



Part of the Nevada landscape burned by the Martin Fire, just less than one year later. (Photo by Sarah Keller.)

Cheatgrass on Fire

The race to save an ecosystem

The wording of this article has been adjusted to a 7-8th grade reading level. Andrea Barbknecht of the Wyoming Wildlife Federation made the revisions as part of the organization's curricula to engage kids in exploring their Wyoming landscape.

The original article, written by Sarah Jane Keller for Western Confluence magazine, can be found [here](#).

By Sarah Jane Keller (May 2020)

Locals think that Nevada's largest fire may have started with a 4th of July firework. No one really knows, though. The 2018 Martin Fire seemed small and harmless until the weather changed. With winds suddenly pushing the blaze, it burned through sagebrush at 11 miles per hour. Firefighters could not get ahead of it.

The Martin Fire doubled in size every day for four days. It grew to be 57 miles long and 30 miles wide, burning 435,000 acres of land. Among the biggest losses in the fire was some of Nevada's best sage grouse habitat. At least 35 leks burned. A lek is

where the birds stage their breeding dances. Ranchers, Elko County officials, and local hunters all chipped in for a reward to catch whoever started the fire. They never did.

Fire is a natural part of the Great Basin, but massive ones like the Martin Fire were unheard of a generation ago. The Great Basin is an ecosystem that evolved with rare fires every 30 to 100 years. Now, there are fires as often as every five years.

Fires are now also larger in the Great Basin. Historically, **rangeland** fires were hundreds or thousands of acres. Today, they often

become megafires, defined as fires bigger than 100,000 acres. The term “megafire” captures how destructive and expensive these very large fires are.

According to data from the Bureau of Land Management, a new trend is emerging. Rangeland fires now tend to burn more acres each year than forest fires. That was the case in 13 of the last 19 years. Even so, there is less attention and funding available to fight mega-sized range fires than forest fires.

Several major changes are stoking Great Basin megafires. First, a history of suppressing fires has led to more shrubs like sagebrush and juniper and less native perennial grasses. The native grasses are bunchy and slow the spread of fire. Second, cheatgrass (*Bromus tectorum*) is covering more of the West. Cheatgrass is an invasive **annual** grass that is often found in disturbed areas like roadsides. Cheatgrass burns easily and quickly. Adding to this, the Great Basin has been getting warmer over the last 100 years. This favors fires and cheatgrass.

Not only does cheatgrass take over an ecosystem, it also makes rangeland more likely to burn. As cheatgrass grows, it covers the landscape in fine, tissue paper like plant parts. This is super fuel for fires. When a lightning strike or escaped campfire sparks a fire, sagebrush dies. Cheatgrass seeds, however, survive fires and **germinate** quickly. They outcompete native grasses and grow even more. After several cycles of fire and cheatgrass growth, diverse and complex shrublands become fire-prone cheatgrass savannas. This pattern has

locked the Great Basin into a viscous cycle of more fire, more cheatgrass, more fire, and more cheatgrass.

The speed and scale of recent changes shows the huge ecological, economic, and social consequences of invasive species. Ranchers, rangeland scientists, and managers are waking up to the rapid pace at which cheatgrass and fire are changing the landscape. They are racing to save what remains of the Great Basin’s sagebrush ecosystem.



Jeremy Maestas, an ecologist who works on sagebrush ecosystem conservation for the US Department of Agriculture’s Sage Grouse Initiative, examines rangeland plants growing in the wake of Nevada’s massive 2018 Martin Fire. (Photo by Sarah Keller.)

“It’s in its own class among invasive species,” says Jeremy Maestas. He is an ecologist who works on sagebrush conservation for the USDA’s Sage Grouse Initiative. “I think what people have to realize is just the sheer disruptive nature of that plant on western range. If you care

about the American West and the rural way of life, this is going to upend everything.”

Cheatgrass lived without making a big ecological impact for thousands of years in Europe and Asia. Since it came to North America, it has spread across human influenced land. It arrived from Europe in packing material in the late 1800s. It soon spread to all 50 states and thrives in the western US.

Range managers in the early 1900s were worried about cheatgrass, says Maestas. Sagebrush and native grasses put a lot of time and energy into putting down deep roots after fire or disturbance. On the other hand, cheatgrass moves fast because it doesn't invest in the future. As an annual plant that can germinate in fall or spring, it has a head start on native plants. Native plants are **dormant** at these times. Cheatgrass dries out by June, producing as many as 5,000 seeds per plant.

By the 1930s westerners thought they could learn to live with cheatgrass. Cattle can eat it in the spring, and it seemed too hard to control. Aldo Leopold, one of the first wildlife managers, sounded an alarm about letting cheatgrass spread in Utah and Oregon.

“It is impossible to fully protect cheat country from fire,” he wrote. “As a consequence, the remnants of good browse plants, such as sagebrush and bitterbrush, are being burned back to higher altitudes, where they are less useful as winter forage.”

