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Yellowstone 2012

Lesson Plan: *Bison: National Treasure or Pernicious Vector?*

**Lesson Plan Outline**

1. *Lesson Description*:

This lesson is focused on the controversy surrounding bison in the Greater Yellowstone Ecosystem. Although bison are native to this area and have migratory routes dating back thousands of years, their presence is not always welcomed due to the threat of brucellosis transmission with cattle. This lesson will explore that controversy and will empower the students to utilize public policy decision-making in establishing a suitable plan for the area. Its intended audience is for Advanced Placement Environmental Science but may be adapted to other levels or classes.

2. *Introduction*:

The lesson will use a variety of techniques to help students explore the bison controversy in greater depth. It will employ a variety of ecological worldviews, historical information on bison, and current data and research on brucellosis to help students develop the best course of action in dealing with the controversy.

Initially, the students will read one of two short excerpts that represent opposing opinions on the bison controversy. These articles will be distributed randomly in a double-blind fashion. After reading the excerpt, students will utilize a Think-Pair-Share method of expressing their opinions on the controversy. Following a whole-class discussion, the origin of the different articles will be revealed with a subsequent discussion on the role of bias and propaganda in public policy. A teacher-developed PowerPoint (*Bison: National Treasure or Pernicious Vector?)* will then serve as a starting point to discuss the matter in greater detail and will serve as an opportunity to clear any misconceptions and to address the science behind the issue. Following the PowerPoint, students will read *Applying an Ecosystem Approach to Brucellosis Control: Can an Old Conflict between Wildlife and Agriculture be Successfully Managed?.* This will be followed with questions to address regarding the controversy. The final portion of the lesson will afford the student the opportunity to work in small groups to develop a new Bison Management Plan.

3. *Concepts*:

Science is a process.

Science is a method of learning more about the world.

Science constantly changes the way we understand the world.

Humans alter natural systems.

Humans have had an impact on the environment for millions of years.

Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

Environmental problems have a cultural and social context.

Understanding the role of cultural, social and economic factors is vital to the development of solutions.

Human survival depends on developing practices that will achieve sustainable systems.

A suitable combination of conservation and development is required.

Management of common resources is essential.

4. *Content Standards* – all standards refer to AP Environmental Science standards developed by the College Board:

*II. The Living World*

A. Ecosystem Structure - (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)

C. Ecosystem Diversity - (Biodiversity; natural selection; evolution; ecosystem services)

*III. Population*

A. Population Biology Concepts - (Population ecology; carrying capacity; reproductive strategies; survivorship)

2. Population size - (Strategies for sustainability; case studies; national policies)

3. Impacts of population growth - (Hunger; disease; economic effects; resource use; habitat destruction)

*IV. Land and Water Use*

A. Agriculture

1. Feeding a growing population - (Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)

C. Rangelands - (Overgrazing; deforestation; desertification; rangeland management; federal rangelands)

D. Other Land Use

1. Urban land development - (Planned development; suburban sprawl; urbanization)

3. Public and federal lands - (Management; wilderness areas; national parks; wildlife refuges; forests;wetlands)

4. Land conservation options - (Preservation; remediation; mitigation; restoration)

5. Sustainable land-use strategies

*VII. Global Change*

C. Loss of Biodiversity

1. Habitat loss; overuse; pollution; introduced species; endangered and extinct species

2. Maintenance through conservation

3. Relevant laws and treaties

5. *Objectives*:

1. The students will understand the concept of bias in public policy.

2. The student will discuss the status of the bison as a representative of states’ rights versus

federal rights.

3. The students will analyze the concept of a common property and its implications in

management of the property.

4. The students will use data to understand the spread of disease (brucellosis) in natural

settings.

5. The student will devise a possible solution to the bison controversy using public policy-

making guidelines.

6. *Time Required*:

*Day One*:

Activity 1: (5-8 minutes) – Read the assigned excerpt regarding the bison controversy.

Activity 2: (5 minutes) – Think-Pair-Share the excerpt.

Activity 3: (10 minutes) – Class Introductory Discussion/Overview of the Controversy.

Activty 4: (25 minutes) – Begin Powerpoint - *Bison: National Treasure or Pernicious Vector?*

*Day Two*:

Activity 5: (25 minutes) – Finish Powerpoint - *Bison: National Treasure or Pernicious Vector?*

Activity 6: (20 minutes) – Introduction to Public Policy Making – Class Discussion of Requirements/Assessment

Activity 7: (Homework – 1 hour) – Read *Applying an Ecosystem Approach to Brucellosis Control: Can an Old Conflict between Wildlife and Agriculture be Successfully Managed?* and answer accompanying questions.

