

>> Looking good. Ah oh, we're going to start with this idea of why we should preserve wild species and list some overall categories, events and specific examples, so the first reason would be economics, money making wild species are considered a resource. We define that word resource [inaudible] about wildlife resources. So wildlife resources are the wild species, like living organisms, that is actually or potentially useful to humans. And so, as we look at all of these categories today, we'll be thinking about wildlife resources, how are these organisms either already realized, it's already happening, or have the potential to be useful in some way. And so when we think about economics, that is money making, some examples of wildlife resources that make money for groups, one we've already talked about; the timber industry. So this idea of logging and forestry, deforestation, that it's happening in part because it is a money making venture so there is economic potential and realization. What else? Fishing is a money making if it's done in a commercial way, so marine fishing, fresh water fishing is an again, economic benefit for people that live either along the coastlines and make fishing, in some way, their livelihood and/or freshwater fishing also a livelihood for people along rivers and lakes. Wildlife tourism, some of you wrote this in your report, about wildlife tourism being actually a money making venture and that this idea of wildlife tourism instead of killing organisms for some economic gain, that tourism actually is another economic gain without having to kill organisms, and agriculture is, as always, a money making venture but the idea here is, instead of replacing plants that are found in these areas, with plants as we talked about, that don't survive well there, to look for plants that are native to something like the rainforest and find ways to gain those plants benefit agriculturally, so two examples that are currently being used in rainforests in Africa and in India, are called the Amaranthus and the Moringa. So instead of taking things like corn or soybeans into these areas, finding and discovering these plants that, instead, can be used agriculturally as a food source for people. And so this what the Amaranthus looks like, this is the Moringa tree, and these pods and the actual pods we're seeing here, are very, very, very, high protein food sources. So instead of taking in plants that you can grow very fast and grow a lot of it, but it doesn't have a lot of protein, you can actually undergo agriculture with plants that are native to the area and provide food for the very high population of people that live there, that are very high in protein. Because just having enough food to eat is not necessarily beneficial if you don't have a high protein diet, you can actually be malnourished even if you're eating plenty of food. And so most of the grains that are planted, as agriculture grains, are not high protein. And so it would be better to continue this kind of agricultural source that are high in protein, to feed large numbers of people that are indigenous to the area. What else? Medical importance; we've talked about this a little bit already. So again, either it's already happening or the potential for medicines from wildlife sources, so about 75%, this is the whole world population, including developed, completely developed, regions, rely on plants as the original source of a medicine. And so I'm going to show you some examples in just a moment, but that means all, we rely on many of the medicines that we take, were derived at some point from a plant, 75%. So I'll show you

some examples; prescription and non-prescription drugs, pharmaceuticals, are often derived from plants, but also fungi, also bacteria, so not just plants are used for medicines and drugs but fungi and bacteria. I'll show you an example of that as well. The other thing about that is, in the [inaudible] parts of the world, traditional medicines, you can't go to the corner Walmart, right? You can't go to the corner CVS, so medicines are derived from nature and so again, a lot of herbal type medications are what are being used around the world, instead of being able to go to the local pharmacy and get medicine. And lastly, a lot of research and experimentation for medicines are done on organisms from the wild, or at least were once in the wild, so things like fruit flies, and mice of course, and certain, bless you, certain types of fish are used in genetic testing to look at genetic diseases that are passed on. Viruses aren't living things, but viruses are used to bring us vaccines into our bodies, so things from nature that are used for experimentation research, again for medicines for humans. So this is called the rosy periwinkle, and the rosy periwinkle is the plant that was found to have the, once it's ground and turned into a liquid, is used now as a cure for leukemia. So, plant derived another cancer cure from a plant, we already talked about taxol. This is called foxglove; foxglove is used to make medicine, originally was called digitalis. Digitalis is used for heart patients, so it helps with heart attacks, preventing heart attacks. This is penicillin; in its fungal form, penicillin is a fungus, so an antibiotic, it comes from nature. This is called quinine; this plant, quinine, is used to treat malaria, we don't have too much bad malaria in the United States but certainly a large population in Africa, where there's bad malaria and this is where the medication originally came from. This is a willow tree bark, which is an actual pain reliever and it is used in pain relievers now that we purchase. So a lot of these originally, just like taxol from the yew tree we talked about, originally came from a plant or a fungus and it can now be made in a lab somewhere, without the original plant source, because the genetic makeup, the chemical makeup of the plant is known, so now you just combine the ingredients that are found in the plant and you can make these medications, these narcotics, for humans. What else? We like to be out in nature I hope, so we should preserve some for, right, aesthetic means beauty or recreational importance for us, so some examples, right, are hunting and fishing, and things we've talked about; bird watching, photography, these are all pastimes, hobbies, that people have out in nature that we want to save and protect. Areas of wildlife so that we can continue to enjoy these types of activities that we find out in nature. And we'll put this one up again, so I said wildlife tourism is a money maker for sure, but it's also something that as a person that enjoys nature, you might take advantage of, for the recreational importance of it. So you know, reasons that we want to protect wildlife or for other hobby-type pursuits that we might have, right, so it's something like tourism on something like safari in Africa. What else? The ecology of it. Why is it important to preserve all types of species; animals, plants, fungi, bacteria, protease? And it's so that the health of the ecosystem is maintained because everything's interconnected, even if we can't see it, or know about it. Okay, so now, this is going to look like a really long list and it is, you can choose your favorites, you don't have

