Assignment Discovery OnLine Curriculum

Lesson title:
Looking for Biodiversity

Grade level:
6-8

Subject area:
Life Science

Duration:
Two or three class periods (During the first period, students will be introduced to the activity, and measuring, counting, and identifying procedures will be reviewed. Depending on the environment chosen for study and seasonal variations, students could revisit their plot at various times throughout the school year.)

Objectives:
Students will:
1. Understand that a variety of plants can be found in each habitat.
2. Learn that biodiversity is an important characteristic of a habitat.
3. Learn that a plant biodiversity study can be conducted in familiar areas by using a line transect or a plot study.

Materials:
The class will need the following:

- Field guides of regional plant life
- Reference materials: books, encyclopedias, Web sites
- Computer with Internet access (optional but very helpful)

Each team of students will need:
- Meter sticks or tape measures
- Stakes
- Flagging tape or string
- Permanent marker (for those doing a transect study)

Each student will need:
- Pencils and paper
- One copy of Classroom Activity Sheet: Data Chart
- One copy of Take Home Activity Sheet: Local Biodiversity Study

This lesson plan could be enhanced by purchasing a copy of the documentary "The Private Life of Plants: Living Together." This documentary airs on the Discovery Channel February 22, March 29, May 3, and June 7.

Procedures:

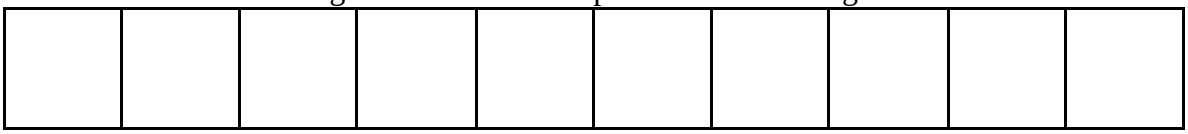
1. Ask students to share what they know about habitats, a designated area where plants and animals live. Then discuss with students the various habitats that surround the school, such as woods, meadows, or grassy fields. Ask students what kind of plant life is found in each of these

habitats. Is there great variety, or diversity, or do only a few kinds of similar plants, such as grass in a field, live there?

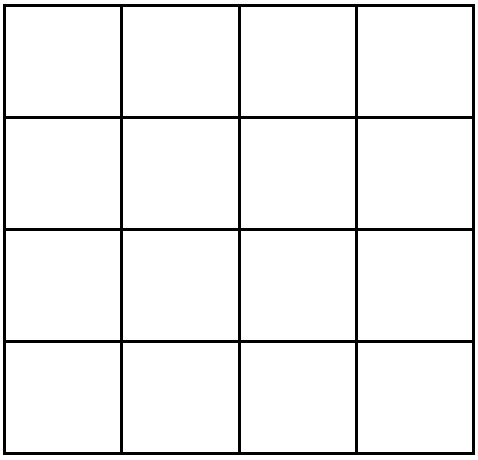
2. Discuss with students the advantages of diverse plant life in a habitat. For example, a greater variety of plants provide nutrients to a greater variety of insects. It also ensures that if a disease strikes one plant, such as Dutch elm disease hitting elm trees, other plant species will survive. For these reasons, *biodiversity*—a measure of the variety of life in a specific habitat—is also an indicator of the environment health. For more background information on biodiversity, students may be interested in visiting the following Web site: http://www.conservation.org/investigate/basics/default.htm

3. Explain to the students that they are going to work in teams of three or four students to complete a biodiversity study of plants in one local habitat. Brainstorm with students about their study design. Two common methods that ecologists use are line transects and plot studies. A transect is a long, narrow sampling area, while a plot study is a square area (often 100 meters by 100 meters) that can be divided into subplots. Transects extend over longer portion of a study area than a plot does, resulting in a larger sample of different plant species. However, plot studies are useful for small areas that have a great variety of plant life. The diagrams below show what a transect and a plot study look like.

Transect: 20 meters long divided into 10 subplots each measuring 2 meters



Plot Study: 100 meters by 100 meters divided into 25-meter subplots



4. Divide the students into teams. Have each team decide where to do their habitat diversity study. Possible sites include woods, a forest, a meadow, a lawn (of three-year-old grass cover not chemically treated), a marsh, or an edge of a pond or lake. If students live in an urban area, they could focus on a local city park or areas where trees are planted along the school's street. If they focus on smaller areas, you may need to decrease the sizes of their plots and transects.

