drained for farming and mined for their valuable peat. Homeowners can help reduce bog mining by choosing compost, instead of peat moss, to enrich their garden soil.



Cotton grasses (*Eriophorum* spp.) are in the sedge family. Their downy white seed heads may create the appearance of a cotton field in a bog.



Grass pink (*Calopogon tuberosus*) is a small, delicate orchid found in bog and fen habitats.



The Minden Bog in north-central Sanilac County, Michigan is the headwaters for the Black River, which flows into the St. Clair River at Port Huron. This vast area of 3,000 ac (1,200 ha) is elevated above surrounding terrain, making it the southernmost raised bog in North America. The bog is the main component of the Minden City State Game Area. It is a beautiful, quiet place where the ground appears firm but will shake if jumped upon.

CHANGES IN BOG HABITAT

Today bogs are more commonly found in the northern reaches of Michigan and Ontario. They used to be scattered throughout the inland area of the Lake Huron to Lake Erie Corridor. Although never common to the flat lakeplain, less than one percent of wetlands in Southern Ontario today are bogs. It is thought that bogs occupied low ground around more than half of Oakland County's 1,468 lakes before European settlement. There also are numerous historical accounts of "cranberry marshes" in Wayne County, particularly in Redford

Township. During the 1800s, settlers harvested the fruit of the cranberry shrubs, which are native to North America, for commercial sale in Europe.

Bogs also provided settlers with a source of metal as they harvested bog iron ore, which is formed when iron oxide emerges as a precipitate from a bog's acidic waters. Dr. Douglas Houghton, in his first report as state geologist in 1838, wrote:

"At a distance of six or seven miles northwest of Detroit, and in the county of Wayne, bog (iron) ore occurs at intervals over an extent of several hundred acres, but I have not been able to examine it with sufficient care to determine its extent; I think however, there can be little doubt

CARNIVOROUS PLANTS



The sweet-smelling sundew (*Drosera* spp.) attracts insects to its sticky red leaves. Once the insect is caught, the leaves slowly close to aid digestion.



The pitcher plant's (*Sarracenia purpurea*) landing pad, red veins and hairs that point downward lead insects to a cup where they drown and eventually are digested.

WOODED COMMUNITIES

Forest was, by far, the dominant vegetation of the Lake Huron to Lake Erie corridor at the time of European settlement. Differences in glacial topography, soils and moisture resulted in a variety of forest communities across the region. Hardwood swamp, conifer swamp, shrub swamp and floodplain forest developed in low areas and along rivers. In upland areas, oak barrens and forests of beech-maple and oak-hickory grew. Today, only small remnants are left of these forest communities, a vital part of the region's natural heritage.



(Above) Southern Michigan and southwestern Ontario are at the northern edge of the range of the opossum (*Didelphis virginiana*). This small's naked ears make it sensitive to cold weather. Opossums prefer to live in woodlands with nearby meadow habitats. Their voracious feeding habits make them adaptable to suburban development.



The Carolinian Zone

The hardwood forests of southern Michigan and southwestern Ontario are called "Carolinian" because they contain many species common to southerly zones of the Eastern Deciduous Forest Biome, such as the Carolina states. These species, which favor warmer climates and longer growing seasons, include paw-paw (*Asimina triloba*), sassafras (*Sassafras albidum*), black gum (*Nyssa sylvatica*),

flowering dogwood (*Cornus florida*), cucumber tree (*Magnolia acuminata*), American chestnut (*Castanea dentata*), Kentucky coffee tree (*Gymnocladus dioica*), blue ash (*Fraxinus quadrangulata*), hop tree (*Ptelea trifoliata*) and several oak and hickory species. Several mammals and birds, such as the southern flying squirrel, opossum, Acadian flycatcher and summer tanager, do not stray north of this climatic region.



(Above) This map shows the transition zone of southern and northern forest types in Michigan and Ontario. The invisible line between the two types lies below the 43rd parallel.

(Left) The paw-paw (*Asimina triloba*) is a Carolinian tree species and is at the northern edge of its range in the Corridor region. Growing in the forest's understory, this small tree favors warm moist floodplains and mesic (moderately moist) woods. The paw-paw produces a unique banana-like fruit from red, foul smelling flowers that are pollinated by flies. Here, seedlings are pictured in the understory of a forest on the campus of the Wayne County Community College Downriver Campus in Taylor, Michigan.



(Left) Old-growth forests, like this one at the Lower Huron Metropark in Michigan, typically have regular gaps in the canopy, rich understory vegetation, deep organic soils and scattered dead, decaying logs and snags (dead trees that are still standing or have only partially fallen.)

The Value of Old-Growth Forests

A forest is considered to be a climax forest community, or "old growth," when it reaches 150 to 250 years of age.

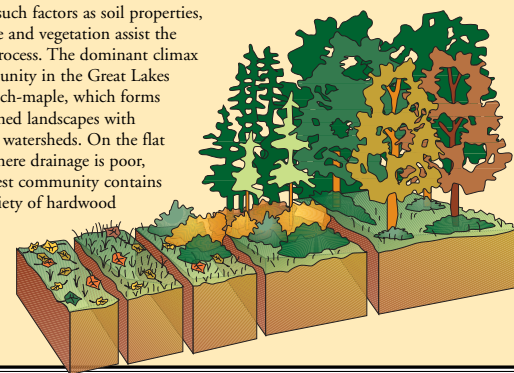
Old-growth forests have all levels of forest strata, from ground vegetation to canopy crowns formed by mature trees that can be very large.

Because old-growth forests take so long to grow, they provide valuable wildlife habitat that cannot be easily or quickly replaced. Various animals, birds and insects live in all strata of old-growth forests. Predatory birds roost and nest in the upper canopy. Songbirds and small animals, such as squirrels, make nests in the understory and shrub layer. Wildflowers and grasses grow in the herb layer and provide food for foraging animals and butterflies. The litter layer consists of decaying stumps and logs from which plants germinate. The soil contains deep organic matter from decades of accumulated leaves; a variety of spring ephemeral wildflowers, which can't be found in any other habitat, thrive here. Even standing deadwood provides food and housing for birds, such as woodpeckers, and insects upon which they feed.

S U C C E S S I O N

Succession is a natural ecological process that begins with colonization of new land by pioneer species and ends with establishment of a climax community. This progression of events may take hundreds of years. Typically, pioneer species are shade-intolerant and short-lived plants that over time are replaced by shade-tolerant and longer-lived species. The process eventually results in a climax community.

