ILLINOIS FOOD WEB PARTNERS

Performance Standard 12B/11A.F

Students will apply the processes of scientific inquiry to study the impact of multiple factors that affect organisms in a habitat accordingly:

- *Knowledge*: Describe the factors that affect the organisms in an environment in the context of a food web.
- *Application*: Diagram the inter-relationships within a habitat's food web of organisms and various abiotic factors.
- *Communication*: Explain the interactions depicted in their food web and that affect the environment.

Procedures

1. ***In order to know and apply concepts that describe how living things interact with each other and with their environment (12B) and the concepts, principles and processes of scientific inquiry(11A),*** students should experience sufficient learning opportunities to develop the following:
   - Construct inquiry cause-effect hypothesis associated with an Illinois ecosystem's food web.
   - Research pertinent sources of information (classification keys/guides, etc.)about the biotic and abiotic factors that interact in the food chain/web/pyramid in general and in specific ecosystems.
   - Document observational and graphic data.
   - Synthesize data and interpret trends to produce reasonable conclusions.
   - Describe the biotic and abiotic factors that can affect the environment, generally.
   - Describe interactions in a specific habitat illustration.
   - Describe different niches and relationships found among organisms, generally.
   - Predict impact of loss of each factor/niche in general/specific ecosystems.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. This activity focuses on the poster, Illinois Habitat Series No. l: Cypress Swamp as the foundational resource from the Illinois Natural History Survey of the Illinois Department of Natural Resources. Dr. Michael Jeffords and Dr. Susan Post were responsible for the incredible photography in this series of posters. This activity was developed initially by Dr. Jeffords who has granted permission for our use. This poster is available for $4 from the Natural History Survey, 217/333-6833 (Ruth Johnson). The series includes #2: Northern Bog, and #3: Sand Prairie, which may be used as extensions of this activity.
4. Begin inquiry by establishing these general niches of the eat-or-be-eaten relationships of a food web: plants as primary producers (converting the absorbed energy of sunlight into food for other organisms), herbivores (eating green plants), carnivores (eating other animals), omnivores (eating a great variety of plants and animals), detritivores or decomposers (relying on dead animals or plant materials) with some animals fitting into multiple categories. Set the geographic stage for studying the Illinois ecosystem of the Cypress Swamp. Ask each student to create a skeletal framework for a generalized food web. Students will generate ideas for the biotic (living) and abiotic (non-living) factors that are necessary in the food web. They should color code the various factors, producers, herbivores, etc. Students should record the impact of the factors in the food web. Study the Cypress Swamp poster and place the organisms (both those pictured and those mentioned in the text) in the proper biotic and abiotic categories. (Some additional research may be needed.) The final food web should show arrows between organisms that are directly related in the food web, along with the necessary abiotic factors (water, sunlight, appropriate temperature range, etc.) Arrows should always point in the direction of energy flow. The rat snake eats the tree frog. Snake takes energy from the frog. For example: tree frog→rat snake. Discuss the complete food webs and the role each organism plays. Additional questions such as these, should be considered: Which category of organisms are the most numerous? Which are the heaviest (have the greatest biomass?) What happens if some of the organisms are removed from the ecosystem?
5. Ask each student to explain the interactions depicted in the food web and that affect the environment of the Illinois cypress swamp. The activity can be extended by replicating the process using the Northern Bog and Sand Prairie posters.
6. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
   - *Knowledge*: The identification of abiotic and biotic factors was complete and correct. The descriptions of the effects the abiotic factors have and the sources of food/energy of the biotic factors were complete and correct,
   - *Application*: The inter-relationships within the food web of organisms and abiotic factors were complete, well-organized and accurate.
   - *Communication*: The explanation and projections of interactions was thorough and accurate.