5. Depending on the habitat chosen, students should decide the size and design of their study. Have students keep in mind the size of the plants they plan to count and study as they decide on the area to observe. Larger plant specimens, such as trees, need a larger plot or transect area than do short grasses. If sufficient space exists, have students choose plots or transects that do not touch or intersect. Also, if a range of habitats is available for study, have each team work in

different habitats. This will provide the class with more data for comparison. Students should record their results in the Classroom Activity Sheet: Data Chart.

6. If students are conducting a transect study, they should follow the steps below:

- Have students measure 20 meters of string. Tie one end of the string to a stake so the string stays in place. Using a permanent marker, students should measure and mark the 5-meter, 10-meter, and 15-meter locations on the string.
- Have students observe and identify all plants along the 20-meter transect. The width of the transect should be 2 meters, with all plants 1 meter from the string on both sides counted.
- Have students identify the species of plants along the transect, measure the height of each plant, count the number of plants, and map all plants along the transect.

7. If students are doing a plot study, they should follow the steps below:

- Measure a square area of sufficient size for a team study. Students should use a meter stick to measure each of the four sides of the plot, and they should put a stake at each of the four corners. This plot size is determined by the size of the plants that the students will be observing.
- Have students outline the plot study area with string or flagging tape. After the plot has been laid out, have the team spread out to cover the entire plot area.
- Students should survey the area and identify the species of plants that are present. Then students should count the number of plants, measure the height of each plant, and map where the plants are found on the plot.

8. Have students complete a study of their entire plot or transect area for at least a week. If time permits, students could work on this project throughout the school year.

9. Discuss the students' data. What do the data tell them about their habitats of study? Was more plant diversity found in one particular area? Did the students observe this area as being healthier? Was a large population of a specific plant species found? Suggest that students write paragraph describing their results.

10. After students have completed their school-based biodiversity study, assign the Take Home Activity Sheet: Local Biodiversity Study. Have students study a completely different area than the one completed for the first project, such as a habitat in their neighborhoods or even in their own backyards. Have students count both plants and animals in this study.

11. At the end of this activity, return to your definition of biodiversity—the variety of living organisms in a given area. Look back at the biodiversity studies students completed at home and school. Point out that some areas have a greater number of species than others: They have more biodiversity. Explain that on a global scale, some areas are more diverse than others. Tropical rain forests have the greatest number of species than any other biome. Some experts believe that 50 percent of all known species on Earth are found in tropical rain forests—yet rain forests cover only about 6-7 percent of the world's land surface. Ask students to consider why tropical rain forests have so much biodiversity? Considering that the rain forests are being destroyed at alarming rates, why should we care about the potential loss of the rain forest's biodiversity?

Adaptation for younger students:
Perform this same activity using a smaller area. Before introducing the activity, provide students with pictures or diagrams of the plants they will most likely find in a local habitat. Young students may identify plants by size, shape, or flower color instead of actual names. Then discuss with students how many different plants were found. Did they have different leaf shapes? How many different blooming flowers were found? Have students identify animal organisms and ask them to think about how the animals are helped by greater plant diversity.

Adaptation for older students:
True biodiversity studies identify all the organisms that live together in an ecosystem. Have students complete their plot study or transect by identifying and counting all organisms. If students do not know the names of some, have them sketch and briefly describe them. Students should develop a data chart and record their data, as well as sketches on an outline of a transect or plot study grid.

Discussion Questions:
1. Compare and contrast the habitats studied. Which area had the greatest diversity of life? Which area had the highest population number? Why were some areas more diverse than others?
2. Genetic, species, and ecosystem diversity are three aspects of biodiversity important to living organisms. Are all three aspects present in your community? How are humans threatening each aspect of biodiversity?
3. Explain some problems that scientists face when they try to count entire populations. What methods can they use to deal with some of these problems? Do they need exact numbers of all populations?
4. What happens when new plants are introduced to a habitat? Do they have a negative impact on the native plants growing there? Give examples to support your ideas.
5. Discuss environmental stresses that could affect your habitat of study. What would happen if a hurricane or tornado struck your study area? Do you think your plant habitat could survive such natural disasters? Should humans take measures to ensure biodiversity?
6. Discuss whether the United States should be involved in controlling plant diversity in other countries.

