



NORTHERN ROCKIES  
CONSERVATION  
COOPERATIVE

**Conservation for the  
Common Good**

*— Since 1987 —*

**2022 YEAR  
IN REVIEW**

**35<sup>th</sup>**

*Anniversary  
Edition*



## DEAR FRIENDS,



NRCC's history is like a watershed – it diverges, multiplies, changes over time, but always contains a path to our original goals. We are now 35 years old, and we are proud to reflect on our many accomplishments and share examples of our work. In the stories found in this publication, you'll see a core commitment to our original 1987 credo: "We believe that the human enterprise can and should be conducted in harmony with the environment. It must be founded on respect for both human and natural communities."

Since our founding, NRCC professionals have worked together, sought out better ways to pragmatically meet challenges, and offered grounded recommendations – many of which are now in action. You can see these in our field work, presentations, workshops, and many publications read worldwide.

How does this relate to the current moment? We're in a critical period of human history that encourages a change to the framing we use in all our activities. This means a renewed and refreshed strategy for our work, our recreation, and our actions as citizens. Coexistence with wildlife, nature, and each other must be based on a philosophy in which we see ourselves as vital members of the great community of life.

This is an enterprise with dimensions far beyond NRCC, but as we see it, we are innovators in a new kind of awareness and pragmatic ethic. By incorporating better concepts, thinking, and words with on-the-ground actions, our work seeks to upgrade people's capacity and improve collective efforts across ecosystems. This is about building the common good together by realizing our shared interests. The high quality of life in the GYE for both humans and wildlife did not happen by luck. We are the beneficiaries of the hard work of a great many people before us

and so, we seek to pass on this great treasure – the GYE – to future generations, and to do the same in other regions of the world.

In this publication, our Writer-in-Residence Todd Wilkinson begins with a framing piece for NRCC's 35th anniversary. Our spring AmeriCorps Intern Leslie Nuckoles reports on a suite of initiatives in high elevation ecosystems that are among the most stressed on the planet. Research Associate Matt Barnes shares insights from his work with carnivores, rangelands, and human communities. Project Partner Andrew Ray reports on seventeen years of wetland and amphibian monitoring in Yellowstone. Research Associate Molly Loomis Tyson reflects on how "sense of place" is integral for creating shared commitment to natural and human communities.

Our people and approach are unique among the many organizations in the Greater Yellowstone region. Our work is a large-scale experiment that we have engaged with for decades. We continue to seek better ways. This work would not be possible without the support of readers like you. We encourage you to send us your thoughts, stay engaged, and join our vital endeavor.

Sincerely,

*Susan*  
Susan Clark

*Peyton*  
Peyton Griffin

*Ben*  
Ben Williamson

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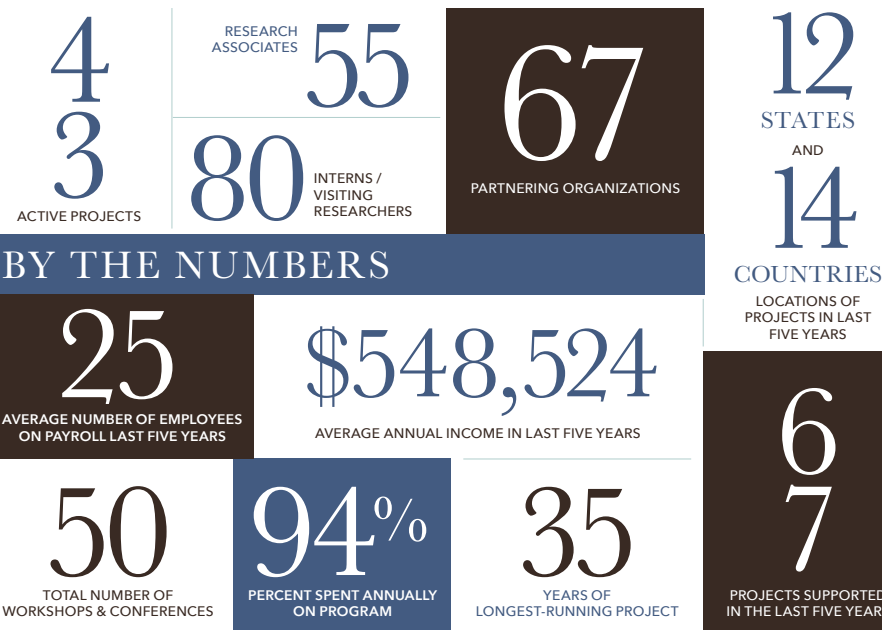
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## NRCC Welcomes New Advisor and Research Associates

NRCC is pleased to welcome Brot Coburn to the Board of Advisors, and Aaron Bott, Joe Riis, and Jennifer Strona as Research Associates. Brot, Aaron, Joe, and Jennifer bring valuable conservation leadership, research, policy, documentary, and communication skills to NRCC.



### BROT COBURN | Board of Advisors

Brot Coburn is a Visiting Assistant Professor for Colorado College and has worked in Nepal, Tibet and India for more than two of the past four decades, overseeing development and conservation projects with the World Bank, Unesco, United Nations Development Program, World Wildlife Fund, and other agencies and non-profits. He has written or edited nine books, including two bestsellers, National Geographic Books' *Everest: Mountain Without Mercy*, and a collaboration with Jamling Tenzing Norgay, *Touching My Father's Soul*. He co-edited *Ahead of Their Time: Wyoming Voices for Wilderness*, published by the Wyoming Wilderness Association, and is presently a board member of the Wonder Institute.



### AARON BOTT | Research Associate

Aaron Bott is a biologist and a doctoral student at Utah State University studying wolves across the American West — predicting spatial and behavioral patterns on an anthropocentric landscape to promote human-carnivore coexistence. Additionally, Aaron works with the Yellowstone Wolf Project, monitoring wolves' spatial persistence and reproduction in the southwest interior of Yellowstone National Park. Under NPS supervision, he is the project lead of this multi-year field study. Deeply connected to the Mountain American West — where his Mormon pioneer family settled in the mid-1800s — Aaron's heritage and conservation experience allow him to move fluidly and genuinely between different cultural values to find common ground. Aaron is also employed as a regional manager for the Utah Division of Wildlife Resources.



### JOE RIIS | Research Associate

Joe Riis is an independent photojournalist, filmmaker, and naturalist. Trained as a biologist, Joe has worked as a wildlife storyteller for the past fifteen years. He's known for his pioneering documentation of animal migrations in the West, through which he aims to give migratory animals a visual voice in our human culture. His current Yellowstone Migrations fieldwork focuses on highlighting behavior and rhythms through long-term field study and cinema. Joe has received photography and film accolades for his work.



