

Calumet Environmental Education Program

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Ecosystems Converge in Calumet

The Calumet region of Northeast Illinois and Northwest Indiana contains three different types of ecosystems that all converge together: wetlands, prairies and woodlands. When exploring the ecosystems surrounding Powderhorn Lake, you can walk from wetland to prairie to woodland. Seeing all of the plants, animals and abiotic factors of the ecosystems can be challenging along with recognizing the threats that these ecosystems face. Developing knowledge of these ecosystems will enhance your experiences in exploring the Calumet region.

Ecosystems are any group of living and nonliving things that interact with each other. This makes the size of ecosystems vary greatly from as small as a puddle to as large as the Earth itself. Within each ecosystem, there are varying habitats. Within a habitat are populations of living organisms all interacting to create communities.

Wetlands:
No two wetlands are alike, they differ according to factors such as climate, water supply, soil type and plant and animal residents. Considering these factors, wetlands are divided into general categories such as swamps, bogs and marshes. The amount of water required for a wetland to form is the amount necessary to sustain wetland plants. Water does not have to be visible in a wetland but is a controlling environmental factor.

Wetlands formed in Calumet and elsewhere around the Great Lakes as a result of glaciers and rivers. Glaciers formed topography and deposited sediment that allowed for water to accumulate. Rivers continuously change course and create oxbows, branches of the river that become isolated and flooded by the main river.

All wetlands have a source of water. In some cases, a deep depression below the water table will be fed by groundwater, water found below the surface of the soil, along with surface waters. A depression that does not extend below the water table receives

only surface water such as precipitation and runoff from the surrounding land. Wetland soils are hydric, meaning they are wet for most of the year and low in oxygen.

Water depth is the most influential factor in determining the types of flora; the more shallow the water, the greater the diversity of species. The varied

types of plants in wetlands include free-floating plants (such as water lilies), emergent plants (such as cattails, arrowheads, and bulrushes), submerged plants (such as pondweed), and moist-soil plants and shrubs (such as sedges and red dogwood). The animals that live in wetlands are transient, therefore making it harder to distinguish a wetland by its animal inhabitants.

Only a few species of mammals, such as the muskrat, beaver, and otter, are adapted to live in water. Other species of mammals use wetlands to varied degrees, such as the white-tailed deer, raccoon, and mink. Birds are important inhabitants of wetlands, although they only utilize its resources for parts of the year, usually for migration and sometimes for breeding. However, the many different bird species need different kinds of wetlands, making it all the more important to conserve varied habitats within a wetland. Wetlands also serve as breeding grounds for many types of amphibians and fish. Reptiles, such as snakes and turtles, also are important inhabitants of wetland ecosystems. Another category of organisms that depend on wetlands are invertebrates, such as flatworms, clams, snails and insects. These kinds of organisms, as a food source, transfer much of the energy created by plants throughout the food web to higher animals or fish in the food chain.



Photo by Jim Nachel- CRI

Important Dates

Aquatic Invasive Species Awareness
February 5, 2004
3-5:30PM

CEEP Inquiry Group
March 26, 2004
TBD

Calumet Stewardship Day
May 26, 2004
TBD



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The energy flow within an ecosystem is the movement of chemical energy in a food chain or web made up of producers, consumers and decomposers. Producers like green algae produce energy by combining carbon dioxide, sunlight, water, and nutrients through photosynthesis. This algae is then eaten by a primary consumer, for example a type of insect or invertebrate. This primary consumer could then become food for fish, a secondary consumer, which can then be eaten by a tertiary consumer like a bird. All of this energy is decreasing with each step in the food web because of the organisms' use of the energy before it is transferred. When the final organism dies the energy is then transferred to decomposers who eat and breakdown dead organic material returning the nutrients to the soil. This means that each organism is trying to conserve energy; and that there is a greater amount of energy in the producer category than in the decomposer level. Therefore, each particular ecosystem has a "carrying capacity", or amount of organisms, that can be sustained according to the



Photo by Jim Nachel - Conservation Research Institute

amount of energy that is produced within it. It is important to understand food webs in all ecosystems to look at the sustainability of all the life within the ecosystem for its survival.

Wetlands provide many ecosystem services by maintaining the quality of the water, controlling floods and providing habitat for a diversity of species making them the most productive non-tropical ecosystem. Wetlands maintain a quality of water through filtering out chemical runoff, agricultural wastes and/or excessive nutrients from industrial dumping. (Note: The U.S. Forest Service is now planting black willows and cottonwood seedlings as a buffer between Indian Ridge Marsh and a contaminated site to absorb contaminants from the soil and water. This process is called phyto-remediation.)

