

Endangered Species & Biodiversity: A Classroom Project & Theme

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ABSTRACT

Students discover the factors contributing to species losses worldwide by conducting a project about endangered species as a component of a larger classroom theme of biodiversity. Groups conduct research using online endangered-species databases and present results to the class using PowerPoint. Students will improve computer research abilities as well as develop organizational, writing, and public-speaking skills. This topic can be used for most educational levels by adjusting the difficulty of the content.

Key Words: Biodiversity; conservation; endangered species; environmental ethics; extinction.

The loss of species diversity is one of the most concerning environmental issues facing the biosphere today. The rate of species loss is so high that experts suggest we are entering the sixth mass extinction event for the planet (Pimm et al., 1995; Leakey & Lewin, 1996; Wilson, 2002). As educators, we can help sensitize students to the problem so that they can become educated citizens able to make informed decisions, for example when voting. This can be accomplished with a project on endangered species as a component of a larger classroom theme of biodiversity. This topic may be utilized for most educational levels by adjusting the difficulty of the content.

Biodiversity, short for “biological diversity,” is that impressive and wondrous aspect of life: from genes, to species, to ecosystems. The number of species discovered to date, according to the *Global Biodiversity Assessment* produced for the United Nations, is somewhere between 1.5 and 1.8 million (Heywood, 1996). A low estimate for the actual number alive is approximately 4 million. Yet when small organisms such as bacteria, protists, and insects are taken into account, the number of species on earth may be as high as a 100 million or more (Parker, 1982; Wilson, 1988; Heywood, 1996). Sadly, the current rate of loss is likely hundreds, possibly thousands

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of times higher than the natural background rate of 1 species/million/year (Wilson, 2006). As a consequence, many species and their special values are being lost before they have been discovered, and if nothing is done we may lose half of the planet's species by the end of the century (Wilson, 2002). Edward O. Wilson's trilogy *The Diversity of Life*, *The Future of Life*, and *The Creation* (Wilson, 1999, 2002, 2006) provides a helpful overview of this subject and are the basis for modern biodiversity conservation.

In a scientific-inquiry course for nonmajors at St. John's University, the path of biodiversity is studied from its evolutionary beginnings some 3.8 billion years ago when the first cells develop, through species' adaptive radiations and mass extinctions, to present-day losses of diversity. To provide an in-depth understanding of biodiversity and the factors influencing its decline, an inquiry-based project is assigned that has students work in groups to create PowerPoint presentations on endangered species. Alternatively, poster presentations can be created and shared with the class or school. Each semester, a project theme based on a geographic biome, local or international, is selected – for example, North American prairie or Amazonian rainforest.

The project begins with a background lecture on factors that make species vulnerable to extinction (Primack, 2010), including large species with low reproductive potential, species with high economic value, and species that live on islands. The class learns about how the exponential growth of the human population affects species, for example through habitat loss, introduction of invasive species, and global warming. Groups work cooperatively on Internet research using online databases for endangered species. Students improve computer skills through their research and presentations as well as develop organizational, writing, and public-speaking abilities. A fitting time for presentations is Earth Day (22 April) or Endangered Species Day (15 May).

○ Objectives

- Students will use an inquiry-based approach to understand the factors influencing the decline of biodiversity worldwide.
- Students will become sensitized to the plight of endangered species around the world, emphasizing the value of species and environmental ethics.
- Students will learn to appreciate the complex sociopolitical nature of endangered species conservation.
- Students will improve computer skills as well as group research, writing, and public-speaking ability.
- Students will research and gather the knowledge necessary to make educated decisions about biodiversity concerns, for example when voting in elections or when purchasing products that may affect endangered species.

○ Project Outline

- 1) Students organize into groups of two. Each group selects an endangered species to profile of their own choosing or from a list provided.

- 2) A blank electronic species factsheet is made available (Figure 1) and acts as an outline for presentations. Students complete the factsheet using their independent research and websites provided (see list below), filling in information for species: taxonomy, geography, ecology, and conservation. On the day of the presentation, the completed factsheet for each group is distributed to all members of the class.
- 3) Students are required to use multiple sources of information, including science journals and magazines, newspapers, books, and Internet sites (see below).
- 4) Once the factsheet is completed, students are given one class period to work on their presentations using their university laptops. It is during this time that problems are discussed and worked out, including assistance to create PowerPoint slides.
- 5) On the day of the presentations, students are given two worksheets to complete during the talks, which helps them stay engaged. Everyone receives a blank world map to locate species discussed. In addition, a table is provided to record factors that influence the profiled species' vulnerability to extinctions. From this a graph is produced.

- 6) Students are graded using a rubric provided in advance that evaluates their talk, presentation print-out, species factsheet, map, graph, and final summary.

