SHRINKING HABITAT

Subject: Science, Social Studies

Skills: Classification, Decision Making, Discussion, Kinesthetic, Large Group, Modeling, Role-playing, Simulation

Duration: 1 lesson period (or more depending on depth and discussion

Setting: Outside or large classroom/open area

Materials:
—green and blue construction paper squares for food and water
—classroom desks, tables, or chairs, OR hula hoops or string
—5 or 6 large blankets or bed sheets for a group of about 25

Michigan Curriculum Framework Content Standards and Benchmarks:
—**Science LEC- III.5 e-1**: Strand III. Using Scientific Life Science Knowledge, Standard 5. Ecosystems (LEC), Benchmark e-1. Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web. (Key Concepts: Producer, consumer, predator, prey, decomposer, habitat, community. Real-world contexts: Food chains and food webs involving organisms, such as rabbits, birds, snakes, grasshopper, plants.)
—**Science LEC- III.5 e-2**: Strand III. Using Scientific Life Science Knowledge, Standard. 5. Ecosystems (LEC), Benchmark e-2. Describe the basic requirements for all living things to maintain their existence. (Key concepts: Needs of life- food, habitat, water, shelter, air, light, minerals. Real-world contexts: Selected ecosystems, such as an aquarium, rotting log, terrarium, backyard, local pond or wetland, wood lot.)
—**Science LEC- III.5 e-4**: Strand III. Using Scientific Life Science Knowledge, Standard 5. Ecosystems (LEC), Benchmark e-4. Describe positive and negative effects of humans on the environment. (Key concepts: Human effects on the environment- garbage, habitat destruction, land management, renewable and non-renewable resources. Real-world contexts: Household wastes, school wastes, waste water treatment, habitat destruction due to community growth, reforestation projects, establishing parks or other green spaces, recycling.)
—**Science II.III.5.MS 1**: LEC Ecosystems, Standard III.5. Describe how materials cycle through an ecosystem. Benchmark MS 1. Describe common patterns of relationships among populations.
—**Science II.III.5.MS 3**: LEC Ecosystems, Standard III.5. Describe how materials cycle through an ecosystem. Benchmark MS 3. Predict the effects of changes in one population in a food web on other populations.
—**Science II.III.5.MS 6**: LEC Ecosystems, Standard III.5. Describe how materials cycle through an ecosystem. Benchmark MS 6. Describe ways in which humans alter the environment.
—**Social Studies II.2.LE 2**: Strand II. Geographic Perspective, Standard 2. Human/Environment Interaction, Benchmark LE 2. Describe the location, use, and importance of different kinds of resources and explain how they are created and the consequences of their use.
—**Social Studies II.2.MS 4**: Geographic Perspective, Standard 2. Describe, compare and explain the locations and characteristics of ecosystems. Benchmark MS 4. Explain how humans modify the environment and describe some of the possible consequences of those modifications.

Kent County Collaborative Core Curriculum (KC[4]):
—**Science:**   3:2, 3:3, 3:5
                          4:1, 4:2
                          5:1, 5:4
—**Social Studies:**   4:4, 4:8, 4:9

OVERVIEW

Students simulate a process of land development by acting as vegetation, herbivores, carnivores, and land developers. Through physical activity, they will identify organisms as part of a food chain, recognize the importance of suitable habitat for wildlife, and understand and describe some effects of land development on plants and animals.

OBJECTIVES

After participating in this activity, students will be able to:
- Understand and describe some effects of land development on plants and animals.
- Recognize the importance of suitable habitat for wildlife.
- Understand and use habitat and food chain vocabulary words and understand difficult vocabulary words.
- Recognize that loss of habitat is generally considered to be the most critical problem facing wildlife today.
- Recognize that development can be planned with a conservation design to reduce habitat loss.

BACKGROUND

All around us, wildlife habitat is being lost. Whenever an area of land is paved for a shopping center, more or wider roads, or it is divided and excavated for homes for people — small animals lose their homes, and their sources of food and water. As these small animals disappear, so too do the larger animals that previously depended upon the smaller animals for food. Animals that cannot tolerate human intervention may also disappear without any direct relationship to the food chain.

