Then and Now

Using Aerial Photography to Measure Habitat Changes

★ **Subject Areas:**
environmental education, science, social studies

★ **Conceptual Framework Topic References:**
HIIIB, HIIIB1, HIIIB2, HIIIB3, HIIIC3, ITIIIA, ITIIIA2

★ **Duration:**
one or two 45-minute sessions

★ **Setting:**
indoors

★ **Key Terms:**
fragmentation, habitat, land use

Method

Students will compare aerial photographs that are of a community and were taken 50 years apart. They will identify features resulting from human settlement. Using a transparent grid, they will next measure and then discuss changes to wildlife habitat that have occurred over time as a result of human population growth.

Objectives

Students will:

1. Describe ways that human settlements have influenced wildlife habitat and populations.

2. Interpret aerial photographs and related sources of information.

3. Describe the effects of human-made structures on native and non-native species.

Materials

Transparent grid, 2 aerial photographs of a community, "Human Related Changes" chart, species list

Background

As early as the 1930s, land-use planners were using aerial photography to assist in map making and to measure changes in land use. Specially equipped airplanes can fly identical routes over several years and can take photographs that will be compared over time. This procedure results in an accurate record of what has happened to the land as the years have passed by.

If soil survey, topographical or aerial maps are not available for your community, the photographs at the end of this activity may be used. (They were taken over Glenwood Springs, Colorado. The first was taken in 1950; the second was taken in 1996.) By studying two photographs taken decades apart, students can measure and compare the changes that have occurred.

Many changes alter a wildlife habitat. In turn, those changes in habitat may change the types and numbers of wildlife species living in the area. All wildlife creatures need food, water, shelter, and space. When any of those parts of a habitat are changed, the numbers and kinds of wildlife also change.

Some changes actually create new habitat for wildlife. Water

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storage structures such as reservoirs can increase waterfowl and fish populations. Hardwood trees planted in towns might attract songbirds that otherwise would not be found in the area. Agricultural lands provide food for a variety of wildlife, including elk, deer, birds, and small mammals.

Some changes may reduce the number of certain wildlife species. For example, changes from agricultural to residential areas will reduce the amount of food available for deer and elk. Highway construction can disrupt the migration of wildlife. Development in forested areas will reduce the amount of habitat available for wildlife.

Preparation

1. Make a copy of the aerial photographs for each group of two or three students.

2. Make a transparency of the grid for each student group.

3. Make a copy of the "Human Related Changes" chart and the "Species List" for each student group.

> NOTE: If possible, ask the local planning commission or natural resource agency for names of guest speakers who can provide aerial photographs and can discuss changes in land use and wildlife habitat.

Procedure

1. Have students work in groups of two or three. Give each group a copy of the two aerial photographs and a transparent grid. Have the groups study the photographs

and list features that have been constructed, altered, or eliminated. Make students aware that the two photographs may not line up exactly.

Examples of things to look for include these:

☆ Constructed—roads, ponds, houses, industrial parks, farm buildings, and reservoirs

☆ Altered—streams, rivers, and lakes

☆ Eliminated—railroads, forests, trees, grass land, meadows, lakes, and wetlands.

2. Have the students use the transparent grid to determine how much of each change has occurred. Ask them to compare the number of squares of each habitat type. For example, how many squares of forest area are in each picture? How many squares of highway are in each picture?

3. Distribute copies of the "Human-Related Changes" chart to each group. Ask students to discuss ways in which the features might affect wildlife habitats and species. Answers might include changes in types and amounts of food, water, shelter, and space.

4. Distribute copies of the "Species List." Ask students to predict how that species list would be affected by the changes seen in the aerial photographs.

5. Use these discussion questions:

☆ What human-made features in Colorado (or in your own community) have been

harmful to native wildlife and why? Examples: roads create travel barriers; houses remove habitat; mines, farms, and ranches use water and change habitat; timber harvest alters forest diversity.

☆ What features have been beneficial to wildlife, both native and non-native? Examples: reservoirs create waterfowl, shorebird, and fish habitats; farms and ranches provide grain for animals to eat; golf courses provide open space and food for some species of wildlife.

☆ What three actions taken by members of your own community could be harmful to native wildlife? Examples: building a shopping center on open land; draining wetlands for housing; building a highway across wildlife migration routes.

☆ What three actions taken by members of your own community could benefit native wildlife? Examples: controlling use of pesticides in neighborhoods and city parks; developing nature centers with exhibits and activities for families and schools; purchasing open land to protect wildlife habitat from development.

Evaluation

Give students the following directions: Using the data you generated about land uses in 1950 and 1996, construct a pie graph for each time frame to show the development of different land uses and the effect on wildlife habitat over time. Label your pie graph, and add a one- or two-sentence description of what it shows.

Extensions

1. Have students research the history of development in their own community. How did the community change over time? What laws and regulations controlled change? When were such laws and regulations passed and why?

2. Have the students research native plants and animals inhabiting their local area or state prior to human development. Have any species become threatened, endangered or extinct? How has human development affected these species? How do the earlier species compare with those found in the local area or state today? Are there any non-native species inhabiting the local area or state today?

3. After reviewing what makes up a community, have the students design their own communities, What requirements would they have for their communities? What laws or regulations would they establish? Ask the students to draw or build a model of their communities. What provisions for the future would be made? What measures would be taken to conserve the environment?

Sources

Adapted with permission of the Wisconsin Department of Natural Resources and reprinted with permission of Colorado Division of Wildlife.

Glenwood Springs, Colorado 1950
Scale: 1 inch = 1050 feet
(Aerial photos donated by Colorado Aerial Photo Service, Denver.)

Human Related Changes

Type of Change	Possible Positive Effects to Wildlife	Possible Negative Effects to Wildlife	Neutral Impacts to Wildlife
Parking Lots			
Houses			
Roads/Highways			
Shopping Centers			
Dams/Reserviors			
Power Plants			
Oil & Gas Wells			
Railroads			
Mines/Gravel Pits			
Fences			
Airports			
Irrigation Ditches			
Farms/Ranches			
Water Treatment Plants			

Wildlife Species List

For Glenwood Springs and Roaring Fork Valley

(This is not a complete list)

Mammals	Birds
Elk	Mountain Chickadee
Mule Deer	Blue Grouse
Mountain Lion	Dark-eyed Junco
Bobcat	Yellow-rumped Warbler
Coyote	Pigeon
Hoary Bat	Hairy Woodpecker
Black Bear	Raven
Chipmunk	House Finch
Cottontail Rabbit	Red-tailed Hawk
Snowshoe Hare	Golden Eagle
Golden-mantled Ground Squirrel	Bald Eagle
Deer Mouse	Canada Goose
Woodrat	Mallard
Red Fox	Great Blue Heron
Pine Squirrel	Broad-tailed Hummingbird
Colorado Chipmunk	Grey Jay
Porcupine	Cooper's Hawk
Ermine	Magpie

TEMPLATE FOR GRID TRANSPARENCY
Scale 1 inch = 1050 feet; 1 square (1/2 inch) = 275,625 square feet
1 square = about 6 acres

Glenwood Springs, Colorado 1996
Scale: 1 inch = 1050 feet
(Aerial photos donated by Colorado Aerial Photo Service, Denver.)