

**Conserving Biodiversity Lecture Outline**

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\*Number in outline corresponds to slide number the PowerPoint presentation.

1. Conserving Biodiversity
2. Biodiversity
  - a. Before we can talk about preserving biodiversity, we have to understand what it is. In broad strokes, biodiversity is simply the types and number of organisms that live in a shared habitat. That habitat can be anything from a tide pool found on the Oregon coast, or an area much larger, such as a tropical rain forest in the Amazon Basin that covers 2.1 million square miles.
  - b. Dig a little deeper and biodiversity includes the variety of living organisms, genetic diversity found in a species and the abiotic factors (Non-living components of an ecosystem) that support them.
3. Conservation Biology
  - a. An ever growing branch of biology that has been getting global attention from the scientific, social and political communities is conservation biology. This branch of biology is focused on studying and preserving the earth's amazingly vast variety of life. There are three ways biodiversity can be studied.
    - 1) Species diversity. Spp. Diversity looks at the different types of organisms that support and/or rely on a community. As we will learn in subsequent lessons, sometimes the survival of one species that lives in a habitat is essential to the survival of the entire community. An example would be endangered sea otters that live in kelp beds along the coast of North America. A sea otter's main source of food is that of sea urchins that share the habitat. Sea urchins in turn, are voracious grazers, whose diet consists mainly of the kelp that provides food and shelter to a myriad of other species. As otter populations continue to decline, the urchin populations explode, quite literally eating themselves, and the rest of the community, out of house and home. Without the otter in that community, the entire ecosystem would crash.
    - 2) Genetic diversity. Genetic diversity is all about maintaining a large number of traits and adaptations within a species. Genetic diversity enables a population to more easily respond and adapt to an ever changing environment. Take the cheetah for instance. Early in the 20<sup>th</sup> century cheetah were highly prized trophies for many recreational hunters and poachers. Pair the dramatic decline in numbers with the increasingly fragmented habitat because of human populations, advantageous traits were slowly lost over time. The increased loss of "good" genes made it so hard for cheetah populations to continue to adapt to human influences, fight off disease, and create viable offspring that they were driven to the brink of extinction, and in fact have been extinct in India in the 1940s.
    - 3) Ecosystem Diversity. Ecosystem diversity is important because it not only encompasses the living components of an ecosystem, but also the non-living components. Every type of ecosystems plays an important role, from tropical rainforests that act as a carbon sink, removing greenhouse gasses from the atmosphere, to wetlands that filter pollutants and maintain optimal water temperatures for streams and rivers that provide homes to salmon.
4. Ecosystem services. These are all the ways humans benefit from resources provided by the world around us. There are two types of service provided: Direct and indirect.
  - a. Direct services are easy to quantify. Food, shelter, medicine, clothing, fuel, are all resources that we obtain directly from our surroundings.
  - b. Indirect services are a little more complicated. Taking into account things such as how much it would cost us to recreate that same service, money spent on damages caused by flooding from damaged riparian zones, and recycling of nutrients back into the soil, tourist dollars funneled into the economy for things like recreational and commercial salmon fishing, it has been estimated that indirect services can be estimated to be worth upwards of 33 trillion dollars.

- c. Fun fact to share at parties: The process of purifying urban waste water is expensive, both monetarily and energetically. The process significantly raises the water temperatures, which must be lowered before releasing into the environment. Maintaining natural water temperature in our rivers and streams is essential to the reproductive success of fishes that live and breed in the habitat.
  - d. The Oregon Garden, near the city of Silverton, Oregon has reconstructed wetlands as part of their educational landscaping program. The city of Silverton feeds cleaned waste water through the wetland to naturally lower the temperature of the water before allowing it to enter back into nearby rivers and streams. This lowers the cost of the purification process, thereby lowering utility cost of the residents of Silverton!
5. Mass Extinction Events.
- a. Although extinction events have occurred throughout earth's history, even before humans came on the scene, current trends are quite alarming to most biologists. The fossil record shows evidence of 5 major extinction events over the course of earth's history, and most conservationists believe we are smack dab in the middle of extinction event number 6, this one almost entirely human caused. So, let's throw some data at you.
6. Globally Threatened Species.
- a. It is estimated that extinction rates are currently 100 to 100 times higher than the normal extinction rates, and it is estimated that globally, every type of species, from bird to fish to bug are under serious threat of extinction.
7. Endangered and Threatened Species
- a. Let's talk about the different levels of threat that a species can be faced with. There are three basic categories that a species can be classified as when it is in danger of extinction. Endangered, threatened and vulnerable. Depending on how imperiled a species is, biologists monitor and evaluate each group to determine whether intervention is required.
8. Humanity's Ecological Footprint.
- a. This graphic shows you, based on the amount of resources humans as a global population use, relative to the amount of resources that are available on the planet.
  - b. Somewhere in the mid 80s, humans began to exceed the planet's biocapacity, or amount of resources available on the planet. With the world population now exceeding 7 billion people, with no signs of slowing, soon enough humanity will either need to slow it's consumption of resources or perish.
  - c. Awesome website alert! Go to <http://www.footprintnetwork.org/en/index.php/gfn/page/calculators/> to measure your ecological footprint
9. Major threats to Species.
- a. There are many human activities that directly threaten biodiversity. We could literally spend an entire term just focused on human impact, so let's just have a brief rundown of some of the most important ones.
  - b. Habitat destruction by far wins as the biggest problem faced today. Agriculture, clear cut logging and urbanization are all heavy players. Fragmentation is the result of human activities encroaching on an ecosystem to the point that it gets broken up into smaller parts, isolating individuals from each other, inhibiting the ability for them to interact, breed , obtain resources, etc.
10. Overexploitation

- a. Overexploitation of a species has been a common theme throughout history. The basic difference between overharvesting and poaching is based legality of the activity, and the value we place on the organisms we exploit.
  - b. Overharvesting refers to the legal harvesting of organisms that are commercially relevant species, such as carrier pigeons or salmon fishing.
  - c. Poaching is the illegal harvesting of a species that, most often, we have placed some sort of aesthetic value on. Elephant ivory, or rhino horns are a good example.
- 11. Invasive Species.** There are many ways a non native species can be introduced into a habitat.
- a. They could be stowaways on planes or boats. A currently relevant issue is the introduction of non native species to the west coast due to debris that is still coming ashore from the tsunami in Japan in 2011.
  - b. Sometimes they are even intentionally introduced, such as the case of the cane toad in Australia. In an astounding lack of thought and foresight, cane toads were brought to Australia in 1935, in the hopes that they would help control beetles that were destroying sugar cane crops. The problem: The beetles are active during the day, while the cane toads are mainly nocturnal. So not only did they not protect the cane crops, the highly poisonous toad still continues outcompete, kill, or consume a vast array of native species to this day.
- 12. Goals of Conservation Biology.** Conservation requires the integrated efforts and expertise of many, both within and outside of biology
- a. Ecologists, geneticists, botanists, and zoologists
  - b. Government leaders, environmental lawyers, and ecological economists
  - c. Social scientists, educators, and conservation organizations
  - d. Perhaps most importantly individuals, whose choices and actions ultimately determine if conservation efforts will succeed. All the experts in the world can strategize, scheme and plan to save the planet, but it means nothing if the individual doesn't play the game.