### JENNIFER STRONA | Research Associate

Jennifer Strona works with the National Park Service as a science communicator and data-wrangler for the Natural Resource Condition Assessment Program in the Natural Resources, Stewardship, and Science directorate. Jennifer assists with web page production, illustration, and editing technical reports covering a wide variety of natural resource topics. She has also facilitated manager-scientist discussions on interdisciplinary park resources and infrastructure. Jennifer has worked as a Professional Geologist in environmental consulting, with experience in natural resources inventory, impact assessment, and site remediation.

## 2022 Visiting Photographer & Interns

### KATE OCHSMAN | Photographer



Kate Ochsmann is an award-winning, international wildlife photographer and photographic guide. Based in Gardiner, MT, she runs her own photographic guiding company, All Things Wild, taking guests on tours throughout Yellowstone National Park and abroad to places like the San Juan Islands and South Africa. Kate's mission is to help others fall in love with all things wild through a deepened connection with the natural world.

### LESLIE NUCKOLES | Intern



Leslie Nuckles was NRCC's spring 2022 AmeriCorps service member through the Teton Science Schools. Leslie assisted in planning a panel on high elevation ecosystems with NRCC Research Associates and wrote an accompanying article featured in this issue. Leslie is an experienced river guide, outdoor educator and is currently pursuing a master's degree in Aquatic Ecosystems Management at Utah State University.

### ANNAH DETWILER | Intern



Annah Detwiler was NRCC's fall 2022 AmeriCorps service member through the Teton Science Schools. Annah began planning efforts for the 2023 Jackson Hole Wildlife Symposium and revamped NRCC's social media platforms. Annah is a recent graduate in Wildlife Resources from the University of Idaho and aspires to take a deep dive into animal behavior. Originally from Idaho, Annah has visited the Tetons since she was eight and loves taking long hikes in search of ice cream.



Photo Credit: Kate Ochsmann

## NRCC AT 35

More Relevant than Ever Before, NRCC Fills an Important Niche in Helping Us Make Meaning of America's Most Iconic Wild Ecoregion

— By Todd Wilkinson

*Consider the following seemingly disparate events that are all, in fact, inter-related pieces in a complicated landscape puzzle. Exotic lake trout find their way into Yellowstone Lake, decimating the cutthroat trout population and casting off ripple effects across the food chain. Warming temperatures in the high country allow mountain beetles to thrive and attack whitebark pine trees whose cones produce seeds that are a vital food source for grizzlies, Clark's nutcrackers, and red squirrels. The Covid pandemic causes an unprecedented wave of humans to head for the American interior and the resulting footprint threatens to set back more than a century of gains in wildlands protection.*

Myriad, literally endless other dramatic examples are now occurring in the Greater Yellowstone Ecosystem at an accelerating, head-spinning pace. Who is paying attention to all the changes and connecting the “dots”? Besides the non-profit journalism site I founded, *Mountain Journal*, there's another entity where I am proud to say I serve as a Writer-in-Residence — the Northern Rockies Conservation Cooperative (NRCC). Both NRCC and *Mountain Journal* are focused on details and at the same time, connecting them to a bigger, more integrated picture.

As a longtime environmental writer, for me, NRCC functions as a nexus for scientists, analysts, and leaders who are tracking key trendlines in the Greater Yellowstone Ecosystem. Their team is extremely experienced on the ground. In fact, insights gleaned from interviewing many different NRCC personnel are part of my own new book, *Ripple Effects: How to Save Yellowstone and America's Most Iconic Wildlife Ecosystem* (Wyatt-MacKenzie Publishing, 2022).

Greater Yellowstone is known world-wide for American wildlife conservation. The term “wildlife conservation” also means paying attention to human needs and the whole environment — nature. Today, the ecosystem is considered a bellwether for the pressing need for humans to learn to live with wildlife and nature amid a mushrooming human footprint, including climate change. Since its creation in 1872, Yellowstone and the larger mosaic of public and private lands around it, known today as the Greater Yellowstone Ecosystem, is a major conservation focus for many.

NRCC is among the Jackson Hole-based organizations that emerged from the modern environmental movement. Now in its 35th year, NRCC fills a niche no other entity does. Founded by Susan Clark and Denise Casey in a living room across the street from the National Elk Refuge, NRCC was born from the notion that lasting conservation is about far more than touting science and enacting environmental laws. Understanding human nature and improving our competency represents the crucial X factor in human attempts to protect the natural world.



NRCC approaches policy and management by bringing together ecologists, social scientists, and many others. This orientation considers both biophysical matters and human processes (actions, relations, and values) to better understand how to solve difficult problems. While largely unheralded, given its track record, NRCC's biggest contribution to advancing conservation of the GYE has been its role as a nexus for genuine inter-disciplinary thinking, projects, work, and writing. Leading the effort has been Susan Clark.

For decades, Clark has spent the academic year as a professor at the Yale School of the Environment. She has amassed an incredible CV of books, peer-reviewed papers, and field work. She has been a magnet attracting a long list of NRCC Research Associates that represent a who's who of people doing cutting-edge work ranging from indigenous leaders to elected officials, and veterans of government to well-known conservationists.



Susan Clark

Clark herself has had a constant presence in the region, including a thirty-plus year engagement with the Greater Yellowstone Coordinating Committee, the government entity that seeks coordination amongst all federal agencies on transboundary resource matters.

Back at Yale, Clark uses the GYE in educational coursework, influencing generations of young leaders. In fact, NRCC's Executive Director Ben Williamson, was one of those students. He was drawn here because of lessons gleaned from Clark's classes and the opportunity to integrate more than traditional science in regional conservation. Peyton Curlee Griffin, the NRCC Board President, is another leader in the region for the same reason. There are many others throughout the Yellowstone region and beyond.

## CONTRIBUTING "FIRSTS" IN THE CRADLE OF AMERICAN CONSERVATION

What few people may know about Clark is that she spent many years in her early career working on endangered species conservation in the GYE and farther afield. For instance, along with her friend Franz Camenzind, an award-winning wildlife filmmaker and biologist, they documented the existence of black-footed ferrets in Wyoming after the federal government had classified them as extinct. Years of field work contributed to the species conservation today.

Clark also assembled the first volumes devoted to cataloguing Wyoming's native flora and fauna. Many other seminal works have come from NRCC, including the first assessment of endangered and sensitive species in Greater Yellowstone by Ann Harvey, NRCC's first Research Associate, and Clark. Other important works include the first bibliography of GYE scientific literature, the first GYE-based teacher's curriculum and the first overall assessment of the health of the GYE.

"NRCC connects people across disciplines, organizations, geographies, beliefs, concepts, and practices," says Peyton Curlee Griffin, NRCC Board President. "Susan, and others in NRCC, use integrative, bridging approaches that have helped frame both urgent needs and attainable improvements for conservation. NRCC's biggest contribution has been to advance the way we see challenges and go about doing coexistence work."

