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PHOTO COURTESY OF BARRY PERRYMAN

# Fire Prevention for the Arid West

Control cheat grass on dryland pastures and rangeland.

by Heather Smith Thomas

Cheat grass has become an ever-increasing problem in the West, taking over many acres of grazing land and contributing to wildfires. This annual grass is not native to North America, but it has spread prolifically in arid regions in the past several decades.

Cheat grass (*Bromus tectorum*, also called downy brome) now dominates millions of acres in the West. A native of southwestern Asia, this annual grass came to America via contaminated grain during the late 1880s. The sharp, sticker-like seeds are easily spread by animals, caught in wool or hair. They cause misery when they get into ears or paws of dogs, or poke into the mouth of cattle, causing abscesses and lump jaw. Cheat grass grows quickly in the spring, but soon matures and makes perfect fuel for wildfires.

## A menace

This invasive grass was well-adapted to the climate and soil in much of the arid West, such as the Great Basin (parts of Idaho, Nevada, Oregon and Utah). It readily invades and takes over native plant communities because it produces

many more seeds than perennial grasses and is drought-resistant; seeds can remain viable in the soil for up to five years. It germinates readily in the fall as well as spring, with rapid elongation of roots. Cheat grass has twice the root mass of blue bunch wheatgrass during its first 45 days' growth. Wildfires enhance it, due to its ability to cross-pollinate more readily after a fire, resulting in hardier plants that outcompete the natives.

Fire has become the biggest threat to natural resources in the West, destroying wildlife habitat, livestock forage and private property. One of the major factors leading to increased incidence of fire on rangelands has been excessive "fuel" — ungrazed forage — especially during dry years when dry grasses are easily ignited by lightning. The accelerating fire cycle (fewer years between fires) began about the time the Bureau of Land Management (BLM) started curtailing grazing. With less grazing, fuel loads built up, fires became more common, and cheat grass began increasing even more after the fires.

With excess fuel, a fire burns hot enough to



PHOTOS COURTESY OF ANN KENNEDY

► During the past 30 years, Ann Kennedy with the USDA Agricultural Research Service (ARS) in Pullman, Wash., has researched several types of soil bacteria that inhibit cheat grass.

destroy annual and perennial plants; former grass/shrub plant communities are replaced by invasive annual grasses like cheat grass and medusahead. Fire return intervals are shortened, fire burns more readily the next time, and range condition/fire danger keeps getting worse.

Some people are realizing we need more grazing, not less. Grazing studies the past few years have shown that next year's fire danger, as well as cheat grass propagation, can be greatly reduced by late fall grazing by utilizing protein supplements to encourage cows to

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eat mature, dead cheat grass. This reduces the seed bank — and the litter that new seedlings thrive in the next spring.

Barry Perryman, professor of Rangeland Ecology and Management at the University of Nevada–Reno, has been interested in the problem of cheat grass for many years.

“I’ve looked at what’s been happening in the West since the 1960s. The cheat grass was already here, but greatly increased its dominance across the landscape after the 1970s,” he says.

“What we’ve been doing in terms of management and cheat grass control has not been working,” says Perryman, who has traveled to central Asia to study what cheat grass is like there. While most of the cheat grass in the United States has a Mediterranean or European ancestry, the grass is common in central Asia, and Eurasia is its ancestral home.

“Over there, it’s not a problem,” Perryman explains. “It can be hard to find cheat grass unless you look underneath a thorny shrub where animals can’t get to it. Those regions don’t have range fires. They don’t have fuel buildup because their lands are more fully grazed. If forage is available for something to eat, something eats it.”

There’s no buildup that rolls over from year to year, adding more dry material that could readily burn. In the United States, fire risks have increased dramatically the past 50 years.

“We thought we needed to leave more grass on rangeland for a number of reasons. Some were legitimate goals, but some are just because environmental groups have been pushing federal agencies to cut back on grazing. We’ve allowed carryover fuels to

accumulate to the point we get catastrophic fires,” says Perryman.

