

Western Confluence

Issue 12

NATURAL RESOURCE SCIENCE AND MANAGEMENT IN THE WEST



WHERE CONSERVATION & PROSPERITY INTERSECT

Buffalo
Rematriation

Rangeland
Carbon Credits

Natural Resource
Wealth

Eagles and Wind Energy

Water from Retiring Coal Plants

Western Confluence

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Western Confluence magazine shares on-the-ground, science-based stories about the interdisciplinary, collaborative solutions to our toughest natural resource challenges.

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EDITOR'S NOTE

By Birch Malotky

When we put out a call for stories exploring how to simultaneously advance social, economic, and environmental well-being, an early response was, “I strongly suspect the concept for this issue is likely to end up focusing on various efforts to apply lipstick to corpses.” The metaphor implied that looking for win-win solutions was sugar-coating a long history of human development causing pollution, habitat destruction, and species loss, and of environmental protection resulting in the forced removal of people from their homelands, lost jobs and revenue, and cultural conflict. But when we went looking for the intersection of conservation and prosperity, we didn’t come back empty-handed.

Instead, we learned how a leap of faith by a multi-generational ranching family has paid dividends to the community, grasslands, and climate (p. 12). We pondered what it would take to turn the loss of an industry into an opportunity to save a river and a community (p. 35). We heard how working with, rather than against, beavers can lead to more resilient river systems (p. 8). In every story, there are people who believe that mutual benefit can be achieved even when it seems impossible. A biologist insists affordable, carbon-free energy doesn’t have to come at the expense of golden eagles (p. 44); a bevy of organizations commit to reducing the footprint of Wyoming’s most popular tourist destination (p. 38); and fading agricultural towns believe an inclusive community is the path to prosperity (p. 21). For Jason and Patti Baldes, the intersection of conservation and prosperity means return: return of buffalo to Wind River, return of sovereignty to tribes, return to a reciprocal way of being where all relations care for one another (p. 2).

Reading these stories is a chance to experience a world where conservation doesn’t have to mean sacrifice and progress doesn’t come at the expense of the environment. It’s a glimpse of what might be possible if we let go of zero-sum thinking. It’s an invitation to re-imagine a future where people and the ecosystems they rely on don’t just adapt and survive, they thrive (p. 46).

Lipstick on a corpse will only get us so far in animating this kind of future. In the lipstick metaphor, we are simply trying to put a good face on something that we’ve already accepted is hopeless. Much like greenwashing, it is meant to appease, to make inadequacy palatable enough that we lose the desire for real, substantive change.

Cover artist Abi Paytoe Gbayee shows us an alternative with her painted beaver skull. Rather than covering up the old, she transforms it. Appeasement is easy and thoughtless. Transformation is difficult and requires vision. She found a skull; instead of leaving it to decay, she imagined a new life for it. Her paint was proxy for care and creativity. With attention and time, the skull became art. So too does this issue highlight how hard work, innovation, and genuine dedication to human and environmental well-being can transform what we thought possible and bring us closer to the intersection of conservation and prosperity.



Front cover and this page: What might be possible in a world where conservation doesn’t have to mean sacrifice and progress doesn’t come at the expense of the environment? How can we transform our thinking to achieve economic, environmental, and social well-being? Cover artist Abi Paytoe Gbayee—a mixed media artist and art teacher in Laramie, Wyoming—shows us the transformative power of creative vision and thoughtful attention, turning a discarded beaver skull into a work of art. Dominique Muñoz—a Guatemalan American artist who uses photography as a medium for storytelling—recast the skull in 2-D (dominiquemunoz.com).

2

CONSERVATION AS PROSPERITY**Bison on Wind River**

Restoring a wildlife economy and revitalizing culture

By Janey Fugate

6

Reciprocity and Sovereignty

An interview with Wes Martel on tribal wildlife conservation

By Temple Stoellinger

8

Leave it to Beaver

Returning to past practices for future water management

By Tesia Lin

12

SUSTAINABLE ECONOMIES**Free-Range Carbon**

Not a silver bullet, but maybe a gold standard, a new market tool benefits climate, ecosystems, and people

By Birch Malotky

21

Not Fade Away

Communities in rural Montana reach beyond agriculture

By Samuel Western

26

Living in a Natural Resource Economy

What can Wyoming learn from studies of the “natural resource curse”?

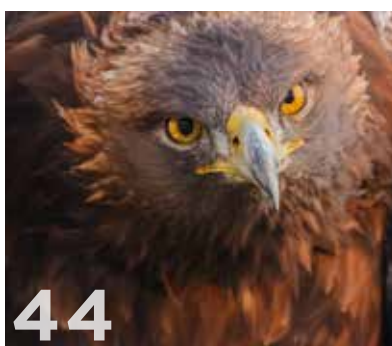
By Emilene Ostlind

31

A New Lease on State Land

How conservation is hoping to buy a seat at the land management table

By Birch Malotky



35

Silver Linings

How Colorado coal country could save the Yampa River

By Randy Rea

38

Creating a Sustainable Destination

Jackson Hole seeks a better tourism future

By Kristen Pope

41

CURRENTS**News from the Haub School and Ruckelhaus Institute**

42

HUMANS ON THE LAND**Sagebrush in Prisons**

Inmates are saving an iconic American landscape—and themselves

By Frani Halperin

44

Flight Interrupted

Biologist works to protect eagles on collision course with wind power

By Jill Bergman

46

Redefining Thrive

Lessons from my children in the context of climate change

By Corrie Knapp

49

UPSTREAM**Wild and Working**

The promise of Western lands

Perspective from John Koprowski

Restoring a wildlife economy
and revitalizing culture

Bison on Wind River

By Janey Fugate

Rolling over a dirt road hemmed in sagebrush, Patti Baldes steered her ATV down to the bison herd that she and her husband, Jason Baldes, restored to the Wind River Indian Reservation after a 130-year absence. I sat shotgun, peering out at the lone bulls we passed as we descended, the distant Owl Creek Mountains framing their massive forms against the horizon. Patti, who's Northern Arapaho, chatted with a calm and vibrant energy, describing the behaviors she and Jason, who is Eastern Shoshone and the tribe's herd manager, had observed over five years of stewarding the bison herd, as well as the challenges they faced along the way.

As we reached the bottom of the track, I was keenly aware of how rare wild bison are. The group of twenty cows and calves

meandering just across the meadow from us represented a mere remnant of the millions that ranged the continent before the arrival of European settlers.

"That's Buffalo Goodbeard," said Patti, pointing to a stately bull browsing near the head of the group. While it's an affectionate name, Patti and Jason don't intend for Buffalo Goodbeard and his companions to live as pets or livestock. With this herd as the beginning, Jason and Patti envision the restoration of a "wildlife economy," in which wild bison become an act of reconciliation between the United States and the tribes, a central part of Native food sovereignty, and a step towards ecological recovery for Wind River. "We are decolonizing our land here," says Jason.

For Jason and Patti, bison bridge the past and future on the reservation. They

were once the cultural and ecological heart of Indigenous culture on the plains, with tribes depending on them for hides, meat, tools, and trade, and honoring them through ceremonial traditions. The herds' intense grazing and wallowing were a force of nature, shaping the plains by creating a mosaic of habitat types that enhanced the region's biodiversity, from insects to songbirds.

But by the end of the 19th century, the westward expansion of white settlers and their subsequent overhunting of bison nearly drove this keystone species to extinction.

Bison were so numerous and embedded in every aspect of life on the plains that researchers argue their rapid decline led to one of the largest economic collapses in North American history. The

“ In 130 years, we’ve
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thousands of years.

Jason Baldes ”



In 2007, Jason Baldes brought the first ten bison designated for conservation to Wind River. Today more than one hundred buffalo roam the reservation.



Photo by Mike Vanden, courtesy of Jason Baldes

Patti and Jason's vision is generational: rematriation and reconciliation through buffalo restoration.

effects of this collapse are measurable today. In 2000, per capita income on the reservations of formerly bison-reliant nations was 30 percent lower than those whose societies were not tied to bison.

Jason says that the Northern Arapaho and Eastern Shoshone, the tribes who share Wind River, have suffered in the absence of a cultural and economic relationship with bison. In turn, the land has suffered from an impaired ecological integrity. For instance, where bison once roamed, promoting biodiversity, feral horses now degrade habitat for other species. "In 130 years, we've forgotten how to see, taste, and smell buffalo, but we've had relationships with them for thousands of years," Jason says.

Wildness and relationship go hand-in-hand in the wildlife economy Jason is working toward. According to Jason, rebuilding a wildlife economy is a step toward cultural recovery for nations like the Shoshone and Arapaho. It may not look like a full return to relying on bison as a primary source of wealth, but it does represent a step away from policies imposed on the reservation that pushed agriculture onto cultures predominantly defined by hunting. Bison as wildlife are tied to Native food sovereignty and landscape restoration.

Yet even the word "wildlife" has a colonial taint. Before the US government established the reservation system, there was no concept of wildness separate from human civilization. "There is no word for wild in our language. What's wild is what happens in cities where the people are," Jason says.

It was far from the US and its systems where Jason found the inspiration to restore his tribe's relationship with bison: on a trip 9,000 miles away in East Africa. There, he witnessed the wildebeest migration with his father. "I drove hundreds of miles alongside them. There were 1.5 million wildebeest, which is less than 5 percent of the bison here two hundred years ago," Jason said. "It changed everything."

Buffalo are the cultural and ecological heart of the plains. Restoration of wild, free-roaming herds would move Wind River towards food sovereignty, revitalized cultural connections, and landscape restoration.

Emboldened by the scale possible for wildlife populations in other parts of the world, Jason returned home to initiate a partnership between Wind River's two tribes and the National Wildlife Federation, as well as leverage a longstanding relationship between the reservation and the US Fish and Wildlife Service. In 2016, Jason brought the first ten bison designated for conservation to Wind River. Over the next seven years, his collaborations—and his herd—grew. Today, the Shoshone bison herd has grown to seventy-five individuals and the Northern Arapaho herd has fifty-six.

Working with wildlife, especially relocating them, is difficult from both a regulatory and a financial standpoint. Knowing this, I was struck by both Jason and Patti's grit. They have bridged tribes with longstanding cultural differences, worked successfully with large, bureaucratic agencies, weathered racism inherent in systems that aren't set up to help Indigenous people

flourish, and strategically paced the changes they are bringing to Wind River.

The biggest challenge, Jason says, is changing the way people see bison, which is nothing less than a "paradigm shift." He is working to have them treated as wildlife, not livestock. This distinction is both symbolic and technical, with legal ramifications for land management.

In most western states, bison are legally designated as livestock outside of national parks, which implies they aren't allowed to range freely like elk or deer. Most bison in the US (around 200,000) are raised for beef on commercial ranches and often share genes with domestic cattle. Even outside of ranches, seeing bison as little more than woolly cattle is pervasive.

However, there are a few exceptions where bison are legally considered wildlife in Wyoming. Bison roam freely in lands adjacent to Grand Teton National Park and in the Absaroka Wild Bison



Management Area that encompasses lands west of Cody. Free-ranging bison outside of these areas is illegal, according to the Wyoming Game and Fish Commission, but Jason is working to make Wind River an exception.

Currently, Wind River's tribal game code does not include bison, meaning they aren't considered wildlife. For this to change, the General Councils of both tribes would have to amend the code, by vote, to include bison. Amending the tribal game code could open more land for bison to roam on the reservation and bring opportunity to retire grazing permits on specific range units currently used for cattle. Patti and Jason both say that prioritizing land for bison habitat is a critical part of land rematriation. The concept of rematriation emphasizes that bison restoration is an act of reconciliation promoting tribal sovereignty and refers to the matrilineal family structure traditional for Wind River's tribes.

Resistance to increasing bison's presence on the reservation largely comes from the agricultural industry, which fears the number of unknowns associated with their potential expansion. There is also the financial cost of retiring grazing leases. And there are bureaucratic hurdles to changing processes instituted by the Bureau of Indian Affairs. "It takes time and persistence, it's political. But we want to build momentum for a favorable resolution, and we do that by educating our people on their historic relationship with buffalo and the importance of it in our lives again," says Jason.

Fighting for these changes is part of Jason's long-term plan, which includes running the newly established Wind River Tribal Buffalo Initiative to manage the herd and coordinate outreach around the project. He hopes to create an academic arm of the institute to guide scientific research—led by Indigenous people—that will monitor the animals' ecological impact on the landscape.

Given the Baldes' accomplishments thus far, these plans seem immanently achievable. But their vision for what bison can mean on Wind River extends far beyond their lifetimes. They are working so that generations of buffalo and humans will once again live in relationship with one another on Wind River. "The thing that drives it the most is being able to go out and hunt a buffalo with my grandkids and my dad," Jason says. A generational focus is a departure from today's economic model that prioritizes instantaneous gratification, but men and women like Jason and Patti Baldes are paving the way for a broader paradigm shift.

Janey Fugate is a storyteller and a master's student with the Zoology and Physiology Department at the University of Wyoming under Matthew Kauffman. Her research focuses on how Yellowstone bison, after being reintroduced to the park, established the migration patterns they exhibit today.

“

The thing that drives it the most is being able to go out and hunt a buffalo with my grandkids and my dad.

Jason Baldes

”



Janey Fugate



Janey Fugate

Reciprocity and Sovereignty

AN INTERVIEW WITH WES MARTEL ON TRIBAL WILDLIFE CONSERVATION

Wes Martel is the Senior Wind River Conservation Associate for the Greater Yellowstone Coalition.

Previously, Martel served on the Eastern Shoshone Business Council for twenty years where he oversaw programs and legislation dealing with water, taxation, energy, and environment. He is a past Chairman of the Fish and Game Committee for the Shoshone and Arapaho Tribes and helped develop and implement the Wind River Tribal Water Code and Game Code. Martel is a veteran of the United States Army.

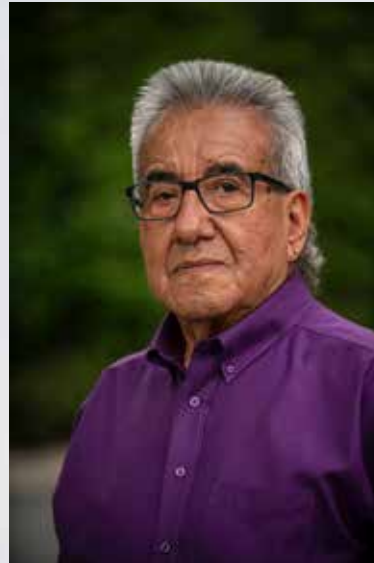
By Temple Stoellinger

This interview has been lightly edited for clarity and length

Western Confluence: You have a long history in wildlife and water conservation on the Wind River Reservation. Tell us about how your interest in those subjects first began.

Wes Martel: You know, I came back one summer after attending college at the University of Colorado and was asked to be the editor of the tribal newspaper. I didn't know anything about newspapers, but I did know how to write, so I said I'd be the editor. So, I started looking into a lot of tribal issues like oil and gas, our legal representation, fish and game; and I started asking questions. Our newspaper wasn't fancy, I just typed columns on a legal size paper, copied them and stapled them together, that was our news back then. But it really generated a lot of community interest and involvement, and people said, you're not afraid to ask people questions, you're not afraid to confront attorneys or the BIA (Bureau of Indian Affairs) people, you should be on the council. So someone nominated me for the Eastern Shoshone Business Council.

I am enrolled in the Shoshone Tribe, but I lost my parents when I was very young and my brother and sisters and I were raised by our Arapaho grandparents. I never imagined I would be on the Shoshone Business Council. When I first got elected I was 29 years old. There was one rough meeting where an old lady talked me down for being an Arapaho on the Shoshone Business Council, but a group of



Wes Martel

five older ladies came up to me and said they were thankful I was on the council and that they believed that when people attack you, it makes you stronger. A couple of my uncles came up and said the same thing. And so I lasted twenty years on the council after that.

When I first got elected I was appointed to the Fish and Game Committee. I didn't know anything about conservation or management. All I knew was I liked to hunt and fish. But the day I got on the committee, they appointed me chairman because of my newspaper experience. It was a good learning experience and really got me on the road to working on conservation.

Western Confluence: Can you tell us about the development of the Wind River Reservation Game Code?

Wes Martel: Our tribes have a long history of conservation. We created the Wind River Roadless Area in

1938. That was twenty-six years before the passage of the Wilderness Act. But we learned our herds were dwindling because of uncontrolled hunting, so we started talking about a game code. Hunting was allowed all year round, even during calving time.

So I worked with the Fish and Wildlife Service to start understanding their data. Richard Baldes worked for the Fish and Wildlife Service at the time, and he was a tribal member, so getting the data from him made it a little easier to accept. He kept saying, look at these numbers. Then we had a big incident where some people slaughtered a whole herd of elk right along the highway. That really galvanized the whole reservation to do something. Right after that, the Wyoming Game and Fish Department announced their intention to impose hunting seasons on the Wind River Reservation and we said "get out of here with that." We knew we had to have our own game code or Wyoming was going to impose their game code on us.

At the time, I didn't really think of it as conservation, I was just protecting tribal rights and tribal resources. We were protecting what we have as tribal members, what our ancestors taught us to protect as our way of life, including hunting, fishing, collecting, gathering, processing, and drying. We were protecting our four-legged relatives. You take care of us; we will take care of you. So it was those two issues, reciprocity and protection of our sovereignty, that really drove the development of the game code. We had to take care of our animal relatives and protect ourselves from the state.

Western Confluence: How does the Wind River Reservation Game Code address carnivore management?

Wes Martel: You know, we didn't really address carnivores like bears and wolves in our game code. We have more of a traditional and cultural understanding of how to respect them and honor them. Traditionally, we don't hunt wolves and grizzlies, and we don't eat them. They are part of the strength that our relatives bring to us. They are good providers, they are brave, they protect their families and make sure they always have food. That's what we also want.

Western Confluence: What are some of the biggest successes from the implementation of the game code?

Wes Martel: All the beautiful herds of wildlife we have now on the Wind River Reservation, some of the best in Wyoming. At one point in time we almost lost our moose population, we were down to only two moose. We've been able to bring back our moose and have almost three dozen now. We have worked pretty well with the Wyoming Game and Fish Department over the years. Their biologists are there for the critters. It's when things get tied up with politics that things start to hit the fan. So that's really the art of the deal, keeping politics out of conservation. Most of us love our wildlife. Now we are focusing on bringing back the buffalo to the Wind River Reservation. There is a spiritual and physical side of the buffalo. We use the physical side of the buffalo, but the spiritual side is even more powerful for us. That's what heals us and protects us. Buffalo are a strong rallying point for us, our families, our communities, our tribes, and all indigenous people. So it's a really exciting time right now.

Western Confluence: Can you tell us more about the connection between spirituality and wildlife conservation?

Wes Martel: The federal government talks about separation of church and state. But for us as indigenous people, our spirituality and our sovereignty are connected. There are also some things that can't be explained by science. When you look at places like Yellowstone, that's why we have to have the indigenous voices and inclusion, because that's the side we know.

Western Confluence: You have had a distinguished career in conservation on the Wind River Reservation and beyond, and have accomplished a tremendous amount. Tapping into your expertise and experience, what are your current priorities?

Wes Martel: Water, taxation, energy, and environment. There are 576 federally recognized tribes and most of them don't understand their own governance and that's why we are at the bottom of the economic

and social ladder, because we don't know how to make our government work for us. I want our people to understand our governance, our sovereignty, our treaty rights, and how to use that knowledge to strengthen our families and communities.

We have to take care of that which takes care of us—the law of reciprocity. We are trying to protect what we have left. How do we breathe life into our treaty? We have to do our homework, we can't just sit here twiddling our thumbs and have some attorney or the BIA telling us what to do. We have to know what to do ourselves, that is the responsibility of our tribal leaders. I'm at that age now where I can come out and tell people that. And I don't mind saying it, because we got to go, man, we've got to get on with the program. We need to move on the reservation to prepare ourselves for this modern world.

But we also need to ensure we are learning from our elders. We are working to get our elders to talk to our school children, from kindergarteners all the way up to high schoolers. I want our children to know what is important to us culturally and spiritually. Community education and involvement, that's going to be a big effort over the next

year. And those community events need to start with hearing from our elders from both the Eastern Shoshone and Northern Arapaho.

Western Confluence: What does the future of conservation and wildlife management on the Wind River Reservation hold?

Wes Martel: It's going to explode. Especially conservation of water as a result of climate change and drought. Our water is warming and dwindling and it's impacting our fisheries and wildlife. How are we going to be able to maintain our water and connect it to the fisheries and to our wildlife areas? One of the major topics at the Wind River Water Resources Control Board right now is water storage. I see conservation becoming more important to all of our families and our youth. It all comes back to reciprocity. If we take care of it, it will take care of us. That's conservation with an indigenous flavor. We are pretty lucky to be from the Wind River Reservation, so we need to protect what we have. We need to make sure we conserve what we have so it keeps taking care of us. That's what we are going to do.

Temple Stoellinger is associate professor of law and environment and natural resources at the University of Wyoming.



RETURNING TO PAST PRACTICES FOR FUTURE WATER MANAGEMENT

Leave it to Beaver



By Tesia Lin

In 2014, John Coffman arrived in Wyoming as The Nature Conservancy's new steward for the Red Canyon Ranch and quickly encountered an unforgettable lesson. "We were trying to figure ourselves out on some new country and trying to make sure we were on top of getting the hay meadows irrigated. An intern was having trouble with a beaver plugging a headgate," he says, preventing water from getting to the fields. They opted to get rid of the pesky beaver, as agricultural operations have done for a long time.

