MEASURING THE RESILIENCE OF RANGELANDS

The science of sagebrush

Baker County field trip examines the ability of sagebrush landscapes to recover from a fire

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"You've probably heard a little bit about the whole resilience and resistance concepts — R and R for short."

Jeremy Maestas, a sagebrush ecosystem specialist with the U.S. Natural Resources and Conservation Service (NRCS), was speaking to a group of about 30 attendees of a June 3 field trip in Baker County titled "How to determine the most appropriate treatments before and after wildfire in sagebrush and piñon-juniper ecosystems."

The group included employees, scientists and a few interns from Oregon, Washington and federal fish and wildlife services; various regional BLM districts; soil and water conservation districts along with ranchers, Baker County Commissioner Mark Bennett, and Leticia Henderson, the Oregon State University Extension Service's livestock and natural resources agent for Baker County.

The group traveled from Baker City to BLM land in the Durkee area, about 25 miles southeast near the Burnt River.

The first of three ecological sites the group toured was about a 100-yard hike from Cement Plant Road about a mile south of the Ash Grove Cement plant.

On the short trek, Bennett pointed out the abundance of the invasive species cheatgrass and medusahead grass on the hillside. He also showed a couple of the participants the significant disturbance made to the ground just by the group making its way up the hill.

"People don't understand how fragile this type of terrain is," Bennett said.

Resilient Ecosystems

After the moderately steep climb to the first site — a fairly level area dotted with juniper, sagebrush along with plenty of perennial and annual grasses — the group gathered in a large circle fanning out from Maestas and Rick Miller, professor emeritus of range and fire ecology at OSU, to hear them discuss the concepts of resilience and resistance in sagebrush-juniper ecosystems.

Maestas explained that a site's resilience determines how effectively it will recover from fire. Determining an area's resilience allows land managers to appropriately treat sage land after fire, or before a fire in cases where prescribed burning is a possible treatment to remove invasive species. A higher level of resilience allows the ecosystem to recover with minimal or no treatment, and a lower level would indicate more extensive treatment such as seeding with native grasses or even herbicide control.

Resistance is a site's ability to resist being taken over by invasive annual grasses, Maestas said.

"We've been applying these ecological concepts on pretty broad regional scales to deal with these large wildfire and invasive species problems," he said, "in order to target resources to places that really really need it."

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Abe Clark, NRCS soil conservationist from John Day, digs a hole to determine soil depth while Reid Kelly of LaGrande and Bret Cleaver, range specialist with the Ontario Soil and Water Conservation District, watch. Soil depth is one of the factors used to determine a site's resilience and resistance.

"If we want more sage grouse, more mule deer, better watershed health or more livestock forage, it all rests on having a relatively stable sagebrush ecosystem that's resilient to fire."

— Jeremy Maestas, U.S. Natural Resources Conservation Service

The purpose of the June 3 workshop was to give ecological scientists the ability and tools to evaluate the resilience and resistance of areas their agencies work in to match up with the regional efforts in the management of public and private lands.

Maestas said it's about the ecosystem.

"If we want more sage grouse, more mule deer, better watershed health or more livestock forage, it all rests on having a relatively stable sagebrush ecosystem that's resilient to fire, that doesn't bounce out of that and move into an annual grass land or something that's really hard to come back from," he said.

He explained that it's important to make land management decisions that keeps the ecosystem stable.

Miller addressed the crowd after Maestas.

He said one of the most important skills for any land manager is to be able to stand on a landscape and say "If we have a wildfire, it's going to do this, should we do a prescribed burn here, or if we do some type of mechanical treatment here instead, how is that going to differ or if we just stand back and maybe change grazing management a little bit, how is this site going to look in five years or ten years?"

"How are we going to predict that?" Miller asked. "It's simply playing detective."

Miller referenced a U.S. Department of Agriculture field guide provided to the participants, "Rapid Assessment of Post-Wildfire Recovery Potential in Sagebrush and Piñon-Juniper Ecosystems in the Great Basin."

An online copy is available at http://www.fs.fed.us/rm/pubs/rmrs_gtr338.pdf.

Another field guide that addresses how to select pre-fire treatments was not available as a hard copy to the participants, but is available at http://www.fs.fed.us/rm/pubs/rmrs_gtr322.pdf.

Miller and Maestas said both field guides have very similar information.

When assessing a site, Miller said ecological site characteristics need to be evaluated to determine the resilience and resistance (R and R) of a site, which then helps to determine its treatment post fire, or general treatment if the area has not been burned.