Evaluation:
Use the following three-point rubric to evaluate students' work during this lesson. Students should be evaluated on how they worked in teams, how they approached and completed the task of counting plants in their study area, whether they could correctly identify different species, whether they could record their data on a chart, and whether they were able to complete a sketch of their study area on a grid of a transect or plot study.

> Three points: Students worked well in their teams; counted a wide range of plants in their study area; identified most of the plants in their study area; created a complete and accurate data chart; completed an accurate sketch of their study area
>
> Two points: Students worked somewhat well in their teams; counted many of the plants in their study area; identified some plants in their study area; created a chart that was mostly complete and accurate; completed a partial sketch of their study area
>
> One point: Students counted some plants in their study area; identified a few plants; created a chart that incorporated some of the data; included some plants on a sketch of their study area

Extensions:

Field Guide
Have the class create a field guide for the plants found in their plot or transect study. Each page should include a sketch of the plant and a description of its flower, leaves, size, bloom time, and a general description of the habitat, as well as a map of the range where the plant can be found. Gather the field guide pages together to use as reference for studying plants throughout the school year.

Classifying Organisms
To help them study all the varied organisms that live on Earth, scientists have devised a system of classification that includes five different kingdoms—Monera, Protoctista, Planta, Fungi, and Animalia. Have students use reference materials to identify the five kingdoms and three species considered part of each kingdom. Ask students to identify each organism as unicellular or multicellular and to describe its nutrition, movement, and whether it reproduces sexually or asexually.

Suggested Readings:

The Enchanted Braid: Coming to Terms with Nature on the Coral Reef
Osha Gray Davidson, John Wiley & Sons, 1998.
The coral reef is not only home to the most diverse range of plant and animal species of any environment in the world, but it is also an amazing example of symbiosis between the coral polyp and algae.

Coral Reef
April Pulley Sayre, Twenty -First Century Books, 1996.
This title is an overview of coral reefs, discussing how they are built, the diversity of life that inhabits them, and how that life interacts. The book also considers the relationship between coral reefs and humans, and it examines environmental dangers that threaten the reef's health.

Web Links:

Aquatic Life on the Great Barrier Reef.
This site has excellent photographs accompanied by interesting facts about the Great Barrier Reef. It will serve as a great resource to familiarize students with the science of the reef.
http://scrtec.org/track/tracks/f01712.html

Jellyfish: My Life as a Blob
Follow the joys and heartbreaks of the wet, the wild, the crazy gelatinous zooplankton.
http://izzy.online.discovery.com/area/nature/jellyfish/jellyfish2.html

Vocabulary:

biodiversity
Pronunciation: bio-di-vur-si-te
Definition: Variety of living organisms in a given area.
Context: In a habitat, the variety of organisms living in the area determines the amount of biodiversity. Scientists also consider the genetic diversity of the pool, the number of different species of organisms, and different ecosystems represented to determine if an area is truly exhibiting biodiversity.

classify
Pronunciation: klas-e-i
Definition: To arrange by category.
Context: Organisms are classified into five different kingdoms based on the number of similar characteristics among organisms. For example, all plants, from onions to grass to trees, are in the plant kingdom.

community
Pronunciation: ke-myoo-ni-te
Definition: The populations of an ecosystem.
Context: All the populations of a habitat make up a community.

habitat
Pronunciation: hab-itat
Definition: The place in which an organism lives.
Context: Organisms live in a variety of different habitats, such as forests, meadows, and streams.

population
Pronunciation: pop-ye-la-shen
Definition: A group of organisms of the same species living in an ecosystem.
Context: In biodiversity studies, scientists determine the population by counting all members of a single species.

symbiosis
Pronunciation: sim-be-o-sis
Definition: A close relationship between two species.
Context: Lichens are really two organisms—a fungus and an alga—that have a symbiotic relationship. Alga provides the fungus with nutrients, and the fungus provides the alga with moisture.

Academic Standards:

Grade level:
6 - 8
Subject area:
Life Science
Standard:
Knows about the diversity and unity that characterize life.
Benchmark:
Knows ways in which living things can be classified (e.g., taxonomic groups of plants, animals, and fungi; groups based on the details of organisms' internal and external features; groups based on the roles within an ecosystem, such as producers, consumers, and decomposers).

Grade level:
6 - 8
Subject area:

Life Science
Standard:
Understands how species depend on one another and on the environment for survival.
Benchmark:
Knows how an organism's ability to regulate its internal environment enables the organism to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment

Grade level:
6 - 8
Subject area:
life science
Standard:
Understands how species depend on one another and on the environment for survival.
Benchmark:
Knows that all individuals of a species that live in the same place at the same time make up a population, and all populations living together, along with the physical factors with which they interact, compose an ecosystem.

