Threats to Biodiversity

Instructions:
Underline important information
Bold or circle important vocabulary
Answer the questions after each section IN YOUR OWN WORDS I CAN TELL IF YOU JUST COPY FROM THE ARTICLE!!

Habitat Loss

Habitat loss is one of the biggest threats to biodiversity—it is the number one reason species go extinct. Clearcutting forests to create fields, filling in wetlands to build houses, and creating dams that change river flow are all examples of habitat destruction. Mediterranean ecosystems and temperate forests have already lost 80% of their original cover. The rapidly growing human population is putting more and more pressure on existing habitats.

In most developed countries, original forest cover was lost and converted to farmland long ago. This has ecological consequences and many countries now have national parks and other ways of preserving land for future use. Now, much of the world’s biodiversity is found in tropical forests. Unfortunately, tropical forests are being cut down at the rate of 50 football fields a minute. Yikes! Why would we need to make so many football fields?

It used to be (before the 1980s) that quickly growing human populations in tropical countries were the main drivers behind forest loss. Individuals and families would clear plots of land for cattle, houses or small farms. Nowadays, large commercial agriculture is behind most of the forest clearing—crops, trees and livestock for the global market usually replace tropical forests.

Many tropical forests are being rapidly cleared for agriculture. In the left column, the Chaco thorn forest (A) in Argentina and Bolivia is converted to soybean fields (B and C)

What is the number one reason species go extinct?

Describe two forms of habitat loss.

Invasive Species

Invasive species are the second largest threat to biodiversity after habitat loss. An invasive species is a species that is not native to a particular area, but arrives (usually with human help), establishes a population, and spreads on its own. Invasive species have much larger impacts on an ecosystem than other species. They have a disproportionate effect, which is what makes them so harmful. Keep reading to see what these suckers do.

Not all species that arrive in a new location become invasive—in fact, most do not. Lots of garden plants are imported from other places, and even if they sometimes grow wild, they do not achieve big populations and do not make a
huge splash on native species survival. These are just called non-native or introduced species. The introduced species that do become invasive are the ones that cause big problems.

**What is an invasive species?**

Here are some ways invasive species impact native ecosystems:

**Habitat modification:** European beachgrass (Ammophila arenaria) was introduced to sand dunes on the coast of California, Oregon and Washington in the 1800s. Beachgrass was planted to stabilize the ever-shifting dunes, and it worked well. Too well. European beachgrass forms huge stands of tall, itchy grass and is usually the only species living on dunes that once had a large variety of native grasses and wildflowers. The beachgrass provides more cover for predators that eat seabirds and native plants.

**Competition for resources:** Invasive species can compete with natives for food and space. Zebra mussels (Dreissena polymorpha) have spread throughout the Great Lakes region very quickly since the 1980s. Mussels need hard surfaces to live on, and zebra mussels take up space that native mussels could use, or sometimes just settle on top of the native mussels, killing them in the process.

**Predation:** Guam, an island in the Pacific Ocean, has lost most of its birds to an invasive species. The brown tree snake was introduced to the island and wiped out three-quarters of the native bird species and two of the eleven native lizard species. Brown tree snakes have been introduced to other Pacific islands and had similar impacts in those places by eating eggs, young and adult birds, and reptiles.

**Herbivory:** On the eastern side of the United States, two insects have been wiping out dominant trees. The Asian balsam woolly adelgid (Adelges piceae) has killed 90-99% of Fraser fir trees in some areas in the Appalachians by sucking the sap out of the trees. This adelgid also affects fir trees in Washington state and Oregon. Its relative, the hemlock woolly adelgid (Adelges tsugae), has killed most hemlock trees in New England.

**Describe 2 ways that invasive species can affect populations of native species.**

**Overexploitation**

Overexploitation means harvesting species from the wild at rates faster than natural populations can recover. Overfishing and overhunting are both types of overexploitation. Currently, about a third of the world's endangered vertebrates are threatened by overexploitation.

Two birds that were victims of overhunting are passenger pigeons and great auks (a type of bird). Both were hunted to extinction. American bison came close to extinction when they were hunted for their skins in the 19th century but have recovered, so luckily it's still okay to eat bison burgers (sorry, vegetarians!). Overhunting still poses a big threat to animals in developing regions, particularly primates in Africa.
What is overexploitation?

Most of the land animals we eat are farm-raised, not hunted in the wild. Fish, on the other hand, are often still fished from the wild. Humans have to eat, but we have been taking fish for food faster than they can replenish their wild populations. It is estimated that 63% of commercial fisheries are overfished to some extent.

