Script

Episode Introduction

Richard Bednarski
In early October I traveled to my hometown, Quincy, California to learn more about how the dixie fire was different from other fires. I wanted to go beyond the sheer size of the fire and learn more about the ecology and what the future holds for the area I grew up in.

I spoke with Plumas National Forest Fire Ecologist, Kyle Merriam at length about fire ecology and some of her research. She found that high severity fires have a greater chance at burning again, at high severity within six to ten years.

She began her career as an ecologist with the Fish and Wildlife service, then moved to the US Geological Service before finally coming over to the Forest Service. This extensive experience as an ecologist, helped shape her knowledge of how forests function as a whole system. As time has gone on, fire has become a major management issue and she said there now are fire effects she has never seen before. This has shifted her work into the ecology of wildfires.

Kyle Merriam
Fire is driven by so many different variables. Obviously climate and weather are super important when looking at fire behavior and fire effects, but then vegetation is a major driver of fire. But then fire is a major driver of vegetation. So that forms a really cool feedback loop.

One of the really interesting things about a lot of vegetation types is that they actually grow and they have adaptations that promote the kind of fire effects that benefit them. Some species might be adapted to high severity fire and they actually grow in ways that promote high severity fire. Whereas other species are more adapted to lower severity fire and they have characteristics that reinforce a low severity fire regime. So you see these kinds of dynamic patterns on landscapes where through succession or through management we might be shifting

from one vegetation type to another. And as a result we're also shifting the kind of fire regimes that we see.

gRichard Bednarski
The Dixie Fire began at the bottom of the Feather River Canyon in northern California. A steep, rugged, and beautiful river corridor that is prone to wildfires.

Merriam's research focuses on this area and found that fires like the 2000 Storrie Fire and the 2008 Rich Fire, have created a pattern of reburning the landscape at high severity.

She had a chance to survey these areas before the Dixie fire came through, giving her a deeper understanding of how the fire ecology has begun to shift under climate change.

Kyle Merriam
~~We found the opposite.~~ We found that if it burns at high severity it's going to be very likely to burn at high severity again. I think that we found that temperature was the strongest driver of reburn severity. And we've seen on the Dixie Fire as well, that on days that it was hot, we had high wind speeds, there really wasn't much that could moderate fire behavior. We saw high severity fire effects kind of regardless of a lot of the other factors we think might affect fire.

But because of both logging, which removed a lot of our large trees from these forests, and fire suppression, we now have trees (stands) that are characterized by a very high density of small trees. So second growth trees, just an infill of trees. And so when those areas burn at high severity we have an enormous density of snags and those snags can then fall and create a tremendous amount of fuels. And unfortunately, in the Dixie Fire, we had something like 300,000 acres of mixed-conifer forests burn at high severity and all of those areas are now set up perfectly to burn at high severity again.

We don't have a lot places where the climate is predicted to support trees in the future, so I think our replanting efforts could focus on areas that have burned twice at high severity, they don't have very high fuel loads, but also target places we

know the climate is going to be able to support trees in the future.

When you look at that map, you think, 'Oh my god it looks like a lot of high severity,' right? And it was maybe like 40 percent, which is high. But when we looked at patch sizes, over 90 percent of the patches were less than 100 acres in size. A hundred acres is actually what we would have expected under a natural fire regime. Even a low severity fire often has small patches of high severity. And that was really important in promoting forest heterogeneity. Having a mix of species, having little patches of shrubs, patches of seedlings and then old growth forest right next to it.

When we look at places that have burned under natural fire regimes, it is incredibly heterogeneous. After living and seeing forests like that you wouldn't even believe how much heterogeneity you see with the natural fire regime. And part of that is that we do have small patches of high severity fire.

We did have some very large patches of high severity, in fact one that was 30 thousand acres, on a patch that was 30 thousand acres. So that's extreme and way beyond the natural range of variation for high severity fire effects. So we have a lot of little patches but they didn't add up to a lot of area. We had a few large patches and they ended up comprising 30 percent of the high severity fire that we saw.