Students can observe this phenomenon near their homes and schools or at least in their region. For example, forests and farmland are divided and built upon. Large animals such as deer need big spaces for their habitat, and poorly planned subdivisions split land into pieces of habitat that are too small to support the previous wildlife population. Undeveloped land is also valued by people for its natural aesthetic beauty.

Many wetlands have been filled in and drained to make land for development. When they are filled in, many kinds of water birds, reptiles, amphibians, crustaceans and other life forms — including a wide variety of vegetation — are lost. Sometimes the animal forms can move on, but most often they cannot.

Builders can reduce the amount of habitat loss by planning developments that include smaller lot sizes and compact neighborhoods. Instead of parceling out all the land to the lot owners, planners can identify primary and secondary conservation areas to be saved as open space and habitat. The open land can then be used as public recreation for residents and as wildlife corridors.
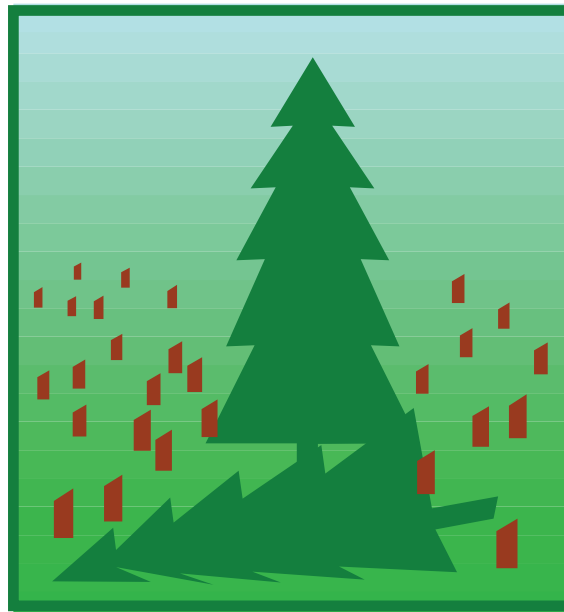
The major purposes of this activity are for students to simulate some of the potential impacts of land development on wildlife and its habitat, to recognize that development can be planned to reduce habitat loss, and to understand that loss of habitat is generally considered to be the most critical problem facing wildlife today.

PROCEDURE

1. Review with the students the elements necessary for a habitat (food, water, shelter and space arranged suitably for the particular animal). After some discussion to make sure that the elements of habitat are clearly in mind, tell the students that they will simulate wildlife in its habitat. (Students might also need a quick review of food chains and food webs.)

2. Divide the students into four groups: herbivores, carnivores, vegetation (trees, shrubs, grasses, etc.) and people (who will be land developers). Familiarize the students with the terms **herbivore** and **carnivore**, provide them with working definitions of those terms (herbivore — a plant eating animal; carnivore — a meat eating animal; and although not needed for this activity, omnivore — an animal that eats both plants and animals). Plan for three times as many herbivores as carnivores with a small number of developers in proportion to the other two groups. The numbers (amount) of vegetation may vary. For example, two developers, three carnivores, nine herbivores and six trees or bushes (vegetation).

3. Establish a large area — either outside or in the classroom — with tables, chairs, and desks moved to the sides of the room. This will be used to simulate the land area. The "land developers" are to stay on the sidelines at this time, simply

observing the undeveloped land and its wildlife inhabitants. Or they can meet on their own to make plans for development. In fact, they can make their entrance rather suddenly once the wildlife habitat has been established, simulating the arrival of heavy construction equipment.

4. Provide each "herbivore" with: (possible Michigan herbivores are squirrels, rabbits, mice, deer...)
   • Two desks or chairs to use as "shelter" (or string or hula hoops)
   • Three pieces of green construction paper to represent food
   • One piece of blue construction paper to represent water.
   • Some of the vegetation portrayed by students

   Provide each "carnivore" with: (possible Michigan carnivores are hawks, owls, badgers...)
   • One desk or chair to use as "lair" (or string or hula hoops)
   • Space equivalent to that used by three herbivores
   • Three herbivores as a potential food source
   • One piece of blue construction paper to represent water
   • Some of the vegetation portrayed by students

5. First ask the herbivores to arrange the food, water and shelter (including the students who are vegetation) in a space to represent their habitat. Once the herbivores have arranged their habitat, ask the carnivores to move into the area to establish their lairs and water sources, keeping an eye on the herbivores as possible food sources. For added interest, suggest that the students identify what particular kind of animal they are and role-play its characteristics. (Allow approximately 10 minutes for the developers to plan and for the herbivores and carnivores to arrange their habitat.)