"What kinds of soils, topography is real key and climate," he said.

Vegetation present will also give clues about a site's R and R.

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SAGEBRUSH

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"Even though the ecological site topography, climate and soil kind of say 'here's the kind of vegetation that's growing here,' what's growing here is going to probably be modified by land use history of this particular site," Miller said.

A site that has a good amount of perennial native grasses — bottlebrush squirrel tail, sandberg bluegrass and bluebunch wheatgrass — has a higher resistance to annual invasives such as cheatgrass and medusahead. Add perennial forbs such as lupins and buckwheat and the resistance is increased.

Assessing the soil

Soil temperature and moisture regimes are also factors scientists consider when determining the R and R of a site.

Miller said that in soil terminology warm soils are known as mesic. Cooler ones are termed frigid and cold soils are known as cryic. Soil moisture can be described as aridic (less that 12 inches of precipitation annually) or xeric (more than 12 inches of rain annually). Soil type — loamy sand, loam, fine loam and clay — determine what temperature and moisture regimes different areas will have.

Soil depth is another characteristic that is important to determine a soil's water-carrying capacity and how well deep-rooted plant species will do.

Another soil attribute that is important is its texture. Loamy soils allow more water to infiltrate and store more water than clay or silty soils.

Elevation and aspect — which direction a slope faces — are other factors scientists look at when calculating the R and R of a site.

"One nice thing about topography is it's predictable," Miller said. "We know that when we go from a low elevation to a high elevation, things get cooler and it gets wetter. We know a north aspect is going to respond very differently than a south aspect."

He said as a general rule resilience and resistance increase as you go up in elevation and if the aspect is more northern. On a north aspect, lower elevations will have similar characteristics as more southern ones at higher elevations.

The characteristics that determine R and R change with elevation. Miller said that locally about 4,000 feet (depending on aspect and other conditions) is the level where soil regimes change from warm and dry (mesic/aridic) to cooler and wetter (frigid or cryic/xeric). When you get to that elevation, it doesn't mean there is an immediate change in those soil characteristics, he said — they change gradually as elevation changes.

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(From left to right) NRCS Wildlife Biologist Jeremy Maestas, NRCS Soil Conservationists Nick Vora and Loarraine Vogt, Amanda Smith and NRCS Range Management Specialist Aaron Roth discuss native grasses present at the site.

What grows where, and why

Plant species can indicate site characteristics such as soil temperature moisture regimes and even elevation and precipitation.

Certain plants will only be present at certain levels of rainfall. For example, Miller pointed out the few juniper trees in the vicinity of the field trip's first stop. Typically juniper grows in areas with at least 12 inches of rain per year, which is about what the site receives.

"We're kind of right at the lower end of the juniper belt here," Miller said. "When I start seeing snowberry or serviceberry, I'm thinking, 'all right, it's starting to push at least 14 inches of precip.' "

As the elevation changes, sagebrush species will change from lower elevation species that do better in warm and dry soils, such as Wyoming sagebrush, to higher elevation species, such as mountain big sagebrush, that thrive in colder moist soils. They will even start hybridizing, making it difficult to determine the exact species. Miller said that when you start seeing that change you know you are at the elevation where the temperature and moisture regimes of the soil are changing.

"You get into that belt — that gradient belt — where you're kind of going from mesic to frigid ... those are the zones where (the sagebrush) hybridizes," he said. "When I get into those messy zones, I know I'm in that transition zone."

"Even though the ecological site topography, climate and soil kind of say, 'here's the kind of vegetation that's growing here,' what's growing here is probably going to be modified by land use history of this particular site."

— Rick Miller, professor emeritus, Oregon State University

Miller talked about how weather can vary dramatically from year to year, which significantly affects the proliferation of cheatgrass.

He said recent studies, not yet published, show that cheatgrass does very well after fires in most areas across the Great Basin in areas that have relatively mild winters and hot dry summers.

Miller said areas with colder winters that don't have major issues with cheatgrass might see the invasive species increase significantly after a mild winter followed by a damp spring.

"That can sometimes give us that extra bump for cheatgrass," Miller said.

He said cheatgrass typically thrives in mesic (warmer) soils.

Dividing into groups

After Miller's presentation the field trip participants were divided into six groups of five people each. Each group was given a worksheet on which they could record site characteristics to come up with a resilience and resistance score. Characteristics included precipitation, varying soil depth, temperature regimes and textures along with grass species present. Soils that are warmer (mesic) and drier receive lower values as do low precipitation and high ratios of invasive grasses. The scores from each category are added together to come up with a total score.

