>> And so, with that in mind of the ideas that we talked about having to do with the problems that species are facing, there are also just some characteristics that the species themselves might exhibit that could then endanger. So all of the outside forces for sure that are happening that we discussed and listed last time. But then some species have a very low reproductive rate, meaning they have very few offspring, very far apart, and maybe don't reach reproductive age themselves until they're a little bit older. So, something like a blue whale which we'll talk about. It doesn't reach reproductive age until 19. And then it has one calf every maybe six years. So, when you have a low reproductive rate like that and your numbers drop, it's really hard to make a comeback. So along with the other problems in the ecosystem that something like a blue whale is facing, it also has this low reproductive birth rate. We talked about this already. We read about some of these. If you eat only one thing, [inaudible], you eat only one thing, the giant panda, then if what you're eating is gone you aren't going to survive either. If you eat at high [inaudible] level. Those feeding levels. And so, the same thing. If I am at a very high feeding level and organisms below me are depleting, I'm not going to get enough energy to survive. If I'm a big organism, it is difficult for me for a lot of reasons, but one of the main reasons it's problematic if you're big is because you can't hide. You can be found easily. So if you're being hunted by humans and you're a large size, it's difficult to find a hiding place. We talked about this one as well. If you are very limited in where you nest or breed or stop off on your migratory route which is another item that we would talk about; fixed migratory patterns. If you only exist in one place all of those ideas are kind of interrelated that I nest in one particular place, I mate in one particular place. I only exist in one particular place. I have a very fixed migratory route. If those areas are being destroyed then your numbers are going to drop. And this is especially interesting if you talk about organisms that are found on islands because if you're on an island you also then can't leave. So, island species are often, kind of, in this category of being in trouble. If you prey on livestock, meaning organisms that humans are raising for their food source, such as a mountain lion, a cougar. We talked about it last time. Or if you actually prey on people, if you actually have developed a taste for eating human flesh, you are in trouble. So that is very problematic. So something like a tiger might actually prey upon people. Not just for livestock. And lastly, at some point, there is critical meaning low number. So with all groups of organisms, all populations of organisms, there is a low number that if you get to that low number or lower, it's going to be hard to come back because they're just too few of the organisms to make a comeback. At least not without human assistance. So we talked about that with the black-footed ferret. How few there were. Eight remaining in the wild. That's a pretty critical number. And the only way they came back is because humans now interfered. So that doesn't happen with all organisms where there's a program in place that humans are even going to assist. So along with everything else that's a problem, if you fit into any of these categories or multiples of these categories, then you're in trouble as an organism. So blue whale, we'll come back and talk about blue whale at the very end of our discussion on species depletions, deplete in numbers. Most whale

species are deplete in numbers, and we'll talk very specifically about whaling at the very end of our discussion. Highly intelligent [inaudible] that have a very strong language and social network and the numbers, from many are falling. All forms of tigers; and so, numbers you don't have to remember. These are the latest numbers. So just check those out this morning. So with this [inaudible] tiger. So [inaudible] tiger less than 400. There are less than 400. The Bengal Tiger, less than 2500. And so, those, again, are considered critical numbers. Twenty-five hundred sounds like a lot, but that's a critical number when you're talking about a large organism that is – fits in a lot of those categories. Large organism, preys upon livestock. Its habitat is being destroyed. It has very specialized eating patterns. It reaches reproductive age very late in life. Has one, maybe two cubs when it does have an offspring. And so, the numbers just keep dropping. They just keep dropping with tigers. The panda in the wild, 1800. Eighteen hundred left in the wild. So the same thing. Their habitat mostly is the problem, and they eat one kind of food. They eat bamboo. When the bamboo forests are gone, they start to decrease in numbers. The Sumatran rhino, there are less than 100. Less than 100. Critical number. Probably aren't going to survive in the wild. We'll probably will only see Sumatran rhinos in zoos and research centers very soon. That's an extremely critical number. All types of green turtles. Marine turtles, many of you have read about them. This is a green turtle that actually breeds, hatches, on the gulf of California, and turtles of all types, marine turtles are highly critically endangered. So with that in mind, let's define these terms we've been using. Endangered species. So, I want you to know these definitions. Highlight them for your second exam. So, make sure you know what these definitions are. So endangered species is, there are so few of the organisms left that they could become extinct, and this is important in nature. So, we're talking about out in nature. So that means that we might have some of these organisms in zoos, research centers, but out in nature you wouldn't find them anymore. So endangered species. It's different from a threatened species, and that terms are often used interchangeably, but they're not interchangeable. A threatened species is the numbers are still good out in nature. We still have a high number out in nature, but the numbers are going down. And if they continue to go down, they can then