NORTHERN ROCKIES CONSERVATION COOPERATIVE

Conservation for the Common Good

– Since 1987 –

2018 YEAR IN REVIEW

2018 Has Been Another Big Year for NRCC

NRCC gained a new Program Director, two new Advisors, two new Research Associates, and three new Project Partners, and we made outstanding contributions on the world stage as well as in our backyard in the Greater Yellowstone Ecosystem.

We're excited to welcome Raylene McCalman as our new Program Director. She brings deep experience as a researcher, writer, editor, and educator. Read her own words about her excitement in joining NRCC and spearheading our programs. Please give her a call, send her an email, or drop in and see her in our Jackson office.

We were privileged to add Dick Baldes and Jim Halfpenny to our Board of Advisors, two exceptional natural resource practitioners. We also brought on two new Research Associates, Matt Barnes and Leonard Carlman–Len has served over the past three decades on our Board of Directors and Board of Advisors. Carl Brown, Donal O'Leary, and Monica Robinson joined NRCC as Project Partners. All of these people bring new projects that will shine light on how we can more sustainably live with wildlife.

While reading this year in review, you'll see that NRCC projects blend innovative methods to understand essential, foundational factors like climate change and human attitudes toward nature, with place-based actions like reimagining ranching practices, land use planning, and education. An example is the work Educator in Residence Richard Wallace, Founder and Emeritus Board Member Susan Clark, and Research Associates Gao Yufang, Doug Clark, and Christina Cromley Bruner presented at the World Bank in November.

NRCC's project leaders engage people in powerful, unique, and profound ways. Be it Photographer in Residence R.J. Turner's images that are moving audiences around the world or Writer in Residence and *MountainJournal.org* founder Todd Wilkinson's pieces that are challenging the ways we understand 21st century conservation in Greater Yellowstone. Artist in Residence Katie Christiansen is bringing a book to press with 50 artists and writers who give us a new look at the beauty, power, and promise of Greater Yellowstone.

We hope to see you at the next Jackson Hole Wildlife Symposium on March 8, 2019 where you'll hear leading voices, new findings, and developing innovations in conservation.

Many thanks for your continued support of NRCC.
Sincerely

New NRCC Program Director – Raylene McCalman

When I arrived in the Jackson area earlier this summer, at the urging of a good friend here who shares my love of landscapes and wilderness, I did so with one clear goal in mind: to build a foundation for the next chapter in life. I had no road map or vision for what that might look like, other than it must allow me to engage in what I refer to as 'legacy work'. Legacy work occurs outside of the box, where one takes risks to push the proverbial envelope beyond status quo, where innovation is born, and an environment for future legacy workers is nurtured.

Little did I know when I accepted my friend's invitation to come test the waters in Jackson that I would find a home here and become a member of the NRCC family of 'legacy workers'. I am both thrilled and humbled to have this opportunity to serve and support NRCC and the phenomenal people who make this organization truly unique in the world of conservation.

I bring to NRCC a diverse toolkit from my years of experience in the environmental consulting and public health sectors, adjunct teaching and research in academia, and communications consulting, as well as personal experience managing a predator-friendly ranch in Southwest Colorado while serving as a citizen advocate for human-wildlife coexistence. As an anthropologist, ethnobiologist, and naturalist, I cannot imagine a more suitable landscape for this next chapter, for conducting my own legacy work, and furthering the legacy of NRCC.

Reach out to me at the NRCC Jackson offices at Raylene@nrccooperative.org, as well as for happenings in the Teton Valley, Idaho area.

BY THE NUMBERS

34
NUMBER OF ACTIVE PROJECTS

57
NUMBER OF PROJECTS SUPPORTED IN LAST FIVE YEARS

TOTAL NUMBER OF INTERNS **67**

AVERAGE NUMBER OF EMPLOYEES ON PAYROLL LAST FIVE YEARS
24

8
NUMBER OF RESEARCH ASSOCIATES AT FIVE-YEAR ANNIVERSARY. NOW...
45

64
PARTNERING ORGANIZATIONS

46
TOTAL NUMBER OF WORKSHOPS AND CONFERENCES

AVERAGE ANNUAL INCOME IN LAST FIVE YEARS **$661,092**

95%
PERCENT SPENT ANNUALLY ON PROGRAM

31
YEARS OF LONGEST-RUNNING PROJECT
(Michael Whitfield's Bald Eagle study)

12
STATES
AND
14
COUNTRIES
LOCATIONS OF PROJECTS IN LAST FIVE YEARS

NRCC Welcomes New Advisors and Researchers

NRCC is pleased to welcome DICK BALDES and JIM HALFPENNY to the Board of Advisors, MATT BARNES and LEONARD CARLMAN as Research Associates, and CARL BROWN, DONAL O'LEARY and MONICA ROBINSON as Project Partners. They bring valuable leadership, research, education, policy, and communications skills to NRCC.

BOARD OF ADVISORS

DICK BALDES served as a project leader for the U.S. Fish and Wildlife Service for decades, promoting hunting and fishing regulations to conserve wildlife on the Wind River Reservation in Wyoming. One of Dick's biggest initiatives dates back to the 1970s, when he began working to bring bison back to the reservation. He and his son, Jason, helped accomplish the return of bison after a 130 year absence, and the first bison was born on the reservation in May 2017. Dick continues to work on many ecological and cultural restoration projects.

JIM HALFPENNY, U.S. Navy (Ret.), PhD is an author, scientist, and educator whose interest in COLD (altitudinal, latitudinal, and seasonal) has taken him to all seven continents, New Zealand and Greenland. A past Research Fellow of the Institute of Arctic and Alpine Research, Jim was Director of the Mountain Research Station and the Long-Term Ecological Research program in the Alpine. Currently Jim is President and owner of A Naturalist's World, an ecological education company located at the north gate to Yellowstone National Park.

