BUILDING RESILIENCE THROUGH ENGAGEMENT: BRENDA AND TONY RICHARDS

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BUILDING RESILIENCE THROUGH ENGAGEMENT: BRENDA AND TONY RICHARDS

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Abstract

Tony and Brenda Richards run a family cow-calf operation in Murphy, Idaho. Their cattle graze a combination of private and public rangelands. The Richards actively work with agencies and other entities that have rule-making authority around grazing management on public lands. Though engagement is not a quick solution, the Richards highlight their experience with the 2015 Soda Fire, where this involvement with other entities benefitted their operation. The Richards are hopeful that by engaging in this way they can help change public lands management so that it provides them with the flexibility they need to have a resilient operation, necessary to address both current and future challenges that arise as the climate, their community, and society's needs and values change.

This case study is part of the Rancher-to-Rancher Case Study project, which explores innovative approaches regional ranchers are using that increase their resilience to a changing climate. Though each case study is specific to the conditions of the rancher being profiled, insights may be applicable elsewhere.

Information presented is based on ranchers' experiences and expertise and should not be considered university recommendations. Mention of trade names or commercial products is solely for the purpose of providing specific information and does not imply recommendation or endorsement. Rancher quotes have been edited slightly for clarity, without changing the meaning.

Readers interested in other case studies in the Rancher-to-Rancher and the Farmer-to-Farmer series can access them on the CSANR website as well as at the WSU Extension Publications Store.

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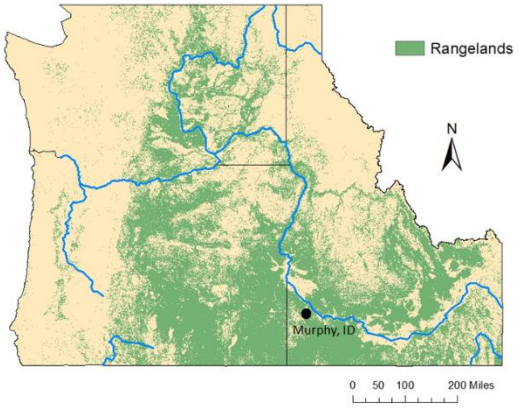
Building Resilience through Engagement: Brenda and Tony Richards

Brenda and Tony Richards. Photo: Darrell Kilgore.

Location: Murphy, ID

Average Annual Precipitation: 11 inches (280 mm)

Production System: Cow-calf-yearling operation in southwestern Idaho, combining grazing on their own irrigated pastures and on native shrub-steppe rangeland through private, state, and federal leases, with some cattle wintering in Nevada.



Map: Sonia A. Hall and Kaelin Hamel-Rieken, Washington State University. Occurrence of rangelands mapped using 250 m resolution data from Reeves and Mitchell (2011).

Introduction

Brenda and Tony Richards run a family cow-calf operation, primarily on rangelands in the Reynolds Creek Valley of Idaho. Their three grown sons all live and work within an hour's drive, close enough to come and help when extra hands are needed at the ranch. Tony and Brenda graze their herd on a complex mosaic of private and public land, with considerable variation in elevation and precipitation (Figure 1). To improve their ability to manage these grazing resources, Tony and Brenda actively work with federal and state land managers and with the Chipmunk Grazing Association on both short-term and long-term issues. While representing a substantial investment of time and effort, relationships with these different entities have made it possible for the Richards to run a profitable operation that has been resilient, allowing them to continue to operate effectively through changes due to a variable environment and to wildfire.

The Art of Range Podcast

Drs. Kirk Davies, Karen Launchbaugh, and Matt Germino were recently interviewed on the Art of Range podcast, sharing their research and expertise on managing invasive annual grasses and, in the case of Dr. Germino, his research on the Soda Fire. In the Art of Range podcast series, Tip Hudson, associate professor at Washington State University Extension in rangeland and livestock management, interviews researchers, ranchers, and resource professionals, discussing a variety of topics related to grazing and rangeland management in the inland Pacific Northwest.

Figure 1. The Reynolds Creek Valley, a mosaic of private and public lands, with ecosystems reflecting environmental variation. Photo: Darrell Kilgore.

Grazing a Mosaic of Private and Public Lands

The Richards' herd consists of about 500 mostly Angus-cross mother cows that run on a combination of private and public land. The private land includes about 450 irrigated acres (182 ha) used for both grazing and hay production, along with some private rangelands leased by the Chipmunk Grazing Association, of which Tony and Brenda are members. The Association is run as a business, with members' voting rights being proportional to the shares they hold, keeping the cost, risk, and investment level balanced. Participating in the Association allows the Richards access to a greater amount and diversity of grazing resources without shouldering all the cost. The public lands are roughly 60,000 acres (24,281 ha) of sagebrush steppe, leased mainly from the Bureau of Land Management (BLM), with some acreage leased from the Idaho Department of Lands (IDL). Calves are held over as yearlings and grazed on a winter lease in northern Nevada. They are marketed at about 850 lb (386 kg) as all natural and GAP (Global Animal Partnership) certified. Their current buyer finishes the cattle, with much of the beef going to Whole Foods stores and ending up as far away as Florida.

Ranching in a Variable Environment

The valley where Tony and Brenda ranch is part of the Reynolds Creek watershed, which ultimately drains into the Snake River. Annual precipitation ranges from about 9 inches (229 mm) on the valley floor (about 3,000-feet [914 m] elevation) to 40 inches (1,016 mm) at some of the highest points (about 5,000-feet [1,524 m] elevation). Much of the lower-elevation acreage has experienced significant pressure from invasive annual grasses such as cheatgrass (also known as downy brome, *Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*). The reasons behind these invasive species' abundance are complex and include historical overgrazing, too-frequent wildfire, and other disturbances (see the *Invasive Annual Grasses and Fire* sidebar).

Water availability is a serious issue for the Richards. They rely on melting winter snowpack to provide irrigation for their fields and pastures and to recharge springs and fill ponds for livestock water. Timely spring rains boost plant growth and forage production, and timing of these rains determines how long rangeland plants stay green into the summer. Fall rains are also critical and will typically "green up" the grasses, especially cheatgrass. This invasive annual provides high-quality (if ephemeral) fall grazing for their cattle.

