AN EDUCATIONAL GUIDE TO THE

Inland Sand Areas of Illinois Poster

Suggested Activities

1. Use the poster to generate a discussion about biodiversity. Ask students how many different organisms are depicted on the poster. Have them define biodiversity. Generally, the more kinds of species in an area, the healthier that area is considered to be. Have the students list the types of organisms found on the poster (plants, insects, etc.). What groups of organisms are not shown on the poster? Would they be part of the biodiversity, too? Would you judge this habitat to be diverse or not? Why do you think that greater diversity means greater health for an area?

2. Food chains represent the transfer of energy in ecosystems by organisms either capturing the sun's energy or obtaining energy by eating other organisms. Have each student draw a simple food chain using organisms shown on the poster. Use arrows to show the transfer of energy from one organism to another. Remember to start with the capture of radiant energy from the sun. Allow students to individually compile their food chain on the chalkboard. Emphasize how a food web is depicted by using arrows to connect one part of a food chain to another, continuing as appropriate.

Which is a better depiction of energy transfer: a food chain or a food web? What does a food web show? What component of food webs and food chains is missing from the poster? (decomposers) Why is it necessary to transfer energy in an ecosystem? What would happen to the web if one of the organisms were to become extinct? How would other species be affected? Why are there more plants than animals?

3. Adaptations are traits or structures that organisms possess that help them to survive. What types of adaptations do the plains pocket gopher and Illinois chorus frog have that the eastern fox squirrel and rufous-sided towhee do not have? What types of adaptations do the eastern fox squirrel and rufous-sided towhee have that the plains pocket gopher and Illinois chorus frog do not have? Do these animals have any adaptations in common? Is color an adaptation for any of the animals on the poster? How can their coloration help animals to survive? What are some adaptations for locomotion seen in the poster? How do plants in the poster show adaptations to their environment?

4. Temperature may directly and indirectly affect organisms living in an area. In the middle of summer, what area shown on the poster would have the coolest temperature? Where would the hottest temperature be? How could the animals in the hottest area escape the heat? As the temperature rises, what could the animals in the open areas do to avoid the heat? What can the plants do to escape the heat? How could soil moisture affect the organisms in the poster? If the pond water evaporates, how would the organisms around and in the pond survive? How could different temperatures at different soil depths be helpful to organisms like the earthworms and plains pocket gophers?

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This poster depicts a typical central or northern Illinois sand area away from Lake Michigan. These habitats are found along rivers like the Illinois, Mississippi, Green, Kankakee and Wabash. Sand was deposited by their slowly flowing waters during the ice age. A few of our sand areas are dunes that "migrated" or were blown away from their stream of origin by the wind. Even fewer are remnants of lake shore deposits of extinct ice age lakes.

Sand's looseness and coarse texture make it vulnerable to wind erosion where stabilizing vegetation is absent or disturbed. Such erosion forms dunes and blowouts through the movement of sand grains by the wind.

The poster portrays a typical area of mixed sand prairie and scrub oak forest vegetation in June. Active dunes are visible as small hills of bare sand in the background and in the immediate foreground. Blowouts are level to depressional areas of bare sand. The left edge of the poster depicts a forest border, open grassy areas are sand prairie and a small pond enters the poster on the right.

Sand is a unique substance for support of plant and animal life. Areas of eroding and even stable vegetated sand provide a challenge to rooting of plants because of their loose and unstable nature. The rapid movement of water through sand leaves little moisture in its surface layer and leads to the leaching and loss of many mineral nutrients needed by plants.

Sand provides a unique habitat for animals because of the ease of burrowing in it, the frequent open sunny places without plant growth and the hot, dry desertlike character of the surface. Water is scarce over large areas since rainfall soaks directly into the soil rather than forming streams or ponds. Ponds are only found at spots where the groundwater table is exposed at the surface or where clay deposits lie under the sand.

With this unique ecology it is little wonder that a majority of the plants and animals living in sand areas are seldom found elsewhere. They possess adaptations that allow them to survive here while many common Illinois species cannot.

While Illinois' sand areas are small in size compared to the whole state, many sand habitats have survived the plow and axe because of their dryness, lack of fertility and low productivity. Today, many sand areas with their native plants and animals are protected in nature preserves, state parks, state forests and conservation areas. These interesting public lands are available for study and enjoyment.

Interpreting Features of the *Inland Sand Areas of Illinois* Poster

Many of the plants and animals shown are western species that survive in Illinois sand areas because their hot dry conditions are similar to climates farther west. They migrated into Illinois during a hot dry period called the xerothermic period some 6,000 years ago. When the climate turned cooler and wetter as it is today, these western species survived in the drier habitat of sand areas while dying out elsewhere in our area. Such remnant flora and fauna of past climate changes, that are now separated from their main range, are called "relicts."

Some western relict animals in the poster include the Illinois chorus frog (33), plains hognose snake (47) and Illinois mud turtle (55). Western relict plants include hairy gramma grass (19), sand love grass (18) and sand evening primrose (24).

Many other plants and animals are western species at the eastern edge of their current continuous range. These

include the badger (31), plains pocket gopher (32), western meadowlark (30), lark sparrow (29), bullsnake (14) and western ragweed (27).

Animals

The champion burrower of the sand areas is the plains pocket gopher (32). It spends virtually its entire life in its dark burrows feeding on the roots it encounters as it digs. The sand that it excavates is pushed up to the surface in the form of mounds, but the vertical burrows to the mounds are plugged with sand to keep predators like the bullsnake (14) out. Plains pocket gophers get their name from the fur-lined pockets or pouches for storing food that appear as lines on each jowl below the mouth. Illinois plains pocket gophers are nearly black while the same species west of the Mississippi River is brown.

