

**Slide 1**

**Text:** Ecosystem management is crucial to sustain the Earth

[Map of world ecosystems]

**Audio:** Standard 8: Characteristics and Distribution of Earth's Ecosystems. The image that you're seeing in front of you on this slide is a map of the world ecosystems. What we see here are nine primary ecosystems on the planet: tropical rainforest, grasslands, deserts, deciduous forest, tundra, coniferous forest, chaparral, savanna and alpine. Of those nine, we can find about five of them in the United States. A geographically informed person needs to understand the spatial distribution or where are the various ecosystems on the planet? How ecosystems function? And how we can maintain and preserve the various ecosystems? Further, what we really need to understand is how human beings have both intentionally and inadvertently modified or change these ecosystems.

**Slide 2**

**Text:** Characteristics and spatial distribution of Earth’s ecosystems

[Photo of Sonoran Desert National Monument]

**Audio:** An ecosystem is comprised of both living and nonliving resources. For example, plants and animals, water waste, geologic formations, soil types and so on live and interact together. These populations of different plants and animals are called a community. On this slide, you see a picture of the Sonoran Desert National Monument. It's a great example of a desert landscape plant and animal community. Here in the Sonoran Desert, we see a variety of biological scientific and historic resources within a functioning desert ecosystem. The Sonoran Desert National Monument encompasses nearly 500,000 acres. And it was established in January 2001 by Presidential Proclamation. The monument's diverse plant communities include plants and animals such as saguaros, creosote bushes, Agave and other circulates as well as a wide variety of wildlife like desert bighorn sheep, mountain lions, desert tortoise, and over 200 species of birds.

**Slide 3**

**Text:** Biosphere = Atmosphere, Hydrosphere, Lithosphere

[Diagram of biosphere]

**Audio:** All of Earth's ecosystems interacting together is called the biosphere or the planet. Within an ecosystem, three other components of the physical environment interact and
interdepend and are interdependent on one another: the atmosphere of the air, the hydrosphere or the water resources, and the lithosphere, the Earth's resources.

Slide 4

**Text:** Characteristics and spatial distribution of Earth’s ecosystems

[Image of a small-scale garden “ecosystem”] [Map of California’s diverse ecosystems or bioregions]

**Audio:** Ecosystems form distinct regions on Earth's surface and they vary in size and in shape and complexity. Ecosystems also exist at variety of scales. They can vary from very small like the small scaled garden ecosystem that you see at the top of this slide. Or they could be a single stand of oak trees or a clump of xerophyte of grasses in the desert. On a larger scale, they can also be precise geographic boundaries. Like a pond ecosystem, a desert biome or ecosystem, an island or a beach. Larger scale ecosystems can form continent wide belts such as the tundra, taiga, and the steppe of Northern Asia. The largest ecosystem is the planet itself, the biosphere.

Slide 5

[Map of ecosystems, bioregions, or biomes in the US]

**Audio:** Noted in an earlier slide were nine important biomes on the planet. Those major biomes, forests, grasslands and deserts can be continually broken down into smaller and smaller sub-units to take into consideration the coast and water currents, the atmosphere and various air currents, physical location on the planet and so on. When we break down the map of the United States into it's major bioregions or biomes, we can count about 25 different sub-regions.

Slide 6

[Chart of Vegetative zones in Arizona by elevation]

**Audio:** Latitude and amount of precipitation are two major determinates of a biome. Elevation works similarly to latitude in this case. So as we look at this graph, on this slide, we see three distinct biomes in Arizona. As if we were moving north from the valley toward Flagstaff, we'll pass through three distinct biome regions. The lower Sonorant [assumed spelling] Desert where we live here in the valley, as we move toward Flagstaff, we'll pass through dry woodlands in Chaparral [assumed spelling] and similarly, once we were to leave Flagstaff and continue driving north to Paige, we'd pass through again, dry woodlands in Chaparral as we come in elevation. The third biome that we'd encounter in Arizona is the Boreal Forest, as we move up toward Flagstaff and toward the San Francisco Peaks; we'll see more Boreal Forest vegetation.
Slide 7

Text: Minnesota Ecosystems

In Minnesota we see three main ecosystems: prairies, deciduous woods, and northern coniferous forests.

This landscape variation is caused by differences in climate and precipitation from north to south. As the ecosystems changes, so too does the flora and fauna of the state.

All of these ecosystems have been altered dramatically since human settlement began. The prairie landscape has been especially affected.