Fire in the Reynolds Creek Valley

Historically, the sagebrush steppe ecosystems of the Great Basin and Intermountain Pacific Northwest plateaus burned from roughly every decade to perhaps as infrequently as once a century (Brooks and Pyke 2001). Since the establishment and expansion of annual invasive grasses, such as cheatgrass, fire frequencies and areas burned have increased significantly, with cheatgrass-dominated plant communities seeing fire-return intervals as low as two to four years (Whisenant 1990; Balch et al. 2013; Bradley et al. 2018).

Invasive Annual Grasses and Fire

***Tipton D. Hudson**, Associate Professor, Washington State University Extension*

On western rangelands, invasive annual grasses, including cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*), lead to increases in fire size, longer duration of flammable conditions, and increased rate of fire spread (D'Antonio and Vitousek 1992). Invasive annual grasses contribute to fire behavior by increasing the continuity of fine fuels, decreasing their moisture level (compared to perennial grasses), and increasing the period of time each year that fuels are dry enough to burn (Davies and Nafus 2013). Frequent fire tends to amplify the now-familiar feedback loop in which fire promotes more cheatgrass and more cheatgrass promotes more fire (Germino et al. 2016). Remote sensing efforts in the northern Great Basin suggest that much of southern Idaho's rangeland has significant densities of cheatgrass, with some areas of eastern Oregon also severely affected (Figure 2) (Boyte and Wylie 2016; Boyte et al. 2019). Medusahead is also present in Idaho in more localized patches.

Once cheatgrass is established in an area, its abundance is driven primarily by fall moisture, when this winter annual germinates, and spring moisture, when the seedlings initiate growth earlier than native or naturalized perennial grasses (Knapp 1998). Above-average precipitation in the fall and winter before each fire season was found to be more predictive of larger and more numerous wildfires than common drought measures, such as lack of precipitation or high temperatures (Littell et al. 2009, using data from 1977 to 2003). Increased interannual variability in precipitation, with possible increases in fall precipitation, are projected under climate change in the western United States, potentially leading to increased risk of invasion by annual grasses, increased fire season length, fire size, fire frequency, and loss of shrubs from shrub-steppe ecosystems (Chambers and Pellant 2008; Abatzoglou and Kolden 2011; Polley et al. 2017).

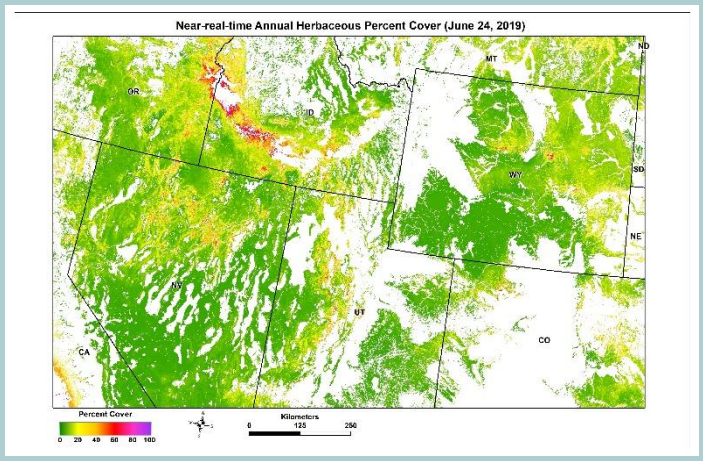


Figure 2. Estimated percent cover of annual grasses, including cheatgrass, in the northern Great Basin in 2019. Public domain map produced by Boyte and Wylie 2019.

Over the last three decades (1984–2016), the Reynolds Creek watershed has had two fires greater than 1,000 acres (405 ha) (Eidenshink et al. 2007; MTBS 2018) and several smaller fires, reflecting regional patterns in the fire regime described above. The 1996 Rabbit Creek Fire burned just over 1,000 acres (405 ha) in the southern portion of the watershed. The 2015 Soda Fire burned 228,077 acres (92,299 ha) in Idaho, including the northern third of the Reynolds Creek watershed, and 51,067 acres (20,666 ha) in Oregon (Figure 3). The Soda Fire was the largest fire in this area of Idaho and Oregon since at least 1984 and burned acres that were previously burned in the Trimble Creek Fires (1990 and 2002), the Texas Basin Fire (1994), and the Jump Fire (2012).

Figure 3. The Soda Fire burned close to 280,000 acres (92,299 ha) in Oregon and Idaho in 2015, including much of the Richards' rangelands. Photo: Hugo Sindelar/BLM Idaho under CCL BY 2.0.

The Richards' Experience with the Soda Fire

The Soda Fire began August 10, 2015, near the Idaho-Oregon border, about 30 miles (48 km) south of Marsing, Idaho, on a grazing allotment adjacent to one used by the Richards. Brenda initially got word of the fire from a neighbor and called Tony. He and their son Tom, both trained and certified members of the Owyhee Rangeland Fire Protection Association, joined other ranchers to fight the fire. After the BLM fire crews arrived, Tony and Tom shifted their focus from suppressing the fire to protecting their cattle and ranch. Everyone involved thought that the fire would be quickly contained.

However, over the next few days, dry vegetation and erratic winds drove the fire in almost every direction. Brenda stated, "the fire came into the Valley four different times from three different directions." As the fire progressed, the Richards moved their cattle at least five different times. With fire burning all around them, this included moving their cattle through a fire line into an area that had already burned. Neighbors and friends were instrumental in this effort despite being stretched thin: there were numerous other ranchers across the area needing to move cattle out of the fire's path.

When the fire was controlled almost two weeks later, the Richards and other affected ranchers combed their lands and gathered the remaining cattle. Tony and Brenda were fortunate in that they suffered little loss of cattle. However, about 95% of their grazing land, both public and private, had burned (Figure 4). They immediately had to begin feeding hay and searching for forage. This search was not only to fill an immediate need, but also to feed the cattle for the next two years; the BLM post-fire plans included a two-growing-season rest period following the Soda Fire. As much of the rangeland the Richards depend on are BLM allotments, all these areas fell under this planned rest period.