The following year, high spring flows washed away bridges and crossings from the fields, forcing Coffman and his team to restore irrigation ditches and pipes, a resource-intensive process. In a different part of the ranch, however, a stream system that still had beavers showed more resilience to the spring flows. "Instead of those streams eroding away, the [beaver] ponds slowed everything down," says Coffman. "The ponds filled with sediment and are now growing willows and lush grasses."

Seven years later, during a mid-July visit, Coffman showed me this historic beaver complex, still thriving after those floods. For twenty feet on either side of the stream, floodplains were green with grasses, willows, goldfinches, and a rattlesnake we were lucky to hear first. Coffman chuckled; he had cautioned me earlier that they're after the rodents abundant in the area. Four beaver dams bridged deep, still ponds. The beavers built with no regard for clean, neat lines or straight waterways—challenging my understanding of what streams should look like.

After the consequential floods in the spring of 2015, Coffman says, "We came to the observation that there were some serious benefits to having beaver dams and beavers in

place." This beaver complex serves as a model for the conditions that he hopes to restore several streams to. Across an increasingly parched and degraded West, land managers and researchers seeking effective and efficient water management solutions may benefit from the same realization. Perhaps, it's time to end recent antagonism against beavers and instead form an alliance with nature's most effective, once prolific waterway engineers.

"None of us in our lifetimes have seen how common beavers would have been," says Niall Clancy, a PhD student at the University of Wyoming surveying fish diversity in beaver ponds. Before the arrival of western settlers in the early 1800s, there were as many as four hundred million beavers in America, creating wetland mosaics that covered almost three hundred thousand square miles of land in serene greens and glittering blues. Beavers dam up slower streams to form deep moats around their homes, creating refuges not only for themselves, but also for plants and animals that rely on, and co-evolved with, these dam structures. Series of dams spawn floodplains, wetlands, and ponds—so called "beaver complexes." Sheltered pools of standing water provide safety for young fish, invertebrates, and amphibians. They are also havens for threatened or rare birds, like sandhill cranes. "The more complex the types of habitats you have, the more types of wildlife you can support," Clancy says. "Messiness is good in ecology."

Messy can also be how land looks when humans are stewards. "When we think of the past, we need to add Indigenous people," says Rosalyn LaPier, faculty in the history department at the University of Illinois and enrolled member of the Blackfeet tribe of Montana and Métis. "When the first settlers arrive in the West, what

they are seeing are these ecosystems that have co-evolved with plants, animals, and humans.” To survive in water-limited environments, Indigenous communities living between the plains and Rocky Mountains studied and manipulated natural processes. LaPier says that they managed beaver populations to manage water; beaver ponds provided a water source for Native peoples as well as the animals they hunted. Beavers were so important that the Blackfeet considered them sacred and divine. Thus, humans developed a close, symbiotic existence with beavers and their natural worlds.

Western expansion upset this balance. As settlers introduced new diseases and deforestation, they also introduced the concept that waterways were most efficiently managed if they were linear, unobstructed, and moved large quantities of water. They diverted rivers and streams into deep irrigation ditches and killed beavers where they interfered, declaring them pests. Coupled with overharvesting for the global fur trade, human pressure nearly extinguished beavers and the ecosystems they maintained by 1900. Of the floodplains and wetlands that once existed across North America, less than ten percent remain today.

In their places are thousands of miles of down-cut streams like the ones that caused Coffman and his team so much trouble a few years back. In straight, unobstructed waterways, controlling transportation to agricultural fields is the main objective. The force of water travelling quickly does not allow water to collect in the soil or for nutritious sediment to be deposited, so incised banks become unable to support plant life. Without roots to hold the banks together, exposed soil dries and crumbles in the heat of summer, eroding the streambanks. Braided stream systems shrink to



Tesia Lin

Beaver dams slow down streamflow, forming complexes of ponds, wetlands, and floodplains that act like nature’s sponges and are resilient to both flood and drought.



John Coffman

After the beaver was removed from Barrett Creek on The Nature Conservancy’s Red Canyon Ranch, heavy spring flows wreaked havoc on the stream.

“ We had some major erosions and down-cutting, to the point where we couldn’t get water out of the headgate.

John Coffman ”

Coffman stands next to a beaver dam analog on the Red Canyon Ranch. While these human-made structures can mimic some of the benefits of beavers, they still require maintenance and can't adapt to changing conditions the way beavers do. Often, they are used as a tool to entice beavers to return to a stream, rather than as a tool of restoration on their own.



a single water channel, drying the surrounding land. This cycle eats away at floodplains and wetlands, which otherwise accumulate nutritious sediment, retain water underground (resisting evaporation), and promote biodiversity. With nature's "sponges" gone, water and nutrients wash out to the ocean, leaving behind arid land and lost habitat.

Reconnecting waterways, reducing erosion, and replenishing groundwater is difficult and expensive. When I asked Coffman

about solutions for managing and retaining water on Red Canyon Ranch, he emphasized the hefty costs of bringing heavy machinery and hiring engineers and landscape architects. Such disruption could also set back ecological processes, displacing invertebrates, mammals, and birds alike. Ecosystem integrity could take years to recover. Not to mention the challenge of maintaining such elaborate construction when faced with the unpredictable nature of rivers and streams, which change their courses over time. All in the

hope of mimicking the effortless effects of floodplains and wetlands.

Nationally, hundreds of millions of dollars have been allocated toward the labor and materials required to develop water resiliency projects in the West alone. These interagency developments prioritize the storage and protection of water in reservoirs and groundwater, as well as the restoration of wetlands and waterways. Though this large sum recognizes the importance of restoring ecosystems, humans cannot accurately replicate natural processes.

"What [modern] restoration practice has done is borrow from empirical observations and produce average conditions. We are crap at designing for variability and complexity," explains Joe Wheaton, an ex-civil engineer studying nature's engineers at Utah State University. Nature, he says, does not adhere to averages but is rather unpredictable. The movement of water and how streams change course are challenges that researchers and engineers cannot account for. Unlike scientists, though, beavers instinctually adapt



Tesia Lin

In the most degraded waterways, beavers and their accompanying biodiversity will not return on their own, but we know how to entice them. Clancy's team facilitates the return of beavers by installing beaver dam analogs (commonly called BDAs). He and his collaborators strategically select for where a beaver's work is required, targeting heavily eroded streams devoid of life and too deep for cattle to cross. Spanning the width of these channels, they weave sticks and logs, and pack mud to mimic dams. These barriers slow the force of water as it moves downstream while creating pools, the goal being to create a habitat appealing to beavers. Should beavers move in, they build upon and maintain these structures without need for human labor and constant surveillance.

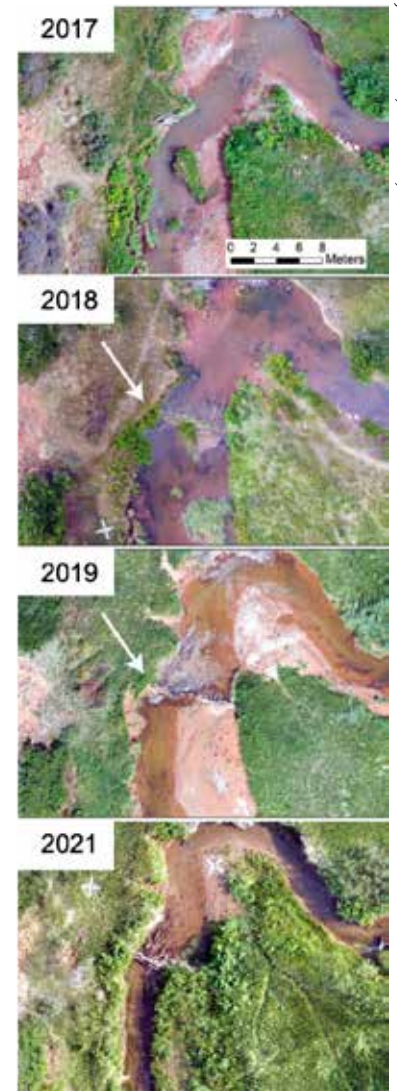
While the implementation of beaver dam analogs and encouragement of beaver repopulation outpaces the research, many initial results have been positive. In places where beavers have been reintroduced, ranchers and researchers alike have seen streams flowing anywhere from an extra week to an extra month. Beaver restoration can also replenish groundwater, often a key source for municipal water use. Meanwhile, burying plant materials during the damming process sequesters carbon, preventing it from entering the atmosphere as a greenhouse gas. And in some once-degraded sites where beavers have been successfully introduced, their restoration effectively increased the variety of habitats and the abundance of critters they could support.

Exploring a symbiotic relationship with beavers is still a new but growing practice that has not been without challenges. Coffman says, "Since that situation years ago, we got beavers back creating messes: damming up ditches, plugging up headgates. But we're trying to approach it a lot differently now." Rather than treating beavers like

nuisances, his management approach centers around the balanced relationship between beavers and stewards. Like Clancy, he is installing beaver dam analogs throughout streams on the ranch—a project that started with five and expanded to over forty structures. Though there are headgates and irrigation ditches where damming is undesirable, Coffman still allows beavers to exist under his watchful eye. After all, early dams can be dug out and individuals relocated—but beavers' effectiveness in retaining water and restoring floodplains cannot be replicated.

Beavers may not be the ultimate clean-cut solution for our water resource problems. Messy, multifaceted tools, they challenge the modern concept of controlling water. But researchers and land managers alike have found that nurturing an alliance with beavers, adapting to their activities, and integrating science with natural processes—the way Indigenous peoples have—can help build resiliency in the face of dynamic environmental challenges.

Tesia Lin is a master's student at the University of Wyoming characterizing pathogens in bighorn sheep pneumonia. She hopes to pursue a career that encourages interdisciplinary and intercultural research at the forefront of ecology and conservation. This story was supported by a grant through Wyoming EPSCoR and the National Science Foundation.



Julianne Davis, Eliza Hurst, and Air CTemps

A time series shows a degraded stream before beaver dam analogs were installed (2017) and regrowth in the years following.

“ We came to the observation that there were some serious benefits to having beaver dams and beavers in place.

John Coffman ”

to and engage with the changing courses of water. They foster jigsaw ecosystems, supporting critters that are codependent on one another in ways that scientists often overlook and would be hard-pressed to reproduce. That makes beavers cost-effective tools for maintaining and helping manage the natural water systems that so many people, industries, plants, and animals rely on. For Wheaton, beavers are tools of restoration that engage natural processes, balancing the “mismatch between effort and scope of problem.”



Free-Range Carbon

NOT A SILVER BULLET, BUT
MAYBE A GOLD STANDARD,
A NEW MARKET TOOL BENEFITS
CLIMATE, ECOSYSTEMS,
AND PEOPLE

By Birch Malotky

When I get Dallas May on the phone for the first time and ask how he's doing, he immediately tells me, "We were getting ready to start selling cattle and a week later the rains started. It's really saved our lives." It wouldn't have been the first time he downsized his herd due to drought, but that doesn't make it any easier. "It sounds like you're saving yourself by selling cows, but it is devastating financially," he says. Not to mention that after a lifetime breeding them, there's a history and emotional attachment to every single cow. "Forty-five generations of cattle have gotten us to where we're at. You can't just buy a replacement."

These are the kinds of crises May has faced routinely, repeatedly, and increasingly. In 2004, drought forced the May family to sell off half their herd; it took eight years to recoup just a third of those losses. Shortly thereafter, the herd was halved again and it took until 2020 to build back up today's 800 head of cattle. Over those decades, May has watched the costs of his operation go up, the price of beef go down, and dry weather stick around. It's a death

spiral, he says, one that threatens not only the financial viability of his multi-generational family operation, but also the health of 15,000 acres of native prairie and wildlife habitat under his stewardship.

As climate change causes more frequent and severe droughts in the arid West, ranching isn't getting any easier. And with crop values on the rise, it's sometimes only a matter of economics until working ranchlands are plowed under for commodity crops like corn and soy. When that happens, it's not just ranching heritage and wildlife habitat that's lost: carbon is released too. In a vicious cycle, the carbon stored in grassland soils ends up in the atmosphere, further exacerbating the climate crisis.

But what if something could break the cycle, serving up the win-win-win that conservationists, ranchers, and climate activists didn't dare hope for? In 2016, the May family got involved in a brand-new conservation tool that purported to do just that: rangeland carbon credits. Five years after their pioneering project began, it's time to see what promises panned out, and if this tool can scale up

to address challenges faced by the people, animals, plants, and carbon safeguarded by America's grasslands.

Threatened: People, biodiversity, and carbon

In southeastern Colorado near the small agricultural town of Lamar, the May farm and ranch comprises 5,000 acres of cropland and 15,000 acres of native shortgrass prairie. When I visit in mid-July, the fields are a shocking medley of greens: thick sagebrush and waist high grasses dipping into wetlands bristling with bulrushes. Hardly a moment goes by without some birdsong or another floating in through the open truck window as Dallas and his son Riley drive me through a shifting mosaic of pasture and stream, regaling me with stories of swift foxes, elk herds, and dragonflies that look like peacocks.

Intact, native grasslands like those on the May ranch provide ecosystem services key to the health of human and natural communities. They support a unique array of plant and animal species, filter and store water, sequester tons of carbon, provide habitat for pollinators, and are the basis of many rural livelihoods. Yet, temperate grasslands are the least protected ecosystem on the planet, and the most endangered ecosystem in the United States, according to the 2020 Plowprint report released by the World Wildlife Fund. And they're disappearing fast.

Historically, grasslands have suffered the one-two punch of being economically profitable to develop and not traditionally scenic, leaving them underrepresented in the public lands portfolio. Now, 84 percent of remaining intact grasslands in the Great Plains are privately owned, and therefore vulnerable to economic pressure. Billy Gascoigne, associate director of conservation strategy for Ducks Unlimited (DU), says that "when commodity prices go up, we see that grasslands go out, and row crops like corn or soy go in." In 2018-19 alone, 2.6 million acres of grassland were converted to crops in the Great Plains of the US

“ If we don't have ranchers, we lose the grasslands.

Billy Gascoigne

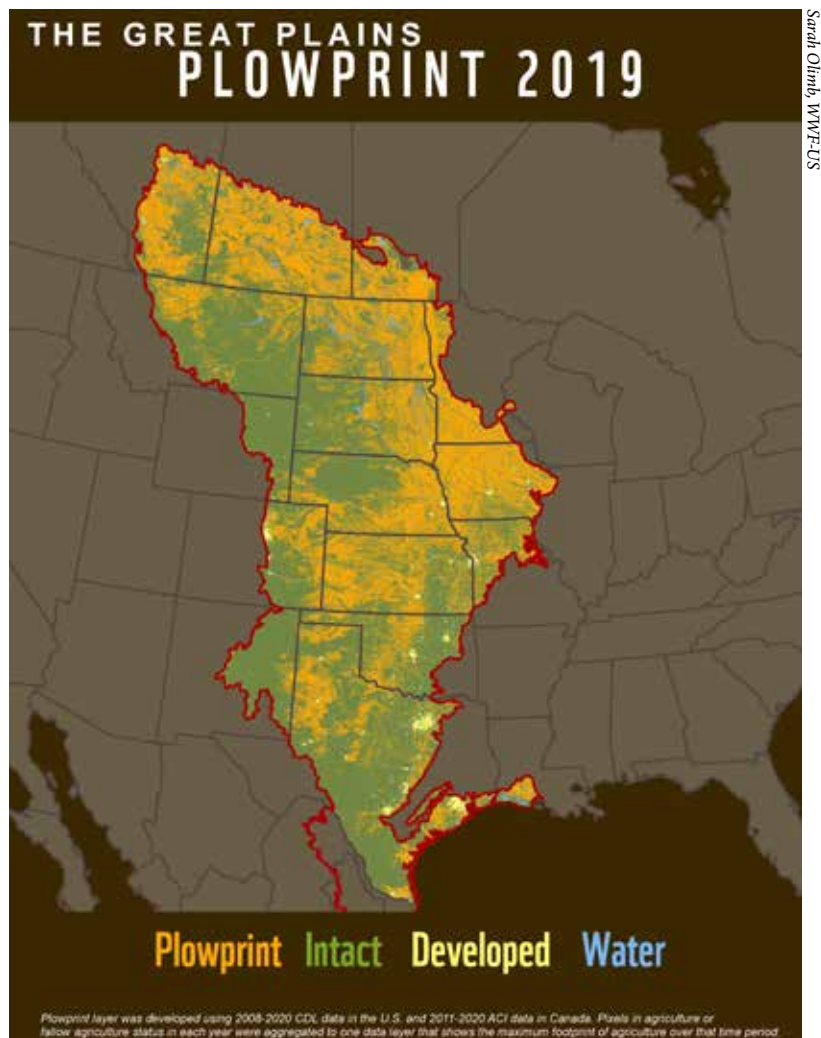
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and Canada. In the American West, eastern Montana, Wyoming, and Colorado; the western Dakotas; and eastern Washington and Oregon are most at risk.

"Ranchers are the last strongholds," says Gascoigne, speaking about the prairie pothole region of the Dakotas where DU focuses its work. "If we don't have the ranchers, we lose the grasslands." But ranchers are facing issues of their own.

The difficulties confronting livestock agriculture are numerous, intertwined, and worsening. In brief, given the low and variable price of beef and lamb, the high costs of land and infrastructure, and the cut taken by the packing industry, "you have a system where the profitability margins are tenuous," and ranchers have difficulty absorbing yearly economic fluctuations says Erik Glenn, the executive director of the Colorado Cattlemen's Agricultural Land Trust and the president of the 11-state Partnership of Rangeland Trusts.

"And then on top of that you add drought and unpredictable weather situations," Glenn says, which leave ranchers with few good options and a hard time recouping losses. Take the Mays for example: if the rains hadn't come just in time, they—like their neighbors—would have had to sell their cattle into a flooded market at rock bottom prices. With half their income to cover the same fixed costs as always, they'd eat into their savings while slowly building their herd back up. Alternatively, a rancher could risk grazing their full herd, potentially



Nearly half of the Great Plains have already been converted from grassland to cropland. Of the intact grassland that remains, 84 percent is privately owned.

damaging the land and jeopardizing the ability of each cow to put on the weight necessary for market.

"Neither decision is a good decision," says Glenn. "And that makes it hard for producers to run a business that is profitable and appealing to the next generation." Indeed, with the average age of landowners continuing to rise (57 in Wyoming 2017), succession is increasingly a concern for agricultural producers. Who will take over management of the land when the current generation retires? There are not enough young people, says a report from the National Young Farmers Coalition, leaving the future of millions of acres hanging in the balance.

Both instability and uncertainty make the land vulnerable to other uses. Absentee landowners may

decide it's more reliably profitable leasing to farmers than ranchers. Land-owning ranchers might go under. "It's a wonder we haven't been swallowed up," Dallas tells me, pointing to the cropland that hems the ranch in on all horizons. We're paused at the geographical center of the ranch, a promontory overlooking a bulrush marsh edged in sagebrush, Big Sandy Creek winding its way through miles of untilled fields beyond.

The May ranch harbors wildlife that the surrounding farms simply can't support. The stream is flush with beaver dams and sandpipers bob along the edges. There are prairie dog colonies, enough that Colorado Parks and Wildlife released black-footed ferrets on the property. The ranch is designated an Audubon Important Bird Area and is part



Dallas (left) and Riley (right) May say they want ranchers and conservationists alike to be inspired by the win-win solutions offered by ecological stewardship on working lands.

of a narrow corridor of grassland connecting the two populations of lesser prairie chickens in Colorado. There is a lek nearby, Dallas says, but it's in grassland that's about to phase out of its protection under the Conservation Reserve Program. Dallas hopes the prairie chickens will find refuge on the May ranch if the lek goes under the plow.

Grassland bird species, like the lesser prairie chicken, have been struggling for decades. Researchers say habitat loss through grassland conversion has contributed to a population drop of 80 percent in some species since the 1960s.

As a group, grassland birds have experienced the steepest decline of all North American birds. Waterfowl and shorebirds also rely on grasslands, using embedded wetlands as migratory stopovers and nesting habitat. The May ranch, for example, plays host to the largest population of eastern black rail in Colorado. In 2020, the rail was listed as threatened under the Endangered Species Act. Key pollinators like the once-widespread rusty-patched bumble bee are also suffering from the loss of native grassland.

It's not just wildlife habitat that makes America's last remaining

grasslands important. World Wildlife Fund's first Plowprint Report points out that every unplowed acre of grassland can store thousands of gallons of water, critical for water catchment and filtration as well as flood and erosion control. And what may seem at first glance like a homogenous field of grass is in fact a rich assemblage of plant species; on the May ranch, surveyors from the Denver Botanical society found 335 species, 90 of which had never been documented in the county.

Widespread alarm about the nation's declining grasslands

is relatively new; concern about the climate impact of grassland conversion is even newer. The impact is real. Proceedings from the 2019 America's Grasslands Conference estimate that from 2008 to 2016, conversion for corn and soy released more than 14 million metric tons of carbon per year. That's the equivalent of the yearly emissions of 13 coal-fired power plants, or a 5 percent increase in the number of cars on the road in the US.

Of course, carbon is getting extra scrutiny lately because the world is on course to vault past the warming limit set by the Paris

Agreement of well below 2 degrees Celsius. Instead, 2020's United Nations Environment Programme Emissions Gap Report predicts more than 3 degrees Celsius warming by the end of the century. To get back on track, global emissions would have to be cut in half by 2030—just seven years from now.

In response to growing demand for action around climate change, dozens of high-profile international corporations have announced sustainability goals, pledging to go carbon-free or carbon-neutral by a certain date. The problem is, some emissions can't be eliminated on such a tight time frame. For a small business whose local utility doesn't offer renewable energy, it might be impossible to cut emissions to zero. The same is true for the aviation sector, which doesn't yet have a usable alternative to jet fuel.