NRCC's conferences, publications, professional development workshops, and intern programs all increase human capacity, the most important determinant of how well we'll be able to achieve a future where humans and wildlife thrive."

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## DELIVERING RELEVANT AND TIMELY PERSPECTIVE

From the beginning, NRCC has realized the importance of understanding and conserving species and ecosystems that aren't always appreciated or well-funded. Its cooperative approach brings people together in ways that are much more effective than the usual fragmentation in science and conservation.

A good example of this integrative model includes the long-term amphibian program carried out by Research Associates Chuck Peterson, Deb Patla, Andrew Ray, Blake Hossack, and Erin Muths. In 2022, along with colleagues, the team published a special issue in *Ecological Indicators*. It summarized the multi-decade program's understanding of amphibian responses to a changing climate. "This is a good illustration of one project leading to numerous others. Spin-off projects include the role of beavers in creating healthy amphibian habitat and the need to mitigate the impacts of roads and other developments on wetlands," says Griffin.

Year in and out, NRCC projects have not only been relevant, but also timely. Often, projects are used to inform a fuller picture of environmental change and impacts. For example, several weeks before the June 2022 floods in Yellowstone, Mike Tercek, Taza Schaming, Trevor Bloom, Gao Yufang, and Ben Williamson led a special session at the National Park Service's *Biennial Scientific Conference on the Greater Yellowstone Ecosystem* focused on critical trends at work in high elevation ecosystems in the GYE and around the world. The floods that came just a few weeks later were illustrative of the warnings and critical needs highlighted by NRCC's panel.



Peyton Curlee Griffin

The panelists discussed the outlook for life-giving snow and water cycles, the future of whitebark pine stands and the myriad life forms that depend upon them, blooming times of wildflowers that sustain pollinators, and the cultural relationships people have with this and other high elevation ecosystems. "This panel is a good example of how NRCC has taken a leadership role in examining interconnected changes happening in the Greater Yellowstone and highlighting where attention, cooperation, and innovation are possible and needed," Griffin says.



Taza Schaming

One of the panelists, Taza Schaming, studies Clark's nutcracker behavior and demography, and aims to understand the impact of the decline of whitebark pine. The corvids and high-altitude trees have a mutualistic relationship in that the seeds provide nourishment to the birds and in turn, they help distribute the seeds that yield new trees. However, blister rust and beetle outbreaks fueled by warmer temperatures have decimated whitebark pine, which bodes ill for nutcrackers and grizzlies that eat the nutritious seeds. I asked her to give examples of what she thinks might lead to better conservation outcomes. "Innovative solutions to management issues and increased ability to adapt instead of maintaining the status quo of management strategies," she said.

## FROM FIELD RESEARCHERS TO THOUGHT LEADERS

Over the years, NRCC has amassed an impressive network of professional contacts, in and out of government. This group also informs Clark's writing, research, and teaching at Yale. "Susan has been a friend and mentor to me," says P.J. White, Yellowstone's Chief of Wildlife and Aquatic Resources. "There are no trivial conversations with Susan. She asks complex and provocative questions in a collegial manner that force you to expand your thought process, focus on the important issues, and clarify your goals. She also helps you to consider viewpoints of others to try to find a solution that provides the greatest benefits for the broader community."

White says field research is the foundation for improving societal understanding of wildlife and ecological processes. "Being in the field and making observations leads to new perspectives and innovative ideas that improve our knowledge and management," he says, adding that field research also builds a spirit of curiosity, commitment, dedication, and perseverance in young scientists. "NRCC contributes to this foundation through their commitments to scientists and dedication to communities, which yields credible knowledge to facilitate our collective conversations about complex management issues," he said.

Michael Whitfield, who runs NRCC's longest-running project, started his career and gained renown as a bald eagle biologist bringing attention to how development and human use of the Snake River system was impacting these majestic raptors.

Whitfield went on to be a leader in private lands protection in eastern Idaho. Today he is an elected member of the Teton County, Idaho Commission wrestling with developmental sprawl, in part caused by the spillover effect from Jackson Hole. Along the way, at every step of his career, he has valued his association with NRCC.

"The NRCC vision has always been about the big picture. That insight of the broader landscape has grown from Greater Yellowstone to the Northern Rockies to now the entire planet," Whitfield says. "As the scope has grown, the research relevance has also deepened. NRCC associates are always encouraged to look beyond the superficial effects to the causative forces, the policies, and political drivers. NRCC is important because it encourages research beyond single narrow arenas to results for the long-term."

Whitfield believes in the value of objective, empirical science, but he also says that scientists are humans first and they ought not to flinch at the notion that they are drawn to areas of interest because they have a passion for the subject. "My working life has been an experiment in how I could most effectively conserve the nature I love. Conservation effectiveness has been the core motivator for each step of my career, and Susan informed those choices. Susan always encouraged me to look behind the curtain, to examine why and how decisions were made rather than just the end result," Whitfield says.

Another long-term Research Associate is Susan Marsh, an award-winning nature writer. For three decades, Marsh worked for the U.S. Forest Service, where she served as a specialist in managing backcountry areas. Marsh was part of a blue ribbon, multi-agency team assembled in the late 1980s to write a plan that would unite managers around a common vision. While politics derailed it, the attempt was instructive to Marsh and in the years' since, as a private citizen, she's been on the front lines of many issues relating to human overuse of wild lands.

In 2019, Marsh received the Raynes Citizen Conservation Award, named in honor of the late Bert and Meg Raynes who personified citizen conservation in the region. Maintaining an affiliation with NRCC as a Research Associate, Marsh exemplifies how NRCC provides a home base for individuals who have distinguished themselves in their professional lives and still want to remain engaged after their retirement from civil service. "NRCC has been a true collaborative for many years, and I'm proud to be part of its large group of associates," Marsh says.

## PROBING THE HUMAN CONNECTION TO WILD NATURE

A specialist who explores the intersection between human values and land conservation, Hannah Jaicks, another Research Associate, is most intrigued by how culture informs options that ecosystem stakeholders consider in their decision-making. By chance, Jaicks bumped into Clark on the Jackson Town Square



Michael Whitfield



during a trip for her dissertation research. As is her habit, Clark invited Jaicks to coffee. “I really liked how challenging Susan’s questions were. It felt like she was genuinely trying to see how I think. It’s that same curiosity and capacity for challenging one to articulate their thoughts that’s made Susan a critical and valued advisor of mine 10 years later,” Jaicks said, noting that Clark



Hannah Jaicks

introduced her to NRCC after their first meeting. “I very quickly felt like I had finally found a home of fellow thinkers who challenge disciplinary boundaries and seek out ways to get us unstuck from our wicked conservation challenges here in the West, as well as globally.”

Describing her training in environmental psychology, Jaicks says, “I have always loved the

natural world and been fascinated by our relationship with its inhabitants, so I chose to merge my background in animal behavior with human psychology in order to creatively apply key concepts from both fields.”