to write everything here, so just choose one or two that you like, but definitely add this last one; maintain biodiversity. So add a couple, whichever ones you want, these all have to do with maintaining a healthy ecosystem, right? So food supplies are dependent on wildlife, we just talked about that, water resources and healthy soil are dependent on all types of wildlife, plants and fungi help to detoxify and flatter pollutants, we've talked about that one a little bit already, those decomposers help break down dead stuff so we're not buried in dead stuff, so lots of, and we can't see all of these, we aren't even aware that all of these organisms are around us, but they're doing all of these jobs continuously, to make sure that the ecosystem is healthy. And the last one, we already talked about this term biodiversity, so in terms of the ecology of maintaining biodiversity, just a reminder of the definition of biodiversity, so remember, biodiversity is all of the organisms, all of the organisms and how they're all very different from each other, and how they interact with each other, the types of interactions that they share, and their genetic makeup, their DNA. That's all part of what we call biodiversity. And maintaining this rich biodiversity again, maintains a healthy ecosystem. So just a, we did it already but we'll asterisk or highlight the word biodiversity, I definitely want you to know the definition of biodiversity so, highlight it again, another reminder about that. And a reminder just about test, again, whenever I kind of pointedly say, highlight or asterisk something, it's because it's going to be on the next test, so make sure you do that and make sure you double check those when you're going back and doing your studying, that you're looking for those particular terms that we're looking at. So, right, biodiversity web and all the interactions of plants and animals and microorganisms, fungi that might be in the soil to bring about a healthy ecosystem, so all of these organisms depend on each other and provide some service to an ecosystem. So, the last one, ethical importance; so all of the things we're talking about here have been an anthropocentric view. And anthropocentric means how are these things important to humans? That's an anthropocentric view. So everything so far, except maybe the ecological importance because that's important for all the organisms including us though, had to do with okay, how can these groups of wildlife help us? And so that's anthropocentric view, human centered. But just as important, excuse me, is the biolife centered view and a biocentric view, the idea is every organism's important and it shouldn't just be important to us because it's going to provide us with something. It should be important just because all organisms are on earth and should remain on earth and have a right to be on earth, equal to all other organisms. And so that's called biocentric, thinking about okay, let's preserve these organisms just because it's the right thing to do because all organisms have a right to existence on earth. The other type of view is called, eccentric, as in ecosystem. And so this is alright, if we think about the entire ecosystem as we were just talking about, especially the ecological importance of organisms, an eccentric view is saying that in order to make sure that species are safe and protected, we should be thinking about protecting an entire ecosystem. So not one species at a time, which we'll talk about next class, ways that species are being protected, but if we try and preserve entire ecosystems that all of the benefits of the ecosystem,