Tony described how "the first year after the fire, we made probably hundreds of phone calls looking for pasture. There was scattered pasture around, but not

Figure 4. The Soda Fire burned about 95% of the grazing land, both public and private, that the Richards' cattle grazed on. Photo: A. Hedrick/BLM under CCL BY 2.0.

enough to accommodate all our cattle." They ended up finding pasture for their herd nearly 200 miles (322 km) away near Tuscarora, Nevada. After utilizing that pasture, they leased crop acreage with corn stubble for a few months, and then brought the cows back to the ranch where they fed them hay late into that first spring. By June and July 2016 they were able to graze some of the private rangeland within the Chipmunk Grazing Association's leases, targeting areas that they considered were sufficiently recovered after the fire. The Richards opted to sell some of their cattle in 2017 in order to reduce feed demand and avoid having to truck their whole herd to Nevada a second time.

By 2018, the Richards were back on their BLM leases and working to rebuild their cow numbers. Tony summarized what they learned: "It cost just as much to pasture in northern Nevada, between the pasture rate that we had to pay and the freight, as it would have cost to feed hay right here on this place. That is not economically sound to me. In hindsight, I could have sold cattle earlier and just kept a base to rebuild with, just as I did the second year. And it would have maybe given me some other opportunities. If I hadn't been looking for that many AUMs (animal unit months, a measure of the forage needed to feed each animal for one month), I could maybe have found some pasture closer by."

Engagement—A Key to Increasing Resilience

Early in their ranching operations, the Richards made a conscious decision to get actively involved—beyond the regular interactions around their leases—with agencies and other entities that have rule-making authority around grazing management on public lands. Brenda describes it as a relatively easy decision, because the alternative was that "we weren't going to know about some of the decisions, some of the opportunities, and what the limitations were." Over the years, being involved has taken significant time and energy as well as a willingness to learn how the agencies' systems and processes worked and why they are important. In the Richards' case, they decided to divide and conquer: Tony has focused on the day-to-day management on the ranch, while Brenda has led engagement with the agencies. Though engagement is not a quick solution, the Richards can now point to examples where this involvement benefitted their operation and impacted public lands management more broadly.

The Rangeland Fire Protection Association

Along with a core group of other ranchers, Brenda was a participant in the process that led to the establishment of the Rangeland Fire Protection Associations in Idaho in 2012, a process that involved the Idaho State Legislature, the Idaho Departments of Agriculture and of Lands, and the U.S. Bureau of Land Management. These Rangeland Fire Protection Associations (RFPAs) are a way for ranchers and other private landowner volunteers to be certified as first responders to wildfires (see the *Rangeland Fire Protection Associations* sidebar). Volunteers receive training and can officially coordinate and communicate with wildland fire response agencies. They can also receive personal protective equipment, radios, and firefighting equipment. Tony and two of their sons are certified members of the Owyhee RFPA, allowing them to respond to fires. Brenda describes key advantages ranchers have when certified: "this allows us to be first responders on fires in remote areas where we live 365 days a year, so in some cases we can get to the fires quickly and get them out."

Even when containment is not possible—as in the case of the Soda Fire—there are benefits to the RFPAs (see the *What Makes RFPAs Effective?* sidebar). The Richards, as RFPA members, were on the radio with BLM firefighters during the Soda Fire, which helped them assist in protecting neighbors' ranches and barns, and move their cattle to keep them safe from the fire.

Community Engagement and Fire Response

Though engagement with state and federal agencies was a conscious, strategic decision, other forms of engagement have come more instinctively, as the Richards are part of a strong rural community where neighbors help neighbors. This community was an essential part of the response to the Soda Fire. Over the three days that the Soda Fire burned in and around the Reynolds Creek Valley, the Richards worked with

Rangeland Fire Protection Associations

***Emily Jane Davis**, Assistant Professor and Extension Specialist, Oregon State University Extension*

Wildfire impacts cross ownership boundaries, and ranchers are often closest to fires when they start. In the sagebrush steppe landscapes of eastern Oregon and Idaho, growing numbers of ranchers, such as the Richards, participate in Rangeland Fire Protection Associations (RFPAs) to help minimize these impacts. RFPAs are associations of volunteer wildland firefighters who receive the resources, training, and authority to respond to wildfires on private and state lands within their jurisdictions. Through cooperative agreements, these associations can also respond on federal lands, such as those managed by the Bureau of Land Management (BLM). Although a few RFPAs developed in Oregon prior to the 1990s, they have proliferated across Oregon and Idaho since 2000 due to increased concern about wildfire impacts on Greater sage-grouse habitat and ranching communities.

Historically, fire suppression responsibilities followed jurisdictional lines. The RFPA facilitates more rapid, safe, and collaborative responses across landscapes. Because members live and work on these lands, RFPAs have the potential to reduce the number of acres burned by catching small fires quickly. Case studies conducted by Oregon State University and the University of Oregon found that RFPAs harnessed ranchers' in-depth local knowledge, resources and equipment, spatial distribution across remote areas, and strong motivation to protect local properties, cattle, and forage (Davis et al. 2017; Stasiewicz and Paveglio 2017). These advantages already existed, but the legal framework, training, and authorities of an RFPA model created a more effective structure for applying them to wildfire response in an organized fashion.

Research on these RFPAs also revealed some lingering challenges (Abrams et al. 2018). These included incidents of disagreement about suppression tactics and strategies, communications and safety standards, and values at risk. For example, there were instances in which ranchers perceived BLM suppression approaches as insufficiently aggressive in fighting a fire or where BLM fire managers felt that their protocols for protection and equipment were not consistently followed.

What Makes RFPAs Effective?

***Emily Jane Davis**, Assistant Professor and Extension Specialist, Oregon State University Extension*

Over time, agency-RFPA relationships improved in several ways, contributing to the overall effectiveness of this model. First, the time that RFPA members and agency personnel spent together during fire events and trainings strengthened interpersonal relationships, created shared experiences and learning, and built joint knowledge. This shared time also enabled RFPA members to increase their understanding of federal fire managers' decision processes and rationales for interpreting fire behavior and choosing suppression tactics. In turn, agency personnel better understood how RFPA members' local knowledge could aid suppression efforts and how RFPA members could contribute skills, such as heavy equipment operation.

Improvements in the capacity and culture of individual RFPAs was also important to their ability to productively partner with federal agencies. RFPAs with strong leadership from their chairperson, board, or other leaders had organizational and administrative robustness. This included well-established and maintained systems for important functions such as bookkeeping, member training records, and tracking of in-kind and volunteer contributions as well a mutually-respectful tone for interactions with the RFPA and its agency partners.