Examples of Student Work not available

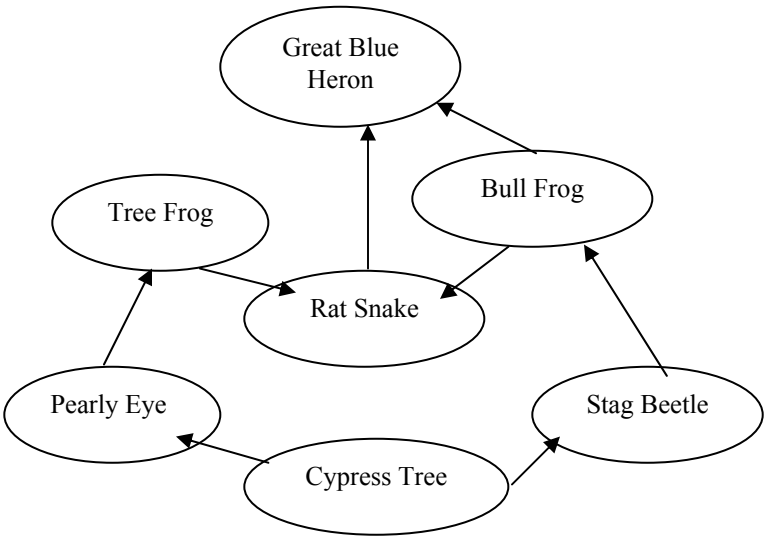
Time Requirements
- 1 class period

Resources
- Illinois Cypress Swamp, Northern Bog and Sand Prairie posters
- Access to additional research resources
- Science Rubric

Teacher notes:

Primary Producer
Cypress Tree
Herbivore
Pearly Eye
Stag Beetle
Carnivore
Tree Frog
Bull Frog
Rat Snake
Detritivore
Stag Beetle
Pearly Eye

A Small Example of a Food Web



Elephant Stag Beetle
Male stag beetles are very pugnacious and battle with each other for females. Their combat equals the brutal shoving matches of bull elk. Adults feed on liquids that ooze from trees or rotting fruit while their larvae eat decaying wood. Adults are active during late June.

Yellow Lady's Slipper Orchids
They grow in rich, moist woods and bloom in mid-spring. Their showy flower is pollinated by large flies and medium-sized bees. Lady's slippers are rate because they have been collected nearly to extinction. They have a unique relationship with fungi that helps provide nutrients to the plant.

Bull Frog
An adult bullfrog is usually solitary and will eat just about anything it can fit into its mouth—other frogs, snakes, insects, even small mammals and birds. Adults breed all summer long when the male's "jug-a-rum" call can be heard throughout the swamp. Bullfrogs can grow to be quite large.

American Featherfoil
This unusual floating plant found in quiet waters is the same family as shooting star. Although considered to be rate or only occasionally found in select locations, the species is capable of incredible 'flushes' with thousand of plants blooming during May. It is pollinated by small bees and flies.

Water Tupelo
Water Tupelo inhabits wet woods and swamps. The trunk is usually swollen at the base. The fruit is found in September and is oblong, dark and pale speckles, and bitter tasting. Swamps in southern Illinois are often mixtures of tupelo and bald cypress. Either can be dominant in a swamp.

Heron Pond Nature Preserve, Cache River State Natural Area

In this strange, silent, primeval world, cypress trees in a seemingly vast stand support little colonies of plants on their knees, islands in miniature. The surface of the pond is covered with several species of duckweed, a thick green blanket broken only by a fallen cypress needle, the black ribbon of a floating frog. In the quiet and stillness the bayous of Louisiana come to mind.

This area of Illinois was originally described by an English journalist in the 1860s as "a forest of dead trees, their ghostly leafless arms over buried trunks like plumes over a hearse—a cheerless miserable place, sacred to the ague and fever."

