

High Country News



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Indigenous rights on
the Colorado River

Beavers make their
mark on the tundra

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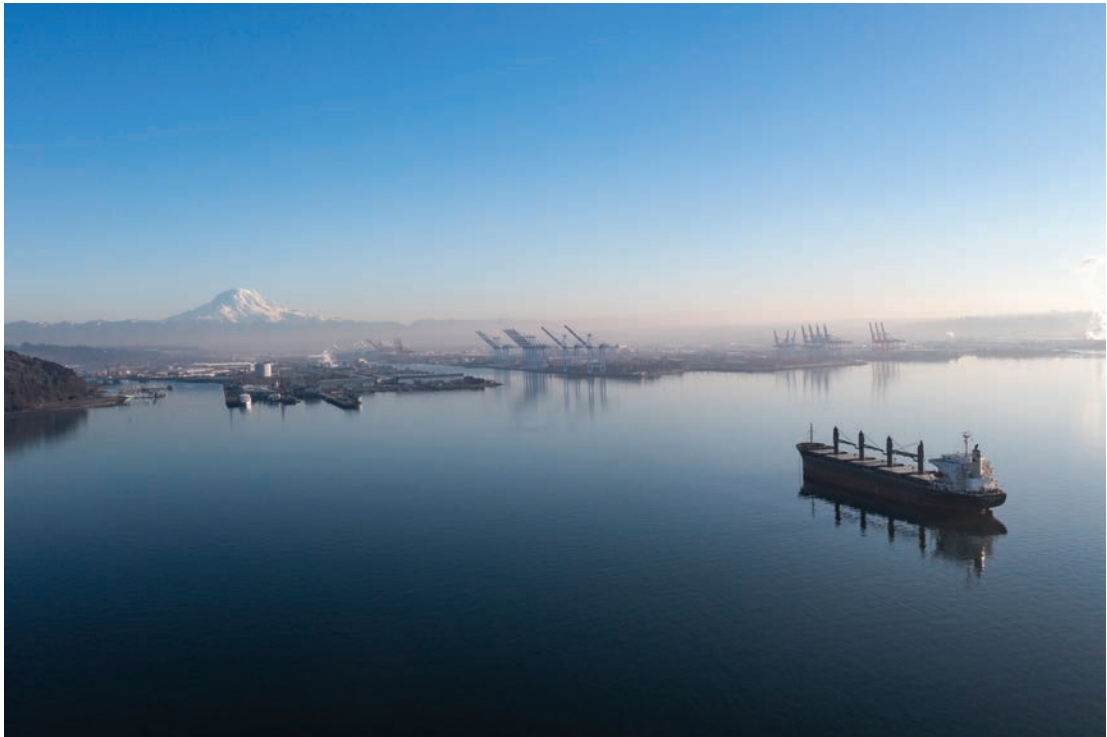
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A ship departs the Port of Tacoma, Washington, where a liquified methane gas storage container can be seen, with the Puyallup Indian Reservation beyond and Tahoma (Mount Rainier) in the distance. **David Moskowitz / HCN**

Know the West.

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A gathering of monarchs

AMID WINTER'S DREARY NEWS of a less than normal snowpack, declining biodiversity, rising inflation, and yes, still COVID — long-haul COVID, asymptomatic COVID, endemic COVID — was a speck of good news: Monarch butterfly populations along the California coast rebounded some. It was not a huge rebound, but a meaningful one, since overwintering populations had dwindled from approximately millions in the '80s to just a few thousand, a precipitous 95% drop. Some overwintering sites dipped to double digits — the one nearest to me had an official count of just 16 butterflies in 2020 — causing many to fear that the Western monarch, the population west of the Rockies that overwinters in California rather than Mexico, was nearly extinct.

We've seen this sharp curve of species decline before with the pelican, the vaquita and the honeybee, to name just a few. The pelican started to rebound once people stopped putting feathers on fancy hats and DDT was outlawed. The exact cause of the monarch's decline is unknown, though pesticides and habitat destruction are likely culprits. What caused their numbers to tick upward is equally a mystery. Nevertheless, they are a sight to behold, as you stand at the base of a eucalyptus tree and watch them flutter overhead against the backdrop of a blue sky. Branches drip with densely perched monarchs, while individual members of the kaleidoscope — one name for a gathering of monarchs — constantly land and take flight.

There are moments when the world seems enchanted, when golden sunlight filters down and you feel your heart flutter like the wings of a Western monarch. Seeing the butterflies clustered in the trees after years of hardly seeing any was one such moment. The uptick in numbers, however, should not be considered a recovery. The population is still just a fraction of what it's been in the recent past, and it's anyone's guess what will happen next year. Despite this dire situation, monarchs have not been listed as endangered or threatened. In December of 2020, the U.S. Fish and Wildlife Service said that "listing the monarch is warranted, but precluded by higher priority listing actions." So the monarch sits in an endangered species waiting room, a bureaucratic limbo where its status will be reviewed annually.