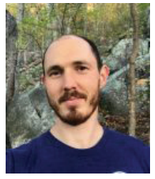
RESEARCH ASSOCIATES

MATT BARNES is an applied rangeland scientist, wildlife conservationist, and consultant, with an MS in Range Science from Utah State University and a BS in Wildlife Ecology from the University of Arizona. Matt works with landowners and managers to improve rangeland stewardship and foster coexistence with large carnivores. He spent a month this year with the Leopold Writing Program's Aldo and Estella Leopold Residency at the historic Leopold Cabin on the Carson National Forest. "With Aldo over his shoulder," Matt wrote about human-carnivore coexistence, including an essay on wildness and the danger of bear conflicts that appeared in *High Country News.*

LEONARD CARLMAN has been rooted in Jackson Hole, Wyoming since 1978, with ties to NRCC stretching back to its founding days in 1987. He is a licensed attorney, an outdoor guide, past non-profit executive director, experienced volunteer board leader, and active community leader. Len's problem-solving approach is respectful of the dynamic culture of the intermountain west. His project focus is on helping to craft a set of new land development regulations (LDRs) to protect the outstanding natural resources of Jackson Hole and meet the inspiring goals set forth in the 2012 Jackson/Teton County Comprehensive Plan.

PROJECT PARTNERS

CARL BROWN is a Masters student conducting research on Black Rosy-Finches within the University of Wyoming's Cooperative Fish & Wildlife Research Unit, Department of Zoology and Physiology (Chalfoun Lab). Black Rosy-Finches are one of North America's highest elevation breeders for which breeding habitat is especially vulnerable to climate change. Carl's research and conservation work has included ungulate diseases and wildlife genetics, as well as work on Trumpeter Swans, Common Loons, and small mammals.



DONAL O'LEARY is a NSF graduate research fellow and PhD student at the University of Maryland–College Park. His research interests include remote sensing of natural resources, computer automation of geoprocessing tasks, and modeling of ecosystem dynamics and carbon cycling. Donal is collaborating with NRCC Research Associates Corinna Riginos and Trevor Bloom to better understand how climate variability drives plant phenology, and the cascading ecological effects that ensue. Donal installed 8 climate stations for Trevor's project this summer, with 30 additional installations planned this fall.

MONICA ROBINSON has traveled most of her life, gaining recent international experience in wildlife management through her work in South Africa, Ireland, and New England. In addition to guiding wildlife excursions in the Greater Yellowstone Ecosystem, Monica's research has examined impacts of winter tick infestations in Maine moose populations. Through NRCC, she will be laying groundwork for the first baseline study of tick infestation in moose in the GYE, considering climate change as one of the driving factors. Monica received her MS in wildlife conservation and management at the University College of Dublin, Ireland.

NRCC at The World Bank

NRCC researchers led four sessions at the Annual Institute of the Policy Sciences hosted by the World Bank this November. NRCC's Educator in Residence Richard Wallace and NRCC's founder and Board Emeritus member Susan Clark presented *The Challenges of Teaching Contextuality: Lessons from Yellowstone and Beyond.* Susan Clark and NRCC Research Associate Gao Yufang presented *A Meta-Framework for Healthy and Sustainable Human-Wildlife Coexistence.* NRCC Research Associate Doug Clark presented *Large Carnivore Conservation in the Populist Era* and Research Associate Cristina Cromley Bruner co-presented *The Role of an Accountable Government in Creating Sustainable Development.*

In 2015 the United Nations General Assembly adopted 17 Sustainable Development Goals (SDGs), which are an articulation of the world's most pressing human development and sustainability priorities and a series of goals, targets and indicators that UN member states use to frame their agendas and political policies through 2030. In order to aid the World Bank in fostering sustainable development, this year's institute addressed climate change, ecosystem management, food security, water management, biodiversity, industrialization, governance, human dignity and equity.

Save the Date:
MARCH 8, 2019!

NRCC will host the 7th Jackson Hole Wildlife Symposium (JHWS) in March, 2019. We are planning a diverse group of speakers, sessions, and activities.

We will also be hosting a workshop focused on how to better link formal and informal GYE education with current conservation challenges. It is designed for educators from nonprofits, agencies, and schools.

More information will be posted in January 2019 about the agenda, registration, lodging, awards, and sponsorship opportunities.

We thank the many organizations that continue to sponsor this event.

The Artists Field Guide to Yellowstone
NRCC ARTIST IN RESIDENCE KATIE CHRISTIANSEN

My book, created in collaboration with fifty prominent Yellowstone artists and writers, will be released in the spring of 2019. *The Artists Field Guide to Yellowstone* has been a six-year journey. The concept arose from my deep wonder and respect for Yellowstone's wildlife and wildness, as well as my fondness for creative conservation projects. Together with the book's inspired contributors, we have created a field guide like none other—one that describes our natural neighbors through varied styles of colorful and, at times, imaginative fine art, eloquent prose and poetry, and descriptive field notes and illustrations. The book conveys the richness of life in Yellowstone, and the riches in life one may experience by intimately knowing this wild community.

The book's collection of reflective, expressive, and personal storytelling is curated to be relevant to readers. Out of this relevancy and connection may emerge attention and even respect. I am employing this same theory as I develop interpretive signs for Bozeman's newest public nature space: Story Mill Community Park. Supported by National Endowment for the Arts funding, and in partnership with the Trust for Public Land, I am creating artful and engaging interpretive signs to enhance visitor learning and experience. As in *The Artists Field Guide to Yellowstone*, I aspire to inspire awareness, curiosity, and respect.

Upon the book's release, people around the region can view the book's original artwork at exhibits, showings, and talks. Event details can be found on the book's website at artistsfieldguide.com.

The Artists Field Guide to Yellowstone is being published by Trinity University Press. Advanced orders may be placed at artistsfieldguide.com. The book will be available at bookstores throughout the Greater Yellowstone region.

"Then one summer I followed the trail of the Clarks Fork herd over the Absaroka Divide, to their summer home in the upper Lamar River, inside Yellowstone National Park. I found them in a different world, one of alpine meadows on high mountain slopes. They were jaunty in their summer coats, with white-spotted calves close on their heels."
—Arthur Middleton, *Bugling the Song of Elk Medicine* by Monte Yellow Bird Sr.

"As Terry and I sit in silence our own breath and beating hearts are indistinguishable from the living, breathing landscape that pulses with sensations, memories, and the very real awareness that what happens to these birds happens to us."—Joanne Dornan with Terry Tempest Williams, *Battle of the Greater Sage Grouse* painted by Loretta Domaszewski

CLIMB-IT CHANGE: The Film

Rocket Soul Studios, in association with the Northern Rockies Conservation Cooperative, presents CLIMB-IT CHANGE, directed by A.J. Winslow, written by Trevor Bloom, and edited by Brian Atkinson.