including the organism survival, will be maintained within an ecosystem. And so the idea there is if possible, it's probably better to maintain organisms in their original ecosystems, than maintain organisms in things like zoos, but we'll talk about zoos, and research centers, and they absolutely have their place in 2019 almost 2020, unfortunately, but the best way to preserve all organisms would be let's try and save some ecosystem in all parts of the world where they would survive. So, we'll talk about that in a couple of our class meetings, we'll just kind of mention these now and we'll come back to each one. So, just a little bit, not a lot, I cut a bunch out but here are some of my favorite, again, history having to do with ecology. So remember, 19th century, the 1900's, were called the age of extermination, we were talking about it originally having to do with deforestation, but now let's add some other organisms since we're talking about other organisms today. So you all know this one, you've been learning about the bison, the American buffalo since probably first or second grade, but it is an example of an organism that was hunted almost to extinction in the United States during this time. So, we'll look at the bison, which was killed for primarily sport, unfortunately, it was used a bit as a food source, but the entire organism in the 1800's was not used, at least not by European settlers, for food, they would just eat kind of delicacies, tongue and internal organs, were considered delicacies, but also again, this goes back to this idea that we were at war with the Native Americans, Western European settlers, and the American bison, buffalo, was used by plains American, Native Americans, every part of the organism; as a food source, as shelter, as clothing, the entire organism. So if we get rid of this main source of livelihood, it will also negatively impact the Native Americans [inaudible]. So lots of reasons that this was happening. Another group of organisms that were dropping in drastic numbers, this is currently happening by the way, we'll come back to in a second, were, bless you, were familiar birds, in particular migratory birds. Birds, migratory birds have very set migratory routes, called flyways, that they absolutely fly in the exact same from point A to point B, every year and they stop in the exact same places every year to rest or to get food. And because of that, because it's known, very specifically, where the flyways are, they're easy to find if you want to find them. And so, at this time in the 1800's, again, this was a time when plume feathers, long beautiful plume birds, the feathers were used in fashion. The big, big fashion [inaudible] during this time, these big, beautiful feathers, I'll show you an example, so on things like coats and hats, the plumes of birds would be used. You can pluck a bird's plume and it'll regrow, but it's easier just to kill the bird. So, they were killed for their beautiful plumes but also people like, right, like to decorate their homes in different ways. And taxidermied birds were used in display and in people's homes to decorate and in some part again, as food sources. So this is a drawing and [inaudible] that are similar to this, of the migratory flight of the, now extinct, passenger pigeon. And passenger pigeons, there are many [inaudible] lots and lots of writings and essays about in the 1800's, when, and there might, they were a migratory bird, they, they're flyway was along the east coast of the United States, and when they would be migrating, they would block out, there were so many millions at a time, they

would block out the sun. It looked like it was night, during the day. That's how many passenger pigeons there were. And unfortunately though, because there were that many, you could just kind of stand underneath, right, this huge like cloud of passenger pigeons, and just shoot, shoot, shoot, and they'd just drop, because there were so many. And no problem, look at how many there are, we'll never run out of passenger pigeons, but yeah, they did get hunted to extinction, the last passenger pigeon was kept in the Cincinnati Zoo and died in 1917, the last existing passenger pigeon. And it was, they were in the, probably hundreds of millions. So those kind of things can happen even if we think oh, we'll never run out, we can never hunt them this much, right? I don't know, I don't know. Okay, I guess that was the look, I'm not sure, I'm not sure but, right, okay. This is a very famous photograph, these are bison skulls, so it's a mountain of bison skulls, and this picture's from 1870, and this was, bison were just hunted, hunted, hunted, hunted to near extinction in this time of the 1800's. So, again millions, millions, millions, in the plains, which is of course, not so anymore. So, because the 1800's, this was already happening in 1800's. West of the Mississippi we're running out of, we're hunting to extinction, we're cutting down our resources to the point where they were not going to survive. So in the 1800's we started seeing events, people that aimed their focus at conservation of resources. So here's [inaudible] this is a short list, [inaudible] favorites, short list, 1872, first national park established was Yellowstone National Park, and Yellowstone National Park was established primarily, and certainly in 1872, almost only to preserve the last original group of American buffalo, bison. So this area, the Yellowstone National Park, was set aside for the last herd of, last herd of original bison, in 1872. In 1890, we talked about this one, and then we had our first national park established in California, Yosemite National Park, so I put this one up because, right, it's our first national park, I want you to go, it's so beautiful and this was our first national park in 1890. 1892, one of the people that, by the way, was instrumental in getting Yosemite Valley designated as a national park, John Muir, founded what's called the Sierra Club. And the Sierra Club was founded as a group that were interested in preserving the natural beauty in the United States and Central America. And John Muir, a naturalist who actually walked from Alaska, not all at the same time, but he walked from Alaska all the way through Central America, at some point in his life, actually kind of hiked along to actually be up class and personal with these beautiful areas. The Sierra Club is still in action today, it has gone from kind of a citizens group that were interested in letter writing campaigns to Washington, to try to establish things like national parks, to now it is a worldwide lobbyist group that, very high powered lobbyist, environmental lobbyist group that lobbies in Washington to make sure that conservation is taking place. And still in practice today. 1894, we have what's called the Park Protection Act, it was introduced by a congressman by the name of John Lacey, from Iowa. And he brought forth this, this is still in place today as well, this Park Protection Act, to establish guidelines for protecting our national parks that were established. So the first national park, Yellowstone, was 1872, but up until this time of the Park Protection Act, right, the national parks established to protect some sort

