Illinois Beach State Park

Modified from a walking tour provided by Duane Ambroz and Illinois Coastal Management Program Issue Paper : Illinois Beach State Park and North Point Marina Including the Dead River and Kellogg Creek Watersheds (2011).

Introduction

Illinois Beach State Park is part of a much larger biological unit of over 4,000 acres of contiguous high-quality natural area including Spring Bluff Nature Preserve owned by the Lake County Forest Preserve District, the Zion Park District, which is property of the former Johns Manville manufacturing plant, and undeveloped portions of property near the decommissioned Zion Nuclear Power Station. This extensive complex contributes significantly to national and regional biodiversity, preserves coastal wetland ecosystems, and provides critical habitat for declining plant and animal species. Three Federally Threatened species occurring here are the Piping Plover (*Charadrius melodus*), Eastern Prairie Fringed Orchid (*Platanthera leucophaea*), and Pitchers Thistle (*Cirsium pitcheri*). Also present is the Karner Blue Butterfly (*Lycaeides melissa samuelis*), which is a Federally Endangered species.

Illinois Beach State Park supports 14 natural community types, including 66 acres of rare and globally declining pannes, and habitat for more than 500 species of plants and 300 species of animals. The state park includes 1,916 acres of dedicated nature preserve protected in perpetuity under the Illinois Natural Areas Preservation Act.

Assignment

Points: 5 bonus pts.

In this activity you will focus on the southern portion of the Park near the Nature Preserve Area. Provided is a map, at the end of the document, and a .kml (Google Earth) file, which you may download and use on your smart phone. Either, or both, can be used to find each of the stops discussed below. You must find each stop, read the associated commentary, and answer the questions given. You start at the Dead River Trail head and proceed in a counterclockwise manner around the loop. The stops are in alphabetical order.

Stop A: Trail Head of the Dead River Trail

The dune (ridge) you are standing on is likely 600-800 years old. The dune-swale (swale is a depression) topography of the area is mostly dependent on Lake Michigan. At one time, every ridge was a foredune (Figure 1), and every swale was a beach. As sand moves south along the

coast, new beaches and foredunes form, making this a continuous process. Elevation of each dune and swale changes slightly, depending on the level of the lake when it was formed. Weather also affects succession, both in the long-term and immediate future. If you were here 600 years ago, when this area was a foredune, you may have seen stands of pine trees along inland swales. The pine trees are gone because the climate has become warmer, moving the pine tree's habitat further north.

Figure 1: Zones of Coastal Dunes. A trough is equivalent to a swale.

Question:

None, get your bearings and enjoy the views!

Stop B: Observation Platform

As you walk this trail section you will see the Dead River to the right (west), and you will notice that to the west are distinct changes in vegetation. Some areas will be grassy and others will have openings populated by large colonies of wildflowers. These differences are due to habitat degradation. There was a prolonged period of fire suppression in this area that allowed thickets of invasive species to establish. Invasive plants would have first populated the wooded bluffs along Sheridan Road (further west), with birds then spreading seeds down to this area. If fire moved through in natural cycles (typically every 2-3 years), the young shrubs would have been killed. Without fire, they quickly crowded out native vegetation.

Some invasive plants can also alter soil chemistry, making it difficult for native species to establish. Soil biota that native plant species are dependent on may be killed off, and will take

decades to repopulate the area sufficiently. This is also why native plants will not immediately spring up in areas that have been subjected to decades of human agriculture.

Question:

Explain how fire allows native plants to out compete invasive plants. Include the term intermediate disturbance in your answer.

Stop C: Marsh Drain (where the Dead River splits)

Here you can see a marsh drain, though in the height of summer it is typically dry. Beyond that you can see a cattail marsh. Notice that behind you the dune ridge is populated by oak trees, and south of the river, the dune is a lot more open. Succession is not always a linear process such as the transitions from foredune, to prairie, to savanna, and finally to woodlands that are found in this area. Why would the dune behind you be populated with oaks, and the dune across the river be prairie despite both being the same distance from the lake? Because behind you (north) the Dead River acts as a fire break and natural fires were less frequent, allowing trees to establish. South of the river there is no natural fire break, and young trees were killed off by natural fires.

