BOONE AND CROCKETT CLUB

&

I.B.E.S.

PARTNERS IN

SCIENCE EDUCATION

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I.B.E.S. is a Two-year Integrated Biological Earth Systems Course Offered at Big Sky High School
Purpose

This curriculum guide allows students to investigate the effects of urban development on big game species. The module offers teachers a user friendly format that demonstrates the need to integrate science curriculum; establish partnerships for community-based problem solving; and to develop long term projects that will continue to monitor the effects of urban development on big game habitat.

Our goal is to apply science to community issues and to validate the need for harmony among the People and the Land.

The authors wish to thank *The Boone and Crockett Wildlife Conservation Program* for its support in developing this big game habitat conservation module. In keeping with their education component, the activities within this module have been field tested and are adaptable for students ranging from middle school through university level.
Preface

The ten activities included within this curriculum module are designed as templates for an intensive integrated lab/field study of the effects of urban development on big game species. They can be used to supplement existing science curricula or they can serve as an independent, in depth class project. To facilitate your study, commonly used reference texts are: Biology by K. R. Miller and Earth Science by S. N. Namowitz, Rocky Mountain Elk Foundation; Educator's Guide, "WILD About Elk," and Project WILD Secondary Education Edition. Additional resources may be obtained from U. S. Forest Service, Bureau of Land Management, Department of Natural Resources Conservation, Fish, Wildlife and Parks, etc.

Regardless of your method of implementation, we encourage total community involvement. The success of this project can only be enhanced by embracing all of the players within your community. Please refer to the acknowledgements and specific activities for assistance in establishing your community partnerships.

Acknowledgements

We wish to acknowledge the following individuals and organizations for lending their time, expertise, and resources to this project:

Dr. Ralph Allen, University of Montana
Jodi Bishop, Rocky Mtn. Elk Foundation
Doug Burreson, Missoula Co. Surveyor
Alan Christensen, U. S. Forest Service
Mark Denton, Property and Business Owner
Mike Flynn, Rancher
Kirsten Hangas, Rocky Mtn. Elk Foundation
Mike Hillis, Lolo National Forest
Nick Kaufman, Land Use Engineer
Percy & Scott Karr, Mont. Aerial Photo
Pat O'Herren, Missoula Co. Planning
Jan Perrin, University of Montana
Jay Raser, Rancher/Residential Architect
Dr. Hal Salwasser, U. S. Forest Service
Linda Smith-Salwasser, Resolve Ed.
Peggy Worden, Lambros Realty
OUTLINE OF ACTIVITIES

ACTIVITY I  THE BIG PICTURE - INTRODUCTION TO FIELD SITE
A. Identify the Issue: Urban Growth and Its Impact upon Big Game Species
B. Identify the "Players"
   2. Aspect/Elevation  7. Farmers/Ranchers
   5. Realtors/Developers  10. Recreationists/Conservationists
   11. Elected Officials  12. Land Use Planners
C. Mapping: Physical Features-Topography, Aspect, Roads, Structures

ACTIVITY II  SENSE OF PLACE
A. Surveying: Township & Range
B. Aerial Photo Analysis
C. G.I.S.

ACTIVITY III  UNGULATE BIOLOGY
A. Video: "Rocky Mountain Elk: Their Life Story"
B. Antlers, Hides & Hooves Lab
C. Harvest Statistics Analysis

ACTIVITY IV  BIG GAME & DEVELOPMENT/ECONOMICS

ACTIVITY V  THE TOWN MEETING

ACTIVITY VI  COMMUNITY GROWTH
A. Research Local Media: TV, Radio, Newsprint
B. Panel Discussion: Business Persons, Developers, Wildlife Managers,
   Governmental Agencies
ACTIVITY VII  LABORATORY PREP FOR FIELD STUDY
  A. Plants  
  B. Ungulates  
  C. Transects

ACTIVITY VIII  FIELD SITE VISIT
  A. Journal Keeping
  B. Transects
  C. Data Collection: Soils, Geology/Aspect, Plants, Animals

ACTIVITY IX  DATA ANALYSIS/ASSESSMENT
  A. Presentations
  B. Recommendations

ACTIVITY X  FURTHER INVESTIGATIONS & ENRICHMENT
Activity I - The Big Picture

Purpose: To provide students with an overview of the issue(s), field site, and principle players involved.

Introduction: A field study is used to enthusiastically “kick off” this project. This gives students a feeling of sense of place regarding lay of the land; biological, geological, climatic factors and human development in the area.

Materials - Two Students per Team:
- topographic map (photocopy)
- compass
- clipboard (1 per student)
- binoculars
- field journal (1 per student)

Procedure:

1. Each team will be given a compass, binoculars, and a copy of a topographic map similar to the attached sample.

Assignment: Part A

1. Give the legal description of the study site (township, range, section, 1/4 section).
2. Label physical features: ridges, valleys, steep areas, flats, hilltops.
3. List appropriate aspects/exposures.
4. Sketch areas of general plant types: trees, shrubs, grasses, forbs.
5. Sketch areas of development: roads, buildings, etc.
6. Indicate locations of wildlife signs or wildlife sighted.

Assignment: Part B

Have a speaker involved in this issue (landowner, game biologist, landuse planner, realtor) give students an on site overview of the relationship between development and big game species. Have students note main points of the discussion and any detectable bias in the speaker’s presentation.

Notes to Teacher:

1. To complete this activity, students are expected to have basic knowledge of topographic maps and township/range; see chapters 7 of Earth Science by Namowitz.
2. This exercise is designed to have students identify issues and collect data. Therefore, teacher presentation of these sensitive issues should be as unbiased as possible.
Introductory Field Journal
The Big Picture

Depart from: ____________________________ Time: ________________

Current Weather: Temp. __________ Sky Cover ____________________________

Materials Needed: ____________________________ ____________________________

Site: # _____ Common Name: ______________ Arrival Time: ________________
T _____, R _____, Sec. _______ 1/4, _____ 1/4

PLEASE FOLLOW INSTRUCTIONS CAREFULLY: PAY ATTENTION!!

Place the following on your map of the study area:

A. Correctly place North (N↑) on your map.

B. Label the following aspects: N, NE, E, SE, S, SW, W, NW

C. Sketch areas of trees and shrubs. Label them separately.

D. Sketch roadways that are not on your map.

E. Homesites: use the symbol ■.

F. Elk (E), Whitetail Deer (WD), Mule Deer (MD), Cattle/Horses (C,H)

G. Traffic count on local roadways (1hr, use the check method) ________________

H. Time period for traffic count. ________________________

II. Ungulate Observations:
A. Make the following counts for the herd:
   does/cows: ________  fawns/calves: ________
   bucks/bulls: ________  collared animals: ________
   total animals: ________

B. Observe the herd and record information on the animals’ behavior i.e. number grazing, number bedded down, number alert, in which direction are they moving, etc. BE VERY DETAILED!!
Guest Speaker Presentation

Assignment: While listening to the presentation by the guest speaker, complete the format below.

PRESENTER: __________________ AFFILIATION (Business/Agency) ____________

Presenter Comments:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Presenter Responses to Student Questions:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

PRESENTER: __________________ AFFILIATION (Business/Agency) ____________

Presenter Comments:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Presenter Responses to Student Questions:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Activity II - A Sense of Place

Purpose: To give students an appreciation of the interdependence of all species in the study area by using different forms of available technology.