In some cases, lessons learned in Greater Yellowstone were applied elsewhere, as in the case of wolves. Research Associate Matt Barnes serves on the Colorado Wolf Restoration Stakeholders Advisory Group and Research Associate Richard Reading was just appointed to the Colorado Parks and Wildlife Commission, the group that is overseeing the new state mandate to reintroduce wolves to Colorado. Both are seeking better decision-making processes that integrate the health of ecosystems with the needs of communities.

But NRCC’s reach goes well beyond the intermountain West. Research Associate Carlos Lopez Gonzalez is working to recover Mexican wolf populations and large cats in the deserts of Mexico and across the border into the U.S. In June 2022, Research Associate Mimi Kessler and colleagues published a first-of-its-kind assessment of Great Bustard populations in Central Asia. Bringing together delegates ranging from Mongolia, Iran and eastwards to China, the effort represents a call to action for the conservation of one of the largest-ranging grassland birds in Asia. Catastrophic losses of bustard populations are much more likely to be reversed through this type of large-scale information sharing and cooperation.

## NEW PARTNERSHIPS AND NEW THINKING

In the real world, Executive Director Ben Williamson notes, the sheer magnitude of conservation, democratic, and social issues can be overwhelming. “The recent acceleration of world-rearranging events can best be understood as symptoms of the deeper crisis of our times – many of which have to do with human-to-human and human-to-nature relations,” he explains. The challenges facing the GYE are indeed connected to the larger climate trends and the tandem weakening of our societal fabric. He adds, “All evidence points to a future that won’t be how it is now or in the recent past.”

While that may sound wonky to some citizens, Williamson

offers this translation: we cannot resolve problems using the same approaches that created them.

“The problems themselves can be used as a chance to change our underlying ideas of what it means to live a meaningful life in nature.

It will require a transformation in how we go about organizing our institutions, starting with the individual self and how we make meaning for ourselves. It will also require a groundswell in motivation and rationale to make constructive changes. Perhaps, the growing crises we see today will be enough to set this kind of transformation into motion,” he says.

NRCC is trying to create positive transformation and it starts with the caliber of people it has brought together. “Rather than focus on specific themes, our goal is to enable capable, experienced, and competent people, who we call ‘change agents,’ to carry out work that has practical societal and environmental benefits,” Williamson says. In this, NRCC continues to extend and strengthen its network of people and seeks partnerships where they haven’t existed before.

*“Rather than focus on specific themes, our goal is to enable capable, experienced, and competent people, who we call ‘change agents,’ to carry out work that has practical societal and environmental benefits.”*

Additionally, NRCC is doing integrative problem-solving in the management policy process, by providing skill-building, leadership capacity, and educational workshops and seminars for groups in the region. “Problem-solving can be thought of as a skill or a method and it starts with asking better questions and paying closer attention to the world around you. Over the past 35 years, NRCC has helped many people become better equipped to deal with the environmental problems they are interested in,” says Williamson.

NRCC believes more ardently than ever in science, particularly in an age when attacks on science are raging. But science doesn’t typically have the last word. And so, NRCC seeks to incorporate reliable science to build better social and institutional processes. If we don’t understand the problems for wildlife and humans, we can’t hope to solve them. NRCC promotes a larger strategy and co-creates a road map for conservation gains.

“NRCC is on the forefront of diverse contributions that help us work together to create a healthy future for all,” Griffin notes. And then she adds, thinking about the future her own children will be inheriting from us, “Greater Yellowstone will be ‘saved’ only if we can agree on what we want its future to look like and work together to reach that healthy future.”



Ben Williamson



Photo Credit: Colin Wann

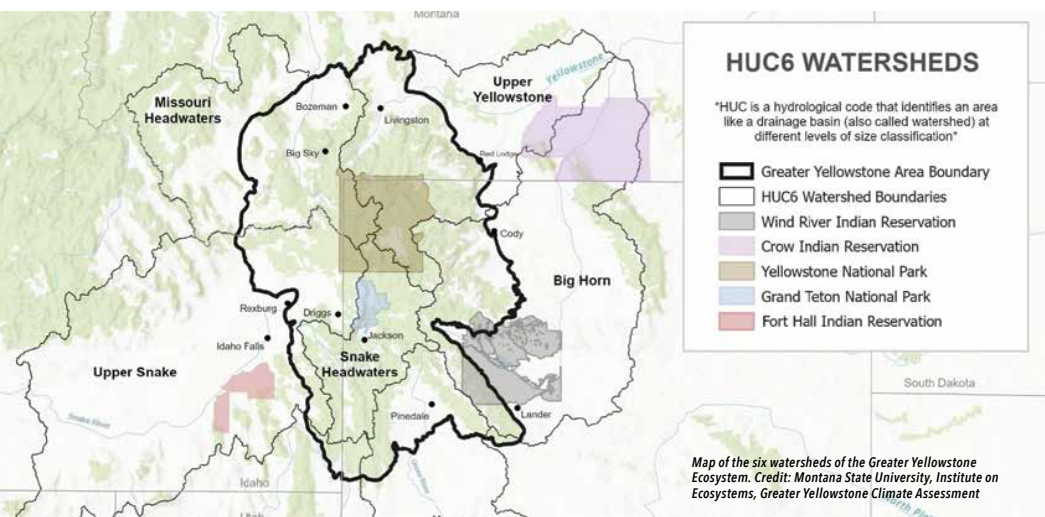
## THE ROOFTOP OF THE ECOSYSTEM

—By Leslie Nuckoles, NRCC’s Spring 2022 AmeriCorps Service Member

*High on the talused slopes I savor an endless view and the chill morning wind. It’s a crisp, fall day but the blue sky has set the Tetons to glowing and makes up for my frozen fingers. A Clark’s nutcracker gives a raspy, irritated call from behind me, no doubt annoyed that I am leaning on his breakfast tree. The whitebark pine lifts its gnarled wind-twisted branches over my head and I am grateful for the warmth its pale bark has absorbed from the morning sun. The tree’s upper branches are laden with heavy purple cones, each scale hiding a rich, oily seed the nutcracker needs to get through the coming winter. He is busy caching seeds this time of year, filling the pouch beneath his tongue with hundreds, to be buried a few inches beneath the soil and retrieved in leaner times.*

Change is happening in the Greater Yellowstone Ecosystem and other high elevation regions at an unprecedented rate. We hear it from those who’ve lived here for decades, in the stories about the snow thirty-years ago, and from the scientists who watch the numbers shift. The delicate webs of life are inextricably linked to deep snow, harsh winters and short, brilliant summers. These cycles are shifting rapidly with the onset of climate change. Everything is connected – from the non-human ecosystems to our towns and cities to the larger cultural context. What happens here, where three of the nation’s largest rivers begin (the Missouri-

Mississippi, the Colorado, and the Columbia), has downstream effects both biologically and symbolically. Combined with its status as a headwater’s region, the GYE contains one of the nation’s oldest conservation legacies – how we manage this area in the face of climate change sets an example for environmental stewardship across the country. Here at NRCC, Nancy Bockino, Taza Shaming, Mike Tercek, Trevor Bloom, and Gao Yufang are all Research Associates who have worked in high elevation ecosystems for many years. Their work exemplifies the critical and multilayered nature of the changes that are occurring within the upper reaches of the GYE.