Finally, deliberate efforts to develop more agreement and structure for RFPA-agency collaboration may be important. In Harney County, Oregon, a dedicated liaison has recently been established between the Bureau of Land Management and the five RFPAs in the county, thanks to a broad dialogue among stakeholders fostered by the Harney County Wildfire Collaborative. As Harney County has a unique density of RFPAs and rangeland fire occurrence, solutions developed there may not always apply elsewhere, but the dedicated personnel have allowed for more consistent communication across agencies and RFPA members.

The rise of RFPAs and rancher engagement in fire suppression suggests that many in working-lands communities desire active roles in fire preparation and response. Effective organizational structures, experience, learning, and relationships may enable participation and positive outcomes.

others to set up a network that shared information on the fire. This network coordinated neighbors' efforts to move cattle, and helped coordinate available equipment to create fire breaks to protect homes and property. Brenda notes that, given the fire's size, it is remarkable that they did not lose any homes, barns, or other structures in the Valley. It is her feeling that "a lot of that had to do with people coming together and ensuring that there were fire lines."

Post-fire Rehabilitation

Understanding how agencies are organized around post-fire rehabilitation, and engaging in those processes, has allowed the Richards to be actively involved in those efforts. After large wildfires, like the Soda Fire, federal agencies are generally able to request additional resources to support rehabilitation, including funds and personnel to seed severely burned lands (Figure 5; see the *All Hands, All Lands Rehabilitation after the Soda Fire* sidebar). Rehabilitation goals usually center around reestablishing vegetation cover and reducing the risk of erosion. Agencies are often better positioned than individual landowners to rehabilitate burned rangelands because they (a) manage large geographic areas, (b) typically plan in advance that a certain amount of the landscape will burn in any given year, and (c) have developed responses based on repeated experience with rehabilitation (albeit in different local contexts). After the Soda Fire, and thanks to the relationships they had previously nurtured with local, federal, and state entities' staff, the Richards were able to obtain grass seed from the U.S. Fish and Wildlife Service and the local Cooperative Weed Management Area to seed privately-held lands that were burned, helping to limit the risk of erosion. They also collaborated with state agencies, seeding state lands burned in the fire in exchange for access to seeders owned by the Idaho Department of Lands.

Figure 5. Successful establishment of grasses during a post-fire rehabilitation on Bureau of Land Management (BLM) lands burned in the Soda Fire. Photo: Sonia. A. Hall.

All Hands, All Lands Rehabilitation after the Soda Fire

***J. Shannon Neibergs**, Professor, Extension Economist, School of Economic Sciences, Washington State University*

Restoring plant communities after large fires is an ecological and economic challenge. Replanting quickly is often critical to reducing erosion and expansion of non-native invasive plants, yet identifying sources of native seeds and plant materials in the amounts needed is not easy, and their establishment is harder than that of introduced bunchgrasses. The effort is further complicated by multi-use objectives on these burned rangelands that include grazing, preserving cultural artifacts, and protecting species, such as Greater sage-grouse and Columbia spotted frog. In the case of the Soda Fire, its large extent required coordinated efforts across multiple agencies and individuals, including private landowners, Native American tribes, the states of Idaho and Oregon, and federal agencies to address emergency stabilization and restoration at the landscape scale. Such coordinated efforts are termed the All Hands, All Lands approach (RFTF 2015).

Stabilization and Rehabilitation

The Soda Fire rehabilitation was the first large scale fire rehabilitation following the release of Secretarial Order 3336, which prioritized the use of government assets and resources for fire prevention and restoration and to improve coordination among partners involved with rangeland management (USDOI 2015). Immediately following fire containment, a rapid assessment process was coordinated across the multiple agencies and expertise teams to assess resources at risk across the landscape. The actions outlined in the resulting plan (BLM 2015) had an estimated cost of $67.3 million dollars (Table 1).

Table 1. Estimated stabilization and rehabilitation costs for the Soda Fire, 2015–2020 (BLM 2015).

	Emergency Stabilization	Burned Area Rehabilitation	Fuel and Fire Suppression	State Total
	$1,000 Dollars			
Idaho	40,197	9,355	7,391	56,943
Oregon	4,179	1,627	4,600	10,406
Total	44,376	10,982	11,991	67,349

The majority of the emergency stabilization work occurred in 2015 and 2016, costing $44.3 million. Primary stabilization treatments included both drill grass seeding and aerial seeding of grasses, shrubs, and forbs. These efforts used 1.6 million pounds (0.73 million kg) of seed in 2015 and 0.8 million pounds (0.36 million kg) in 2016, with seed acquisition efforts supported by the National Seed Strategy for Rehabilitation and Restoration (PCA FC 2015), a nationally coordinated effort to develop seed reserves and storage facilities. The total cost of seed and plant material for stabilization and rehabilitation was $26.3 million. On the 17,257 acres (6,984 ha) where soil depth and terrain were appropriate, drill seeding occurred. In addition, over 200,000 acres (80,937 ha) were aerial seeded. Approximately 13 percent of the drill-seeded acres were seeded exclusively with native species; the remainder used mixes of native and introduced grass varieties. The percentage of the aerial-seeded area using only native grass seed was about 49 percent. Seeded sagebrush established better at higher elevations, on flatter slopes, and areas with lower heat loads, leading to recommendations on variables to consider in planning and evaluating future rehabilitation treatments (Germino et al. 2018).

Aerial herbicide application of imazapic, targeting reduction in invasive annual grasses, was completed on 27,426 acres (9,885 ha), leading to a reduction in non-native grasses in treated areas. A study evaluating the effectiveness of the imazapic treatment found that spraying in either the first winter or the second fall appeared to provide temporary reductions in non-native annual grass cover in moderately invaded areas (Applestein et al. 2018): non-native annual grass cover was approximately 7 percent in the areas sprayed in the first post-fire winter, and 10 percent when applied in the second fall, compared to 19 percent in the untreated control.