To supplement emissions reductions, airlines and many others are investing in carbon offsets, which are meant to compensate for certain unavoidable emissions by creating reductions elsewhere. Offset projects may also have "co-benefits"—like protecting natural spaces or supporting local livelihoods—that make them more desirable to businesses who want to tell a good story about their sustainability work.

That's why a diverse group of stakeholders is pushing forward rangeland carbon offsets. Rangeland carbon could check all the boxes, they argue: protecting endangered grassland ecosystems and their declining biodiversity while supporting local food systems and rural communities in the heartland of America. And of course, fighting climate change through low-cost, long-term carbon sequestration.



Under the hood of rangeland carbon

The principle behind carbon offsets is that carbon dioxide and other greenhouse gases are not localized or specific issues, but rather global and universal. Therefore,

any kind of carbon sequestration anywhere in the world can help balance emissions in a worldwide ledger. In that ledger, and the burgeoning carbon market, the universal currency is carbon credits. Each credit stands for one metric ton of carbon dioxide that isn't in the atmosphere (or the carbon dioxide equivalent of other greenhouse gases like methane and nitrous oxide).

In some countries and the state of California, participation in the carbon market is mandatory and regulated. Elsewhere, businesses, organizations, and even individuals can choose to participate in a voluntary carbon market, purchasing credits to offset anything from personal travel to yearly or historic operations. Google, for example, announced in 2020 that it had used offsets to compensate for all the emissions it has ever created (a claim that is still being scrutinized). The voluntary market is less centralized than the regulatory market, but that's not to say it's a free-for-all. Most, if not almost all, carbon credits go through one of three registries: the American Carbon Registry, the Climate Action Reserve, or VERRA. These registries develop protocols that outline what offset projects qualify, how emissions reductions are calculated, and the process for verifying and monitoring credit generation.

There are dozens of kinds of carbon offset projects; each of them generates credits by either increasing the capture and sequestration of carbon, or by reducing or avoiding emissions that would otherwise be generated. Many kinds of offset projects rely on technological improvements for emissions reductions, like investing in renewable energies or improving waste management systems. However, projects categorized as natural climate solutions, or nature-based solutions, take advantage of land management strategies that create and maintain natural carbon sinks like forests, wetlands, and



We want to conserve, not consume. Hopefully we stay financially solvent enough to be able to do that.

Dallas May



grasslands. A 2017 study published in the Proceedings of the National Academy of Sciences found not only that natural climate solutions could contribute significantly to short-term global emissions reductions, but also that they are cost effective and deliver important auxiliary benefits to people and nature.

Grassland carbon credits are relatively new to the carbon offset scene and still not very prevalent. They fall under the "avoided emissions" category of offset, preventing the release of soil carbon (and other greenhouse gases) that would result if the grassland were converted to cropland. There is ongoing research investigating whether grasslands could also produce carbon credits by increasing sequestration, but Drew Bennett, Whitney MacMillan Professor of Private Lands Stewardship at the University of Wyoming, says that "there is still debate if you can increase carbon stocks through management and it seems like even if you can, it's a very, very slow process and probably not viable financially." In contrast, he says, "There is a significant and clear benefit to preventing the existing carbon that's in the soil from being lost through conversion to row crop agriculture." Any activity that does not disturb the soil carbon, including grazing, recreation, and light haying, are still permitted under these projects.

While the impacts of conversion are obvious, understanding how they apply to specific land parcels—and how that translates into carbon credits—is far more complicated. Now, the American Carbon Registry and the Climate Action Reserve have both developed protocols that outline exactly how to start and run a grasslands carbon project. When Dallas and Riley May first got involved, however, no such protocol existed.

When the elder May finally signed the deed to his farm and ranch in 2012, he immediately began calling around to local conservation organizations. He wasn't looking to sell carbon credits, which he had only vaguely heard of—he was just trying to protect the land for future generations. Even if down the line his family could no longer care for it, he wanted to be sure that the land stayed native prairie, "just the way God planted it." Back then, he says, "there was a daily chance that it would get sold and someone would plow it all up." He knew from the years it took to close on the land that "there were entities waiting in the wings" to snatch the property up.

Initially, Riley says, his dad couldn't get any traction. Dallas gives a knowing laugh, explaining, "We're not the mountains. We're the flat, arid, eastern plains." By 2015 though, grasslands were enjoying enough of a surge in attention that non-profits were stepping over themselves to work with the Mays on financing the conservation of the property.

The various organizations, however, were careful not to step on each other. "We all came together to tackle various pieces of the conservation puzzle," says Gascoigne. The Conservation Fund, with the help of The Nature Conservancy and others, spearheaded the fundraising process to secure a conservation easement on the property, which, everyone agreed, should be held by the Colorado Cattlemen's Agricultural Land Trust. The easement paved the way for



Birch Malachuk

The reason that selling credits isn't a one-and-done deal is because the avoided emissions aren't either. Avoided emissions are calculated based on how many greenhouse gases would have been released in the atmosphere if the land had been converted to row crop agriculture. Loss of soil carbon is greatest initially, when grassland is first plowed for crops, and continues to be emitted for decades, tapering over time until a new equilibrium is reached. As such, the avoided emissions of a grassland project also taper over time. After 50 years, it's assumed that the soil carbon would have reached equilibrium, and the project no longer generates credits, instead moving into a 100 year "permanence period" that guarantees the avoided emissions remain avoided.

Even that is a bit oversimplified. Avoided emissions account for not just soil carbon, but also include the nitrous oxide that would be released from fertilizing cropland and the fossil fuel emissions from any equipment that would be used in the farming operation. It's also important to note that grassland projects like the Mays' can only sell their "surplus" carbon. All the emissions the ranch

Gascoigne to simultaneously develop a carbon project, which had only ever been done on rangelands once before. Dallas, eager to preserve the agricultural and conservation value of his property however he could, accepted.

Then and now, the first step in developing a carbon project is determining the land's eligibility. For an avoided grassland conversion project, the land has to have been grassland for at least ten years. Next, the most important thing to assess with any offset project is whether or not the carbon being sold as credits would have been protected or sequestered if it weren't for the project's efforts and revenue. This idea, known as "additionality," is critical, Bennett says, "because if you're developing carbon credits on a bunch of land that is never going to be converted, say, or logged, you're not actually doing anything for climate change."

For avoided grassland conversion projects, the question of

additionality means determining if it would be possible to use a piece of land for row crop agriculture, and if that happening would be probable. One factor is land ownership and existing legal protections; only private land and non-federal lands managed for profit are eligible for a carbon project. Moreover, that land can't have any regulations, zoning laws, deed encumbrances, or existing conservation easements that prevent it from being used for farming. The other factors relate to the land itself: soil type, water availability, topography, and present and future climate conditions all help determine if the land is even suitable to grow crops. Land that passes these tests must also be situated in a county where cropland is 1.5–2 times more valuable than ranchland, thus indicating a risk of conversion due to potential financial gain. Lastly, a project has to guarantee that the carbon being protected will stay protected. For this, a conservation easement with a no-till clause

is required, alongside follow-up monitoring to prove that the soil carbon remains undisturbed for at least 100 years after the last credit is sold.

A third-party verification body has to confirm everything. Dallas says that when the May ranch was first verified, a team from San Francisco flew in from their previous assignment verifying forestry carbon projects in the Congo. They spent four days walking the land, taking soil samples, mapping wetlands, and investigating the grazing management. Months later, the team submitted their report approving the May ranch carbon project to sell carbon credits and outlining exactly how many credits it was authorized to sell, based on the emissions avoided by the project. Because the verifiers are the ones who confirm that the project developers calculated the credits correctly, projects have to get re-verified every time they want to sell. For the May ranch project, that means every year, for up to 50 years.

Black-footed ferrets, North America's "rarest mammal," were released on the May Ranch in November 2021, part of a species recovery plan that has spanned years and involved more than 500 reintroductions.

produces are subtracted from the total avoided emissions before credits are calculated. This includes emissions from the breakdown of manure and other organic fertilizers, all fuel and electricity usage, and methane emissions from their cattle. Avoided emissions are further reduced to account for the possibility that preventing conversion in one place may increase the probability of conversion elsewhere (known as “leakage”). And finally, a percentage of the credits are withheld from each sale in a buffer pool, which acts like an insurance policy against something like a natural disaster that could release soil carbon. All this tallies so that, for example in 2018, the May Ranch avoided 14,278 metric tons of emissions, but generated 4,582. After 182 metric tons were withheld for the buffer pool, they were authorized to sell 9,512 carbon credits that year.

“Lawyers, paperwork, and scientists,” Dallas says of the whole process. “You have to have everything perfect.” It took the Mays and Gascoigne a full year to work through the protocol, until December of 2016 when they finally closed on the conservation easement and the

carbon project together. In the end, Colorado Cattlemen’s Agricultural Land Trust owns the easement, and thus the development rights; Ducks Unlimited owns the carbon project, and thus the greenhouse gas rights; and the Mays retain ownership of the property and all other rights. Complicated, perhaps, but with all parties working together to ensure the long-term protection and productivity of the land. For Dallas, Riley, and the rest of the May family, the project was sweet relief.

As the project owner, Ducks Unlimited is responsible for generating and selling the credits and paying all associated costs. The Mays don’t know where their credits go and receive a just a portion of the profits from credit sales. “And honestly, what we get is small,” says Dallas. “What we really get is the emotional satisfaction of getting the job done,” and knowing that “this ranch has to stay just how it is, forever.”

Once the credits are verified, DU submits the verification to one of the registries, which are the rulemaking bodies of carbon markets. The registries approve the credits for sale, assign them serial numbers, and issue them into a kind of “checking account” that DU pays to have at the registry. From this account, DU can sell to various buyers, sometimes direct to an end buyer like a major corporation, at other times through one or more intermediaries.

In the past, Planet Bluegrass has purchased May ranch credits to offset its annual Telluride Bluegrass Festival and Mountainfilm Festival, and the town of Telluride has used them to offset its public bus system, the Galloping Goose. These credits were sold through an intermediary—the Pinhead Climate Institute. The credits are also available to individual consumers on the public-facing, non-profit website Cool Effect, another intermediary DU has worked with. Public-facing prices may range from \$10-15 per credit, but it’s worth noting that, like any market, the



Courtesy of Dallas May

In grasslands, 90 percent of the sequestered carbon is in the soil, making it resilient to short-term and surface-level disturbances, including grazing.

more intermediaries and associated costs there are, the less the final price reflects the value of the credit to the producer.

When I get home after visiting the Mays, I log onto Cool Effect. The May ranch is one of just a dozen projects and bears the title “Home on the Range.” The credits are sold out. They’re one of the first projects to sell out every year, Dallas has told me, despite being priced higher than many other projects on the site. “I guess there’s something about US grassland that resonates with people,” he says.



Does it work?

Certainly, the story is a nice one, the kind that would make eco-conscious buyers feel good about where their money is going. But to what extent do these grassland carbon projects really move the needle on climate change? Do they actually protect grassland biodiversity and ecosystem function? And can carbon credit payments supplement a rancher’s profits enough to deal with the tough times ahead?

Compared to forestry offset projects, which are far more common, grassland projects deliver relatively low carbon sequestration

rates: on the scale of 1 metric ton of carbon per acre compared to perhaps 100 metric tons per acre. Some may take this as an indication that rangelands projects are less worthwhile, but Kyler Sherry would say otherwise. She is a senior program manager at The Climate Trust—the oldest climate offset entity in the country—and deals with both grassland and forestry projects. “To say that we’re only going to do forestry projects because the one ton per acre [of avoided grassland conversion] doesn’t matter, I think that’s not the argument to make,” says Shelly. “A ton of carbon is a ton of carbon. And when you scale it up, it has an even greater impact.” In 2017, for example, the May ranch’s net avoided emissions were the equivalent of taking 2,300 cars off the road.

Gascoigne, who developed two of the earliest grassland projects, agrees, saying, “If we can make these projects work without drawing away resources from other projects, then it’s all additive.” Besides, he adds, “Grassland carbon is some of the most steady-state carbon that we have, and we still have vast grasslands, so it’s a very important carbon pool.” Because 85–90 percent of the carbon is below ground, anything from tornadoes and fire



Ryan Hagerly, USFWS

to disease and grasshoppers can come in and destroy the grassland aboveground, but the carbon stocks remain protected. That's a significant difference from forest carbon, which can turn into emissions in the blink of an unattended campfire.

Still, there are those skeptical of offsets in general, concerned about projects claiming to sequester or protect carbon, but not delivering that key element of additionality. This not only creates setbacks for climate change mitigation that the world can't afford, it also threatens the market. For example, when low-integrity carbon credits made it into the Chicago Climate Exchange, which operated from 2003 to 2010, "The price of carbon cratered in part because nobody had confidence that what they were buying was actually what it was represented to be," explains Bennett, the University of Wyoming researcher. Recently, accusations have been leveled that a few high-profile forestry offset projects are selling "empty" credits, leading to a wave of concern and scrutiny of both project developers and companies buying offsets. Mostly, critics say that carbon payments aren't changing land managers' behavior, that the managers would be doing these practices anyways and so the carbon credits produced by these projects are not "additional."

A counterargument is that no matter the intentions of the landowner, there's no guarantee they won't change their mind or lose the land and the right to decide. Dallas and Riley May, for example, aren't planning to plow up their ranch land, but there was no actual guarantee of protection for the soil carbon until the carbon project and conservation easement made that a legally binding decision in perpetuity. Some say it's important to get this guarantee while there is a willing landowner, whereas others might say willing landowners are less likely to provide additionality in the short term.

Despite the furor, few would

argue that offsets are fundamentally useless, or that no high-quality credits exist. Riley May says that, just like anything, "there's always a loophole that someone finds and abuses, but that shouldn't discredit the good programs out there." It might just be that, in the decentralized voluntary market, there is greater onus on the individual players to hold themselves and others accountable. Project developers like The Climate Trust and Ducks Unlimited, for example, set requirements for potential projects that go beyond the registries' protocols. Sherry says The Climate Trust will only support a project if it requires behavior that is not considered standard practice or the cultural norm. Gascoigne says that regardless of the protocol's maps that determine eligibility, he wouldn't support a project if it wasn't genuinely at risk and absolutely worth saving.

From a buyer's perspective, there are a few ways to sift out potentially "bad" credits: a high-quality project should follow a scientifically grounded protocol, have proof of validation by an independent verification body, be registered with an established carbon registry, and perhaps most importantly, foster transparency by making all protocols and verification documents publicly available. I can say personally that after reading over the Climate Action Reserve's Grassland Protocol 2.1, as well as the documentation for the May ranch, I feel more confident that grassland carbon credits do what they claim to do, and that the number of credits generated by a piece of land is not inflated.

Transparency may also apply to the buyers of credits, since another common criticism is that offsets (high integrity or not) are a form of greenwashing that companies use to improve their image while avoiding serious emissions reductions. If companies made it clear how much of their carbon neutral goal is being fulfilled by offsets as opposed to reductions, and if they disclosed the sources of their offsets, claims

of greenwashing might be readily confirmed or dismissed. In general though, an annual survey carried out by the Ecosystem Marketplace has found that companies buying offsets spend, on average, ten times more on reductions than companies that don't buy offsets. Ultimately, offsets, says Sherry, "are a great tool for the short term and when the technology isn't there yet. But they're just one tool in the climate mitigation toolbox."

Carbon offset projects are also just one tool in the grassland conservation toolbox.

Other common tools for preserving grasslands include conservation easements (which protect land from development in perpetuity) and the federal Conservation Reserve Program (which pays farmers to not crop their land for 15 years). Carbon projects do offer a number of conservation benefits that these others don't.

Most notably, carbon credit projects protect the land from being plowed in the long-term, as opposed to the brief 15 years in the Conservation Reserve Program. While easements are also long-term, many conservation easements lack a "no sod busting" clause that forbids plowing, whereas carbon projects require it. The entire May property, for example, is under a conservation easement, but 5,000 of those acres are on farmland. It's the carbon project, not necessarily the easement itself, that protects the native grassland on the 15,000-acre ranch. Also, carbon credits can act like "a cherry on top," says Bennett, when selling credits creates "a tipping point that makes an easement financially viable where it may not have been otherwise."

More than anything, carbon projects "maintain the canvas that we need to paint conservation onto," says Bennett. "Restoring row crop agriculture is inefficient, challenging and expensive, so once the canvas is lost, it's lost." But, he says, "If the land stays rangeland, it maintains the potential for us to go in in the future

Preston Hoffman, courtesy of Dallas May



and steward in a way that maximizes the conservation value."

With careful land managers like the Mays, however, painting conservation on the rangeland canvas doesn't need to wait for the future. There's "a trope out there that all these ranchers are living on degraded land and just ruining it," says Sherry, who worked in rangeland management before joining The Climate Trust. "That's not actually what's happening. A lot of ranchers are probably the best conservationists out there."

Dallas and Riley embody this sentiment, bringing my attention to the land again and again. Here is the blue grama going to seed. Here are the beaver dams that irrigate the fields simply by raising the water table. Here are the burrowing owls, a mule deer. They've never poisoned a prairie dog, they say, nor have they shot a coyote or killed a rattlesnake. They're Audubon Conservation Ranching certified. They're planning wetland restorations. They harbor rare



and endangered species and plan to introduce more. They see their land as one, complete, intact ecosystem. “It’s a sanctuary,” says Riley.

And the cows are included. Yes, there can be deleterious impacts of too many cattle on the land: there are well-documented cases of overgrazing leading to erosion, water pollution, loss of soil nutrients, invasive species, and a depauperate grassland flora. But grazing can also build a shifting mosaic of grassland habitats essential to diverse plant and animal species. Tall and dense vegetation may be great for sedge wrens to nest in, but meadowlarks do much better in moderately grazed pasture. Horned larks thrive in the exposed terrain created by intensive grazing, whereas northern bobwhites love the tall wildflowers that grow up afterwards.

Most ranchers aren’t interested in overgrazing their land, Sherry tells me, but the Climate Action Reserve protocol further ensures this by dictating that rangeland health be

maintained throughout the course of the project. If the land departs too far from ideal conditions described by a Bureau of Land Management protocol, the landowner is required to create a management plan to fix it, and to show improvement by the next verification period. If they don’t, they won’t be allowed to sell credits for that time period.

This active management means that that private rangelands can even be healthier than public lands. A study in the Larimer foothills comparing rangeland, state parks, and residential development found greater biodiversity and fewer weeds on rangeland than the other two land uses. Researchers suggested it was because the ranchers had greater capacity and incentive to manage the land than Colorado Parks and Wildlife.

Indeed, Erik Glenn had a landowner once tell him as he looked out over his hay field, “I’ve been here my entire life. My dad grew up here, my grandfather spent most of his

It took years for the May family and their conservation partners to get the carbon project up and running. For them, the payoff wasn’t necessarily the money, but rather knowing that 15,000 acres of native grassland would be protected forever.

life here, and I can look at the land and I can tell when it’s sick. And I can tell when it’s healthy. And it’s my job when it’s sick to tend to it and to make it better.”

The biggest question, perhaps, is if the sale of carbon credits could increase the chances that landowners can continue stewarding and loving the land for generations to come.

By all accounts, at current market prices, credit sales wouldn’t be a windfall. “They’re not going to buy the neighbor’s farm,” quips Gascoigne, or even pay off the mortgage. When I ask the Mays if it could help make up for the widening gap between revenue and operational costs, Dallas tells me straight up, “It’s not enough. It’s nice—like running an extra 50 cattle every year—but it’s not enough.”

But Bennett maintains that “for individual families, this has the potential to be really valuable, especially in small rural communities where payments [like carbon credits] can have spillover effects.”

A 2020 study of Colorado found that investment in conservation easements generated twice as much economic activity, and that most of the benefit remained in the local economy. The hope, it seems, is that a little extra income could help ranching families get through a bad year or two, providing an economic buffer to help them cope with things outside their control, like market prices and weather.

“I would say another component of this is that agricultural producers provide a lot of benefits to society, like carbon storage, that they’re traditionally not compensated for,” says Glenn. “And so any opportunity we have to compensate them for that added societal benefit is something we want to be exploring and advocating for.”

What I see on the May ranch is how a little extra money, wherever it’s coming from, goes right back into the land. A small grant from Audubon of the Rockies has allowed them to put in five miles of wildlife-friendly fencing. Colorado Parks and Wildlife is providing plague vaccines to the ranch’s prairie dogs so the black-footed ferrets released on the ranch can thrive. In continuing partnership with DU, the Mays are restoring wetlands to create improved waterfowl habitat, installing erosion control devices, and leveling playa bottoms. And so on.

The way Glenn sees it, “When you’re only getting compensated for producing a commodity, then there’s many more external pressures on you to continue to manage your land in a way that’s best for the commodity, not the land.” But because “the vast, vast majority of ranchers want to do the right thing in terms of resource management,” even a little help—perhaps in the form of carbon credits—can go a long way. “That’s how stewardship of the resource improves,” says Glenn.

“We want to conserve, not consume,” says Dallas. “Hopefully we stay financially solvent enough to be able to do that.”



“

Agricultural producers provide a lot of benefits to society, like carbon storage, that they're traditionally not compensated for, so any opportunity we have to compensate them for that added societal benefit is something we want to be exploring and advocating for.