Changes in such factors as soil properties, microclimate and vegetation assist the succession process. The dominant climax forest community in the Great Lakes region is beech-maple, which forms on well-drained landscapes with well-defined watersheds. On the flat lakeplain, where drainage is poor, a climax forest community contains a greater variety of hardwood tree species.



THE FOREST FLOOR



The floor of mature forests is marked by pit-and-mound topography, created when old trees topple, heaving their root mass upward. The forest floor, known as the litter layer, consists of rich organic soil formed by decomposed fallen leaves. Ferns, mosses and vines, such as Virginia

creeper (*Parthenocissus quinquefolia*), thrive in this leaf litter and help recycle nutrients in the forest ecosystem. When old trees die and fall, new seedlings germinate in cracks and crevices of the decaying bark, which supplies nutrients to help them grow and mature.



ROBERT STEWART

The mature hardwood trees at the City of Detroit's Palmer Park offer hints of how the original forests of the Detroit area may have looked.



GLENN OGIVE

At the Lorne C. Henderson Conservation Area in central Lambton County, nature trails wind through floodplain and mixed hardwood forests.

Forests of the Past

Descriptions provided by early surveyors give valuable clues to the extent and diversity of forests of the past. In Lambton County, for example, early surveyors indicated that townships contained small areas of "good land" interspersed with "beech, maple and hickory," with "oak and hickory" plantations at times, interspersed with black ash and elm swamps. "Swarmland swamps" were noted as common in some townships. Areas of hardwood swamp in Sombra, Brooke, Niskillen and Dawn townships were described as "enormous." Areas with high, dry lands of beech-maple forest were characterized as having "old Indian scrub," a description attributed to the native peoples' practice of using maple sap to produce maple sugar. In the townships, survey notes included "open marsh" with "willow and rose h." Occasionally, a surveyor described areas as "open meadow with high grass extending a considerable distance to the right and left."

Even this early description of the vegetation, much of the landscape has been drained and farmed. Less than ten percent of Lambton's original forest remains today.

For the above information: Sydenham Valley Conservation Authority, 1965. Department of Energy and Resources Management, Conservation Authorities Branch, Toronto, Ontario.



Black Creek forest is one of the largest remaining areas of forest in southwestern Ontario. On the 800-acre (324 ha) preserve are remnants of the original forests of the Detroit area, including oaks, beech and maples.

The Forests of Today

Two forest types dominate southern Michigan and Ontario: beech-maple in mesic areas and oak-hickory in more xeric sites. Much of the region's original forest cover has been destroyed. Most surviving forests are fragmented woodlots in varying states of disturbance. The least disturbed upland forests now are dominated by sugar maple (*Acer saccharum*) and beech trees or combinations of white oak, black oak, red maple (*Acer rubrum*) and black cherry.

Disturbances cause changes in forest communities. These include natural disturbances, such as storms that knock down trees. Man-made disturbances involve clearing and filling land for agriculture and development. Today, the Corridor region is characterized by a mosaic of cleared lands and woodlots in various stages of succession.

Many pre-settlement accounts do not mention tree species that are less tolerant of fire, such as black cherry and red maple. They now are common. Black cherry is an opportunistic species that grows in areas of disturbance, including forest edges and openings. Red maple can live in a broad range of site conditions. Its main habitats are swampy lowlands, but it is an aggressive colonizer of upland sites. In recent times, there has been a marked increase in red maple's abundance due to fire suppression and disturbance of pre-settlement forests by humans.

After many years of decline, forest cover has been increasing in some parts of the region. For example, it has grown in the outlying reaches of Detroit's metropolitan area where farmland has been abandoned. Forest cover in St. Clair County, Michigan, has increased since 1900 as deserted farmland has grown into young woodlots. It takes decades for a forest



DEBRA A. BOUSSEY

Railroad tracks bisect parts of Black Oak Heritage Park in Windsor, Ontario.

ecosystem to mature. In Ontario, where agriculture remains an important part of the economy, forest cover remains low. Forests cover only three percent of the landscape in Essex County and less than five percent in Kent County. There have been various public and private tree-planting programs in southwestern Ontario over the years and continue today. Citizens can help by increasing the size of their own woodlots and participating in community tree-planting events.

The Problem with Fragmentation

The vast forests that once covered large areas of land in southeastern Michigan and southwestern Ontario have been broken into hundreds of thousands of woodlots, which are surrounded by agricultural fields, roads, transmission lines, railroads and homes.

A major problem with breaking up, or fragmenting, forests is that the remaining pieces aren't large enough to have expansive, dense interiors that provide habitat for certain birds and animals. Loss of this habitat is a key factor in the decline of populations of "interior forest species" of birds, such as scarlet tanager, ovenbird, Acadian flycatcher and many warblers.

Because fragmented forests aren't connected, small forest mammals can no longer travel far without venturing into the dangers of open land. This prevents the exchange of genetic information between breeding populations, which results in a weakening of the gene pool. It also leads to localized extinctions and the reduced ability of animals to re-colonize woodlots. This also applies to plant populations that depend on birds, animals and insects to spread their seed.

WAMP

swamp is a forested wetland that typically has standing water during part of each year and contains moisture-tolerant tree species. Types of swamp in the Lake Huron to Lake Erie Corridor are conifer, hardwood and shrub swamp.

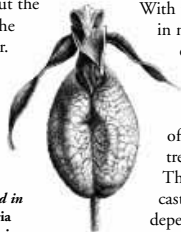
Conifer Swamp

In conifer swamps are dominantly tamarack (*Larix laricina*) and black spruce (*Picea mariana*) and white cedar (*Thuja occidentalis*) present to a lesser extent. Hardwood trees, such as red maple, silver maple (*Acer sp.*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), yellow birch (*Betula alleghaniensis*) and American elm (*Ulmus americana*), often grow among the conifer trees.

Conifer swamps occupy isolated depressions in the landscape. Like bogs, these swamps have acidic soil conditions and deep organic matter deposits of peat moss. Many of the poor conifer swamps that exist today likely were once bogs. Over time, they were colonized by tamarack and black spruce.