Bringing together the worlds of conservation science and outdoor recreation, this is a story of adventure, rock climbing, science, friendship, and humility. Researchers Trevor Bloom and Matt Kneipp traverse and rock climb the entire Rocky Mountain chain, from New Mexico to Jasper National Park in Canada, investigating the impact of climate change on at-risk flora and the incidence of high elevation wildfire across 76 alpine peaks. Along the way, they interview researchers, firefighters, National Park employees, and climbers, to reveal the current and future impacts of climate change across the Rocky Mountain landscape.

CLIMB-IT CHANGE has been entered into a number of film festivals, including Banff Mountain Film Festival, Atlanta Film Festival, and Earth Day Film Festival. The film's trailer can be found on YouTube at CLIMB IT Change Official Teaser.

In related news, Trevor presented his phenology research this fall at the 14th Biennial Scientific Conference on the Greater Yellowstone Ecosystem in Big Sky, MT, as well as at the 8th Mountain Climate Conference MtnClim 2018: Anticipating climate change impacts in mountains at the Rocky Mountain Biological Laboratory in Gothic, CO.

Research Associate Susan Patla
RETIRING FROM WYOMING GAME AND FISH DEPARTMENT

Susan Patla has worked with NRCC since 1987, when she led a Northern Goshawk research project on the Targhee National Forest aimed at measuring how timber harvesting affects the birds. She worked on numerous other projects around the GYE and in Alaska before becoming the Nongame Biologist for Wyoming Game and Fish Department's Jackson region in 1998.

Untold species have benefited from Susan's restoration, education, and monitoring work. One of her most successful projects is the Trumpeter Swan Restoration Project, which has established new breeding populations through relocation of captive-bred birds, doubled the nesting population, and greatly expanded the breeding and wintering range of swans in WY. She has worked with landowners to fund and create shallow ponds for Trumpeter Swans–which has resulted in more than 50 new acres of wetland habitat.

Other species that Susan has monitored and researched include Bald Eagles, Peregrine Falcons, Harlequin Ducks, Long-Billed Curlews, and numerous owl, waterfowl, and songbird species, as well as mammals like wolverine and Canada lynx. Susan wrote the first Wetland Conservation Strategies for the Green and Snake River wetland priority areas and was instrumental in obtaining Wyoming's first Wetlands Conservation Act grant for one million dollars in 2012.

Susan has also somehow found time to chair the Greater Yellowstone Trumpeter Swan Working Group, serve on the advisory board of Nature Mapping Jackson Hole and the board of directors of the Meg and Bert Raynes Wildlife Fund, as well as being a member of the Jackson Hole Bird and Nature Club, the Wyoming Wildlife Society, the Raptor Research Foundation, the Wyoming Golden Eagle Working Group, and the founder and organizer of the Teton Valley Christmas Bird Count.

It is no wonder that Susan was awarded the Craighead Conservation Award, the North American Breeding Bird Survey Service Award, and a Sportsman of the Year Award from the Jackson Chapter of Ducks Unlimited. Nongame wildlife is losing a formidable champion from the Game and Fish Department, but just think of all the extra time Susan will have to devote to her many other projects!

The Power of an Elk Map

by Todd Wilkinson, NRCC Writer in Residence

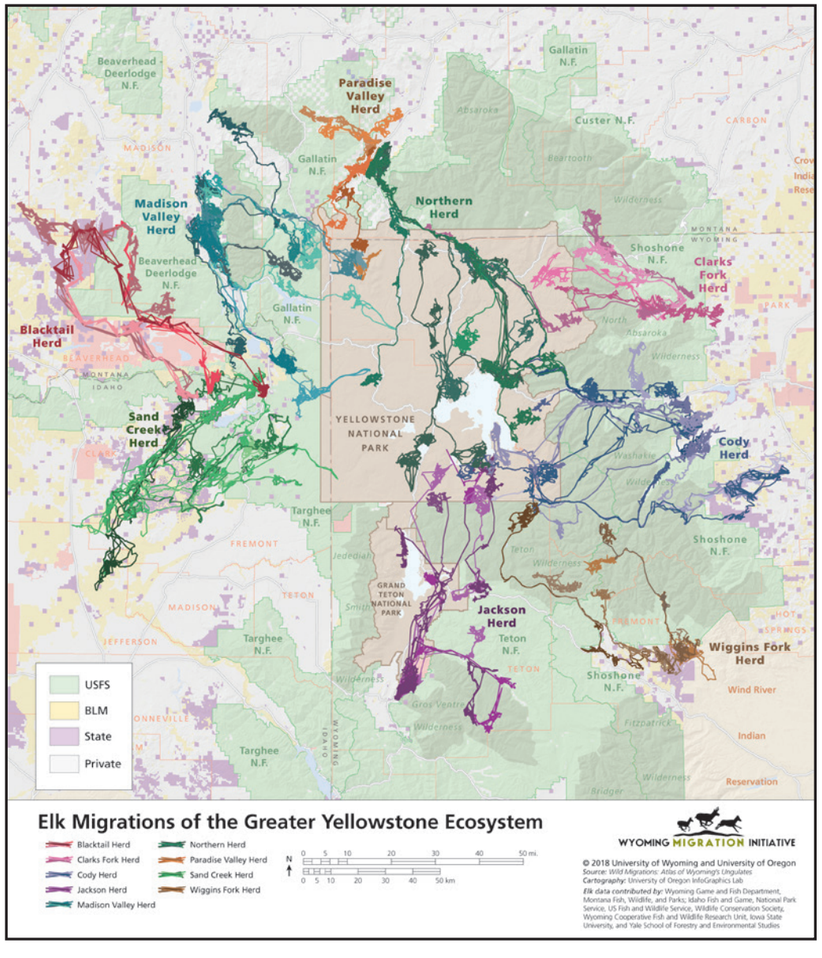
Photograph by R.J. Turner, NRCC Photographer in Residence

Nearly every spring for a long while, I've met with students from Yale University's School of Forestry and Environmental Studies. The purpose of their annual field adventures: becoming immersed in the complicated issues shaping the Greater Yellowstone Ecosystem.