Millions of acres of wetlands have been lost in Illinois alone, not to mention over 100 million acres that have been drained and destroyed in the continental U.S. More than 90% of Illinois' wetlands have been destroyed; most of which was done in the late 19th and early 20th century period for industrial purposes (See "Calumet's Extreme Life"). Wetland filling and destruction for development inhibits wetlands from performing their ecosystem services. Missing floodplain wetlands cannot regulate the water and areas are suffering from flood damage. This is especially a problem in

Illinois along the Illinois River.

Prairies:

Communities of grasses dominate prairies where the soil is usually rich in organic or mineral materials. Although prairie was once the dominating ecosystem of the region, covering over 21 million acres (60% of the state), many have been destroyed. According to Chicago Wilderness, only 1/100th of one percent of Illinois' original high quality prairie survives. There are different types of prairies dependent on climate, the types of soil or rock the plants prefer, along with the soil moisture and drainage. Prairies within Calumet are often found in sandy soils that were once the beaches of the receding glacial Lake Chicago, which was formed by the melt waters of the Wisconsinian Glacier. Throughout Illinois, there are black soil prairies, sand prairies, gravel prairies, dolomite prairies, hill prairies and shrub prairies. Prairies are thought to be treeless but they are closely related to open woodland communities. Prior to European settlement, the prairies and woodlands collided gracefully from grassland with no trees to grassland with scattered trees, or savanna, to dense woodland.

Prairies are very diverse in their grasses and plants. We might find a hundred species of plants within a few acres of prairie and there is always something in bloom. Hundreds of species of flowering plants and prevalent grasses, like the big bluestem, cordgrass, Indian grass and needlegrass, make up prairies. A diverse collection of animals call Illinois' prairies their home. Even though settlers eliminated big grazing animals like bison and elk, there are still many smaller creatures that you might see, like the endangered Franklin's ground squirrel found in Calumet. Most of the animals in a prairie are insects, butterflies and moths, which are highly dependent on particular plant communities, with some caterpillars confined to a certain plant species. For example, a species of root-borer moths live only in the roots of the rattle-snake master, a plant common to prairies but rarely grows outside of them. Birds within the prairie are also affected by the plants and structure of their habitat as they use the ground for nesting and need it to be free of woody vegetation. Smooth green snakes still inhabit the Calumet region and can be found in prairie remnants. These snakes are an indicator of the quality of the area because of their ability to survive.

The prairies of Illinois became dependent on periodic fires because of the millions of years of evolution they encountered in the presence of fires sweeping the barrier free rolling hills. Fires eliminate dead leaves and stems of prairie plants that start to accumulate. To withstand fires prairie

More than twice as many threatened or endangered species live in our wetlands than any other habitat.



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plants store most of their biomass underground in root structures. Root systems of some prairie species extend nearly 20 feet below the surface. The fires keep trees and shrubs from invading and shading the grasses allowing the grasses to grow from year to year.

There are many threats to our prairies. With the suppression of fire, woodlands and development have fragmented the prairies. Non-native and invasive species are thriving on the disturbed lands of abandoned cornfields and vacant land not allowing the prairies to return. Prairies are in need of intensive management and reintroduction of the ecology they once had. Only 10% of the low-quality prairie in the region is being managed and it represents some of the most endangered ecosystems in North America.

Woodlands:

Woodlands are forested communities where trees are the defining characteristic that varies with species over time. Illinois woodlands are of various types, including oak-hickory and beech-maple. They have different types of cover from top-down: canopy, sub-canopy, shrub and herbaceous (grasses and flowers) levels. All of our woodland communities have been changed by the settlement of the lands. With the suppression of fire, the maples and ashes that were kept out of oak forests and open woodlands have moved in creating dense forest.

Healthy Chicago woodlands are very biologically diverse in reptiles, amphibians, birds and mammals because the communities of woodlands are the highest quality of habitat for wildlife remaining in Illinois. An important stopover for migratory birds, woodlands hold the sizes of trees and density of tree growth that many need for finding food and shelter. The divisions of tree types and heights allow many species within the habitat to occupy the same grove of trees. Rarely seen species of salamanders, frogs, toads and snakes are still abundant in the Chicago region. Amphibians are cold blooded and cannot live within the densest forests because of their need for sunlight. This makes it difficult for them to find a home under invasive trees and shrubs that cast heavy shade on the plants below.

The ground layer of plants in the woodlands is greatly affected by the introduction of non-native and invasive plants which prevent plants and seedlings from growing and small animals from eating. A common threat is the invasive shrub from



Photo by McHenry County Conservation District

Europe called buckthorn. This plant grows very dense causing agencies to introduce controlled burns in attempts to revive the open woodland to allow groundcover and seedlings to grow again. An ongoing debate exists about how to preserve woodlands that need fire while not putting lives and homes in danger. Today, Illinois has 4.3 million acres of forest covering about 12% of the land. As a result of habitat fragmentation, due to development, most of the woodlands in the Chicagoland area are in poor condition.