fall into the endangered category. So, what is causing those numbers to decrease? What can assist with that? So, I just want to say those of you that have your outlines, that was all written; and so, if you don't have the outline that's what you're still writing because well this is all on your outline so we're going to move on from that. Keystone species we talked about already. Keystone species is one that if it's numbers declined, there are organisms that depend on its numbers decline. So that species – other species are dependent upon it either directly or indirectly. And we talked about this before. Many plant species would be considered a keystone species because it's providing food or shelter or water, shade, whatever it might be for other species that depend directly or indirectly on it. So, we've seen this term before. Keystone species. The last term called Bellwether. Note the spelling. There's no A in there. And so, a Bellwether species is one that's showing some indication that there's a problem

in the ecosystem. That if there are problems showing up in that species, there's something going wrong in the ecosystem, and we should pay attention to it, right? So, early warning of some environmental problem that we need to take notice of and then go check what's happening in that ecosystem. So many times that is going to be an amphibian. Something like a frog or an insect. And with amphibians, that's because amphibians, [inaudible] indicating something wrong in the water because an amphibian's skin – our skin, if we go into the water where we don't take on water. We don't jump into the pool and bloat up from the water. But in an amphibian, actually water will actually diffuse the skin, and that's why it can be in the water and actually breathe for a bit because it can take oxygen along with the water through its skin. But if it can't get out of the water, a frog will bloat up and take on water and eventually [inaudible]. So if there's a problem in the water, it's taking it in through the skin whereas our skin would prevent us from being exposed, through our skin anyway, to anything that's problematic there. So if that were to happen you might have something like this. What are you noticing about these frogs? They are dead. That is true. That's not a good sign, but what else about their body? What are you noticing about their bodies? They have multiple extra legs. So they had six legs instead of four, and they were taken out of a lake from Minnesota that was then tested because there must be something wrong in that water. High pollutant levels causing mutations in their DNA, causing extra limbs to form. And it's a fresh water source. Fresh water source is used not just by the frogs but by humans, and again, it is, of course, in the United States when we pull water from a source it gets cleansed at least two, probably three times before it comes to us. But still. That should be a problem. That should be an indication that that's not good. Let's see what's going on. And that's what Bellwether means that if it shows up in those organisms, we probably need to take notice because it could affect all organisms including eventually humans. Do you have something? And so, how are we going to help manage, protect, wildlife? So, what we're going to talk about today – everything that we're looking at in the next several slides is what's called the species approach. So there are two main approaches. There's a species approach and an ecosystem approach. So, we're going to focus on the species approach in the next few slides. And what that means is the species approach is ways to protect species by doing the following things. In order to protect a species you have to know what they are. They have to identify which species are in trouble. So that's the first step is just knowing which ones need help. But then you can't just say, "Oh, you're in trouble. Good luck. See you later." Then the next step is there have to be laws in place to protect that. That if the law is broken that someone is held responsible so that the species are protected. So there have to be laws in place. And then we've talked about this a lot already. You can't just say, "Okay. You're protected. Okay. We're going to put a law in place." There has to be a place for the organisms to actually live; and so, that's their habitat. So not just they have to be protected, but their habitat has to be set aside and protected so there's a place for them to live. If that doesn't work, if there's no place in nature or not enough room in nature for them to survive then we'll talk about a few of these. We've already talked

about a few of these. Then you might have to actually raise these organisms in captivity and try to breed them and try to raise offspring in captivity. And that would not be a first choice. That's kind of the last effort but if there's so few numbers of some of those organisms we just talked about, it might be the only chance of survival. So just like the black-footed ferret was the only chance of survival was to bring them in and breed them in captivity and release them. So then the final step if you're going to do this for these organisms in captivity is the final step would be to release them out into nature. And so, something like the black-footed ferret that worked because we still have a lot of our Great Plains, but other organisms, that final step might be hard because there might not be enough ecosystem to release them into. So they're being raised in captivity but there's no safe place for them to return to in nature. So, with that approach, let's talk about what we say the second thing is you have to establish laws. If it's an organism that is outside of your country's laws then you establish what's called a treaty with other countries where you agree on certain aspects of protecting species. So here are some treaties and laws that are international that help protect species. So the first is called the Convention on International Trade in Endangered Species. You don't have to remember that. You just have to remember it by its name CITES. And so, CITES was established way back in 1975, and under this act, this treaty, 183 countries have signed