Introduction: The impacts of development are not limited to big game animals. Wildlife species at all levels are affected by expanding human populations. By using technology, students can gain an appreciation of the interrelationships of the entire resource base on the study area.

Materials:

- U.S.G.S. Maps
- aerial photos
- stereoscopes
- computers
- GIS Software
- local GIS database

Procedure:

1. Using GIS data can be a technological challenge in some buildings. You need one computer for every three to four students or students can be rotated through computer stations while others complete the activities on topographic maps and aerial photos. You will need computers with at least the power of a 486 machine and a minimum of 8 megs of RAM.

2. ArcView II, or similar software, can be used to access your local GIS database. ArcView II can be obtained at no charge from:

   Environmental Systems Research Institute, Inc.
   K-12 Education and Libraries
   3460 Washington Dr., Suite 101
   St. Paul, MN 55122
   Ph. 612-455-0600, Fax 612-454-0705
   Attn: Charlie Fitzpatrick

   Local GIS database is available through your local City/County Planners office. Check database availability and compatibility before deciding on which type of viewing software to use.

3. Give students an overview of GIS software and let them explore independently to familiarize themselves with its operation. Their first task is to design simple maps of the primary resource themes. Students will then create more complex maps by layering the themes. This will allow students to examine the relationships between biotic and abiotic factors.

4. The second part of the activity is designed to give students an appreciation of the power of GIS and to have students analyze habitat requirements between big game and non-game species. Students should come away from the activity with the realization that protecting big game habitat also benefits non-game species.
Township & Range Mapping

Purpose: To enhance the problem solving process, precision and accuracy are of critical importance. The exact location of a specific grass specie, soil type, big game winter range, or a housing development, for example, must be accurately documented. The Township & Range Survey method allows for this specific site location.

Assignment: Refer to U.S.G.S. topographic map supplied by your instructor and answer the following questions.

a. List the township & range of your study site.
   
   T____ R____ Sec._______ 1/4

b. List the approximate acres representing your study site. Acres ______

c. Which direction on the map is North?

d. List the specific elevational relief of your study site. From ___ feet to ___ feet.

e. List the dominant aspect/exposure of your study site. ______________________

f. A distance of 4 inches on your map represents how many miles? (Measure to nearest tenth.)
Aerial Photo Analysis

Background: The purpose of this exercise is to give students experience in examining land data collected from above the surface. Aerial photos are to be used to examine and describe the relationships among objects on the earth's surface.

Procedure: Place your stereoscope on top of two overlapping photographs. This procedure allows you to view your study site in an excitingly exaggerated three-dimensional picture. Often, important data that was not evident on the surface will be picked up by aerial photo analysis.

Assignment: Your aerial photos of this study site were shot at an elevation that allows for direct comparison with your U.S.G.S. map scale. While observing your stereo photos, as well as your U.S.G.S. map, select 5 points of interest found within each and describe their physical appearance.

<table>
<thead>
<tr>
<th>Point of Interest</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.a.</td>
<td></td>
</tr>
<tr>
<td>1.b.</td>
<td></td>
</tr>
<tr>
<td>1.c.</td>
<td></td>
</tr>
<tr>
<td>1.d.</td>
<td></td>
</tr>
<tr>
<td>1.e.</td>
<td></td>
</tr>
</tbody>
</table>

2. Describe two different types of vegetation and list the aspect/exposure each tends to favor.
   a.                  
   b.                  

3. Note the established home sites. List the type of landform in which they tend to be found.

4. Using both the U.S.G.S. map and aerial photos, list the regions that would offer big game shelter.
   a. T____ R____ Sec____, ____1/4
   b. Now, list an area that would provide forage/food for big game species.
      T____ R____ Sec____, ____1/4

5. Based on your research, which aspect/exposure would offer reliable big game winter range? Please explain your answer.

6. Upon reviewing your answers to questions #1-5, do you believe there is a harmonious relationship between man and wildlife? List your comments and concerns.
Can You Spell G - I - S?
A Technological Analysis of the Study Site

Background: The purpose of this exercise is to use Geographic Information Systems (GIS) to examine the interdependence of biotic and abiotic features of the study area. By allowing students to view assorted geographic “themes” singly or in combination, GIS provides a visual means of understanding ecological relationships. For the ungulate project, the primary focus is viewing big game distribution, vegetation, hydrography (streams), roads, and ownership themes. In addition, the digital elevation model (DEM) provides a three-dimensional view of the study area from any vantage point. From the DEM, slope, aspect, and elevation can be studied.

Procedure:

1. After an overview of the GIS system and its operation by your instructor, familiarize yourself with its operation by creating simple maps of the features outlined in the Background section. Your instructor will check and initial your maps of the following features:

   ______big game    ______vegetation    ______hydrography    ______roads
   ______slope    ______aspect    ______elevation    ______land ownership

2. Design more complex maps of the study area by layering the features in #1. This will allow you to study the following relationships:

   a. How many streams/ponds are located within a mile of the study site? What is the distance of the nearest water source?

   b. Examine the vegetation as it relates to aspect. List the aspect(s) and corresponding vegetation types of the study site.

   c. Describe the dominant vegetation types of the study site. Based on this vegetation, is the area used primarily as a feeding area, bedding area, or travel corridor by the big game species? Defend your response.

   d. How many roads are within one mile of the study area? What is the distance to the nearest road? Do any of the roads restrict animal movement to and from important habitat i.e. from feeding area to water? Explain.
e. Is the study site and surrounding area privately owned or publicly owned? Explain. How does ownership of the land affect the movement and distribution of the animals?

3. List all of the available “themes” for the study area (do not forget those outlined in #1).

4. From #3, list only those components you feel directly impact big game species.

5. Choose a non-game species and list those components from #4 you feel also directly impact your non-game animal.

Conclusion: Write a conclusion addressing the big question: Are big game species the only animals affected by urban development or Does protecting big game habitat also benefit other wildlife species? Use data and relationships from GIS to support your conclusion.
Activity III - Ungulate Biology

Rocky Mountain Elk: Their Life Story

Purpose: To familiarize students with the overall life cycle of big game ungulates.

Procedure: Prior to viewing video, read through all 28 questions. Now, while viewing, answer the following questions.

Teacher Note: Video can be obtained by writing Rocky Mountain Elk Foundation, Missoula, Montana. It is appropriate to stop the tape from time to time to expand upon points, as well as, to allow students the opportunity to complete the form.

1. Who was sent by President Thomas Jefferson to explore the Louisiana Purchase?

2. How large was the elk herd estimated to be at that time?

3. By 1900 the North American Elk herd had decreased to approximately how many?

4. What percent of their historic range had the elk been removed from?

5. As elk populations declined, big game managers transplanted elk from this region...name it.

6. What time of year are most elk calves born?

7. Why does the cow elk move the calf away from the birthing area?

8. What fraction of the calves born each year reach the age of ten months?

9. Describe three major aspects of the "hider strategy."
   A.
   B.
   C.

10. What are characteristics of favored elk summer habitat?

11. How many chambers does an elk stomach have? Why do elk have a multi-chambered stomach?

12. What constitutes 85% of an elk’s diet?

15
13. What structures enable elk to utilize dry, coarse, plant material as a food source?