Wetlands, prairies and woodlands large and small are an important part of the Calumet region. Conserving the land that remains today is important to help support the plants and animals living within these ecosystems along with the services that these ecosystems provide for us. ■

Resources for this article include:

Physical Geography.net

<http://www.physicalgeography.net/fundamentals/9d.html>

U.S. EPA

<http://www.epa.gov/students/index.html>

“Natural Wonders”- Chicago Wilderness

<http://www.chicagowilderness.org/wildch/wonders/index.cfm>

“An Atlas of Biodiversity.” Chicago Wilderness, Chicago, 2003.

Interactive websites:

Build-a-prairie

<http://www.bellmuseum.org/mnideals/prairie/build/>

Panoramic circle in the prairie in different seasons

http://www.bellmuseum.org/mnideals/prairie/prairie_qtvr.html#

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Calumet's Extreme Life

The World's most extreme bugs can be found in the waters of slag dumps that filled the wetlands of the Lake Calumet region. With waters reaching a pH of 12.8, pH=0 the most acidic and pH=14 the most alkaline or basic, this water is far beyond any other known alkaline environment, the highest known being a pH of 11. These alkaline waters are caused by steel slag reacting with water and air creating lime (calcium hydroxide), which then drives up the pH. An Illinois groundwater scientist, George Roadcap from the Illinois State Water Survey, found the microbial communities thriving in water that is comparable to floor strippers and close to bleach at a pH of 13. These microbes are considered extremophiles meaning that they can thrive in super hostile environments including locations with high temperatures, acidity, radiation and heavy metal contamination. Some microbes found are related to Clostridium and Bacillus species that can also be found in remote locations like Greenland, South Africa and the alkaline waters of Mono Lake, California. Other bacteria found are hydrogen oxidizing bacteria that exploit the hydrogen given off from the corrosion of metallic iron slag in the water. It is still unknown how the unusual bacteria got into the slag dumps. Two possibilities are that local bacteria adapted to the extreme environment over the last century or the bacteria somehow got imported. Its effect on the groundwater contamination problem within slag dumps is still unknown. This example shows that the most extreme environment for life isn't at the bottom of the ocean or inside a volcano but it's in Calumet.

To read more about this:

"Extreme Bugs Found in Slag Dump"- BBCNews

<http://news.bbc.co.uk/1/hi/sci/tech/3250199.stm>

"World's Most Alkaline Life Forms Found Near Chicago"- Geological Society of America

<http://www.geosociety.org/news/pr/03-38.htm>

Resources Included!

- < ***The Educators' Guide to the Field Museum, Spring 2004 Special Issue:*** More on the Year of Biodiversity and Conservation programs! Also, if you missed the last IL Biodiversity Basics Teacher Curriculum Training there is another coming up at the Field Museum, information is on the back page with the other Exciting Professional Development Opportunities. The three day workshop will be held on April 28 & 29 from 4:30-7:30PM and May 1 from 9:00AM-3:00PM. Register for teacher workshops by calling 312-665-7500.
- < ***Family Adventures in Biodiversity and Conservation:*** A map of realted exhibits within the Field Museum to learn about the incredible diversity of life on Earth and the importance of conserving our environment. This map and information guide is great for field trips and personal trips for the family. Another note is the information on the back to learn more about biodiversity and for more visit, www.fieldmuseum.org/biodiversity
- < ***Calumet Stewardship Initiative Events Calendar, January through April 2004:*** A listing of environment related events within the Calumet Area for you and your students!

Upcoming Teacher Workshops and Opportunities for Students

- < ***Aquatic Invasive Species Awareness- Through Youth Stewardship Projects:*** (Flyer enclosed)
- < ***DNR Entice- Field Trip Grants:*** You can still receive funding for your natural resources-related field trips with students. Applications are due February 15, 2004. For additional information or an application form, contact the DNR Division of Education, One Natural Resources Way, Springfield, IL, 62702, teachkids@dnrmail.state.il.us or (217) 524-4126.
- < ***Small Project Program of the Wildlife Preservation Fund:*** Proposals may address many types of projects including management, site inventories or education. Individual proposals are eligible for up to \$1,000 with grants effective July 1, 2004- June 30, 2005. To receive a packet with instructions and an application form, call (217) 785-8774 or email SpecialFunds@dnrmail.state.il.us. Applications are accepted through April 1, 2004.
- < ***The Gloria Barron Prize for Young Heroes:*** Honoring outstanding youngleaders who have made a significant positive difference to people and our planet. Nominees, students ages 8 to 18, must have been the prime mover of a service activity, and demonstrated positive spirit and high moral purpose in accomplishing their goals. Winners each receive \$2,000 to be applied to their higher education or totheir service project. Nomination packets must be received by April 30, 2004. For more information go to, www.barronprize.com



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