EDUCATION OUTREACH EVENT REPORT AND RECOMMENDATIONS

Attendee's and Report Writer's Name:
Joseph Kerski, Geographer: Education/GIS, USGS, Denver.

<u>Event:</u>
Conserving Biodiversity Workshop

<u>Location:</u> Colorado Division of Wildlife Building, Denver, Colorado.

<u>Other USGS Attendees:</u> None.

<u>Event Dates:</u>   15 June 2001

Executive Summary:

The USGS participated in the first of three workshops to support an educational project entitled "Conserving Biodiversity in the Denver Metro Area." The USGS is a major partner in the project, which is designed to bring conservation biology concepts and tools to the geography curriculum at the secondary level. We helped write the grant that was funded by the National Geographic Society, developed lessons using print and digital materials, and marketed the project among the educational community. The project was divided into four phases:

1)   Write grant proposal to National Geographic Society.

2) Plan project and form team from University of Colorado, USGS, Colorado Division of Wildlife, Colorado Natural Heritage Program, and 11 secondary social studies and science teachers.

3) Write educational lessons.

4) Conduct workshops to teach other teachers the tools and lessons so that they could use them in the curriculum.

The Biodiversity Workshops Are Held at the Colorado Division of Wildlife, one of the major partners in the project.

Partners in the project are the USGS, the University of Colorado Department of EPO Biology, the University of Northern Colorado, and the Colorado Natural Heritage Program. Financial support came from the National Geographic Society Education Foundation, IBM, ESRI, and McGraw-Hill.

The first workshop exceeded our expectations, as nearly 20 teachers attended. The next workshops are scheduled for 10 August and 13 October. We might conduct the third workshop at GeoTech Colorado 2002 (see my report for the May 2001 conference). We also need to do more work on the educational lessons before the August workshop.

The workshops were also open to teachers outside the 8-county Denver Metro Area, and to staff providing curricular support for teachers.

Workshop Content

The workshop presented standards-based pilot lessons for incorporation into a broad array of geography and science courses offered in grades 6-12 of the 8-county Denver

Metro Area during 2001-2002.

Left, Dr Wilson Crumpacker, Principal Investigator on the project and Professor of Biology at the University of Colorado.

Examples of subject matter:

(1) global species and ecosystem diversity/value/status/threats with special emphasis on the Denver Metro Area;

(2) the conservation area system (parks, refuges, public forests, open space, etc.) of the Denver Metro Area - its current effectiveness in maintaining biodiversity, methods for strengthening it through community-based conservation, and its relationship to regional human population growth patterns;

(3) socioeconomic/political/cultural aspects of biodiversity conservation;

(4) student field projects involving scientific study of regional biodiversity with internet-based reporting of results; computerized analysis and improved design of the Denver Metro conservation area system; and participation in community-based conservation efforts.

Each participant received free-of-charge a printed curriculum containing eight units of pilot lesson materials; and three large

(approx. 4'x3') colored, laminated (for durability) maps of the Denver Metro Area showing (1) the conservation area system, (2) natural ecosystems, and (3) location of rare species, rare subspecies, and rare natural ecosystems.

Workshop participants desiring 0.5 hours of graduate-level recertification credit through the Colorado School of Mines will need to pay $25 and satisfactorily complete the workshop. Teachers paid $10 to attend the workshop.

All attendees agreed to incorporate at least one workshop pilot lesson into one or more of their courses to be offered in academic year 2001-2002 and to assist the workshop sponsors in assessing the value and usefulness of the lesson(s).

Participants use species, population,

conservation areas, and vegetation maps in the project, produced by the Colorado Natural Heritage Program.

Reasons for Participating:

(1) One of our goals in the education program is to form formal partnerships with organizations. This was mentioned in all bureau education meetings from Fall 2000 to the present. This project meets that goal, as it is an ongoing relationship with several organizations and directly with teachers who are active in the Colorado Geographic Alliance (COGA), with whom we have worked since 1995.