it. And so, that's called a signatory nation. And so, if you're a nation, a country, a region, an area that has signed this treaty called CITES, that means you agree to abide by what the treaty says. And so, currently, there are 56,000 animals and 30,000 plant species that are listed as endangered or threatened or in some way, they are dwindling in numbers and might not be either endangered or threatened but there's some problem to take care of, and this is all around the world. Animals and plants from all around the world. And the main idea behind CITES is over exploitation meaning exploitation means you hunt or you gather or you kill for parts, and you trade those parts for the animal for money. And so, the main idea behind CITES is that these organisms that are listed are protected against commercial trades. [Inaudible] organisms to make money. And so, one example of the organisms on the list is African elephant product ban where African elephants are poached for their ivory tusks, and under the CITES Act, if you're one of the 183 countries that have signed this treaty, you will not allow for any buying or selling of African ivory. When you have that many countries that sign that and agree to that, it's a pretty strong treaty that allows the organisms to make a comeback. So, African elephant killed specifically and only for the ivory tusks, used for decorative items. But other types of organisms that you might find on CITES all types of tortoises. Tortoise land dweller, turtle, water dweller. All types of coral, which we talked about already that are highly endangered. All types of flowers like orchids that are in nature. They're being gathered because they're so beautiful and being sold, and their numbers in nature are dwindling. Rhinoceros of all types, bluefin tuna, cacti, we've already talked about of all types. So overexploitation. Taking too many from nature; numbers are dropping. So all different categories, both animals and plants that are on the CITES list. International. Another international treaty is called

the Convention on Biological Diversity. Biodiversity, we defined it a couple of times now. One hundred and 96 nations are part of this plan to actually put a list together of all of the living organisms in their country. Because what did we say? In order to start protecting you have to identify. So this starts with just a list that's being put together in each of these countries of all of the living organisms that naturally occur in their region. So that are least you know what we talked about with the rainforest. The tropical rainforest don't even know what all of the organisms are. They haven't been found or catalogued or identified. So it's hard to protect if you don't have a list. So this actually puts a list together. It not only puts the list together then, but because humans are part of the ecosystem too, how can you then manage those ecosystems, still have some development, but make it sustainable? Meaning that we still can develop but we have to have a plan for always being able to have that resource and not just getting rid of it and making money one time. So that's called a convention on biological diversity. It's being spearheaded by the branch of the United Nations called the International Union for Conservation of Nature. So this is the conservation branch of the United Nations. World of Wildlife Fund, we know about them. And their sub-group called TRAFFIC. And so, TRAFFIC is the sub-group of WWF that monitors wildlife trade throughout the world. So those three groups are spearheading and overseeing all of these nations to try and make it an entire – the entire Earth organized assistance to wildlife. So international. These are happening on an international level. We also have treaties and laws in the United States. So, tell me, did I make this change already? Did I make this correct [inaudible]? So just so you know, this is the correct spelling there. I saw that this morning. So that should be Lacey with an E. But we've talked about Lacey before. I told you we're going to come back to him. So remember John Lacey from Iowa was the congressperson that introduced the Park Protection Act. And we said we're going to see him again. Here he is, and it's called the Lacey Act of 1900. This is how long, still in effect today. And this is what the Lacey Act originally was meant to do. So the original act for the Lacey Act had to do with having to have a permit to take live or dead wild animals across state borders. And so, this had to do with primarily hunting. That you couldn't go across a state border, hunt an organism, and take it to another state without a permit. So this is the beginning, kind of, the permit system for hunters. And so, it's still in place today. This Lacey Act, having to do with you have to have a permit if you're going to hunt and bring organisms across state borders. But it's been added to, as things have gotten worst for species, to also include importing. So not just within the United States which is how it was originally written, but to regulate importing species from other countries that are protected either in the United States or wherever they are coming from, and it prevents this. Something we've talked about already. That idea of if you bring a species into the country that has no predators or no competitors, that it can take over the ecosystem like the water hyacinth when we talked about it. So it also prevents – tries to prevent bringing these, they're called invasive species into the United States. And if they do make their way like the hyacinth that this law helps-when we saw that machine in the Everglades