## NATURAL

The whitebark pine, a keystone species at high elevations, fills a critical role in maintaining the integrity of our upper watersheds. The pines shade the winter snowpack, slowing spring melt-off and holding on to the “water bank” for later in the season. Nancy Bockino is a field ecologist and has studied the trees for 20 years. She calls them the “rooftop of the ecosystem.” Unfortunately, as winters have steadily warmed, the whitebark pines have found themselves in a precarious situation, threatened by a duo of intersecting challenges – amplified by warming weather, drought and changes in fire regimes.



White pine blister rust, a non-native fungus, arrived on the scene in the 1930's, a hitchhiker on a shipment of seedlings from Europe. It kills trees slowly, forming large blisters that eventually strangle the tree. Efforts have been underway for decades to breed genetically resistant trees, but it is a slow process. The second significant threat is the

mountain pine beetle. Unlike blister rust, beetles have long been integrated in this ecosystem and there's evidence that seedlings may, in fact, do best under a beetle-killed canopy. However, beetle populations were typically kept in check by spring and fall cold snaps that killed their larvae. With steady warming and fewer cold snaps, the population has exploded. Along with extensive monitoring of thousands of trees, Nancy and her crew identify mature, seed-bearing trees and protect them with pheromone packets that effectively repel the beetles. She cites an example in Grand Teton National Park where, thanks to the packets they've

tacked on the trunks of the trees, a stand of whitebark continues to produce a yearly crop of cones contributing to the leggy stands of young pines growing from under the brown overstory. She hopes that this stand, and others like it, will provide for the continued survival of the species.

Since 2009, Taza Schaming, an ornithologist, has been studying how the decline of whitebark pines is closely connected to Clark's nutcracker breeding ecology, home range size, habitat selection, foraging behavior and dispersal strategies. The nutcrackers, a member of the crow and jay family, have a remarkable spatial memory that allows them to cache whitebark seeds across the landscape, which they return to as a reliable food source. Some forgetfulness is inevitable, and the seeds that are left uneaten become the next generation of pines – a strategy that enables the whitebark pines to disperse their seeds. Taza refers to the nutcrackers as “forest architects,” distributing seeds across a wide range and providing a critical food source for more than one hundred species.

As climate changes, the nutcrackers will play an important role in moving seeds across landscapes, allowing whitebark pine populations to migrate, as old habitats become uninhabitable and new habitats become available at higher latitudes. Taza hopes that her research can fill gaps in knowledge, so bird behavior can inform management strategies to take a landscape scale view when deciding on restoration and habitat improvements. “Everything is connected,” says Taza, “and nothing is untouched by humans.”



## SOCIAL

The human role in the GYE cannot be underestimated. People have gathered in this area to find food, trade, build tools and participate in ceremonies for millennia, and nearly every tribe in the region has an origin story here. Human visitation, though vastly different from previous centuries, continues to this day. With ever-increasing numbers comes a growing demand that the management process upholds the integrity of high elevation areas. This is a human process among federal agencies, local communities, visitors, and many others, where values are reflected in the decisions that are made. Management responses to whitebark pine mortality, recreation demands, downstream water use, and wildfire, are just a few examples of the types of decisions taking place. Across the ecosystem, managers and scientists recognize that we are doing a good job at understanding the changes to the natural world. But many others think we are under-examining the value dynamics in human decision-making – with enormous implications for how change is dealt with and how trust is built or lost.

Mike Tercek, a climate scientist, points out that in the near-term, changes to global temperatures will make the GYE more

*“In my mind, values and the sense of being part of something bigger, are more important than the science we do. The most important question is, what do we want Yellowstone to be in the future? It won't regulate itself. We have to decide what it looks like. We have to decide what values we want to maintain.”*

– Mike Tercek

hospitable compared to places in the U.S. at lower latitudes as they become intolerably hot. He follows this up by saying that in the long term, higher temperatures will cause human and biodiversity crises even at high altitude places. After 20 plus years of gathering data and building graphs, Mike says, “In my mind, values and the sense of being part of something bigger, are more important than the science we do. The most important question is, what do we want Yellowstone to be in the future? It won't regulate itself. We have to decide what it looks like. We have to decide what values we want to maintain.” As more people are flocking to the GYE in record numbers to visit and stay permanently, the demand to meet increased management challenges becomes urgent. Seeking to meet the more immediate challenges, Mike is shifting his focus from solely climate modeling, and instead seeking out ways to build partnerships with agencies to iteratively and quickly get information to the people who work in wildfire, flood, drought and parks to improve proactive planning across the system.

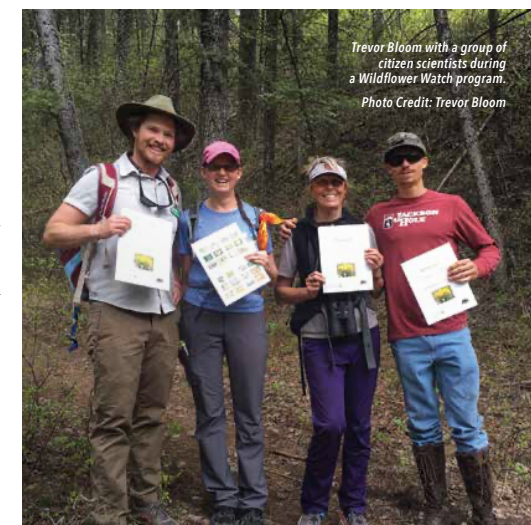
Trevor Bloom, a community ecologist at The Nature Conservancy, is also working to participate more fully in the social sphere. Trevor studies plant phenology, and recently published a report that found early flowering species in the Tetons are blooming up to three weeks earlier compared to the observations of Frank Craighead in the 1970's. Recognizing that wildflower timing is something everyone can observe, he wants to leverage this project to engage people on a more personal level.

He leads trainings called Wildflower Watch, to teach citizens how to collect information on timing of flowering events, which he uses to augment the phenological research. Additionally, he created a native plant garden at the National Museum of Wildlife Art and has produced several short documentaries about climate change in the GYE. For Trevor, the value of his research goes far beyond the conclusions. He believes that it is vital for people to form personal connections to nature and take it one step further by learning how to care for ecosystems. Trevor sees citizen science as a means to build respect and trust into science as a way to foster this type of care. The hope is that more people will engage in this work, and so, more people will feel empowered to act responsibly in the ongoing coexistence effort between our growing communities and the landscapes where they are located.

