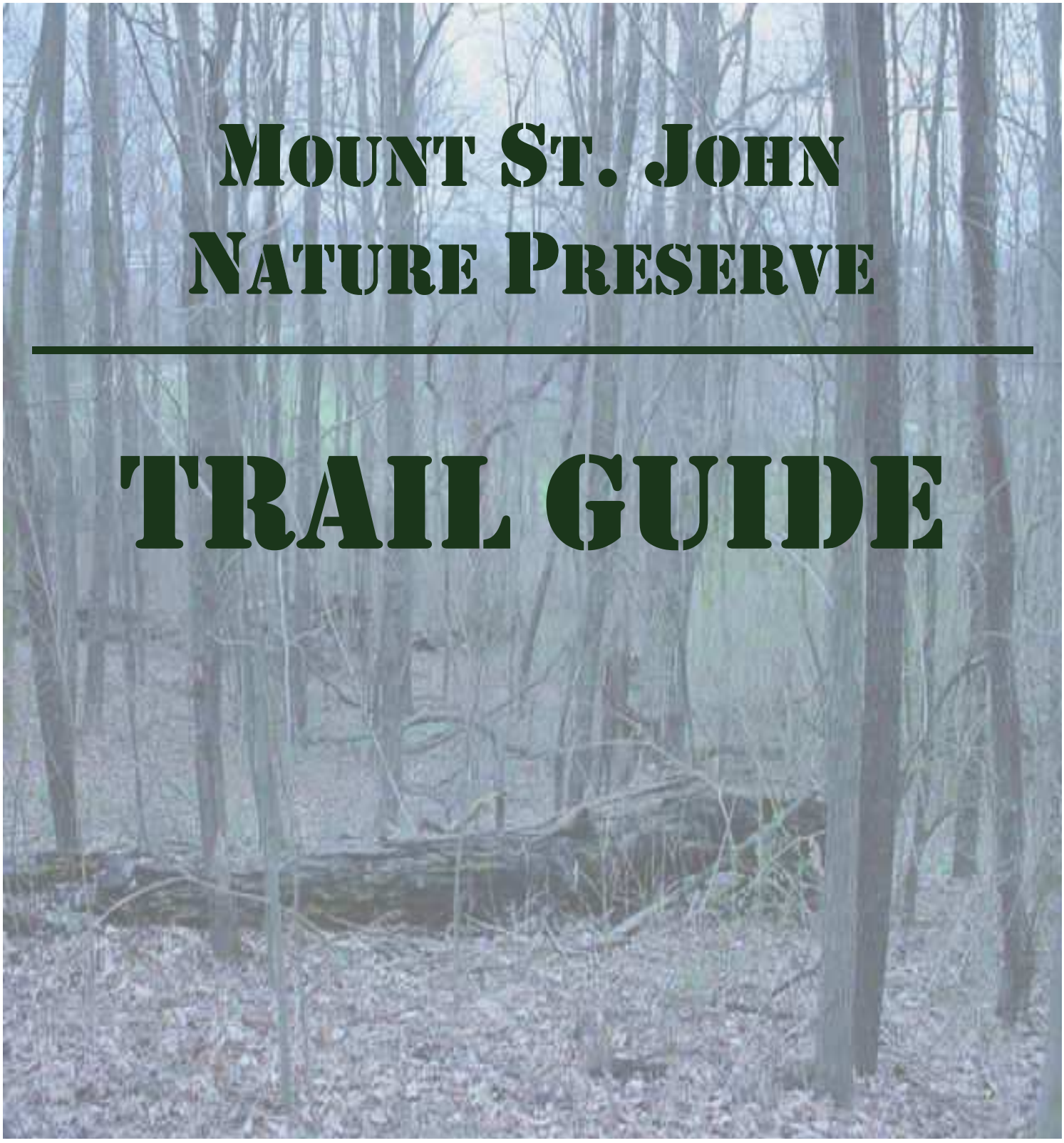
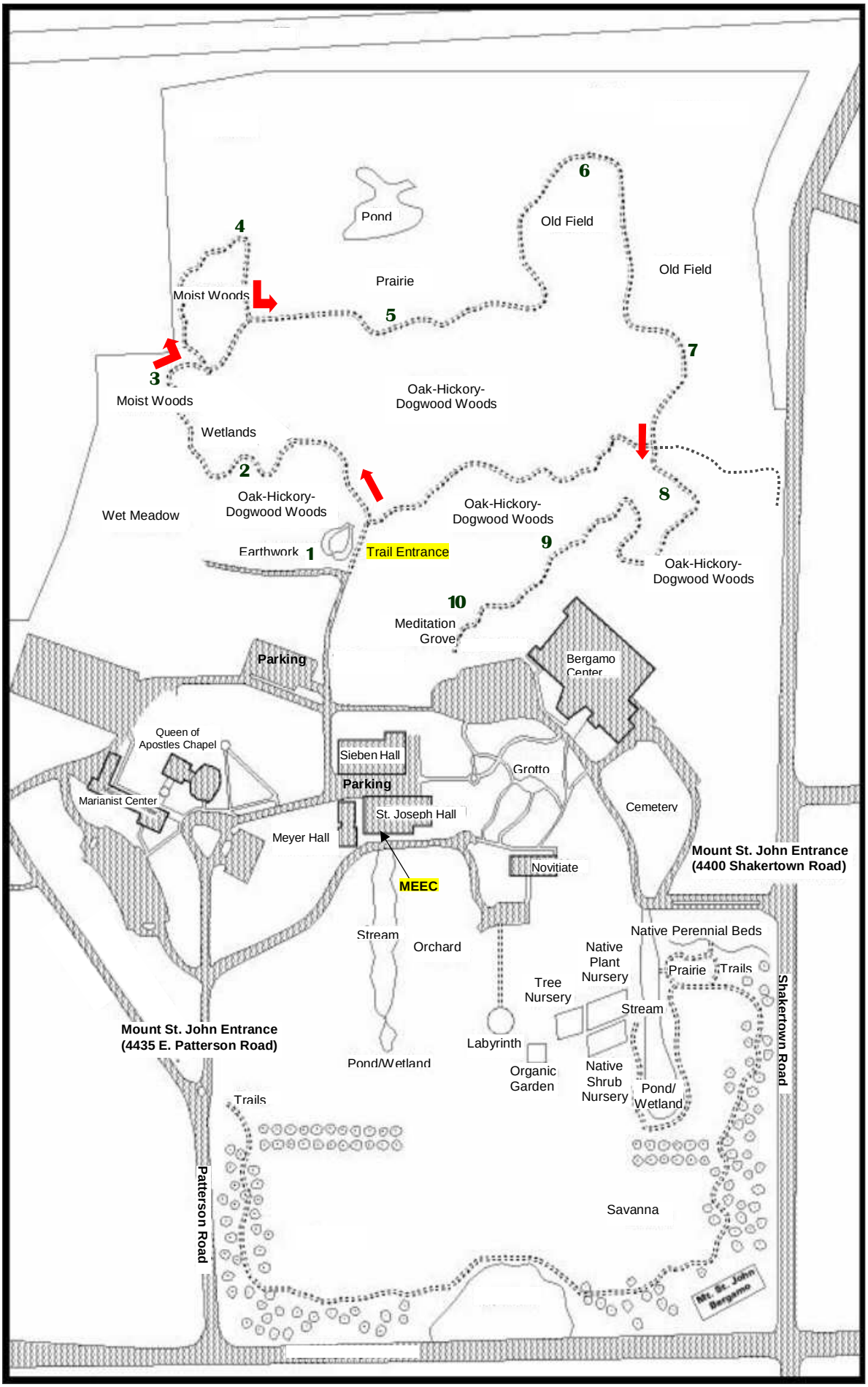