Credit:
Mary C. Cahill, middle school science coordinator, Potomac School, McLean, Virginia.

DiscoverySchool.com
http://www.discoveryschool.com

Classroom Activity Sheet: **Looking for Biodiversity**

Name: _____

Biodiversity Study

Habitat Studied: _____

I. As you work on your biodiversity study, fill in the chart.

Data Chart

Plant Common Name	Scientific Name	Description of Plant	Description of Leaf	Any Flowers, Fruits, or Cones	# of Single Species	Plant Height	Plant Diameter

Continued

Classroom Activity Sheet: **Looking for Biodiversity**

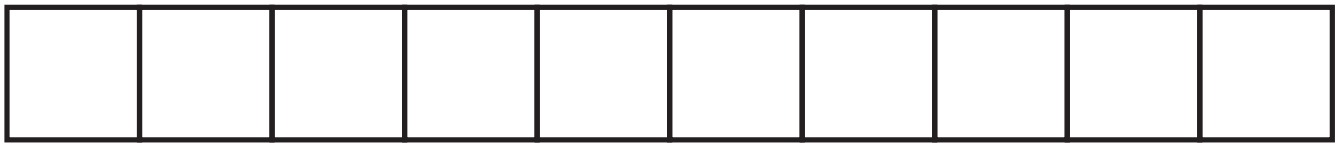
Name: _____

Biodiversity Study

Habitat Studied: _____

II. On the appropriate grid, draw plant locations. Consider labeling when you located the plants and how many you counted.

Transect: 20 meters long divided into 10 subplots each measuring 2 meters



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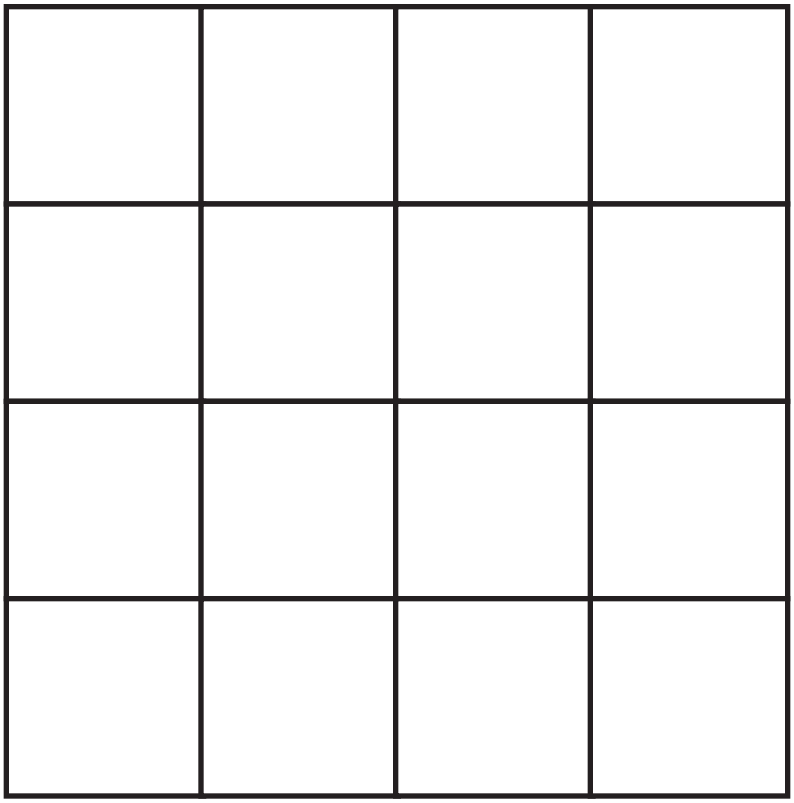

Name: _____

Local Biodiversity Study

You have just completed a biodiversity study of the plant varieties found in a school-area habitat. Using either a transect or a plot, complete a biodiversity study of an area in your neighborhood, such as your own yard. For this study, you will count and survey both plant and animal species. Make a map of your transect or plot and design a data sheet similar to the one you used at school.

After you have completed your study and shared your results with the class, discuss whether plant diversity leads to a greater degree of animal diversity. Compare your results obtained at home to those you studied at school. What factors may account for the noted differences?