6. Once all the animals are established in their habitats, it is time for the developers to enter the picture. These developers have been given the opportunity to create a housing and shopping area. (They may use three to seven minutes to construct their development, explaining their actions as they take them.) The developers may use the sheets and blankets to build their development. They may remove trees (represented by students) without physically hurting the students, shelter (represented by desks), food and water to lay down their blankets. If the developers lay their blankets apart from each other, this can simulate poor development planning that breaks large plots of habitat into many smaller pieces, known as **habitat fragmentation.** Later, in the second simulation (step 8), explain that it is good to keep development close together in order to keep larger plots of habitat together (for larger animals that need

bigger ranges).

7. Once they have constructed their development, engage all the students in a discussion of what happened. What action took place? With what consequences? Would or did any animals die? From what causes? Could the developers have done anything differently to change the consequences? Could they have developed one large area, instead of several scattered small areas, or vice versa? With what effects? Would it have reduced negative consequences for wild- life if they put the development in a different area of the habitat? Rather than negative consequences, were there positive consequences (such as the preservation of part of the habitat)? If so, what were they? How were they achieved? Ask the students to consider and discuss what seemed realistic about the activity and what did not. For example, sometimes development can take place that enhances the area for some kinds of wildlife. Planners and developers can sometimes add vegetation and water sources, creating additional food, shelter and water for some kinds of wildlife.

8. Conduct this activity a second time, with the students trading roles. When the former wildlife become land ☐developers, have them produce a development plan that could benefit the area for both people and wildlife. The activity can also be conducted to show wise development planning that develops only part of the habitat area, leaving some wildlife likely to survive. For example, developers can connect the blankets in a concise area and leave a larger part of the habitat in tact. This will allow larger animals that require more land to roam to continue to use the habitat.

9. Discuss loss of habitat as something that is affecting wildlife in your local community and all over the planet. Ask the students to summarize the importance of suitable habitat for wildlife. Discuss the students' concerns and recommendations. Ask the students what they can do to reduce the loss of habitat in their community (such as shopping locally to reduce sprawl, evaluating development plans for wise use of land, etc.).

ASSESSMENT OPTIONS

1. Describe a character that you portrayed in the development simulation. What was necessary for the habitat? What food chains did you see? How did you feel when the developers came in? What happened to the vegetation when the developers came in? What happened to the herbivores? What happened to the carnivores?

2. Design (draw) a community for both wildlife and people. Include 3 houses, grocery store, fire station, farm, forest, river, 3 herbivores, and 1 carnivore.

3. Have the students write a paragraph explaining how development can affect a field or forest environment.

4. Name and describe one animal or plant that used to live in your area but no longer does. Describe the changes that seem most responsible for eliminating the plant or animal. Suggest and evaluate possible actions that could have been taken to prevent the elimination of this plant or animal from the area.

Student Assessment Answers
from Highlands Middle School (5th grade), Grand Rapids, MI

1   deer. He died because the land developers put up factories and homes. He didn't have enough food.

2   People could have had a vote if they want a factorie or home right in the middle of their animals home.

3   I gave shelter to some animals and a good home. they might of ate my leaves. Each animal needed food, shelter and water.

4   I saw a food chain the plants get their energy from the sun, the Herbivores get their energy from the plants, and the Carnivores get their energy from the Herbivores.

5   I felt like I might not have enough water to survive. I could get cut down if I was in the middle of were they wanted to build.

6   the Herbivores some died because the land builders took some of their land and water so they died.