Conifer swamps have peat soils, but the poor conifer swamps, but they do have a neutral pH due to the leaching of alkaline groundwater. Conifer swamps typically occur in a variety of glacial features, such as channeled depressions in glacial till, sandy lakeplains,

Many orchid species are found in conifer swamp habitats. Whorled pogonia (*Isotria medeolae*), Loesel's twayblade (*Liparis loeselii*), yellow fringed orchid (*Platanthera ciliaris*), small green wood orchid (*Platanthera elliptica*), rose pogonia (*Pogonia ophioglossoides*), dragon's mouth (*Arethusa filiformis*), grass pink (*Calopogon tuberosus*), pink lady's slipper (*Cypripedium acaule*) are found growing in the Corridor region's conifer swamps. Pictured is the pink lady's slipper (*Cypripedium acaule*) whose pink, pouch-like structure often traps insects when they enter to pollinate the flower.



AMELIA HANSEN, CORVUS ART

kettle-kame topography and coarse-textured end moraines.

The spire shape and open branch pattern of tamaracks allow a large amount of sunlight to reach the swamp's ground layer, resulting in the growth of a thick and diverse understory. As many as 28 species of shrubs can grow in the understory of a relict conifer swamp, including spicebush (*Lindera benzoin*), highbush blueberry, poison sumac, winterberry (*Ilex verticillata*) and nannyberry (*Viburnum lentago*), black chokeberry (*Aronia melanocarpa*.) The ground layer is typically composed of sphagnum mosses, sedges and orchids.

Rare animal species closely associated with conifer swamps include tamarack tree cricket, Mitchell's satyr butterfly, eastern massasauga rattlesnake, Blanding's turtle and spotted turtle.

With the suppression of fire in modern times, tamarack has come to dominate many fen communities, transforming them into relict conifer swamps. The lack of fire also has enabled red maple trees to invade conifer swamps. The leafy canopy of the red maple casts dense shade, causing shrubs dependent on the open nature of a conifer swamp to slowly die out from lack of sunlight. This change in the swamp's understory can adversely impact songbirds and other wildlife that depend on the prolific fruit production of shrubs, such as winterberry and black chokeberry, as a food source.

Although conifer swamps were never a significant forest type in the region, many accounts from early settlers indicate there were pockets of them throughout the landscape. During the last 200 years, the swamps were drained and logged, then used for agriculture. Settlers also mined them for peat. Changes in the hydrology of the surrounding watershed have converted them to wet meadow, shrub or hardwood swamp. Tamarack logs were commonly used for fence posts, house and barn beams, and wheel spokes on early automobiles. Today, fewer than one percent of the original conifer swamps still exist.



MAURA MCNEIL

The winterberry shrub (*Ilex verticillata*) thrives in conifer swamps and a variety of other wetland habitats, such as deciduous swamps, wet woods and the edges of lakes and ponds. Many bird species relish the winterberry's bright red fruit.



Fire, insect outbreaks, flooding caused by beavers, and winds that uproot trees (called windthrow) are important natural disturbances that actually help conifer swamps prosper. Tamaracks' shallow, wide-spreading root systems make them particularly vulnerable to being uprooted by windstorms and fire. Tamaracks are not tolerant of shade, so disturbances that remove trees are beneficial because they result in more light penetration. The same benefits also arise from periodic infestations of larch sawfly (*Pristiphora erichsonii*) and larch casebearer (*Coleophora laricella*). However, long-term flooding caused by beaver dams or other drain blockages, such as road construction, can kill too many tamaracks and result in a conifer swamp's conversion to hardwood swamp, wet meadow or marsh.



The ground layer of a conifer swamp is rich with wetland vegetation.



AMELIA HANSEN, CORVUS ART



The tamarack is unique among conifers in that it is deciduous. Its needles turn yellow in autumn and fall off the tree.

Hardwood Swamp

Hardwood swamps are wetlands that are dominated by deciduous trees. Their soils are usually saturated and are sometimes under water.

Before settlement times, hardwood swamps covered vast areas of the flat, poorly-drained terrain. Tree species varied by local conditions. Early surveyors in Wayne County, Michigan, noted the presence of "black ash, sycamore, poplar, elm, willow and ironwood." Forests of pin oak, swamp white oak, black oak, silver maple (*Acer saccharinum*), pumpkin ash (*Fraxinus profunda*), eastern cottonwood (*Populus deltoides*), black willow (*Salix nigra*) and peachleaf willow (*Salix amygdaloides*) grew on the dry plain. Black ash (*Fraxinus nigra*), American elm (*Ulmus americana*) and sweetgum (*Tilia americana*) were prevalent in swamps with sandy soils.

The drainage and development of the landscape has made hardwood swamps increasingly rare in this region. Those remaining are located in low-lying areas along the margins of lakes. Red maple, silver maple, black ash and American elm typically dominate the forest canopy. Other common species include sycamore (*Platanus occidentalis*), swamp white oak, pin oak, yellow birch (*Betula alleghaniensis*), basswood and red-beech (*Carpinus caroliniana*).

Hardwood swamps often have a sparse understory due to dense shade and wet soils. The ground layer is generally composed of decaying wood and leaf litter, especially after heavy flooding. Ponds adjacent to flooded areas are suitable for moisture-tolerant plants, including ferns, spring wildflowers, such as jack-in-the-pulpit (*Arisaema thysifolium*) and smooth Solomon's seal (*Polygonatum canadense*), and moisture-tolerant shrubs, such as spicebush. Flat terrain and sufficient ground moisture sometimes produce stretches of sedge hummocks.



A hardwood swamp at Crosswinds Marsh in Wayne County, Michigan.



ONTARIO POWER GENERATION

Pumpkin ash (*Fraxinus profunda*) is very water tolerant, growing in swamps where water stands for many months. A signature feature of the species is its enlarged, swollen lower trunk, which compensates for its shallow root system. This tree is rare in the region, found only in remnant hardwood swamps of the lakeplain. The tree pictured above is found in the natural areas of Ontario Power Generation's Lambton Generating Station in Lambton County, Ontario. Pumpkin ash also has been identified in the wet woods of Belle Isle Park in Detroit, Michigan.



WALPOLE ISLAND HERITAGE CENTRE

Black ash was an important tree for native peoples, who wove its wood into baskets. Fresh, green wood was pounded with a mallet until it separated along annual growth rings into thin, pliable strips. These baskets are still made on Walpole Island today, preserving an important part of the region's cultural heritage.