### Grazing trails

“We started an experimental grazing project in Nevada, thinking we might be able to reduce the amount of carryover fuels. Grazing cheat grass in the spring is easy; we know grazing animals will eat it when it’s young and green. Many ranchers in Nevada would be out of business if they didn’t have cheat grass to utilize in their annual grazing cycle,” he says.

Cattle will also eat it in the fall. Summer is when they won’t touch it. When it’s green, it’s nutritious and palatable, but that quickly changes as it matures. By the time it goes to seed and turns purple, the protein level drops and no grazing animal wants a mouthful of sharp seed awns. These seeds can cause injury if cattle get them in their eyes or embedded in the mouth — where punctures can lead to infections, abscesses and lump jaw, he explains.

“Yet later in the year, after seeds drop, the



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plant is palatable again. If we can get animals to eat it in the fall, when the seeds are not a problem, this alleviates some of the planning issues that are a challenge if we try to graze it in the spring. You don’t know, from one year to the next, when it will start growing. If it’s a mild winter and a warm, wet, early spring, cheat grass is green and growing in February. But with a cold, dry spring, it may not start growing until April. You don’t know when there will be enough of this early grass to turn out,” he grants.

It is difficult to plan spring grazing, or how many animals it will take to reduce cheat grass for optimum fuels management.

If cattlemen wait until seeds drop in late July or August you can determine how much is there in pounds per acre and how many animals will be needed to graze it down to the desired level of fuel management. They know when they can turn cattle out, how long it will take to graze that amount of cheat grass, and when cattle will be coming off — and can plan for where to take the cattle when they come off, Perryman explains.

“In terms of fuels management, if we have 500 pounds (lb.) of dry cheat grass per acre on September 1, and can reduce that to 200 pounds, this may be the difference between being able to readily control a fire or not. If we can reduce the cheat grass below that threshold level, it can really help,” he notes. Even if rains reduce fire worries in the fall, this would be 300 lb. per acre that wouldn’t be carried into next year.

### Nutritional value

When analyzed for nutritional value, Perryman says dry cheat grass was found to be high in energy (structural carbohydrates that cattle convert to energy during rumen digestion), but could be low and highly variable from year to year in crude protein.

“I’ve seen crude protein as low as 3%, and as high as 8%,” he says. “When cattle are given a choice, we found they’d much rather eat cheat grass in October than crested wheat, or any native perennial that is not green and growing. Cattle prefer dry cheat grass to dry bunch grasses because it’s not as stiff and coarse. The cheat grass becomes softer in the fall.”

If cattle are turned out on cheat grass in the fall when everything is dry, protein must be supplemented. This increases feed intake with dry forages. Cattle need an adequate amount of protein to feed the microbes in the rumen that digest fiber and turn it into energy. If a ruminant is short on protein, digestion slows down, the animal can’t eat as

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PHOTOS COURTESY OF BARRY PERRYMAN

► Cheat grass is palatable in the spring when it is young and green. As it matures (right), cattle leave it and it becomes fuel load.

much forage, and tends to lose weight. With protein supplement, cattle will consume more cheat grass, and any other dry feed out there.

“We put out supplement tubs — liquid protein supplement — and found we could move those around and improve cattle intake, and better distribution in areas we want them to graze,” says Perryman, adding that results of the first study published results of the study on their first project in the March 2014 *Professional Animal Scientist*. “We found additional benefits, such as seed bank reduction. The cheat grass seed bank dropped tremendously in grazed areas.”

Even though plants are grazed after they drop their seeds, grazing makes a big difference because cheat grass does not establish very well on bare soil. It needs litter. The more litter the better — such as old plants from last year and all the previous years they were not grazed. The old standing dead material protects the seed and it germinates in that litter, he says. If you clean up litter by grazing in the fall, any seed that’s still there may germinate, but it dies. It can’t survive and establish a new plant on bare soil.