Grazing Restrictions

In Idaho, the Soda Fire affected approximately 29,672 livestock and 2,304 wild horse AUMs. In Idaho, 36 grazing allotments were impacted by the fire and four grazing allotments were affected in Oregon. The Normal Fire Rehabilitation Plan outlines that allotments burned will be rested from grazing for two full growing seasons or until resource objectives are met (BLM 2004). Entire pastures were closed if the majority of the pasture was damaged by fire or was undergoing a rehabilitation treatment. Temporary fences were constructed in pastures partially burned to allow for reduced grazing in the unburned portions, determined on a pasture-by-pasture basis. The Soda Fire impacted approximately 350 miles (563 km) of fence, critical for managing livestock and grazing. Over 300 miles (483 km) of fence were reconstructed in 2016, at a budgeted cost of $2.5 million. Given the use of unburned areas within the fire perimeter, the reconstruction of fences, and the success of rehabilitation efforts, some ranchers were able to return to some grazing allotments in the fall of 2017.

Fire Risk Reduction

Like most ranchers in the inland Pacific Northwest, the Richards recognize that the landscapes they live in face significant fire risk. They view grazing as a tool that can help maintain a healthy rangeland, which supports not only their grazing operation but other societal values these arid landscapes provide (see the *Grazing to Improve Rangeland Health and Increase Resistance to Invasion* sidebar).

In addition to post-fire rehabilitation, the Richards are also supportive of testing other approaches to maintain rangeland health and reduce fire risk. For

example, the Richards' son, Daniel, who ranches close by, is participating in an experimental project to reduce cheatgrass abundance and the resulting fire risk. This project, led by the BLM, works with interested ranchers to target cattle grazing in key roadside areas in the early spring, when cheatgrass is green and palatable (see the *Spring Grazing of Cheatgrass to Suppress Seed Production* sidebar). The intent of the BLM pilot project is to apply high-density grazing in strategic locations along roads—both expanding the fire break that the road provides and isolating the surrounding shrub steppe from human-caused ignitions on roadsides—and evaluate its effectiveness in fragmenting fuels and facilitating wildfire suppression in that landscape.

While Tony sees the potential for grazing targeted areas to be part of a solution, he is more cautious about whether grazing can be helpful to manage invasive annual grasses across the wider landscape. "On smaller acreages I can target graze with enough calves to make an impact. On bigger acreages it would take some different approaches, and I'm not really sure whether it would work. There aren't enough calves in this country to actually make an impact." Tony has observed cattle pawing through litter to reach green cheatgrass in the fall, and fall grazing is one added possibility he is currently exploring (see the *Fall Grazing of Cheatgrass to Reduce Litter* sidebar).

Grazing to Improve Rangeland Health and Increase Resistance to Invasion

***Tipton D. Hudson**, Associate Professor, Rangeland and Livestock Management, Washington State University Extension*

Control of invasive annual grasses is expensive and difficult, so preventing degradation in the first place is of vital importance. In native bunchgrass plant communities, management focused on promoting the vigor and reproduction of perennial bunchgrasses can be an effective strategy for resisting invasion and domination by annuals (Fuhlendorf et al. 2011).

Light to moderate grazing maintains native grass and forb species diversity and abundance in most rangeland ecosystems (Sneva et al. 1984; West et al. 1984; Courtois et al. 2004; Manier and Hobbs 2006). Grazing that is designed to maintain healthy plant communities before or after fire should follow several key principles:

- Duration of grazing achieves light to moderate defoliation of the most preferred forage species.
- Timing of grazing allows non-rhizomatous species to produce seed periodically, ideally every other year.
- Grazing is conducted periodically outside of the short growing season, i.e., deferred grazing, where defoliation occurs during plant dormancy, allowing for recovery and seed production during the growing season.
- Intensity of grazing avoids significant soil disturbance and disruption of biological soil crusts which limit establishment of invasive grasses and weedy forbs.
- Period of regrowth or recovery is sufficient for plants to fully recover from the grazing event.
- Grazing is distributed across each pasture, avoiding concentration of cattle—and overgrazing—around attractants, like water.

This moderate grazing approach has the effect of reducing fuel amounts and disrupting fuel continuity without transitioning plant communities into a less desirable stable state (Svejcar et al. 2014; Vermeire et al. 2014). Additional grazing treatments can be implemented to reduce fuel loads, which reduces flame length, a variable related to impacts on the firefighting and social costs of wildfire. However, such grazing treatments require careful planning of stock densities, supplement placement, and duration of grazing period on target plants to avoid unintended consequences on rangeland health (Bruegger et al. 2016).

Spring Grazing of Cheatgrass to Suppress Seed Production

***Tipton D. Hudson**, Associate Professor, Rangeland and Livestock Management, Washington State University Extension*

In rangelands that are dominated by invasive annuals, grazing to reduce continuity and amounts of fine fuels has numerous advantages over mechanical or chemical management options (Mosley and Roselle 2006). The costs of using mechanical or chemical treatments, seed, and human energy to restore degraded rangelands on any realistic spatial scale are often prohibitively expensive and are not always successful (Hulet et al. 2015).

Targeted grazing efforts have mostly focused on inhibiting seed production of annual grasses by grazing them intensively in the spring, after most individual grass plants have reached the boot stage of phenological development but before seed shatter (Mosley and Roselle 2006). Most exotic annual grasses are only palatable and nutritious during this narrow window of time, a window which tends to coincide with the start of the critical period of growth in perennial bunchgrasses. The timing of this narrow window of opportunity for grazing exotic annuals without negatively affecting native bunchgrasses' critical period of growth also varies from year to year. After this stage, the exotic annuals are unpalatable and livestock movements may serve only to assist in distributing and planting seed rather than consuming it.

Effectiveness of this approach is not without dispute. Research in Oregon that evaluated cheatgrass cover and production found no difference between grazed and ungrazed treatments (Bates and Davies 2014). In other studies, however, careful application of this strategy has shown success (Mosley and Roselle 2006; Taylor 2006; Diamond et al. 2010; Bruegger et al. 2016). However, seeds remain viable for over a decade (Hull and Hansen 1974), and repeated applications are required for long-term results (Mosley and Roselle 2006; Schmelzer et al. 2014). Additionally, only a small area can be treated in this way in a given year, and the logistics of implementing these treatments in a variable environment are challenging, so ranchers and land managers must be strategic about where to apply grazing treatment for limiting fire.