So some of those are quite damaging and it will be hard to restore those areas to what they were prior to the fire.

Richard Bednarski
These massive tracts of high severity fire can have devastating effects on the landscape. As climate change increases temperatures, it is also drying out the land. One of the ways this happens is by an increase in the atmospheric demand for moisture.

In addition, as plants sprout back from roots or seeds, climate change has begun to make conditions unfavorable for fledgling seedlings.

Merriam gives an example about a beloved grove of cypress trees that burned in the 2007 Moonlight fire, which is just west of Susanville, California, that may not have survived the high severity reburn of the Dixie Fire.

Kyle Merriam
I think we get really focused on the catastrophes and tragedies that have occurred with these fires but really after a fire happens, we're somewhat limited in what we can do to restore those areas. Now because of Climate change, we're seeing that we have a hard time, a lot of species have a hard time germinating and surviving after a large high severity fire because of the recent droughts that we've had. And also just long term increases in temperatures and increasing dryness.

Places where trees were still able to survive, are not necessary places where a seedling can do well. In fact, a lot of our trees right now are already really stressed by drought. Some of them are already at the limit of the climatic conditions that they can tolerate. So I think more focus on our unburned landscapes and a sense of urgency is warranted.

You know unfortunately, we're losing some of our species that reproduce by seed. Because we've had so many fires now a lot of woody vegetation can't really tolerate being burned by high severity multiple times. Species that reproduce by seed need enough time to mature, produce that seed, and in order for that seed to germinate. So when you get fires really frequently like we're seeing now, species that reproduce by seed tend to get lost from the system. That's happened a lot in southern California and we're seeing that here as well.

I think we're still lucky we have sprouting species that are able to sprout back, they may not be able to do that forever. Some of our oak species can also sprout back and those also provide a lot of great ecological services. I think just allowing that process to occur is an important part of our post fire strategies.

Unfortunately we lost a population of cyprus, which is a serotinous species. It requires fire in order to regenerate and it was burned in the Moonlight Fire (2007) and it had a lot of little seedlings. But then they were only 14 years old and when the Dixie Fire came it completely extirpated that population. We can never get that population back. That is lost forever and similarly some of our old growth forests, our 600 year old red fir forests. We're not going to have a stable climate for 600 hundred years to regrow those trees. We'll never get those trees back.

Richard Bednarski
Another fire effect the Dixie Fire shown was burning in places that previously resisted fire. The Dixie Fire traveled across the mountain divide of the Sierra Nevada Mountain range for the first time in recent history.

This means the fire had to burn through a high elevation red fir forest. Which typically is known as a moist and cool environment. However, the fire moved through in July, which happened to be the hottest month on record and in the midst of a harsh drought. This allowed the fire to burn nearly 60 miles from west to east, changing fire ecology as we know it.

Kyle Merriam
When we think about the importance of the Feather River Canyon being mostly southwest facing slopes and what that might mean for fire activity, southwest facing slopes are often drier and so we'd expect them to burn hotter and see more severe fire in those areas.

But now as a result of the drought and climate change, just warmer temperatures, we're seeing that places that we used to think were moisture and probably would not burn at high severity, like our northeast facing slopes, are actually burning at really high severity. And we're also seeing that higher elevation forests, red fir forests, places that were often wet for a longer period of the year because of our snowpack, are also much much drier than they were historically.

And the way that it did that was that it burned over our higher elevation forests, like our red fir forests. That historically really didn't see these kinds of high severity burns so they're no longer limited by climate.

All of the fuel on our northeastern facing slopes and our higher elevation forest is now available to burn, and it is burning. So that's part of what drove the large, just the extent of the Dixie Fire, the fire was not moderated or stopped in places that used to really not have fuel that was not available to burn because it was too moist. It's not moist anymore, it's dry.

So we had just an unprecedented drought on top of a long term trend of increasing temperatures in the region. And declining snowpacks at higher elevations, so it's really a climate driven phenomenon.