14. What stimulates antlers to initiate growth?

15. How many points on each antler do most mature bull elk have?

16. When and why do most bulls shed their antlers?

17. Why is it important that elk herds have mature "breeding" or "herd" bulls rather than just yearling bulls?

18. What part of the day do elk do most of their feeding?

19. What are three factors that contribute to an elk’s winter survivability?
   A.
   B.
   C.

20. What is the single most important factor that determines a bull’s survivability after the rut?

21. What are the characteristics of ideal winter elk habitat?

22. What types of food material are classified as "marginal feed?"

23. What is the rut? When does it occur? What controls it?

24. Why are a large set of antlers important during the rut?

25. What role does the bull’s bugle play during the rut?

26. What is the function of Jacob’s Organ?

27. What are the responsibilities of the lead cow?

28. Despite large wilderness areas such as the Bob Marshall and Selway Bitterroot, the future for elk remains uncertain. Why?

To summarize, an elk’s life is influenced by five major factors, list them.

_________________________  ______________________  ______________________  ______________________  ______________________
Antlers, Hides & Hooves
Active Learning Trunk Lab

Purpose: After viewing and discussing the main points of the "Rocky Mountain Elk" video, set up lab stations in order that students can examine the actual anatomical features of ungulates discussed in the video.

Procedure: Lab stations might include: Antlers, horns, hides, hooves, skull/jaw/teeth, internal anatomy (esophagus, trachea, stomach chambers, liver, heart and lungs, etc.)

Teacher Note: Many of the lab items can be obtained by request from parents/students, Fish, Wildlife and Parks, Taxidermists, Fur Tanneries, and The Rocky Mountain Elk Foundation. The Rocky Mountain Elk Foundation, in conjunction with project WILD, coordinates the lending of trunks to schools. These trunks contain many of the lab samples mentioned above. An educator’s guide, "WILD About Elk" provided by Project WILD/Rocky Mountain Elk Foundation is a great reference to assist in this hands on activity.

Assignment: Visit each LAB station and describe the appearance and function of each anatomical part…sketches are helpful.

Lab Station One: Antlers and horns. Compare elk, deer and/or moose antlers with horns from cattle, sheep, goats, etc. Lab should focus on particular species, age of species, and their habitat location.

Lab Station Two: Hooves of bull, cow and calf elk, white tail deer, mule deer, moose, etc.

Lab Station Three: Skull/jaw/teeth of bull and cow elk, deer, moose, etc.

Lab Station Four: Hide/hair of elk, deer, moose, etc.

Lab Station Five: Internal anatomy (accessible during hunting season); esophagus, trachea, stomach chambers, liver, heart and lungs.
By the Numbers
Harvest Statistics Analysis

Background: The purpose of this activity is to identify big game population trends in our study area by analyzing hunting statistics provided by local Fish and Game agencies. Hunting seasons, permit availability, and hunter success are all dictated by population size and population trends. By examining the management aspects of the big game in the study area, conclusions can be drawn and predictions can be made about population trends and overall population health.

Procedure:

1. Obtain a copy of harvest statistics and/or special permit statistics from your instructor. Graph the number of animals harvested vs. time. If either sex hunts are allowed in the study area, be sure to distinguish between bulls/bucks and cows/does harvested.

2. Answer the following questions based on the data from your graph:
   a. In which year was the harvest the highest? ______ The lowest? ______

   b. Provide three possible explanations for the above extremes in harvest numbers:

      1.
      2.
      3.

   c. Describe the overall trend in harvest data based on your graph i.e. rising, falling, steady, etc.

   d. Provide three possible explanations for the harvest trends:

      1.
      2.
      3.

   c. Would it be valid to draw conclusions about population size/health based on harvest statistics from a single year? Why or why not?

Conclusion: Write a conclusion for this activity by addressing the big question What is the overall health of the big game population as indicated by harvest statistics? Be sure to mention further studies that could be performed to validate your conclusion.
Harvest Statistics - Sample

ELK HARVESTS FOR HUNTING DISTRICT 283
DISTRICT SIZE REDUCED IN 1984 AND 1985

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. TOTAL BULLS</th>
<th>COWS</th>
<th>CALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td>2917</td>
<td>381</td>
<td>196</td>
</tr>
<tr>
<td>74</td>
<td>2823</td>
<td>249</td>
<td>121</td>
</tr>
<tr>
<td>75</td>
<td>3694</td>
<td>166</td>
<td>120</td>
</tr>
<tr>
<td>76</td>
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<td>125</td>
<td>89</td>
</tr>
<tr>
<td>77</td>
<td>2063</td>
<td>235</td>
<td>120</td>
</tr>
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<td>2447</td>
<td>187</td>
<td>89</td>
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<td>269</td>
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<td>194</td>
</tr>
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<td>88</td>
<td>2400</td>
<td>312</td>
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<td>2801</td>
<td>216</td>
<td>100</td>
</tr>
<tr>
<td>94</td>
<td>1736</td>
<td>142</td>
<td>66</td>
</tr>
</tbody>
</table>

Trends in Missoula Valley
Elk Populations

No. Elk Observed

YEAR (Spring)

17 17 33 45 31 23 66 61 80 90 89 94 138 138 109
Activity IV - Big Game & Development

Purpose: To have students compare the needs of big game with the need for development and to determine if the two can be met in a compatible manner.

Introduction: This activity allows students to plan a major housing development in an area that provides important winter range to elk, mule deer, and whitetail deer. The activity is based on an actual development located just outside of Missoula, MT so students can compare their development plan with the actual plan used on the project. In this way, students can determine for themselves if the needs of wildlife and need for development can actually be met in a compatible fashion.

Materials (per student or team of two students):

    • colored pencils or markers (at least 2 colors)
    • local monthly real estate listings
    • calculator
    • copy of wildlife recommendations from the original project

Procedure:

1. Students will be given a packet including a map of an area that is about to be developed with a 90 unit subdivision. The area was formally a family ranch which provided important winter range for several big game species. The students will try to place 90 homes on their maps while trying to minimize impacts on the wildlife.

2. This activity is fairly self explanatory and should not require a lot of input from the teacher. In our view, it is important that students complete this activity with an open mind so it is imperative that they do not see any information from the actual Circle H development project until they have completed their subdivision plans.

3. Real estate listings should easily be obtained from any local Realtor. We use one copy per two students to cut down Realtor costs.

4. Calculations can be performed on a calculator or on a computer with any spreadsheet software.

5. This activity may provide a good opportunity to bring in a guest speaker with expertise in development and/or landuse planning.

Notes to Teacher:

1. Although most of us do not like to see areas around our homes and schools become more crowded, the fact is that economic growth and corresponding population growth is a reality if not a necessity for most communities. Therefore, we feel it is important for students to consider alternatives for community growth that minimize impacts on wildlife and other natural resources.

2. We use the actual development modeled in this activity as the site for our field research. Over the course of several years, students will collect data on range condition and wildlife use to see if the clustered approach to home placement will actually allow big game animals to continue utilizing the area as winter range.
ELK + DEVELOPMENT = ???

You have just inherited the family ranch; nearly two square miles of land located on the outskirts of a growing, community. The ranch provides important winter range for large herds of elk and mule deer. Being the environmentally sensitive, scientific person that you are, you would love to preserve the land for the elk and deer but the taxes are prohibitive and keeping the land in its present state is impossible. You decide to sell the land to a development company with the understanding that the integrity of the land will be preserved as much as possible. The developers agree to let you plan the subdivision and devise covenants, land use restrictions, minimizing impacts on the elk and deer.

Ranch

(insert family name here)

I. The family ranch is comprised of the eastern half of section 26, all of section 25, and the western half of section 30. Be sure to pay special attention to the outlined areas of primary and secondary big game winter range.