Fall Grazing of Cheatgrass to Reduce Litter

***Tipton D. Hudson**, Associate Professor, Rangeland and Livestock Management, Washington State University Extension*

Relatively recently, ranchers and researchers have worked together to experiment with a fall grazing approach to cheatgrass control. Ranchers have noted that fall grazing on newly germinated cheatgrass seedlings seems to reduce the cheatgrass population the following growing season. Interestingly, Tony Richards has observed grazing behavior consistent with this hypothesis in which cattle paw through and consume litter in order to reach horizontal green cheatgrass stems inside the litter layer.

Building on similar anecdotal evidence, Perryman theorized that an integrated approach to controlling cheatgrass could include spring grazing to limit seed production alongside fall grazing to interrupt fall germination and establishment, reducing the litter layer that gives cheatgrass a dramatic advantage over native species and most perennial grasses (Perryman et al. 2018). Cheatgrass thrives in heavy litter (the very name *Bromus tectorum* derives from tectum, the Latin for roof, referencing the thatch roofs used centuries ago) (Schmelzer et al. 2014) while most perennial grasses will not germinate without contacting bare mineral soil (NRCS 2005). Livestock researchers meanwhile suggest that if cattle have sufficient protein to metabolize the associated low-quality litter, rumen microbes can utilize the fiber in the litter, making it potentially a palatable and nutritious feed source (Llewellyn et al. 2006; Llewellyn 2012).

This fall grazing strategy has been successful in demonstration projects in Oregon (Kirk Davies, personal communication), and though more widespread testing is needed, late fall and early winter grazing show some promise as a control mechanism that disrupts, consumes, and exposes annual grasses, weakening the population over time. The reduction of biomass, and therefore dead fine fuels, could also contribute to reducing fire risk, potentially lengthening the period between fires during which perennial plants could reestablish.

The Sage Grouse Initiative

Greater sage-grouse is an iconic bird of the shrub steppe in the western United States, and its populations have been declining. This has led to an array of voluntary and regulatory actions to protect and restore Greater sage-grouse habitat. On the regulatory side, additional requirements were placed on many public lands to support these habitat conservation efforts. Such restrictions can pose challenges to ranchers who graze on public lands. In the Richards' case, this has led Brenda to focus on voluntary actions, participating in the activities of the Sage Grouse Initiative (SGI), a "partnership-based, science-driven effort that uses voluntary incentives to proactively conserve America's western rangelands, wildlife, and rural way of life." Ranchers involved in the SGI develop grazing management plans that include practices that favor Greater sage-grouse, such as rotational grazing plans that alternate use of different pastures, ensuring each pasture is rested during the growing season every few years.

Brenda participates in SGI field tours, shares her and her neighbors' perspectives on sage-grouse-related issues, and contributes to the development of approaches and actions that work for both the bird and ranchers. Minimizing and mitigating the impacts of wildfire, for example, is a shared goal. "Last week, I spent two days on a Sage Grouse Initiative fire tour. I was the only landowner with 150 people. But it's important. I felt that that was an opportunity to give them a perspective of what we're up against."

Photo Monitoring

Changing management parameters for allotments on federal lands—the timing of grazing or amount of cattle, for example—is challenging, especially if the flexibility to make those changes has not been written into the allotment management plan (AMP) and is not allowable under the terms and conditions of the grazing permit. These plans spell out in great detail when, where, with what livestock, and with how many animals the allotment will be grazed and often preclude changing the timing or season of use. These AMPs are updated once a decade or less, when the BLM has the resources to carry out the necessary National Environmental Policy Act (NEPA) assessments. The ability to make changes also depends on vegetation monitoring results, which track actual forage utilization and progress towards multiple-use objectives through the status and trends of indicators, such as native species diversity, total plant production or plant cover, and litter cover (BLM 1997). Yet, there are situations when the resource staff does not have the capacity to complete such monitoring. This becomes an added barrier to informed discussions and changes to grazing management on BLM allotments.

Brenda was involved in a project with the Idaho State Department of Agriculture (ISDA) that is helping fill this capacity gap while at the same time educating ranchers on monitoring protocols and the advantages of regular monitoring (ISDA n.d.). The ISDA developed a photo monitoring protocol that meets the Idaho BLM's monitoring standards, and now has dedicated staff to train and certify ranchers so they can carry out photo monitoring on their lands and leases. Monitoring photos taken within BLM allotments are accepted by the Idaho BLM and included in the lessee's official file. Brenda described how she is now working with the ISDA and the BLM to explore the possibility of expanding this program to riparian areas, as these ecosystems are important providers of multiple goods and services in these arid landscapes, and an area where the Richards are not convinced that BLM's monitoring effectively reflects improvements over time (Figure 6). "We were trying to accomplish some riparian improvements, and we did see our riparian areas expand," Tony states. "I am concerned, though, whether the BLM data collection actually reflects what's going on, on the ground." He hopes that the use of these shared protocols and repeat photos can help document such on-the-ground changes.

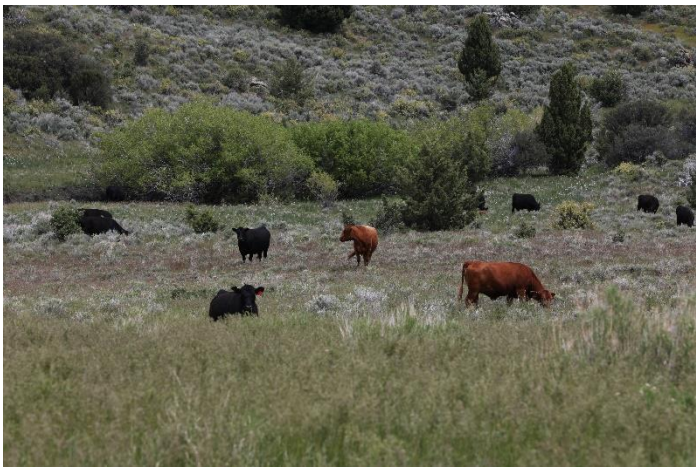


Figure 6. The Richards are hopeful that photo monitoring will help demonstrate improvements in the condition of riparian vegetation on lands they graze. Photo: Darrell Kilgore.