of natural resources, but there weren't any guidelines in place to do that. So even though the national park was established, people were still going into Yellowstone and hunting bison. And still going into Yellowstone and cutting down timber. Because there were no, there were no laws against it, so this was the law that has now established national parks to be protected areas in the United States. Very little to no development of any kind, because of this 1894 bill, the Park Protection Act. We'll talk about John Lacey again. So there, there it is, this is the view, it's called Tunnel View, when you drive into Yosemite from the south entrance, absolutely beautiful granite monoliths, El Capitan, Half Dome in the distance, what beautiful waterfalls, beautiful, beautiful, this is the valley that you'd be entering, I'm thinking when our next, 3 day holiday is, next 3 day holiday, what is it? Veteran's Day? Is that it? Okay, Veteran's Day, next 3 day holiday, make your plans, make your plans, I'm not seeing everybody smiling about that [inaudible], make your plans, Yosemite National Park, what do you think? What do you think? Doesn't it look beautiful?

>> [inaudible]

>> [inaudible] are there a lot of animals there do you think?

>> [inaudible]

>> There you go, yeah maybe, maybe, stay away from the bears, [inaudible], stay away from the bears, stay away from the bears. There are bears, it's true. They aren't bears that would eat you though, they eat plants. So John Muir and Teddy Roosevelt again, they're standing at Glacier Point, overlooking the part of the Yosemite Valley, into Nevada Falls in the background, beautiful, beautiful, beautiful. 1908, Aldo Leopold graduated from the Yale First School. So one of the things that was established after, in the early 1800's was a forestry school at Yale University. And Aldo Leopold graduated from Yale Forestry School and started work in the national forests. And he is very famous for his writings about, please know this, he's very famous for his writings about the interconnectedness of organisms in an ecosystem. And how if you take one group of organisms out, that other organisms will grow in their numbers, so if you take a prey species out, a predator species will overgrow, overgrow, overgrow, and not only ruin the ecosystem, but they will become less viable because they will pass diseases to each other. So he talked about this interconnectedness, and that you shouldn't get rid of organisms before you know what the results are going to be to other organisms. Very, very, very, famous writer of nature in the forest, so that was in the early 1900's we're already having our national forests, we have researchers in the national forests doing research on these types of studies. 1913, there was a dam built, begun to be built, called Hetch Hetchy Dam. And the reason that's important, is that Hetch Hetchy is in Yosemite National Park, and this dam was built as many dams are, to provide a reservoir of water behind it for San Francisco Bay area, because San Francisco is growing, growing, growing, in the early 1900's, and they needed fresh water and so this area in Yosemite National Park, was decided to be the easiest place to build a dam and pipe water towards San Francisco. So it's still there today, and it was built, it was