1. Describe, in detail, the "lay" of the land. Is it flat, steep, rolling, where are the high points and low points, what are the elevations of the high and low points, is there water and where, etc., etc.
2. The plan for this development eventually calls for 90 housing units. Using the symbol "x" (a bright color would be helpful), place your housing units on the map on the previous page. As you are planning your lots, remember to keep in mind characteristics such as steepness of slope, aspect, presence of water, ease of access, minimizing impacts on wildlife, etc.

3. In the space below, write a paragraph (at least 4 sentences for you non-English wizards) that provides rationalization for your housing locations. i.e. Why did you put houses where you did?

Property Value

4. As mentioned in #2, houses in your development will be built on lots and not acreage. Building lots usually range from a 1/4 to 3/4 of an acre. In trying to assess the market value of your lots, compare them with similar parcels around your community. Look through a real estate home buyer's guide for your area and compare the prices of five building lots in town with five building lots located in the hills surrounding town (similar to the property you wish to develop). Use the information to fill in the table below:

<table>
<thead>
<tr>
<th>Table 1: Property Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location Description</strong></td>
</tr>
<tr>
<td>In Town</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Outside Town</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

5. In the space below, calculate the average price of a lot in town vs. a lot in the surrounding hills.

<table>
<thead>
<tr>
<th>In Town</th>
<th>Outside Town</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. The prices for real estate, like all other commodities, is based on supply and demand: the higher the demand for a particular type of property, the higher the price. Analyze your average price data from question 5. Based on your data, where do people most want to live in your community? Defend your conclusion.

7. Now compare where people want to live with areas of important wildlife habitat. Do these areas overlap? Why or why not?

Covenants

8. As land owner and development partner, you have the authority to establish covenants on the property. Covenants are land use restrictions designed to protect the quality of life in an area. For example, a group of property owners in an area may wish to establish a covenant to prohibit raising pigs!! Re-read the introduction for this exercise at the top of the first page. Keeping in mind your interests in protecting wildlife and the integrity of the land, devise 5 covenants that will help you meet your environmental objectives for the development. In the spaces provided, write the covenant and the reason for the covenant.

a.

b.

c.

d.

e.

Conclusion

9. As you may have guessed, the scenario for this exercise is based on an actual development outside of a rapidly growing community in the Northern Rockies. Obtain a map of the actual development from your instructor. Notice the cluster arrangement of homes on the map. Using a color different from the “x’s” in step 2, sketch in the housing clusters on your map (try to keep them to scale). The clusters on the map represent five housing units of 1/2 acre each. Which development plan, yours or the original, provides for the most open space, wildlife habitat, and migration corridors? Defend your answer.
10. Obtain a copy of the development plan titled "MAN AND WILDLIFE ON THE CIRCLE H RANCH." Compare the restrictions outlined in this document with the covenants you proposed in step 8. Are there any similarities between your plan and the original plan? If so, what are they? If there are no similarities, should there be; i.e. does one plan seem to be better than the other. After examining both plans, which one would you favor and why?

11. Write an overall conclusion for the exercise. Areas you may wish to address are the necessity of development and growth; the importance of wildlife; can the two be compatible and if so, how?; or are they mutually exclusive?
MAN AND WILDLIFE ON THE CIRCLE H RANCH*

Background

The coexistence of man and wildlife is not always successful and trouble-free. Success depends on people--their objectives, their understanding and the choices they ultimately make. Planners of the Circle H Ranch development want to provide you with the experience of enjoying and successfully living with wildlife. Choices they have made were based on the best information available about wildlife using the ranch. Among those choices were: 1) foregoiing development of and assignment of a conservation easement to a large portion of the ranch, 2) establishing standards for future human activities and 3) initiation of habitat improvement projects.

As residents and owners, you will be making choices about future wildlife use of the property by the actions you take. Our experience suggests that those choices will may not be easy. In concert with others, you will be a manager of wildlife on the Circle H. It will be a challenge, but a firm basis has already been laid by previous owners.

What's Here

What we now call the Circle H Ranch has supported wildlife for thousands of years. For the past 100 years, since the settlement of the Missoula Valley, wildlife and man have co-existed reasonably well at the Circle H Ranch. Notably elk and white-tailed deer populations here have prospered during the last century. Credit is due largely to past owners who gave wildlife the space it needed and cared for the habitat.

The largest and most planned for species on the ranch is Rocky Mountain elk. This particular elk population now (1995) numbers about 150 head. Its winter range includes the foothills on both sides of Grant Creek--hence it is commonly called the Grant Creek herd. Elk may be on the ranch from late fall to the end of the calving season in June. This population's greatest need for the ranch occurs during severe winter periods. During those times, you may see the entire herd on the slopes above your homes.

Since their movements were studied through radio-telemetry, we know that in the summer this herd migrates north into the Rattlesnake Wilderness and Cold Creek areas. When temperatures drop and the snow flies in the fall, they return to this part of the Missoula Valley. Because of the herd's size, the extent of its yearlong range, and its visibility, the general public is very interested in this herd's continued well-being. Elk require lots of space and forage, and they are not very tolerant of human activities.

White-tailed deer are yearlong residents of the ranch. Whitetails are widespread and often adapt to living close to human developments.

Black bears and mountain lions can be found on the property. The bears are generally interested in high energy vegetable matter
such as green grass, wild berries and pine seeds, while lions are generally interested in the deer and elk on the ranch. Both species may frequent human developments at night looking for their favorite foods.

If you are interested in some of the smaller critters, many other species, commonly found in the native grasslands and open pine forests of western Montana, also depend on the Circle H Ranch. The list is a long one, but a sampling includes coyotes, meadow voles, meadow larks, red-tailed hawks, striped skunks, mountain bluebirds, hungarian partridge and long-billed curlews. If you don't already know these animals, you soon will.

**How to Keep Them**

Keeping these populations around is a major objective at Circle H and will depend on how well you understand their habitat needs and behaviors. The following discussion highlights some rules for insuring that the wild animals will continue to be part of the Circle H community and some strategies for reducing the risk of having unpleasant human/wildlife encounters.

**Outdoor recreation**: Planning for Circle H development included the delineation of "primary and secondary" elk habitat—primarily the ridges and upper slopes connected to the rest of the elk winter range. Homes and roads were sited below that delineation.

Since elk attempt to avoid human activities, winter and spring hiking, skiing, sledding, etc. within the delineated primary and secondary habitats will cause elk to abandon this otherwise high quality habitat. If such activities occur, you will see less elk, less often, than you normally would. More importantly, the health of the population will be adversely affected.

So, one important choice you and your neighbors must make in order to keep elk on the Circle H and in healthy condition is to limit your outdoor winter activities to those areas below and outside of the primary and secondary habitats.

**Pet management**: Pets are a source of enjoyment to many of us. Good pet management at the Circle H will mean that you also will enjoy having and viewing wildlife.

Unfortunately, dogs and cats can be destructive elements in wildlife habitat. This is particularly true in the relatively open country of Circle H, where many birds nest on the ground and other wild animals have a difficult time finding a place to hide.

Although wildlife have natural means of avoiding predators, they are not adapted to the unnaturally high densities of domestic predators that can come with housing developments. Dogs and cats chase and sometimes kill wild birds and mammals, destroy nests and dig up dens.