Swamps are areas where the soil is saturated or covered with surface water for most of the growing season and dominated by woody vegetation. In Illinois these deep swamps contain trees with swollen or buttressed bases and knees. This vegetation, typical of the Southeastern Coastal Plain, reaches its northern limit in Alexander, Pulaski, Johnson and Massac counties in extreme southern Illinois. Today, this area is known as the Cache River Basin, the prehistoric river valley of the Ohio. The Cache Basin crosses southern Illinois, extending to the Ohio River on the east and the Mississippi River on the west. It marks the geographical point where the last invasion of the sea into the Midwest reached its northern most limit and lies only a few miles from the southernmost extent of the continental glaciers. The Basin is referred to in the original United States Land survey as "inaccessible, a drowned land." Here stood the vast bald cypress—tupelo gum swamps of southern Illinois.

The Cache remains the only river in Illinois with two National Natural Landmarks along its banks, Heron Pond—Little Black Slough and Buttonland Swamp. Heron Pond, so named because it formerly served as a rookery for the great Blue Heron, is part of a larger parcel of swampland called Little Black Slough. The swamp is dominated by Bald Cypress and Tupelo Gum with approximately 200 acres covered with water throughout the year.

The original extent of cypress—Tupelo Forest in southern Illinois was about 250,000 acres. Extensive timber cutting, land clearing, and drainage for agriculture have consumed most of the natural character of the area. Yet, for those who visit, this area continues to show its character as one of the epic landscapes found in Illinois.

Indian Pink
Indian Pink grows in moist woods in southern Illinois. The species was originally thought to be a cure for intestinal worms; thus large quantities were harvested during the 19th century. Pollinators include long-tongued bees and moths. The plant usually blooms in the late spring into an early summer.

Copper Iris
A common flower of Louisiana, the Copper Iris is at the northern limit of its range in southern Illinois. It lives in shallow swamps and blooms in mid-May. This showy species has also colonized roadside ditches. A rare yellow form can occasionally be found.

Great Blue Heron
The Great Blue Heron is one of the largest wadding birds in Illinois. Herons build their nests high in trees, often bald cypress and water tupelo in southern Illinois. The noisy squawking of their rookeries can be heard from some distance. Herons will eat just about anything they can swallow.

Black Rat Snake
Black Rat Snakes are excellent climbers and often live in cavities high in trees. When cornered, these snakes are very aggressive and will literally' stand up and fight'. They are constrictors that feed on mice, rats and small birds. Young snakes will also eat tree frogs and lizards.

Purple Fringeless Orchid
This orchid occurs in wet woods and prairies. It is uncommon, but widespread only in the southern half of Illinois. The flower has a long nectar spur and is pollinated by long-tongued sphinx moths. Certain insects, however, chew a hole in the spur to extract nectar without pollinating the plant!

Northern Pearly Eye
Adults of the butterfly appear in June and August and are most active at daybreak and early evening. These butterflies feed on fermenting fruit, sap flows, carrion, and animal feces. The caterpillars eat various forests grasses. Males will perch on tree trunks waiting for females to come by.

Green Tree Frog
This southern frog gets into Illinois only in the extreme southern part. The species is sometimes called the "cowbell" frog because of its call. Green Tree frogs are reluctant to jump even when disturbed. Males can congregate in large numbers during spring for mating. Their diet is mostly insects.

Large Bald Cypress
This spectacular example of a Bald Cypress is over 40 feet around at its base! The base is hollow (ten children can easily fit inside), giving rise to its nickname of "Winnie-the-Pooh" tree. Several examples of these very large cypresses occur near Kamak.

Heron Pond Nature Preserve in Winter

Even in this most southern part of Illinois, four seasons still occurs. A "freak" blizzard has coated the cypress trunks with snow. Subsequent melting created the haloed effect around the trees. The distinctive pattern in the ice is caused by the freezing of moist soil.

Bald Cypress Foliage
Bald Cypress is a deciduous evergreen–it loses its needles during winter. Cypresses buttress at the base and produce 'knees' if growing in water. Knees can be nearly as old as the trees. Large trees are often hollow with open, feathery canopies.