Erik Glenn

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price... If we can get to a certain price point—I think it's got to be somewhere around \$20 a ton—then it will be impactful.” Gascoigne, on the other hand, emphasized that “in order for rangeland carbon projects to work, there need to be large scale projects or a framework by which partnerships come together.” Both men are getting at the same thing; for rangeland carbon credit projects to really take off, the balance of income from credit sales compared to start-up costs has to be worth it for the landowner. Getting a project registered and verified can be really expensive, around \$10,000 for initial verification with the Climate Action Reserve, and somewhat less for subsequent verifications. Certainly, the price of carbon rising (as it is expected to) would go a long way to make rangeland projects more viable, but there are other ways to tip the scales in carbon's favor.

One strategy is aggregation, the focus of a report recently commissioned by the Partnership for Rangeland Trusts. Travis Brammer, a University of Wyoming law student pursuing a concurrent degree in environment and natural resources under Bennett, was tasked with determining if it was legal to group several landowners together under one carbon project, so that they could get verified as one entity and split the cost. He found that it is in fact legal, and that it would be best to group landowners within a day's drive. This keeps travel expenses down for the verification site visits and prevents the grouping from getting too unwieldy—having to deal with different state laws and easement forms, for example. He also found that keeping the aggregation relatively local makes for a clearer narrative. Anecdotally at least, “Buyers seem to be looking for a good story, and it's easier if they can show a picture of a family farm in a board room, rather than saying I bought one credit in each of these five states,” Brammer says.

If efficiencies and the market combine to create the perfect conditions for rangeland carbon, everyone involved wants to be ready. The research that Brammer is conducting, the discussions simmering across land trusts for years, the initial interest expressed by landowners—it's all laying the groundwork to take advantage of this tantalizingly multi-dimensional conservation tool when the time comes.

As anticipation builds, it is important to remember that rangeland carbon sequestration isn't going to be a silver bullet. “I don't think it's going to be a great solution for everybody across the West,” says Gascoigne. “But maybe we can get creative and make things work in certain instances.” Those instances seem to be in the case of conservation-minded, financially challenged ranches in eastern Wyoming, Montana, and Colorado and the western Dakotas, particularly at-scale or in future conditions where the cost of voluntary carbon has increased significantly. In those conditions, Dallas would say to an interested landowner, “Why are you waiting? There is no downside whatsoever if you're serious about conserving grasslands.”

Even if it doesn't solve all our problems, the kind of mutual benefit it provides—to the climate, to conservation, and to people—should be the gold standard we all aspire to. “The more we can support both ecological and human communities,” says Bennett, “that's the balance we need to strike.”

***Birch Dietz Malotky** is a research scientist and the emerging issues initiative coordinator for the Ruckelshaus Institute at the University of Wyoming. This story was supported by a grant through Wyoming EPSCoR and the National Science Foundation. Listen to “A Promise Never to Plow,” a podcast based on this story, at [modernwest.org](#).*



A way forward

As of writing, there are ten avoided grassland conversion projects registered in the United States. They range from 265 acres to nearly 15,000 (with most around 4,000) and occur in Montana, Oregon, Colorado, and the Dakotas. “Generally speaking, landowners are very interested in these markets and are willing to consider participating if the structure and incentives are such that it makes reasonable sense to do so,” says Glenn, who has talked with a number of landowners about the possibility. Jessica Crowder, executive director of the Wyoming Stock Grower's Land Trust, emphasized that “this is a big decision, and it's forever, so people don't take it lightly.” Understanding and ensuring the market is strong are both important factors, she says.

From a market perspective, rangeland carbon credits perform

well, and the market looks bullish. An annual assessment published by Ecosystem Marketplace notes that broad corporate demand for offsets fueled by increasing carbon-neutral pledges made 2020 a record year for voluntary carbon markets. “With so many larger companies making commitments to sustainability goals right now,” Sherry says, “there isn't going to be enough supply for all the demand.”

Moreover, “grassland offset projects are receiving high prices compared to other offset types because they have so many co-benefits that make them really charismatic,” Sherry says. Natural climate solutions in general are valued higher in the carbon market than other offset types and Ecosystem Marketplace predicts that that trend will continue.

So far though, the price has not been right for widespread adoption. According to Glenn, “The challenge for rangeland carbon is one of

Not Fade AWAY

COMMUNITIES IN RURAL MONTANA REACH BEYOND AGRICULTURE

By Samuel Western

I'm in upper eastern Montana, a land of undulating drainages, heading north on Highway 87. The Little Snowies are off to my left, white-capped, drifting in and out of the clouds. You can put miles on this road and see little that is man-made besides telephone poles, fence posts, and the occasional cell tower. Rarer still does a pump jack come into view, especially one that's actually working. A ranch house appears flanked by a low barn, equipment scattered around the buildings like chicks to a mother hen, all hiding behind a wind break. Then it's prairie again, short—very short—grass and sage.

Then it's more prairie.

The Musselshell and Upper Missouri River watersheds of Montana are classic tomorrow country, as in tomorrow it will be better. However, for the shrinking towns nestled around these drainages, the idea of thriving communities is gaining currency over fatalist nostalgia. While rooted in farming and ranching, residents recognize that inclusivity and economic diversity, rather than clinging to the status quo, is a more expedient path to prosperity.

Petroleum County sits between these two rivers. It only has 496 people—the smallest population of any county in Montana. It has lived at the mercy of the commodity index. US Department of Agriculture data show that from 2012 to 2017, net farm cash income in Petroleum County dropped 63 percent. Years ago, there were twenty-four school districts in the county. Now the single remaining district faces declining enrollment. When students graduate, they tend to leave.

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Petroleum County is wind, and blizzards, and worry for man and beast alike. It is the unmistakable blue of Chinook clouds. It is everything that is beautiful.

Marjorie W King,
Petroleum County
resident

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These aren't new problems for the county or agriculture. In 1939, Petroleum County officials sold off 20,000 acres of land taken for non-payment of taxes. Some went for as little as fifty cents per acre. By 1941, the county still found itself with 120,000 acres of land taken from landowners who couldn't pay their taxes.

In the northern Rockies as a whole, ranchers find themselves buried under rising costs. “We are getting a smaller piece of the food dollar. And it keeps on shrinking,” said Leo Barthelmess, who operates in Phillips County, just north of Petroleum. “Meanwhile our input costs, like insurance, equipment, and feed, keep on rising. The price of land is also climbing.”

“Life here is hard,” says Lindsey Wilkerson, superintendent of the Petroleum County schools. “Those hardships have developed some very

self-reliant people.”

And sometimes embittered. It's no accident that the Montana Freeman Movement, a militant antigovernment group that surged in the 1980s, had its roots in Garfield County, located just east of Petroleum County. The signs of a siege mentality abound in Winnett, the Petroleum County seat. Trump: No More Bullshit. Save the Cowboy: Stop the American Prairie Reserve. The Sierra Club Sucks. Each block has at least two or three abandoned and boarded-up homes. Paved streets are few.

But that's not the whole picture. Far from it. Winnett is redefining what it means to be self-reliant. It has the standard rural metrics of sufficiency: plenty of neat and well kept homes, a bar, grocery store, motel, post office, city hall, county buildings, and a K-12 school. But it also has new and restored structures,

one quite imposing at nearly 12,000 square feet. Indeed, one cannot help but notice the activity, the roar of equipment and echoing of hammers, as workers erect the Petroleum County Community Center. Once completed, it will serve as a gathering place for community events like weddings, adult education classes, and receptions.

One might reasonably ask: What's going on? How can a county with a \$1.8 million total assessed valuation be building a \$5 million community center? The answer is that extractive-based money funded most of this structure and county residents chipped in the rest. Native son Larry Carrell, a petroleum engineer, made his money in oil and gas. He gave back to a place with disappearing oil and gas reserves.

Oil isn't the only commodity paying it forward. Just up the block from the construction activity sits

a well worn, boarded-up structure. The Odd Fellows Hall, built in 1914, rests upon a brand new foundation. It took 245 hours for volunteers to dig, shoot grades, haul dirt, set footings and pour the concrete. The building, with much celebration, was moved from its original site on February 7, 2022.

An organization rooted in agriculture—Winnett Agricultural Community Enhancement and Sustainability (ACES)—holds title to the Odd Fellow's Hall. This nonprofit 501(c)(3) has renovation in the works, including a major interior remodel. There's discussion of a retail and coffee shop on the first floor and apartments on the second.

There's more on ACES's improvement docket. With the help of the Montana Historical Foundation, and others, ACES is undertaking a feasibility study for rehabilitation of the county courthouse. Commercial spaces and small apartments for new school teachers are planned for the now mostly disused upper floors.

Founded in 2016, Winnett ACES understood that if the region was to thrive, agriculture had to become more inclusive and involve community affairs. The ACES Facebook page describes the organization as “a community group that works to improve land, life, and community in Winnett, MT.”

Laura Nowlin, who ranches north of Winnett with her husband, Levi, says their first meeting was ostensibly about how Petroleum County could have a more direct role in managing wildlife. “The conversation morphed into a discussion about the problem with absentee ranch owners. Then the talk centered on a more existential question: the future of Winnett,” Nowlin says.

At first, ACES undertook steps directly related to ranching, such as putting local beef in the public schools and, most ambitiously, starting a grass bank for young

ranchers. A grass bank is a type of grazing cooperative where aspiring stockmen combine their herds on a shared, leased piece of ground. Grass banks attempt to solve one of the thorniest problems in ranching: cost of entry for the next generation. The baton theory of agriculture—passing your operation on to the next generation—is on its last legs. The reasons have been thoroughly documented. Among them: cost of land, cost of capital, and cost of equipment.

Not so long ago, it was ranches with river access and high scenic amenities nestled next to the Rockies that commanded princely prices. Now, ranches everywhere are being purchased by non-residents for recreation and hunting, squeezing agriculture out of the market. For example, the realty firm Hall and Hall recently sold the 8,426-acre Salt Sage Coulee Ranch in Petroleum

County. The asking price was \$4.4 million. According to the US Census, the median household income in Petroleum County is \$40,000.

This meant ACES had to expand its network in the search for grazing opportunities, sometimes finding partners in unlikely places. “We got funds from the US Fish and Wildlife Foundation,” Nowlin says. “They had money on how to develop a grass bank strategy. Some of us didn’t know what that was. We hired a consultant to write a feasibility study.”

Another door opened when Bill Milton, a rancher who lives between Roundup and Winnett, introduced the possibility of grazing on the Matador Ranch. That’s in Phillips County and owned by The Nature Conservancy (TNC). Milton invited a TNC representative to lunch. “Nobody else knew he was coming,” says Nowlin. “We were all too polite

to ask him to leave. So, we listened to what he had to say. The people of ACES are conservative, but they are also open-minded and willing to find solutions.”

According to Milton, the meeting was met with mixed results. Some of the older attendees balked, saying the group needed to accept the fact that environmental nonprofits like TNC “just didn’t like us.”

Agriculture invests a lot of time being on the defensive: grazing on public land, use of chemicals, soil loss, trespass issues, fencing policy, and more. Milton and ACES prefer positive demonstrations. Converts to the ACES aspirations, “are no longer spending 90 percent of their time at a stock grower’s meeting defending themselves,” says Milton. “They’re not trying to hold the line. Hold the line? Bullshit, we’re going to create something. We’re going to build

community centers. We’re going to put beef in the schools. We’re going to work on historic buildings. We’re going to invite people in to talk about soil. These things are well attended.”

So far, the Matador partnership has not come to pass. Yet Milton remains confident. A grass bank, he says, will happen. “It’s just a matter of time. We’ve got all the pieces in place.” And although deciding to form a grass bank is what pulled ACES together, their mission has expanded. Nowlin says, “We have a lot of broader community goals, too. We’re an agricultural community but can’t survive with those who live in town. If we’re concerned about ag, we’re concerned with the town itself.”

This blurring of the distinction between town and county is relatively novel for the American West. For decades, agricultural communities gave priority to supporting farmers and ranchers. They considered it a prudent path to prosperity; more essentially it allowed residents to keep their cultural identity. Then reality required a readjustment. Market cycles proved punishing and, for many, unsustainable. Principles of efficiency and evolving technology were so ardently followed by ranching and farming that they minimized the human factor. The 1980s agricultural crisis drove the final nail in the projection that successful agriculture equaled thriving town. Since then, it’s questionable if production agriculture needs towns or any semblance of a working community to succeed.

For example, in a recent interview, Karl Stauber, former deputy undersecretary of rural development, observed, “We are at a strange point in our history. The economic reality of agriculture has displaced the cultural reality of community. Education, broad-based education, is no longer necessary for a farmer to prosper. If a community loses its champion high school,

Kelly Beavers



Winnett ACES holds title to the Odd Fellows Hall, which was moved to a new foundation after hundreds of hours of community volunteer work. Future renovations include stores, a coffee shop, and apartments.



how does that relate to the farmer or rancher? What farmers need to prosper, and what community needs are two different things. I think more farmers and communities haven't realized this yet."

Milton doesn't think that fits the Winnett model. "There's probably data that agree with that vision. But we have a competing vision. These self-governing, self-organizing circles have the capacity to right this huge wave of concentration. And these circles involve more than just agriculture."

This inclusivity goes beyond Winnett. Roughly 135 miles north lies Phillips, a struggling county on the Milk River. The county seat is Malta. The population is declining and growing older. The number of ranches and farms dropped 20 percent from 2010 to 2020. Leo Barthelmess, who runs 700 mother cows south of Malta with his brother, is trying to do something about this.

He goes to school often. Never mind that he is sixty-six years old, a fourth-generation rancher who has been raising cattle and sheep since 1964. You would think he already knows what he needs to know. Yet Barthelmess is afflicted with a bad case of lifelong learning. As he puts it: "I'm a breeder and a reader. I've spent many a night reading about how we can be better ranchers."

Barthelmess attends classes put on by Ranching for Profit, a Wheatland, Wyoming, based company that advertises itself as "transforming ranches into sustainable businesses." This approach dovetails with lessons Barthelmess has learned over the years from applying the principles of holistic management. This school has

Leo Barthelmess next to one of five solar-powered cell towers on his property, which transmit to electronic cattle collars. With these collars, Barthelmess is able to change the size and placement of his pastures from his computer.

a core tenet (monitored rotational grazing) but also advocates that livestock needs to be managed as an integral part of the wider ecosystem. The longer you listen to Barthelmess, the more you realize he's talking about more than just running cows, although they get plenty of attention.

Barthelmess is president of the Rancher's Stewardship Alliance, based out of Malta. Its mission statement is "Ranching, Conservation, Communities—a Winning Team." He writes in the organization's annual report, "Our collective successes are only possible when we tap into the reserves of a deeply rooted community. We need each other to build a thriving future."

This also means avoiding technological seclusion. Since 2019, Barthelmess and his brother have been part of a pilot project using electronic collars to move cattle. The collars, manufactured by the Vence Corporation of San Diego, permit real-time monitoring of livestock and pressure the animals, either by auditory or electronic stimulus, to move in a certain direction and avoid others. If a cow approaches the edge of a grazing paddock, the collar emits a sound. If the cow continues to move towards the perimeter, she gets a shock. "It takes about two days for a cow to learn the drill," says Barthelmess.

The use of electronic collars, if they prove viable in the long-term and at-scale, have a long list of benefits. For starters, they help efficiently and economically maintain better pasture. The ultimate goal of rotational grazing is fostering soil health; with better soil comes an abundance of better forage and, hopefully, fatter cows. Yet moving cattle frequently requires time and labor, a strike against economy. In contrast, the collars have allowed Barthelmess to manage his paddocks virtually, altering the size and placement of the pasture through the Vence Herd Manager webpage. As a result, the ranch has gone from minimal rotation to having thirty-

“Our collective successes are only possible when we tap into the reserves of a deeply rooted community. We need each other to build a thriving future.”

Leo Barthelmess

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eight or more pastures. “We move the cattle weekly or even every ten to twenty days. We’ve also been able to diversify their diet and increase stock density,” says Barthelmess.

Electronic collars could also mean reduced fencing, a boon to wildlife. Barthelmess says, “We have sixty miles of barbed wire fencing. Some of it’s eighty years old. The cost to replace it is tremendous, about \$15,000-20,000 per mile. We also have the second longest antelope migration in North America. Less fencing would improve their survival. We like to minimize the conflict with wildlife, plus improve our soils and grazing lands.”

Marisa Sather, a wildlife biologist with the US Fish and Wildlife Service, helped Barthelmess get a grant for the collars. She says they portend major change for ranching. “It’s really a new business model. The amount of emails and phone calls I’ve gotten inquiring about electric collars is impressive. It [development] won’t be fast and probably won’t totally eliminate

boundary fencing. But it will reduce interior fencing,” she says.

This reduction in fencing, she says, spells good news for wildlife. During migrations antelope can, “hit hundreds of fences, some wildlife friendly, some not,” she said. “With each fence they might either scrape off hide and hair or spend some time running up and down the fence line looking for a place to cross. Some die trying.”

The promise of fence elimination leaves Barthelmess hopeful but far from certain. “Maybe,” he says. “But what if these collars, in the long run, don’t work? We plan to remove old fence as maintenance costs exceed value. Then it will be replaced by the newest Vence technologies.”

Barthelmess and his brother are challenging another tradition: winter feeding. Their goal is to graze year-round. “We haven’t done it yet but we’re working on it,” says Barthelmess. If successful, it would rewrite ranching tradition and economics. Putting up feed is expensive. “When I was a kid, we’d invest three to four hundred hours each summer cutting and putting up feed,” he said. “The value of livestock and the price of equipment has changed. It’s not sustainable for the long-term. We can’t afford to put up hay.”

To those unfamiliar with tomorrow country, these developments—Winnett’s community center, the work of ACES, the Barthelmess brothers’ willingness to experiment with electronic collars and reduced winter feed—may appear insignificant. Yet they represent the logical path for bottom-up shifts in conservative rural communities. They are what sociologist Shawn Ginwright calls “a pivot”: a small but powerful change. Once the pivot is made, other changes often follow.

Think of the situation in these counties as an earthbound version of an extended slack tide. Commodities grown by family producers have been moving away from these places



A common sight in Winnett, Montana, the sign reads “Save the Cowboy: Stop American Prairie Reserve.”

for decades. In the rural Rocky Mountain West, small ranches get swallowed by larger operations. Grain elevators and houses sit empty.

The demographic data suggest, however, the tide is slowly coming back in. The 2010 and 2020 censuses show that Petroleum County actually gained population. Maybe it’s only two folks, but that means that the bleeding has slowed to a trickle. Phillips County only lost thirty-six people from 2010 to 2020, the slowest decrease in forty years.

It also shows confidence in an idea, expressed with an agricultural sense of patience. For example, after struggling to create the grass bank it deemed so critical, the Winnett ACES’s relationship-building paid off last year.

Curt and Kate Vogel, a couple from Bozeman, had a 680-acre parcel of land near Winnett. It had been in the Vogel family since 1911 and was being leased out to a neighbor. The couple decided to donate it to The Nature Conservancy, but TNC wasn’t sure it was a good fit for their land purchases. “But,” said TNC grassland conservation director Brian Martin, “we thought it would be a perfect fit for the Winnett ACES.”

Nowlin sees this gift as the foundation for creating a grass bank.

“For now, we lease the property to the neighbor because there are multiple parcels that are intermixed in a large BLM allotment. But down the road, it creates all kinds of opportunities.”

It’s this lens on the future that excites Barthelmess. “We have so many more opportunities than I did when I was younger. I hope the young realize the opportunities we have out here. One of the hopes of the collar is that it will engage the next generation.”

And don’t forget fun. “We enjoy the work with ACES,” says Nowlin. “It’s a social thing. It’s energizing. It’s energizing to have people appreciate the work. We go to the bars but instead of complaining, we celebrate we’re solving some of the world’s problems.”

Samuel Western has covered Rocky Mountain natural resource issues for decades. For twenty-five years he was a correspondent for The Economist in London. His next book, Among Mountains and Prairie: Restoring Commonwealth Values in the Great Plains and Northern Rockies, explores the political and economic shifts of the Great Plains and Northern Rockies from statehood to the current era.

Living in a Natural Resource Economy

WHAT CAN
WYOMING LEARN
FROM STUDIES OF
THE “NATURAL
RESOURCE CURSE”?

By Emilene Ostlind

Wyoming has long produced the most coal of any US state and lands in the top ten states for natural gas and oil production. In a fossil fuel driven economy, all that mineral wealth should make Wyoming rich, and sometimes it truly does. Consider the first decade of the 2000s when hydraulic fracturing opened up previously inaccessible natural gas reserves. In 2008 Wyoming's economy—as measured by gross domestic product, personal incomes, state revenues, or number of jobs—flourished. State coffers were overflowing and citizens across the state benefitted from the bounty.

But then in 2012 natural gas prices were low and the state economy crashed. By 2015 it was up again. In 2016 it dropped. It improved somewhat through 2019. In 2020 it took another hit, leaving Wyoming's GDP down more than 15 percent compared to 2008, while US GDP had grown more than 18 percent over those 12 years.