Everyone will need to make sure that their pets stay home, if wildlife is to continue to be an abundant and interesting part of your environment.
Controlling Attractants: In addition to limiting winter recreation activities and managing your pets, one of the most important things you can do is control substances that attract wildlife. If attractants are deliberately placed or inadvertently left near a homesite, wild animals become nuisances, cause property damage, or threaten human safety. In response, people feel frustrated, angry or fearful of the wild animals they initially enjoyed. Eventually, expensive deterrents or destruction of the animals may be required. No one wants these things to happen.

You might be surprised by the variety of species with which people have "problems." The range of complaints received by the Montana Department of Fish, Wildlife and Parks, includes deer, elk, black bears, foxes, skunks, bobcats, mountain lions, woodpeckers, beaver, coyotes, raccoons, ravens, bighorn sheep, pocket gophers, deer mice, swallows and moose.

Not all problems are avoidable. However, by giving some thought to what is available to wildlife around your home, you can reduce risks and expenditures. Three kinds of attractants cause the most difficulties for people living in semi-rural areas.

1) Deliberately placed attractants are a major source of problems in western Montana. Wanting to see wildlife up close and personal, we are often tempted to improve the odds by placing artificial feeders, water, and salt near our homes to attract wildlife within view of a living room or kitchen window. You won't need to do this at Circle H to see wildlife. If the native habitat and vegetation is well-managed and if you are able to limit your own and your pets' recreational activities, Circle H Ranch will surround your home with a rich variety of wildlife.

2) Many problems can be avoided by keeping a sanitary homesite. When left outside, garbage, dog and cat food, grain, bird feeders, compost piles, ripe fruit, small pets will certainly attract black bears, mountain lions, coyotes, foxes or raccoons. Inside storage of these items, use of bear-proof containers and regular trips to the landfill will reduce the risk of having some very unpleasant experiences.

3) Vegetable and flower gardens, ornamental trees, fruit trees, and shrubs may be a labor of love for you, but they are just tasty delights for white-tailed deer and other herbivores. You can reduce your troubles by selecting varieties that are less palatable to wildlife, but still be prepared to build fences.

Additional Information: Living with wildlife is a noble, but difficult, objective to achieve. Fortunately, many experienced people can help you in this endeavor.

The following organizations can provide you with information and ideas that may help: Montana Department of Fish, Wildlife and Parks, Missoula County Rural Planning Office, Missoula County
Extension Service and Lolo National Forest. Private nurseries can help with selection of plants of low palatability for wildlife. Other resources in the community are the University of Montana (wildlife professors and library) and the Missoula City-County Library.

Summary: The Circle H Ranch provides habitat for over 100 elk and many other wild mammals, birds and amphibians. Planning for the development of the ranch includes the protection, maintenance and enhancement of important habitat components, as well as homesites and associated infrastructure.

The key to the continued well-being of wildlife on the ranch will be you, the future homeowners. You will manage the habitat, recreational activities, pets and substances that attract wild animals. This is a responsibility you will share with your neighbors, requiring cooperation. You can find help at a variety of private and public organizations in the Missoula community.

*Courtesy, Jay Raser, Circle H Ranch, Homesites and Equestrian Park*
Activity V - The Town Meeting

The case of
Wild O. Wapiti

vs.

The People of the City of Taylorville.
(adopted from project WILD: WILD About Elk)

Purpose:
Students will utilize what they have learned about elk in order to discuss the issues surrounding the need for a city to expand and the need for big game habitat to be preserved.

Method:
Students will adopt roles and research issues surrounding community population increase and large ungulate habitat. Students will then hold a mock town meeting to discuss and come up with a solution to a proposed housing development.

Background Information:
As the human population increases, more big game habitat is lost to human development. Elk, deer and other big game species are impacted by development in a unique way. The summer range of these species is often remote, rugged and typically preserved as Federal and State public lands. However, winter range is accessible, more easily developed, closer to population centers and is privately owned. Many people who live near big game species work to preserve their habitat while others feel that economic growth must come first. Refer to Activities IV - Big Game and Development and VI - Community Growth for a more in depth discussion. Students need to realize that these issues are complex, and simple solutions seldom exist. They need to consider these controversies from a variety of viewpoints and then take a position in a mock town meeting to debate and try to resolve the issue.

Materials:
- Role cards, one per student
- Research materials
- Costumes and props

Procedure:
1. Announce a County Commissioners' meeting to discuss a proposal to develop a large tract of land.

2. Set the scene. Tell the class that Taylorville is a rural, medium to small sized community. In recent years, Taylorville has experienced some growing pains. In-town housing has become highly sought after, and rental properties have become almost nonexistent. A land developer has proposed the development of a 850 acre plot of land called Elk View Estates. The developer has proposed that the land be subdivided in to 425 two acre plots with one home being built on each plot.

The development is aptly named because the area is winter range to a herd of about 150 elk. Twenty percent of the 850 acres is considered to be primary winter elk habitat, and the remaining 80% is considered to be secondary. The herd of elk spends the months from December through April in this area.

Opposition to and support for this proposal has sprung up very quickly. Tempers are hot but each side has agreed to present their side to a board of three County Commissioners who will ultimately make a decision regarding the fate of Elk View Estates.

The Commissioners have requested a panel of experts to address the meeting.
3. Assign students roles they will play at the meeting. Some roles may be duplicated or omitted as long as all interests are equally represented. Three County Commissioners need to be picked and, as an option, they could be other teachers or administrators.

4. Give students time to research their roles and prepare position statements. Encourage them to:

- work with their interest group (pro, con, or expert) to identify the groups attitude towards the Elk View Estates Proposal.

- research arguments against their position and rebuttals to those arguments.

- strengthen their arguments with facts, expert quotes, statistics, and research data.

- rely less on emotional argumentation and more on argumentation based on fact.

- use props such as graphs, illustrations, maps, or videos to reinforce their position.