SARAH SCHADE

The bright yellow flowers of the marsh marigold (*Caltha palustris*) brighten the forest floor of hardwood swamps in springtime.

Salamanders

Salamanders are amphibians that, unlike their more conspicuous cousins, frogs and toads, are secretive and often subterranean. Living in cool moist places in forest soils, under rotting logs, and leaf litter, salamanders absorb water and "breathe"—taking in oxygen and releasing carbon dioxide—through their skin. Adult salamanders also breathe with their lungs, although some species, like the red-backed and four-toed salamanders, don't have lungs. For these reasons, salamanders are very sensitive to pollutants.

Most salamanders breed in vernal forest pools. The juvenile salamanders are similar to tadpoles in their aquatic stage, but always have external gills and are carnivorous, feeding on insect larvae, fairy shrimp, and other invertebrates. In mid- to late-summer, these juveniles transform to their terrestrial adult forms.

In healthy woodland habitats, adult salamanders can be numerous and



The spotted salamander (*Ambystoma maculatum*) lives in relatively undisturbed woodlands where vernal pools occur. It is at risk due to the degradation and fragmentation of forest habitats.

can play an important role in the food chain of a forest. As predators, they feed on insects, spiders, and worms, but in turn are eaten by larger animals, such as songbirds and mammals. The loss of forest habitats, contamination by pesticides, fertilizers, and sewage, and the loss of vernal pool and wetland habitats threaten populations of these fascinating woodland creatures.

(Above right) Spotted salamanders reproduce by laying up to 250 eggs in gelatinous masses in vernal pools; these eventually hatch into gilled aquatic larvae. Within two to three months, the larvae mature into terrestrial adult salamanders. (Note: this egg mass was disturbed for scientific evaluation; normally, citizens should never touch egg masses as it may damage them.)

Vernal Pools

As their name suggests, vernal pools form during spring when water accumulates in depressions, or low areas, of forests, meadows and farm fields. These seasonal wetlands then dry out amid summer's heat. Wetland vegetation may become established but annuals usually dominate. Vernal pools are important to many amphibian species. Salamanders, toads, wood frogs, tree frogs and spring peepers depend on vernal pools for their aquatic larval stage. Tadpoles grow rapidly by feeding on bacteria, algae and organic debris in the pool before



moving up onto the land for the terrestrial frog stage. With water present only temporarily, vernal pools don't support fish that normally prey on the

eggs and tadpoles. Many predatory insects that feed on mosquitoes, such as dragonflies and damselflies, also breed in vernal pools.

Shrub Swamp

Shrub swamps are wetlands dominated by shrubs that grow on seasonally flooded, poorly drained soils with fluctuating water levels. These swamps generally form in local depressions or next to streams, rivers and ponds. Their soil is muck that typically ranges from saturated to inundated with a few inches of water. Biologists often refer to this community as shrub-carr, meaning a wetland dominated by tall shrubs.

Shrub swamps are ever-changing systems. They may start as a shallow pool of standing water or as a floodplain with lakes, ponds, rivers or streams. Water-loving shrubs are the first vegetation to grow there. Over time, decayed vegetation accumulates until water depths increase, allowing denser brush growth. Further succession eventually results in shallower waters and built-up organic soils that support more woody cover. The rate at which this succession from wetland to upland occurs depends on water levels. Several years of wet weather can slow the transition; several dry years can hasten it.

These ecosystems are strongly influenced by their drainage basins, the chemical composition of waters flowing into the basins and the amount of surface water input.

Due to these variable conditions, shrub swamps may be wetter than lowland forests but generally do not contain large numbers of deep-water marsh plants such as cattail and bulrush. These plants may appear around edges or openings, however.

Dominant shrub growth typically includes alder (*Alnus* spp.), buttonbush (*Cephalanthus occidentalis*), willow (*Salix* spp.) and dogwood (*Cornus* spp.). These provide food and habitat for mink, skunks, raccoons, beavers, deer and cottontail rabbits. Mallards, wood ducks, herons, black-capped chickadees and several kinds of warblers nest in shrub swamps, as do snakes, turtles, frogs, toads, butterflies and dragonflies. Beavers move invading trees and help retain the shrubby appearance.

While construction and dredging projects can destroy shrub swamps, some logging and farming practices on adjacent uplands can convert forested wetlands into shrub swamps. Surface

water runoff and streams that flow from agricultural or developed areas can convey pollutants and unnatural nutrient levels that also can change the swamp's character.



LARRY CORNELIUS

The buttonbush flourishes within the Bickford Oak Woods Conservation Reserve in Lambton County, Ontario.

The 741-ac (300-ha) natural area was recently protected by the Nature Conservancy of Canada with the help of the Ontario Ministry of Natural Resources and other partners. This large forest, which is surrounded by agricultural land use, is unusual in Lambton because the county has lost 90 percent of its forest cover.



JOHN SCHAEFER

The distinctive ball-shaped flowers of the buttonbush (*Cephalanthus occidentalis*) are a favorite nectar source for many insects, including the tiger swallowtail butterfly.

Trees common to beech-maple and oak-hickory forest communities occupy the reserve's rolling clay-soil topography. In lower areas, pockets of buttonbush and winterberry shrubs grow within a silver maple swamp that also contains swamp white oak, bur oak, American elm and willows. The site harbors two unique tree species, swamp cottonwood (*Populus heterophylla*) and Shumard oak (*Quercus shumardii*), both of which thrive in the wet, clay lakeplain soils. The destruction of lakeplain hardwood swamps makes these two tree species rare today in the region.

Birds that require large continuous tracts of forest to survive, such as cerulean warbler, rose-breasted grosbeak, wood thrush and white-breasted nuthatch, find habitat in Bickford Oak Woods. The rare Butler's garter snake, which is susceptible to habitat fragmentation, has been identified here. Other wildlife spotted includes wild turkey, wood duck, white-tailed deer and beaver.

Floodplain Forest

Floodplain forests are forested areas along rivers and streams that flood during heavy rains or spring melt. Soils are usually heavy sand or mud, rich in nutrients and poorly drained. Although standing water may remain well into the growing season, floodplain forests usually become very dry in late-summer and may contain trees representative of upland forest communities.

Floodplain forests are very important to the health of adjacent rivers and streams. They improve water quality by filtering pollutants and reduce soil erosion by stabilizing banks. Floodplain forests also improve aquatic habitats by supplying woody debris and providing shade that keeps water temperatures cool. They benefit humans by absorbing potential floodwater from heavy spring rains and melting snow.