Sometimes it feels like Wyoming's economy is cursed. For every boom, there is a bust, leaving

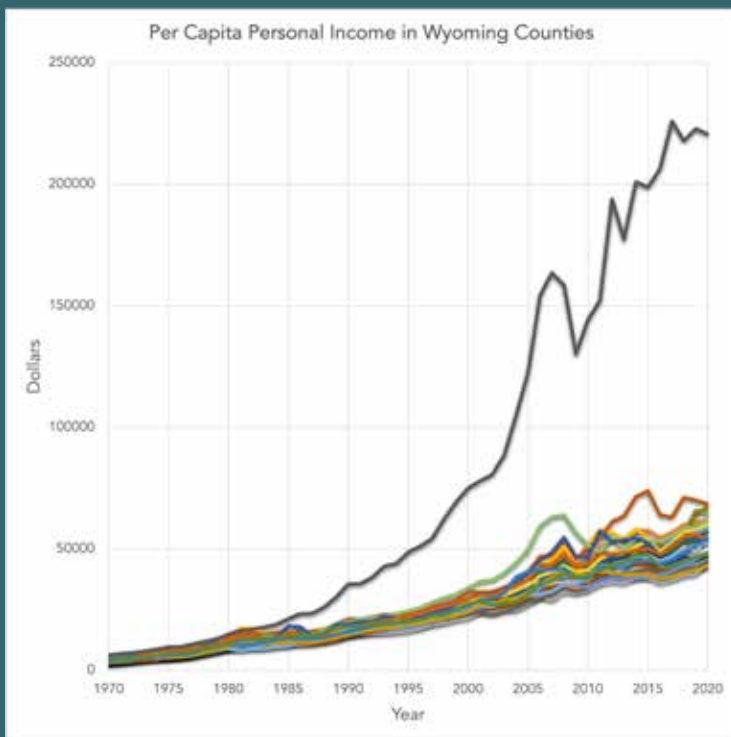
statewide institutions and citizens hurting. The crashes trigger layoffs in both private businesses and state agencies, with painful cuts to public services such as schools, mental health clinics, rest areas, and more. In 2020 the University of Wyoming, where I work, prepared to slash nearly 80 jobs and even whole departments. Which is why, when I heard of an economic concept called the “natural resource curse,” I wondered whether it haunts Wyoming. If it does, could looking at Wyoming's economy through the lens of the natural resource curse help us bolster our economy, create resilience, and buoy the lives of our citizens?



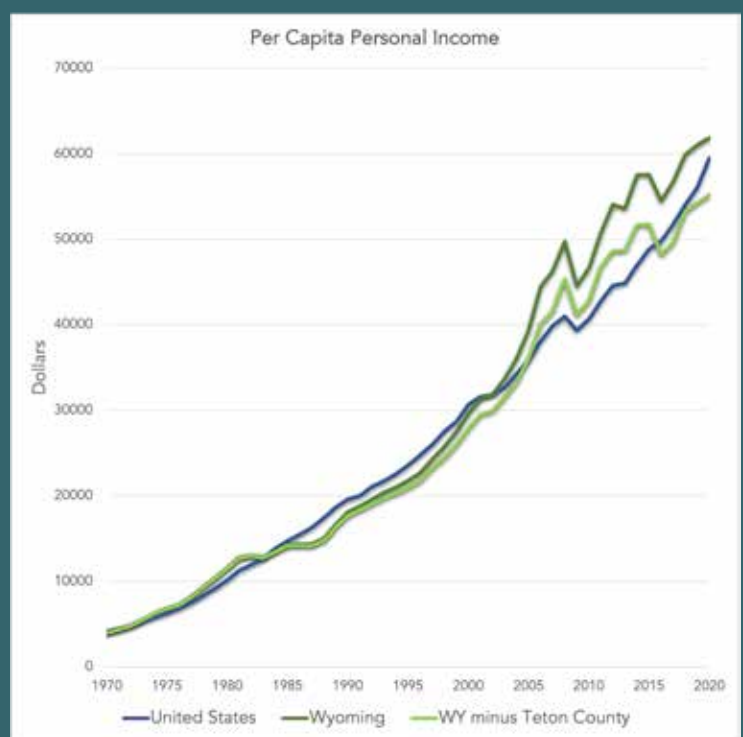
For decades, economists associated natural resource richness with wealth. The thinking went, a country or region with lots of natural resources—say, timber, minerals, fisheries, or farmlands—could parlay those into economic development and grow its citizens' incomes to a higher standard of living. This played out, after all, in countries like Australia, the United States, and Great Britain in the late 19th and early 20th centuries.

Real Window Creative/Shutterstock.com





Teton County, in gray, is a clear outlier in Wyoming with much higher per capita personal income than any other county. Data from US Bureau of Economic Analysis.



Wyoming's per capita personal income (dark green) has been better than the US average (blue) since 2003. However, with Teton County excluded, the per capita personal income for the remaining Wyoming counties (light green) dipped below the US in 2016. Data from US Bureau of Economic Analysis.

But then, in the 1970s the Netherlands discovered and started to develop natural gas. Rather than enriching the country, the boom came with economic stagnation: unemployment rose, manufacturing declined, and corporate investment fell. This brought the link between natural resource richness and prosperity into question.

After that, economists began to notice similar patterns in other

regions. Geographer Richard Auty observed that economic development in countries with abundant natural resource wealth—Peru, Zambia, Papua New Guinea, and others—lagged that of countries with fewer natural resources such as Taiwan and Korea. He coined the term “resource curse” in 1993 to describe this correlation. Following that work, Harvard economists Jeffrey Sachs and Andrew Warner examined dozens of countries’ economies for the years 1970–89 and found, again, the more a country depended on natural resources to fuel its economy, the weaker its growth had been.

Then economists Elissaios Papyrakis and Reyer Gerlagh looked at data for the United States from 1986 to 2001 and found that states with big natural resource economies like Wyoming, Alaska, Louisiana, and Oklahoma had slower per capita growth in their GDPs than states less



Points above the axis are positive, below the axis are negative. Wyoming's personal income growth (light green) has fluctuated more wildly than that of the US (blue) since 1961, with higher peaks and lower troughs. Data from FRED.

“Volatility is a quintessential feature of the resource curse.”

Frederick van der Ploeg and Steven Poelhekke

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dependent on natural resources, such as New Hampshire, Massachusetts, Oregon, and Colorado. When University of Wyoming economists Alex James and David Aadland examined over 3,000 US counties for the years 1980–95, they found “clear evidence that resource-dependent counties exhibit more anemic

economic growth.” They ended their paper with a case study of the counties in Maine and Wyoming and concluded, “Wyoming’s decision to specialize in natural resource extraction and production appears to have limited its relative potential for economic growth, at least for the sample periods since 1980.”

Again and again, increasingly rigorous analyses of regions around the world revealed a natural resource curse. But, “There was a metamorphosis in the resource development literature throughout the 2000s,” says economist Alex James, who earned his PhD at the University of Wyoming and is now associate professor of economics at the University of Alaska, Anchorage. Researchers, himself included, realized there had been flaws in early natural resource curse studies. For one thing, ideas about the natural resource curse emerged from data spanning a time when the price of natural resource commodities was generally falling around the world. Further, for all those regions with lackluster growth, it’s not clear that natural resource dependence caused the poor economic outcomes, even in James’s own paper on US counties.

“In my perspective, yes natural resources can curse economies and lead to bad outcomes, but that’s not the general rule or even the right question,” James says. “The question we should be asking is, what is the best way to manage natural resource wealth? Forget whether there is a natural resource curse.”

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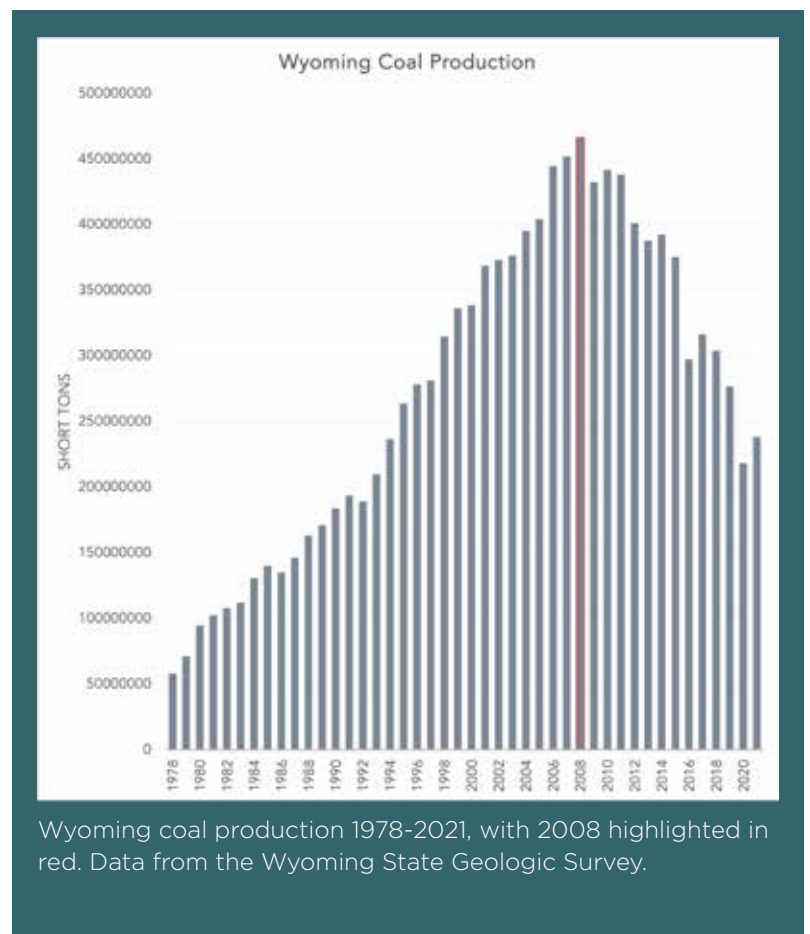
To investigate that question, researchers scrutinize how natural resource dependent economies function and effects on the well-being of their citizens. One finding is that intensive natural resource extraction often brings social and environmental problems. “There is good evidence that resource booms do pull people out of college and high school prematurely. That finding is fairly robust.” James rattled off more examples: “Crime, different types of pollution—water pollution, air pollution—traffic congestion.”

Also, a natural resource boom can drive wealthy landowners away from a region while attracting less-wealthy workers to, say, a natural gas or oil field. If some of the people who move out don’t come back, and those who moved in stay, “you’ve changed the composition of the type of people that live in these communities and that potentially has very serious long-run economic effects,” James says.

Further confounding the original concept of the natural resource curse, economists began to observe that in the short-term after a new resource discovery, “income goes up, poverty goes down, employment goes up, unemployment goes down. Every economic factor that you can think of is moving in the right direction when there is a sudden extraction of a natural resource,” James says.

This played out in Wyoming in 2008. Energy resource prices were up, and the state produced huge amounts of coal and natural gas. That year, personal income also soared, unemployment bottomed out, government budgets were flush, and citizens across the state enjoyed the largess.

And there are other ways Wyoming’s economic history does not seem to align well with the original view of the natural resource curse. Bureau of Economic Analysis data shows that since 2003, Wyomingites have enjoyed incomes higher than those of the average US citizen—in 2020 the per capita

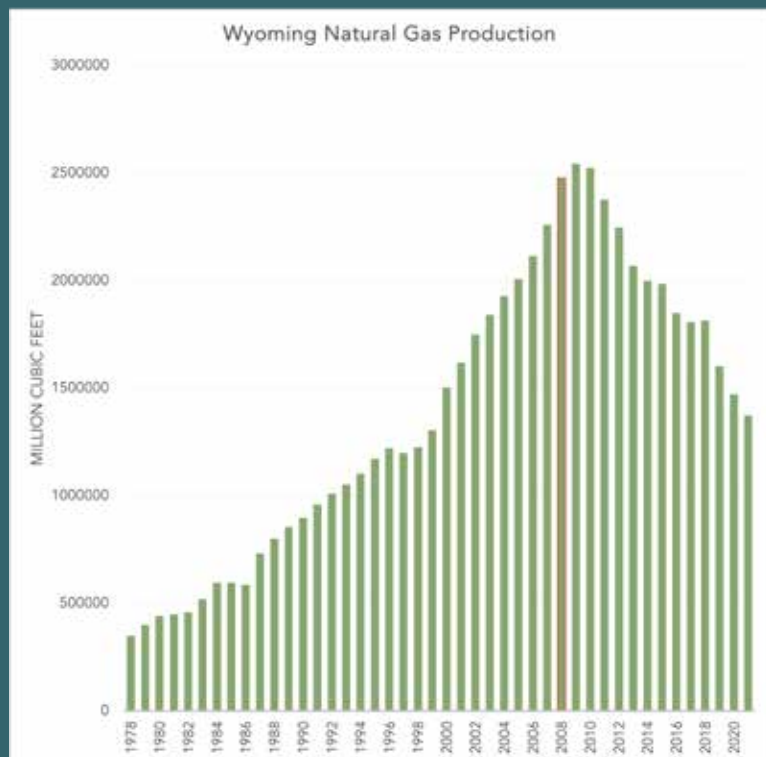


personal income for a US resident was about \$59,500 while that of a Wyoming resident was over \$61,800. UW economics professor David Aadland sent me data showing that incomes for Wyomingites grew more than those across the US from 1970 to 2020, “which is kind of counter to the resource curse, which surprises me actually,” he says.

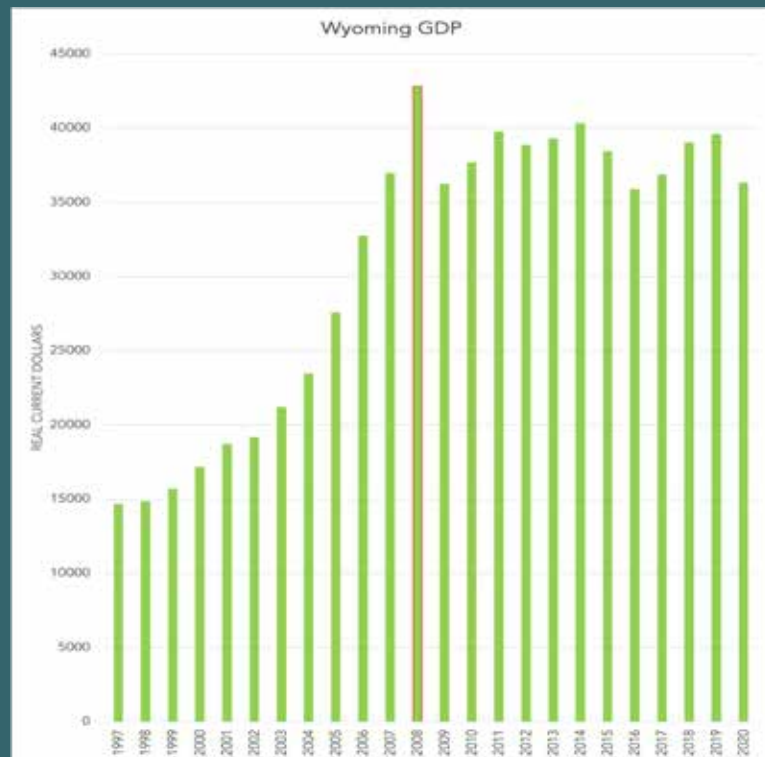
However, I did find one key factor that tempered this finding. Wealth is soaring in Teton County (a clear outlier in Wyoming) where incomes are much less tied to natural resources than in the state’s other 22 counties. In 2020, per capita personal income in Teton County was \$220,645—the highest of any county in the US—while in the rest of the state it was \$55,178. Indeed, with Teton County excluded, Wyoming’s income growth from 1970–2020 falls below that of the US, as do our actual incomes for the last five years, suggesting that Wyoming does suffer from at least a mild natural resource curse.

Meanwhile, Wyoming’s 2008 boom points to a key feature of natural resource dependent economies that researchers are now trying to better understand: their volatility. While a diversified economy, like that of the US, can be expected to grow relatively evenly year to year, “It’s very clear that our [Wyoming’s] growth rates swing a lot more wildly than the US’s,” says Aadland. “When you don’t diversify your economy, you get these big ups and downs.”

“[V]olatility is a quintessential feature of the resource curse,” wrote economists Frederick van der Ploeg and Steven Poelhekke in 2009, suggesting that “Future research should [focus] ... on how to cope with such volatility and manage the associated risks.” This has guided some of James’s work, and he sees reason to be wary, even when booms are lucrative. “It’s not at all clear to me that these places that experience a short-run economic gain are going to experience a long-run economic gain,” James says.



Wyoming natural gas production 1978-2021, with 2008 highlighted in red. Data from Wyoming Oil and Gas Conservation Commission.



Wyoming GDP from 1997-2020, with 2008 highlighted in red. Data from US Bureau of Economic Analysis.

Volatility also creates challenges for governance. Managing an unpredictable budget is difficult. Researchers at the Natural Resource Governance Institute looking at international cases wrote, “Governments often get trapped in boom-bust cycles where they spend on legacy projects, such as airports and monuments, when revenues are rising and then must make painful cuts when revenues decline. Resource-rich governments have a tendency to over-spend on government salaries, inefficient fuel subsidies, and large monuments, and to underspend on health, education, and other social services.”

Further, “It’s exhausting—if you work at a university or as a business owner—when you don’t know what’s going to happen to the state economy next year,” says James. “If you can just move to another state and avoid all that risk, why not do that?”



So, what are policy makers to do? Can Wyoming apply an

understanding of the natural resource curse and its features, including volatility, to optimize our economy? Two obvious approaches emerge. One, which Wyoming has done well, is to save during good economic times and dip into those savings during bad years. The other, which Wyoming has not accomplished, is to diversify both the economy and state funding streams.

“You know, the Wyoming legislature is relatively, understandably, conservative and we want to be low tax,” says Wyoming chief economist Wenlin Liu. “Any time we have some extra revenue, we tend to save more.” In fact, Wyoming has created a complex network of savings accounts, all meant to ferret away funds during natural resource booms so that we can access them during busts. Perhaps the most secure version is our “sovereign wealth fund.”

In 1975, Wyoming citizens overwhelmingly voted to amend the state constitution to create a severance

tax on mineral extraction and direct a proportion of it into a permanent fund. Government officials can never withdraw money from the Permanent Wyoming Mineral Trust Fund itself. The interest goes into the state’s general fund. In the decades since its creation, the fund has grown to about \$8 billion and in 2021, its earnings fed about \$388 million into the state general fund, a quarter of that fund’s total revenue (with the rest coming from sales taxes, mineral royalties and severance taxes, income from other investments, and other sources).

State senator Charlie Scott, R-Casper, has called Wyoming’s Permanent Mineral Trust Fund, “the smartest financial move the people of Wyoming have ever made” and “Wyoming’s fiscal savior.” Further, the Peterson Institute for International Economics, a nonpartisan research organization based in Washington, DC, scores sovereign wealth funds based on 33 factors related to management transparency, soundness of

the investments, ethics, and accountability. In 2021, that institute gave Wyoming’s fund a score of 93/100, the third highest score behind Norway and New Zealand and higher than any other US state.

And that’s not our only savings account holding mineral income. The legislature has created an array of such accounts, including the Common Schools Permanent Land Fund, worth about \$4 billion, which invests earnings from state trust lands and uses the interest to fund public schools. At over \$1.5 billion, we also have the biggest rainy-day fund relative to our government of any US state, enough to fund our entire state government for about a year. In 2021, Wyoming dipped into that fund to help close a gap in K-12 school funding. Finally, the Hathaway Scholarship Endowment Fund (\$591 million) and the Excellence in Higher Education Endowment Fund (\$120 million) both direct mineral royalties to support higher education. “Things like that,” James says, referring to the Hathaway



Jim Parlin/Shutterstock

Wyoming has been the top coal-producing state since 1986, and lands in the top ten states for natural gas and oil production. Energy-related royalties, severance payments, and other taxes have accounted for, on average, about two thirds of Wyoming's annual revenue.

politics, according to natural resource curse studies. "I've been surprised recently . . . that the literature is continuing to find evidence of a political resource curse," James says. That is, government officials and policy makers frequently accept both legal campaign donations and illegal bribes from natural resource industries. They in turn favor the industry over pursuit of wide-reaching economic security. In a 2022 paper looking at US states, James and co-author Nathaly Rivera found that, on average, "oil-rich US states experience more corruption than their oil-poor counterparts, but only during periods of high oil prices."

Wyoming leaders have made efforts to diversify both Wyoming's economy and revenue structure for decades, to little avail. "The goal for the Wyoming Business Council is trying to diversify Wyoming's economy starting 20 years ago," says Liu. "But it's not that easy. It takes resources, takes money, takes time."

In 2021, Wyoming Governor Mark Gordon wrote a proposal to

the state legislature for how to spend some of the more than \$1 billion coming from the American Rescue Plan Act, a federal response to the COVID-19 pandemic. He called for spending on such items as broadband internet, outdoor recreation and tourism, higher education, and wildlife conservation alongside matching funds for large-scale energy projects and economic development efforts to support mining. The proposal teeters between pursuit of economic diversification and bolstering the mineral extraction and energy industries.

"In all of that, even though the words are not used, is the natural resource curse," says UW economics professor Aadland of the proposal. Given Wyoming's long interest in and failure at achieving economic diversification, it's not clear that we can have both at once.

According to resource curse studies, pursuing true economic diversification in this environment may require policymakers to back off on some support for the mineral extraction and energy industries—eliminate subsidies for energy production, establish stronger ethics oversight for political leaders, and create a tax structure that asks citizens and industries of all stripes to contribute more to the state.

None of those are easy tasks, but they may be necessary. Data for both coal and natural gas production in Wyoming show steady inclines up to 2008 and steady declines since. State GDP tracks a similar pattern. "People slowly are starting to understand we have come to a point where we will probably never go back to the boom of 2008," says Liu. Awareness of the natural resource curse, and how dependence on mineral wealth can trap us in an un-diversified economy subject to volatile and unpredictable swings, might help Wyoming move in the right direction.

Emilene Ostlind edits *Western Confluence* for the Ruckelshaus Institute at the University of Wyoming.

fund, "are a phenomenal thing to do, where you are turning an exhaustible resource—coal and natural gas largely, one form of natural capital—and turning it into human capital."