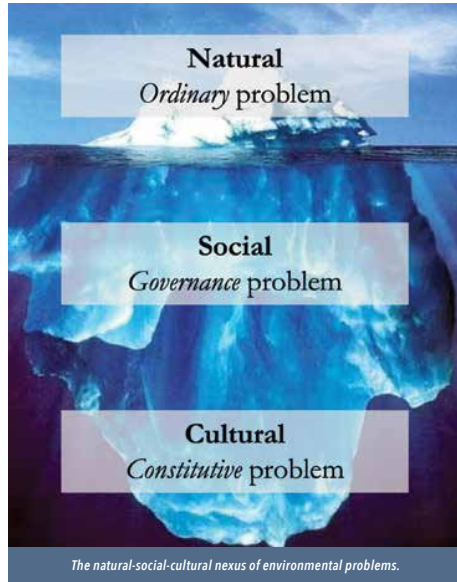
## CULTURAL

Gao Yufang, a PhD student in Conservation Science and Environmental Anthropology at Yale University, studies human-wildlife interaction on the high Tibetan Plateau. Gao sees himself as a “conservation edge-walker,” what he describes as “someone who can build bridges between people and wildlife, natural sciences and social sciences, theory and practice, the East

and the West.” He does this through a lens of a natural-social-cultural nexus. The problems that high elevation ecosystems face are implicated in this three-tiered framework and achieving coexistence requires considering all three layers together.







The “ordinary problems” are about the ecosystem and natural processes and are often responded to by scientists and managers with solutions that are typically technical — many of which we already know how to do, like thinning, planting, prescribing fire, to name a few. Beyond our ordinary problems, Gao has found that many of our conservation problems are rooted in a social process, which has to do with “governance, trust, collaboration,” the ways our organizations and agencies operate. Lastly, Gao sees that our challenges are fundamentally built on the meaning-making practices, norms, conventions, and stories that underpin our societal relationship to nature. This is what he refers to as the cultural or constitutive layer.

From this cultural lens, high elevations are both a descriptor and a symbol, and people project different meanings depending on the context. So high elevations can be examined in their geographic and biologic scales, and they can also be thought of in terms of their significance to people. Gao notes that this “cultural dynamic is most oft missed when working on conservation challenges.” Many see culture, thought, and belief systems as too complex, too abstract, or too far out of reach to consider in conservation work. But many others have characterized our past

fifty years of conservation strategy as not nearly adequate to achieve the outcomes desired. The need for a deeper systemic change likely lies in a change in beliefs. Gao seeks to bring attention to these belief systems, and he does so by looking at the many different contexts of conservation across the world. In Western contexts, there's a dominant belief that divides and dichotomizes people and nature, a force that's always in play but hard to discern. Gao points out that this belief system is what underpins the responses, both technical and social, most often used in GYE conservation efforts.

A good example of cultural beliefs can be seen in the Himalaya, where Gao works with Tibetan Buddhist Monks to understand their approach to livestock-predator interactions, often including snow leopards, wolves, yaks and sheep. A foundation of their worldview is believing that all sentient beings are born equal, humans and wildlife are interdependent neighbors, and conflict occurs because equality is broken by outside factors. Because of this worldview, the Tibetan Monks see some loss of livestock by predation as part of a functioning ecosystem; something to be accepted rather than changed. The result is a vastly different standard for coexistence than what is typically accepted in Western conservation efforts. Gao explains, “Our foundational beliefs, the stories we tell about ourselves, change the way we interact with the world.”

The challenges we face today are bigger than mechanical solutions. Protecting a tree, removing a dam, replanting a burn, are important to keep doing, but they aren't enough. We need a new story. A story of interconnection and coexistence and responsibility and sense of place. As Charlie Craighead notes, the GYE is the headwaters and an icon in conservation. If we truly intend to care for this place, and set an example for others, we will need to examine not just our practices, but also our beliefs. We need to re-write the stories we tell ourselves and the stories we teach. As Tashi Sangpo, a close collaborator of Gao's writes, “The environmental crisis we are facing today is fundamentally cultural; what has changed is not the environment, it is the human mind...What we need to do is reconstruct how we view the world...This world belongs not only to humans but to all life.”



Gao Yufang interviewing two Tibetan Buddhist Monks during a 30-month phase of field work in the Himalayan region. Photo Credit: Gao Yufang

This article uses quotations and information from a special panel of NRCC Research Associates at Yellowstone National Park's 15th Biennial Scientific Conference on the Greater Yellowstone Ecosystem in Bozeman, MT in May 2022, titled “Challenges to High Elevations Ecosystems in the GYE.”

## REINTEGRATING WILDNESS:

From the Northern to the Southern Rockies across the heart of the West

— By Matt Barnes, NRCC Research Associate

When Aldo Leopold concluded in “Thinking Like a Mountain” that perhaps the hidden meaning in the howl of a wolf, echoing from the rimrock, is the same as in Thoreau's dictum, “in wildness is the preservation of the world,” he hinted at an important point: wildness is inherent in all of us. For literary purposes, Leopold condensed his realization into a moment of watching the green fire die on the riverbank, but the truth is this was the decades-long unfolding of an ever broader, more inclusive, more integrated view of apex carnivores, land, and people.

Here at NRCC, we've been carrying that fire, working on land and wildlife restoration and coexistence. We are drawn to grizzly bears or wolves because they are the species most like us and yet the most relegated to Other status, and as such they raise subtle questions about our relationship to the more-than-human world. NRCC's co-founder, Susan Clark, uses the integrative policy sciences framework to promote a coexistence paradigm to deal with complex environmental challenges. Research Associates like Douglas Clark and Dave Mattson apply this coexistence paradigm to large carnivores like grizzlies and cougars. Steve Primm, Seth Wilson, Hannah Jaicks, Timmothy Kaminski and others have applied it in collaborative conservation projects with rural communities in the Northern Rockies.

My own work involves reintegration of wildness in the ecological sense, as exemplified by coexistence with wolves, bears, cougars, as well as with fires and floods — as well as in the cultural sense, here in the mountain West.

We've inherited cultural ideas about the land, especially this land. Clashes over values about the West are often framed as a clash between the Frontier Myth and the Wilderness Myth.

Both may be projections of even deeper ideas about Paradise, Fall, and Redemption. It's not simply a dichotomy of Old and New West, right and left, utilitarian and mutualistic values — but an evolution of partial perspectives. Properly understood, the Wilderness Myth is more inclusive and transcends the Frontier Myth; yet beyond both we may find a coexistence where mutualistic values inevitably include a degree of use of the land. But who, exactly, is the we? That leads us to the subtle, mostly unanswered questions about the basic and foundational nature of nature.