Mount St. John Nature Preserve

TRAIL GUIDE

Marianist Environmental Education Center

With support from the
Ohio Environmental Education Fund


6
Pond
Old Field
4
Old Field
Prairie
Moist Woods
5
7
3
Moist Woods
Oak-Hickory-
Dogwood Woods
Wetlands
2
8
Oak-Hickory-
Dogwood Woods
Oak-Hickory-
Dogwood Woods
Wet Meadow
9
Earthwork
1
Trail Entrance
Oak-Hickory-
Dogwood Woods
10
Meditation
Grove
Parking
Bergamo
Center
Queen of
Apostles Chapel
Sieben Hall
Grotto
Parking
Marianist Center
St. Joseph Hall
Cemetery
Meyer Hall
Mount St. John Entrance
(4400 Shakertown Road)
Novitiate
MEEC
Native Perennial Beds
Stream
Orchard
Native
Plant
Nursery
Prairie
Trails
Tree
Nursery
Stream
Mount St. John Entrance
(4435 E. Patterson Road)
Labyrinth
Shakertown Road
Pond/Wetland
Organic
Garden
Native
Shrub
Nursery
Pond/
Wetland
Trails
Patterson Road
Savanna
Mt. St. John
Bergamo

WELCOME to the Mount St. John (MSJ) Nature Preserve trails – two miles that wind through 100 acres of land cared for by the Marianist Environmental Education Center (MEEC). On the trails you will experience five distinct **ecosystems** - woodland, wetland, prairie, pond and old field. Ecosystems provide many services that benefit humans, including air and water purification, flood control, pollination of agricultural species, climate moderation, soil fertility maintenance, waste decomposition, aesthetic inspiration and much more. While we could never precisely measure the price of these services, they are estimated to be worth several trillions of dollars annually to our world.

Humans have been part of Ohio's ecological communities at least 12,000 years. Various Native American tribes, most recently the Shawnee, lived or hunted on this land until the late 1700s. In the early 1800s what is now Mount St. John was the East Farm of the Watervliet Shaker Community. A hundred years later the Society of Mary – an order of Catholic brothers and priests – established a farm here and continued agricultural practices until the mid-1960s. The evidence of each group of human inhabitants are etched into Mount St. John. Impacts of land use decisions on adjacent property, such as the re-engineering of the Little Beaver Creek in Research Park west of MSJ, and global disruptions, such as climate change and the transport of species around the globe to new habitats, are also visible.

MEEC's mission is to teach principles of **ecology**, restore ecosystem function and increase native species diversity at Mount St. John. You will see the results of some of our efforts as you use the guide.

Open your senses of sight, smell, hearing and gentle touch to experience features of each community and the 350 native plants that live in the preserve. Perhaps you will also glimpse signs of some of the 65 birds, 8 reptiles and amphibians, countless insects and 26 mammals (27 counting *Homo sapiens*!) that have been cataloged here.

HOW TO USE THIS GUIDE.

Begin with a walk through the Sacred Embrace earthwork, located at the trail head. Once you enter the woodland trail system, you will find numbered posts corresponding to the numbered stations in this guide. Their positions are indicated on the map on the preceding pages. The text and accompanying images will help you understand what you see.

Throughout the text you will find terms in bold. These terms are defined in the text as well as in a glossary located on pages 18 & 19 of this guide.

While using the guide, you will encounter the following symbols:

The binoculars are an invitation to look around for an example to enhance your understanding of an idea.

The question mark indicates a question and an opportunity to apply knowledge in the guide or to take a deeper look at something happening in the preserve

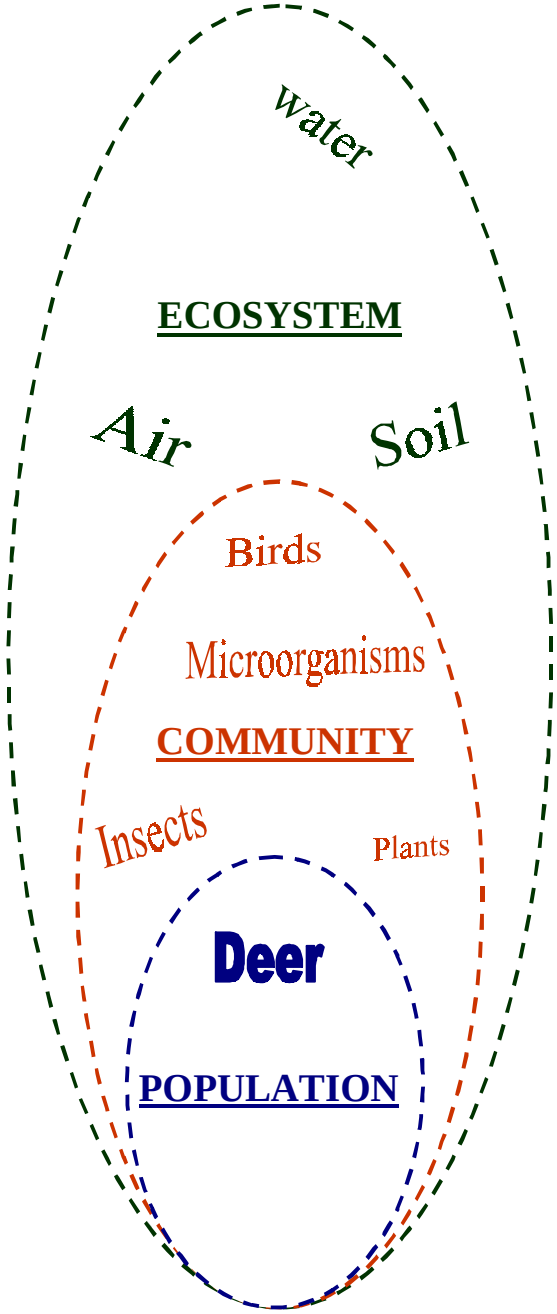
The compass rose marks turns or forks in the trail. Please read the accompanying directions carefully and refer to the map if needed.