County-Level Decisions

Not all decisions that affect the Richards' operation occur at the federal or state level, some are local, ranging from open range designations, to possible tax exemptions for agricultural lands, to investment in university Extension capacity. Roughly three quarters of Owyhee County is comprised of public lands, so the perspectives of the rural communities that are supported by these public lands in county-level decisions is important. Brenda was an elected official—county treasurer—for 12 years, where she developed important relationships with county-level decision makers. Among other responsibilities, she worked on the Public Lands Committee for Owyhee and neighboring counties, where she strove to educate other public officials on what ranchers do and how their ability to effectively manage public and private lands intersects with other public values, such as preserving open space and recreational opportunities.

Benefits

The return on the Richards' investment of time and energy spent engaging in their community and with civic and agency processes is difficult to quantify. However, there are some clear indications that their efforts are impactful. During the Soda Fire, for example, existing relationships were likely key to the timely coordination of federal rehabilitation projects with similar efforts on private and state lands, allowing for the sharing of seed and equipment. Beyond the specifics of the Soda Fire experience, the Richards consider that their involvement with state and federal agency processes gives them a voice in broad-scale conversations around grazing on lands with multiple-use objectives. Brenda has articulated how a productive ranch can help maintain and improve open space for various uses and interests (Figure 7): "We are very much advocates of multiple use on the public lands. We need to educate about what's out here, that there's not more open space, and helping to understand what we're doing and embrace why this landscape looks healthy. We have to do a little bit better job communicating that and finding ways that resonate with people that aren't in our industry."

Brenda hopes that her engagement with agencies favors the development of grazing allotment plans that include greater flexibility to allow ranchers and range conservationists to better respond to the needs of cattle, the land, and future environmental and other changes (see the *Variability in Forage Production and the Need for Flexibility* sidebar). In her opinion, flexibility is critical for ensuring ranchers are not constrained by prescriptions defined a decade or more ago, under different conditions. Prescriptions determined many years ago set sideboards on the grazing management options available across a significant portion of our public lands, due to agencies having limited resources to review and update grazing plans and the accelerated rates of change in rangelands across the western United States.

Figure 7. The Richards believe a productive ranch can help maintain and improve open space for various uses and interests. Photo: Sonia A. Hall.

Variability in Forage Production and the Need for Flexibility

***Matthew C. Reeves**, U.S. Forest Service, Rocky Mountain Research Station*

The amount of annual net primary production (ANPP) on rangelands forms the forage base upon which billions of dollars of commerce and countless stakeholders depend. Managers and producers in the Pacific Northwest struggle with high year-to-year variability in ANPP, which often varies 40 percent between years due to variations in precipitation. This high variability emphasizes the importance of flexible stocking rates (Ritten et al. 2010).

Long-term trends—over decades or even generations—in stocking rates relative to variable forage production also have implications for the overall economic viability in rangeland ecosystems (Hart and Ashby 1998; Brunson and Huntsinger 2008; Ritten et al. 2010; Irisarri et al. 2016; Hamilton et al. 2016). In the future, it is widely expected that climate change will lead to substantial increases in interannual variability (Reeves et al. 2019, in review), creating both challenges and opportunities for producers who have appropriate risk management strategies. These changes heighten the need to understand longer-term changes and the resultant patterns of ANPP, and to explore new options that provide increased flexibility to ranchers and managers, to address the increased variability in forage production.

In the Reynolds Creek watershed, the amount of forage currently varies about 20% from year to year, on average (Figure 8A). However, as ranchers know, averages are rarely observed in rangeland environments. Annual production values varied from reductions of up to 60 percent for drought years, like 1992, 1999, and 2007, to around 40 percent increases in high productivity years, such as 2005 and 2011 (Figure 8A). This range represents a 1.5- to 2-fold difference between highs and lows, suggesting that risk management strategies should include quantitative assessments of forage production. These can inform the development of "what if" scenarios and help ranchers develop contingency plans.

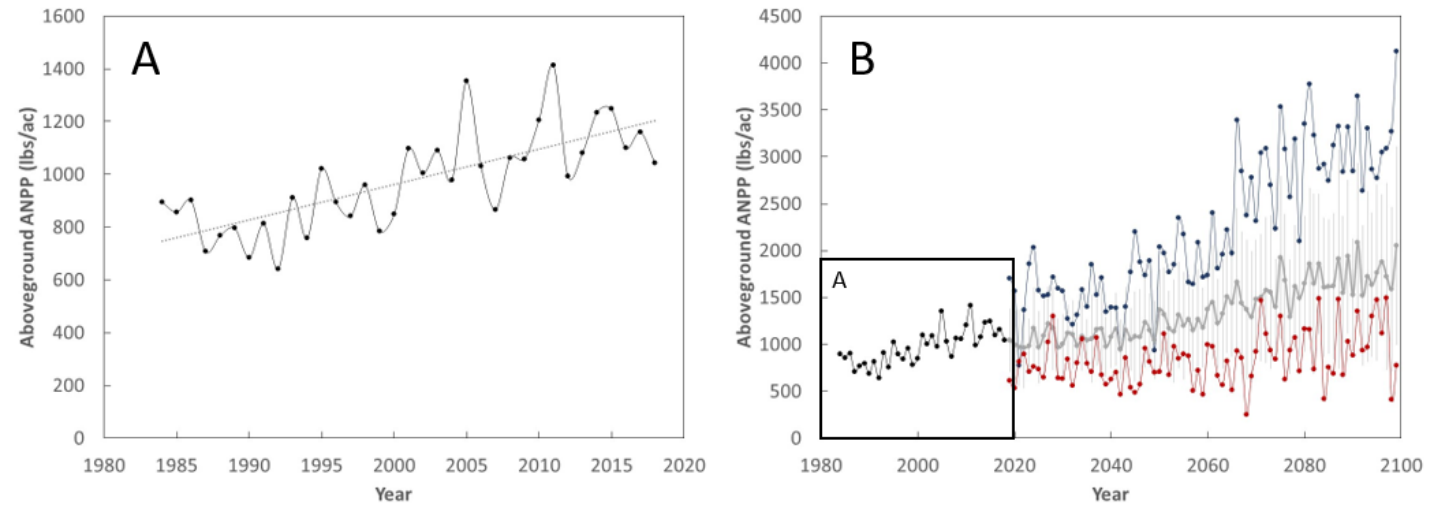


Figure 8. Annual net primary productivity (ANPP) in the Reynolds Creek watershed, Idaho. (A) Historical ANPP, which ranged from 642 to 1,413 lb/acre (720 to 1,584 kg/ha) between 1984 and 2018. Data source: Rangeland Production Monitoring Service (RPMS). (B) Projected ANPP under future climate change using different Global Circulation Models (GCMs), which is modeled to range from 1,293 to 2,087 lb/acre (1,449 to 2,339 kg/ha) between 2064 and 2098. These data were obtained from an ensemble of five different Global Circulation Models (GCMs) run under a future scenario called Representative Concentration Pathway (RCP) 8.5 (projections exist for other RCPs; however, RCP 8.5 was selected because it is the scenario that current emissions align best with). The gray symbols represent the average of the five GCMs, and the error bars represent one standard deviation, showing differences between the various models. The red and blue symbols represent the projections from the GCM with the lowest and highest ANPP, respectively. The peaks and valleys of each line represent the variability in ANPP that a particular GCM projects. The difference between the blue and red lines, as well as the error bars, reflect uncertainty about which model will best represent the future.