*“If indeed the health of the entire spiral of human development underlies all progress, I contend that promoting growth among all will get us to a future of coexistence faster than oppositional strategies.”*

We inevitably work closely with people who hold competing values and visions. If indeed the health of the entire spiral of human development underlies all progress, I contend that promoting growth among all will get us to a future of coexistence faster than oppositional strategies.

As a rangeland scientist and former ranch manager, I work to promote the evolution of western ranching into a way of living on the land that can coexist with carnivores. The Frontier Myth is strong, yet there are progressive trends: from self-identifying as cattle producers to grass farmers to land health stewards; from continuous grazing to rotational grazing to strategic grazing management; from feedlot finishing to grass-fed; and from conventional livestock handling to low-stress livestock handling. I actively promote strategic grazing management and low-stress herding both in the rangeland management profession and on the ground, from Montana to Arizona. For example, I spent a few years partnering with livestock permittees on the Shoshone National Forest in Wyoming, who then used those methods to prevent conflicts with grizzly bears and wolves. Those ideas are now increasingly being adopted and promoted in the rangeland profession and among carnivore coexistence practitioners.

Matt Barnes demonstrating low-stress herding. Photo Credit: Matt Barnes







Matt Barnes on the Upper Green River at the start of his 700-mile expedition to investigate wildlife corridors between the Northern and Southern Rockies. Photo Credit: Matt Barnes



## CONSERVATION AND MONITORING DURING AN ERA OF RAPID ENVIRONMENTAL CHANGE

— By Andrew Ray, NRCC Project Partner

Field technician Mary Greenblatt surveying for amphibians near the Snake River in Grand Teton National Park.

Photo Credit: Andrew Ray



A wolf near the border of Yellowstone National Park. Photo Credit: Kate Ochsman

se. Known as “impact-based management,” we are recommending that there be no population target, and that conflicts be dealt with on a case-by-case basis with non-lethal methods being prioritized over lethal control.

Last year I paddled the length of the Green River across the arid “Heart of the West,” to the Colorado River, exploring potential connectivity for wolves, wolverines, and grizzly bears from the Northern Rockies to the Central and Southern Rockies. A journalist joined me across Wyoming’s notorious “predator zone” and into Colorado, covering the expedition in a story published in *High Country News*. I documented the expedition with photos and videos, and I am now working to tell the story through a film.

On the riverbank, contemplating my own myths of frontier, wilderness, and the redemption I see in the unfolding of coexistence, both as a paradigm and as the on-the-ground efforts of many of us at NRCC, I am reminded that wildness and garden, predator and prey dance as opposites in the human mind. I work for the restoration of the full predator guild up and down the Rockies, and for a human culture capable of that dance. The river seems to flow from Old West to New West and beyond; yet the river cannot be traced to a single source, and merging with innumerable tributaries without ending, grows ever wider and deeper.

Those of us fortunate enough to call the Greater Yellowstone Ecosystem home appreciate the largely intact ecosystems captured with the region’s vast public and private lands. In the GYE, nearly two thirds of the land area is managed by federal agencies charged with maintaining or restoring healthy functioning ecosystems. Land and resource managers now strive to study, understand, and address the fact that air temperatures in our region have risen dramatically since the 1950s (Sepulveda et al. 2015) and temperatures since 2000 were warmer than any period in the last 1,250 years (Heeter et al. 2021). We also know that warming is contributing to more prolonged and severe drought (Heeter et al. 2021), reductions in snowpack (Tercek et al. 2015), increased fire frequency and severity (Tercek 2019), and changes to the hydrology of rivers (Al-Chokhachy et al. 2017) and wetlands (Ray et al. 2019). Without effective and timely strategies to curtail CO<sub>2</sub> emissions, projections for this region suggest continued warming (Hostettler et al. 2021), the consequences of which will be seen and felt in our forests, grasslands, wetlands, and riverways. These changes throughout the GYE will undoubtedly influence residents’ way of life, visitor experiences, and most importantly its plant and animal communities.

While climate projections for the GYE are concerning, climate change has already had observable effects on biodiversity. Globally, losses of vertebrates are happening at a rate that is 100 to 1,000 times faster than centuries past. Declines in insects,

amphibians, birds, and mammals are well documented. In the GYE, whitebark pine die-offs, shrinking glaciers, and warming river temperatures leading to the upstream movement of aquatic invaders (e.g., smallmouth bass) are all evidence of the regional manifestations of climate change. These examples demonstrate that the expansive areas of land and vast network of water under careful stewardship in the GYE do not exempt this landscape from the singular and interactive effects of climate change and other ecological drivers (i.e., invasive species, novel diseases, and land use change).

As practitioners of conservation, how do we get traction when the environment is literally changing around us? In 2022, the effects of severe dryness (dry fall and reduced winter snowpacks) and extreme flooding (above average spring rains combined with the June 10 to 13 atmospheric river event) were present within months of each other. This type of ecological ‘whiplash’ between opposing weather conditions (severe drought and significant flooding) is becoming increasingly common (Swain et al. 2018) and the frequency of extreme weather events is expected to increase. As conservation practitioners, we need a systematic approach to tracking responses to these short- (weather = floods) and long-term (climate = drought) events. Conservation scholars generally agree that ecological monitoring or the organized use of observations to address science-driven questions regarding the health (state) of ecosystems is essential for their proper stewardship.





Andrew Ray surveys a small pond in the Yellowstone backcountry. Photo Credit: Lindsay Coe



Field technician Katie Davis takes an environmental DNA sample. Photo Credit: Lindsay Coe

Recently, my colleagues and I reflected on a long-term amphibian monitoring program launched in 2006 (Ray et al. 2022). Our multi-species, amphibian monitoring program is now one of the longest running in the Western U.S. and was started after years of thoughtful planning by some of the regions most recognized natural historians (Debra Patla, Chuck Peterson, Rob Bennetts, and Steve Corn). I'm thrilled to report that this year our NPS and NRCC crews completed their 17th consecutive year conducting surveys. That work has offered important insight on the status of the GYE's amphibians and the wetlands where they breed. Two of our region's most common amphibian species, Boreal Chorus Frogs and Columbia Spotted Frogs, occur in most of the watersheds we monitor in Grand Teton and Yellowstone national parks, and have not shown the concerning declines that have been reported elsewhere for similar species on protected lands (Halstead et al. 2022, Adams et al. 2013). Tiger salamanders, while widespread in our region, are most abundant in Yellowstone's Northern Range and Grand Teton National Park. Western toads are less widespread but are thought to be less common than they were historically (Koch and Peterson 1995).

