Webinar Brief for Resource Managers

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Changes in Fuels across the Western Juniper/PJ Woodland Succesional Gradient and Implications for Effective Use of Fire Treatments

Presented on February 24, 2011by Steve Bunting, Professor of Fire Sciences at the University of Idaho

Project Summary: Steve Bunting from the University of Idaho shares his research on changes in fuels across the western juniper/PJ woodland succesional gradient and implications for effective use of fire treatments. He discusses some challenges of managing succesional stages in terms of fuel loading and fire behavior.

Management Implications

- Woodland development decreases herbaceous fuel loading and increases woody fuel loading. Changes in that relationship reduces the window of environmental conditions under which sites will burn, particularly under moderate conditions
- Prescribed fire is more difficult at later stages
- Wildfires in later stages are usually more intense and more severe

Abstract: Juniper and Pinyon-Juniper (PJ) woodland encroachment can happen in the Great Basin in two ways: by infilling of historic ranges (which increases density, but not coverage area), and encroachment into adjacent vegetation types. The second scenario is what managers on the Great Basin are particularly concerned with when it comes to maintaining healthy sagebrush steppe ecosystems. When Juniper/PJ establishes in an area, it has a period of slow growth that can last for years, then suddenly will transition into a period of rapid growth. These differing fuel loads at different phases of the woodlands will produce different responses when managers attempt control by use of fire. Bunting and his team looked at how fuel loads and fire behavior is altered by these different phases and fuel loadings. Using FARSITE they evaluated fires along succesional gradients and different spatial arrangements of landscapes. The findings showed that Phase 3 and mature woodlands have the most influence on fire behavior and where it will occur on a landscape. Mature woodlands increase fire severity decrease flame length, rate of fire spread, and fire size; this is due to a lack of understory to spread fires horizontally and when they do catch, the tree size and abundant fuel in the crowns increases fire severity. Looking at the landscape arrangement of succesional patches on the landscape, they found that fire

positively related to patch density, landscape diversity and landscape evenness, but was negatively related to patch size area. In short, the more diverse a landscape, the better for fire spread. In 2007, a fire burned through the group's test site, leaving them with a natural wildfire on an area with well documented vegetation data. Some of the conclusions they were able to draw from the study were that: fire was the most effective treatment next to chainsaw and bullhog treatments, increasing fire occurrence increases cheatgrass which increases fire occurrence which leads to fast fire spread across the landscape, and there was a greater survival of species on earlier succesional stages due to lower fire severity.

Questions:

What process was used to assess landscape composition in 1800?

It was long and involved. We went in and classified current vegetation within watersheds by separating watersheds into classes, and sampled individual representatives of different types of classes. We then developed a demographic profile of what the typical stand within that class looked like. Using drilling or increment cores, we were able to age specific trees within that bracket. We then rolled succession back and said when they would have and have not been present. 1900 composition is fairly certain, but back to 1800, well, a lot can happen in 200 years; we have less confidence. We had a new type that appeared, but were not sure could have been sagebrush-steppe or early woodland development. We did know that we did not have the later stages based on the material that was present.

Did you look at more severe burning conditions, and if not, why not?

In what context?

Generally, we have had very few fires out there. The Tongue fire was the only one that burned under severe conditions in 30 years. What we don't have are wildfires that burn under moderately severe conditions. Lower higher severity fires goes out fairly quickly. We don't have information on low severity fires. We have data from prescribed fires, but very high severity has little information.

What percentage of the 1800 landscape was described as mature woodland?

An average of 15% of the 4 watersheds had mature woodlands on them. It varied quite a bit, Smith Creek had the least and Red Canyon had some of the most, even though it was right next to Smith Creek.

Do you think that expansion of PJ woodlands has ceased for all intents and purposes and it is now a matter of progression to the later stages of canopy closure?

It varies a lot by location. In some places, it has occupied all of the area it will occupy, and we will just see aging. In other places, expansion is occurring, and that depends on how much woodlands was there at the time; as it moves across the landscape and you get the heterogeneity, you will have more seed source. The encroachment will happen more rapidly where mature woodlands were and then trees broke out in contagion areas. It depends on land management too, and you had areas where trees were areas affected by mining activities, with an increase in mining decreasing woodlands. With the decline of mining, there is a redeveloping of woodland back to these sites, historical human effects and natural effects make these variations.

What fuel models did you use to model fire in sagebrush and PJ in FARSITE?

We developed out own models by sampling stands and developing custom models.

On Smith Creek, how did you interpolate back?
We classified historical photographic data into phases, then compared to current data, then could roll back time. Phase 1 lasts about 50 years, so over 50 years previous, it was sagebrush. We did demographics of age structure.

Why only 6 hours? It can take several days for fires to establish in PJ and exhibit the type of behavior you described, i.e. Torching and sodding.
We did 6 hours because we didn't want fires to exceed landscapes. Our test areas are approximately 15-20 sq miles. We included a large buffer zone, but only did 6 because we didn't want fire to run out of our landscape.

Did you do any comparisons on impacts to soils between the phases and treatment methods?
There is research going on in SageSTEPP looking at those effects on soils. I'm not involved, but other folks are.

Could you explain how flame length decreases as PJ woodlands mature, but fire severity increases?
The flame length was related to surface fires, not ground fires. What happens is surface fires become less and less prevalent, and in fact fires are burning through, and jump from surface into crowns. That is a different kind of fire that has long flame lengths that burn very intensely. It was two kinds of fires I was talking about.

Were mature woodlands, true woodlands, on unproductive soils or encroachment? True woodlands have a lot of grasses and shrubs in the Great Basin.
In the areas I've been in, you have both kinds. The typical things we think of is that that mature woodlands, these fire safe sites, are often protected by some kind of rocky outcrop or something. The soil types and characteristics can be different in those areas. But we also have mature woodlands, for no apparent reason, that sit out in the middle of the sagebrush steppe areas. In some cases we have many rims that go around lava flows, and up on top we have these really well developed sites. But the site is protected by adjacent topography. We have both kinds of situations in the Owyhees and most of our juniper woodlands. They are very old with good soils and productive understories, more savannah-like, like you were describing.