kind of built secretly, and water started coming, and then people realized that it'd been built and started saying wait, what about the Park Protection Act? I thought there wasn't supposed to be any major development in national parks and it really, and as early as 1913, was kind of a big uproar and brought about policies that further strengthened that act so that there couldn't be any kind of major development like that in the future into national parks. So it, in and of itself for Yosemite wasn't good, good for water source for San Francisco for sure, but park itself not good and so those kind of large developments don't happen in national parks anymore because of this particular project. Jump up, last one, got to talk about her, in 1962, a wildlife biologist by the name of Rachel Carson, wrote an essay called Silent Spring. And Silent Spring, in Silent Spring she discussed how certain pesticides that were being used in the United States, were causing problems in wildlife populations. And in particular, she talked about a pesticide called DDT, and how DDT affected large bird population's eggshells to be too soft, so that when the mother or father bird sat on an egg, the eggs cracked. And when that happened, populations of birds that relied on organisms that were taking in DDT, started to drop drastically. And one of the bird populations that happened with was the Bald Eagle. So the Bald Eagle, right, our national symbol, the Bald Eagle, the numbers started dropping drastically and it all got traced back to using this pesticide on agriculture, called DDT, that starts to build up in the food chain. We'll define this term in a second. But what happens is so I'm spraying DDT to try and get rid of bugs on my plants, okay, and so those bugs now, have DDT in them, and organisms that eat the bugs now have DDT in them. But I have to eat a lot of those bugs if I'm a bug eater and so the DDT in the little bug isn't a lot but if I eat a lot of bugs, I now have a lot of DDT in me. And now organisms that ate that organism, have even more DDT and something like a Bald Eagle or a Peregrine Falcon, they're at the top of their food chain and so they're eating organisms with large amounts of this pesticide and it didn't affect them, they didn't die from it, but it affected their eggs so that when they went to sit on an egg, the eggs cracked. And if I don't have eggs, I don't have offspring, and if I don't have offspring my numbers start to drop drastically. So she was the person that discovered this about the link between DDT and birds eggs that were cracking and numbers falling in population. So this is Aldo and Lois Leopold, I don't know, I think maybe Spot, I'm naming this dog Spot, I don't know, I just made it up, but this is Aldo and Lois. This was Hetch Hetchy Valley before, and after the dam that was built, and the reservoir that's providing in part, water to San Francisco. This is Rachel Carson, Rachel Carson died of a heart attack related to breast cancer, which was related to her work with DDT. So here's the other thing that we have to keep in mind about the foods we eat; we have to be careful about the foods we eat because if we're not careful about the foods we eat, we're eating foods that have been sprayed with pesticide, and as we take that into our body, it is most definitely causing problems, most likely cancers, in our body from the foods that we eat that are sprayed with pesticides. We do need to be aware of what types of foods absorb pesticides, what types of foods have an outside covering that can remove the pesticide for the most part, but

better yet, if possible, foods that weren't treated with pesticides at all. Because we have enough things to worry about with our health, not the food that we're eating because you couldn't taste it, you couldn't taste the pesticide, but it would affect your health. So just things to keep in mind. So with that in mind, let's look at, wait, let's take our 5-7 minutes, take 7, be back at 10 'til and we'll pick up here on how species, these things you've already read about. Take 5.

[Ambient Noise]

Don't let me forget to start this back up, look me in the face Isobel, because you never know it's going to work out okay.

[Ambient Noise]

Alrighty, so now let's talk about some things that you read about when you were doing your first report and that is how do organisms become depleted, led to extinction, ask you to finalize whatever you're working on on your phone, and we'll go from there. So the first is probably the biggest, and you read about that right, habitat loss, habitat disturbance, is the primary cause for a lot of organisms to drop in numbers, and so with that we're looking at things, these are the words that we would use for that, so either the habitat is completely destroyed, alright things that [inaudible] we cut down a forest, it's now destroyed, fragmentation means it's cut down or taken apart and just tiny areas are left behind, and degradation has to do with things like pollution. So those are the ways that habitats can be affected so that it affects the organisms that live there. And the things that happen because of these things then, we talked about migration routes, we talked about birds having very specific flyways where they stop at certain places to eat, they stop at certain places to rest, and if those places are gone, they are having trouble further, they aren't all going to make it, and numbers start to drop, there are some organisms, and you read about some of these and wrote about some of these that have very specific breeding areas, so one that several of you wrote about had to do with sea turtles and sea turtles are also migratory organisms by the way and have very specific breeding areas, certain bird species certainly, and right, food sources are gone. So if we take out the habitat, we take out where they're stopping and resting and maybe we're also taking out their food sources. And the other thing to think about with migration routes is that it's not just things like birds or sea turtles, but large mammalian species, often migrate as well. So these are some of the reasons that we would see drops in numbers. The one type of habitat loss that we've already talked about, deforestation, and currently tropical rainforests, that's what we're currently talking about, please asterisk this statement, is the number one cause of decreased numbers of biodiversity in the world, currently. So we're going to talk about some others that have to do with habitat loss, but absolutely deforestation is the number one cause, currently, that is in terms of habitat loss, deforestation, especially rainforests. So we want to remember that, that's why we spent some time on it, because that is the number one habitat loss ecosystem, tropical forest, but here's some others; wetlands are being diminished, and coral reefs are being destroyed. And in these areas, wetland