The second proven approach to address the volatility associated with the natural resource curse is to diversify. "Wyoming is the least diversified economy in the country, depending on how you calculate," says Liu. Establishing additional economic sectors such as healthcare, manufacturing, technology, or others—each of which will respond to external shocks in different ways—can smooth out a volatile economy. But attracting new sectors to the state's economy won't stabilize revenues unless Wyoming also taxes them. As it stands, bringing new businesses or workers to Wyoming actually costs the state;

the Wyoming Economic Analysis Division estimated an average Wyoming family in 2020 paid about \$3,770 in taxes and cost the state about \$28,280 in public services. Diversifying both the economy and state revenues (that is, creating new taxes) could help ease the pain of boom-and-bust cycles.

But, one key take-away from the natural resource curse literature is that mineral extraction dependence interferes with a region's ability to diversify economically. Any new economic sector that tries to establish must compete with the lucrative energy and mineral extraction industries for materials, infrastructure, labor, and possibly even funding.

Another challenge is that resource dependence affects not only a region's economy, but also its

A New Lease on State Land

HOW CONSERVATION
IS HOPING TO BUY A
SEAT AT THE LAND
MANAGEMENT TABLE

By Birch Malotky

In early November 2020, the Wyoming Outdoor Council's (WOC) staff huddled around a laptop and logged into their freshly minted account on energynet.com, an online marketplace where 199 leases for oil and gas development on Wyoming state trust lands were up for auction. When T28N, R103W Sec 36 in Sublette County came up, they submitted a bid. Leases for adjacent parcels had sold for just one or two dollars an acre, so "we were shocked as oil and gas companies kept outbidding us," says John Rader, a conservation advocate and staff attorney at WOC. "I suspect their bidding was automated, but even when we backed out, a bidding war between two companies drove the final price up to \$28 per acre." Not to be deterred, WOC staff set their sights on a parcel in southwest Wyoming's Red Desert, just north of the Killpecker Dune Field. As the only bidder on that lease, they won it: the right to develop oil and gas on 640 acres of remote, rolling, sagebrush.

WOC, a statewide conservation group dedicated to "protecting Wyoming's environment and quality of life," had no intention of developing either parcel. Instead, they meant to protect environmentally important land from what Rader calls the "immediate threat" of the lease sale, which would have opened the land to oil and gas development and put the area's wilderness character—as

well as declining and culturally valuable wildlife—at risk. The first parcel WOC bid on was situated in the "Golden Triangle," an area between Farson, South Pass, and Big Sandy "that contains some of the best sage grouse habitat on the planet," says Rader. The longest mule deer migration ever recorded also passes through the Golden Triangle, and 90 percent of the auctioned parcel is within the migration corridor's high-use area and borders a stopover site where mule deer gather to build crucial fat stores during the long journey. The parcel WOC won lies south of the Golden Triangle in the Red Desert, one of the last high-desert ecosystems in North America, a landscape of dunes, badlands, and sagebrush that's important spiritually, historically, recreationally, and ecologically, and "surrounded by federal lands, including areas of environmental concern, wilderness study areas, and viewshed buffers," Rader says. These are not appropriate places for roads, rigs, and other oil and gas development, says Rader, which could scare off mating and nesting sage grouse, fragment wildlife habitat, displace migrating big game, alter scenic views, and conflict with sacred sites.

There hasn't been much that WOC or other conservation organizations could do to prevent development of environmentally important state lands. Advocates have, in the past, sent letters to state administrators and Wyoming's governor requesting deferrals of oil

and gas leasing in important wildlife habitat, but to no avail. Rader says, “I’m not aware of [the state] ever pulling leases off a sale for conservation concerns.” Fair enough, because the managers of state trust lands—the State Board of Land Commissioners—don’t have an environmental management mandate. Instead, they are constitutionally required to make money off state trust lands for the benefit of certain public institutions, which they do by leasing the land to private organizations and individuals. There are leases for oil and gas development, coal mining, hard rock mining, grazing, logging, and various “special uses,” but there has never been a “conservation lease.” At least, not yet.

After winning the Red Desert parcel in the 2020 oil and gas lease auction, Rader says, “We were prepared to write a check, but the state canceled the lease.” The Board of Land Commissioners determined that it was inappropriate for a conservation organization with no intent to drill to hold a lease for oil and gas development. This is in keeping with how the state manages all its leases, which it issues to a particular user for a specified use, each through its own

process. Rader says, “The point [of bidding at the oil and gas auction] was to expose the lack of a regulatory framework for conservation organizations to purchase state land leases,” adding “If we can’t bid on an oil and gas lease, then there ought to be some other avenue.” That avenue would empower organizations like WOC to protect individual land parcels from disturbance and buy conservation a seat at the state land management table for the first time ever. For WOC, the state canceling its lease was the beginning of a conversation around conservation leasing, not the end.

“It’s good to start every conversation about state lands with why they exist,” says Jason Crowder, deputy director of the Office of State Lands and Investments (OSLI), the administrative arm of the Board of Land Commissioners, which oversees day-to-day state land operations. At statehood in 1890, the federal government granted Wyoming millions of acres to be held in trust for funding a common school system, as it did for most western states. The Wyoming constitution and subsequent statutes charged the Board of Land Commissioners (comprised of Wyoming’s elected

officials: the governor, secretary of state, state auditor, state treasurer, and superintendent of public instruction) with managing trust lands to sustainably make money for specified beneficiaries while ensuring long-term growth in value. While there are occasional land sales and swaps, state lands generate revenue through rental fees (the yearly cost of the lease) and royalties (payments made for the right to develop minerals owned by the state). In fiscal year 21, the state’s 3.4 million surface acres and 3.9 million subsurface acres produced \$100,587,888. Of that, roughly \$85 million came from mineral leases and royalties, \$66 million of which was from oil and gas. Though OSLI’s annual report doesn’t break down the rental versus royalty proportions, Crowder says, “It’s heavily weighted towards royalties.” The year’s other \$15 million came from grazing leases, special use leases, temporary use permits, payments for “surface damages,” and to a much lesser extent, timber and real estate sales.

The vast majority of state land revenue goes directly to K-12 education in Wyoming, contributing nearly half of the school system’s yearly operating costs and helping

Wyoming lead the nation in per-pupil spending on education. Additional beneficiaries of state trust lands include the State Hospital, the State Penitentiary, and eleven other public institutions, with each beneficiary assigned a set of acres that benefit them. “So this is very much a financial revenue generating agency I work in, and these lands are utilized as assets to generate revenue for the beneficiaries,” says Crowder. In case it wasn’t clear, “[State lands] are for the beneficiaries, and solely for them,” Crowder says.

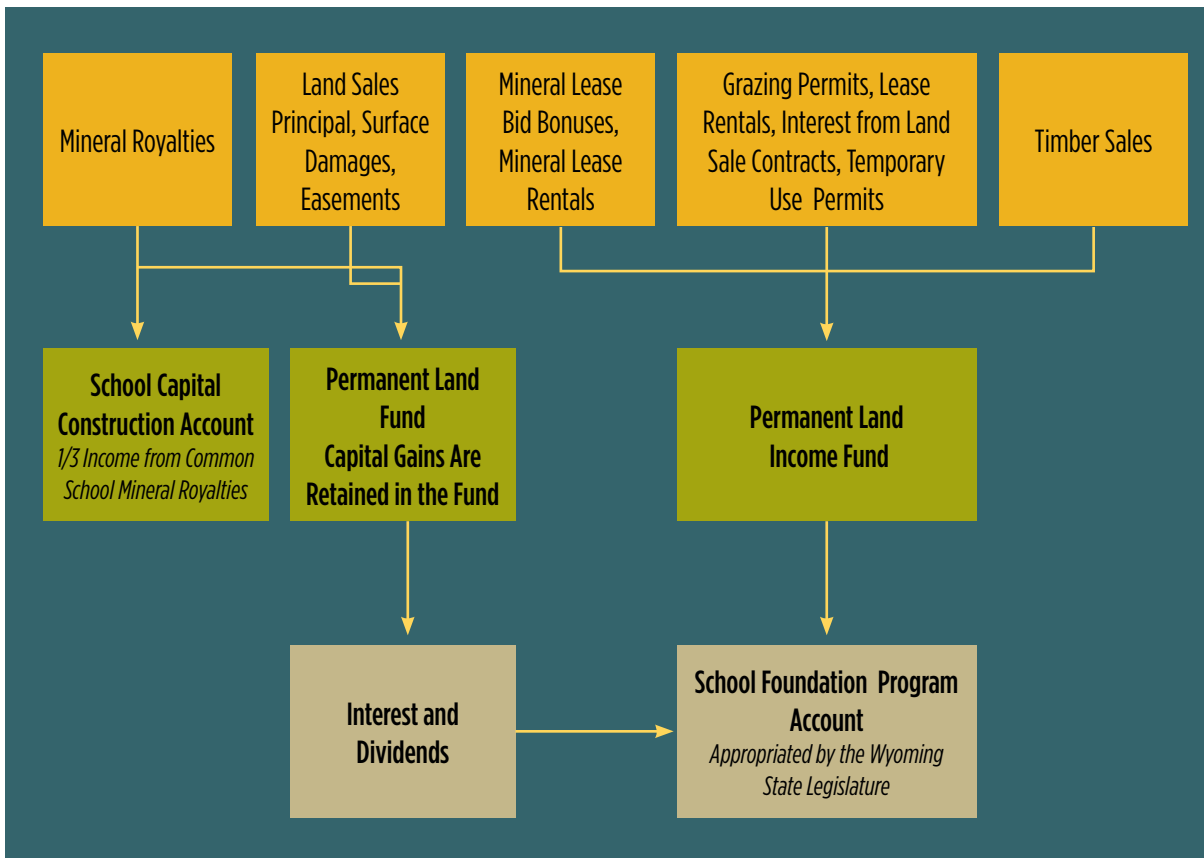
This money-making mandate can be limiting, because it means that OSLI and the Board of Land Commissioners can’t consider other types of value, such as scenic or ecological value, when they make land management decisions. Crowder says if someone suggests putting a casino on state land in Teton County adjacent to the national park, “That probably doesn’t make sense in the real world, but it could have a very large revenue stream, so we do have to look into it. . . and if a parcel is otherwise unencumbered, then there’s nothing really stopping us from moving down that road.”

But the focus on revenue itself, rather than how that revenue is generated, also creates opportunity. As long as it’s optimized and sustainable, trust managers have broad legal leeway to explore and accept creative ways of making money off state lands, according to a white paper WOC authored. OSLI does not need legislative action to broker new special use leases, for example, just approval from the Board of Land Commissioners. Developing these leases does require an initial investment of time, but it’s a normal part of OSLI operations that becomes more streamlined with repetition. Crowder says that wind

Nick Wegner



The parcel WOC won at auction lies south of the Honeycomb Buttes in the northern Red Desert (pictured) and north of the Killpecker Dune Field, the second largest active dune field in the world.



OSLI manages 86 percent of state lands to benefit K-12 education in Wyoming. This graphic, from the Wyoming Legislative Service Office's 2019 "Review of Revenue from State Trust Lands," shows the various pathways by which state land revenue makes it to Wyoming's public schools.

energy "is a relatively new industry in our office but we've gotten pretty good at leasing for it," administrating it as a category of special use. WOC's white paper claims that OSLI could likewise use special use leasing to establish an explicit track for conservation leases.

Not only is it a possibility, Rader says, "Arguably, the state has an obligation to use tools like conservation leasing if it's truly going to maximize revenue generation on state lands." That's because state lands (typically sections 16 and 36 of each township) "were not strategically placed, they were kind of just shotgun across the whole state," Crowder says. Some are in areas perfect for industrial uses, but many are not. Of the 199 oil and gas leases auctioned in November 2020, for example, 83 didn't even receive bids. Dozens more were purchased at the minimum \$1 an acre—perhaps speculatively—and may never be developed and therefore never produce royalties. In many of these cases, Rader says conservation

offers the highest use value for the land, and the greatest value to state beneficiaries.

And yet, getting a conservation lease on the ground in Wyoming will require overcoming a few challenges. For one, thinking about conservation as a valuable "use" of land, particularly in monetary terms, is relatively new. In a recent *Science* paper titled "Allow 'nonuse rights' to conserve natural resources," an interdisciplinary team of researchers led by the Property and Environment Research Center outlines how the laws and traditions around public land use were codified 100 years ago or more, when mainstream ideas about the environment centered on extractive and consumptive use. The research team goes on to say that today, non-extractive uses like conservation and recreation are increasingly in favor. But these "shifts in modern uses of public land aren't reflected in the historical legal institutions," says Temple Stoellinger, co-author on the paper and associate

professor for the Haub School of Environment and Natural Resources at the University of Wyoming. This can create institutional bias towards historical, consumptive uses of land. In Wyoming, Crowder pointed out that "conservation is a very new fish in this pond, up against 130 years of historical practice," adding, "The state is extremely accustomed to its revenue streams from traditional uses, so trying to develop a revenue stream that might supplant those existing uses is a very hard conversation and a very slow starter."

Overcoming the inertia of tradition is a challenge in itself, but moving too fast or without consideration for existing uses can also undermine the integrity of a conservation-oriented program. In Montana, after a conservation organization outbid a timber company for a logging contract on state trust land, industry representatives made it their "number one priority" to get the law that allowed it repealed. They succeeded,

eliminating the possibility of future conservation licenses. Rader hopes that "a more cooperative stance will be more sustainable."

There are also very real constraints on the time it takes to implement new ideas. Crowder says that OSLI has been talking about conservation leasing for years, but, "We're like any other state agency, we're tapped as far as duties and bodies to complete those duties, so it's difficult to chase down every initiative that needs chasing down."

Since the oil and gas lease auction, WOC has taken the initiative on conservation leasing. In a letter sent to the Board of Land Commissioners and OSLI in early 2021, WOC emphasized that conservation leasing is a smart financial decision for state lands and their beneficiaries, one that can be made without stepping on the toes of industry. That's because WOC is focused on parcels with high conservation value—which includes things like big game migration corridors and winter range; sage grouse habitat; riparian areas; historical, archeological, paleontological, and cultural resources; and national historic trails—but low oil and gas development potential. Low development potential might mean the land is difficult to access, burdened with inconvenient restrictions, unlikely to contain economically viable oil and gas deposits, or all three. The parcel WOC won at auction, for example, had no other bids, probably because developers weren't interested in "cutting a road through this really remote desert full of federal protections in order to develop a parcel that probably doesn't have much gas there," Rader says. These types of parcels are low-hanging fruit because they minimize conflict with existing uses and offer clear financial advantages to the state, giving WOC the best chance of overcoming the inertia of historical practice to implement conservation leasing.

But how much conservation value do these parcels offer if they are unlikely to be developed? Rader says that as long as the right to develop exists, “there’s always a risk,” and some lands and ecosystems are too important to leave vulnerable. Conservation leasing offers surety, he says. As importantly, leasing is conservation’s ticket to the discussion around how state lands are used. Crowder says that “right now, [environmental interest groups] are just out there and they don’t have any rights to state land. The only way they get rights and get to be a part of the conversation of responsible development is to have an interest in that land, and right now the only way they can do that is through a lease.” The researchers behind the *Science* paper argue that opening leasing to conservation can also reduce conflict in natural resource management by giving environmental groups tools other than lobbying and litigation, which pit them as adversaries against

industry. This should lead to more efficient and durable conservation gains, they predict.

When Crowder formally presented WOC’s conservation leasing concept to the Board of Land Commissioners in August 2021, they too saw it “as a way to get the conservation community a seat at the table,” and “as compensation that wouldn’t otherwise be there,” says Crowder. Since then, the focus has been on clarifying the process and terms for conservation leasing, with an eye toward promoting cooperation over conflict and ensuring that trust land beneficiaries are being compensated at fair market value.

Drawing on examples of conservation-oriented programs on state lands in Idaho, Arizona, Washington, and Oklahoma, WOC proposed that state agencies, local governments, nonprofits, charitable trusts, and the public should be able to nominate a parcel for

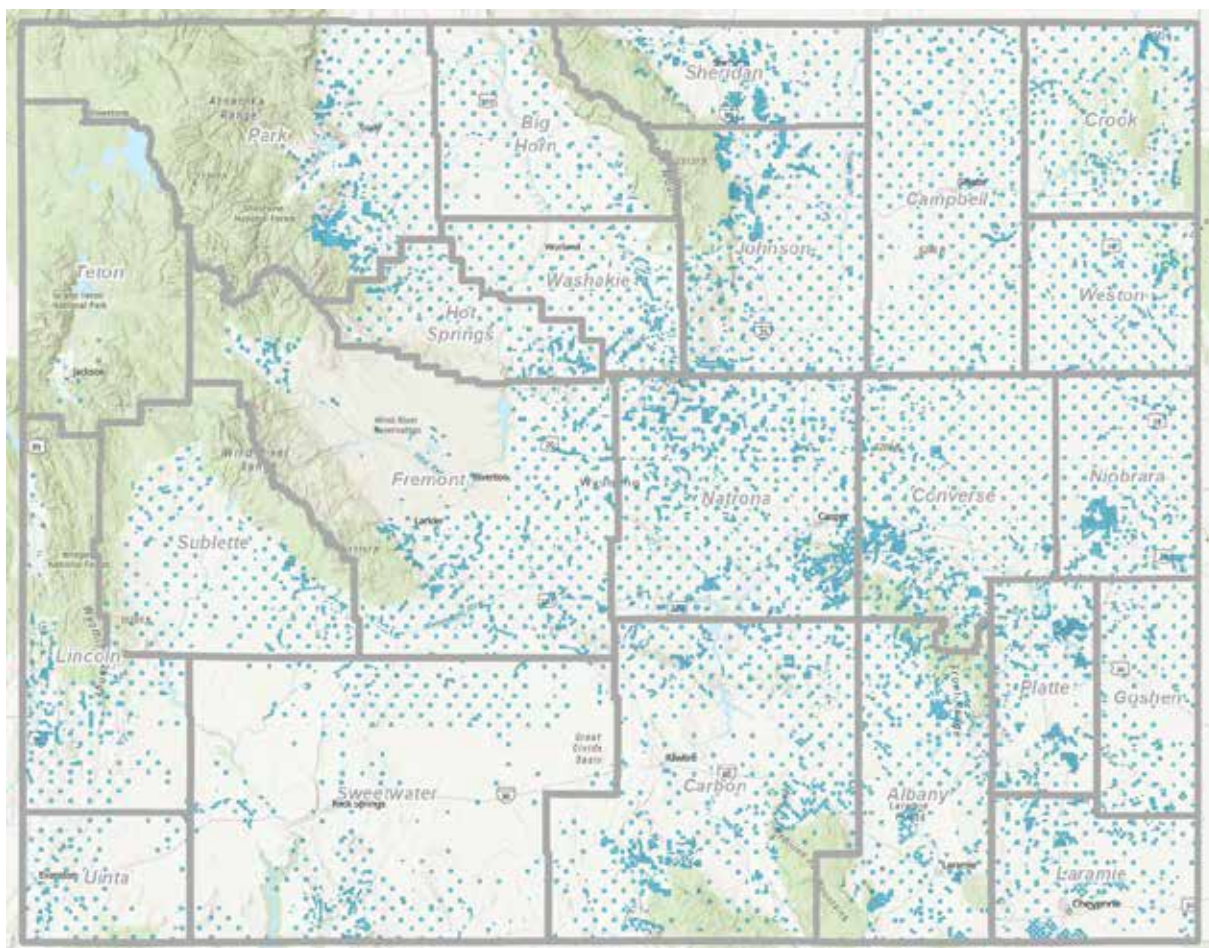
conservation leasing, and the Board of Land Commissioners would decide whether that use offers the best chance of long-term growth in value and optimum, sustainable revenue production. Crowder emphasizes that once the board approves conservation leasing on a parcel, OSLI would not sell the lease at open auction, even though it might seem like direct competition between all potential users would maximize revenue generation. That’s because, “[conservation leasing] has to be sustainable,” says Crowder. “OSLI has been here for 130 years and we’re going to be here for another 130. Having a situation where one industry is elbowing out another does not lead to a sustainable solution.” Across lease types, OSLI avoids pitting different categories of users against each other, and special use leases in particular are negotiated, not won. WOC needs to identify the specific environmental attribute they want to protect, determine the

degree of protection they are asking for, and try to evaluate what it’s worth, Crowder says. “Then we can have the lease negotiations that OSLI is accustomed to,” he says, which would take into account internal appraisals and the potential value of other uses of the land to ensure fair market value.


The negotiation might even include compromise around shared use of the parcel. Though WOC’s initial focus has been on the low-hanging fruit of high conservation value, low development potential parcels, both Rader and Crowder envision scenarios where conservation leasing is combined with compatible uses. A conservation lease could be stacked on top of a recreation or grazing lease that stipulates seasonal closures, for example, or on top of an oil and gas lease where lateral drilling allows for the parcel itself to remain undisturbed even while there is subsurface development. With lease stacking, says Rader, “No one really stands to lose.”

Thinking about the spectrum of possibilities and the strong foundation WOC and OSLI have laid, Crowder says he’s confident that there will be a conservation lease on the ground within a year. Rader is working on a lease proposal and says that WOC has already approved funding for a lease purchase. He is positively cheerful about the prospects of environmental organizations getting the tools and voice they need—and have never had—to protect assets like wildlife habitat, headwaters, and other rich natural and cultural resources on Wyoming’s state lands. Plus, he says, “It’s kind of heartwarming, that the public can raise money to pay for public education while protecting the environment and wildlife... It’s a rare case of a real win-win.”

Birch Dietz Malotky is a research scientist and the emerging issues initiative coordinator for the Ruckelshaus Institute at the University of Wyoming.