Vegetation in a floodplain forest generally consists of deciduous trees with supporting herbs and shrubs. Skunk cabbage (*Symplocarpus foetidus*), marsh marigold (*Calthia palustris*) and golden ragwort (*Senecio aureus*) are just a few of the wildflowers that grow in the wet, organic soils. In higher, drier areas, typical spring wildflowers, such as early meadow rue (*Thalictrum dioicum*) and wild geranium (*Geranium maculatum*) blanket the forest floor.

Seasonal flooding, mild temperatures and a nutrient-rich environment influence the types of trees that grow in a floodplain forest. The constant input of sediments creates slight changes in the topography of the floodplain and varying sediment types. This allows trees, such as red oak (*Quercus rubra*), white oak and American beech (*Fagus grandifolia*), to grow on the higher, drier sediment deposits in the floodplain. Trees that are tolerant of seasonally wet conditions,



ALLEN CHARTER

(Inset Left) The cardinal flower (*Lobelia cardinalis*) has a brilliant red flower whose nectar is a favorite of hummingbirds. It is found growing along the shady edges of streams and ponds and in low, wet woods.

(Inset Right) The spotted touch-me-not (*Impatiens capensis*) is an annual wildflower whose orange flowers brighten the edges of rivers and streams and damp, open areas in and around marshes.

The wild ginger (*Asarum canadense*), with its heart-shaped leaves, grows in large colonies on the floor of floodplain forests. This rhizome has a peppery taste and a smell similar to that of the commercially marketed ginger plant (*Zingiber officinale*), which hails from tropical areas. Wild ginger has been used to make a flavorful candy by boiling the root stocks and simmering them in sugar syrup.



IAN BOST

Sycamores (*Platanus occidentalis*) display a distinct black, white and gray mottled bark and often grow along rivers. When settlers entered the region, they looked for these "white ghosts" of the forest to lead them to water.



Thriving in the humid, nutrient-rich floodplain environment, this mature riverbank grape (*Vitis riparia*) climbs the trunks of American beech trees in the floodplain forest of the Pine River Nature Center in St. Clair County, Michigan.

h as silver maple, eastern cottonwood, ck willow and American elm, thrive in er areas.

rm and humid summer temperatures d cooler conditions in the spring create istinct microclimate in the floodplain vironment. The cooler spring peratures prevent trees from leafing efore spring frosts, which results in ch woody plant community and motes the growth of tree species at orthern edge of their range. Many s more common to the southern S., such as redbud (*Cercis canadensis*), ey locust (*Gleditsia tricanthos*), ntucky coffee tree, sycamore, and thern hackberry (*Celtis occidentalis*), ive in the floodplain's unique roclimate.



The delicate white flowers of spring cress (Cardamine bulbosa) bloom along the moist edge of a vernal pool at the Lower Huron Metropark, which contains one of the finest examples of floodplain forest in southeastern Michigan. Located along the Huron River, the forest's towering trees form an arboreal cathedral, and a colorful community of springtime wildflowers carpets its floor. This natural area has particular significance because of its old-growth trees, which are a rarity in this highly developed region.



Marsh ferns (Matteuccia struthiopteris) grow in low, wet open woodlands along swamps and in swamps.



ESSEX REGION CONSERVATION AUTHORITY (ERCA)



The corky ridges of Kentucky coffee tree bark are distinctive.

The Canard Valley Conservation Area in Essex County, Ontario, has one of the largest populations of the Kentucky coffee tree (Gymnocladus dioica) in Canada.

ERICA

Birds that need Large Areas of Forest are in Decline



ROGER ERIKSSON

Red-shouldered Hawk

The red-shouldered hawk (*Buteo lineatus*) is one of the most beautiful hawks. It is secretive and prefers extensive, mature floodplains and deciduous swamp forests where it preys on amphibians, crayfish, snakes and even ducklings.

The red-shouldered hawk was once the most abundant breeding hawk in the eastern part of its North American range, including southern Michigan and southwestern Ontario. But by 1960, it was nearly eliminated. It now is considered a species at risk in Michigan and Ontario. The bird no longer winters in this area, preferring the southern states through central Mexico.

The population decline has resulted from habitat loss and the species' sensitivity to disturbance. As riparian habitats have been destroyed or fragmented, red-shouldered hawks have been replaced by the more adaptable red-tailed hawk.



ROGER ERIKSSON

Cerulean Warbler

The cerulean warbler (*Dendroica cerulea*), named for the bright blue color of the male, nests in North America and winters in South America. It once was abundant in southeastern Michigan and southwestern Ontario. Early Detroit ornithologist Bradshaw Swales noted ten pairs in one woodlot in Grosse Pointe in 1902. Now it is rarely found nesting in that area, and is listed as a species at risk in both Michigan and Ontario.

It is difficult for humans to see this warbler, which lives in the canopy

of mature forests, often along watercourses. The dramatic declines in its numbers have made a glimpse even more challenging. Special efforts have been made in recent years to document habitat requirements and populations of cerulean warblers in the U.S.

Cerulean warblers nest in eastern North America, including the Corridor. One factor in its decline is loss of the large tracts of mature forest that it requires for breeding. Another contributor may be destruction of its winter habitat in South America through conversion of primary forest to farmland.

Scarlet Tanager

The scarlet tanager (*Piranga olivacea*) is a migratory songbird that winters in the canopy of tropical forests in northwestern South America and lives in eastern North America during warmer seasons. An inhabitant of deciduous forests and pine-oak woodlands, it feeds primarily on insects, supplemented by berries and buds. Loss of large tracts of forest has contributed to this bird's decline in the Corridor region.



JULIE A. GRAVES

Interestingly, the male scarlet tanager's feathers change color with the season. In autumn, the brilliant red plumage on his body turns olive green, a color similar to that of the female scarlet tanager.

Beech-Maple Forest

Beech-maple forests grow in damp, nutrient-rich soils in well-drained portions of lakeplain, till plains and glacial ridges. As the primary climax forest of the region, the beech-maple represents the highest order of forest community succession.

The name implies, American beech and sugar maple dominate this forest type. Basswood, red oak, white oak, white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), black walnut (*Juglans nigra*) and tuliptree (*Liriodendron tulipifera*) are common associates. Depending on drainage conditions, they can be as numerous as beech and maple. In cooler areas, further north into St. Clair and Lambton counties, Eastern hemlock (*Tsuga canadensis*) and yellow birch become more common.