Always leading the pilgrimage of bright young thinkers is Dr. Susan Clark, who teaches at the college during the academic year and heads west to Jackson Hole where, during summer, she serves as founder emeritus of NRCC.

In my living room in Bozeman, Montana, amid landscape and wildlife paintings on the wall, the Yalies in 2018 were introduced to two maps—one offering a general overview of Greater Yellowstone; the other overlaid by the migration routes of almost a dozen different major elk herds.

The first bit of cartography reveals a framework for pondering a bold idea pioneered in the region—ecosystem management—that came to fruition around the same time that NRCC opened its doors back in the 1980s; the second map illustrates, perhaps more clearly now than ever before, how Greater Yellowstone's biotic community transcends human-drawn lines, the boundaries of land jurisdictions, topography, bureaucratic fiefdoms, time, space and traditional approaches to problem-solving.



Part of my time with the Yalies involves talking about environmental journalism and it concludes with me giving them an assignment: write a letter to their present selves from 50 years into the future. I ask them to add up the facts as they know them and try to imagine how Greater Yellowstone might be different; that is, as more people inundate the region and, further, as climate change renders today's linear, empirical, seemingly-predictable notion of conservation potentially obsolete.

That is the reality being heired to them based upon decisions being made by us now.

Yes, it's easy to despair, overcome by a sense of powerlessness while pondering the challenges. Yet within the simple construct of the elk map, I believe there is a powerful platform for hope.

Not only do the still-functioning migrations of elk, mule deer and pronghorn, as documented by the Wyoming Migration Initiative, demonstrate why Greater Yellowstone is worthy of rare comparison to the African Serengeti; not only do they support the dispersal of biomass around the ecosystem, supporting the presence of hundreds of other creatures big and small; not only does their herbivory help keep soils and grasslands healthy as major sequesterers of carbon; not only do their ancient pathways, based upon intergenerational learning going back to the post-Pleistocene, inspire us with awe and wonder.

They offer a cohesive, easy-to-comprehend blueprint of sorts for what's at stake, and it forces us as a diverse community of people to come together, abandoning our fragmented notions of land use if we want to protect a larger whole that will ensure migrations persist.

"We can do this," I tell the Yalies. Still, I often hear from them how the conservation movement has been dominated by old white guys, which is obviously true; they say wildland environmentalism lacks

diversity, which is also blatantly obvious; they say that if a park like Yellowstone is to persist 50 years into the future, it needs to be "culturally relevant" to an ever-widening cross-section of America, to whom it presently does not register as a necessity in the modern world.

All of the above—whether it's reshaping the environmental movement or trying to save the character of America's most iconic wildland ecosystem—represents a serious existential crisis staring the conservation movement in the face.

So, let me return to the elk map and, more generally, the network of scientists and Research Associates affiliated with the Northern Rockies Conservation Cooperative.

Becoming a citizen conservationist, conservation biologist or environmental journalist does not require permission. Caring about the natural world does not necessitate approval. A grizzly bear or elk, Clark's nutcracker, trumpeter swan, black-footed ferret or boreal toad—all species that have been subjects of study for NRCC colleagues—does not care what one's background is.

The animal does not care about a wildlife advocate's race, gender, income level, cultural background or even if that person happens to reside in Greater Yellowstone. What matters to their survival is habitat. Do they, will they, have a place to live?

Imprinting biophilia, for most people, I am certain, does not begin with exposure to public lands. It can start with a parent reading to an infant child, having a photograph of an animal tacked to the wall, a plant perched on the windowsill, a bird feeder in the back yard, or watching ants on the sidewalk.

Empowerment starts with caring and rejecting apathy or making excuses. It's not where the journey begins; it's where it takes us.

I reminded the Yalies that, as public land owners, as citizens, the preponderance of acreage in Greater Yellowstone belongs to them whether they choose to accept a stewardship role or not.

I asked them if they have the courage to want to belong to the ecosystem, lending their voice to the search for solutions with how people can co-exist more meaningfully with nature?

Now that they have been awakened to the wonder of wildlife migrations, which exist nowhere else on this scale in the Lower 48, how can they contribute their intellect, expertise, passion and dedication to insuring they persist?

That, after all, is the only way that the potentially frightening future they imagine looming half a century from today can be altered or averted.

Which leads me back to NRCC and what I have learned being a Writer in Residence. To a person, across the three decades that I've known them, a diverse array of scientists affiliated with NRCC have always been driven by a vision of what's possible—of how having better knowledge can transform the way society thinks about our relationship with nature.

Still, science alone—having more information—isn't enough to preserve a region like Greater Yellowstone and the miracles—such as terrestrial wildlife migrations—that still persist across it.

When NRCC adopted as its motto "conservation for the common good," Susan Clark and her associates recognized that just as conservation constructed during the late 19th-century became radically more sophisticated in the 100 years that followed, so too will it make great leaps forward in this new millennium.

NRCC is devoted to bringing forward diversity in thinking—through more enlightened land management, pondering the role of culture, and drawing upon examples from elsewhere in the world—to better protect diversity in nature. Indeed, the prospects of having a healthy wildland ecosystem improve mightily when they are matched by a healthy, diverse, engaged ecosystem of human advocates rallying around it.

My message to any young person reading this? The preservation of Greater Yellowstone—a true national American treasure—depends on you and you can be an advocate no matter where you live.

So, how can you make a difference? Contact any NRCC Research Associate. They were once daunted by the prospect just as you are. They'll give you plenty of suggestions for how to roll up your sleeves.

The elk map of Greater Yellowstone doesn't only pertain to wapiti; it belongs to you, and you to it.

Remembering Great Apes

PHOTOGRAPHER IN RESIDENCE R.J. TURNER

My image, *Tumbo*, was chosen to be a part of the conservation project Remembering Great Apes. This image will be included in the coffee table book *Remembering Great Apes*, and will also premier in the photography exhibit at La Galleria Pall Mall in London this fall. I am thrilled to be involved for the second time with the project Remembering Wildlife, with all profits going directly to conservation efforts to help great apes. To find out more and purchase your own copy of the book, please go to rememberingwildlife.com/remembering-great-apes/.
In other news, this year I was a finalist in the Nature's Best Photography Awards, with a field of 22,000 entries from 59 countries.