that was gathering up all the water hyacinths, it helps to try and get rid of the invasive species. So it's added a little bit since it was written in 1900 to make it a little bit more broad, a little bit more helpful with some of the problems that we're seeing in the ecosystems. The Lacey Act. Still in place today with a little bit of extra info. So we're going to finish our day with the Endangered Species Act which is the most important environmental legislation we have. But we'll do that after we take our break. So let's take until 10 until to get the extra minutes, and we'll import and import, everything that we talk about with this act. So we'll finish up with that today. [Inaudible] looking at me. Check our little red dot. Looking good. All right, everyone. Giving you a chance to finish whatever phone messages, calls, texts, you're doing. So finish those up and we'll finish our day. And before we get back into this good – Melissa had a good question at the break. So if you have – you're going to see the list of extra credit places that I mentioned to you, and I did those so that they'd be fairly close to our area. But if you have a place that you think would fit the academic environmental ecosystem help kind of an idea that is behind all of those that I don't have on the list, just shoot me a link to it, and I'll check it out and see if it works out and say yay or nay. Same thing and just have pictures, pictures, pictures at the place, but just let me know, and if it's closer to you [inaudible] time out to [inaudible] some places to you closer than our area. So definitely just let me know, but don't go and then ask. Shoot me up. Shoot me the link, and I'll go check it out for you, okay? Let's see if I've got this organized here. So Endangered Species Act of 1973, the ESA, and here what is we need to know about it. So the Endangered Species Act, by the way, is about this thick. So we're not going to cover everything about it. I'm just going to use the bullet points and terms of the main ideas behind what's happening in the Endangered Species Act. So the first thing goes back again to that trade importation of any sort of product that's made from an endangered species. So it's illegal. If you are a citizen of the United States, if you're an agency of the United States. If you are the United States government, it is illegal to carry on any kind of trade of any part or entire organism that is on the Endangered Species List, and we'll talk about how many organisms that is in a second. Like we said, there has to be protection in place. So it also provides them protection for any species that is on the list as endangered or threatened, which are terms that we just defined. So it provides legal protection meaning if someone does not abide by the law, they will be arrested for not abiding by this law of endangered species. And they are the first thing is you have to identify them, and then you put them on a list. And the two agencies in the United States that are responsible for identifying and listing species are called the National Marine Fisheries Service, the NMFS. And so, anything, obviously, that has to do with marine organisms, this is the organism that would list, identify and list those species. National Marine Fisheries Service. And the other organization is called the Fish and Wildlife Service. It's the FWS. And so, if it's not a marine organism, it's the fish and wildlife service that would identify the lists. Those are the two groups, two federal agencies that are responsible for overseeing all of the parts of the Endangered Species Act. So currently just in the United States, as of September

of this year, there are 1662 species on the Endangered Species Act. And that's just in the United States. We've added another about 300 if we're looking worldwide because the Endangered Species Act does cover certain species from outside of the United States. So 1662 is the current number of species, and that changes, kind of continually changes. We'll talk about some reasons in a moment. What else does the Endangered Species Act say? If a species is on the list, endangered or threatened, it can't be hunted, can't be killed. So [inaudible] hunted because you want it but killed because you don't like it, collected, or injured within the borders of the United States. So with these kind of four ideas, it kind of covers everything. You can't hunt, you can't kill. You can't injure. You can't collect any of these species. And this part of the law makes it very, very, very strong. And that is that a species gets placed on the list based on biology only. Not having nothing to do with economics. So what that means is you can't say, "We can't put that species on the list because it will affect my livelihood." A species is going to be on the list based only on the numbers, dwindling numbers. It's threatened. It's endangered. It's not going to make a comeback on its own; and so, you can't say, "Well, but it's going to affect my business so you can't put that species on the list." It makes it very, very strong because most of the time when we're talking about how things get done or why they get done, it has to do with money and how much money somebody's going to make, and this is the opposite of that. It's saying it can't have anything to do with anyone making or not making money. This is another very strong part of the law. Prohibits, does not allow the federal government from carrying out, giving money for, or saying it's okay to do a project that might or would jeopardize a species on the list. So, the federal government can't do the project. It can't give money for the project. It can't say some other organization it's okay for you to do the project if that project will jeopardize an endangered species or destroy a habitat because remember what the other part of the species, the whole idea of this species way of looking at organisms is we have to protect our habitat. And the Endangered Species Act includes protecting the habitat. So, very strong. So it seems like things that might be projects that might be carried out or hunted or authorized by the federal government might be building a dam. That's a really big project that changes an entire ecosystem and if there are endangered species in the area where that's happening, it wouldn't be carried out. Building something like a freeway. A freeway is usually a joint federal state funded project. But if there's an endangered species on the route that you want to build, you have to figure something else out because this law prohibits that from happening. Very strong. Not only am I going to identify the organisms and put a law in place, but I have to have also a plan for their recovery. So I have to have an actual, in writing, what are we going to do to make sure this species doesn't go extinct recovery plan? That's the recovery plan, again, we'll include habitat protection for that particular organism or maybe captive breeding so that the numbers can increase. Resubmitting an organism into the wild; whatever it might be. Concurrently, there are 1167 recovery plans. So 16 plus species, 1100 recovery plans. But we're short on recovery plans. We're 500 short on recovery plans for organisms