At the time of European settlement, beech-maple forests were, by far, the dominant forest type, covering most of southern Michigan and southwestern Ontario, as well as in much of Ohio and Indiana. Today, fragments of this forest remain as isolated woodlots between fields and development, or as publicly protected land.



STACEY WELKENBACK

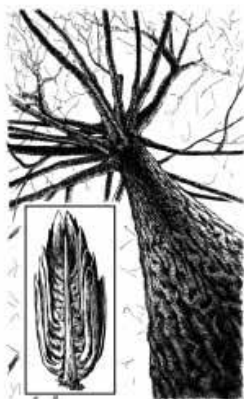
Beech-maple forests, like this one at Kensington Metropark in Michigan, have a dense to moderately dense canopy of deciduous trees, very few or no shrubs, and a well-developed herbaceous forest floor that tolerates the shade provided by the leafy canopy.



ELAINE DANIELSON

Bottlebrush grass (*Hystrix patula*) is a common grass of woodlands.

(Right) A Carolinian species, the tuliptree (*Liriodendron tulipifera*) is sensitive to frost. It is the tallest-growing tree of eastern North America, reaching heights of about 150 ft (50 m). Its showy yellow flowers resemble those of the tulip. The tree's honey is known to be a delicacy.



AMELIA HANSEN CORVUS ART

FUNGUS

Fungi play an important recycling role in forest ecosystems. They decay organic matter, making nutrients from the dead plants available for future plant growth. They can be found in a variety of shapes and colors. Some, such as morel mushrooms, are good to eat, and others, such as the fly agaric, are deadly poisonous.



(Left) This coral mushroom (*Hiericium ramosum*) can be found on fallen logs of beech and maple.

JULIE FOUNTAIN



BOB WEIR



(Above) Polypores are genera of fungi that grow as brackets on dead and living trees.

BOB WEIR

WOODLAND WILDFLOWERS

Beech-maple forests are home to an impressive array of wildflowers, including jack-in-the-pulpit, wild leek, wild ginger, wild geranium, toothwort, trout lily, spring beauty, mayapple, woodland phlox and large flowered trillium. These plants, known as "spring ephemerals," flower before trees have fully leafed out, which allows them to take advantage of the seasonal sunlight. They die back as shade from the trees increases.



TRISH BECKLORD

The large-flowered trillium (*Trillium grandiflorum*) is one of the best-known spring wildflowers. It takes six years from the time a seed germinates for the trillium to produce its first flower. As with many woodland wildflowers, ants play an important role in dispersing its seeds.



MAURA MCNICHO

Flies pollinate the purple trillium (*Trillium erectum*), also known as "Stinking Benjamin." They are attracted to its ill scent.



The wild columbine (*Aquilegia canadensis*) grows in the shade of many woodland habitats. The bright orange and yellow flowers provide nectar to many butterflies in the spring.



TRISH BECKLORD

Shown nestled among the roots of the American beech, the yellow flowers of the trout lily (*Erythronium americanum*) carpet the forest floor in spring.



TRISH BECKLORD

Pollinated mostly by bumblebees, dutchman's breeches (*Dicentra cucullaria*) are wildflowers found in woods rich with organic matter. This plant was named for the flower's likeness to pants worn by traditional Dutch men.



JOHN TIEDIE

The beautiful white flowers of the mayapple (*Podophyllum peltatum*) are hidden underneath their large leaves. This plant often grows in circular colonies on the forest floor. The fruits of this plant are edible, but other parts of the plant are extremely poisonous.



LINDSEY WISHLER

The distinctive flower of the jack-in-the-pulpit (*Arisaema ariflorum*), a wildflower of damp woodlands, is known as a spadix. This forest herb is also easily recognized in the fall by its showy red berries.



MAIRE BOYLE

The wild geranium (*Geranium maculatum*) thrives in the light shade of open woods.



DON HILL

The delicate white flowers of the bloodroot (*Sanguinaria canadensis*) are short-lived, sometimes lasting only a week. This early-blooming spring wildflower is known for the red juice that can be extracted from its stem and rhizome, which was used by native peoples to dye baskets.

RARE WOODLAND

FOREST ANIMALS



MICHIGAN NATURE ASSOCIATION

distinctive white and pink flowers the painted trillium (*Trillium* *latifolium*) bloom at the Irene and Elmer P. Jasper Woods Memorial Nature Sanctuary in Kimball Township, St. Clair County. The painted trillium is rare, with Michigan's only known populations found in this locale.



Irene and Elmer P. Jasper Woods Memorial Nature Sanctuary, owned by Michigan Nature Association, is graced by towering stands of eastern hemlock (*Tsuga canadensis*) that grow inside a hemlock-maple forest on rolling topography. The eastern hemlock's dense foliage shades the forest floor, creating darkness even in afternoon sun. Although the area is dominated by hemlock, associates include white birch, sassafras and eastern white pine. The presence of the eastern hemlock is common in more northern forests, marking the transition between southern and northern forest types in the Corridor.

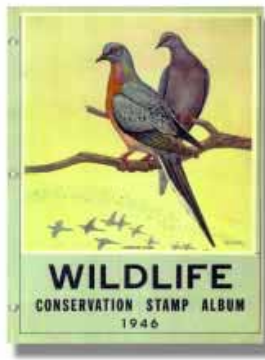


JIM SIMEK, NATURE'S IMAGES



PHILIP MYERS

(Above) The southern flying squirrel (*Glaucomys volans*) doesn't really fly, but it has a loose membrane of furred skin between its front and back legs that allows it to glide through the air from tree to tree. These small squirrels have been known to glide as far as 240 ft (80 m). The southern flying squirrel lives in mature forests, often nesting in tree cavities left by woodpeckers. It likes to feed on acorns, hickory nuts and the seeds of beech, maple and poplar trees. It rarely is seen by humans because of its nocturnal nature.



(Above) The red-headed woodpecker (*Melanerpes erythrocephalus*), found throughout eastern North America, has been known by many colorful names, such as tri-colored woodpecker and flying checkerboard. It populates open, deciduous woods in the Corridor region in summer and migrates to the southern U.S for the winter.