(2) Working in education is an excellent way of starting long-term relationships with people and organizations. These relationships with state and university organizations could lead to our folks getting included in major research projects, for interns, or even funding for data production by one of these groups.
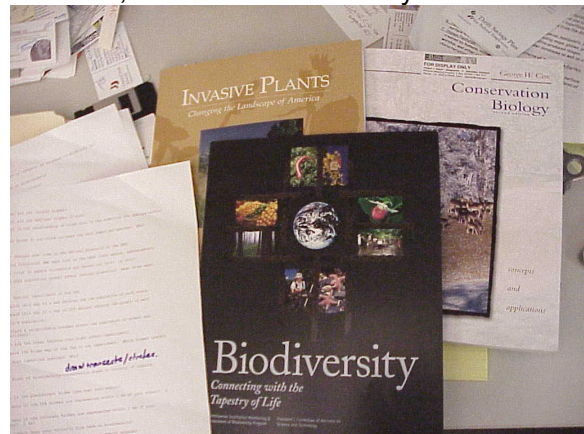

Karen Edgerly from the University of Colorado works with the participants.

Materials

I brought materials on USGS digital data, geography, water resources, geology, and biology, emphasizing biodiversity and also the Colorado Front Range. I thank Pat Schassburger for providing the *Biodiversity*
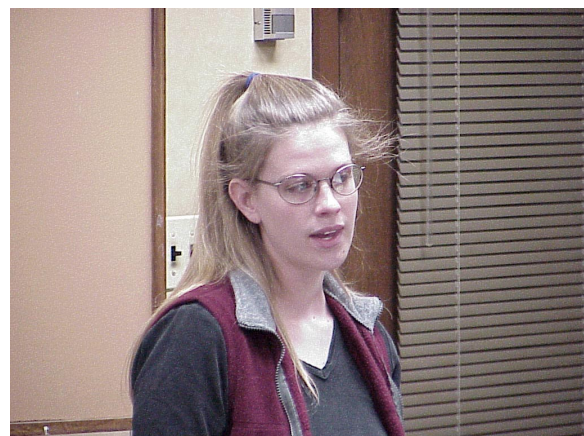
booklets, which were extremely useful.

Sample materials I brought to the workshop.

Participants in the computer section of the workshop use Internet Map Server sites, Terraserver, AerialMart, and GIS.

Amy Lavender of the Colorado Natural

Heritage Program provided maps and digital spatial data and support for the project.

Debbie Lerch-Cushman of the Colorado Division of Wildlife, explaining her "Bottleneck Genes" lesson.

Sample Lessons That I Developed with Other Teachers:

From the Technical Standpoint, How Can Biodiversity be Maintained?

Technologies that can support this question:

1. Tables
2. Ground Photos
3. Maps
4. Charts
5. Aerial Photos
6. Satellite Images
7. GPS
8. GIS

4 Major Categories

1. What is a Conservation Area?
2. Size and shape of conservation areas.
3. Purpose of maintaining present conservation areas.
4. Future impacts on biodiversity.

Parts:

1. Exploring Conservation Areas Through Visuals
2. Analysis of size, shape, and patterns of conservation areas
3. Purpose of Maintaining present conservation areas.
4. Temporal analysis using Topographic Maps.
5. Temporal analysis of DMA.
6. GIS.

Part 1.

Inquiry Question: What is a conservation area?

Student Objectives:

By examining pictorial examples of different conservation areas, be able to define a conservation area and foster an image of these areas in the mind.

Map Use Objectives:

Geography Standards:
   2. How to use mental maps (a person's internalized picture of a part of Earth's surface) to organize information about people places, and environments.
   4. The physical and human characteristics of places.
   5. That people create regions to interpret Earth's complexity.
   8. The characteristics and distribution of ecosystems on Earth's surface.
   13. How the forces of cooperation and conflict among people influence the division and control of Earth's surface.

14. How human actions modify the physical environment.

15. How physical systems affect human systems.

Science Standards:

Background information:
Conservation areas vary widely in terms of their human impact in the past and present, in their plants and animals, climate, and how they are used. Conservation areas can be used for many purposes under carefully managed conditions, such as livestock grazing, recreation, forestry, and water conservation.