If you have questions or comments about the guide, please contact us at meec@udayton.edu or at 937/429-3582.

If you would like to keep this copy of the trail guide, feel free to do so. If not, please return it to the display where you picked it up so someone else can use it.

LEVELS OF ECOLOGY

The terms **ecosystem**, **community** and **population** will be encountered frequently in this guide, and understanding them will help you understand later concepts. A **population** is all the members of the same species, or closely related species, in a given area. The deer population in a forest and the insect population in our woods are examples. A **community** is all the populations in a given area—everything that is living. An **ecosystem** is the entire community plus the **abiotic** (non-living) components including air, water and soil.



Sacred Embrace Earthwork. At the trail head is *Sacred Embrace*, an example of landscaping with **native species**. *Sacred Embrace* is a living earthwork designed by local artist Carrie Pate and planted with some 40 native prairie wildflowers (**forbs**) and grasses which thrive in full sun. Constructed on what was once a dumping ground, the earthwork reminds us of the beauty of native plants and the potential to restore native ecosystems.

Why were native plants selected? Native plants have evolved in our area for thousands of years, and are well-suited to the local climate, rainfall, and soil chemistry. They have established relationships with predators, pollinators and other plants and animals which allow each to survive. For this reason, native plants do not require inputs of chemical fertilizers and pesticides or additional water. They are truly a low-energy landscape option.

The 30-plus species in Sacred Embrace include rattlesnake master (*Eryngium yuccifolium*), royal catchfly (*Silene regia*), blue & white false indigo (*Baptisia australis* & *B. leucantha*), and butterfly weed (*Asclepias tuberosa*).

How might other plants and animals benefit from using native plants in landscaping?

PLEASE READ THE TRAILHEAD SIGN GUIDELINES AS YOU PREPARE TO WALK THE TRAIL.

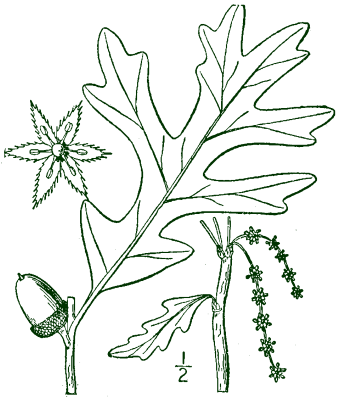
FOLLOW THE ARROW THAT POINTS TOWARD THE WILDFLOWER AREA. YOU WILL FIND NUMBERED WOODEN POSTS THAT CORRESPOND TO THIS GUIDE.

1 Oak hickory woodland.

As you enter the woods on the way to stop #2 you are walking through a dry, upland oak/ hickory/ dogwood woodland. Its dryness is a function of the topography – the surface features which are a legacy of glacial activity which shaped this land thousands of years ago – and drainage. The soil of Mount St. John is well drained as it lies on top of 100-200 feet of sand and rock, deposited here by the glaciers. The most recent of the four glaciers to cover parts of Ohio, the Wisconsinan which receded from this area about 17,500 years ago, left snakelike mounds of soil and rock called *eskers*. This portion of the woods is located on such an esker. The well-drained soil helps determine which plants can grow here. The oak and hickory trees thrive in thin, dry soil. They tend to have shallow root systems and are susceptible to being blown over in storms; thus, their average lifespan is only about 100 years. Notice the large oak a few feet down the trail on the left side – it is an exception. At about 150 years old, it is the oldest tree in the woods. It has even survived a lightening strike, as evidenced by the strip of burnt bark.

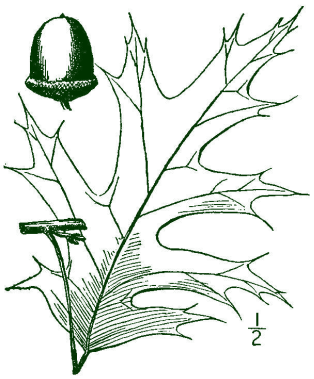
The **disturbance** created when mature trees are blown over is actually a natural part of the health of the woods. A disturbance changes a landscape and the environment. Consider what happens when a tree falls — new soil is exposed and sunlight hits the soil where leaves had previously cast shade. The seedlings of oaks and hickories grow slowly when they are young in the protective shade of adult trees, but their growth accelerates in the patches of sunlight that strike the woodland floor after a mature tree has fallen. This helps maintain a **population** of mature oak-hickory trees.

Of course, losing too many trees at once creates a larger disturbance that is much harder to overcome. When a forest is clear-cut so much soil is exposed is it susceptible to run-off, and nutrients are lost. Young trees lose shade in which to grow (if there is a remaining seed source in the area).



White oak (*Quercus alba*)

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 622.



Red oak (*Quercus rubra*)

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 617.

Black oak (*Quercus velutina)*

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 619.

See if you can spot *bracket fungi* (turkey-tail fungus is a common example) growing on woody debris on the woodland floor. Fungi are **decomposers** and grow on dead wood, recycling the nutrients into their own bodies. All the material you see in the woodlands comprising each leaf, log and insect is only passing through that organism. It has been recycled through unknown numbers of organisms over millions of years. By observing fungus growing on a fallen tree, we can see this matter passing from one organism to the next.

All energy ultimately comes from the sun. Think about the food you've eaten today for energy. Can you trace its energy back to the sun?