Red-headed woodpeckers excavate cavities in dead trees in which to raise their young. They have a broad diet of insects, nuts, fruit and even the eggs and the young of other birds. The characteristic tapping sound heard in woods is a sign that a woodpecker is working on a tree.

In this region, the red-headed woodpecker was once the second most abundant woodpecker, after the downy. Populations have been declining due to habitat loss, especially removal of dead trees. Some breeding pairs have built nests on poles, but studies show that the young don't hatch if poles are newly treated with creosote. The red-headed woodpecker has declined throughout its range, and is a species at risk in Canada.

(Left) The passenger pigeon (*Ectopistes migratorius*), whose native habitat was the deciduous forests of eastern North America, once was Earth's most abundant bird species. Numbering three to five billion, passenger pigeons may have comprised 25 to 40 percent of the native North American bird population. Accounts by early pioneers stated that migrating flocks were so thick they obscured the sun.

Sadly, this species is now extinct. Its demise resulted from mass conversion of forests to farmland and uncontrolled hunting and slaughter by European settlers. The last passenger pigeon specimen in Michigan was shot in Dearborn in 1898.

INVASIVE FOREST PLANTS

Originally from Asia, common buckthorn (*Rhamnus cathartica*) is an invasive species that threatens native plant diversity in forest habitats. Left unchecked, common buckthorn forms dense thickets that crowd and shade native shrubs and herbs. Its expansion has been furthered by fragmentation of forests and the spread of its seeds by birds that feed on its many berries.

Garlic mustard (*Alliaria petiolata*) is a biennial herb that came from Europe, where it was consumed as an edible green. It is an invasive species and has carpeted many disturbed urban woodlands, smothering native plants, including spring wildflowers. Removing garlic mustard is difficult, yet important for maintaining plant diversity in forests. Restoration ecologists study the life cycle of this and many other invasive plant species in order to determine how to control their spread.

The tatarian honeysuckle (*Lonicera tatarica*) is an invasive, deciduous shrub that is native to China, Korea and Japan. It was introduced to the United States in 1846 as an ornamental plant. Its prolific seed production and the fact that birds readily feed and disperse the seeds have enabled it to escape into the wild. Other Asian invasive bush honeysuckles include Amur and Morrow. These shrubs' vigorous growth allows them to out-compete native vegetation for light and other resources. They can be particularly abundant on the disturbed edges of fragmented forests, where they dominate the understory.



JIM SIMEK, NATURE'S IMAGES

The wild turkey (*Meleagris gallopavo*) had disappeared from Michigan and Ontario by the early-1900s due to over-hunting by early settlers and intensive destruction of large forest tracts. Successful reintroduction efforts have brought this magnificent game bird back to the area.



MARY BOHLING

The eastern screech owl (*Otus asio*) is a small owl common to deciduous woodlands and even suburban settings, if there are sufficiently large trees and suitable snags for nesting.



JAMES H. HARDING

The five-lined skink (*Eumeces fasciatus*) is one of two lizards native to Michigan. Found in wooded habitats and open areas in woodlands, where it likes to bask in the sunlight on stumps, logs, and rocks, the five-lined skink feeds on insects like grasshoppers, spiders, and centipedes. This lizard has a unique predator escape system- when the skink is grabbed by its tail, the tail breaks off and later re-grows.



Witch hazel (*Hamamelis virginiana*) blooms in the fall when most plants are dispersing seed. From September to December, its bright yellow blossoms brighten the oak-hickory woodlands. Witch hazel oil has been used for many years to treat a variety of skin problems.

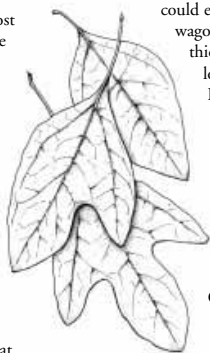


LARRY CORNELIS

Oak-Hickory Forest

Oak-hickory forests occur most commonly on rolling moraine ridges and well-drained sand dunes, where the drier conditions favor oak and hickory trees over moisture-loving beech and sugar maples.

The rolling topography of Oakland County, Michigan, once was home to great expanses of oak-hickory forests. Early settlers there were struck by the preponderance of forests seeded with large oak trees that



seemed like parks through which they could easily drive their horses and wagons - much different than the thick floodplain forests of lowlands closer to the Detroit River and Lake St. Clair. So impressed were these people of the early 1800s that they named the area "Oak Land."

Red oak, white oak, black oak and pignut hickory (*Carya glabra*) are the dominant species in an oak-hickory forest. Other tree species in these forests vary according to the soil's moisture content. They

can include red maple, sugar maple, white ash, black cherry, basswood in more mesic sites and scarlet oak (*Quercus coccinea*) and sassafras in drier areas. Overall, the dominant tree species in oak hickory forests have changed since pre-European settlement times. The suppression of fire has resulted in red maple and black cherry trees increasing in pre-dominance.



Typical understory herb and shrub species include witch hazel, choke cherry (*Prunus virginiana*) and downy arrowwood (*Viburnum rafinesquianum*). Blueberries also grow wild in the dry understory of these forests. Spring ephemeral wildflowers include hepatica (*Hepatica* spp.), bloodroot, rue anemone (*Anemone thalictroides*) and Dutchman's breeches. Pennsylvania sedge often will grow in grassy tufts throughout the understory. In autumn, the forest floor is resplendent with asters and goldenrods.

(Above) the gray squirrel (*Sciurus carolinensis*) is a common mammal of forest ecosystems.

(Left) Sassafras (*Sassafras albidum*) is a small to medium-size tree that can be found in the understory of oak woodlands. It is one of few tree species that has more than one kind of leaf. In fact, the sassafras has three differently shaped leaves, with one, two or three lobes. The two-lobed leaves look like mittens. In autumn, their fall color is brilliant pink, red and orange. In the past, the essential oil derived from this plant was used to flavor medicines, candy and root beer. Illustration by Amelia Hansen, Corvus Art.

WHAT MAKES FALL COLOR

The Corridor's landscape can be spectacular in autumn as the green leaves of trees turn glorious shades of red, purple, orange and yellow.

This color change is caused by a chemical process in the leaves. They are green during the tree's summer growth period because they contain chlorophyll, which they use to absorb energy from sunlight and to transform carbon dioxide and water into carbohydrates to feed the tree. Leaves stop making food in the fall as the tree heads into its winter rest period, so the chlorophyll breaks down and the green color disappears.