Time and Location:
1 period, in the classroom.

Materials:
Photographs, either hard copy or online.

Procedure:
1. Using the photographs supplied, list 5 characteristics that these conservation areas have in common.
2. Using the photographs supplied, list 5 ways in which these conservation areas differ.
3. Using the photographs supplied, construct a definition of what a conservation area is.

- - - - - -
Part 2.

Inquiry Question: What is the distribution, size, and shape of present conservation areas in Denver?

Student Objectives:
Determine the distribution, size, and shape of conservation areas.

To determine the quality of conservation

areas as they appear in the Denver Metropolitan Area today.

Map Use Objectives:
1. Be able to determine the location of conservation areas in Denver Metropolitan Area.
2. Be able to determine the size and shape, of conservation areas in Denver.

Geography Standards:

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and
   report information.
3. How to analyze the spatial organization of people, places, and environments on Earth's surface.

4. The physical and human characteristics of places.
5. That people create regions to interpret Earth's complexity.
8. The characteristics and distribution of ecosystems on Earth's surface.

Science Standards:

Background information:
A conservation area should include contain (1) many; (2) large; (3) blocky or circular (as opposed to linear); (4) adjacent, preferably interconnected, conservation areas for maintenance of natural biodiversity in a region.

Time and Location:
2-3 periods, in the classroom.

Materials:

Map A: Conservation Areas of Denver Metropolitan Area

Vegetation map of Denver.

Procedure:

Divide the class into the number of groups that maps are available for.

Make 3 observations about the spatial pattern of the conservation areas in Denver.

How does the N side compare to the S in terms of number and extent of areas?

How does the E side compare to the W side in terms of number and extent of areas?

How many conservation areas are adjacent to rivers?

Explain 2 reasons why these differences may exist.

Does more open land exist west or east of I-25?

Give one reason why you think this is the case.

Does more open land exist in metropolitan Denver or in rural areas?

Give one reason why you think this is the case.

What county contains the most open space?

Which vegetation type has the most open land?

Which vegetation type has the best connectivity?

Which vegetation type has the worst connectivity?

Which county is the most urbanized?

- - - - - -

Part 3.

Inquiry Question: Knowing the characteristics and distribution of present conservation areas, what effect do these areas have on the biodiversity of the Denver Metropolitan Area?

Student Objectives:
To determine the quality of conservation areas as they appear in the Denver Metropolitan Area today.

Map Use Objectives:
1. Be able to use Rare Species and Ecosystems Map to assess the quality of biodiversity in the Denver Metropolitan Area.

2. Be able to determine the influence that the size, shape, and distribution of conservation areas have on the quality of conservation and on the maintenance of biodiversity.

Geography Standards:

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.
   3. How to analyze the spatial organization of people, places, and environments on Earth's surface.
   4. The physical and human characteristics of places.
   5. That people create regions to interpret Earth's complexity.
   8. The characteristics and distribution of ecosystems on Earth's surface.
   13. How the forces of cooperation and conflict among people influence the division and control of Earth's surface.

Science Standards:

Background information:
Many conservation area systems, including that of the DMA, were developed in a somewhat ad hoc fashion for purposes such as preservation of natural wonders, outdoor recreation, maintenance of timber, livestock, water, and military resources. Biodiversity was an afterthought, if a thought at all.

Time and Location:
1-2 period, in the classroom.

Materials:

Conservation Areas of Denver Metropolitan Area
Species Map of DMA.

Vegetation map of DMA.

Procedure:

What, in your opinion, is more important in terms of defining conservation areas:

availability of open space, political pressure, land development pressure, or some other factor? Why?

What is the total area represented by each of the vegetation types under protection?

What is the total area under protection in each county?

What vegetation types are underrepresented?

Why do you think these types are underrepresented?

What areas of the DMA are underrepresented by protected land?

Why do you think these areas are underrepresented?

Based on the table of animals that live in specific vegetation types (we need this table), what animals are the most threatened?

8. Based on the specific plants that live in specific vegetation communities
(we need this table), what plans are the most threatened?
- - - - - -
Part 4.