2 Woodland fen.

A fen is a type of **wetland** which is fed primarily by ground water. (Bogs, by contrast, are fed almost exclusively through precipitation.) The water is usually around 55° F (13° C), and never fully freezes. Like other wetlands, fens help reduce flooding, recharge aquifers (from which we pump drinking water) and purify groundwater.

Additionally, wetlands host a diverse and unique community of plants and animals. Although only about 5 percent of US land is wetland, about one-third of all known plants in the US are wetland plants! A significant number of endangered species—up to 45 percent nationally—rely on wetlands for at least part of their life cycle. This fen is home to species that are not found in other areas of the preserve.

Compare the wetland plant community with the surrounding woodlands. What differences do you see? You may notice that there are no trees in the fen – only a few shrubs. You may also note there are more species - higher **diversity** – here. The processes that recycle material in nature – such as the fungus decomposing the fallen logs – work slowly in most wetlands because the water blocks oxygen required for decomposition. Many nutrients are *sequestered* (tied up and unavailable for other organisms) in dead plant material, leaving few nutrients for new growth. Aggressive species that outcompete other species and lead to monocultures prefer higher nutrient levels. Low nutrient levels actually results in higher diversity!

More than 90 percent of Ohio's wetlands have been drained or filled for agriculture or development. Only California boasts a higher percentage of lost wetlands.

Think about a farm field that was abandoned just a couple of years ago and one that was abandoned five years ago. Which might host a higher diversity of plant life?

This wetland is a good place to see plants that thrive in very wet conditions such as sweet Indian plantain (*Cacalia suaveolens*), royal fern (*Osmunda regalis*), queen-of-the-prairie (*Filipendula rubra*), marsh marigold (*Caltha palustris*) and skunk cabbage (*Symplocarpus foetidus*). Skunk cabbage is consistently among the first wildflowers to bloom on the property; in fact, it often melts the snow around it as it begins its spring growth. Each of these plants have special adaptations—such as hollow stems, to move oxygen to their roots even in saturated conditions. Plants are not the only life in the wetland, however. Amphibians such as the red-backed salamander call this home, and it is not uncommon to see coyote tracks through the fen. Insects are also very diverse, but surrounding bird habitat provides a source of predators that keep insect populations low.

Spotted jewelweed, *Impatiens capensis* A common Ohio wetland plant with hollow stems and specialized cells that trap oxygen & send it to the root system.

USDA-NRCS PLANTS Database / **Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 2: 440.**

3 Moist woods. This area of the woods is a good place to see **stratification**, described in the chart on page 9. The plants of the **herbaceous** (non-woody, broad-leaved) **layer** are diverse here – in the spring look for Solomon's seal (*Polygonatum biflorum*), trilliums, twinleaf (*Jeffersonia diphylla*), and waterleaf (*Hydrophyllum* spp.). During the summer and early fall you can see several asters, avens, and impatiens. The **litter layer** is also thick. Take a moment to peel back the layers of fallen leaves and twigs. What do you see?

In the springtime, a *green wave* moves upward from the herbaceous layer, which is the first layer to leaf out, to the **canopy**, which is the last to leaf out. This pattern gives each layer a period of springtime growth in the full sun. Many plants of the herbaceous layer are **ephemerals**. Most ephemerals here emerge in April and May, and complete their lifecycles before being shaded by the canopy. Wildflowers such as Dutchman's breeches (*Dicentra cucullaria*) with fern-like foliage, trout lilies (*Erythronium americanum*) with green and purplish mottled leaves, and bluebells (*Mertensia virginica*) are common ephemerals.

In this canopy and **understory**, oaks and hickories are still abundant, but more sugar maples are able to thrive in the deeper, more mesic (moist) soil. MEEC land managers have noticed a change in recent years in the balance between oaks, hickories and maples. In the canopy, oaks and hickories outnumber maples. In the understory, the opposite is true. Two of the many effects of human activity include acid rain and increased greenhouse gases such as carbon dioxide (CO_2). The nitrogen in acid rain acts as a fertilizer and causes the canopy to be very dense. The atmospheric increase of CO_2 has caused the growing season to begin earlier. These conditions favor the maples, which are more shade-tolerant than oaks and hickories. Add to this the suppression of fire (oaks and hickories are adapted to survive light, occasional fire) and you

How do you think an extended growing season for trees might affect the wildflowers?

Stop at the fork in the trail and take a moment to examine the shrub layer around you. Find a patch of honeysuckle, identifiable by its light, striped bark, egg-shaped leaves, white flowers (in summer) and red berries (in fall).

Amur honeysuckle (*Lonicera mackii*) is an **invasive species.** It is native to Asia and was introduced in the US in the late 1800s as an ornamental. By the 1960s, it was commonly planted in southwest Ohio and was becoming abundant in pastures and woodlands around Cincinnati. Today, it is a widespread problem throughout the East. It cannot tolerate full shade, but as most of Ohio's woodlands are *second growth* woodlands (95% of the original woodlands were cut in the 19th century) with loose canopies, it thrives. Having evolved in a different climate, it leafs out earlier in the spring than do native species, and shades out seedlings and spring ephemerals.

Dutchman's breeches, *Dicentra cucullaria* A spring ephemeral.

USDA-NRCS PLANTS Database / **Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 2: 142.**

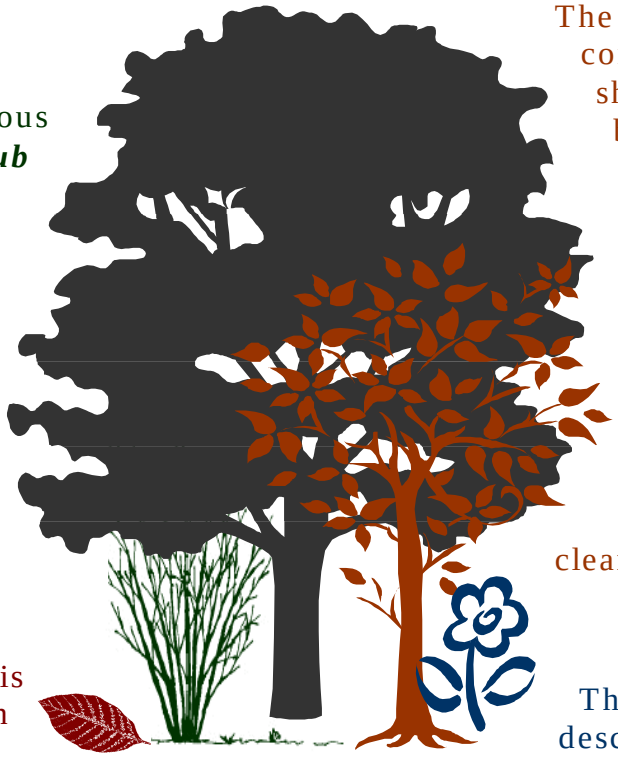
WHEN YOU ARE READY TO PROCEED, TAKE THE LEFT FORK TOWARD THE PRAIRIE OVERLOOK

WOODLAND STRATIFICATION

Various layers of vegetation, or strata, can be seen in a mature woodland. This stratification results in different levels of light, nutrients and moisture available to each layer. The availability of these resources allow different plant types to grow together in a given habitat.