The cattail marsh is an example of habitat degradation due to human disturbance. Historic records indicate this was once a hemi-marsh, an area where water levels slowly fluctuated during the year. When humans settled the bluffs and the coastal plain, water flow was disrupted and instead of water moving slowly across the surface and trickling down through the soil, rainwater was channeled into storm drains. Water moved into the system more rapidly and was warmer, altering the vegetation that could grow. Railroads that came through the area carried a coastal species of cattail inland where it hybridized with the native cattail. The hybrid out-competed most native vegetation and was particularly well-adapted to human-altered hydrology, and, as a result, quickly swamped out the native vegetation and formed a monoculture.

Question:

Hypothesize two reasons why the hybrid cattail was able to out-compete native vegetation (hint: think adaptations for resource acquisition, to the abiotic environment, to herbivory etc.)

Stop D: Wetland (to your left)

Are you standing in the midst of a wetland? Yes. Experienced biologists can tell by the change in vegetation and elevation, but the way anyone can tell is by examining the soil. A wetland is determined by an ecosystem that has hydric soils, or soils that prevent rapid drainage of water from a site. Upland plants cannot grow in these environments because of anaerobic soil conditions (*i.e.*, their roots need oxygen to breath), whereas wetland plants can take in oxygen through their stems and leaves. Illinois Beach wetlands are unique in that they are also affected by the hydrology of Lake Michigan. The lake does not just stop at the shoreline, but continues inland under the sand and affects how quickly water can drain through the sand. A low swale with several centuries of organic material build-up does not drain as quickly as a younger swale closer to the lake.

Question:

Wetlands have relatively low rates of primary production. Explain why.

Stop E: Pollution + Disturbance = Degradation

Notice the vegetation in the river. Compare it to vegetation in the Chicago River or North Shore Channel that is influenced by the following types of pollution:

- Silt pollution: the Chicago River receives silt run-off from upstream forest preserves where trees have shaded out soil-stabilizing vegetation. Rain washes the silt into the river, choking out vegetation. However, the Dead River receives very little silt pollution. In Google Earth you can compare the silt cloud of the Dead River to that of the Waukegan River to the south (forest preserve run-off) and the Pike River to the north in Kenosha (agricultural run-off).
- Chemical pollution: rivers that receive run-off from lawns and agriculture have higher concentrations of nutrients such as phosphorus and nitrogen. This encourages excessive vegetation growth, especially of algae, changes the amount of light that penetrates the river, and favors certain vegetation over others. The Dead River has a natural level of nitrogen and phosphorous.
- Hydrological disruption: the Dead River is surrounded by relatively undisturbed wetlands. When rains come, water can overflow into these wetlands, easing the burden on the river. As the water level slowly drops, the wetlands gradually release water back into the river. The Chicago River, by comparison, has a much lower concentration of wetlands causing bank erosion and scouring of the stream bed that prevent the establishment of vegetation.
- Invasive species: agriculture, and later fire suppression, along the Chicago River allowed invasive species to populate the banks. However, notice that along the Dead River there are large stands of native bulrushes and sedges that extend well up the banks. The Dead River has been managed with fire for the past 30 years, which keeps invasive species out. When the river rises, the banks contain the extra water without significant erosion because of the roots of native plants that extend as much as 10 feet into the soil. Invasive species do not provide these benefits.

Question:

If you do not know the definition of eutrophication, look it up in your text. How does eutrophication (or the lack thereof) explain the types of plants found in the Dead River?

Stop F: Later Succession

As you walk towards the lake, you are moving forward in time. Notice the change in vegetation (fewer trees). This occurs because winds from Lake Michigan and nutrient-poor sandy soils

stunt tree growth. Sandy soil has less organic material, and organic material holds water and binds nutrients more effectively. Without it, only plants adapted to barren soils can survive.

Question:

Explain the role of asymmetric competition in the change in plant composition as you move closer to the lake.

