

Local Biological Diversity (Student copy)

Objectives

1. A brief introduction to the history and biodiversity of the local natural environment
2. Observe the remarkable diversity of local biological organisms
3. Practice the important scientific skills of careful observation and attention to detail
4. Explore the concept of “native” and “introduced” species

Background

The land that we call “Iowa” has been shaped by glaciers over the past 2 million years. As the Earth’s climate has alternatively cooled and warmed, a series of glaciers has advanced and receded over this portion of the planet, dramatically affecting both the land surface and the organisms living here. The most recent glaciation (the Wisconsin glaciation) reached its peak around 18,000 years ago and covered much of present-day central Iowa. At that time, the present-day location of Ames would have been buried under glacial ice. By approximately 14,000 years ago, the ice had receded and this portion of central Iowa was covered by tundra containing dwarf spruce trees, similar to portions of modern day northern Canada. As the climate continued to warm and become drier, the tundra was replaced, first by forest, and subsequently by prairie. By approximately 8,000 years ago prairie was well established across the state. These transitions in the vegetation of Iowa can be studied by examining pollen preserved in the sediments of lakes, marshes, and bogs. Viewed under a microscope, the various types of pollen can be identified and quantified. Radiometric dating allows determination of the age of the pollen-containing sediments.

Between 8,000 years ago and approximately 1850, a diverse ecosystem called the “tallgrass prairie” (approximately 28,000,000 acres), dominated much of Iowa, including central Iowa. The grass species here could reach heights in excess of 6 feet – much taller than the grass species in the drier “short grass prairies” further to the west. The tallgrass prairie included numerous species of grasses (e.g., big bluestem, Canada wild rye, switch grass, etc.) and broad-leaved plants (“dicots”, e.g., rattlesnake master, prairie clover, gray-headed coneflower, compass plant, etc.) and animals such as elk, bison, Dakota skipper butterflies, prairie chickens, bobwhite quail, sandhill cranes, mountain lions, and wolves. Much of central Iowa was also covered by wet prairie or wetlands in the poorly-drained recently glaciated landscape. Iowa was officially opened to “settlement” in 1833 (although native Americans were, of course, already present), and became a state in 1846. The rich soils produced by the prairie were viewed as an excellent agricultural resource. Drainage of wetlands provided additional opportunities for agriculture. By 1900, the human population of Iowa was approximately 2.2 million and 95% of the prairie, as well as most of the wetlands, had been converted to agricultural or urban use. Today, less than 0.1% (about 20,000 acres) of Iowa’s original prairie remains – typically in small, isolated patches of less than 100 acres. Over the past 150 years, humans have had an impact on the biology of Iowa comparable to that of the glaciers. Over 98% of the state’s land surface has been modified for human use.

“Native” species are organisms present in a particular area without any assistance from humans. “Introduced” species are organisms whose presence in a particular area is directly due to human intervention. This intervention may be deliberate (e.g., soybeans, carp, and starlings), or unintentional (e.g., zebra mussels and yellow foxtail). Some native species that were once present in Iowa are extinct (e.g., passenger pigeons), or no longer live here, other than in captivity (e.g., elk, bison, wolves) and others are endangered (see: <http://www.state.ia.us/dnr/organiza/ppd/tespecies.htm>). In some instances these species are endangered by over-exploitation or loss of habitat, in other instances introduced invasive

species, e.g., zebra mussels, purple loosestrife, or garlic mustard (see: <http://www.npwrc.usgs.gov/resource/1999/loosstrf/loosstrf.htm> and <http://www.invasivespecies.gov/geog/state/ia.shtml>), are out-competing native species for limited resources. Even though most of Iowa's land surface is now populated by introduced species such as corn, soybeans, alfalfa, Kentucky blue grass, brome grass, yellow foxtail, dandelions, European corn borer, German yellowjacket wasps, carp, cattle, hogs, English house sparrows, starlings, and pheasants, there are still remnants of Iowa's native ecosystems and organisms remaining. Given the extensive changes of the past 150 years, the amount of biological diversity remaining in Iowa is remarkable, but the long-term maintenance of the diversity of native Iowa organisms is in doubt. One approach to maintain native species diversity is to attempt to reconstruct natural habitats. In recent years attempts to reconstruct tallgrass prairie habitats have become more common in Iowa, even including prairie reconstructions in roadside ditches (<http://www.uni.edu/irvm/web/>). It is important to remember that such reconstructions include only some of the native species that would have been present in a natural tallgrass prairie.

Exploring Local Biodiversity

- 1) Do a linear transect across the Elwood Prairie site according to instructions given by your Teaching Assistant.
- 2) Collect small portions of, or individual organisms, of as many distinct types of organisms (these will be mostly plants, insects, and fungi) as you can and place in your crisper or kill jar for further observation back in the lab.
- 3) Make note of the presence of any additional organisms (e.g., mammals, birds, reptiles, etc.) that you observe but are unable to collect.
- 4) Record, on the provided data sheets, descriptions of the distinct types of organisms that you've collected or observed.

Critical Thinking Questions

1. Will Iowa always be predominantly populated by the species (e.g., corn and hogs) that have been introduced here by humans? Why or why not?
2. Imagine that 5,000 years from now another glaciation event reshapes the surface of Iowa. 5,000 years after that glacier recedes would you expect the same species that were present here 200 years ago to re-establish themselves? Why or why not?
3. Why are there no microscopic organisms listed on Iowa's "Threatened and Endangered" species list?
4. How does the plowing of Iowa's prairie, beginning 150 years ago, compare with the current logging of tropical rain forests?
5. How many species that were present in Iowa in 1850 no longer live here? How would you attempt to answer this question?
6. How many of the species you encountered were "native" and how many were "introduced"? How would you go about answering this question?