areas, coral reef areas, very high biodiversity, lots of different types of species living in communities and so they're often food sources for other organisms, and so when these areas are destroyed, then there's a real domino effect to the organisms that are affected. So, right, this is what fragmentation looks like. So this is all gone, this is left standing, but organisms don't like, if they're used to forested region, they probably are going to be very haltingly, leaving this little island of forest to cross it to get to the next patch of forest. So they kind of get stuck in this little island and then there might not be another organism of their type to mate with, or they might run out of food, there might not be water, so it's very, very detrimental to their numbers if they get stuck in one of these little fragmented region. That's what fragmentation looks like. This is a healthy coral reef, lots of colors, lots of organisms present, and this is a bleached coral reef, and so one of the main problems with coral reefs currently is this bleaching effect where when we look at a healthy coral reef with all the colors, the reason we're seeing all these colors is that coral, which is a living organism has mutualistic symbiotic relationship with bacteria that live in the shell that they produce and it's the bacteria that are colorful, and we talked about some bacteria are photosynthetic, and when you're photosynthetic, you have a pigment in your skin that absorbs sunlight, and it can be, we usually think green because we think about [inaudible], but in the ocean, the bacteria in the ocean, have all different pigments; orange and yellow and red, blue, and that's what gives the clear to coral, so the coral itself are the bacteria that live in it. And so, with things like heating up of ocean waters, the bacteria don't like it, they die, they have a narrow range of tolerance to hot ocean water. The other thing that happens with the hot water, as some of you reported, is that the carbon in the water turns acidic, they also have a very narrow range of tolerance to acid, so they have hot acidic waters that kill the bacteria, and then in turn, the coral can't live because the bacteria supply the coral with food. So again, this kind of chain of events takes place where it's not one organism, there's multiple organisms and if the coral isn't there, the other organisms that rely on it are gone as well. So a whole chain of events happens when the problems in the ocean affect coral, and that's happening in all coral spots around the world, hot spots of major coral episodes becoming bleached and losing entire ecosystems because of that. What else? Hunting and poaching, and the word commercial is important here. So commercial hunting and poaching; so let's define two that aren't commercial; the first is called subsistence hunting, so subsistence hunting just means I have to feed my family, that's what subsistence is, by how much to feed my family. And subsistent hunting is not going to drastically reduce numbers of any organism, just take what I need to eat. So that's not going to call depleted numbers. Sport hunting, if it's not regulated, could be problematic but sport hunting, at least in the United States is highly regulated, and we'll talk about that on another day, but for now we'll just say that at least in the United States, hunting for sport is very highly regulated. So that wouldn't, in itself, decrease numbers. The problem with hunting is commercial, commercial hunting and commercial means I'm hunting to make money. I'm not hunting to feed my family, I'm not hunting during season for sport, I'm hunting to use

the animal to make money. And to do that I need to hunt a lot, to make a lot of money. So, I'm selling the animal I'm hunting or its parts, that includes, and please note this term as well, poaching. So poaching means I'm hunting commercially, to make money, and I'm doing it illegally, and that would happen if I'm hunting organisms that are protected. If I'm hunting organisms that are legally protected, that's called poaching, and so poaching and commercial hunting do drastically reduce numbers of organisms, because you have to get a lot of them to make a lot of money, as with anything else. So, these, right, feed my family, sport is regulated, this is the one that's problematic in terms of drastically reducing organism's numbers. And that has led to depletion, this commercial hunting and poaching, and we'll talk about some organisms before we finish and the numbers they're at now and what has caused their depletion. So, this commercial hunting and poaching does decrease numbers of organisms, so we'll take a look at some examples before we finish today. And then here's the last bit that's problematic for the organisms; a lot of the organisms that are protected that you read about, aren't in regions of the world that are less developed, they're in transition, they're trying to become fully developed, and this is, these are regions of the world where people maybe don't have a job, don't, can't provide for their family, and this is what they would consider as the only way they can get money for their family, is by poaching organisms that are protected. And the reason that that's kind of a catch 22, a really bad negative feedback loop, is that the fewer organisms there are, the more valuable they become. So if there are a million tigers, right, nobody's that interested in tigers, but when there are less than 400 of all type of tigers in the wild worldwide, now they become very valuable. The fewer they are, the more valuable they become, and the more money you can get. Does that make sense? So now, those organisms that are really, really critically endangered, a lot of them are in these areas where it might be the only way I think that I can make money for my family is to poach them. So this is a wildlife arts gathering station in Myanmar, which is west of China and this is, these are mostly you see furs from endangered organisms, that poachers were trying to get out of the country to sell to make money. So this is just what was caught, this is just what officials caught before it left the country. So this is one small gathering of protected organism parts in, this is a small island, one small island west of China. Some people collect animals for pets or plants for decorations, so that happens, I'll show you some examples, pollution of the ecosystem, climate change is causing depletion in numbers of organisms, and we talked about pesticides already, let's mention them again and define something here. So a group of pesticides that are defined as slowly degradable, the word is persistent, mean they don't leave the ecosystem very quickly, they're slowly, if ever, broken down, are both mobile and non-selective and so that means they move from where they're placed and they don't just kill what they're meant to kill. So, slowly degradable, they don't break down very quickly, and then right, I'm spraying my pesticide, let's say DDT, although that doesn't have [inaudible] we're going to try one in a minute, so I spray my pesticide on the plants, and then I water my plants and then the pesticide moves with the water, so if the water goes into the ground, so does