[Map of Minnesota ecosystems]

Audio: Noted in an earlier slide were nine important biomes on the planet. Those major biomes, forests, grasslands and deserts can be continually broken down into smaller and smaller sub-units to take into consideration the coast and water currents, the atmosphere and various air currents, physical location on the planet and so on. When we break down the map of the United States into its major bio regions or biomes, we can count about 25 different sub-regions.

Slide 8

Text: Aquatic Ecosystems

[Drawing of a Wolf Lake] [Logo of Aquatic Ecosystem Restoration at Wolf Lake]

Audio: As we have terrestrial, or land based ecosystems, we also have aquatic or water based ecosystems. The slide on this page describes the Wolf Lake aquatic ecosystem restoration project. Wolf Lake is located on the northwest of Hammond, Indiana and the far, southeast edge of Chicago, Illinois. The land covers over 450 acres in Indiana and has a maximum depth of about 18 feet. The ecosystem degradation problem in Wolf Lake includes the proliferation of exotic plant species, low diversity of plant and fish species, a lack of adequate water depth, poor aquatic habitat, negative impacts from contaminates and shoreline erosion. The proposed project features include creating approximately 25 acres of new aquatic and wetland habitat plantings. Also, restoring approximately 5,000 feet of shoreline, creating deep holes to locally diversify the lake bottom, controlling aquatic and shoreline exotic and undesirable plant species using herbicides and biological controls, clearing channels, and creating openings in dikes and causeways to restore natural water levels in the project area.

Slide 9

Text: I Spy an Ecosystem
All elements of the environment, physical and human, are part of several different but nested ecosystems.

[Image of a girl looking at the surface of the Earth, which is divided like a puzzle, through a magnifying glass] [Diagram of nested ecosystems]

**Audio:** So, as we can see an ecosystem is a complicated thing. Looking more closely, we can break this down from a desert ecosystem, including the plants and the animals, the floor and fauna, the water, and the geology, all the various physical and natural components of Arizona and the Sonoran Desert. Then we need to add the human element, the city, the agriculture, the growth, the dams that we put in place and all of the other actions that humans take on the land. From there then, we can see that all elements of the environment, both physical and human are part of several different, but nested ecosystems.

**Slide 10**

[Photo of a spider web]

**Audio:** In ecological terms, the physical environment can be seen as an interdependent web of production and consumption cycles. Ecosystems are self-regulating open systems that maintain flows of energy and matter. Ecosystems naturally move toward maturity, stability and balance in the absence of major disturbances. Ecosystems are dynamic and ever changing. In fact, if you change something in one ecosystem or in one part of an ecosystem, you see ripples throughout other ecosystems with varying degrees of impact. Thus, the web of ecological interdependency is fragile and needs to be maintained.

**Slide 11**

[Diagram of the hydrologic cycle]

Concepts:

- Water cycles through various pools in the environment
- Cycling occurs when water changes state (*liquid to vapor*)
- This cycling is driven by solar energy

**Audio:** One way to understand the functioning of an ecosystem is to understand the various solar powered cycles that drive the earth. In this slide we're looking at the hydrologic cycle. We can see various pools or storage units of water, like lakes, like rivers, like aquifers or other underground storage units. This water cycles through the earth and back into the atmosphere and down and through earth again. Like all of the various cycles, they keep regenerating themselves. Plants provide the energy to keep animals alive, either directly through consumption or indirectly
through their death and decay into the soil, where the resulting chemicals are taken up by new plants. Soil keeps plants and animals alive and it works to cleanse water. The root systems of plants and the mechanical and chemical effects of water percolating through the bedrock create new soil layers. Ecosystems therefore help to produce chemicals needed by living things to survive. They redistribute waste products. They control many of the pests that cause diseases in both humans and plants and ecosystems offer a huge pool of resources for humans and other living creatures.

**Slide 12**

**Text:** Cycles that power ecosystems

[Diagram of the water cycle, carbon cycle, nutrient cycle and energy cycle]

**Audio:** In addition to the water cycle, we also look at the nutrient cycle, the carbon cycle, and the energy cycle. All of these cycles are critical to the functioning of ecosystems.

**Slide 13**

**Text:** Change & Vulnerability of Ecosystems

[Map of the world showing precipitation during El Niño]

**Audio:** Each one of our ecosystems is subject to change and each one is vulnerable. The stability and balance of ecosystems is altered by large scale, natural events such as El Niño, volcanic eruptions, fire, drought and so on.