The **canopy** is composed of the crowns of the tallest trees. When tree leaves are fully developed in the summer we refer to the canopy as "closed." When the canopy is closed, very little light reaches the woodland floor. Light, precipitation and minerals in the form of dead material (detritus) flow from the canopy to the litter layer. The density of the canopy layer helps determine the amount of light, moisture and nutrients available to lower levels.

Above the herbaceous layer is the ***shrub layer***. In this layer, spice bush, witch hazel, bladdernut and other woody perennials are common, as are tree saplings waiting to take their place in the woodland as mature trees.



The **understory** is composed of those shorter trees such as red bud (*Cercis canadensis*) hornbeam (*Carpinus caroliniana*) and canopy trees that have not yet reached maturity. In young woodlands such as this one, the understory and canopy are not always clearly differentiated.

The ***litter layer*** is composed of fallen leaves, twigs and other organic matter, and is home to entire communities of insects, mosses and even amphibians. The litter helps keep the surface of the soil moist for shallow-rooted wildflowers, much like mulch in your home flower beds. Decomposers are also at work recycling nutrients.

The ***herbaceous layer*** describes the non-woody, low-profile plants common on the woodland floor. They often have special adaptations which allow them to live in the shade of taller species. The spring ephemeral wildflowers are a good example; they flower and reproduce quickly in the early season before leaves develop on the taller trees and shrubs.

4 Prairie edge. As you emerge from the woodlands, notice the change in the feel of the air – the environmental factors of temperature, light, wind. This is the boundary between two **microclimates**, which creates patches of communities with different light and moisture requirements.

Look out over the 14-acre expanse of prairie between you and I-675. This is a reconstructed tallgrass prairie, planted in 1986 after Interstate 675 was built along the edge of the MSJ property. This part of Ohio is rich in sand and gravel, a legacy left from the glaciers which plowed the materials into our area like a bulldozer, leaving the land to the north of Dayton flat. The pit in front of you is a *borrow pit* from which sand and gravel was removed to construct the highway. This is a **disturbance** that far exceeds the normal cycles of floods, fires, and wind in severity. Because the excavation removed the soil, this pit is an example of **primary succession**, similar to the disturbance caused by the glaciers themselves. (In **secondary succession**, the soil is not removed.)

Dr. Don Geiger, a Marianist brother, biology professor at the University of Dayton and MEEC founder, selected the tallgrass prairie species you see here. Because prairies thrive in harsh, dry conditions and have extensive root systems (2/3 of a prairie plant is located below-ground), they thrive in the nutrient-poor and dry conditions here. Mosses can be found throughout the prairie in the bare patches between the grasses, adding organic matter for soil health, trapping moisture and providing protection for seed germination.

Today, the prairie is one of Ohio's rarest ecosystems. Most of the 300 or so "prairie islands" the first European settlers encountered were converted to farmland or have been invaded by trees since the suppression of natural fires.

The pond only dries out during the very driest years. Though we have never stocked it, it has sometimes hosted populations of bluegill fish. How might they have arrived?

Big bluestem (*Andropogon gerardii*) An historic Eastern tallgrass prairie grass. Note "turkey foot" inflorescense.

USDA-NRCS PLANTS Database / **Hitchcock, A.S. (rev. A. Chase). 1950. *Manual of the grasses of the United States*. USDA Misc. Publ. No. 200. Washington, DC.**

Prairies, which are grass-dominated ecosystems, are important storehouses of genetic diversity. **Diversity** refers to the variety of species, ecological roles (or niches) and genes that exist. The majority of the world's food supply comes from grasses. Think about what you have eaten in the past day, and it is likely that the grass family has been part of it. Pasta, bread, pizza are all made from wheat; rice, breakfast cereal and granola bars are all made from grass grains. When diseases affect crops, plant breeders often go back to the native genetic stock to breed in resistance and other traits for survival. Stocks of diversity such as prairies are safety nets for our food supply.

WHEN YOU REACH THE FORK IN THE TRAIL, STAY TO THE LEFT.

5 Prairie Overlook (Bench).

Ohio's pre-settlement landscape boasted prairies interspersed among the tracts of forests. The tallgrass prairies that once covered about 4% of Ohio (more than a million acres) exist now as mostly scattered remnants most often found in old cemeteries and along railroad tracks and power line right-of-ways. North American prairies evolved in the rain shadow cast by the Rocky Mountains. About 5,000-8,000 years ago, Ohio experienced a drier, warmer climate similar to that found in Nebraska or Iowa today. This allowed western prairie species to spread to Ohio. Prairie plants require full sunlight and quickly succumb to the shading of trees. Why, then, did prairies persist in Ohio as the temperature became cooler and moister? Why did the process of succession not lead to woodlands? The answer is fire. Evidence suggests that Native Americans burned prairies for two reasons. First, fire killed the tree and shrub seedlings that emerged and maintained the unique, grass- and forb-dominated character of the prairies that deer thrive on. Occasional fires maintained this important source of food & clothing for these human communities. Strategically set fires were also used to chase deer in a certain direction where hunters waited to slay with flint arrows. Prairies exist in Ohio today because of these fires, and fire remains an important tool to prairie managers and restorationists. MEEC staff burns about 1/3 of the prairie each spring. This prevents woody species from establishing, kills unwanted weeds, returns nutrients to the soil for new growth and exposes the soil to the warming rays of the sun.

Look carefully over the entire prairie, and note the diversity of the colors, heights and textures of the vegetation. This prairie habitat is diverse, with many microhabitats, influenced by differences in soil, slope and moisture. Notice the areas with the lush vegetation and shrubs. There are "seeps" where water is emerging.