Adaptations/Extensions

1. Ask students to complete the following sentence, and discuss their response: "If I were going to build a house for my family in a previously undeveloped area, I would..."
2. Look at old and new maps of your area. What kinds of habitat are gone as a result of land development? Make a bar graph of the number of forests, wetlands, farms and prairies that have been developed.
3. Continue discussion on a chalkboard. Help the students to summarize some of the possible impacts on wildlife from human activities such as development of land areas. Are there places in your community where wildlife habitat has been lost by human development? Are there places where wildlife habitat has been enhanced by human activity? What choices, if any, are there for the development of previously undeveloped areas? What trade-offs are involved? For example, what are the trade-offs in developing vacant areas within communities rather than undeveloped areas outside of communities? If development does take place, what kinds of actions can people take to minimize the negative consequences for wildlife, vegetation and other elements of the environment? What about possible economic costs? Social costs? Ecological costs? Aesthetic costs, etc.?
4. Allow the students to study a different kind of habitat. Play the game again using plants and animals that the students suggest. What are the results of development in the new habitat? Continue discussion and make compare and contrast statements.
5. If possible, take the students on a field trip to a nature center to see Michigan habitat up close.

Computer Extensions

1. DiscoverySchool.com. Habitats of the World. 21 May 2002. <http://school.discovery.com/lessonplans/programs/habitats/index.html> Teacher lesson plan. Students research different habitats and present their projects.
2. LessonPlanz.com. Habitat Lap Sit. 21 May 2002. <http://entowww.tamu.edu/academic/ucourses/ento489/lessons/lesson5.html> This is a fast and easy lesson plan for teachers. Students physically form an interconnected circle to demonstrate components of habitat. This activity takes very little time, has a lot of impact, and is very fun.
3. National Wildlife Federation. Educator Resources. Jan. 2002. 21 May 2002. <http://www.nwf.org/schoolyardhabitats/educatorresources.cfm> National Wildlife Federation resources and programs supply educators with the background knowledge, activities, and planning materials for integrating conservation lessons into science, math, language arts, and art classes. Available at this site are the Habitats newsletters. (<http://www.nwf.org/schoolyardhabitats/habitatnewsletters.cfm>) Also, creating schoolyard habitats (<http://www.nwf.org/schoolyardhabitats/creatinghabitatsites.cfm>)

SOURCE
Adapted with permission from Project WILD, "Shrinking Habitat," Western Regional Environmental Education Council, Inc. 1992. Pg. 258-261.

ADDITIONAL RESOURCES
Contacts:
American Planning Association (APA) or the Michigan Chapter of the APA
Calvin College (Ecosystem examples)
Ducks Unlimited
Local City Planning Division or Planning Commission
Local Nature Center
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Land Use Institute
The Nature Conservancy
U.S. Army Corps of Engineers (the Corps)
U.S. Environmental Protection Agency (EPA), Env. Ed. Program

References and Teacher Resources:
Arendt, Randall G. Conservation Design For Subdivisions: A Practical Guide to Creating Open Space Networks, Washington, DC: Island Press, 1996.
Arendt, Randall G. Growing Greener: Putting Conservation into Local Plans and Ordinances. Washington, DC: Island Press, 1999.
Chesky, Edward. Habitat Restoration: A Guide to Proactive Schools. Waterloo County Board of Education, 51 Ardelt Avenue, Box 68, Kitchener, Ontario, N2G 3X5, Canada, 1993.
Saunders, D. A., R. J. Hobbs and C. R. Margules. "Biological consequences of ecosystem fragmentation: A review." Conservation Biology. 1991. 5 (1): 18-32.
Soulé, M. E. "Land use planning and wildlife maintenance: Guidelines for conserving wildlife in an urban landscape." APA Journal. 1991. 57 (3): 313-323.

Additional Lessons:
National Geographic Totally Tropical Rainforest (video)
Project WILD: Deadly Links, Pg. 270-273; Owl Pellets, Pg. 144-145.
WOW! The Wonder of Wetlands: Marsh Market, Pg. 109-111.

CONCEPTUAL FRAMEWORK REFERENCE
IB4,IB6,IIA1,IIC1,IIC2,IIC3,IID1,IID2,IIIC2,IVA,IVB,IVC,IVD1, IVE1,VF1,VA1,VB1,VC1,VD1