Richard Bednarki
As warmer temperatures have led to a shorter period of time during the year when precipitation falls as snow, the snowpack is declining from year to year. This reduced snowpack often melts earlier in the year as well. Taking away water from the plants during the dry season leading to increased fuel aridity.

I had the chance to visit a burn area along with Merriam and she showed me what a high severity fire looks like on the landscape. As you might imagine, black and dusty. Snags, or dead trees left standing, were stacked like toy soldiers amongst charred and shattered rocks.. Thick stumps of chaparral species, most likely manzanita, are all that remain of something that just months ago was alive.

Merriam explained that the thicker the diameter of these stumps left behind after a fire passes through, indicates a higher burn temperature and increased severity. But there were areas of low severity throughout the fire scar. These areas may be the future of our forests.

Kyle Merriam
I mean it makes sense that these fires generate a lot of attention but I think that are the best opportunities and what

may even be more urgent than answering questions about what we do after a fire, is focusing on areas that have not yet burned. And really thinking about whether we set these areas up to survive and benefit from a future fire.

We may not be able to restore forests in a lot of the places where the Dixie Fire burned, but we still do have forests on other parts of these landscapes. And those are the areas where we have the best chance. If we want to have forests in the future, I think that's where we need to be focusing our attention. And that's where we need to have a sense of urgency. Because it's not a matter of if, it's a matter of when those places are going to burn.

We're looking at much greater areas of high severity, larger patches, and greater proportions of the fire that are burning at high severity than we would have ever predicted. High severity fires do a lot of damage to our sonic resources. They can potentially create a lot of erosion, sedimentation, and landslides. In terms of what we can do to reverse some of those effects: reestablishing vegetation in those areas is really important.

One of the vegetation types that can do well after a high severity fire are some of our montane chaparral species. They tend to either sprout back after a fire or they have a long lived seed bank that can germinate after a fire. They can actually play a really important role in stabilizing the soils, they can return soil moisture, they can return nutrients to the soils. But I think in this era of just extremely large high severity fires, we need to think how other vegetation types can really help us restore the fire and provide ecological services in the future.

Instead of just taking on this whole giant fire as one huge effort, which could be overwhelming, we tried to break it down and recognize that there are areas where the Dixie Fire may have had beneficial effects. In some places they have now burned at low severity two or three times. So a lot of our mixed conifer forest is adapted to frequent low severity fires. That's how they evolved. Those kinds of fire effects can really have some

beneficial effects for forest health. They can reduce stand density, they can particularly reduce small trees, they often retain large trees, which are some of our most fire resilient trees.

And so in those areas, we may be able to say that the Dixie Fire has started to establish natural fire regimes and we can focus on trying to promote those kinds of fire effects in those areas. So places that were able to withstand the Dixie Fire and still have forest, those places may be more resilient to future climates. They have already shown they were somewhat resilient to the drought and because they didn't burn at high severity.

So currently our fire organization only prioritizes trying to save, protect human life and protect property. So a lot of the efforts that we see in fires are directed at saving people's houses and protecting towns. But I think that it's important that we consider the value of our natural resources. When we lose three hundred thousand acres of mixed conifer forests, we are losing a very significant source of carbon sequestration.

One of the probably most important ecological values that our forests provide especially as climate change is progressing. Sequestering carbon is one of the really primary functions that we need to be trying to protect. Unfortunately, we're losing forests globally, it's not just here in the United States, it's all around the world. I think efforts to protect our forests, if only for their ability to sequester carbon, provides an immense value to not only the American people but to the entire planet.

Richard Bednarski

Focusing on stands of trees that have survived not only the current drought but the Dixie Fire, may be a smart move. Viewing these resilient stands of trees as a form of carbon sequestration may be one of the more prudent tools we have against the changing climate.

Knowing more about the way the Dixie Fire acted on the landscape, and seeing the effects as well, makes it clear that the fire regime has changed due to human activity. And what we do moving forward in terms of forest management, will shape what

the future of fire ecology and fire regimes in the American west look like.