The range of the score possible is 4 to 27.6. Scores less than 14 indicate low or very low R and R, 15-20 indicate moderate R and R while scores above 20 show high R and R.

After about an hour of scientific discussion by Miller and Maestas about how the various site attributes could be determined, the groups took about 20 minutes to evaluate the site for its resilience and resistance.

Aaron Roth and Lars Santana, NRCS range management specialists from John Day and Redmond, respectively, provided specific details about elevation and soil type at the site for the groups to assist them in filling out their worksheets.

Jackie Coupples, a biologist with the U.S. Fish and Wildlife Service, talked with her group about bluebunch wheatgrass, a native species that is valuable forage for livestock and wild animals.

"Blueblunch grass is kind of the gold standard of resistance to invasives due to its deep root system that dominates available resources," Coupples said.

Another perennial grass present was Sandberg bluegrass.

Nick Vora, a soil conservationist for NRCS in La Grande, joined the discussion about how perennial grasses increase the resistance of rangeland to invasive grasses.

"It's good to have a diversity of perennial species," he said. "Bluebunch and Sandberg have two different root profiles that occupy different areas of the soil."

He said the two grasses complement each other and don't compete. Bluebunch has a very deep root system while Sandbergs have a shallower one. The way their roots occupy the soil makes it less likely for invasives such as cheatgrass or medusahead to move in to the area.

The dominant perennial grass in the area was squirreltail grass, a fairly deep-rooted perennial.

The group ended up with an R and R score of 14, which reflected a fairly low resilience, but with the presence of the beneficial perennial grasses, it had better resistance to invasives.

Overall, the six groups' scores varied from 10.5 to 15. After asking the groups what they came up with, Miller went through the categories himself and came up with a score of 13.5.

"I think probably most of us feel like, really, this site is not where we would sure like it to be," he said. "But it's definitely not down at the bottom where it could be. And you wouldn't have to walk very far to get into where it's all cheat(grass)."

How to improve a site

Miller then asked: "Do we do anything about it?"

That depends on what the landowner's objectives are and how vital the area is to sage grouse.

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GRASS SEED

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This means less of the Kentucky bluegrass and fine fescue Blue Mountain Seeds produces is being shipped out of the country to places such as China, Canada and a number of countries in Europe, all of which have been strong international markets for the Imbler company, Merrigan said.

Grass seed producers in the United States are not the only people in agriculture being affected negatively by the strong dollar.

"The strong dollar is hurting (United States) agriculture in general," Merrigan said.

A year ago, Oregon grass seed producers were also set back by a strike at many ports along the West Coast including the Port of Portland. The strike meant that a number of shipments of grass seed set to go overseas never made it out.

"The strike cost us a lot of money," Merrigan said.

Overall, however, Merrigan feels good about the position the grass seed industry is in because of the strengthening housing market in the U.S. and because farmers have not overproduced grass seed, which is also helping to stabilize prices.

"We are doing just fine," Merrigan said.

Merrigan said that working in the grass seed production industry is a lot of work year round, but it is rewarding.

"I enjoy the people in the business and the growers. It is a fun business," he said.

Merrigan said he enjoys working with grass seed for a number of reasons, including the fact it is a perennial crop which can be harvested numerous times before dying.

"It can be left in four, five, six or seven years," Merrigan said.

He also likes its environmental qualities, noting that grass filters contaminants out of water, produces oxygen and cools the ground temperature near buildings.

"It provides great support for the environment," Merrigan said.

CATTLE PRICES

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Prices have moderated since the end of the year with less volatility and more seasonal patterns driving price movements.

Fed cattle prices have shown the most improvement since bottoming out in December 2015, increasing to $137.57/cwt through the third week of March, up nearly 14 percent. Average prices for 550-lb. feeder steers increased 8.5 percent since December to $197.12/cwt. During the same period, 750-lb. feeders increased 3.5 percent to $160.13/cwt.

Supply and Demand

USDA estimates the U.S. beef cow herd increased to 30.3 million head as of Jan. 1, 2016. This represents a year-over-year increase of 3.5 percent and the second consecutive year of herd growth. All-time lows of 29.1 million head came at the end of 2013.

CattleFax projects continued herd expansion in 2017 based on the impact of heifer retention over the previous two years. Heifer slaughter as a percentage of total fed cattle slaughter declined significantly in 2015 when the beef cow herd increased over 1.0 million head.