Trying to save something from forever-gone status is a noble pursuit, and though the Endangered Species Act can help, it's not the only way to save a species. In this issue you'll read about the ongoing attempt to use cloning to save North America's most endangered species, the black-footed ferret. Questions abound about the ethics of cloning, not to mention the ambitious de-extinction efforts that cloning could enable. Perhaps the biggest question is this: Wouldn't it be better to appreciate, protect and foster the creatures that are here with us now, in this troubling and heartening moment in time on Earth?

Jennifer Sahn, editor-in-chief

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From petri dish to prairie with North America's most endangered species.

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BY PAULY DENETCLAW

A black-footed ferret bred in captivity in northern Colorado. **Kathryn Scott Osler /The Denver Post via Getty Images**

Debris at the home of Paul and Gurjeet Dhanoa in Louisville, Colorado, which burned in the Marshall Fire. The homes of two other family members were also among the more than 1,000 that burned (*right*). **Caleb Santiago Alvarado / HCN**

ON THE COVER

Illustration by Klawe Rzczy / HCN



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The place that coal built and fire burned

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Extractive industry laid the infrastructure for the suburban sprawl that fueled Colorado’s destructive Marshall Fire.
BY KATE SCHIMEL



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LETTERS

High Country News is dedicated to independent journalism, informed debate and discourse in the public interest. We welcome letters through digital media and the post. Send us a letter, find us on social media, or email us at editor@hcn.org.

JUSTICE FOR FARMWORKERS

I wanted to commend your recent article on the farmworker movement for environmental justice (“Sowing Change,” February 2022). The article speaks poignantly to the economic inequality in this rich region and the unequal impacts of the climate crisis.

Lisa Citron

**Cascadia College, professor,
environmental economics
Seattle, Washington**

First of all, muchas gracias for the terrific article “Sowing Change” in your February issue. The fact that the pandemic has placed a heavier, often lethal, burden on migrant workers in the U.S. is a huge but undercovered story. Second, it must be acknowledged that the “man with a sombrero and exuberant mustache” on the posters of the Tierra y Libertad cooperative is no doubt an image of the famous Mexican revolutionary Emiliano Zapata. His Zapatista revolutionaries fighting in the 1910s to restore their lost lands marched under the banner and slogan “Tierra y Libertad” (“Land and Liberty”). Zapata’s example no doubt inspires the work of this Washington organization.

Bert Kreitlow

Waukesha, Wisconsin

RESIST REPLICATION

The unavoidable pain of the transition to a green economy does not mean that we approach

“Connections on all levels need to be available so community can thrive without exploitation.”

it indifferent to the inequality of impacts on those directly impacted (“Electric vehicles drive up demand for ‘green metals,’” February 2022). As we seek to correct income inequality as a hideous feature of our current economy, we must resist a replication of that inequality when it comes to beating the burdens of changes that will, ultimately if not immediately, benefit us all.

William DePaulo

Lewisburg, West Virginia

LAMPREY LOVE

Thank you for your recent piece in *HCN* on the lamprey (“I pray, you pray ...,” February 2022). It is so rich in meaning and information, and so compelling. I recall the excitement when, after a small dam was removed on a tributary in the Connecticut River Basin in Massachusetts, lamprey returned to spawn. Your piece adds so much history, culture and context to this wondrous being.

Sandra Postel

Corrales, New Mexico

I’m actively working on getting over my “horrificed fixation on the oral disc.” Thanks for the great article on the lamprey, Brian Oaster and *HCN*!

Christine Pearcy

Bozeman, Montana

Very interesting story in the February *High Country News*. Hard, however, to read a lamprey story without the mention of Elmer Crow Jr., who died heroically eight years ago saving his young grandsons from drowning in the Snake River. Elmer was the strongest promoter of the Pacific Lamprey in the Columbia, Snake and Salmon rivers for years. He was a legend among the Nez Perce and conservationists throughout Lapwai, Orofino and the Clearwater Valley.

Steven K. Berg

Boise, Idaho

TRASHED SOONER

Thank you for an awesome review of the recent metaphor by Ben Goldfarb, and the insight into the hyperobject concept (“How do you make a movie about a hyperobject?” February 2022). The only thing I have to disagree with is that final statement, that the humans who will bear the brunt of this don’t yet exist. I’m pretty sure that if we continue with business as usual, growing our population by 1% per year while increasing carbon dioxide emissions yet another 30%, our planet will be thoroughly trashed in just 30 years. My grandkids will experience all this ugliness, Ben will probably be around for this, and, who knows, I might even still be here.