Tumbo, *by R.J. Turner*

NRCC Intern

MEGHANLATA GUPTA

Throughout this summer and into the academic year, Professor Susan Clark and I have been collecting research relating to wild bison management in the Greater Yellowstone Ecosystem. Bison management in and around Yellowstone National Park has been fiercely debated. Federal and state governments, local communities, livestock ranchers, environmental activists, and Native American tribes are some of the participants.

In analyzing this issue and attempting to propose viable solutions, Professor Clark and I are using comprehensive and interdisciplinary methods. With such a multi-faceted issue, it is necessary to employ a policy meta-framework. This meta-framework, also known as a "periodic table of human interactions," helps us fully understand the cultural values, biases, and goals of all participants involved in any policy problem. Additionally, the method we use focuses heavily on problem-comprehension. What specific events have caused such differences in opinions? How do the vastly different cultural upbringings of participants affect their stances? Ultimately, the methods we use in this research place significant weight on culture-shaped perspectives and human interactions in searching for effective policy solutions.

Although the majority of this project thus far has been research-collection and documentation, I will be writing a significant paper on the project this semester through Professor Clark's Foundations of Natural Resources Policy and Management course. I plan to incorporate my thoughts on bison reintroduction onto Native lands—such as the Wind River Indian Reservation—in the paper as well.

The Research Associate (RA) program at NRCC lies at the heart of our work. It grows each year, increasing understanding and facilitating improvements in ecological and social processes around the globe. We hope you enjoy reading about a few of our current, active projects in this issue. For more information on all NRCC RAs, please visit nrccooperative.org.

Debra Patla

DEB PATLA

How do you monitor small, cryptic animals across the large landscapes of Grand Teton and Yellowstone national parks? In a word, "persevere'!

For the past 13 consecutive years, we have monitored breeding populations of amphibians across the two national parks. NRCC has supported the effort by formally partnering since 2010 with the National Park Service's Greater Yellowstone Inventory & Monitoring Network (Bozeman, MT). We collaborate with NPS and other partners to conduct annual fieldwork and to manage and interpret the data. In so doing, we provide continuity based on long-term experience. In the 1990s, NRCC was already a vital resource for amphibian investigations in the GYE by Research Associate Dr. Chuck Peterson (Idaho State University) and myself. In the early years, we hashed out concepts and techniques that would eventually be adopted by the formal monitoring program. I often think how fortunate I am to still be doing this work, and how unlikely I would still be doing it without NRCC!

In a nutshell, the amphibian monitoring program consists of documenting amphibian reproduction each year. That means looking for the eggs or larvae (tadpoles) of the four widespread native species: Boreal Chorus Frog, Columbia Spotted Frog, Western Toad, and Western Tiger Salamander. We survey the same places each year, namely, all the wetlands in 31 small watershed units distributed widely across the two parks, mostly away from developed areas and some very remote. "Survey" means two people patiently dip-netting throughout the wetland, counting each amphibian encountered per species, and collecting habitat data.

Over the years, we have found that at least one amphibian species breeds in about 56% of the 230-290 wetland sites in our monitoring sample that provide potential breeding habitat in a given year. Boreal Chorus Frogs are the most common and widespread, but show considerable variation year to year. Western Toads are consistently and by far the rarest, and most in need of more intensive monitoring and management attention. Patterns of amphibian species occurrence at sites (stability, appearance, disappearance) provide insights not attainable from short-term study. Plus, the program provides an excellent tool for tracking how wetlands respond over the years to annual weather fluctuations and climate change trends.

Fieldwork in 2018 adds to an extensive database that is helping answer questions such as: Do wetlands recover in a wet year that follows several years of drought? Do warmer temperatures, predicted and observed as an aspect of climate change in the GYE, result in the permanent loss of shallow-water wetlands and the amphibian populations that depend on them? What happens to amphibian populations when beavers arrive or disappear in an area? What can managers do to protect wetlands and amphibians or mitigate for losses?

LYDIA LAWHON

Since completing my dissertation on wolf policy in Wyoming in the fall of 2016, and earning my PhD, I have transitioned into a faculty instructor position with the Masters of the Environment program at the University of Colorado Boulder. I work closely with our professional Masters students in a variety of capacities, including teaching courses on environmental policy and public lands issues, leading the environmental policy specialization, and overseeing the academic rigor of our students' Capstone Projects.

My research interests include how local experiences with and understandings of natural resource problems can help inform policy, as well as the interstitial dynamics of layering natural resources-related policies at the local, state, and federal scales. I am currently wrapping up a project focused on understanding community perceptions of the role of prescribed fire as a management tool for reducing catastrophic wildfire risk and restoring forests. I'm also in the early stages of a project investigating how regulations promulgated at the federal level are implemented and enforced through local US Forest Service Ranger Districts, and how these regulations are perceived by the public. My biggest accomplishment in the past year, however, has been transitioning into motherhood as we welcomed the birth of our daughter, Iris, in the summer of 2017!

TIMM KAMINSKI

Resource management that conflates politics with large carnivore-livestock conflict management inspires chronic rancor between urban values and rural life, undermining land stewardship benefits to the agricultural economy and large carnivore conservation. Resentment in communities, accompanied by widening public distrust, belies ranchers' search for science-based help to avoid economic hardship, and ignores broad support for long-term and socially acceptable management to prevent and reduce large carnivore-livestock conflict.

We redress this deficiency at Mountain Livestock Cooperative with a land management paradigm for reducing large carnivore-livestock conflict. Extending our work by invitation across 13 states in the U.S and Canada, our land and livestock management approach follows George Schaller's imperative for mediating science and culture by sharing information that extends ranchers' knowledge about carnivore behavior and biology and aligns their interest in risk-avoidance with grazing management, stocking, and allotment-specific conditions. Ranchers' evolving knowledge about prey behavior and advances in predation efficiency improves their understanding for how calf and yearling cattle, prone to anxiety and flight, are at risk where wolves or grizzly bears and livestock interact, and guides grazing-related decision-making on predictable stocking, widespread and fixed pasture location, purposeful dispersion, and calving dates that exacerbate livestock exposure.