- - - - -
Part 5.

Inquiry Question: Knowing the characteristics, distribution, and quality of present conservation areas, and considering population growth, what is the future of biodiversity in the DMA?

Student Objectives:
To determine the quality and quantity of DMA conservation areas in the future.

Map Use Objectives:
1. Be able to use Rare Species and Ecosystems Map to assess the quality of future biodiversity in the Denver Metropolitan Area.

2. Be able to determine the influence that the size, shape, and distribution of conservation areas have on future quality of conservation and on the maintenance of biodiversity.

Geography Standards:

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report

information.

    3. How to analyze the spatial organization of people, places, and environments on Earth's surface.

    4. The physical and human characteristics of places.

    5. That people create regions to interpret Earth's complexity.

    8. The characteristics and distribution of ecosystems on Earth's surface.

    13. How the forces of cooperation and conflict among people influence the division and control of Earth's
    surface.

    17. How to apply geography to interpret the past.

    18. How to apply geography to interpret the present and plan for the future.

Science Standards:

Background information:

Time and Location:
    1-2 period, in the classroom.

Materials:

Conservation Areas of Denver Metropolitan Area, Species Map of DMA, Vegetation map of DMA.

    Procedure:
    Based on the number of maps, divide students into groups.
    9) Which county is the most urbanized?

    10) Which county urbanized the fastest between 1960 and 1990?

    11) Why?

    12) Which county urbanized the fastest between 1990 and 2020?

    13) Why?

14) Which vegetation type is in the most danger of disappearing?

15) Based on your answer to the previous question, which animals are in most danger?

9. Rank the counties in terms of growth from 1970 to 1990.

10. Rank the counties in terms of growth from 1990 to 2010.

11. Give 2 reasons why some counties grew faster than others.

12. Make 2 observations about the pattern and rate of growth
from 1970 to 1990 versus 1990 to 2010.

13. Based on the growth rates for the counties, and the
protected areas on the map, what vegetation and animals do
you think are the most threatened? Why?

Part 6: Extension - GIS.

Reference:

The Complete List of the Geographic Standards:

The World in Spatial Terms
Geography studies the relationships between people, places and environments by mapping information about them into a spatial context. The geographically informed person knows and understands:

    1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and
    report information.
    2. How to use mental maps (a person's

internalized picture of a part of Earth's surface) to organize
information about people places, and environments.

3. How to analyze the spatial organization of people, places, and environments on Earth's surface.

Places and Regions

The identities and lives of individuals and peoples are rooted in particular places and in those human constructs
called regions. The geographically informed person knows and understands:

4. The physical and human characteristics of places.

5. That people create regions to interpret Earth's complexity.

6. How culture and experience influence people's perceptions of places and regions.

Physical Systems

Physical processes shape Earth's surface and interact with plant and animal life to create, sustain, and modify the
ecosystems. The geographically informed person knows and understands:

7. The physical processes that shape the patterns of Earth's surface.

8. The characteristics and distribution of ecosystems on Earth's surface.

Human Systems

People are central to geography in that human activities help shape Earth's surface, human settlements and structures are part of Earth's surface, and humans compete for control of Earth's surface.

The geographically informed person knows and understands:

9. The characteristics, distribution and migration of human populations.

10. The characteristics, distribution and complexity of Earth's cultural mosaics.

11. The patterns and networks of economic interdependence.

12. The processes, patterns, and functions of human settlement.

13. How the forces of cooperation and conflict among people influence the division and control of Earth's
surface.

Environment and Society

The physical environment is modified by human activities largely as a consequence of the ways in which human
societies value and use Earth's natural resources and human activities are also influenced by Earth's physical
features and processes. The geographically informed person knows and understands:

14. How human actions modify the physical environment.

15. How physical systems affect human systems.

16. The changes that occur in the meaning, use, distribution, and importance of resources.

The Uses of Geography
Knowing geography enables people to understand the relationships between people, places, and environments over time. The geographically informed person knows and understands:

17. How to apply geography to interpret the past.

18. How to apply geography to interpret the present and plan for the future.

*** End of Report ***