that are on the list. And a lot of that has to do with – this isn't free. This isn't something free that just happens. People have to be paid and land has to be set aside. It costs money to do studies. Then there's only so much money for all of the 1600 organisms. And so, it's not especially well funded currently. You don't have to remember this, but these are the current numbers, and this is still low. In 2019, the federal budget for the Endangered Species Act to do all the things that it needs to do sounds like a lot to me. I'd take it. But to do all this, it's not that much. Four hundred and 86 million dollars in 2019. This year it's been cut almost in half; 252 million dollars to do all of this for 1600 organisms that are endangered. And so, that still sounds like a lot of money, but if we look at it, because how are these things funded? By taxes, by our taxes. If we look at that per person in the United States, 300 plus million of us, it's about 80 cents a year. Eighty cents per year per person for the current funding. So it's not certainly – and it's not that much. I think we might find that in the cushions of our car or our couch, or be okay with 80 cents per person. But my thought and my hope, I guess, is that most people would be okay with more than 80 cents per person to protect species that might become extinct. Since it first was introduced, there have been two groups of amendments that have weakened the law a little bit. And so, the first one is, now when the habitat – part of the recovery process is setting aside habitats. And so, now, with habitat, there are boundaries that are set meaning the gray wolf which has been reintroduced into areas of Wyoming and Montana is a roaming organism covered hundreds of miles to hunt, and at first there weren't any boundaries to find. But since this happened, now there are boundaries. The gray wolf is protected but only between these gridlines. And if the gray wolf steps on this side of the gridline, it's not protected anymore. Well, the gray wolf doesn't know where the gridline is; and so, now that weakens the law a bit. It put boundaries on where the critical habitat for protection is. Now, this also weakens it a bit. Some of its strong parts about it was no money involved. It doesn't matter if you're not making money, but now for every species that's meant to be listed, an economic impact statement has to be formed. So now the economics of protecting the organism is taken into account. Is that going to affect people's jobs, the local income, et cetera, et cetera, et cetera? That weakens the law a bit if you're going to take that into consideration. And the last thing that happens now is that, again, if a species is being considered to go on the list, public hearings are held where put an announcement in the paper where no one will see it because no reads the paper. But you put an announcement in the paper or you put an announcement online and you say, "The Arroyo toad which is an endangered species in Little Rock at the Little Rock Dam. The Arroyo toad is being considered for listing on the Endangered Species List." There's going to be an open forum meeting. Come one, come all. Tell us what you think about that. And three public hearings have to be held over the span of five years before an organism can be considered. So, the biggest problem with that is that if this an organism that's critically endangered, five years might be too long. And in the meantime, the numbers continue to drop. So again, it weakens the law a bit. We need to start maintain those kind of [inaudible] on the law itself.

So the Endangered Species Act, very strong. The last thing is remember that one we said no projects can be completed or funded? There is an exemption process. If you feel like your project has benefits to humans that outweigh the protection of a species, you can submit paperwork to say, "No. Even though there's a protected species here, I think we should be exempt because what we're bringing is really important." So, there is a process to do that. The interesting thing about that – you don't have to remember this but these are the latest numbers on that. Ever since this amendment in 1988, only six, six exemption groups of paperwork have been submitted. There's not very many in that amount of time, but that's because the red tape was anything or the federal government, that paperwork that you'd have to do is expensive. And in your project you have to make all kinds of concessions for the species. You have to have an area where you are going to protect them, and you have to make sure that there is an enforcement agency there to protect them, and it's a lot of stuff that you'd have to do to complete your project. So most of the time people are like, "Well, I'm good." And of those six, only two have been approved. One was a dam, and one was the Bureau of Land Management wanting to continue to do cutting down of timber in Oregon. Those two workgroups because they put in place, "This is how we'll protect this species when we do that." Interesting. But that's the law that protects endangered species of which we have 1600 in the United States from going extinct. Very, very, very, very important law. So this is, again, this is the idea that there's some significance to the law. This is why we should protect Endangered Species Act. So we're still talking about the species approach. Let's me see if there's anything else. No. And when we come back – I think that's it, right? When we come back we'll finish up species approach and do the ecosystem approach and finish up our discussion on species depletions. Have a wonderful weekend, and I'll see you on Monday. Christavo, can I see you before you go? And Latoya, can I see you before you go?