my pesticide. If the water goes into another water source, so does my pesticide. And then, they're not just killing the pest that they're meant to kill, they kill anything that they come in contact with, right? Non-selective. So DDT, the one we talked about earlier, was one of these, one of these slowly degradable, mobile and non-selective pesticides. And so here's the thing, yeah, slowly degradable, DDT was banned in the United States because of the problems it causes, in the 1970's but it lasts in the water, 150 years. So even though we don't use it in the United States anymore, it's still in the ecosystem, because it's slowly degradable. So it's still affecting organisms, even though we don't spray it. Then here's the other thing, it's mobile. So other countries near us, that do use DDT, we still get some amount of DDT in our ecosystems because it's being used in other regions near us, right? And so here's the word I want you to know, that we talked about earlier; biological amplification. And so those predatory scavenger birds are an example of the pesticide building up, building up, in greater and greater amounts, as you move up the food chain. It builds up, it builds up, the organisms that are at the top of the food chain have a whole bunch of the pesticide in them, causing problems like fragile eggshells on these scavenger birds, like the bald eagles. So know that term, what does it mean, building up pesticide in organisms as you move up a food chain, right? The other thing that happens is, you might bring some species into an area that doesn't belong there, it's called an exotic or an alien species, call I bring a plant back with me from a travel I was on and it takes over the ecosystem. And that's because it might not have any predators that keep it in check, and no competition in the other organisms. So I'll give you some examples here as well, right, so all the things we're listing can cause organisms to deplete in numbers and sometimes, it's not just one, sometimes an ecosystem has multiples of these, so now it's really a problem for organisms, right? When there's multiple problems in the same ecosystem. So exotic birds are often collected to be kept as pets from the rain forest, beautiful colors, but they live in the rain forest and need a rain forest ecosystem to survive. They don't survive in ecosystems that don't have the climate of a rain forest and they are often poached and some moved illegally from one place to another and they often don't survive the travel. Right, plants, cacti, about a third of the natural cacti in southwestern part of the United States are endangered because people like them in their yard and so they move them out of the desert ecosystem they're in, into an ecosystem where they won't survive. They're also very fragile in their root system, so when you dig them up, very difficult for them to survive when they're replanted, cacti. Bald eagle, we talked about, you don't have to remember any of these numbers, but just some interesting numbers that we'll talk about. So the Bald Eagle, in 1963, there were 417 mating pairs left in for United States, less than 1000 birds because of the DDT in the ecosystem. And so they were placed on the endangered species list, endangered suppose act took effect in 1973, we'll talk about it next time, and they have been protected to the point where they are now 10,000 mating pairs in the United States. So, the problems can be reversed in terms of the numbers if action is taken for sure, our national symbol, right. This is called the water hyacinth, and the water