Our work reveals that all GYE amphibian species benefit from the habitat created by beaver impoundments (Hossack et al. 2015). This insight is critical to planning and implementing strategies to reintroduce beaver or augment habitats through the introduction of beaver mimicry structures (Ray et al. 2022). In recent years, our program has also worked with partners to examine the benefits of emerging technologies. Notably, remote sensing and molecular tools show great promise in ecological monitoring. For example, satellite imagery offers a bird's eye view that expands our focus from a relatively small number of watersheds to larger landscapes and identifies which wetlands on the landscape are more resilient to climate-induced drought (Brice et al. 2022). We are currently working with the University of Wyoming to delve deeper into the animal use of individual wetlands using environmental DNA (DNA shed from the animal and found in surface waters). While there are some limitations to its use, environmental DNA is inexpensively collected with water samples from wetlands and requires no professional knowledge of amphibian life stages. Monitoring approaches based on eDNA surveys offer hope that our work can be expanded through meaningful participation by community scientists (Estes-Zumpf et al. 2021).

Given the forecasts for this region, I may be most proud of the work that our long-term amphibian monitoring program has done to integrate climate datasets into our workflow. Documenting climate links to amphibian occurrence and their

primary habitats (wetlands and small ponds) has allowed us to identify which species, habitat types, and regions within this large, protected landscape are most vulnerable to anticipated climate change. Finally, collaboration has become standard for long-term, cross-jurisdictional, landscape-scale monitoring. Not surprisingly, our cooperative efforts to monitor amphibians in Grand Teton and Yellowstone national parks is testament to the fact that collaborative monitoring leverages funds, facilitates resource and knowledge sharing, enables the completion of annual work, and supports mutual learning. Collaboration also increases the effectiveness of monitoring, outreach, and, ultimately, conservation action.

We all have a stake in preserving and protecting the GYE. The amphibians and wetlands monitoring represents just one of the many long-term, well-coordinated ecological monitoring programs at work in this region. Information from these programs provides managers and the public with some understanding about how, where, and when resource conditions are changing. For a region recognized as one of Earth's remaining intact wildlands, I would argue that a richer understanding of the region's health is vital to managing through continuous change. Awareness gained through monitoring will further buttress an already robust foundation of science in the GYE — science that supports conservation dialogue, underpins future policy and serves as a spark for public engagement. Finally, synthesizing the web of information generated by multiple sources is not trivial. It requires cooperation by many stakeholders, mutual trust, and the establishment of a common language to communicate and work through management options. This work will be crucial to providing needed insight and a clearer view of the health of this region and serve as an indispensable component of protecting and preserving the GYE's most beloved resources.



Debra Patla checks her net for amphibians. Photo Credit: Lindsay Coe



Photo Credit: Kate Ochsmann

## SENSE OF PLACE REVISITED

— By Molly Loomis Tyson, NRCC Research Associate

Nearly four years ago, I loaded up my van with two dogs, one man, and eight Gazetteer maps for a journey from the Tetons all the way to the Atlantic Ocean. The 43rd parallel was our route. Why the 43rd parallel? I was leaving home, heading East to start a Mid-Career Masters at Yale's School of the Environment. Leaving home after 20 years — the longest I'd ever lived anywhere after a childhood of relocations — the move had me thinking a lot about what connects people to their place and what level of connection inspires protection of that place.

As contentious as environmental politics may be in the Greater Yellowstone region, it seems fair to say that there's a well-developed connection to this place, as varied as it may be. I was curious to see how this measured up to landscapes and communities elsewhere. Considering latitude is a key factor dictating the cast and composition of an ecosystem, following the 43rd parallel created a common thread that could lead us across the country with some degree of continuity.

In gas stations, restaurants, and hotel lobbies I asked people from every walk of life, "What does sense of place mean to you?" When that baffled them, as it did most, I rephrased, "What

connects you to this place?" Most often, the answers centered on community and recreation. Connection to place centered on human doing, not human being. There was never a mention of simply watching the light change across the landscape or recognizing that our health is entirely dependent on the quality of the air, soil, water, plants, and animals — all the things I hold as the foundation of connecting with something greater than myself.

*"Change is inevitable, but what seems to be lacking in our community dialogue, alongside the gratitude for the ability to relocate to places where the "great outdoors" is right outside the door, is the responsibility of stewardship that comes with living in a place like the Greater Yellowstone."*

Four years later, as I consider sense of place again, familiar concerns resurface but this time under the guise of how much and how little COVID has changed us. Despite humanity's central



Photo Credit: Kate Ochsmann



role in the emergence of COVID, little seems to have shifted in acknowledging our dependence on the non-human world and the urgency of rekindling this connection if we are to minimize the potential for future pandemics.

COVID has created an influx of urbanites relocating to small mountain towns throughout the Greater Yellowstone, and our ecosystem and communities are experiencing a host of growing pains. Change is inevitable, but what seems to be lacking in our community dialogue, alongside the gratitude for the ability to relocate to places where the “great outdoors” is right outside the door, is the responsibility of stewardship that comes with living in a place like the Greater Yellowstone.

The entire premise underlying this great migration — COVID — stems from our collective lack of connection to the world’s remaining undeveloped places and a sense of responsibility towards stewarding them through unprecedented levels of human growth, consumption, and impact.

COVID and other emerging infectious diseases are typically the result of wild animals encountering other species, including humans, in unique ways. As growth gnaws away at undeveloped

land and increasing numbers of animals are squeezed into smaller spots of habitable terrain (not to mention humans interacting more frequently with these species), the potential for disease spillover increases. The risk amplifies as already stressed animals are transported around the globe in increasing quantity to meet market demand.

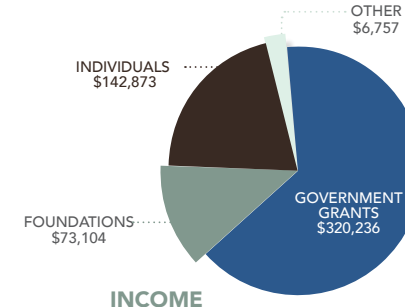
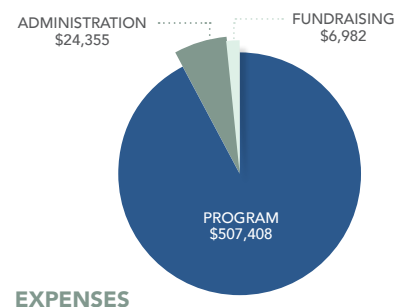
While the forests of Asia, where a still-identified species harboring COVID ended up in a market and transformed our world, may seem worlds away from the Northern Rockies, that same forest doesn’t seem so distant when one considers how our collective lack of understanding and respect for landscapes and humanity’s place as one species amongst many, lies at the root of the pandemic. And, thereby the undercurrent of the changes transforming the Greater Yellowstone.

Sense of place is filtering into the collective dialogue with reminders to newcomers about social norms and etiquette for multi-use trails. Let’s hope the dialogue begins to extend and emphasize how we can care for this place that is not simply a playground, but is also what sustains us and an entire cast of other species.

## 2021 FINANCIAL REPORT

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In 2021, 94% of all expenditures directly supported conservation projects.



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