*Days Three & Four*:

Activity 8: (Entire Class Periods) – With partner, devise a Bison Management Plan following the guidelines assigned in class.

7. Materials (may be found in the appendix):

*The Wild Yellowstone Bison* excerpt (Appendix One)

*United States Achieves Cattle Brucellosis Class Free Status* excerpt (Appendix One)

*Bison: National Treasure or Pernicious Vector?* Powerpoint

*Applying an Ecosystem Approach to Brucellosis Control: Can an Old Conflict between Wildlife and Agriculture be Successfully Managed?* article and accompanying questions (Appendix Two)

Bison Management Plan Public Policy guidelines (Appendix Three)

8. Procedures:

Activity 1: (5-8 minutes) – Students will read the assigned excerpt regarding the bison controversy. Excerpts will be randomly assigned by the instructor.

Activity 2: (5 minutes) – Think-Pair-Share the excerpt. Students will partner with a classmate and will discuss their opinions on the bison controversy.

Activity 3: (10 minutes) – Class Introductory Discussion of the Controversy. What are the major ideas? Who are the stakeholders? What are the effects of the current plan?

Activty 4: (25 minutes) – Begin Powerpoint - *Bison: National Treasure or Pernicious Vector?*

*Day Two*:

Activity 5: (25 minutes) – Finish Powerpoint - *Bison: National Treasure or Pernicious Vector?*

Activity 6: (20 minutes) – Introduction to Public Policy Making – Class Discussion of Requirements/Assessment – Students will have a brief introduction to the steps used in developing public policy.

Activity 7: (Homework – 1 hour) – Students will read *Applying an Ecosystem Approach to Brucellosis Control: Can an Old Conflict between Wildlife and Agriculture be Successfully Managed?* and answer accompanying questions. The questions will help the students better understand the topic and will prepare them for the development of the Bison Management Plan. The answers to these questions will serve as their “ticket” to the conference.

*Days Three & Four*:

Activity 8: (Entire Class Periods) – With a partner, students will devise a Bison Management Plan following the guidelines assigned in class. They may use assigned articles as well as the internet and textbook to develop their plan.

9. Activities:

All assignments for the lesson plan are student-centered except for the PowerPoint which is teacher-centered.

10. Assessment:

A rubric will be used to assess the quality of the Bison Management Plan (see Appendix Three).

11. Extensions:

A field trip to a local ranch may be utilized to explore local issues regarding ranchers.

Students may write to their state representatives, senators, and the state of Montana regarding their Bison Management Plan.

A representative from the National Park Service will act as a guest speaker to address other policy issues regarding public lands.

12. Interdisciplinary Features:

History/Social Studies –Students will explore the history behind the eradication of Native American Indians through biological and military control. Students will learn the steps involved in developing public policy.

Math – Students will study carrying capacities of different ecosystems.

Language Arts – Students will develop technical writing skills in their Bison Management Plans.

Appendix 1:

Excerpts for Pre-Lesson Reading

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| Excerpt 1 |
| **The Wild Yellowstone Buffalo** |
| The Yellowstone bison herd is unique, and is descended from 23 individuals who survived the 19th century near-extinction by taking refuge in the Park's remote backcountry.  Unfortunately, America's only truly wild, genetically pure buffalo find themselves at the center of a violent conflict that can result in the yearly slaughter of hundreds or thousands of buffalo.  Yellowstone does not provide sufficient winter range for the resident herds of wildlife due to the deep snows of its high elevation plateaus. Animals leave the Park to forage on lower elevation grasses necessary for winter survival. When buffalo follow their instinctual migration routes to lower elevations, as they traditionally have done, they unwittingly enter a conflict zone where their survival is undermined by Montana politics.  Montana's powerful livestock industry demands that buffalo exiting the Park must be slaughtered to prevent the spread of brucellosis, a European livestock disease introduced by cows and first detected in Yellowstone buffalo in 1917. The livestock industry continuously complains about the threat of brucellosis, but the facts tell another story.   There has never been a single documented case of wild buffalo transmitting brucellosis to livestock. Even if such a transmission were biologically possible, the absence of cattle from lands where buffalo forage in winter months make it physically impossible. Yellowstone elk and other wildlife, also known to carry brucellosis, are allowed to freely exit the park without coming under fire as the buffalo do, belying the DOL's assertions that brucellosis poses such a grave threat.  During the winter of 1996-'97, nearly 1100 buffalo were slaughtered when they crossed the arbitrary Park boundary and entered Montana. These killings, combined with deaths from the unusually severe winter, resulted in a loss of more than half of the Yellowstone herd in a matter of months.  In winter a portion of the Yellowstone buffalo population migrates across Park boundaries to traditional winter range following the Yellowstone River valley, a trek that once reached beyond present-day Livingston, Montana - a 55 mile journey from the Park's gateway Arches in Gardiner, Montana. Buffalo also move from geothermal habitats into the Madison River corridor in search of wintering range and spring calving grounds. Nomadic migrations by wild buffalo in Yellowstone originally stretched across the Gallatin River valley, and into the Snake River Plain.  Today, under the banner of "disease risk management" and the so-called Interagency Bison Management Plan, Montana Dept. of Livestock inspectors and National Park Service Rangers intercept and harass buffalo off their winter range and spring calving grounds and capture wild buffalo in a slaughter program done in partnership with Yellowstone National Park that has destroyed over 3,200 wild buffalo in the last decade.  Arbitrary boundaries are drawn and America's last buffalo are destroyed for stepping across a line into Montana, Idaho and Wyoming.  The undocumented claim by the state of Montana and Yellowstone National Park is grazing cattle in the buffalo's range are at risk of contracting brucellosis - a disease introduced by exotic cattle to native elk and buffalo before 1917. Buffalo calves captured from the wild were "mothered with domestic bovine cows" and pastured with cattle that were brought into Yellowstone to feed Park tourists.  Recent investigations of brucellosis transmission to cattle in the Yellowstone ecosystem indicate that elk are the suspect source of infections in Montana, Wyoming and Idaho.  There has never been a documented case of a wild buffalo transmitting brucellosis to livestock.  Brucellosis is a bacterial disease that affects livestock and wildlife, sometimes causing cattle to abort their first calf post-infection. While abortions have been documented in wild buffalo, such incidents are rare, and the impact of the disease on Yellowstone buffalo and elk is insignificant. Brucellosis, which originated in European livestock, was first detected in Yellowstone's buffalo in 1917 after some buffalo were fed milk from infected cows.  At present, the federal and state agencies behind the Interagency Bison Management Plan are wasting $3 million tax-dollars each year to harm America's wild buffalo as they migrate into Montana. The U.S. Congress appropriates your tax money to each agency in the federal budgeting process.  The American taxpayer picks up the tab for nearly all of Montana Department of Livestock costs directed at removing or slaughtering wild buffalo in Montana. The figures below are incurred state costs, and do not reflect the hundreds of thousands of taxpayer dollars flowing from the Animal and Plant Health Inspection Service to the Montana Department of Livestock.  Adapted/Excerpted from <http://www.buffalofieldcampaign.org/>   |  |  | | --- | --- | | Excerpt 2  **UNITED STATES ACHIEVES CATTLE BRUCELLOSIS CLASS FREE STATUS** | | |  | | | |  | WASHINGTON, Feb. 1, 2008--The U.S. Department of Agriculture today announced that for the first time in the 74-year history of the brucellosis program, all 50 states, Puerto Rico and the Virgin Islands have simultaneously achieved Class Free status. Texas is the last and final state to be declared brucellosis free.  "This tremendous achievement could not have been accomplished without the combined efforts of state and federal agencies and industry," said Bruce Knight, undersecretary for USDA's marketing and regulatory programs mission area. "But our work is not done. We must now focus our efforts on eradicating brucellosis from the free-ranging elk and bison populations in the Greater Yellowstone Area in order to protect our national cattle herd against future outbreaks of this disease."  Class Free status is based on a state finding no known brucellosis in cattle for the 12 months preceding designation as Class Free. A state's Class Free status, however, can change. If brucellosis is found in more than one herd of cattle in a brucellosis free state within a two-year period, the state is downgraded to Class A status.  The presence of brucellosis in free-ranging bison and elk in Yellowstone National Park and Grand Teton National Park still threatens the brucellosis status of surrounding states. In May 2007, Montana discovered brucellosis in a herd of cattle, potentially jeopardizing its free status.  The classifications for brucellosis are as follows: Class Free, Class A, Class B and Class C. Restrictions on the interstate movement of cattle become less stringent as a state approaches or achieves Class Free status. The Class C designation is for states or areas with the highest rate of brucellosis. States or areas that do not meet the minimum standards for Class C are required to be placed under federal quarantine.  In 1934, the eradication of brucellosis was elevated to a national scale with the formation of a cooperative state–federal brucellosis eradication program to eliminate brucellosis from the country. Brucellosis is a bacterial disease that causes decreased milk production, weight loss, infertility, loss of young and lameness in cattle, elk and bison. The disease is contagious and can, though rarely, affect humans. There is no known treatment for brucellosis, and depopulation of infected and exposed animals is the only effective means of disease containment and eradication. | |   Ranchers are nervous about mingling between cattle and bison because of brucellosis, which can decrease milk production and animal weight, cause spontaneous abortion of the animal's first fetus and cause infertility. For nearly 60 years and at a cost of billions of dollars, the livestock industry across the United States has waged a war to eliminate brucellosis from its herds. In 1952, the U.S. Department of Agriculture (USDA) estimated that annual losses due to this disease were more than $400 million. To prevent an epidemic of the disease, federal and state agriculture officials have eliminated infected herds.  Brucellosis can also infect human beings, causing persistent, intermittent flu-like symptoms known as undulant fever. Transmission occurs through direct contact between a person's open cuts and birthing fluids or animal tissue. Veterinarians, butchers and farmers have been those most commonly affected, though the incidence of brucellosis in humans is extremely rare.  Brucellosis was first identified in domestic cattle in the United States in 1910. In 1917, it was first identified in Yellowstone bison.  The USDA, responding to livestock and public health concerns, began an effort to control and eradicate brucellosis in 1934 by developing vaccines and depopulating entire herds when several animals tested positive for the bacterium. Currently, all but Florida and South Dakota are brucellosis-free, and these last two states are poised to eradicate the disease.  After more than 30 years and $30 million, and the sacrifice of many cattle, Montana achieved brucellosis-free status in 1985. That same year, state and federal agencies began eliminating some Yellowstone bison that migrated out of park boundaries. Since the winter of 1991-92, Native Americans from reservations such as northern Cheyenne, Crow, and Fort Peck have sometimes assisted in harvesting and using the bison carcasses. Other bison carcasses have been distributed to nonprofit charitable organizations and food banks.  Adapted/Excerpted from: <http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2008/02/0027.xml> |