Projections for heifer retention in 2016 and 2017 remain aligned within historical levels. Cattle imports increased in 2015 to support domestic consumption trends.

Herd expansion reduced domestic beef production by 2.3 percent year over year. Slowing domestic production drove import volume to increase by approximately 14.2 percent. The top suppliers of U.S. beef imports continue to be Australia, Canada and Mexico. However, Australian imports are likely to decline in 2016 given significant drought-induced herd liquidation. Mexican and Canadian imports have been down significantly year-to-date and are forecast to be lower through 2016. Mexico and Canada are both struggling with tight domestic cattle supplies and a smaller exportable supply of feeder cattle. Lower US cattle prices have further driven the decline in cattle exported to the US from these countries. The USDA forecasts beef production to increase 3.6 percent causing exports to rebound by as much as 6.3 percent in 2016.

Beef export volume declined by approximately 11.7 percent in 2015 as the strengthening of the U.S. dollar relative to other foreign currencies made US beef products more expensive. Export volume in early 2015 was also negatively impacted by the residual impact of the West Coast port labor dispute.

WAGNER

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"Millions of homes and golf courses around the country have greener turf because of the ingenuity of one man," James wrote in 1950 of Wagner, who died in 1951 at age 67.

Wagner was born in upstate New York on a farm near Colbrook. His family moved to Nebraska when he was 7. When he was a teenager his family moved to Western Oregon.

As an adult Wagner moved his family to the Grande Ronde Valley in 1930. The Wagners rented land here for $15 an acre, according to James. After unsuccessfully trying to grow several crops Wagner became convinced that grass seed would be successful.

He was correct because Northeastern Oregon generally receives most of its precipitation in the fall and winter and has dry summers.

Arid summers are critical because grass must be dry when harvested, according to Bill Merrigan, general manager of Blue Mountain Seeds in Imbler.

SAGEBRUSH

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If there were sagegrouse leks (mating areas) nearby, the treatment might just be to remove the juniper, Miller said.

One participant suggested that it looked like a good area to only allow fall grazing. Several others agreed. A BLM employee said the area is in fact part of a fall grazing allotment.

Miller said grazing has to be carefully managed throughout the year to avoid losing the perennial grasses. That can happen if cattle are allowed to eat grass before it produces seed heads.

"That's when that plant is really cranking away (with growth),"he said. "It's taking that factory that's producing at max and shutting her down."

Maestas said treating the area with prescribed burning would probably not be a good thing because of the low resilience.

"We have perennials and they look good because of the fall grazing," he said.

Maestas said treating the area with fire might be just enough to knock the perennial grasses down enough that it would allow invasive annual grasses to move in.

At a second site, several miles south of the first one and at an elevation of about 4,600 feet, the group was greeted with a colorful display of wildflowers among mountain sagebrush and junipers on a north-facing slope just below a ridgetop.

Miller pointed out that he had passed a serviceberry bush on the way to the site, which was about 100 yards from the road. He said the presence of serviceberry indicates the yearly precipitation is likely 14 inches or more. That, combined with other characteristics of the site — moderate soil temperature regime with good moisture, texture and depth; the presence of mountain sagebrush and plenty of forbs and perennial grasses — gave the site a score of 25 on the R and R worksheet.

After a lunch taken in the shade of junipers about five miles west of Durkee near the Burnt River Canyon Road, the groups each evaluated another site nearby that was at about 4,000 feet in elevation.

The site was a fairly level area surrounded by hills that had been grazed fairly heavily. Miller said he would have expected to see basin wild rye grass. Overgrazing could be factor in its absence. He said there was also a possibility that the site could have been used in the past for dryland farming.

In spite of those possible past impacts, the site scored well.

Most groups gave it a score of about 17 to 21 on the R and R worksheet. The site's 12 to 14 inches of annual precipitation, a good amount of perennial grasses, soil temperature that was mesic but on the cool side and very deep soil with decent texture all contributed to the site's relatively high score.

Before returning to Baker City, the group briefly examined an area in the vicinity that was burned in the Cornet/Windy Ridge Fire in August 2015. The only apparent signs of the fire were the brown and black skeletons of junipers in the distance and, upon closer inspection, small areas of blackened earth.

Perennial grasses and forbs were fairly abundant, but invasives were present as well.

Miller said the presence of the perennial grasses was a good indicator that the area was recovering from the fire.