Take a careful look at the pond and its surrounding vegetation. You can see short vegetation around the pond, followed by a layer of shrubs such as willow which thrive in moist soils around ponds and rivers. This transition found around waterways is called a **riparian zone** and fosters diverse animal life. It's important to not mow or cut the vegetation surrounding waterways. In addition to fostering diversity, this zone absorbs excess nutrients before they enter the water and protects against flooding and erosion damage in high water years.

The pond itself is actually the exposed water table of the Great Miami Valley Buried Aquifer, part of an ancient river valley system called the Teays that was filled by the glaciers. One of the largest aquifers in the US, it provides the water most of us drink. That it is so close to the surface and covered by a permeable layer of sand and gravel reminds us of the vulnerability of this resource and the need to protect it.

What might the prairie look like in 15 or 20 years if we stopped using fire as a management tool?

Sandbar willow, *Salix interior* A woody, early successional species found growing around seeps and near the pond in the prairie.

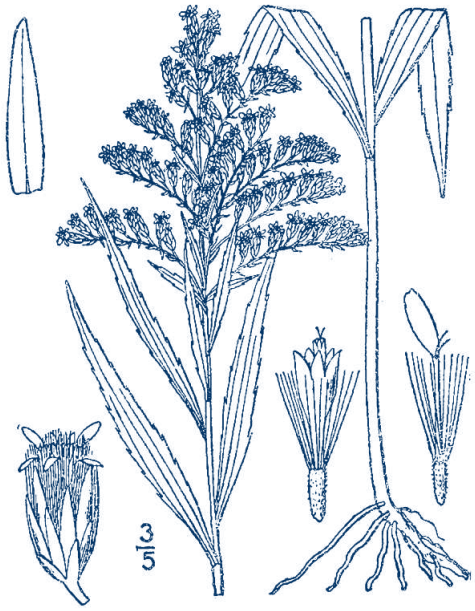
USDA-NRCS PLANTS Database / **Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 595.**

6 Old field succession. This area is an old field that has not been farmed since the mid 1960s. During the intervening years, the process of ecological **succession** has slowly worked to repair the effects of farming – a **disturbance** – and return this area to woodland. The area on the left (east) side of the trail, however, underwent another disturbance during the mid 1980s when it was cleared of vegetation (but not soil) during the same highway construction that left the borrow pit where the prairie now stands. There, the process of secondary succession had to start anew. Look carefully at the progress of succession by comparing the area on the left – about 15 years post-disturbance – to the area on the right which is 40 years post-disturbance. What differences do you see?

During succession woody species, such as the brambles (berry bushes with canes) apparent to the left of the trail, and honey locust (*Gleditsia tricanthos*, with defensive spikes growing on the trunk), which are visible on the right side, take hold. Many early successional plants – thistles, brambles and the honey locust among them – succeed because they have thorns and stickers to prevent grazing. If you were to stop mowing your lawn for several decades, you would end up with many of these species in your yard!

Look around on the ground in this area for a seed pod from a honey locust tree. The pods resemble, but are much larger than, those of another legume, the pea. Given their large size and very hard coat, few animals consume the seeds. How do you think the seeds are spread?

As the trail winds back into the woods, consider another example of the safety net **diversity** provides. The American chestnut (*Castanea dentata*) was once a stately tree common in the canopies of Eastern United States forests. During the first part of this century a fungus introduced from Asia - *Endothia parasitica*, or chestnut *blight* – began killing chestnuts before they reached reproductive maturity. What would our Ohio woodlands look like if the American chestnut had been the only tree in the community? We would have a woodland that could not sustain itself. Instead, the tree community in Ohio is very diverse. Even though the loss of the mature American chestnut has profound impacts on our woodland communities, there are still trees housing birds and insects, storing carbon and feeding wildlife in Ohio.



Canada goldenrod, *Solidago canadensis* An early successional, opportunistic native species.

USDA-NRCS PLANTS Database / **Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 3: 393.**

ECOLOGICAL SUCCESSION

Or, what happens when you stop mowing your lawn?

First Year

A few annual plants that don't like competition, such as foxtail and pigweed, thrive on the high levels of nutrients present in abandoned fields and lawns. Their seeds are long-lived, capable of waiting years for conditions to favor growth and reproduction. Their small seeds are also readily spread by birds and other wildlife

Years 2 - 4

Diversity increases as asters, goldenrods, teasel and other sun-loving, drought-tolerant species take hold. A few fast-growing woody species may establish, and the habitat favors small burrowing mammals such as field mice and voles that find protection from predators in the taller vegetation that is emerging.

Years 5 -10

Long-lived annuals become dominant and provide protection for an increasingly-diverse community of woody species. This community typically consists of thorny species such as brambles and honey locusts which resist **herbivory**. Nesting birds become more abundant, and the cool-season grasses (that you have to water in July and August to keep green) that once dominated succumb to shade.

Years 11 - 25

A few **pioneer** trees reach maturity, giving further physical structure to the young community. Patches of dense shade arise and **litter** accumulates, both of which increase soil moisture. These conditions no longer favor some of the early forbs, and they fall out of the community to be replaced by woodland wildflowers. Soil nutrient cycling slows as nutrients are held in living organisms.

Years 25 +

Light continues to decrease as the canopy spreads, favoring shade-tolerant species and spring **ephemerals**. Gradually slow-growing trees, such as oaks and hickories, enter the community. The climb to dominance by slow-growing hardwoods may take another hundred years or more. Their maturity marks the climax phase, in which species composition changes no longer occur with time. Minor disturbances such as a tree falling in a storm, however, may reset the process of succession on a very localized scale.

7 Osage orange tree.

The Osage orange (*Maclura pomifera*) is not native to Ohio – it originated in Texas, Oklahoma and Arkansas. Unlike some non-native species, they do not dominate native species and are not considered "**invasive**." They were popular among settlers as hedgerows (you may be familiar with another one of this tree's common names – the hedge apple). At one time, an estimated 250,000 miles of hedges were constructed with Osage orange trees. The strong yet flexible wood was also preferred by Native Americans for hunting bows.

Take a close look at the bark and roots of the tree. The grayish-green papery growths on its bark are lichens. A lichen is actually two species – a fungus which provides nutrients and an algae which transforms energy from the sun into food via photosynthesis. They are some of the heartiest photosynthetic organisms, growing very slowly but surviving harsh conditions. They can grow on soil and even on rock. In northern areas reindeer moss, which isn't a moss at all but a lichen, provide are an important food source for caribou.