As Leopold predicted, overgrazing and drought led to cheatgrass invasion. His fears

about the consequences of failing to control the weed came true. Today, cheatgrass makes up so much of the vegetation across the West that about one third of the landscape is covered. This is a lot of fine fire fuel that dries out as fire season begins. **Monocultures** of cheatgrass are most common at lower elevations, but cheatgrass is also spreading to the Northern Rockies and showing up in places people never expected it.

Cheatgrass has expanded in the West since 2000, according to Maestas. Along with that, fires are four times more frequent in the Great Basin. The fire season is also longer, and the fires are much larger.

“When people’s houses aren’t burning down, it’s really hard to motivate people at a large enough scale to do something about it,” says Maestas. That has changed though as cheatgrass has made fire more common. About 15 million acres of sagebrush burned between 2000 and 2018. “People’s ranches and **allotments** are burned out regularly, and they have nowhere to go with their livestock. Now we’re seeing consequences of not taking action.”

As the economic, ecological, and social consequences of cheatgrass have become clear, people have become more urgent about fighting it. Jon Griggs, a ranch manager, is one Nevadan who has experienced the consequences. One of those is the emotional damage of seeing livestock burned and watching fire rush toward him on the ranch.

There are clear consequences for ranching communities that rely on healthy sagebrush ecosystems. It costs hundreds of thousands

of dollars to feed livestock when range can't be used after a fire. Ranchers may have to sell their cattle. "Fire and the aftermath of fire might be the biggest challenge that we have," says Griggs. "It does put people out of business. It changes our livelihood, sometimes forever."

In addition to the threat of being burned and put out of business, wildlife managers and ranchers worry about how cheatgrass and fire will affect conservation goals. For example, when mule deer arrive on burned over winter range, they can't find the sagebrush and bitterbrush they rely on. This leads to loss of fawns and starvation. Fires in northern Nevada have taken a toll on wildlife herds. In the early 1990s one of Nevada's mule deer herds had 20,000 animals. By 2018 there were fewer than 10,000 mule deer. "Most in our agency attribute that major decline in population to wildfires that have burned the majority of winter range for this herd," says Cody Schroeder. Cody is a Nevada Department of Wildlife mule deer biologist.

The fate of 350 wild animal species are tied to healthy sagebrush. Of these, sage grouse have been a focus because they are so sensitive to healthy ecosystems. Ranchers like Griggs have viewed avoiding listing sage grouse as endangered species as an opportunity to do conservation work that benefits cattle and wildlife. Fire can sweep through and damage all that work in a few hours.

Sage grouse will return to a lek and do their mating dances even if the ground is blackened, says habitat division chief Alan Jenne. Sage grouse who are exposed to the

sky and don't have sage to hide in are likely to be eaten by predators. To avoid getting eaten, they will leave the lek and not mate or produce new chicks. If the grouse do mate, their chick are more likely to be eaten by predators like ravens because of the lack of sage brush cover. When the chicks do survive, they are harmed because they need to find flowering plants to eat. If cheatgrass has taken over, those flowering plants don't grow and the birds will need to move to a new area. At that point, "they're kind of on a death march to get to something more productive," says Jenne.

When the Martin Fire took out 35 sage grouse leks, it was like watching years of work go up in smoke. Land managers and biologists had been working hard to keep sage grouse healthy and off the endangered species list. Griggs calls fire *the* concern when it comes to potential sage grouse listing. "Three quarters of a million acres in two fires last year in the north end of this state burned up the best habitat we've got," he says. "Thinking about listing, just those two fires really concern me."

These concerns are supported by evidence and shared by the sagebrush conservation community. If current wildfire trends continue sage grouse populations may go down by 43 percent over the next three decades according to a 2016 study.

After the Martin Fire, sagebrush skeletons poke out of the black soil and wind whips up sooty dust clouds. Returning this landscape to a place where sage grouse chicks can thrive means overcoming all of cheatgrass's advantages.

Sagebrush **habitat restoration** is an evolving art and science. While we see the results above the soil, a key part of the battle against cheatgrass is belowground. Research is showing that maintaining or re-growing the extensive root systems of native plants keeps cheatgrass from getting a start.

The key for restoring sagebrush is “right seed, right place, right time.” This is a short way to say it takes care to grow native plants in a harsh, cold desert climate with less than 10 inches of rain a year. Restoration in large settings far from cities is difficult, expensive, and hampered by the rough climate. It took nine semi-trucks carrying up to 30,000 pounds of seed to replant after the Martin Fire. To do this, burned, snowy, wet roads needed to be repaired first. In the end, it is impossible to even try to fix all of the 435,000-acre burn scar.