Although current variation in ANPP seems large, climate change is expected to increase variability. Evaluation of five different climate models reveals that year-to-year variability could double over the next 50 to 85 years, and differences between extreme droughts and bumper years could reach 2.5- to 3-fold (Figure 8B). While

precisely what the future will be like remains uncertain, extremes in the forage base will likely become more common and more extreme. Sustaining viable ranching operations may well require management characterized by increased flexibility and adaptability. Not only are future climates going to lead to more variable forage quantities, they may also enhance shifts in vegetation that may not be beneficial to the forage base, such as increasing shrub density or exotic annual grasses or decreasing average forage production (e.g., Reeves et al. 2017; Derner et al. 2017). Planning informed by an understanding of the year-to-year variations in forage production can help ensure that current stocking rate decisions do not degrade the forage resource, decreasing the odds of speeding up such shifts in composition of the vegetation (Derner and Augustine 2016; Wilmer et al. 2017).

Well-established relationships can foster experimentation to overcome ecological or operational challenges, as illustrated by the ongoing pilot project evaluating targeted grazing to suppress cheatgrass. In this case, the working relationships between the Richards and the BLM staff supports collaborative experiments. In the BLM-led pilot, where BLM staff and ranchers deal with—and learn about—the logistics of targeted grazing and of its impacts on cheatgrass abundance along key roadsides, the stage is set for shared understanding of the economic and ecological costs and benefits of this strategy. Thus, this work can facilitate discussions around how to integrate targeted grazing into future allotment management plan (AMP) updates, if appropriate. Such updates would likely be needed to build in the additional flexibility to use this strategy on BLM lands under variable conditions, such as those that characterize rangeland in the Reynolds Creek watershed.

Challenges

The most obvious challenge the Richards have faced is the investment of time needed to effectively engage and build durable relationships with agencies and other entities. While beneficial, engagement has not been a panacea for all the Richards' problems and, in general, the Richards consider the current regulatory environment too prescriptive for a landscape that is defined by variability and where adaptability is necessary to succeed ecologically and economically. For example, the Richards' public lands agreements specified, as most do, a two-year rest period after a fire to facilitate recovery of grasses that survived and the establishment of seeded plants. Though the Richards were able to successfully weather these restrictions, they would have preferred grazing restrictions that were more responsive to the actual conditions of specific sections of recovering rangeland.

Annual invasive grasses, like cheatgrass and medusahead, are a severe and ongoing challenge for the Richards and are common across lower elevation rangelands in the Intermountain Pacific Northwest (Figure 9). While using grazing to assist in managing these species has been helpful on their private land, the Richards' federal grazing allotments give them few chances to target grazing in this manner. As Tony describes: "We graze up through the system on our BLM permit. Our BLM permit runs from April 1st to August 1st. We move every 30 days. We have a fall use that runs from October 15th to about November 15th, depending on how many livestock I put in." Such prescriptions provide little flexibility for tracking year-to-year variations in the phenology of invasive annual grasses to reduce fire risk.

Figure 9. Cheatgrass (*Bromus tectorum*, here appearing with a typical reddish tint) and medusahead (*Taeniatherum caput-medusae*, the bright green, spiky seed heads) are annual invasive grasses that pose a severe and ongoing challenge for the Richards and other ranchers. Photo: Darrell Kilgore.

Looking Forward

Tony and Brenda Richards recognize that their way of life and their ability to continue to profitably operate their ranch is influenced by a variety of factors beyond their control. These include changes in local, domestic, and international livestock and beef markets, the potential for increased regulations, and population growth in Boise and surrounding areas that could lead to increased recreational use of the public lands they graze. Yet, they remain optimistic that there is a path forward. They firmly believe that grazing is a cost-effective way of maintaining open space, recreational opportunities, and wildlife habitat across large landscapes like the one they live and work in. And they consider that maintaining these values through ranching can benefit individual ranchers, local communities, and society as a whole. They also believe that their engagement in the conversations that shape public lands management is one mechanism through which they can have influence (Figure 10). They are hopeful that informed conversations will lead to an approach to public lands management that provides them with the flexibility they need to be resilient to changes to come, and gives ranchers and agency staff throughout the western United States the ability to adapt not only to current challenges but to future ones that arise as the climate, their community, and society's needs and values change.

Figure 10. Brenda and Tony Richards remain optimistic that, through engaging with agencies, they can inform conversations that shape public lands management, providing them with the flexibility their ranching operation needs to be resilient to future changes. Photo: Darrell Kilgore.

Additional Resources

To learn more about the Rangeland Fire Protection Association (RFPA) case studies described in the Oregon State University and University of Oregon's research, visit: http://www.nwfirescience.org/RangelandFireProtectionAssociations.

To learn more about the RFPAs functioning in Idaho, visit: https://www.idl.idaho.gov/fire-management/rangeland-fire-protection-associations/.

To learn more about the RFPAs functioning in Oregon, visit: https://www.blm.gov/oregon-washington/shared-conservation/rangeland-fire-protection-associations.

To learn about current research on RFPAs in Harney County, Oregon, visit: http://www.nwfirescience.org/CoManagingRisk.

To learn more about the Rangeland Production Monitoring Service and the Rangeland Planning Act Assessment, visit: https://www.fs.fed.us/research/rpa/.

To learn more about climate change adaptation management strategies and tactics, visit: http://adaptationpartners.org/library.php.

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