hyacinth is an aquatic plant, this is Lake Okeechobee in Florida, and this plant was accidentally reduced into the Florida Everglades and it has no competitors, and only one natural predator and it doubles its population every 2 weeks, every 2 weeks it doubles its population. So it took over the Florida Everglades, and started choking out the natural plants and then the organisms that depended on those plants, and so now it has to be removed, at great expense, from the waters in Florida, the only predator it has, look at that! Is the Florida Manatee, this is the Florida Manatee. So Florida Manatee is itself threatened, it's been up listed from endangered to threatened, but the main reason it's the only organism that eats the hyacinth in the everglades is the Manatee. But the Manatee is a mammal, it needs to surface for air, and it's very slow moving, [sing song], it rolls, it rolls, it rolls, it surfaces, but it can't move out of the way fast enough is a boat passes by and that's the main reason its numbers have decreased is encounters with humans in watercraft. So the good news is, because it was protected, it's been up listed, still threatened, but no longer endangered, but it's the only organism that eats hyacinth and there aren't enough of them to control the plant. One thing leads to another leads to another leads to another, in these problems. Last couple things, we'll finish with this idea; predator and pest control depletes numbers and so when we start to eliminate what we think are pests in an ecosystem, or we think is a predator for something that we want to keep in our yard, right? Our puppies, our kitties, any sort of livestock that we're keeping, then we sometimes attempt to bring down their numbers so that they don't compete with us anymore, I'll show you an example before we go. Predator and pest control. And this is what, Also Leopold was talking about, that if you remove a species just because you don't like what it's doing, that it's probably going to cause problems with other species and in particular if it's a prey species or it's a predator species, the other group of organisms is also going to start to drop in number. So, this is problematic for the ecosystem when you just [clapping hands] remove organisms without thinking about what it, what are the consequences. [inaudible] some research into what are the consequences before you get rid of organisms because you don't like them or because they're causing a problem for you.

[Ambient Noise]

So, we talked about this species already, my favorite cat besides Boo the Cat that lives at the [inaudible] house, so, right? The, it, many names; cougar, American cougar, is what it's usually known by, mountain lion, beautiful animal that lives naturally in Southern California, lives naturally in Southern California around us, mountain lion, just know, be aware, right? Is considered a pest because with its habitat gone, it preys upon people's animals in their backyard. We don't have mountain lions in [inaudible] Valley, but we currently have a small bobcat population that is doing the same thing that mountain lions do which is their habitat is diminishing, so they are coming into people's yards, hunting in your yard for your little furry friends. And so be aware that that's happening with, we have some of those small cats, small predator cats, in our community. Now look at how cute is that? Come on. That's called a prairie dog and it's

just too cute, it does, but it's a big one, it's a big one, it's a big one, look how cute! We wouldn't keep it as a pet, it's a wild animal, but, it is the prey species and the only food source for a black footed ferret and so here's some numbers, you don't have to remember them, this is what happens. So black footed ferret only eats, only eats little prairie dog, it's the only thing it eats, that's it's food source. And so what happened was prairie dogs are considered keystone species on the prairie, there're over 150 other species that depend on them directly or indirectly, and the black footed ferret directly eats prairie dogs. The prairie dogs live underground, they burrow into holes under the ground, and so at the top of the ground it leaves open spaces, holes, that when we moved west and brought our cattle and our sheep, they would step into these holes and the organisms would break their limbs and they'd have to be put down and so the government, the United States government, started poisoning, en masse, prairie dogs. To the point where 90% of the population of prairie dogs were exterminated in the prairie, which led to black footed ferret completely diminishing in numbers to the point where in 1986, there are 18 left in the world, 18, 18, were put on the endangered species list, captive breeding programs, and there are currently, rereleased, 370 in the wild, because the prairie dogs have also been reintroduced to the prairie and there are about 300 in currently captive breeding programs. So it's still diminished numbers but, again, when we make some effort, it can make a difference. Melissa?

>> Okay, so, there's so [inaudible] how can people have them for pets?

>> They have ferrets but not black footed ferrets.

>> Oh, okay.

>> So there are other ferret species that are, that people do keep as pets, absolutely, but not a black footed ferret, that's a wild organism. Yeah?

>> [inaudible]

>> Say again.

>> [inaudible]

>> So, same thing with chinchilla, chinchilla are raised in breeding compounds, just like certain dogs in particular that are bred and then you buy them from a breeder, that's true chinchilla. So it, yes, was once wild, but now it is domesticated and raised in that kind of breeding environment so they aren't considered endangered. Yeah, good question, good question. So we'll stop there and I'm going to start with a little video next time about the black footed ferret and the prairie dog, because it's pretty cute. And we'll go from there. Great questions, great questions. Very nice.

[Ambient Classroom Noise]