Appendix 2:

Questions to Accompany *Applying an Ecosystem Approach to Brucellosis Control: Can an Old Conflict between Wildlife and Agriculture be Successfully Managed?*

1. How was brucellosis first transmitted to the Yellowstone bison?

2. How can humans contract Undulant Fever?

3. What position do most ranchers take concerning bison, elk, & brucellosis?

4. What position do most conservationists take in this issue?

5. How does brucellosis affect cattle?

6. In the current Bison Management Plan, what happens to bison when they leave Yellowstone National Park?

7. What happens to elk when they leave the park?

8. How many bison had been culled from YNP by 2006?

9. Why does Wyoming have designated feeding grounds for elk?

10. How does the prevalence of brucellosis in Wyoming elk on winter feeding grounds compare to those not on the winter feeding grounds?

11. What percent of bison are seropositive for brucellosis but have no active infection?

12. Why do most ranchers prefer test-and-slaughter methods of brucellosis management rather than quarantine for their cattle?

13. How does keeping brucellosis-resistant bison in the herd reduce disease transmission?

14. Why have vaccines not been used more with bison?

15. Why do the authors of this paper not like the idea of MDOL heading the program for brucellosis control in bison?

Appendix 3:

**Steps in Developing your Bison Management Plan:**

[**http://www.reocities.com/athens/2400/ppsteps.html**](http://www.reocities.com/athens/2400/ppsteps.html)

[**http://www.wisegeek.com/what-are-the-steps-in-the-public-policy-process.htm**](http://www.wisegeek.com/what-are-the-steps-in-the-public-policy-process.htm)

**1. Identify the Problem**

The first step in the public policy process is to outline the problem. This involves not only recognizing that an issue exists, but also studying the problem and its causes in detail. This stage involves determining how aware the public is of the issue, deciding who will participate in fixing it, and considering what means are available to accomplish a solution. Answers to such questions often help policy makers gauge which policy changes, if any, are needed to address the identified problem. The agenda — which problems are addressed — can be set by the public, special interest groups, or government officials, among others.

You and your partner should develop a two-paragraph problem identification. Be sure to address the basic arguments involved in the controversy, who/what is affected by the issue, and why the current policy needs amending.