Cooperating ranchers on horseback and foot deployed our conflict avoidance model across a public-private land mosaic occupied by resident wolves and grizzly bears with repeat depredation histories during consecutive grazing seasons in 2011 and 2012. Systematic human attendance was consistently applied and appropriately scaled to the home range defined by season, and orderly rotated across all at-risk angus-cross pairs within wolves' home range approximately every 4 days.

Our results demonstrate that livestock vulnerability can be managed to avoid risk through properly scaled vigilance. Conflicts were minimal during 2011 and 2012 (1 wounding; 1 depredation) and no control actions took place. Livestock associations and cooperatives reported complete counts, no damage or additional management, and profitable weight gains for both years, and economic grazing benefits exceeded vigilance costs to producers.

Delivering economic profit in rural communities where large carnivores and livestock interact, while avoiding large carnivore turnover and social disruption, are long-term and cost-effective benefits of land and livestock stewardship.

Conservationists must improve their awareness of and efforts to incorporate important market effects. Differences in grazing environment and regional agricultural economies can affect the ways ranchers can mitigate large carnivore impacts and keep working ranches profitable. Our experience across the Mountain West, and more recently in Oregon and California, emphasizes the preceding factors as critical to a sustainable economy and large carnivore conservation.

Insights offered by ranchers are instructive in their objectivity and awareness. Our continuing work with ranchers shows how sharing information and experience between people of differing backgrounds contributes to the future of agriculture and wildlife, so each might benefit. Both pose humble reminders to meeting a 21st century public interest and need: science doesn't do the work of stewardship and conservation—people do.


Timm Kaminski

CORINNA RIGINOS

I continue my work making highways in Wyoming safer for wildlife and the public. Using infrared video footage of deer attempting to cross highways, I found that deer struggle to cross roads safely when cars are less than 60 seconds apart. That means that most roads are difficult for deer to cross except during the dead of night, and some roads are difficult or impossible for deer to cross virtually all of the time. The latter are situations where highway over- or under-passes are most needed to enable animals to safely cross highways and access the diversity of habitats they rely upon.

I have also continued a study testing whether reducing the speed limit at night causes drivers to slow down and be less likely to hit big game wildlife on roads. Reducing speed limits seems like a simple, inexpensive way to reduce wildlife-vehicle collisions, but our results show that drivers only slow down by 3-5 mph on rural highways where the speed limit was reduced from 70 to 55 mph.

Most importantly, I have been working on a small task-force with partners from the Wyoming Department of Transportation, the Wyoming Game and Fish Department, the Wyoming Migration Initiative, and the Wyoming Wildlife Federation to identify the places in Wyoming where roads and wildlife come into greatest conflict and to recommend a strategy for addressing these problem areas. I am optimistic that we will, in time, reverse many of the negative effects that roads are having on big game wildlife in Wyoming. This will help create a more connected, resilient landscape and conserve our amazing long-distance wildlife migrations.


R.J. Turner


Taza Schaming

TAZA SCHAMING

In 2018, I expanded my long-term Clark's Nutcracker research project into the North Cascades of Washington State. In collaboration with the US Forest Service and the National Park Service, and with funding from Seattle City Lights and the American Ornithological Society, I fit seven satellite transmitters to nutcrackers near Winthrop, WA in February. I have been monitoring the birds' movements and am currently conducting statistical analyses to determine summer home range size, as well as evaluating how the birds reacted to wildfires in the area.

Satellite-tracking Clark's Nutcrackers in two geographically distinct regions, Northwest Wyoming and the North Cascades, enables comparisons of nutcracker resource tracking, landscape-scale long distance movements, and habitat selection in regions with different habitat types and health. In addition, because these satellite-tags function for multiple years, we will be able to evaluate movement as a function of conifer cone crop levels and other changing environmental variables. These results will improve local managers' ability to identify Clark's Nutcracker habitats and connectivity between distant habitats, aiding in the design of effective local and range-wide restoration and conservation strategies for both species.

Please continue to NatureMap Clark's Nutcrackers while out exploring and in your backyard! I will continue to use this data to better understand how variable nutcracker behavior is in relation to Whitebark Pine cone crop and weather patterns.

To stay updated on The Nutcracker Ecosystem Project please visit my recently launched website, thenutcrackerecosystemproject.com. To NatureMap nutcracker observations, go directly to naturemappingjh.org/offline#/login, or link through jhwildlife.org/our-work/nature-mapping/clarks-nutcracker-project/

CARL BROWN

The 2018 field season had its lessons and challenges. One big takeaway is that it may be more difficult to establish survey sites at lower elevations than I previously thought. The terrain can prove to be too challenging and low numbers of birds may create false absences since the species is more reliably observed at higher elevations. When visiting sites that have a 25% chance of detecting a single pair of finches, compared to a 90% chance of detecting a single bird from three breeding pairs, the lower elevation sites may not be very informative.

Many survey locations did not have birds present, however these sites were all at lower relative elevations. This did not come as a complete surprise, but if these are true absences, then the species may be more restricted than previously known and that would have important conservation implications.

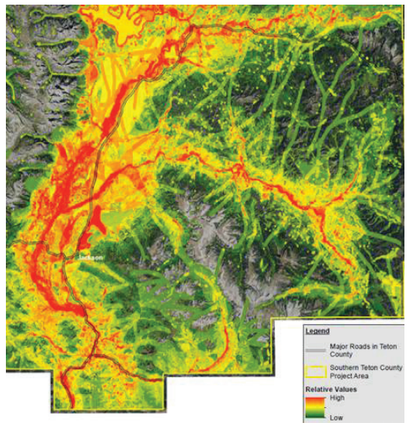
Thanks to support from the Meg and Bert Raynes Wildlife Fund I was able to visit twelve locations during the field season, but I had hoped to complete more. Six surveys were busts due to unexpected storms, mechanical failures, and a road that was unexpectedly closed. Results from this season include one new nest discovered in the Tetons at lower elevation, with a second nest appearing active. Unfortunately, three historic nests visited for visual observation via rappelling were not active and another had fallen. My data will be added to the Wyoming Game and Fish Department (WGFD) breeding map, which will better define the species' range. Methodology and new site locations will be submitted to the WGFD for long-term monitoring.