IAN BOST

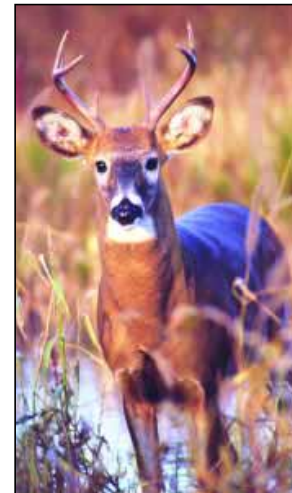
That allows carotene and xanthophylls, which are orange and yellow pigments that have been in the leaf all summer, to become visible and give the tree its "fall color." Anthocyanin pigments found in trees such as

dogwood, sumac and sugar maple produce a host of hues ranging from brilliant orange to crimson to purple. Brown leaves, common to oak trees, come from a mixture of pigments.



DAN FAVLEY

The red-tailed hawk (*Buteo jamaicensis*) is the most common raptor in the Corridor region. It often can be seen sitting in roadside trees or atop fence posts, waiting and watching to prey upon small rodents.



JOHN SCHAEFER

White-tailed deer (*Odocoileus virginianus*) have become extremely populous throughout the Corridor and extremely harmful to natural areas, particularly in the absence of hunting. Other than humans, there are virtually no predators left to keep their numbers in check. As natural habitats become increasingly rare, deer are having a dramatically negative effect on the remaining natural areas.

Deer browse heavily on the wildflowers and grasses of the forest floor. Trilliums and other spring wildflowers can disappear altogether. In fact, the native plant diversity of many of our parks is threatened. At the Pinery Provincial Park, Point Pelee National Park and Rondeau Provincial Park in Ontario, and many Huron-Clinton Metroparks in Michigan, the diversity of forest ecosystems are in danger because of over-browsing by deer. Such alteration of the ecosystems provides opportunities for invasive species, such as garlic mustard, to move in and further disrupt plant communities. Managing deer populations through hunting has become important in the protection of native biodiversity.



At the Highland Recreation Area in Oakland County, the State Park Stewardship Program is restoring the quality of an oak barren ecosystem. Lack of fire, changes in surrounding land use, unchecked brushy growth, proliferating pine trees and non-native invasive species, such as spotted knapweed (*Centaurea maculosa*), all threaten the integrity of this vanishing ecosystem. Partnerships with recreational users to remove brush and a prescribed (controlled) burn program conducted by the Michigan Department of Natural Resources are helping to bring back the native prairie grasses. Removal of invasive shrubs and trees allows the large old oak trees to flourish.

Oak Barren

Oak barrens occur on dry, gravelly or sandy moraines and glacial outwash. Oak barrens are characterized by widely scattered clumps of oak trees and shrubs, standing tall and stately in otherwise open fields of prairie grasses and wildflowers. There are few oak trees – more than ten per acre – in oak barrens but they have a commanding presence, with their crowns and massive

branches spreading 100 ft (33 m) or more in all directions.

Also historically known as “barrens,” “oak openings,” “barren and scrubby timber” and “scattered timber,” these communities are a transitional zone between dry prairies and forests.

The dominant trees in oak barrens are white oak, black oak and dwarf chinquapin oak (*Quercus prinoides*),



Rough blazing star (*Liatris aspera*) grows in the dry prairies often associated with oak barren ecosystems.

occasionally joined by northern pin oak (*Quercus ellipsoidalis*), pignut hickory and shagbark hickory. Plant species are needle grass (*Stipa spartea*), little bluestem, big bluestem, Indian grass, stiff goldenrod (*Solidago rigida*), butterfly weed (*Asclepias tuberosa*), aromatic sumac (*Rhus aromatica*), sand milkweed (*Asclepias amplexicaulis*), wild lupine and rough blazing star (*Liatris aspera*.) Many rare grassland birds find habitat in oak barrens, including the bobolink, loggerhead shrike, and the Henslow’s, savanna, grasshopper and vesper species of sparrow.

Soils in oak barrens may vary from pure sand to loam. Historically, their dryness made this community prone to frequent wildfires and promoted the presence of prairie grasslands among the scattered oaks. Fire helped to recycle nutrients into the soil and remove accumulated plant litter. This allowed soils to warm more quickly, a factor favored by warm-season grasses. Without fire, oak barrens convert to brush and, eventually, forest. Native peoples intentionally set fires to control underbrush, which made these habitats good for hunting.



Remnants of an oak barren ecosystem grow at the Island Lake Recreation Area, near Brighton, Michigan. Ecological restoration efforts, which include prescribed burns and brush removal, are helping to bring back its native plant diversity.



Pictured is a pine plantation at Island Lake Recreation Area. In the past, pines often were planted in oak barrens and savanna ecosystems because they could thrive in poor, sandy soils. At the time it was not understood how these plantings would diminish the native biodiversity of oak barrens and savannas. The shade produced by these evergreens inhibits the growth of the ecosystems’ rich grassland flora.



The stiff goldenrod (*Solidago rigida*) looks unlike most goldenrods with its wide, rigid leaves and stiff stature. The yellow blooms contribute to the late summer color found in oak barren and prairie communities.

INSECTS

Insects are one of the most important members of ecosystems. They perform functions that are necessary for life on Earth, such as pollination and decomposition. The number of the earth’s insect species is unknown, but about one million have been identified so far. They include beetles, wasps, bees, ants, butterflies, moths, flies, bugs, mantids, cockroaches, stick insects, grasshoppers, dragonflies and damselflies. New species are constantly being discovered.



Wasps are closely related to bees. But while bees feed on plants, wasps are predatory and feed on other insects, such as house flies.



The cecropia moth (*Hyalophora cecropia*) is North America’s largest silkworm, with a wingspan reaching almost six inches (15 cm)



The red milkweed beetle’s (*Tetraopes tetraophthalmus*) bright orange color warns birds that it eats milkweed and thus tastes very bitter. Its scientific name, *Tetraopes*, means it has four eyes.



The praying mantis (*Stagmomantis carolina*) is carnivorous, feeding on other insects. It strikes its prey so fast that it is able to catch flies and mosquitoes.

The natural communities of the Lake Huron to Lake Erie Corridor are rich in biodiversity. Whether they are on land or in water, on open or forested land, each one supports plants and animals that play an important role in the web of life.

The next chapter explores the impact humans have had on the landscape and its biological communities.