5. Hold a meeting. The three County Commissioners should preside as chairs of the meeting. Each group should be given time to state their position, answer questions, question other groups and present rebuttal arguments. The Commissioners should encourage each side to consider compromises and trade-offs. Ultimately, the Commissioners make a decision to either adopt the Elk View Estates proposal as is or require modifications to it.
<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
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<tr>
<td><strong>COUNTY COMMISSIONER</strong></td>
<td>- You and two other COUNTY COMMISSIONERS will preside over the town meeting. As an elected official you have a responsibility to be &quot;generally&quot; well informed. You should avoid taking sides but rather ask many questions. Ultimately you and your two colleagues will decide the fate of the Elk View Estates proposal.</td>
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<td><strong>CITY &amp; COUNTY PLANNER</strong></td>
<td>- You are the person who reviews all development proposals be it a shopping mall, a burger stand, or a housing development. You are very familiar with the state and federal laws governing development. Be prepared to answer questions about the legality of this proposal as well as the long term development &quot;vision&quot; of Taylorville.</td>
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<tr>
<td><strong>U.S. FISH AND WILDLIFE SERVICE OFFICER</strong></td>
<td>- You know the national controversy concerning big game winter habitat requirements and the community development needs. You know the federal regulations protecting elk. Be prepared to answer questions about hunting, private land, and federal regulations with respect to habitat protection.</td>
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<tr>
<td><strong>STATE FISH AND GAME MANAGER</strong></td>
<td>- You are very familiar with the area proposed for the Elk View Estates development. You know that it is high quality winter elk habitat. You know the size of the herd, the health of the herd, the bull to cow ratio, and where the herd summers. Be prepared to answer questions about the impact of the development on the herd.</td>
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<td><strong>TRIBAL LEADER</strong></td>
<td>- You represent the Native Americans who live in Taylorville and the surrounding area. You understand the elk's significance to your culture. Be prepared to talk about how Native Americans hunted elk, and how they are depicted in pictographs and petroglyphs. Be able to discuss the historical importance of elk in this area.</td>
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<tr>
<td><strong>ELK BIOLOGIST</strong></td>
<td>- You are an all-round elk expert. You have spent most of your professional career studying elk. You know about their behavior, habitat requirements, anatomy and physiology, and esthetic value. Feel free to support any other groups or individuals with your expertise.</td>
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<td>ROLE CARDS</td>
<td>Pro Development Group</td>
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<td>LAND DEVELOPER</td>
<td>Pro development Group</td>
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<tr>
<td>• You are the main individual who has proposed the Elk View Estates development plan. You have been in on this project from the beginning. You stand to gain if this is a successful project. Be prepared to discuss your development proposal as well as any alternative plans.</td>
<td>BUILDING CONTRACTOR</td>
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<td>Pro development Group</td>
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<tr>
<td>• You are the contractor who will build most of the proposed 425 homes in Elk View Estates. Your company employs many carpenters as well as subcontractors. Be able to answer questions about how your business will be affected by Elk View Estates and how the local economy will be affected.</td>
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<td></td>
<td>Pro development Group</td>
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<tr>
<td>BUILDING SUPPLY COMPANY</td>
<td>Pro development Group</td>
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<tr>
<td>• You are the owner of the building supply company who will more than likely supply all the building materials for Elk View Estates. You will need to hire more employees for the increase in business. Be able to answer questions about how your business will be affected by Elk View Estates and how the local economy will be affected.</td>
<td>LAND OWNER</td>
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<td>Pro development Group</td>
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<tr>
<td>• You are one of the current owners of the land on which the Elk View Estates will be built. This land is part of a ranch owned by your family for three generations. You have mixed feelings about selling the land off, but you stand to make a large amount of money. Be able to defend your decision to sell your land to the development project.</td>
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<td></td>
<td>Pro development Group</td>
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<tr>
<td>REAL ESTATE AGENCY</td>
<td>Pro development Group</td>
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<tr>
<td>• You are a real estate agent for the agency that will handle marketing and selling the Elk View Estates. You know the Taylorville housing market very well and are familiar with housing shortage. Be ready to answer questions about how Elk View Estates will help to solve the housing shortage as well as market forecast for Elk View Estates.</td>
<td>MAYOR OF TAYLORVILLE</td>
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<td>Pro development Group</td>
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<tr>
<td>• You are the popular and well respected Mayor of Taylorville. You have seen the dramatic increase in the need for housing in Taylorville. You have heard the citizens of Taylorville! You know the value of compromise and are willing to discuss options. Bottom line though is Taylorville needs to expand its housing which ultimately lead to a vibrant Taylorville economy.</td>
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### ROLE CARDS
#### Anti Development Group

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<tr>
<th><strong>BIG GAME HUNTERS</strong></th>
<th><strong>HUNTING OUTFITTERS</strong></th>
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<tr>
<td>You are the representative of the local big game hunting organization. You are adamantly opposed to Elk View Estates proposal because you fear that development of this land will be the demise of the herd that winters in this area. No elk means no hunting. Be prepared to answer questions about how Elk View Estates will impact your way of life.</td>
<td>You are the representative of a group of hunting outfitters. Your livelihood is dependent upon large healthy herds of big game. You are adamantly opposed to the Elk View Estates proposal because you feel it will threaten all big game in the area. Be prepared to answer questions about how Elk View Estates will impact your business.</td>
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<th><strong>ELK FIRST!</strong></th>
<th><strong>LOCAL RANCHERS</strong></th>
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<tr>
<td>You are a member of ELK FIRST! an environmental activist group that adamantly opposes human development. You see the needs of humans no more or less important than the needs of elk or any other organism for that matter. Your group has threatened to commit acts of civil disobedience until Elk View Estates is removed from consideration.</td>
<td>You are one several ranchers in the area who have family ranches that are three to four generations old. You are concerned about Elk View Estates because 1) it will remove some prime ranch land from operation, and 2) property taxes will skyrocket making ranching too expensive. Be prepared to answer questions about how the development will impact your life.</td>
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<th><strong>SPORTING GOODS STORE</strong></th>
<th><strong>ADJACENT HOMEOWNERS</strong></th>
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<tr>
<td>You are the owner of a large sporting goods store in Taylorville which is geared to hunting and fishing. You see Elk View Estates as adversely affecting your business. You are concerned that the elk population will decrease which will lead to less hunting permits which will lead to decreased demand for hunting supplies.</td>
<td>You are a member of Friends of Taylor Creek, a homeowners association who own residences in the area surrounding the proposed development area. You are opposed to the development because 1) the increased traffic, 2) the increased property taxes and utilities, and 3) the overall decreased quality of life because of the feared decreased elk population.</td>
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Activity VI - Community Growth

**Purpose:** To expose students to relevant "real world" issues and public opinion regarding community growth and its impact upon big game species.

**Background:** This activity can be addressed in two parts: (1) Student research of periodicals, newspapers, radio and TV; (2) the establishment of a panel discussion representing a social, economic, and political cross-section of their community. Speakers could be grouped into four major categories. These would include a Business/Development group such as a Chamber of Commerce Representative, a rancher, a realtor or a commercial land use planner. The Wildlife Management group might include a representative from Fish, Wildlife & Parks or U.S. Forest Service. The Environmental Conservation group might include a representative from The Rocky Mountain Elk Foundation, Nature Conservancy, or Friends of Wildlife. The Governmental Agency might include a County Commissioner, County Surveyor or a City/County Planner.

**Procedure:** Student Research

Students will be given a couple days to research, collect, and assess newspaper, periodical and radio/TV information regarding our mission statement, the effects of urban development on big game habitat. This exercise will heighten awareness and relevancy, emphasizing the importance of this issue to their community.

**Assignment:** A brief written and oral presentation would conclude this supplementary exercise.

**Teacher Note:** This brief exercise is especially effective when completed just prior to your panel discussion. Appropriately informed students make for a more effective panel discussion.

**Procedure:** Panel Discussion/Speakers

Preferably, a panel discussion can be arranged with a member from each of the four categories taking part. However, if logistics precludes this from developing, individual presentations are very effective.

**Teacher Note:** At this point students should be able to readily identify the many variables which must be taken into consideration when assessing the issue of development upon big game habitat. It is imperative for the teacher to remain neutral, allowing the students to receive panel members in a strictly unbiased fashion.
Procedure: Prior to speaker presentation/panel discussions, students are to design a list of questions appropriate to each presenter. Possible questions might center around: zoning restrictions, resource impact, suitability of big game habitat, cluster housing, open space, groundwater, stewardship and how a prospering economy go hand-in-hand with a healthy big game habitat.

Speaker: ___________________ Affiliation (Business/Agency) ___________________

Questions: __________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Speaker: ___________________ Affiliation (Business/Agency) ___________________

Questions: __________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Guest Speaker Presentation

Assignment: While listening to the presentation by the guest speaker, complete the format below.