**Slide 14**

**Text:** Change & Vulnerability of Ecosystems

[Photo of a dust storm]

**Audio:** And perhaps, more importantly, ecosystems are drastically transformed by human activities. Balance is a key concept in understanding how human intervention can work to restore the over production and over use disruptions we have caused in the global ecosystem. The picture you see on this slide is a truck riding away from the dustbowl conditions in the 1930's in the Great Plain States.

**Slide 15**

**Text:** Mangroves

[Photo of mangroves]
**Audio:** This slide is showing us a picture of mangroves. A mangrove is a sub ecosystem within a greater tropical ecosystem. It's both coastal and aquatic, as well as terrestrial. The benefits of mangroves on the tropical ecosystem are great. They prevent erosion. They provide habitat for both terrestrial as well as aquatic animals. And they provide shade again, for both terrestrial as well as aquatic animals. However, mangroves are in danger of being lost due to unsustainable coastal use practices.

### Slide 16

**Text:** Florida Everglades

[Photo of an alligator]

**Audio:** The image on this slide is a Florida alligator. The disappearance of mangroves and the bio diversity of southern Florida is clear when we look at the number of organisms that depend on the mangrove. The intricate level of the food web in the mangrove forest is apparent when we began considering the role of fungi, bacteria and algae. For example, when leaves drop from the mangrove trees, they are decomposed by the fungi and the bacteria. This decomposed matter then runs into the estuary. The decomposed matter then acts as a food source for life such as shrimp, crabs and fish. About 75% of the game and 90% of the commercial fish in southern Florida are dependent upon mangrove forests. Mangrove forests of southern Florida also provide habitat for a variety of fish. These forests also act as hatcheries, nurseries, feeding grounds and daytime refuge to many fish. The role in the life of the fishes exists partially because of the high amount of nutrients found in the water around the mangroves due to their leaf fall. Mangroves also serve as habitat for many other species, such as birds, reptiles, crustaceans, and mollusks.

### Slide 17

**Text:** ANWR (Alaskan National Wildlife Refuge)

[Map of northern Alaska]

**Audio:** Another ecosystem in the United States that's far flung from the Florida mangroves is ANWR, the Alaskan National Wildlife Refuge. ANWR is located very close to some known petroleum accumulations. It's been put in the public light recently and there's a lot of public debate and controversy about drilling in the unique wildlife area.

### Slide 18

**Text:** Gulf Coast

[Map showing the population density of the Gulf Coast]
Audio: In another example of a unique ecosystem region in the United States, is along the gulf coast. The map on this page shows us the population density of the states around the gulf coast region.

**Slide 19**

**Text:** The BP OIL SPILL in the Gulf of Mexico

[Map of the Gulf of Mexico]

Audio: This slide of the gulf coast is from a map from a New York Times article about the BP oil spill in the Gulf of Mexico. If you go to the New York Times interactive article about the oil spill, you'll see that the image on this slide has a dot in the place the oil spill originated. At the website, click on the arrow and watch as the oil spill throughout the gulf increasingly grows larger and larger and larger. Time will tell what the impacts of the BP oil spill will be on the Gulf Coast.

**Slide 20**

**Text:** Sonoran Desert

[Map of the regions of the Sonoran Desert] [Photo of people removing plants in the desert]

Audio: The map on the left shows us a regional breakdown of the Sonora Desert. The picture on the right hand side of this slide is showing us people on a butte in the Sonora Desert trying to eradicate an invasion of non-native species that threaten the Sonoran Desert Ecosystem. Invasive species upset the natural balance of the unique Sonoran Desert as they disrupt other natural environments as well.

**Slide 21**

[Image of book cover of The Land of Little Rain and The Desert Smells Like Rain]

Audio: By knowing how ecosystems operate and change, students are able to understand the basic principles that should guide programs for environmental management. Students can understand the way in which they are dependent on the living and nonliving system of earth for their survival. Knowing about ecosystems will enable students to learn how to make recent decisions, anticipate the consequences of their choices and assume responsibility for the outcomes of their choices about the use of the physical environment. It is important that students become well informed regarding ecosystem issues so they can evaluate conflicting points of view on the use of natural resources. The degree to which present and future generations
understand their critical role in the natural functioning of ecosystems will determine in large measure the quality of human life on Earth.

**Slide Twenty-Two**

[Photo of Elizabeth Larson]

**Audio:** Standard 8 was written and narrated by Beth Larson, Lecturer, School of Geographical Sciences and Urban Planning, Arizona State University 2010.