

[NARRATOR:] Yellowstone National Park. Founded in 1872, it is considered to be the first national park in the world.

[CARROLL:] There's really important lessons from Yellowstone. Great lessons. As the first national park, this is the place that saved some of the great mammals. But this vast, carefully-managed ecosystem can't protect itself from forces on the outside. Global forces of environmental change that are happening so quickly, that their impact is being felt here, by both plants and animals.

[NARRATOR:] Sean Carroll is visiting Yellowstone with Liz Hadly, who has been studying the biodiversity of Yellowstone for 30 years. They are here to trace the threads that connect the plants and animals living in this park. Their first stop is a grove of whitebark pine trees.

[HADLY:] This is what a healthy tree looks like, this bark. You know, first of all, you can see this is kind of what's given whitebark its name. This is what a healthy tree should look like. So the stand that we're in is really in good shape.

[NARRATOR:] This particular tree has had a hungry visitor

[HADLY:] So these are bear claw marks. Well, what's it doing here? Why is it approaching this tree? Well, it's because whitebark pine produce very high-nutrient seeds. The bears will come here right before they go into hibernation and this is when they really pack on a lot of fat in order to overwinter. The nutrients from those seeds is directly correlated with overwinter survival of bears...

[NARRATOR:] But grizzly bears cannot reach most of the pinecones, because they're too high up on the trees. So they rely on a smaller animal for their snack. Red squirrels easily get up to the pine cones to eat the seeds, storing the excess in ground burrows, or middens. Further down the path, they find evidence that a hungry grizzly bear dug up one of the hiding places.

[HADLY:] ...and all around us are middens from squirrels and this is what the bears go after, and indeed, here is a pile of bear scat. And in this scat... are seeds from whitebark pine.

[CARROLL:] So this is most all seed...

[HADLY:] 100% seeds from whitebark pine.

[CARROLL:] Yeah. He found what he was looking for...

[HADLY:] He dug up the midden, and there they are.

[NARRATOR:] These three organisms-- the tree, the squirrel, the bear-- represent a healthy food web. But a tiny creature is threatening the survival of all three organisms.

[HADLY:] OK, Sean, this tree, it's been hit by the mountain pine beetle. What happens with these, what you see, the evidence, are these little holes. What happens when you see this kind of response on the part of the tree, is that the beetles won. This tree is dead.

[CARROLL:] How old do you think this tree is?

[HADLY:] This tree? Probably 700 years or so.

[CARROLL:] 700 years. And how long does it take the beetles, once they attack, to kill a tree like this?

[HADLY:] So, once they attack... this is a big attack. It's a day or two.

[CARROLL:] A day or two?

[HADLY:] A day or two.

[CARROLL:] After 700 years.

[HADLY:] After 700 years.

[NARRATOR:] The beetle has always existed in Yellowstone. It's not a foreign species. What has changed is where and for how long it survives.

[HADLY:] The warming climate in this high-elevation region is allowing beetles to move into these... what were previously high-elevation cold regions. And now they're high elevation, it still gets cold, but it's not cold enough to kill the beetle. So they're surviving longer, and killing whitebark pine.

[CARROLL:] So the warmer Yellowstone has created an opportunity for the beetles, but to the detriment of the whitebark pine.

[HADLY:] Absolutely.

[NARRATOR:] The changing climate is also affecting life lower down the mountain.

[HADLY:] There's a pond right here. This is a pond that sometimes holds water earlier in the year. You can see it's drying out, it's almost dry now. Look over here. Look at the dust over there where the bison are moving around. That pond no longer stores water at all. You can see that's dry. Ponds are less permanent. There are fewer ponds that retain water. And there are more ponds that never get water at all.

[CARROLL:] And why is that?

[HADLY:] So, it's... We've been getting less rainfall and temperatures have gotten warmer, even just over the last couple of decades.

[CARROLL:] What effects do the drying ponds have on the wildlife?

[HADLY:] So, the big effect that we've noticed is on the amphibians. So we've monitored amphibians for the past 20 years, and what we see is that there are fewer ponds that have amphibians, so there's fewer populations of amphibians, there's been a decline in the species diversity within the ponds that have amphibians to begin with, and there are fewer populations for each species in the area.

[NARRATOR:] They visit a pond where aquatic life used to be teeming.

[HADLY:] OK, Sean, so this is perfect amphibian habitat. You see the cover around the margins of the pond, you see cover for birds, and for salamanders and frogs.

[CARROLL:] But I don't hear the frogs.

[HADLY:] No. You used to hear the frogs. I don't hear the frogs either.

[CARROLL:] So there's a really incredible parallel between what's going on with the amphibians and what's going on with the whitebark pine...

[NARRATOR:] Like the whitebark pine forests high in the mountains, habitats for amphibians here in the valleys are being degraded by climate change.

[CARROLL:] Yellowstone shows us that it's possible to protect animals, even those that have been pushed virtually to the brink of extinction. We don't want lions and bears and tigers to go the way of the dinosaur, to be gone forever. Just something that we'd see in a museum, and have no idea what they looked like, what they lived like.

[HADLY:] Yellowstone is a special place. It's a success story in many ways. But it's not immune to global threats. Climate change, invasive species, population growth. All of these can chip away at the diversity here. Our work is not done.