Stop G: Early Succession

From here you can walk to the beach and back. Take note of the change in vegetation. When on the beach, examine the sheered-off section of the foredunes and the extensive nature of the roots and rhizomes (underground stems) of the dune grasses. These underground structures allow the plants to access water as it quickly drains through the sand. It is also the basis of organic material that begins soil formation. Sand on the foredunes is constantly moving and rapid-growing, long rhizomes enable the plants to continue producing green stems as parts of the plants get buried or exposed.

Walking back to the trail junction, and then to the north, you'll notice different habitats as you go. The juniper shrubs (Figure 2) to the right are usually alpine (mountain) species. To the left, you will occasionally see a cactus, species normally associated with the desert. Many of the plants here, especially the shrubs and wildflowers, occur in clumps or groups because they reproduce using rhizomes or stolons (above-ground horizontal stems) that can take root. This mode of reproduction is an adaptation to shifting sands. If one part of the plant gets buried, another part can put up new stems. These plants are further contributors to the establishment of organic soil.

Figure 2: Horizontal Juniper (*Juniperus horizontalis*) found on a foredune.

Question:

Use your knowledge of ecology to explain why Junipers and cacti grow in this habitat.

Stop H: Ice House

At this point the tallest dunes are behind you, and you can see that the junipers thin out and the entire area transitions to sand prairie. Notice there are several ponds near the ice house ruins. These ponds were excavated to build foundations for rail beds. The vegetation populating these ponds is native instead of invasive because the seeds that were buried in the sand, the "seed bank", were all of native plant species. Seeds can persist in soils for decades as long as the soil stays cool and damp. When the ponds were excavated and the seeds brought to the surface, they had no invasive plants to compete with and germinated. This does not happen in agricultural areas because decades of plowing and disturbance have turned over the seed bank enough that the seeds have dried out and died.

Question:

Describe the type of plants found in the ponds (hint: it is a sand prairie). Explain why, in terms of soil nutrients, moisture, and succession, that type of plant is found in these ponds.

Stop I: Claim Pit

The same phenomena observed at the ice house are in play here. This wetland was originally a sand dune. It was excavated in the 1960s to build the foundation for the resort hotel. The vegetation is similar to that which would grow in a wetland swale much closer to the lake. The sand has less organic material than would naturally occur given the age of this area. Notice how different the vegetation is in this swale compared to the next swale to the west.

Question:

Explain why this wetland looks like a wetland swale much closer to the lake and why it will eventually be dominated by plants found in the next swale to the west.

Stop J: Sedge Meadow

This is another type of wetland, with soil that has a higher organic content and greater diversity than the swale to the east. If succession were allowed to continue naturally, this area would likely become a mesic (moderate or well-balanced supply of moisture) prairie. You can see this transition in the next stop.

Question:

Explain why plant diversity is greater in this wetland than in the wetland swale to the east.

Stop K: Succession forwards and backwards.

There is a swale to the west that isn't a wetland; it is a mesic prairie. Why the difference? In the past, the lake level was higher than it is today, and this swale would have been a sedge meadow like the swale to the east and possibly even a marsh. As the lake level dropped, the soils became less hydric, as water needed to drain down to a greater depth before hitting the water table. The soil at the top retained the organic material that built up from the wetter period, and the wetland succeeded to prairie. Often this transition is short-lived because steep terrain like that surrounding the swale can inhibit fire movement through an area, and slopes that are shaded from the sun stay cooler and wetter than surrounding terrain, causing trees to establish and the formation of an oak savanna.

You also see a lot of downed oak trees in this area. Wind storms in 2011 damaged or killed many oaks in this section of savanna. This is an example of "backwards" succession (or disturbance) because the oak savanna opened back up into a prairie-like state. Further to the south along this trail, fewer trees were damaged, and this combined with the affect of the river, which acts as a natural fire break, resulting in an area that continues the slow transition from oak savanna to oak woodland.

Question:

The first stop commentary mentioned that many of the geographical and ecological characteristics of the area are determined by the lake, however, this final commentary makes it clear that the lake is not the only factor. In your own words, explain how the affects of the lake interact with the affects of another factor to dictate the location of one habitat found in this area.

Map of the Stops for Illinois Beach State Park Activity