Overfishing happens mostly because humans have gotten really good at fishing. We have big boats, fancy GPS systems, and mechanized fishing lines. The fishing techniques called bottom trawling and dredging involve dragging huge heavy nets across the ocean floor, picking up everything along the way. This includes plants and animals that are not the target fish. These unwanted things usually get tossed out. All this other, non-target catch is called bycatch. Bycatch can include sea turtles, sharks, corals, and lots of other animals. These fishing methods are super destructive of habitats on the bottom of the ocean, especially slow-growing corals, in both warm and cold water.

The tuna, cod, halibut and haddock fisheries in the North Atlantic Ocean have declined to one-third of what they used to be. The overexploitation of fisheries is an example of a tragedy of the commons—people take more and more of a common resource until it is no longer available.

Sometimes organisms are harvested for purposes other than food. Many animals and plants are collected to be pets, souvenirs, or trophies in a collection of exotic species. Many of these collecting efforts are illegal and are also known as poaching, which is the illegal capture of protected organisms.

Poachers collect rhinoceros horns, parrots, orchids, and many other living things illegally from tropical forests, and also collect fish or corals from marine ecosystems. The problem is that collecting these animals is bad for their populations and habitats, especially when it is a species that forms a habitat, like coral reefs. Not to mention what it does to the organism itself—many animals die while they are being smuggled for the pet trade, and corals are killed off to make trinkets for souvenir shops.

Describe two examples of overexploitation.

Pollution

You might have heard about the hole in the ozone layer. To understand what it is and why it is important, we'll first look at what ozone does in our atmosphere. The atmosphere is divided into two layers—the lower layer is the troposphere, and the stratosphere is the upper atmosphere. Most ozone occurs naturally in the stratosphere and acts as a protective shield, keeping out harmful UV rays from the sun. We'll call this the "good" ozone.

Some ozone is also located closer to the ground. This ozone causes smog and is destructive when it comes into contact with living things. We'll call this "bad" ozone (or some might call it "misunderstood" ozone). The US Environmental Protection Agency uses the phrase, "good up high, bad nearby" to describe ozone's split personality. Kind of a nice rhyme, if you ask us. Kudos to the US EPA.
Pollution from human activities has caused ozone to be destroyed (or “depleted”) in the stratosphere, leading to the "hole" in the ozone layer. Technically, it’s not exactly a hole but a depletion of ozone around the north and south poles.

Chemicals used in air conditioners, pesticides, aerosol propellants, such as chlorofluorocarbons (CFCs) and other ozone-depleting chemicals called halocarbons are responsible for destroying ozone in the upper atmosphere. When ozone in the protective layer has been destroyed, it lets more UV-B reach the ground. These harmful rays cause sunburns and skin cancer in people, damage crops, and harm marine algae. The good news is that the main ozone-depleting chemicals are being phased out and are not allowed when an alternative chemical can be used instead.

Depletion of ozone is actually a reversible event—as long as we stop using chemicals that destroy ozone, our stratosphere should return to normal eventually. The EPA estimates ozone levels will return to normal by 2050.

Why is the ozone important?

Acid rain: Another unintended consequence of pollution is acid rain. Acid rain is rain that contains nitric and sulfuric acid, and is usually caused by pollution from power plants that burn fossil fuels. Power plants release sulfur dioxide and oxidized nitrogen, which form acids in the atmosphere.

As you might imagine, acid falling from the sky is not great for the things it lands on—rivers, lakes, trees, even buildings and cars. The sulfuric and nitric acids released at power plants can travel hundreds, even thousands of miles by wind.

Acid rain hits lakes and streams hard. The organisms that live in lakes and streams (fish, amphibians, plants, clams, snails, insects) have a hard time surviving in acidic conditions. To be fair, you would not be happy if acid rained down on you from the sky, either. Fish eggs cannot hatch if pH is too low (≤ 5), adult fish die, and clams, snails, and insects die even at higher pHs, leaving fewer food options for predators. Acid rain also hurts trees by damaging their leaves, slowing their growth, and making soil more toxic to plants.

How does acid rain affect an ecosystem?

The good news is that the US passed laws to reduce air pollution in 1990 with the Clean Air Act Amendments. Since then, the effects of acid rain on aquatic and forest ecosystems have decreased (Talhelm et al. 2012).

Write to explain: How do threats to biodiversity (habitat loss, invasive species, overexploitation, pollution) affect ecosystems? Use and explain AT LEAST 3 pieces of evidence from the article! Use loose leaf paper if you need more room!