PRESENTER: ___________________ AFFILIATION (Business/Agency) _____________

Presenter Comments: ____________________________________________________________

____________________________________________________________________________

Presenter Responses to Student Questions: _________________________________________

____________________________________________________________________________

____________________________________________________________________________

PRESENTER: ___________________ AFFILIATION (Business/Agency) _____________

Presenter Comments: ____________________________________________________________

____________________________________________________________________________

Presenter Responses to Student Questions: _________________________________________

____________________________________________________________________________

____________________________________________________________________________
Activity VII - Field Study Preparation

Purpose: The purpose of this activity is to familiarize students with research methods, plant species, and animal sign they will encounter in the field.

Introduction: This is an important activity because it prepares students to conduct valid field research. In the I.B.E.S. program, field research is a privilege and students have to earn the right to go, by successfully completing field trip qualifying labs and quizzes. If the data collected by the students will be used for long term projects or by other agencies, it is imperative they are well trained in proper field study techniques.

Materials:

- Compass (1 per two students; we use Silva Rangers)
- Plant Samples
- Pellet Samples

Procedure:

1. Students will have to be able to follow a compass bearing to do a Parker Transect in the field. Performing a Parker Transect is outlined in detail in Activity VIII. If you are not familiar with compass use, refer to the instructions which come with the compass or find a book on compass use and orienteering. We have found that placing the compass on the overhead (Silva compasses are see through) greatly facilitates student understanding. After a brief introduction in the classroom, take students outside to complete items 2 and 3 on the lab sheet.

2. When collecting plant samples for this activity, we try to keep everything in themes of four. Therefore, we bring in the four most dominant species of each plant type; grasses, forbs, shrubs, and trees. Limiting identification to four species keeps the data more manageable for the students.

3. Again, the goal is to simplify procedures for the students while still allowing them to collect meaningful data in the field. Decreaser, increaser, and invader refer to plant species in terms of plant succession. Decreasers tend to be climax species, increasers represent earlier successional stages, and invaders are exotic or introduced species. Decreasers are usually favored forage species over increasers and invaders (The term decreaser comes from the fact that they decrease in number because they are favored forage).

4. Lab pellet analysis is particularly important if your study area includes more than one big game species e.g. elk, deer, and moose. For a detailed description on how to perform a pellet count study, refer to Activity VIII.
Field Trip Qualifying Activity

**Background:** The purpose of this activity is to prepare students for data collection in the field. Two areas will be emphasized in the field study: condition of the range and overall use of the range by big game species. A sampling method called a Parker Transect will be used to study range condition and pellet group counts will be used to determine range use. Pay close attention to the methods and techniques outlined in this lab, they will be crucial to the validity of your data collected in the field!

**Procedure:**

1. A key component of a Parker Transect is being able to find and stay on a specific compass bearing. As you listen to the introduction from your instructor, write a brief summary on taking a compass bearing in the space below:

2. Take compass bearings on the objects chosen by your instructor and fill in the chart below. Have your instructor check and initial your responses.

<table>
<thead>
<tr>
<th>Object</th>
<th>Bearing</th>
<th>Instructor</th>
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3. Reverse the process by first having the bearing named by the instructor and then finding the object.

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Object</th>
<th>Instructor</th>
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4. Now that you can follow a bearing, it is important (extremely important) that you can identify the common forage species found in the study area. We will concentrate on the four most common species of each plant type; four grasses, four forbs, four shrubs, and four trees. To study range condition, plants must be categorized as **decreasers**, **increasers** or **invaders**. While listening to your instructor, define the terms below:

   - **decreaser:**
   - **increaser:**
   - **invader:**
5. Examine the plant samples from the field site and complete the table below. Take your time to get detailed information; these notes will be invaluable in the field.

**Field Study Plant Key**

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Type: grass, forb, shrub, tree</th>
<th>Forage Type: Dec., Inc., Invader</th>
<th>Sketch</th>
<th>Primary Characteristics</th>
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6. To improve reliability and validity of our range condition study, a Parker Transect method will be used in the field. Teams of three will run each transect: a pacer, a recorder, and a taxonomist. While listening to your instructor, take notes on how to perform a Parker Transect in the space below.

7. You and your research team may be involved with the Parker Transect, pellet group count, or both. Complete the table below with information on pellet characteristics. This is especially important if there is more than one type of big game species that inhabits the study area.

**Field Identification of Pellet Groups**

<table>
<thead>
<tr>
<th>Animal</th>
<th>Pellet Size</th>
<th>Sketch</th>
<th>Primary Characteristics</th>
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8. While listening to your instructor, outline the main points of how to perform a pellet group count.

Now you are ready to go into the field and conduct some meaningful research. Have your instructor look through the data you collected for this activity and then initial in the space below. (Be sure to bring this information with you into the field!)

Instructor's Initials_________ Date_________
Activity VIII - Field Site Visit

Purpose: The purpose of this activity is to have students collect field data on the quality of the habitat and the overall use of the study area by big game species.

Introduction: This visit to the field site is the focal point of the entire unit. Students will use the Parker transect method to determine habitat suitability and will perform pellet group counts to determine overall use of the area by big game species. If time is a limiting factor in your field exercises, divide the class into two equal groups; one group will work on the vegetation transects and the other group will work on the pellet group counts. Otherwise, each team can perform both studies.

Materials: Vegetation Transect Team - 3 members per team

- compass
- lab notes-plant ID
- clipboard

Pellet Count Team - 3 members per team

- compass
- measuring tape (100 ft.)
- string
- clipboard
- corner stakes - 4

Note to Teacher: While reviewing this procedure, it will be helpful to refer to the data sheets found within this activity.

Procedure: Vegetation Transect Team - Parker Method

1. Use a starting point that will adequately cover most of the study area. A top of a ridge or hill makes an excellent starting point because students can cover areas of different exposure or aspect. Student transects can be run at regular intervals from a starting transect or they can be run from a central starting point as spokes on a wheel.

2. Assign each team a compass bearing for their transect. One team member runs the transect and the pace, one identifies the plant species encountered, and one records the data.

3. From the starting point of the transect, each team follows their bearing and collects a data point every pace (every other step). At each pace, the plant species at the end of the pacer's toe is identified. If there is no species directly beneath the toe, the nearest species in front of the toe is identified. This process is continued for 100 paces or 100 data points.
4. Refer to Table 1 within this activity. When the pacer contacts a plant specie directly, the name of the specie is noted on the upper half of the data table square. If the pacer does not contact a specie directly, the type of bare ground, selected from the Near Hits column at the bottom of Table 1, is recorded in the top half of the square and the nearest specie is recorded in the bottom half. Fig. 1 below represents a data point where the pacer’s toe fell directly on a grass plant, Idaho Fescue. Fig. 2 shows a data point where the pacer’s toe fell on Bare Soil, B, and the nearest plant specie is the forb Blue Bell.

\[
\begin{array}{|c|c|}
\hline
1 & 2 \\
\hline
ID Fescue & B \\
\hline
\end{array}
\]

Fig. 1

Fig. 2

5. After completing the transect, students are to tally their data in the space to the right of the data table. They are to list the species identified under the appropriate title, decreaser, increaser or invader, then tally the percentage of each plant type i.e. 36% decreaser, 50% increaser, and 14% invader. Contact your local game biologist to determine the common decreasers, increasers, and invaders for the game species in your area.

Procedure: Pellet Count Team

1. After locating study area, have students layout sample plots as outlined in the field instructions. If your study will span several years, it is important that study teams give exact details regarding the locations of their plots.

2. Students may need lab practice prior to going into the field on identifying pellet groups from different species and distinguishing this years pellets from past years.