Most invasive weed programs can treat about 10 percent of invaded acres each year. This is a problem since invasive plants can spread 15 to 35 percent each year according to a 2017 report by the Western Association of Fish and Wildlife Agencies. If we cannot fix those numbers, it doesn't look good for a sagebrush ecosystem that is already 41 percent gone. “It's hard for me personally, the notion that we could almost lose this ecosystem in its entirety within my lifespan,” says Liz Munn. She is a rangeland ecologist for The Nature Conservancy's Nevada chapter.

To help prevent that outcome, Munn and other researchers are developing technologies to help native plants compete.

One technique is to try to give native grasses a head start. To do this, researchers coat native seeds like blue bunch wheatgrass and squirreltail seeds in pods of activated charcoal. Those pellets protect the seeds from herbicides. When cheatgrass comes up, it can be treated with herbicides without harming the native seeds. Other types of seed coatings can help seeds germinate earlier or later than they would on their own to give them an advantage.



Liz Munn, rangeland ecologist for the Nature Conservancy's Nevada chapter, displays squirreltail seeds coated in pods of activated charcoal, a technique researchers are experimenting with in hopes of helping native plants compete with cheatgrass. (Photos by Sarah Keller.)

“Ultimately we're sort of mimicking what cheatgrass does,” says Munn. “Cheatgrass needs a little credit here, really. It's adapted to this environment. It germinates quickly. It germinates often. So, we're trying to basically give native seeds the same advantages that cheatgrass already has.” The Nature Conservancy and USDA Agricultural Research Service are borrowing techniques like these from agriculture. These are called precision restoration technologies. They are designed to boost the odds of a successful restoration. The technologies include seed coatings and mapping tools to help managers make

better decisions about what techniques to use or when to use them.

Seed coating techniques have worked in the lab, so The Nature Conservancy and others are testing them in the field around the world. One of those places will be mule deer winter range in Nevada that is being restored after the 2017 Snowstorm fire.

While the first tests are too small to make a big difference for mule deer yet, they could in the future. Mule deer herds near Elko have seen dramatic population declines due to loss of winter range from cheatgrass and fires. “We have populations that are solely reliant on our past efforts at fire rehab at different times of the year,” says Caleb McAdoo. He is a habitat biologist with the Nevada Department of Wildlife.

The deer herds are one reason why it is important to protect intact and restored habitats from fire. Currently, the best option available is to put in fuel breaks to keep fires from growing too large. Managers plant bands of nonnative plants that grow well but are not invasive. These plants are chosen because they stay green and can slow fires.

Disturbing areas and planting nonnative plants means that this is a controversial technique. There is not a lot of evidence supporting the idea that it is effective. There are some instances where it has protected key habitats and restored areas. One example was the 2017 Centennial Fire in Idaho where a fuel break slowed the blaze enough that firefighters could control it before it reached 20,000 acres.

Fuel breaks are an extreme measure. Once an invasive species changes the way an ecosystem works, often only extreme actions will work to counter their impact. The Bureau of Land Management is planning to build 11,000 miles of fuel breaks in Nevada.

The Bureau of Land Management is breaking up the land enough that big fires don't form. They must be careful to not break up the ecosystem so much that they are hurting the ecology with their actions.

Beyond containing Great Basin megafires and restoring habitat impacted by cheatgrass, managers are trying to prevent its spread. It is important to not let cheatgrass take over new regions.



Native wildflowers emerge amidst burned sagebrush stalks nearly a year after the Martin Fire swept across 435,000 acres of Nevada rangeland. Managers, conservationists, and ranchers are in a race to keep cheatgrass from taking over these lands. (Photo by Sarah Keller.)

“We go into areas that are broken and try to fix it,” says Maestas. “We need to get out of that model. Invasive species management 101 tells you you’ve always got to prevent first.” That means doing what Leopold begged westerners to do almost 100 years ago. We need to go into areas where cheatgrass is just starting, like

the Rocky Mountains, and stop it while it is small.

Wyoming used to be considered too far north and too high in elevation for cheatgrass to take off. Now managers are finding cheatgrass above 9,000 feet in elevation. It is clear that Wyoming can be invaded. Wyoming also has 37 percent of the West's sage grouse population, the most leks, and the most sagebrush of any state. The stakes are high for controlling cheatgrass in Wyoming.

In places like the Great Basin, the prevention work didn't happen soon enough. There, the challenge is to learn how to live with cheatgrass. "But that doesn't have to be the future for a lot of the West," says Maestas.

"We still have a lot of land that is in really good shape, but it's threatened by invasion. I think it's a cultural mindset, that people have to be ready to respond quickly before there's an obvious problem."

Glossary

Rangeland Open country used for grazing or hunting animals

Annual A plant that grows, live, reproduces, and dies in a single growing season or year

Germinate When a seed begins to grow and put out shoots

Dormant In a state of low or no activity or growth, either as a reaction to environmental conditions or as part of an organism's normal annual rhythm

Monoculture The growth of a single plant especially on agricultural or forest land

Allotment A plot of land rented by an individual for grazing

Habitat Restoration To repair and bring an ecosystem that has been damaged by human activity back to functionality