Many true mosses also make their home here. Mosses are very small, primitive plants which lack vascular (conductive) tissue to move water from roots to the leaves. In fact, mosses don't even have roots – they absorb water and nutrients directly through their leaves. They are not decomposers, nor can they kill a tree or a lawn. They are capable of holding comparatively large amounts of water within their leaf structure, and provide organic matter to the soil when they die. They often play an important role in ecological succession by providing moisture and shelter for seeds to germinate. *Sphagnum* mosses cover one percent of earth's terrestrial surface. Mosses may make their home on trees, fallen logs, soil, rock and even in water. In addition to "reindeer moss," other plants that despite their common names are not mosses include Spanish moss (a flowering plant in the pineapple family) and club mosses (which have conductive tissue and are more closely related to ferns).

Osage orange (*Maclura pomifera*)

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 632.

There are many ways in which different species relate to each other in nature, and often the removal of one species has effects on another. A predator-prey relationship is a good example. Below are three other relationships which you can see in the nature preserve. How many examples of each can you find? Which term best describes the relationship between the fungus and the algae in a lichen?

- **Mutualism** describes a relationship in which both species benefit.
- **Commensalism** describes a relationship in which a species receives a benefit from another without helping or harming it.
- **Parasitism** describes a relationship in which one species receives a benefit from another to the detriment of the latter. Parasitism often results in death of the "host."

8 Bench in dry woods. One of the strongest threads that knits together an ecological community is the transfer of energy in the form of food between individuals. We've already seen an example of a **predator-prey** relationship between the insects and the birds around the wetland. A series of predator-prey relationships comprise a **food chain**. The birds that consume the insects around the wetland are in turn hunted by larger animals such as the fox and coyote, both of which have dens on the property.

The introduction of invasive honeysuckle is altering one such food chain in this section of the woods. Each May, we record many nesting birds here during our annual nesting bird survey including brown thrashers, catbirds and cedar waxwings. As you make your way to the next stop, you will see dense thickets of honeysuckle. In areas where this species has invaded the **shrub layer**, cardinals will use honeysuckle as a substitute food source and nesting site. However, honeysuckle does not afford the birds the same protection from predators as do native shrubs, making the cardinal easier prey for the fox. The effect this disruption will eventually have on cardinal populations is yet to be seen.

We replace the honeysuckle after we remove it with native shrubs such as hazelnut (*Corylus americanum*). The wildlife use this plant for food and shelter, and it helps guard against re-invasion by honeysuckle.

Hazelnut (*Corylus americanum*), a native shrub.

National Plants Database / Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 1: 607.

Each step in a food chain is a **trophic level**, and each organism in the chain uses energy from the level below it to maintain itself through biochemical reactions. Energy is lost at each step. (Remember the skunk cabbage that melts the snow around it in the wetland? That heat is energy gained from the sun and lost as it is transformed to maintain the plant.) That means that only some of the energy the honeysuckle gets from the sun is available to the cardinal who eats the berries, and only a portion of that energy is available to the fox who preys on the bird.

From a food chain point of view, is it more efficient to consume energy directly from plant material or from plant material that has been fed to an animal?

9 May apple community.

From April through July, look for plants about one foot tall which resemble miniature "umbrellas" (less than a foot in diameter). If you are hiking in May look for a white flower at the juncture of the two leaves. (Single-leaved plants don't produce a flower or fruit.) You are looking at a popular plant called the "May apple," or *Podophyllum peltatum.* As spring becomes summer, the May apple flower will become a yellowish, egg-shaped fruit, about two inches in diameter, referred to as its "apple." May apples tend to grow around oak trees, and thus May apples and oak trees are typical members of the woodlands community. Look around. Do you see any oak trees? May apples thrive when exposed to tannic acid, found in oak leaves and acorns. This relationship is an example of **commensalism**, in which one species benefits from another while providing neither harm nor benefit to its benefactor.

May apples, *Podophyllum peltatum* A cluster of May apples may actually be a single plant. They commonly send up clones of themselves, called *ramets*. They are connected underground by root-like structures called *genets.*

USDA-NRCS PLANTS Database / B**ritton, N.L., and A. Brown. 1913.** ***Illustrated flora of the northern states and Canada*****. Vol. 2: 130.**

10 Soehnel Meditation Grove.

The nature preserve trail ends at the Soehnel Meditation grove, and you are invited to pause at the benches to reflect on your experience of walking the trail through the woodland and prairie ecosystems before proceeding to the front field. Walk carefully around, looking at the cement structures remaining standing at the various levels. What evidence of former occupants can you see? The meditation grove is a "ruins" of a number of small buildings built in the 1940s that housed chickens, ducks and pigs. The Marianist brothers farmed the land you have walked from 1910 when they arrived, until 1967, when the farm was torn down to make way for Bergamo Center. Although "progress" removed some of the natural areas, nature is gradually taking back part of the landscape. Notice the re-growth of vegetation amid the cement. The hill to the east of the grove provides a woodland edge habitat that is home to a variety of birds that thrive "living on the edge" where both tree canopy and open space is provided to meet their food and shelter needs.

The grove is named after Brother John Soehnel (1905 - 1986) a Marianist brother who lived at Mount St. John for most of his life in many different roles, including working on the farm. While still a young brother, he lost his eyesight and lived here for the remainder of his life, on the land he knew well. Brother John's life of prayer and reflection, his love for the land of Mount St. John, his use of his senses of touch, smell, hearing and his reliance on memories and others' descriptions are an inspiration to all of us to more fully experience the beauty of the ecosystems that serve us all.

FOLLOW THE SIGN AT THE BACK OF THE NOVITIATE PARKING LOT AND WALK DOWN TO THE LABYRINTH.

11 Front field. The western 40 acres of Mount Saint John is an area that was formerly an agricultural field and orchard. Today it contains our forb, shrub and tree nurseries, an organic community garden and compost area, and created wetlands to catch runoff from around the buildings. Just below the Marianist novitiate building is a labyrinth for walking meditation with a mowed grass path and "walls" made of native prairie plants.