Notes to Teacher:

1. The vegetative transect need not be difficult. Contact your local game biologist or range manager to determine the most common decreasers (most desirable forage plants), increasers (less desirable forage plants), and invaders (least desirable forage plants) for your area and have students concentrate on those in the pre-field study activity. Focus on four plant species of each type.

2. Returning to the same study area for several years will allow students to analyze changes in range condition and range utilization.
Vegetation Transect - Parker Method
(Range Quality Analysis)

Depart from: ___________________________ Time: ___________________________
Current Weather: Temp. ___________ Sky Cover ___________________________
Materials Needed: ___________________________ ___________________________
Site: # ___________ Common Name: ___________________________ Arrival Time: ___________________________
T _____, R _____, Sec. _____, 1/4, 1/4

Background: The purpose of this study is to determine the overall range quality of the study area using a survey method known as a Parker transect analysis. You will be running a transect along a specific bearing (provided by your instructor) and you will be sampling vegetation types using the same method you learned in the lab.

Procedure:

1. Transect Bearing: ___________ Aspect/Exposure: ___________ Elevation: ___________.
   Describe the study area in terms of topography, geology (soil type, texture, and moisture), and types of vegetation.

2. Record your data on Table 1 on the following page with the results from your transect analysis then summarize your data in the columns below.*

Data Summary (list by name and tally):

<table>
<thead>
<tr>
<th>Decreasers</th>
<th>Increasers</th>
<th>Invaders</th>
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</table>

*Final data analysis and group presentations will be completed upon return to the lab.
Table 1: Parker Transect Data

<table>
<thead>
<tr>
<th>Near Hits</th>
<th>Totals</th>
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<tbody>
<tr>
<td>Bare Soil - B</td>
<td></td>
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<td>Pavement - P</td>
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<td>Litter - L</td>
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<td>Moss - M</td>
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</table>
The Scoop on the Poop
(Pellet Count Analysis)

Depart from: ____________________________ Time: __________

Current Weather: Temp. __________ Sky Cover __________________________

Materials Needed: ____________________________

Site: #_________ Common Name: ______________ Arrival Time: ______

T_____, R_____, Sec_____, _____1/4, _____1/4

Background: The purpose of this study is to determine overall use of an area by big game species. Pellet counts are not typically used to obtain a precise population count but they can be used to determine approximate changes in habitat use over time. If you count many more pellet groups in the study area this year than did your peers last year, one can conclude there are probably more animals using the area this year than last.

Procedure:

1. You will need to find the study site used in previous years then sample a rectangular area 12 by 72.6 ft, 1/50th of an acre. In terms of distance and direction, describe the location of one of the corners of your study area: distance from ____________________________ = ____________________________ (landmark) (include units; ft, yds, etc) compass bearing from landmark = ____________.

2. Using a measuring tape, corner stakes, and string lay out your study area. If permanent corner stakes exist, simply outline the area with the string. On the sketch of the study area below, circle the starting corner (found in #1) then write the compass bearings (using the starting corner as a reference) to the other corners in the space next to the arrows.

3. Count the pellet groups from the current year and mark their locations using X’s on the sketch of the study area above. Total pellet groups counted = ____________

Conclusion: Compare your pellet group count with those from previous years. Provide a possible explanation for any differences or trends you observed.
Activity IX - Data Analysis/Assessment

Purpose: The purpose of this activity is to have students organize, analyze, and record collected field data and make management recommendations about the study area based on the data they collected.

Introduction: This activity represents the culminating exercise of the project. It is here students organize, analyze, and record the data they collected in the field. Each research group makes a presentation to the class explaining their data and results. This gives each student access to all of the data they will need to make individual management recommendations about the study site.

Materials:

- calculator (1 per group)
- computer
- soil map of study site available from Natural Resource Conservation Department, formerly Soil Conservation Service

Procedure:

1. Soil maps are used during the data analysis so students can see the impact of soil type on plant diversity and abundance. If you have time, teams of students could be assigned to perform soil analysis tests (using common equipment such as Lamotte Soil Test Kits) in different areas of the study site.

2. Use a computer with appropriate software to have groups enter their data on a class spreadsheet. Once all of the data is recorded, the computer screen is projected on a large screen TV or overhead projector so groups have a visual reference to their data as they make their presentations to the class.

3. Although the field work and data analysis is done in groups of three, we feel it is important for each student to complete the Field Study Data Analysis sheet and draw their own conclusions. This allows for group assessment on field performance and the team presentation and individual assessment through the completed Data Analysis and, most importantly, the conclusion.

4. After group presentations are completed and the Data Analysis sheets are finished, it is beneficial to have a class discussion where individual students are asked to share their conclusions and management recommendations. Try to have a game biologist and land use planner present for the discussion to provide input and feedback to student ideas.

5. Other assessment options are up to the individual instructor. Because the I.B.E.S. program is lab/field oriented, a lab practical is used to assist with individual assessment of the entire project.
Field Study Data Analysis

**Background:** The purpose of this activity is to organize and analyze collected field data in order to identify range quality and animal usage trends and to make recommendations on the management of the area based on those trends. It will be the responsibility of each group to organize and present their data to the class and record their data in the project database.

**Procedure:**

1. Fill in the following table with the information from your Parker Transect. Listen to the presentations from the other groups to complete the table. Be sure to record your group’s data in the class database.

**Table 1: Range Quality Data -**

<table>
<thead>
<tr>
<th>Group</th>
<th>Bearing</th>
<th>%Decreaser</th>
<th>%Increaser</th>
<th>%Invader</th>
<th>RangeQual.</th>
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Assign range quality based on the following information:

- **Decreasers 75%+ = excellent, 50-74% = good, 25-49% = fair, <25% = poor**

2. What is the aspect or exposure of the site (if you can’t remember, look at a map)?

3. Are all transects on the same aspect? Explain.

4. Look at a soil map of the study area. What is the predominant soil type?

What is the slope (% grade) of the site?
5. Do all transects indicate the same range quality? _____ If not, provide three explanations for any differences.
   a. 
   b. 
   c. 

6. Fill in the following table with information from your pellet count study. Listen to the presentations from the other groups to complete the table. Be sure to record your data in the class database.

Table 2: Pellet Count Data - Fill in site legal description

<table>
<thead>
<tr>
<th>Group</th>
<th>Site Location/ID</th>
<th>Total Pellet Groups</th>
<th>Pellet Groups/Acre (col. 3 x 50)</th>
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   Average

7. Do all study areas have approximately the same pellet group counts? _____
   If not, provide three possible explanations for any differences.
   a. 
   b. 
   c. 

Conclusion: According to our data, what is the overall status of range quality and range usage? What are your recommendations for this area, i.e. should it be managed the same way or should changes be made and why? Be sure to specify changes. It would be helpful to include information on the historical use of the study area in your conclusion.
Activity X - Further Investigations & Enrichment

Purpose: The following are suggestions to provide enrichment activities for students who wish to further pursue this study.

A. Community Service: Teachers assist students in connecting with governmental agencies and/or the business community in helping these professionals with an activity related to our theme. Possible work might consist of big games counts, habitat reclamation, animal damage remediation, or work with homeowner associations mitigating problems caused by big game.

B. Adopt-A-Student: Teachers assist students in scheduling a day with a professional in the real world of work. The teacher would pair a student with a realtor/developer, a land use planner, chamber of commerce official, a wildlife biologist, etc. Students are expected to share their experience with their classmates.

C. Public Relations Video: Students would produce a video or public service message outlining the delicate relationship between community growth and big game habitat.