Student Names:	
ENDANGERED SPECIES FACT SHEET (put common name here)	
<i>Picture of your species</i>	<i>Map showing where your species lives</i>
TAXONOMY	
Domain	
Kingdom	
Phylum	
Class	
Order	
Family	
Genus	
Species	
What is the IUCN and FWS status for this species?	IUCN: FWS:
Where is this species found?	
Is it located in a biodiversity hotspot? If so which one?	
Describe briefly the ecology of your species. What habitat does this species live in? What does it eat?	
Why is this species endangered – What threats does it face?	
How many are left?	
How is it protected – what laws protect it?	
What can we do to help this species?	
Facts of interest for this species.	

○ Enrichment Activity: Why Do Species Have Value?

To support the project, an activity is conducted in which the class divides into groups of five to discuss why species have value and to consider whether limits need to be placed on protecting endangered species. Once students have had time to work out their thoughts, a classroom discussion ensues during which lists are made on the board.

The activity is introduced by a homework assignment in which independent Internet research is conducted about why species have value. In addition, websites are provided to read (see links below) for a case study about an endangered species controversy such as the snail darter of Tennessee or the spotted owl of the Pacific Northwest (Murchison, 2007; Primack, 2010).

Students discover that species provide us practical or instrumental values in that they give us the necessities for life, such as oxygen to breathe, food to eat, and medicines to treat disease. In addition, students may realize that species provide us with a less tangible, but no less important, value – intrinsic value, based on respect for life, beauty, and spirituality. Students learn that species go extinct naturally

Figure 1. Species factsheet.

but that humans are escalating the process, and that conservation may become necessary in these situations. Ultimately, students discover that protecting endangered species is largely an ethical matter (Wilson 1984, 1999, 2002; Kellert, 1996).

○ Links of Interest

For the project, students are required to visit the following websites in addition to their independent research to gather information for species profiled.

○ Background Information

- Endangered species project
<http://facpub.stjohns.edu/~laurob/>
This site, created by the author, provides forms used for the project and useful links to information, including those below.
- United Nations International Year of Biodiversity 2010
<http://www.cbd.int/2010/welcome/>
Useful background information, including an informative video, is available at this site.
- Biodiversity and Conservation: the Web of Life
<http://www.fieldmuseum.org/biodiversity/intro.html>
This Field Museum (Chicago, Illinois) site on biodiversity provides user-friendly background information on the subject of biodiversity.
- Interview with E. O. Wilson by Bill Moyers on PBS
<http://www.pbs.org/moyers/journal/07062007/watch.html>
This broadcast provides a useful review of the subject of biodiversity by a leader in the field. Students are required to listen to the interview as background.

○ Why Do Species Have Value?

- Why Save Endangered Species?
http://www.fws.gov/endangered/esa-library/pdf/Why_Save_Endangered_Species_Brochure.pdf
This pamphlet made available electronically by the U.S. Fish and Wildlife Service gives a helpful overview of endangered species conservation.
- Ethics and the Spotted Owl Controversy
<http://www.scu.edu/ethics/publications/iie/v4n1/>
This article by Claire Andre and Manuel Velasquez provides a useful synopsis of the conservation debate for this endangered species.

○ Endangered Species Databases

- IUCN (International Union for Conservation of Nature) Red List
<http://www.iucnredlist.org/>
The Red List is an international system that evaluates and assigns conservation listing status (for example, endangered vs. threatened) for species. This site has a useful database that students use to complete factsheets for species; it includes listing status, taxonomy, geographic location, and ecology. Students are required to explain the IUCN Red List status for species profiled.
- CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)
<http://www.cites.org/>

An international agreement among 175 countries whose aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. It places international sanctions on the trade of endangered species' body parts, such as elephant ivory, rhinoceros horn, and tiger skin and bones. Students are required to explain whether CITES applies to the species they profile.

- U.S. Fish and Wildlife Service (FWS) Endangered Species site
<http://www.fws.gov/endangered/>
The FWS is the lead agency in the United States, empowered by the Endangered Species Act of 1973, to protect species within the country and around the world. It evaluates and lists, develops detailed recovery plans, and protects habitats for species. It is also responsible for protecting species from harm, "taking" or trade, both nationally and internationally. Students visit this site to examine whether and how the FWS protects their species, comparing it with the IUCN Red List that may be different.
- Biodiversity Hotspots
<http://www.biodiversityhotspots.org/>
Biodiversity hotspots are regions of conservation concern around the world that have a high number of endemic vascular plants (at least 1500) but have lost at least 70% of their original habitats. Students are required to determine whether their species is located in a biodiversity hotspot; if so, they need to describe it to the class.

References & Additional Resources

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