Julie Smith

Golden, Colorado

COMMUNICATIONS FOR HUMANS

I wanted you to know how much I appreciated the article “Digital Natives” (January 2022). I also long for a purer communications network that supports humanity. Connections on all levels need to be available so community can thrive without exploitation. I feel if enough of us would like to see

this happen, it will manifest.

Kenneth L. Williams

Boise, Idaho

ILLUMINATING AND LEVEL-HEADED

Your article “Gold Country” (January 2022) was a deeply illuminating and superbly well-researched piece of journalism and investigative reporting. I found your approach to the various layers surrounding these issues to be thoughtful and level-headed; you put them in the context of the broader commercial statewide trends for northeastern Nevada’s long-term economy and global gold mining, while effectively humanizing the gold mine employees and tribal members whose livelihoods are directly affected by the expansion of the mine.

Secretary of the Interior Deb Haaland has expressed greater support for accommodating tribal reservation land claims. Do you think she might play a tangible role in facilitating the geographic and legal relationship between Nevada Gold Mines and nearby tribal nations? I was surprised she was not mentioned in the article.

As a Nevadan who was a former employee for Barrick Gold in their Goldstrike Mine back in summer 2017, I found your reporting insightful, reasonable and compelling.

I hope to come across similar work in the future, as in-depth local journalism that examines long-term issues in the state make me glad to support *High Country News*.

Eddy Torres

Mesquite, Nevada

HOPE IN GRIEF

What a wonderful, hopeful story in the midst of so much grief for our planet — and us (“See the Channel Islands’ stunning ecological recovery,” 1/27/22, hcn.org)! I could feel the spirit of my late son, who died in the ocean off Santa Barbara, crying for appreciation and joy with me.

Mari Vlastos

Berkeley, California

Beaver boom

The tundra newcomers are both a symptom and an agent of northwest Alaska's changing ecosystem.

BY KYLIE MOHR

CYRUS HARRIS HOPPED ON a snowmobile one day in early January and zoomed up a peninsula near Kotzebue, Alaska, to break trail for his sled dogs. “The first beaver dam I’m running into is about three miles from town,” he said. “Nearby that one is another one, about five miles out is another one, and that’s just one little area.” Harris (Inupiaq) was born in 1957 and spent his childhood across Kotzebue Sound in Sisualik. “Beavers were really just unheard of,” he said. “It’s crazy the amount of beaver coming in, they’re just

raiding the whole area.”

Beavers — once seldom seen in northwest Alaska — started appearing more frequently in the ’80s and ’90s. Pastor Lance Kramer (Inupiaq) traps beavers today, mostly for making fur hats. He recently asked an elder about the area’s first sightings. “They saw this thing on the tundra, and it looked like a wolverine, but it was a really long beaver,” Kramer said. “(It) had walked so far on the tundra to get up this way that it wore out the bottom of its tail.”

Now the animals — and their ponds, dams and lodges — are everywhere. Using satellite images of the Kotzebue area, scientists found that the number of beaver dams surged from two in 2002 to 98 in 2019, a 5,000% jump. And it’s not just Kotzebue: Beaver ponds doubled regionally since 2000, with 12,000 in northwestern Alaska now. Beavers, dubbed “ecosystem engineers” because of how they flood their surroundings, are transforming the tundra.

North America’s largest rodent is moving north partly because of climate change: As the tundra grows warmer and greener, it also becomes more inviting to beavers, which need shrubs for food, dams and lodges. Their proliferation is also linked to a population rebound: Beaver trapping, popular

for centuries, has tapered off, and the animals are thriving.

Beavers were recently cited as a “new disturbance” in the National Oceanic and Atmospheric Administration’s 2021 Arctic Report Card, a yearly report that tracks changes in the region. That’s because they are damming rivers and creating deeper, warmer ponds that open up new types of aquatic habitat. “The key question to ask, wherever you’re standing in the Arctic, is, ‘How long will it be until beavers get there?’” said Ken Tape, an ecologist studying beaver expansion at the University of Alaska Fairbanks. “Because when they get there, it’ll never be the same again.”

Harris worries that beavers swimming in the reservoir that supplies Kotzebue’s drinking water could overwhelm the community water treatment plant. Beavers (and other animals) carry the giardia parasite, which they excrete into the environment, and water contaminated with their feces can cause intestinal infections. Harris and others used to drink directly from rivers on their hunting and fishing trips, but today, they’re having second thoughts. “If our water quality gets damaged, where do we go from there?” Harris said.