A primary predator of the plains pocket gopher is the badger (31), a member of the weasel family. It is a strong digger and can rapidly excavate and capture a gopher when it locates one.

Another subterranean animal is the Illinois chorus frog (33). Unlike the gopher, it makes no burrow, but simply plows through the sand searching for food while escaping the heat at the surface. The Illinois mud turtle (55) churns through the sand in a similar manner once the temporary pond dries up. Animals occupying this ecological niche are called "sand swimmers." Various animals have adapted to this niche in sand areas around the world.

The tiger beetle (36) is a rapid-running predator that hunts on the ground although it is perfectly capable of flying. Its larva (37) is also a predator that digs a vertical burrow in the sand. It lines the burrow with webbing and then anchors itself into the web with a spine on its back at a height that just leaves its head exposed. Here it waits with its jaws open. When prey comes within range, it lurches out, grabbing it with its jaws and trusting the spine to keep it from being jerked from its den by the prey. Once subdued, the prey is taken to the bottom of the den and eaten. Notice the insect remains at the bottom of the den.

The antlion (49) is the larva of an insect that resembles a small dragonfly. It constructs a pit in the sand under the shelter of leaves or other protection from rain. When an ant or other insect stumbles into the cone-shaped pit, it slides toward the bottom because the steep, loose sand gives way under its feet. The antlion senses the presence of the prey in the trap and flexes its body, throwing sand up to the top of the trap with its long sharp mandibles. This sand starts a landslide which hastens the movement of the prey to the bottom where it is grabbed in the antlion's mandibles and eaten. The sand pitching reaction of antlion larvae is easy to observe by dropping small pieces of sticks into the trap.

The regal fritillary butterfly (35) feeds on the nectar of a variety of sand prairie flowers, especially butterfly weed (9). The specimen depicted is a female with all white spots on its hind wing. On males, some of these spots are orange in color. This butterfly lays its eggs on the spring-flowering bird's foot violet (not illustrated) that provides the food for its caterpillars.

The ornate box turtle (34) is a vegetarian and is depicted eating the juicy stems of the Ohio spiderwort (20). Its shell protects it from predators. The six-lined racerunner (46) depends on its speed and agility to avoid being eaten.

In the pond, the Illinois chorus frog tadpole (56) is growing legs in preparation for metamorphosing into an adult. One tadpole has nearly completed transformation and is leaving the water but still has a tail. Illinois chorus frogs lay eggs during the first warm days in March. They hatch into tadpoles that are ready to transform into adults as ponds begin to dry up in early summer.

The tiny fingernail clam (57) is often abundant in sand ponds where it feeds by filtering minute life forms from the water. It feeds from the bottom or attached to vegetation. Fingernail clams can be important food for ducks and other water birds. They apparently survive times when the ponds dry up by burrowing into the mud at the bottom.

Plants

The hazard of wind erosion to plants is depicted by the exposed roots of the blackjack oak (2) in the blowout shown in the distant center of the poster. Such plants may eventually be uprooted and die.

The sand three-awn grass (40) grows in blowouts and on dunes where it has little competition from other plants. In such exposed sites, this weak grass is blown around its central root, leaving circular "tracks" in the sand, as shown on the poster.

Scrub oak forests are very simple in species composition because few trees are adapted to the unique ecology of sand areas. Black oak (1), blackjack oak (2) and black hickory (3) are about the only tree species present in dry areas. River birch (51) grows in damp sand at and near ponds.

Some plants grow only in sand. Poppy mallow (26), sand evening primrose (24), hairy puccoon (6) and horsemint (25) are among many species restricted to sand in Illinois.

Sand reed grass (39) is an important stabilizer of bare sand areas. It colonizes such areas by sending out underground rhizomes which send up stems from time to time. This process lets it avoid the difficult task of establishing seedlings on the shifting sand. Plants with rhizomes are often critical to the process of converting eroding sand into stabilized sand prairie.

Mohlenbrock's umbrella sedge (41) has no problem establishing seedlings in the open sand of blowouts and dunes but is unable to compete with sand prairie plants for moisture. As barren sand areas are populated by more kinds of plants, the umbrella sedge dies out and disappears. Its seeds lie in the soil for many years, and when disturbance causes the formation of a new blowout or dune, its seeds spring to life again.

The eastern prickly pear cactus (23) is one of the most striking blooming wildflowers in June. Its protective spines enable it to escape damage from grazing animals, allowing it to become very abundant in pastured sand prairies.

The earth star mushroom (45) grows in bare sand areas where it arises from the body of the fungus that is buried in the sand. The star is formed when the outer coat splits as the mushroom matures. Moisture causes the star points to arch toward the ground raising the spore-producing center high where raindrops can strike it and force puffs of spores out of the small hole in its center.

Some good places to view Illinois' interior sand areas are Sand Prairie-Scrub Oak Nature Preserve near Bath in Mason County, Sand Ridge State Forest in Mason County, Big River State Forest in Henderson County, Ayers Sand Prairie Nature Preserve near Savanna in Carroll County and the Green River Conservation Area in Lee County. In eastern Illinois, visit the west end of the Kankakee River State Park in Will County, Iroquois County Conservation Area and Sand Ridge Nature Preserve in southern Cook County.