**2. Formulate a Policy to Resolve the Problem**

After identifying and studying the problem, a new public policy may be formulated or developed. This step is typically marked by discussion and debate between government officials, interest groups, and individual citizens to identify potential obstacles, to suggest alternative solutions, and to set clear goals and list the steps that need to be taken to achieve them. This part of the process can be difficult, and often compromises will be required before the policy can be written. Once the policy is developed, the proper authorities must agree to it; a weaker policy may be more likely to pass, where a stronger one that deals with the problem more directly might not have enough support to gain approval. It is at these early stages of policy making that intelligence can be more important than politics.

First, list each of the stakeholders in this case and their position. Then, using sound scientific data, determine a policy to address the bison management issue (cite your sources). Your policy should address the concerns of all the stakeholders (not necessarily satisfy each of them, but it should try to reach a suitable compromise). Your policy should be a minimum of 3 paragraphs and should use data to support your reasoning.

**3. Implementing the Policy Change**

A new policy must be put into effect, which typically requires determining which organizations or agencies will be responsible for carrying it out. This is the third step of the public policy process, and one that can be difficult if the people who are tasked with carrying out the policy are not committed to complying with it. During the policy development step, compromises may have been made to get the policy passed that those who are ultimately required to help carry it out do not agree with; as such, they are unlikely to enforce it effectively. Clear communication and coordination, as well as sufficient funding, are also needed to make this step a success.

You and your partner should list each of the local, state, and federal agencies’ roles in carrying out your new policy. A minimum of 5 different agencies and their roles’ should be discussed here. You should also discuss appropriation of funds in this portion. Use the agencies in the existing Interagency Bison Management Plan as a guideline.

**4. Evaluating the Effect of the Policy Change**

The final stage in the public policy process, known as evaluation, is typically ongoing. This step usually involves a study of how effective the new policy has been in addressing the original problem, which often leads to additional public policy changes. It also includes reviewing funds and resources available to ensure that the policy can be maintained. Problems are bound to arise once the policy is actually being implemented. People may object to the interpretations the bureaucracy has made in its implementation. It may be found that the cost of implementing the policy far outweighs the benefits received from it. The implementation of the policy may have consequences that were unforeseen by the legislators and bureaucracy. In addition, the bureaucracy, itself, does formal evaluations upon its performance for inspection by Congress or other policymakers. They check to see if their performance is not only efficient, but also if their actions are politically acceptable. All of this information feeds back into the government and could end up on the agenda again to be interpreted as a new public problem. The cycle would then begin again.

You and your partner should develop a one-year, five-year, and ten-year plan to test the effectiveness of your policy. Discuss how scientific data, anecdotal evidence, and public opinion will be utilized to determine its efficacy. This portion should be a minimum of three paragraphs.

Public Policy Rubric

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| --- | --- | --- | --- | --- | --- |
| CATEGORY | **4 - Above Standards** | **3 - Meets Standards** | **2 - Approaching Standards** | **1 - Below Standards** | **Score** |
| **Identifying the Problem** | Students identify more than 4 reasonable, insightful barriers/problems that need to change. | Students identify at least 4 reasonable, insightful barriers/problems that need to change. | Students identify at least 3 reasonable, insightful barriers/problems that need to change. | Students identify fewer than 3 reasonable, insightful barriers/problems that need to change. |  |
| **Policy Development** | The policy provides a clear, strong statement of the author\'s position on the topic. | The policy provides a clear statement of the author\'s position on the topic. | A policy is present, but does not make the author\'s position clear. | There is no clear policy development. |  |
| **Support for Policy** | Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the policy. The policy anticipates the concerns, biases or arguments of the stakeholders and has provided at least 1 counter-argument. | Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the policy. | Includes 2 pieces of evidence (facts, statistics, examples, real-life experiences) that support the policy. | Includes 1 or fewer pieces of evidence (facts, statistics, examples, real-life experiences). |  |
| **Policy Implementation** | Students identify more than 5 reasonable agencies of change as well as appropriation of funds. | Students identify at least 5 possible agencies of change. | Students identify at least 4 reasonable agencies of change. | Students identify 3 or fewer agencies of change. |  |
| **Policy Evaluation** | Plans and support are provided in a logical order that makes it easy and interesting to follow. | Plans and support are provided in a fairly logical order that makes it reasonably easy to follow. | A few of the details or plans are not in a logical order or seem a little confusing. | Many of the plan’s details are not in a logical order and make the plan seem very confusing. |  |
| **Policy Overview** | The policy appears strong and plauisble and leaves the reader solidly understanding the position. | The policy is well-detailed and reasonable. | The policy seems reasonable but may be lacking in potential effectiveness. | The policy seems illogical. |  |