Says Perryman, “We have shown that if there are any perennial grasses there at all, within about three years of fall grazing you can shift dominance from cheat grass to the perennials. The perennials can then keep cheat grass at bay, in our experience.”

With fewer plants, meaning a thinner stand of cheat grass because it grows thicker than bunch grasses, perennials thrive better. The young perennial seedlings can see the sun, and get enough water; it’s not all being used by cheat grass.

“After three years of grazing these areas, we saw a flip-flop in numbers. We started

with about 500 pounds of cheat grass per acre and about 100 pounds per acre of perennial grass production. At the end of three years, it was just the opposite on our pilot study on 1,500 acres,” he says.

Researchers began a larger study at the TS Ranch between Battle Mountain and Carlin, Nev., the fall of 2014 on about 6,000 acres.

“We put 800 cattle out there for five weeks, trying to graze a straight line across the landscape to create a firebreak, using supplement as an attractant. Our plan was to create a firebreak in a cheat grass matrix. The biggest threat to sage grouse and every other species out there is fire. Every year it burns up more bird habitat, yet the anti-grazing approach is to remove more livestock. Grazing is one of our best tools to reduce fire danger,” says Perryman.

Dry cheat grass in regions where it has become dominant is the biggest danger because it burns so readily. Utilizing cattle to reduce fuel loads, finding ways to enable them to graze cheat grass — with use of protein supplement to facilitate grazing — could be one of the most effective ways to combat wildfires and enable more perennial grasses to come back into the landscape.

### Biological control

We can use cows to reduce cheat grass and prevent fires, and now we also have another weapon in the battle against cheat grass — a natural herbicide in the form of certain soil bacteria.

During the past 30 years, Ann Kennedy with the USDA Agricultural Research Service (ARS) in Pullman, Wash., has researched several types of soil bacteria that inhibit cheat grass. She discovered these while trying to find the cause of poor root growth in winter

wheat in early spring. She found numerous soil bacteria that hinder root growth, including some that inhibit only cheat grass roots. Kennedy started culturing these in her lab and applying them onto experimental plots.

One type can be sprayed onto a cheat-grass-dominated area in the fall during cool weather. As cheat-grass seeds germinate, these bacteria inhibit the roots and the plant doesn’t put out any tillers. The result is a tiny plant that doesn’t produce very many seeds. There are fewer seeds produced each year that these bacteria are present.

During the past decade, research collaborators have done field studies in many locations, establishing test plots up to 10 acres in size. These studies have consistently shown a 50% reduction in cheat grass within three years of a single bacterial application. In long-term field trials in the western United States, application of bacteria resulted in almost complete suppression of cheat grass in five to six years after one application, when perennial bunchgrasses and other native plants were present. No cheat grass remained in the seed bank five to seven years after that single application of bacteria.

Biowest Ag Solutions of Nampa, Idaho, has now developed its own strain of this bacteria after working with Kennedy. Biowest began marketing this as a soil amendment until it can be registered with the Environmental Protection Agency (EPA) and labeled as a bio-herbicide.

David Lister, operations manager, says Biowest was founded in Idaho 26 years ago as a fertilizer company. “Our original concept included integrating the biological component into fertility systems. We tried to

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enhance soil conditions to stimulate and propagate active bacteria that normally grow in the soil — as well as using fertilizer — to get the best of both worlds,” he says. This results in healthier, more fertile soils.

“This is not a novel concept, but on large farms this idea was not accepted. We started working intently on biological components of fertility systems, but it was more difficult to get this idea across to people than it is now. Then we had an ownership change and Brian Wieburg came to us (as an investing owner) through Coors. His background was brewing beer; he was a microbiologist by trade. He said that what we were doing was great, but we could take it a step farther by propagating active bacteria,” says Lister.

Wieburg suggested growing beneficial bacteria and integrating them back into the soil, Lister explains. They started using various strains of soil bacteria that promoted growth in plants, and also enhanced the good bacteria that were already present.