The checkerboard distribution of state lands (displayed in blue) means that some are in areas prime for industrial use, but many are not. Where there is low potential for things like oil and gas extraction, but important natural features, conservation may be the highest value use of the land.



Rafting the Yampa River through Dinosaur National Monument requires one of the most coveted rafting permits in the United States. White water rafting is just one of the ways people like to recreate on the Yampa.

Silver Linings

HOW COLORADO COAL COUNTRY COULD SAVE THE YAMPA RIVER

By Randy Rea

The Yampa River Basin is in trouble. Revered for its wild and unencumbered nature, the Yampa River starts high in the Flat Tops Wilderness at around 12,000 feet, flows down through the resort town of Steamboat Springs, Colorado, and meanders westward roughly two hundred and fifty miles to its confluence with the Green River in Dinosaur National Monument. It has mostly avoided major damming, making it a prized river for recreation, including fishing, white water rafting, kayaking, and more. The Yampa River also serves as a critical water source for industries like ranching, farming, and energy generation. Historically, the Yampa's annual flows have been sufficient to satisfy all its users, but a twenty-two-year megadrought exacerbated by climate change has left the West drier than any time in the last 1,200 years. With temperatures increasing, snowpack decreasing, and soil moisture plummeting, people and industries reliant on the Yampa have had their headgates shut and their river rafts forced ashore.

Simultaneously, plans to close two coal-fired power plants in the Yampa River Basin have moved forward. In the face of growing political, social, and economic pressures, utility companies like Tri-State Energy Generation and Xcel Energy are making hard decisions to transition their energy generation portfolios away from coal and toward renewable assets. Over the next eight years, Craig Station and Hayden Station, stalwart employers of rural northwest Colorado, will systematically retire their power units. While these retirements will undoubtedly have a drastic impact on the rural communities whose citizens work at the power plants (and the local coal mines that provide the coal), the closures present an unprecedented opportunity for creative solutions to both water shortages and economic hardship in the Yampa River Basin.

While pursuing a joint law and master's degree at the University of Wyoming College of Law and Haub School of Environment and Natural Resources, I have taken a hard look at the Yampa River and how Colorado



Jimmy CC BY-SA 2.0, bit.ly/craig-station

Craig Station is a coal-fired power plant in Craig, Colorado, scheduled to retire in 2030. It provides jobs and tax revenue to Moffat County, and also consumes large amounts of Yampa River water to generate power.

water law can be used to bolster its stream flow and offer auxiliary benefits to local communities. The way I see it, the Yampa River Basin has two problems: first, it is losing its largest employers and bedrock economic industry; second, its river and riparian ecosystem is deteriorating rapidly. Coincidentally, the first problem may offer a solution to the second. These large, industrial employers consume tremendous volumes of Yampa River water, and soon will no longer need it. So how can the Yampa River make a comeback? How can the water that supported the energy industry for over fifty years be repurposed to support an evolving rural community and the environment? One possible answer is by transferring water rights from these coal-fired power plants back to the state in the form of instream-flow water rights.

Legally, a water right is a type of property right; you own the right to use the water like you own the right to use a piece of land. Collectively,

Craig and Hayden station have water rights to consume approximately 21,000 acre-feet of water for energy generation each year. A single acre-foot is roughly 326,000 gallons and, for comparison, the entire city of Steamboat Springs consumes approximately 3,000 acre-feet of treated water annually. Colorado's rivers and streams are governed by the prior appropriation doctrine, two pillars of which are "beneficial use" and "temporal priority." Water rights are only legally recognized for certain, specified types of use that are considered "beneficial" (for example irrigation), and it matters when they are first granted. A common catch phrase for prior appropriation is, "first in time, first in right." This means those who obtain a water right before others will have senior priority to the water. Craig Station's water right dates back in priority to 1951; Hayden Station holds a very senior water right with a priority date of 1897. These senior water rights have more bite than a simple

decree on paper. If a river's flow is so diminished that there is less water in the river than there are water rights to fulfill, like the Yampa River today, the state will begin administering water diversions based on priority dates. Thus, senior water right holders will be able to divert and use their entire allotment of water before junior appropriators may take any water out of the river. It pays to be first.

Interestingly, a water right is not exclusive to out-of-stream water users. Colorado is a leader in the West for a legal concept called "instream-flow water rights." Instream-flow rights grant a property right to the environment, meaning the state can designate a particular stream segment with a minimum volume of stream flow and attach a water right to it. Just like any other appropriator on a stream, an instream-flow water right is a legally protected property interest and subject to the same priority administration in times of low flow. Instream-flow water rights are unique because they expand the definition of "beneficial use" beyond diversion, to include keeping water in the stream for environmental conservation. The General Assembly first authorized the Colorado Water Conservation Board to appropriate water rights for instream-flows in 1973, in order to protect the environment and conserve waters of the state. Since passing the Instream Flow Act, Colorado has protected 1,684 stream segments covering 9,720 miles of stream and 482 natural lakes.

For the Yampa River, an instream-flow water right could not only protect the river but also maintain the necessary water levels for four native fish species listed as endangered by the US Fish and Wildlife Service: Colorado pikeminnow, razorback sucker, bonytail chub, and humpback chub. Punctuated by rushing, high-flow snowmelt from April to June, the Yampa River distributes nutrients and sediment and physically rearranges cobble bars and river banks, making suitable eddies and

channels for spawning and rearing young fish. These type of flows make the Yampa one of the most important tributaries in the Upper Colorado River Basin for the recovery of these species. When flows are reduced, cascading effects disturb and diminish important recovery habitat.

Meanwhile, the rural communities along the Yampa River's banks are set for a large economic down-turn. In Craig, Tri-State Energy Generation and Colowyo provide over \$9 million in tax revenue and hundreds of high-paying jobs to the local residents. These business work in unison; Colowyo coal mine provides the coal that Tri-State burns to generate electricity. The tax revenues they provide are critical to support the school district, fire district, and other Moffat County municipal government functions, but when Craig Station shuts down, so too goes the tax revenue. While Tri-State is making significant investments in the community to aid in the transition, few things can replace such a singularly important economic pillar. More than likely, these towns will need to rely at least in part on the Yampa River and the intrinsic value of their natural landscapes to draw recreation tourism and community investments. An instream-flow water right on the Yampa could protect the area's natural value and preserve the conditions needed for recreation like rafting, fishing, and kayaking.

So, how would it work? The Colorado instream-flow statutes establish clear and flexible options for transferring water rights for environmental purposes. While all instream-flow rights must be administered by the Colorado Water Conservation Board, the Colorado Water Trust (CWT) is a statewide non-profit dedicated to ushering transfers of existing water rights back to the environment. In over twenty years the CWT has restored 13.5 billion gallons of water to 588 miles of rivers and streams throughout the state and, if this option lifts off, the CWT could take

the lead. A permanent water right transfer requires a formal application to the Colorado water court and the CWT is versed in making transitions seamless.

Even if the details of a formal transfer could not be worked out by the time the plants officially shut down, Colorado statutes allow for temporary, informal transfers through water right leases. This option could allow the stakeholders of each plant to generate revenue to aid in the transition process and provide vast volumes of water back to the Yampa during the lease, while continuing to weigh their long-term options.

While a transfer of water rights to instream-flows would provide a windfall of needed water to the Yampa, it may not be the most likely of options. First is the issue of funding. The Colorado Water Conservation Board is earmarked an annual budget of \$1 million to acquire new instream-flow water rights, but it is not enough to complete an unprecedented, bona fide purchase of the Craig and Hayden Station water rights, which are potentially worth more than \$100 million. An upfront purchase would require alternative funding sources, such as Great Outdoors Colorado, the Colorado Conservation Trust Fund, non-profits dedicated to the conservation of rivers, or additional Colorado General Assembly appropriations.

Additionally, there are many other competing entities for water in the region, like Colorado's front range cities. Pumping water from the Yampa back over the Continental Divide has been proposed before and fought down multiple times. However, with the front range's ever-growing demand, this may be an inevitable solution to quenching the greater Denver metro area. Another viable option would be for the Hayden and Craig Station owners to sell and transfer their water rights to another entity in the energy industry, like nuclear or hydrogen energy generation. These forms of energy

generation technology are gaining steam in the region and require just as much water as coal-based energy generation. While these options may serve economic purposes for each plant's respective stakeholders, they fail to recognize the Yampa River is dying for more water.

The West is in an unprecedented time. Water, not only in the Yampa River Basin, but also the broader Colorado River Basin, is in severe decline and every drop counts. Because no person can create more water, we must be willing to think outside of the box as to how water is divvied up. While it might be a long-shot, the retirement of coal-fired power plants possessing massive water rights provides such an opportunity. Craig Station and Hayden Station, just two of several coal-fired power plants in the Colorado River Basin facing retirement, can serve as important case studies to alleviate the pressures on the very rivers and streams they have relied on for decades. The Yampa provided water to make their businesses possible, perhaps it is just to return that water at a time when the river desperately needs it.

Randy Rea is life-long admirer of the Colorado River. Growing up in the lower basin he vacationed just above Imperial Dam; now living in the upper basin, he has developed a passion for the river's headwaters. Randy holds a JD and MA from the University of Wyoming with a focus on water law and water right transfers.

USFWS



US Fish and Wildlife service releases hatchery-raised razorback suckers in the Yampa River. These fish are one of four endangered fish species native to the Colorado River Basin.

Creating a Sustainable Destination

JACKSON HOLE SEEKS A BETTER TOURISM FUTURE

By Kristen Pope

Hiking mountain trails festooned with larkspur, lupine, and arrowleaf balsamroot flowers; paddleboarding on an alpine lake beneath the Tetons; seeing playful bear cubs frolic; and watching bison graze by the Moulton Barn with a backdrop of towering peaks—these are just a few of the reasons people come to Jackson Hole. The area is known for its wild and rugged beauty, wildlife, and outdoor recreation, but increasing visitation is leading to challenges, ranging from traffic to the environmental toll of hauling the county's trash to a landfill a hundred miles away.

To protect the environment, quality of life of residents, and visitor experience, local leaders are developing a Sustainable Destination Management Plan, starting by asking community members how visitation impacts their daily lives and what they would like to see in the future. Other groups and organizations are working to combine technical solutions—like finding a way to compost restaurant waste locally—with the human side of the resident and visitor experience.

In 2021, Grand Teton National Park recorded 3.8 million recreation visits—an all-time record for the park. Grand Teton National Park is just north of the town of Jackson—

so close, in fact, that the Jackson Hole Airport is actually within the park. So, rising visitation to the park means more people in Jackson too.

Cory Carlson, Jackson Hole Travel and Tourism Board Chair, says that after the COVID lockdown in 2020, the board saw “an influx like nobody could have imagined in terms of demand for the destination.” The boom in visitation was good for the economy, contributing \$1.1 billion in fiscal year 2020, but at a cost. “We saw the impact that the volumes were having,” Carlson says, “whether it was trash, whether it was misbehaving with the environment, whether it was the wildlife, whether it was trail usage, campfires, things of



Jackson Hole is known for its wild and rugged beauty, wildlife, and outdoor recreation. Local leaders are trying to protect that.

every nature.”

In response, local leaders formed a steering committee and started to develop Jackson Hole’s first Sustainable Destination Management Plan, beginning with information gathering. In collaboration with George Washington University’s International Institute of Tourism Studies, the Jackson Hole Travel and Tourism Board invited people living or working in Teton County, Wyoming, to complete a resident tourism sentiment survey. They expected 1,200 responses or so but were overwhelmed when 4,777 people responded to the request for feedback. They also held focus groups, interviews, and community

meetings to gather more information about community members’ thoughts. Using this input, the board and partners expect to have a draft plan ready by the end of 2022.

How do residents feel about tourism? Not surprisingly, 86 percent of survey respondents said it was important to the local economy. However, beyond infusing the local coffers with cash, 53 percent said the county does not receive any non-economic benefits from tourism. While the tax revenue generated by visitors contributes to public services, 61 percent say they’re willing to pay more for those services if the trade-off is fewer visitors.

The same survey found that many residents believe tourism contributes to problems in the community, including traffic issues (98 percent of respondents agreed with this) and impacts to the natural environment (86 percent agreed). Respondents’ concerns about tourism in Teton County included overcrowded sites, lack of housing, and tourist misbehavior, among other issues.

Respondents’ top two requests were to stop advertising the area (18 percent) and to limit visitation (17 percent), while others asked for no additional hotel development and stricter regulations on short-term rentals. Meanwhile, the Jackson Hole Travel and Tourism Board has already shifted its marketing efforts. Years ago, the board focused on luring visitors to the mountain town, then shifted toward increasing visitation during off-peak times rather than the already-busy peak season. Now, they’re focusing their marketing efforts on responsible and sustainable tourism messaging.

The 2022 summer marketing campaign used messages like “The best souvenir is one you can come back to” and “Take care of what takes your breath away.” The ads focused locally and during peak summer season, from July 4 to September



Courtesy of Tim O'Donoghue

Tim O'Donoghue is the founder and executive director of the sustainability-focused Riverwind Foundation.

5. Carlson notes that the campaign aimed to create a better all-around experience for everyone.

“Some of the best marketing that we can do as a destination is to provide a really great guest experience, and if we’re overcrowding the destination that’s not going to happen, and it’s not going to provide [a good] experience for the local community, which is equally important,” Carlson says.

Focusing on sustainable tourism isn’t a new concept, already practiced by destinations around the world, including Hawaii, Park City, Venice, and New Zealand. Messaging strategies range from the staid and serious to the “Aspen Pledge,” which asks tourists to make promises like “I will carve the snow and not the trees.” While Jackson Hole doesn’t currently have a similar pledge, it’s one of many ideas that has been discussed.

These recent efforts in Jackson Hole build on longer-term desires to move toward sustainability. For decades, some locals have been working to integrate sustainability into decision-making and planning efforts.

In 1999, Tim O'Donoghue founded the Riverwind Foundation, and today he is the organization’s



Courtesy of Aaron Pruzan

Aaron Pruzan, owner of Rendezvous River Sports, works towards sustainability at multiple scales on and off the river.

executive director. The foundation now manages the Jackson Hole and Yellowstone Sustainable Destination Program, which was formed in 2014. It offers resources for businesses looking to improve their sustainability practices and works with over 400 businesses and organizations through workshops, one-on-one technical assistance, the Sustainable Business Leaders Program, and BEST (Business Emerald Sustainability Tier) certification. These resources help businesses that are eager to be more sustainable but not quite sure how to do that, especially while being profitable.

“There is this old paradigm—and it’s false—that to be environmentally responsible that that’s going to hurt your economic performance, or to do things that are socially responsible is going to hurt your economic performance,” O'Donoghue says. “They’re rather complementary in reality.”

Aaron Pruzan, owner of Rendezvous River Sports in Jackson, is another long-time sustainability leader. He has worked on these issues since his company’s inception in 1995 and has advocated for environmental stewardship for decades. Amid brightly colored



Teton County Integrated Solid Waste and Recycling



Courtesy of VisitJacksonHole

The Road to Zero Waste initiative works to keep Jackson's trash out of the landfill, which is over a hundred miles away, by bolstering recycling and composting efforts.

Tourism contributed over a billion dollars to Jackson's economy in 2020, but a recent resident sentiment survey revealed that there are costs, too.

kayaks and racks of paddle sports gear, Pruzan talks about his river adventures all around the globe and in his own backyard with his family. He also talks about the importance of preserving and protecting these waterways. Pruzan, a founding board member of the Snake River Fund, was instrumental in the campaign to designate the Snake a Wild and Scenic River and has been active in many stewardship initiatives. Now he's working to achieve BEST certification to further cement his company's sustainable ethos as well

as create formal documentation and training systems for his staff.

Pruzan avoids selling single or limited use items and works with manufacturers to reduce packaging. When he does receive packaging materials—like blankets used to cushion boats during shipment—he repurposes them, often giving them to local moving companies. When a boat becomes damaged, the company will repair it or, if it is beyond repair, part it out. On guided trips, employees track waste and chart how much they keep out of landfills by recycling, composting, and reusing. In 2021, the company's guides recorded 87 percent of waste was diverted from landfills—just shy of their goal of 90 percent. His team can often be seen picking up trash others leave behind at boat ramps, leaving places nicer than they found them.

Finding balance between resource protection and increased visitation is key, according to Pruzan. “We do have limits,” he says. “It’s okay to not buy into the idea that we always need year-over-year growth, and I think we need to move to a different paradigm,” though he acknowledges that may be more of a challenge for newer businesses.

Community organizations and local agencies are also working together to make city services like waste and transportation more sustainable. Currently, trash produced in Jackson, Wyoming, is hauled 102 miles away to a landfill in Bonneville County, Idaho. The Teton County Integrated Solid Waste and Recycling's Road to Zero Waste initiative aims to divert 60 percent of waste from the landfill by 2030, by encouraging more recycling and composting, including commercial food waste.

In terms of transportation, Yellowstone-Teton Clean Cities is working to boost the use of electric vehicles in the region, which should become easier with the network of charging stations the recent infrastructure bill is funding. Executive director Alicia Cox says driving an electric vehicle charged on the locally available grid mix—which uses hydropower and other renewable power sources—reduces emissions by 97 percent.

All these efforts have led Jackson to become an award-winning sustainability destination, including North America's first EarthCheck certified travel and

tourism destination in early 2020. While many community members are excited about these awards and certifications, O'Donoghue says he's received calls and emails from people who are concerned about Jackson Hole receiving such top-notch awards when it's dealing with issues like roadway wildlife kills and poor water quality in local creeks. When he receives these communications, O'Donoghue reaches out to find common ground and have a conversation. Sometimes, this leads to volunteers and partnerships. Other times, his efforts are less successful. “This journey of striving to be more sustainable has a lot of bumps in the road,” O'Donoghue says.

As the community builds a forward-thinking Sustainable Destination Management Plan, residents and local leaders are working to envision a future where conservation and economic goals coexist, and future generations can enjoy a robust local economy while also enjoying a high quality of life and a sustainable community.

Kristen Pope is a freelance writer and editor. Learn more about her work at kepo.com.

“
This journey
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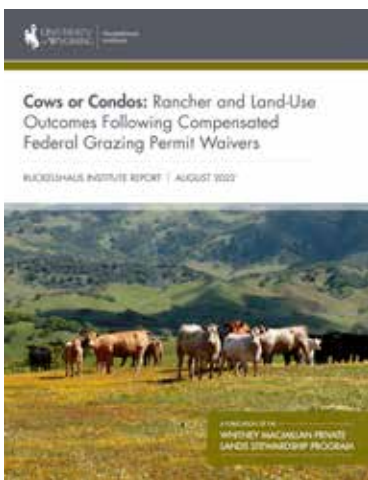
Tim O'Donoghue ”

News from the Haub School and Ruckelshaus Institute

Western Confluence magazine is a publication of the Ruckelshaus Institute of Environment and Natural Resources at the University of Wyoming. The institute supports stakeholder-driven solutions to environmental challenges by conducting and communicating relevant research and promoting collaborative decision making.

uwyo.edu/ruckelshaus

Faculty across the Haub School of Environment and Natural Resources, home of the institute, conduct applied and community-engaged research spanning disciplines such as law, economics, biology, human ecology, anthropology, outdoor recreation, geography, and more to help the citizens of the West find effective ways to address our most complex environment and natural resource challenges.



Cows or Condos: What Happens Following Waivers of Public Lands Grazing Permits?

To address conflicts between wildlife and livestock on public lands, conservation groups sometimes pay ranchers to voluntarily waive their grazing permits. Could this cause financial impacts to livestock operations that lead to subdivision, development, or other conversions of privately owned rangelands? This argument is often expressed as a choice between “cows or condos.” Drew Bennett and research scientist Tessa Wittman conducted interviews, a survey, and records searches of 51 permittees who have accepted compensation to waive their public lands grazing permits to assess the “cows or condos” argument. Read the report at bit.ly/cows-condos.

2022 Summer Ambassadors Program

In summer 2022, conservation economist Jake Hochard partnered with Wildlife Tourism for Tomorrow, an initiative linked to the Wyoming Game and Fish Department, to launch the 2022 UW-WTFT Summer Ambassadors Program. In this program, UW undergraduate and graduate students connect Wyoming small businesses in the outdoor recreation and tourism industry with the WYldlife Fund to provide philanthropic support for wildlife conservation.



Mullen Days

Two years after the Mullen Fire burned more than 170,000 acres in the mountains just west of Laramie, a documentary film, interactive open house, panel discussion, storytelling event, and field trip helped community members reflect on what the transformative power of fire means for our human and natural communities. Birch Malotky with the Ruckelshaus Institute and Rhiannon Jakopak with the Monteith Shop hosted the three-day, interdisciplinary event, which created a space to process, grieve, learn, and re-imagine what living with fire means.

Mule Deer on the Big Screen

A short film produced by the Monteith Shop chronicles mule deer F014 struggling to raise her young, drawing attention to the costly impact of wildlife-vehicle collisions to deer and people. The ten-minute short film, *The Road Less Traveled* (vimeo.com/748122219), features the researchers who study F014 and the conservation organizations working to make her world safer through proven strategies like wildlife crossing structures over dangerous roads.



New Director

The Ruckelshaus Institute welcomes Melanie Armstrong as our new director in 2023. She comes to the institute from Western Colorado University where she founded the Center for Public Lands and taught in the Master's in Environmental Management Program. Her work embodies principles of engaged scholarship, interdisciplinarity, and co-production of knowledge, and is grounded in research on how societal systems are built around shifting ideologies of nature. Armstrong's interdisciplinary training includes a master's degree in communications (Ohio University), a doctorate in American studies (University of New Mexico), postdoctoral work in environmental history (University of California, Davis) and cultural geography (University of California, Berkeley), and a 15-year career with the National Park Service.