Look out over the field. We are beginning the process of restoration on this field of cool season grasses. The earliest land surveys of Mount St. John, conducted by Israel Ludlow for whom Ludlow Street in Dayton is named, show that prairies once existed in this field, which is part of the floodplain of the Little Beaver Creek. Over one hundred native oaks were planted in the field, creating savanna-like conditions (savannas are prairie grasslands with occasional oak trees that resist fire).

We only mow the field once each year. What is its value? Though it appears to be merely a grassy old field, look carefully around you and notice signs of wildlife. You may hear the red-winged blackbird, calling out to establish its territory (males are more noticeable with bright red and yellow wing-bars). Other ground-nesting birds are found here. Look above you or on the various perches in the field and you may see hawks or other birds of prey, a sure sign that the grassland is teeming with rodents such as moles, voles, shrews and mice. Countless soil and grassland invertebrates (animals without backbones such as insects, worms, spiders, slugs and snails) live on leaves, on the **litter layer**, and beneath the soil.

If you look carefully on the ground as you walk, you may notice signs of *scat* – the droppings of larger mammals. We have fox and coyotes at Mount St. John that journey to the front field at night to search out their prey, which includes birds and smaller mammals.

See if you can trace a food chain here with four or five trophic levels beginning with grass (as a producer) and ending with hawks (as consumers).

Think back over the role humans have played at Mount St. John – from the Native Americans who hunted here, the Shaker community who farmed the land in the 19th century, and the Marianist brothers' stewardship in the past hundred years. The care for Mount St. John and the land where we each live is entrusted to each of us. We each have an important part to play. Our environmental choices and efforts at restoring communities of land and people will be the gift for the generations after us who will benefit from our preservation of ecosystem services.

GLOSSARY

Abiotic is a synonym for non-living. In ecology, this term is used to describe the soil, air, water and decaying material.

Biotic is a synonym for living. In ecology, this term is used to describe plants, animals, microorganisms, etc.

The **canopy** is the tallest layer in a community. In the MSJ woods, this layer is comprised of mature trees. (See p. 9)

Commensalism describes a relationship in which one species relies on another without harming it. Plants who deposit their seeds on animal fur or your pant legs in the hope of colonizing new areas are an example.

A **community** is comprised of all the species that share a particular space and share resources. Thus, we may speak of the woodland community, the prairie community or the wetland community.

A **decomposer** is an organism that digests and receives energy from degrading organic matter. Examples are the fungi.

A **disturbance** is the result of a force that alters a landscape. Disturbances can be natural (floods, glaciers, or storms) or caused by human activity (mining, agriculture, or urbanization). Disturbances can be small scale, such as a single tree being blown over in a wind storm, or widespread, such as a large-scale forest fire or severe flood. Disturbances are measured by their *frequency* (an annual versus 100-year flood event) and by *severity* (a minor wind storm versus a tornado).

Diversity is the measure of the number of species or other groups of organisms in an area or the number of genes or traits in a population.

Ecology is the study of the relationships between living organisms and their environment. Ecology attempts to answer questions such as "Why aren't all species found everywhere?"

An **ecosystem** is comprised of the community and the abiotic (non-living) environment. A wetland ecosystem is comprised of not only the plants and animals that live there, but also the special soil found only in wetlands, water, nutrients, air, the bodies of dead organisms, and climate factors such as temperature, sunlight and wind.

Ephemerals are plants which complete their reproductive cycle (flowering and seed production) in a short period of time—typically in the spring—while conditions are favorable.

A **food chain** is a series of predator-prey relationships.

A **forb** is a non-woody, broad-leaved plant. Most of what we call "wildflowers" are forbs.

The **herbaceous layer** of a community describes the layer in which forbs and grasses grow. (See p. 9)

Herbivory is the process of animals consuming plant material as food. Herbivores include insects which feed on foliage and deer and rabbits browsing on twigs.

An **invasive species** is a plant or animal which has been introduced to an area and harms the local ecosystem, often by competing with the native species for resources such as sunlight, food or water. Honeysuckle in the MSJ woods is an example.

The **litter layer** in an ecosystem is comprised of the decaying material—such as leaves and twigs—that fall to the ground. Many small

organisms make their home here. (See p. 9)

The **microclimate** is the climate immediately surrounding an area or habitat, which may be influenced by topography or vegetation.

Mutualism is a relationship exhibited by species who rely on each other without harming each other. A bird feeding on a shrub's berries and then dispersing the seeds is an example.

A species is **native** to an area when it evolved in that place. Native species are well adapted to local biotic and abiotic conditions.

Parasitism describes a relationship in which one species relies on another, causing weakness or death. A fungus feeding on a living tree is an example.

A **population** is comprised of all the members of the same species, or closely related species in an area. The deer population of Mount St. John is an example.

A **pioneer** is an organism that establishes in an area during the early stages of succession.

A **prairie** is a grass-dominated ecosystem. The term comes from the French for "meadow."

Predator-prey describes a relationship in which one species obtains energy by consuming another. A hawk eating a mouse is an example.

A **riparian zone** is an area on the banks of a waterway that controls sedimentation and protects against pollution. It is often home to diverse organisms.

The **shrub layer** is comprised of short woody perennials and tree saplings in a woodland.

Stratification describes the vertical layers in a community, each with their own levels of light, nutrients and moisture. (see p. 9)

Succession describes the chronological changes in a natural community that follow a disturbance. *Primary succession* follows a disturbance that removes the soil from a site, such as a glacier or mining. *Secondary succession* follows disturbances that leave the soil more or less intact, such as farming or a flood.

A **Trophic level** is a single step in a food chain.

The **understory** is a layer in a community comprised of short and immature trees. (See p. 9)

NOTES

[1]"Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems." Issues in Ecology #2, published Spring 1997 by the Ecological Society of America.

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The Marianist Environmental Education center (MEEC) is interdisciplinary education ministry in the Catholic Marianist tradition. As part of the network of education and justice ministries of the Marianist family (laity, sisters, brothers and priests) we work locally, nationally and internationally. MEEC stewards the 100-acre Mount St. John Nature Preserve, designated in 1988 as an Ohio Natural Landmark, and cares for native plant nurseries, a community garden, a native-plant labyrinth and the Sacred Embrace meditation earthwork. Ecological research conducted on the property focuses on prairie establishment, woodland dynamics and invasive species control and has been presernted at national and international conferences. MEEC offers programs on environmental justice, global climate change, sustainability, ecological spirituality and teacher education. Staff members are available for custom talks, field trips, workshops and retreats for youth or adults.

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