While Biowest had been doing this for about 12 years, Lister learned of what Kennedy was doing with biological herbicide and cheat grass five years ago and got in touch.

“Not only do we have the ability to propagate bacteria on a large scale, but we can also distribute it and follow up with application onto the soil. It’s challenging to work with a live material; this is not something that can sit on the shelf. It has to be used in a timely fashion. This is the limiting factor, but that’s where we come in. We have the ability to produce it in large volume. We can grow it, deliver it and apply it,” he says.

Kennedy was trying to get her product

► Cheat grass has been significantly reduced after three years of fall grazing.



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registered with EPA as a biological herbicide, but this is a very slow process. “While we were waiting, we went a different route and developed a product called MB906, and in the fall of 2015 got it registered as a soil amendment. It works best during the cool, moist weather in the fall and in the spring,” he explains.

“Once the registration comes through from the EPA, we will label it as a natural herbicide and can market it under a brand name. It is liquid, to be applied at the rate of a gallon per acre. Based on Ann’s technology, this provides a three- to five-year window of management for controlling cheat grass, especially if you can give perennials a chance to establish a healthy stand, or reseed, or do other things to create competitive edge for native plants. The bacteria give better results when you have a complete, integrated management system,” he explains.

Ranchers and range managers fighting cheat-grass invasions and wildfires are

interested, because it provides another tool to help control cheat grass. Lister advises application in the fall when moisture is more predictable. He says they apply the bacteria in conjunction with a grass killer called imazapic, using a product called Plateau®, via tank mixing. In late fall, a low rate of chemical application won’t kill perennial grasses that have gone dormant, but it hits the fall flush of cheat grass.

If it can be applied in that window, it works really well. Lister says they add a gallon of the bacteria MB906 and apply it at a 3-gallon total rate per acre from an airplane. The herbicide halts initial fall germination of cheat grass and eliminates growing plants. It cleans the slate because by spring there will be fewer plants, and then the bacteria have time to go into the soil and colonize.

“When they colonize, they attach to the roots of cheat grass. The bacteria limit cellular elongation, limit germination, cell growth and root activity. Any seeds that escape the bacteria and germinate will be stunted plants. This creates a better environment for desirable grasses. This is a big jump ahead in the battle against cheat grass by integrating those two weapons initially. If you don’t have the ability to do that, or there’s no window to mix the bacteria with chemical, you can apply the bacteria alone, but it takes longer to see results. It takes a while for the bacteria to get into the soil and start colonizing,” says Lister.

“This product simply enhances what Mother Nature has provided. We just try to level the playing field and take the competitive advantage away from cheat grass — and allow the desirable grasses to propagate,” he says.

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**Editor’s Note:** Heather Smith Thomas is a freelance writer and cattlemaster from Salmon, Idaho.

### Restoration efforts after a fire

Land-management agencies generally do restoration projects after a severe fire, to re-establish desirable plants in the burned area, but many of these projects have not been as successful as hoped.

“To aid this process, we can coat the seeds of a desirable plant with these bacteria,” says Ann Kennedy, with the USDA Agricultural Research Service (ARS). “Then the bacteria are delivered along with the seed.”

What grows back after the fire will be desirable plants rather than just cheat grass again.

“We need to stop that vicious cycle, and go back to bunchgrasses. I am hoping we can use this organism to help ranchers and federal-land managers have better forage and stop wildfires,” Kennedy says.

Many ranchers can’t afford to buy seed and drill it, which is the best way to establish new plants. “I’m not a proponent of the government coming in to do things, but when a fire goes through an area, there are funds for restoration. If ranchers can obtain some of those funds — to buy the seed and rent a drill — putting bacteria on the seed will give them a leg up for better restoration and less cheat grass,” she says.

Fighting fires has become such a huge part of the land-management agency’s budgets that other important things like preventing fires are neglected. If we could slow down the fires and do better restoration efforts, this vicious cycle could be turned around.