Sagebrush in Prisons

INMATES ARE
SAVING AN
ICONIC AMERICAN
LANDSCAPE—AND
THEMSELVES



Diomé Méjia, Institute for Applied Ecology

Inmates plant sagebrush to restore an area that was mined for uranium.

By Frani Halperin

On a very windy fall day, Gina Clingerman, project manager for the Bureau of Land Management Abandoned Mines Lands program in Wyoming, walks through rolling hills where a wildland fire torched more than 14,000 acres of sagebrush steppe in 2020. Clingerman estimates that the sagebrush lost in this blaze near the small town of Hanna were probably 100 to 150 years old. But now, she says, they're, "Dead. Gone. Forever." That's an irreplaceable loss for the pronghorn, mule deer, elk, and some 350 other species of wildlife that depend on this ecosystem. The sagebrush landscape, she says, is in peril.

Current estimates are that nearly half of sagebrush ecosystems, the largest

interconnected habitat type in America, is gone because of human activities—including roads and urbanization, extractive industries like oil and gas and mining, and devastating fires, which are increasing with droughts and warming temperatures due to climate change. The Bureau of Land Management wants to restore these habitats, and Clingerman says just scattering seeds on the ground doesn't work. Among blackened nubs of dead sagebrush, she points out little yellow cages about 12 inches tall, each sheltering a hand-planted seedling. Loose seeds have less than a three percent survival rate compared to the 40 to 70 percent viability of seedlings, but cultivating sagebrush from seed to stem is arduous and time-consuming. Here, Clingerman and her colleagues got help from a

surprising source—inmates from the Wyoming correctional system.

When Levi George was incarcerated at the Wyoming Honor Farm—a minimum-security prison in Riverton, Wyoming—every day starting in April 2021, he and three other inmates made nurturing seedlings the focus of their day. “We mixed the dirt and the soil and made sure the pH levels are where they need to be. And then, we do the seedlings, and then throughout the year, we water and fertilize them,” George explains.

Over six months, the inmates’ plants grew to about three inches tall. Growing from seeds in the wild, they would have taken five years to get to the same height. In the fall, inmates at the Wyoming Honor Farm shipped out 25,000 sagebrush seedlings to sites around the state where they and partnering organizations planted them by hand.

The Institute for Applied Ecology, a nonprofit organization focused on conservation of native species and habitats, recognized a need for native plants to restore lands following wildfires. Inspired by Evergreen State College’s Sustainability in Prisons Project in Washington, the institute launched the Sagebrush in Prisons Project in 2014.

Stacy Moore, ecological educator with the Institute for Applied Ecology, says prison officials were skeptical at first about dedicating resources toward growing a plant that most dismissed as “a weed that grows everywhere.” But after giving the program a try, the staff at the first prison, the Snake River Correctional Institution in Ontario, Oregon, told Moore that they wanted to double production the next year. “So, that’s what we did, and the next year we went from one prison to five prisons. Then, other prisons saw the benefits and they put up their hand to be involved as well.” The nonprofit

now works with 11 prisons in Wyoming, Oregon, Idaho, Nevada, and California.



If the only goal was to grow sagebrush, the nonprofit could just do it on their own. But the ability to benefit adults in custody far outweighed the constraints that working with prison populations presented.

“These inmates are soon going to be out in the community, they’re going to be your neighbors, they’re going to be the ones you’re standing in line next to at the grocery store,” Moore says. “So, we want to give them as many skills as we can before they are released.”

The institute brings in experts at each prison to teach inmates—and staff who also seem eager to learn—about sagebrush ecosystems. At the end of the season, each participant receives a certificate listing the skills they’ve acquired.

George says he’d never grown a plant from seed and found the experience therapeutic. “It’s nice to see something grow from nothing.” He adds that working with plants also offered him a place of refuge. “In prison, just like anywhere, everybody is not going to get along. So being able to be away from everyone else and be with the plants and nurture them and watch them grow, to me, it was very soothing.”

The program is so popular that there are not enough spots for everyone who wants to join. The inmates tell Moore they like the smell of the sagebrush. Some say nurturing the seedlings lowered their blood pressure. Moore hears that the program has helped reduce violence at facilities. Officers shared about one inmate in Idaho who was so depressed he wouldn’t go outside. His involvement in the program raised his spirits, and he became the lead team member. Prison staff said the program, “brought him out of his shell and saved his life.” Studies show programs like these also

reduce recidivism because inmates reenter society with tangible skills, feeling valued.

The experience convinced George, who was due to be released within days from the Wyoming Honor Farm when this story was reported and then went to a halfway house, to apply to work for the Bureau of Land Management. “I plan on still continuing to work with them after my release here and try to help other people that’s been in my situation when they get out to have somewhere to start from because it’s hard for felons to get employment sometimes.”

And meanwhile, the tens of thousands of seedlings shipped out from prisons across the West each autumn are putting down their roots to bring back damaged areas of the sagebrush sea.

“It’s just knowing that you had a part of something that you’re giving life to that’s going to hopefully sustain other life form(s),” George says, trying to put into words what the program meant to him. “It’s a big deal.”



It’s just knowing that you had a part of something that you’re giving life to that’s going to hopefully sustain other life form(s).

Levi George



Frani Halperin is executive producer at H2O Radio. Western Confluence editor Emilene Ostlind adapted this piece from Halperin’s original piece, “How Inmates Are Saving an Iconic American Landscape—and Themselves,” published November 18, 2021, on H2O Radio, h2oradio.org.



Dania Delmont/Shutterstock.com

By Jill Bergman

There are places in Wyoming where the sky is more imposing than the land. The force of wind and emptiness define this spare country. This is the home of sagebrush, prairie dogs, and coyotes. This is the home of golden eagles that soar on thermals, watching the ground for their next meal.

It is also the site of major wind energy development, with hundreds of turbines already turning and many more proposed. Wind power is an important solution for helping slow climate change and can provide new jobs, low-priced energy, and plenty of economic benefits for windy Wyoming. With new transmission lines planned, Wyoming's wind power generation and connectivity is set to increase dramatically.

This has Mike Lockhart worried. Landscapes filled with wind turbines, each blade moving about 150 miles per hour at its tip, are deadly for bats, smaller birds, and raptors including eagles. Power lines threaten electrocution, and development means habitat loss, especially for golden eagles, which are particularly sensitive to human intrusion.

Lockhart, a wildlife biologist who started studying golden eagles in 1972, believes that "climate change is the most pressing environmental challenge in human history." He supports clean energy development. But, he says, the transition away from fossil fuels can't come at the expense of sensitive and valuable wildlife while there are alternatives available. He has spent the last decade collecting the data needed to keep that from happening, trying to protect eagles from being overlooked in the rush to increase wind energy generation.

In the Shirley Basin near a proposed wind farm, Lockhart drives a remote dirt road. He is looking for the perfect spot to set a trap for a wild eagle so he can examine it and fit it with a tracking

FLIGHT Interrupted

BIOLOGIST WORKS TO PROTECT EAGLES ON COLLISION COURSE WITH WIND POWER



Linocut by Jill Bergman

device like a tiny backpack. Lockhart works with the US Geological Survey and Conservation Science Global Inc. with funding from the National Fish and Wildlife Foundation. In the last eight years he has captured 185 golden eagles and fit 122 with tracking devices on breakaway harnesses. Of those, 89 were captured on or near wind project areas and proposed sites. The huge amount of data collected should help identify which wind projects will put eagles at risk.

When he finds the right place, Lockhart moves quickly. Eagles are so observant and wary that if they see him setting up his trap they will stay away. From the back of the pickup, he brings out his working partner of five years, a golden eagle with sharp curved claws, intelligent eyes, and one wing that was broken in the past and never healed properly. Although they have a comfortable relationship, and Lockhart cares for her like a family member, this eagle doesn't have a name. She is a wild bird, not a pet.

This golden is a lure eagle, meaning her presence on the ground next to a dead prey animal will tempt other eagles to investigate. Although she can't fly, Lockhart thinks she enjoys being out on the plains on trapping days, socializing with other birds. He tethers her near a game camera, a frozen jackrabbit, and a specially modified leg trap that only a golden eagle's weight can trigger. Then he drives far away to watch through binoculars.

This part of Wyoming is expansive and uninhabited except for a distant ranch tucked against the foothills of the Shirley Mountains. There are no trees to block the view as Lockhart keeps one eye on the trap and one eye on the sky.

"Shirley and Laramie Basins—and adjoining hills and mountain slopes—are one of the most important habitat areas for golden eagles in North America," he says. They support large, year-round

“ Shirley and Laramie Basins—and adjoining hills and mountain slopes—are one of the most important habitat areas for golden eagles in North America.

Mike Lockhart



Linocut by Jill Bergman

eagle populations and are a major migration corridor and overwintering area for migratory eagles.

He has seen this spending hours poring over the GPS data from eagles he is tracking. The eagles are individuals to him; he knows the habits of each one. The longest migrator winters in Raton, New Mexico, and summers in Denali National Park in Alaska. Another eagle, tagged in 2016, successfully reared young for four years. Then, months after a wind project became operational, a turbine killed the eagle while it still had an eaglet in the nest. Wind turbines have also killed three other eagles Mike was tracking. The US Fish and Wildlife Service requires companies to check for eagle nests within a two-mile radius of newly proposed wind sites, but Lockhart says there are known nests well within that radius of wind turbines now.

It is federally illegal to kill or harm eagles, but difficult, if not

impossible, for wind projects to avoid. Worst case, these eagle deaths go unreported unless discovered and prosecuted. Best case, companies operating turbines can seek incidental take permits, which allow a certain number of eagle deaths to happen without a fine. For the permit, the companies must have plans to minimize eagle collisions and enhance their conservation in other ways, like employing spotters who can have a string of turbines temporarily stopped if they see an eagle in the area. There is also new technology, the IdentiFlight system, which combines cameras with artificial intelligence to identify birds and their flight path and shuts down turbines where needed. Power companies can also retrofit power poles to prevent eagle electrocutions.

According to Lockhart, both spotters and the camera system are “far from fool-proof,” and “must not be used as a crutch to justify new projects in prime habitat.” That

means stopping new developments in these important areas of the Shirley and Laramie Basins.

His data show that “most of Albany and Carbon counties [the location of Shirley and Laramie Basins] are exceptionally important habitat for golden eagles.” Also, they already have wind energy projects that cause significant eagle deaths. “Increased wind development,” he says, “will exponentially, profoundly impact both resident and migratory populations.” Lockhart believes there are alternative locations available, that aren’t in dense eagle habitat but still have enough wind to generate clean energy. Now is the time to include this valuable wildlife in the equation along with the other benefits, so that green energy isn’t devaluing a segment of the natural world while simultaneously trying to benefit the natural world.

Standing in the sparse, wind-beaten landscape in the afternoon, Lockhart decides it’s time to pack

up, even though he’s disappointed he hasn’t caught an eagle all day. Nothing is guaranteed out here—for the biologist looking for an eagle, or the eagles looking for a meal. Later, he’ll study the camera images to see which birds visited the site and the drama that unfolded around the jackrabbit bait while he was driving around other parts of the valley. For now, he kneels to let his lure eagle step onto the gauntlet protecting his arm. She flaps her huge wings and settles. As Lockhart stands, he strokes her feathers, a gesture of appreciation before the drive back home.

Jill Bergman, an artist and printmaker living in Steamboat Springs, Colorado, is originally from windy Wyoming. For years, she has worked to incorporate her interest in environmental issues and public engagement into her art practice. Learn more and see her artwork at www.jillbergman.com.



Redefining THRIVE

LESSONS FROM MY CHILDREN IN THE CONTEXT OF CLIMATE CHANGE

By Corrie Knapp

When she was a baby, my eldest daughter had a strong latch and I enjoyed focusing on her breathing and feeling my milk let down. Allowing myself into this flow that was both release and connection at the same time was a lesson for me, the first of many. She would look up at me, her small hand caressing my arm as she nestled in. So young, and intuitively, she knew how to show love. Many mornings I sat, legs up on the glider, my girl tucked into my arm, seeing the first light of the day enter the room as I reached for a scientific article.

As a new and untenured professor, I read while my daughter fed. I study how human communities and the ecosystems they depend on adjust to a changing climate, now and in the future. At the beginning of my career, I said that I studied “climate adaptation,” but when I had children, I realized that what I cared about was far more ambitious than that. It wasn’t that I wanted my children to adapt and survive. I wanted them to thrive.

When I read my first International Panel on Climate Change (IPCC) report in 2003, it was clear that because of the long lifespan of greenhouse gases in the atmosphere, some amount of climate change would happen even if we stopped all future human emissions. Over the years, I recognized that

mitigation—reducing greenhouse gas emissions—wasn’t happening quickly enough to avoid significant negative effects of climate change. Mitigation is critically important, but I wanted to work at the grassroots level, helping empower communities to plan for their future and implement local strategies.

Adaptation requires change. Often, the solutions posed are short-term coping mechanisms and disappointingly incremental. A rancher unable to graze livestock because of a megadrought might “adapt” by buying hay. An indigenous community confronted with warming summers and breakdown of traditional food storage might “adapt” by purchasing a community freezer. These actions deal with immediate risk, but they don’t address the root causes of climate change—the structures, systems, and cultural norms that we have all internalized. We need a new way of looking at the world, one that helps us make the changes we need, including reducing our emissions and consuming fewer resources, but also enriching our lives and relationships.

My daughter as a baby was a good feeder and a social girl: she paused every few minutes, liked to make eye contact with me. I would meet her gaze and try to align the pure blue of her eyes with the staggering forecasts of a warmer future, wondering how we would we get through this together. I wanted to

have all the answers for her, but I still don't. Instead, I continue to do what all parents do: I try to control what I can, answer the many questions she and her sister have, and listen to what they are trying to show me. My children are three and six now, and as I've watched them grow, they have given me fresh eyes to see with. They haven't internalized the systems, structures, and norms that I have. Instead, they offer a new perspective on some of the deeper levers of change that could lead to a future where we all thrive.

The first lesson on thriving my children taught me was about being present, which allows us to moderate stress, remember and recognize our connection with the natural world, and adapt from a place of groundedness. I am not always good at slowing down and paying attention to what is around me, but my kids are. Before we had them, my husband and I loved to hike far and fast on weekends, and when we had kids, we were slow to adjust. For years, our expectations let us down and turned our children into hooligans. We would get a quarter mile in three hours and our girls, riding on our shoulders, would rip out the hair at the top of our heads from holding on too tightly. We ran out of snacks in the first 15 minutes, and there was usually at least one potty accident. We came back with headaches and drove silently home. Finally, we just decided to explore—no timelines, no destination, just attention to where our children's feet took them and what they wanted to watch.

Last time we were out, we balanced on precarious rocks by the side of a stream and felt the icy cold water running over our toes. My older daughter watched the water as it tumbled, gurgled, and flowed over smooth rocks speckled with sunlight. "Is it always like this here?" she asked, and I breathed it in with her, noticing the light dappled on the water and broken by trees, the deep pool near our feet where we could see small silver fish darting, the smell of warm skin, the hush of the stream with its never-ending waters. I was silent. I looked her in the eye and I knew that she felt the same peace as I did, knowing that

it would be here even when we left, that we would both close our eyes back in town—before I started a Zoom meeting or while she waited in line for lunch at school—and return to the awareness of this place. If collectively we could act from a place of connection with our ecosystems and each other, the choices we make around adaptation would be more effective and durable. They would be tailored to our particular relationships with the human and natural world.

The second lesson from my children has been about focusing more on our connections to others and less on our consumption of things. My younger daughter turned three during the still-cautious winter days of the pandemic, so we had a small party with just my family. The lack of a big celebration made me feel guilty, so I compensated with a few extra gifts. Judging from the bags of things my family brought into our home, so did they. After cake, most of our attention fell to the bright stack in the corner of the room. But my daughter Alma hadn't learned to focus on presents, so her eyes were on her older cousins. When they sat down, eager to give their gifts, she sat down next to them.

The first gift was a "Hungry Hippo" game and Alma wanted to play it immediately. Her cousins helped her remove the tape securing the box and circled around the coffee table, showing her how to assemble it, how to make the bright hippos open their mouths and catch the little red balls. The pile of gifts faded into the background as we watched the cousins teach my kids how to play. Alma wanted to set it up over and over, until she had mastered pushing the button at the right time to load her hippo's mouth, then dumping it out to try again. The adults exchanged glances above our children's heads; the other presents could wait. That day, it wasn't about the quantity of gifts, but the quality of time with family. Although our culture prioritizes things, Alma didn't need much to thrive. Perhaps we can all live better lives with less.

The third thing my children have taught me about thriving is about





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letting go of my attachment to productivity. A typical academic, I never feel like I'm doing enough. I keep a file folder in my office with old to-do lists as proof that I've accomplished things even when I feel like I'm drowning. This busyness spills over from my work into my weekends in unfortunate ways: I want to clean the chicken coop, wash the floors, and scrub the toilets all at the same time. My kids, on the other hand, want to play. They want to make forts and pop bubbles, run through the sprinkler and make garden "burritos" out of mint, chives, lettuce, and sometimes a surprise carrot.

We reach a compromise in the backyard. My "work" there is play and they can weave in and out of my tasks—weeding the garden, rummaging for raspberries, and picking bouquets for the house. They

pull me onto my back in the grass and point out clouds that look like cats, balloons, and a girl running. They slow me down and we come into a different rhythm in that place. The backyard is a place where the whole family savors time, soaks it up, sits with it. Our time there doesn't cost anything, is carbon-free, and rich with experience and interaction. These afternoons show me how the pulse of economic growth has seeped into my feelings of self-worth, and asks me to reconsider what I value.

There is no way I cannot want desperately, and sometimes without much optimism, for my children to thrive. And not just them, but the bees laboring in our garden, the deer that walk quietly through the woods, and the butterflies that grace our yard with their boisterous and tremulous beauty. But I am not asked to be optimistic; I am asked to love, and

listen, and learn. So I pay attention to what brings them joy and lean in that direction.

Each morning, my girls come in to snuggle me in bed. Nestled into either side of me, they often fall back asleep and I can feel their chests expanding and contracting next to mine with each breath. I turn from one to the other, heavy with the sheer weight of love. I close my eyes in their tiny embraces, their little fingers wrapped around my arm. We are in this together.

***Corrie Knapp** is an assistant professor in the Haub School of Environment and Natural Resources. Her research revolves around how federal land management agencies and human communities can adapt to climate change. She is a mother to two, an aunt to eight, and godmother to six.*

As climate change advances, how can we consume less while enriching our lives and relationships?

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WILD AND WORKING

The Promise of Western Lands

PERSPECTIVE FROM JOHN L. KOPROWSKI

I was a youngster in Cleveland, Ohio, when the Cuyahoga River started on fire...again! After more than a dozen previous ignitions, the images were commonplace on local television: the river's surface—covered by oil, gasoline, and other volatile products produced by industry and run-off—burning.

I also remember fishing in Lake Erie at ten years old. Before wetting our lines, we had to check the current limit for yellow perch, not to protect the fishery, but to protect ourselves from the high levels of mercury accumulation in the fishes' tissues.

Such impactful moments as a boy made me long for the western United States, a place I imagined didn't suffer from these industrial concerns. I read everything I could about wildlife, climbing, backpacking, and fishing. I dreamed of one day visiting, or even being able to live near, wild places like Yellowstone, Grand Canyon, Yosemite, Glacier, Grand Teton, and the working lands in between. Unlike the waterways of my youth, where economic prosperity had been traded for ecological integrity, the western lands I longed for provided early examples of landscapes that integrated conservation alongside prosperity.

Not surprisingly, I chose a career in environmental science, wildlife conservation, and natural resource

management, which led me West. Now, I am fortunate to serve as dean of the Haub School of Environment and Natural Resources at the University of Wyoming. As dean, as well as a researcher, I want to find ways to ensure that our western lands are managed so that their natural wealth supports human and environmental well-being.

Now that I'm here, I wear my appreciation for open spaces on my sleeve. The vast rolling grasslands, seemingly endless seas of sagebrush, glowing sunsets in the desert, fall mountain forests of dark conifers and yellow-green aspens, and jagged mountain peaks speckled with alpine meadows and snowfields are postcard images that I and many residents relish. These places draw massive numbers of tourists from across the country and around the world. A love for wild things and wild places unites us. But to live, work, and play in these beloved places, we need sustainable practices that won't compromise them.

The top economic drivers in most of our western states are intimately tied to natural resources: tourism, mining, energy, and agriculture. These industries generate income, jobs, and tax revenue that provide opportunities for people and communities. If we also value wide open space, a sense of remoteness, and a high quality of life, then sustainable

solutions require finding balance. The fulcrum in this balance, the triangle in the middle of the teeter-totter, is the collective values of local communities. We need to engage stakeholders in thoughtful planning and incentivize sustainable approaches.

It's a challenge. Aldo Leopold provides a path forward, writing, "Examine each question in terms of what is ethically and aesthetically right, as well as what is economically expedient." Residents of the West have a common connection to the land. We can use that commitment to empower mutually beneficial approaches to living and working with the land. We can make an investment in our future through efforts that are ethically, aesthetically, and economically appropriate. With foresight, we can ensure that many young boys and girls with dreams of wild things and wild places will not be disappointed.

John Koprowski is dean and Wyoming Excellence Chair in the Haub School of Environment and Natural Resources and a professor of Zoology & Physiology at the University of Wyoming. He has spent his 37 years of professional service working to ensure that our wild and working lands continue to function for future generations and has been enjoying them for much longer.



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