LEONARD CARLMAN

My project focus is on helping to craft a set of new land development regulations (LDRs) to protect the outstanding natural resources of Jackson Hole and meet the inspiring goals set forth in the 2012 Jackson/Teton County Comprehensive Plan. The Plan has a 21-word vision statement whose basic ambition may not have ever before been declared by a unit of local government anywhere in the United States: "Preserve and protect the area's ecosystem in order to ensure a healthy environment, community and economy for current and future generations."

Making the connection between grand aspiration and practical implementation is always difficult. We are getting there. For example, this line in the current draft of the LDRs gives hope that this link will be made: "All limits of disturbance of the physical development or use shall be located in the lowest value habitat patch identified on a Field Verified Habitat Map."

In its context, this is what teeth look like in a set of natural resource protective LDRs. Here's why: The phrasing is clean; the word "shall" is a no-nonsense declaration of priority. The reference to a "habitat patch" correctly implies that local government has undertaken the careful work of mapping and comparatively valuing wildlife habitat throughout the privately owned lands of Jackson Hole. And the phrase "Field Verified" means what it says—for either mid-value or high-value habitats as first identified on the comprehensive county map, owners are required to secure competent field verification of on-site conditions prior to securing a development permit. That means the modern tools like high-tech digital mapping and respected habitat scoring algorithms that we are using will get what they always need before they prescribe a permanent outcome: a common sense, dirt-on-the-boots, wind-in-your-face double check by a person who knows what to look for.



Teton County's aggregated focal species habitat map, sometimes called a heat map, reveals the densest concentrations of vital wildlife habitat in red, with the gradient of decreasing concentration in yellow and then green. As one might expect, Jackson Hole's rivers, creeks, wetlands and other water bodies are essential for all manner of animal life.

Another line from the current draft of the new LDRs shows proper respect to wildlife migration corridors: "The requirements of this [migration] section apply to all parcels regardless of zoning or habitat value." This puts the vital ecological attribute of migration activity ahead of the land use planning construct of zoning. It's basic and important, and the draft LDRs are getting it right. There's more work ahead, and the vagaries of local politics are always factors that can support or erode ambitious efforts. But with a well-rounded team of Stakeholders and a remarkably dedicated Teton County Planning Staff offering their best initiatives, there's good reason to hope the Teton County natural resource protective LDRs will rise to the challenge of our community's pioneering vision statement.

NRCC Board of Advisors member Sandy Shuptrine is also a member of the Teton County Commission appointed Stakeholders Group. She and I are both at-large members. Our workload is equal, and our goals are the same—to give functional effect to the vision statement of the 2012 Jackson/Teton County Comprehensive Land Use Plan.

MICHAEL B. WHITFIELD

Bald eagle recovery is a tremendous success story for the Endangered Species Act. The once small and geographically isolated Greater Yellowstone Ecosystem (GYE) nesting population has now expanded dramatically thanks to laudable management actions. In 2018 we continued our work to understand how this recovery has occurred, and thus how to ensure the sustained good health of the GYE population.

This nestling is the offspring of a female banded by Michael in 1987

Our primary tool is genetic analysis of eagle blood and feathers to define the biological boundaries of the GYE population and evaluate population structure and gene flow. Thanks to the Meg and Bert Raynes Wildlife Fund, we have been able to band nestling eagles and collect blood samples from more nest sites across a broader geography than in the past.

We are particularly interested in the recovery contributions of some very long-lived nesters, several of which are over 30-year old adults we banded as nestlings back in the 1980s. For the Idaho portion of the GYE, we have blood or feather samples from a total of 50 bald eagles collected from 2017- 2018, with an additional 88 historic samples collected in earlier years. Genetic analysis is underway and we anticipate further work to fully understand and secure this great success story.

Editor's note: At this year's Land Trust Alliance Rally, Michael was awarded the Kingsbury Browne Conservation Leadership Award and Fellowship, which honors individuals whose vision and creativity have resulted in extraordinary accomplishments for land conservation.

ERIN MUTHS & BLAKE HOSSACK

We are working on several conservation projects funded by the US Geological Survey and Wyoming Department of Transportation, all dealing with amphibians in the Northern and Southern Rocky Mountains, Northern Plains, and the Desert Southwest. Projects range from long-term studies on demography of amphibian populations to specific investigations on topics of particular interest to our collaborators, such as wetland mitigation.

One of our major projects examined mitigation measures for the recent highway construction at Togwotee Pass north of Jackson, Wyoming. Mitigation wetlands are frequently constructed to make up for the loss or disturbance of natural wetlands, but how well they replicate the functions of natural wetlands is still uncertain. We used the macroinvertebrate community as a proxy for wetland recovery and function, and assessed this community in created, impacted and reference (undisturbed) wetlands. Our data indicate that created wetlands had lower taxonomic richness and lacked species that disperse passively, such as on the legs of waterfowl, that were common in other wetland types. We suspect the lower species richness reflects the slow establishment of aquatic vegetation, which provides important habitat for invertebrates and other taxa. Overall, created wetlands had diminished and altered macroinvertebrate communities relative to reference and impacted wetlands, suggesting that long recovery times may be required for wetland mitigation projects in cold temperate climates. A manuscript that describes these results is in review at *Freshwater Biology*.

A second major project is focused on evaluating the role of captive-rearing and translocation for recovery efforts of the federally endangered Chiricahua Leopard Frog in Arizona and New Mexico. Recovery efforts have been led in part by a more than 10-year collaborative program of state, federal, non-profit, and private partners to establish new populations of the frog and speed its recovery. In 2018, we organized a large sampling effort across much of the Southwest to understand how many translocation events are required to establish a population, whether stocking certain life stages (e.g., larvae vs. adults) increases the odds of establishing a population, and how aquatic pathogens and invasive species affect the likelihood of local extinction. These survey efforts are based on a combination of environmental DNA (eDNA) methods and traditional survey methods. This information will be useful in guiding recovery of the Chiricahua Leopard Frog and relevant to other captive rearing programs for amphibians.

