How Big Is Your Landscape?

Goals:
To understand how an organism perceives its landscape and how changes to its landscape can affect its survival.

Objectives:
Students will be able to:
1. Define landscape, resources, scale, extent, resolution, and patch.
2. Draw diagrams representing landscapes from the perspective of different organisms.
3. Evaluate the consequences to organisms of various kinds of changes to the landscape.

Introduction:
Students are taught that conserving habitats, not polluting, and being careful with an organism’s home is important. Of particular interest to scientists is the effect of urbanization on the environment and how organisms survive in cities. Urbanization in this lesson is defined as the conversion of nonhuman-dominated land (i.e., native habitats) to land dominated by human-built structures such as transportation corridors, commercial buildings, and residential buildings. To evaluate the impact of disturbances such as urbanization or the effectiveness of a conservation effort, one needs to first have an idea of how the organisms perceive their environment. This lesson will give that background information.

The lesson is organized in the following manner: first, an engagement activity to get the students thinking about what they perceive as resources, what resources they use, how they get them, and how much space they use to obtain their resources. Second, they are introduced to landscape terminology and concepts they can relate to themselves. Finally, they do an activity in which they need to apply the new concepts and terms to other organisms. Discussion with the students occurs throughout the lesson to make sure they understand what they are being taught.

Background:
Most people are familiar with the term landscape, but it is usually in reference to the design of vegetation in someone’s yard. To ecologists, however, a landscape is simply an area with a heterogeneous (uneven) distribution of a factor of interest—in other words, a patchy environment. For example, a yard with areas of grass intermixed with areas covered in rocks. The patches of grass could be the factor of interest.

Every organism perceives its environment, or landscape, differently. One reason is due to the size of an organism. An elephant is much larger than a mouse. Due to resolution, this affects how an organism views available resources. A raindrop may be seen and used by a mouse to relieve its thirst while an elephant needs to find a pond. Moreover, the mobility of an organism affects the size, or extent, of land used to obtain resources. An elephant can travel hundreds of miles in search of water, but a mouse will usually travel less than a mile.
Terminology:

- Landscape: an area with an uneven distribution of at least one factor of interest
- Resources: any component of the environment that can be used by an organism
- Scale: the spatial (space) or temporal (time) dimension of an object or process
- Extent: size of an area or time span of interest
- Resolution/grain: precision of identifiable components
- Patch: an area that differs from its surroundings

Materials:

Supplies needed include:
- color printer
- paper cutter or scissors
- paper on which to print
- laminator (for cards, optional)
- computer and projector (if using power PowerPoint presentation)
- Connection to internet (to find, copy, and paste pictures)
- Word program (to paste pictures to cards)
- paper for students (for drawing)
- pencils and colored pencils

Procedure:

Preparation:

1. Find pictures (websites suggested on the card template), copy and paste in a word document of cards, print on a color printer, laminate if desired, and cut. One set of cards (total = 30) or two sets of cards can be made. Or, sets of cards from one or two of the ecosystems may be used. Also, find pictures of the three types of ecosystems and print them—either enough for each group of students or for posting around the room.

2. Use the simple PowerPoint© presentation provided, if desired. The presentation is meant as an example of how to present terms.

Engagement:

3. Project image of Figure 1 onto a white board or screen. Randomly call on students to write (with marker if using white board) or stick (with sticky notes if using a wall or screen) their name to the house they would want to live.

Figure 1.
4. When they are finished, have a discussion on why they chose the place they chose. Ask 
them if the thought of being able to obtain food or their parents finding a job influenced 
their choice. Did the thought of having a car or public transportation influence their 
choice? Discuss how these factors influence how much space they use and where they live 
in an area.

**Term Introduction:**

5. Introduce and discuss the following terms: landscape, resources, scale, extent, 
resolution, and patch. Relate the terms to the student's (human) perspective.

**Application:**

6. Hand out at least two cards with different organisms to each student (or have them 
work in groups of two) and the activity handout. Make sure the organisms differ in 
landscape scale. Post pictures of the Sonora desert, Florida Everglades, and Alaskan forest 
(Tongass) so the students can see the types of ecosystems in which the organisms are 
found. The same organisms may be handed out to different students so a comparison of the 
drawings can be done and discussed.

7. Tell the students that they need to read the information on the cards and use the 
concepts/terms they just learned to draw a landscape from the perspective of the 
organisms they have. They need to include the following in their diagrams: a scale line that 
show the extent of the landscape; labeled sources of food/nutrients, energy (if 
appropriate), water, and shelter; and the organism. Also, they need to answer the questions 
on the handout. Emphasize to them that it is okay that they do not know much information 
about each organism, it is important that they demonstrate use of the concepts and critical 
thinking skills.

8. Discuss their diagrams and answers as a class.

**Evaluation:**

Students should be evaluated by their participation in classroom discussion (30%), completion of 
activity and handout (30%), and an exam (40%). Exam should consist of multiple choice, short 
answer, and “essay” questions that reflect the types of questions asked during discussions and on 
the handout and the terms introduced.

**Extensions:**

Students can also research and report on an organism (from the cards or another of specific 
interest), giving more information about its life history and how different kinds of disturbances 
have, are, and will affect it (e.g., urbanization, drying of the land, human recreational use, 
glaciations, etc.)

In addition to the state science standards directly addressed by this lesson, several other state 
science standards can easily be incorporated into the lesson, either during the lesson or in 
extensions. Examples (not exhaustive) of additional science standards that can be addressed 
include:
SC01-S4C3-O3: Describe how plants and animals within a habitat are dependent on each other.
SC03-S4C3-O2: Examine an ecosystem to identify microscopic and macroscopic organisms.
SC03-S4C3-O3: Explain the interrelationships among plants and animals in different environments: producers - plants; consumers - animals; decomposers - fungi, insects, and bacteria.
SC04-S4C3-O1: Describe ways various resources (e.g., air, water, plants, animals, soil) are utilized to meet the needs of a population.
SC06-S4C3-O1: Explain that sunlight is the major source of energy for most ecosystems.
SC07-S4C3-O2: Explain how organisms obtain and use resources to develop and thrive in niches; predator/prey relationships.
SC07-S4C3-O5: Analyze the interactions of living organisms with their ecosystems: limiting factors; carrying capacity.
SC08-S4C4-O5: Analyze the following behavioral cycles of organisms: hibernation; migration; dormancy (plants).