B. Sigafus, USGS

Chiricahua Leopard Frog

A third facet of our conservation work focuses on long-term demography of amphibian populations in Arizona, Colorado, Wyoming, and Montana. Such work can help to identify declines in ostensibly common species and provide information vital to identifying declines. Our analysis from ongoing work on Boreal Chorus Frogs provides estimates for survival and recruitment and assesses the proportion of explained variance in environmental factors that may drive population dynamics. This information provides insight into the relevancy of tested environmental covariates to demographic estimates (like survival) and thus long-term persistence of the population. A paper detailing these results is in press at *Ecosphere*. Other long-term work on Canyon Tree Frogs in Arizona is described in a paper that is in press at *Ecological Applications*.

SETH M. WILSON

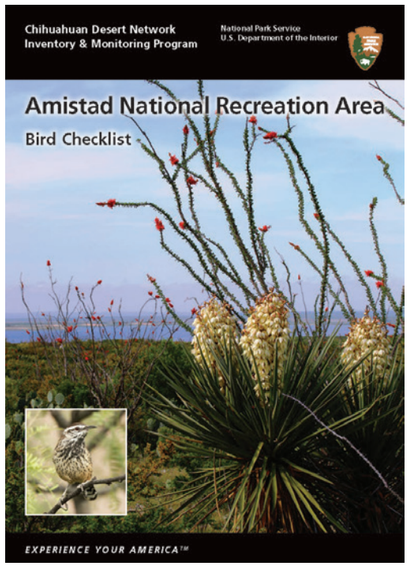
I am currently working in Slovenia to provide expertise on a Eurasian lynx translocation effort called the LIFE Lynx Project (www.lifelynx.eu/). Lynx numbers in Slovenia and Croatia have dropped significantly over the past twenty years and genetic inbreeding threatens this small population. Healthy lynx from Slovakia and Romania will be brought to Slovenia beginning in 2019 to augment the population and genetic diversity. All told, 14 individuals will be translocated over the next several years.

Since carnivores are controversial and public support is critical for reintroduction efforts like this, one of my main tasks is to provide strategic expertise to build local community-level support for the restoration of lynx in Slovenia and Croatia.

Among many projects I am involved with, one example has been through the medium of film. I recently co-produced and co-directed *Path of the Lynx*, a documentary that chronicles the historic role hunters played in reintroducing lynx to the former Yugoslavia in 1973. Lynx had been eliminated from Slovenia by 1910.

Today, hunters in Slovenia and Croatia are vital to the project since they control and manage some of the last, best lynx habitat. The film has been used widely as a point of entry to organize community meetings, develop local advisory groups, and develop hunter support centered around lynx release areas. An important goal of the film is to showcase the conservation ethic of hunters by honoring and respecting their historic contributions—with the explicit understanding that hunters today are needed again if the project will be successful. For example, one of the release sites for lynx was chosen by hunters and is on privately owned land managed by a hunting "family" or club, called Loški Potok. Local hunters and contractors from Loški Potok have been hired to construct quarantine enclosures and will care for and feed lynx before they are released. This type of participatory approach to conservation of large carnivores relies on a spirit of collaboration, power sharing, and mutual respect. It is encouraging and exciting to see the role that Slovenian hunters are willing to play in this new chapter of Eurasian lynx conservation.

Film team (left-to-right) Gregor Šubic, Rožle Bregar, Matej Vranič, and Seth Wilson



ALLYSON MATHIS

The National Park Service's (NPS) Inventory and Monitoring (I&M) networks assess the condition of park ecosystems and help the NPS develop a stronger scientific basis for stewardship of natural resources. As a NRCC Research Associate, I work with NPS's Chihuahuan Desert and Southern Plains Inventory and Monitoring Networks to help with the dissemination of natural resource information by applying science communication principles.

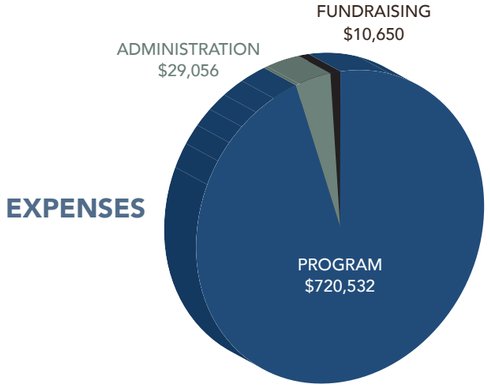
The NRCC-NPS collaboration for improved science communication presents a unique opportunity to help people of all ages understand the importance of conservation of natural resources, while adding to the body of knowledge about the status and trends of critical natural resources in national parks.

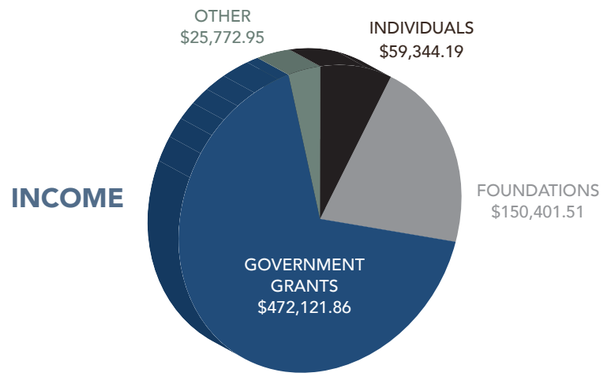
I work with NPS ecologists and other resource management specialists to develop a range of publications ranging from natural resource reports to resource briefs and newsletters. For example, in conjunction with subject-matter experts from the network and parks, I am developing illustrated bird checklists for four Chihuahuan Desert parks. These checklists include not only species information, but also essays about bird habitats, good birding locations in the park, along with identification photographs and additional information about selected species. This combination of data from NPSpecies and from Chihuahan Desert Network landbird surveys, with natural resource and conservation information and attractive design, will ensure that information about bird species found in these parks will be available to resource specialists, serious and novice birders, and park visitors.

2017 Financial Report

NRCC is a 501(c)3 non-profit organization headquartered in Jackson, Wyoming.
Our revenue comes from a wide variety of sources including foundations, government agencies, and individuals.

In 2017, 95% of all expenditures directly supported conservation projects





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