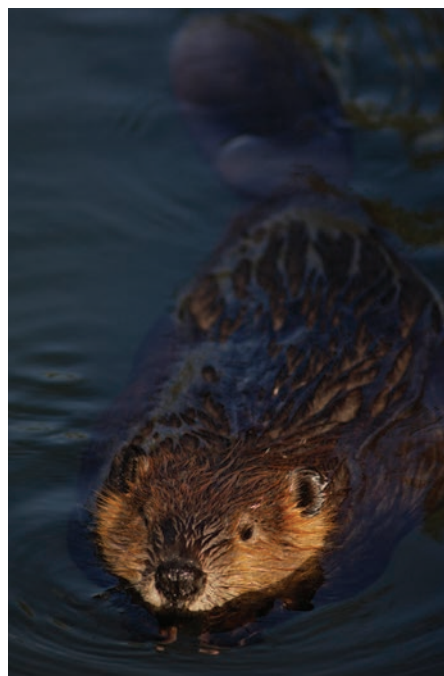
Selawik, about 80 miles to the east, is a beaver hotspot, too, and

some are upset that the animals are blocking hunting access by boat. “Elders said to start getting rid of the beavers, but nobody listened, and now it’s overpopulated,” said Ralph Ramoth Jr. (Inupiaq), a subsistence hunter who also works for the local airport and his town’s road, water and sewer department. Lodges up to 15 feet tall make navigating sloughs to hunt moose on the periphery challenging. “You can’t even go some places now with a boat, because it’s dammed up,” Ramoth said. Sometimes he tries to chip away at beavers’ handiwork, with little success. “If you tear up part of a dam or a beaver igloo, they’ll come right back and fix it up again,” he said. “They’re just busy beavers.”

Hunters like Ramoth regard beavers as pests, and Harris wants to see beaver population-control efforts. But others argue that the beavers aren’t necessarily creating a better or worse tundra — just a different one. Kramer considers them a blessing for habitat diversity. “They’ve enhanced our land in an incredible way when they do come up,” Kramer said. “They make lakes and ponds and bigger sloughs, which makes for more moose, ducks, waterfowl and muskrat.”

Scientists will continue to monitor beaver activity and its possible environmental impacts. One major question remains unanswered: Are beavers accelerating climate change in the region? The pools of water that their dams create are warmer than the surrounding soil, and that could thaw permafrost and release carbon and methane greenhouse gases into the atmosphere. “Beavers are maybe a player,” said Christina Schädel, a professor who studies permafrost at Northern Arizona University. “How big, we don’t know. But it’s absolutely worth investigating.” 🌱

This winter beaver food pile was flushed out by high waters in the Nuna River, east of Kotzebue, Alaska (*left*). A beaver works in the bright night of summer in the Arctic (*right*).
Seth Kantner





REPORTAGE

Pensions, prisoners and Puyallup

In Tacoma, a pension fund-backed methane gas project offers a preview of the climate battles to come.

BY RICO MOORE | PHOTOS BY DAVID MOSKOWITZ

IN THE TIDEFLATS of Tacoma, Washington, beyond the masts of sailboats anchored in the Puyallup Tribe's marina, pipelines emerge from the earth and snake their way inland. Their destination — an 8 million-gallon liquefied methane gas tank — was once considered by politicians to be the logical answer to the climate crisis. Now, it's the center of a local controversy with international implications.

The tank, owned by Puget Sound Energy (PSE), is the product of a recent era of proposed climate solutions. In 2012, the Environmental

Protection Agency gave the shipping company TOTE Maritime a waiver to switch its operations to methane gas, also referred to as natural gas, in order to encourage it to lower the sulfur output from its diesel emissions. Two years later, PSE signed a contract with TOTE to supply its ships with gas. Against the express wishes of the Puyallup, the 14-story waterfront tank was born.

"The salmon are sick in the water because of facilities like (PSE's) that continue to pollute us and dump these toxic chemicals on top of us, day

in and day out," Puyallup member Dakota Case told *High Country News* in January.

The subsequent fight against the tank illustrates the critical place Indigenous sovereignty holds at the intersection of human rights and climate change. On Nov. 19, 2021, the state's Pollution Control Hearings Board affirmed the issuance of the final permits necessary, which require PSE to monitor sulfur dioxide and volatile organic compound emissions. The Puyallup Tribe and a coalition of environmental groups represented by EarthJustice



Tahoma (Mount Rainier) rises beyond the Puyallup Indian Reservation in Washington. The methane gas terminal can be recognized by the large round storage container in the foreground (*left*). Tribal Councilmember Annette Bryan on tribal land across the water from the terminal, which sits on the edge of the Puyallup Reservation (*above*).

immediately appealed, arguing that the facility and its associated operations would hamper decarbonization at a life-or-death moment for the planet. They were joined by some unlikely allies: immigration advocates, who fear that it would endanger detainees in the nearby Northwest ICE Processing Center, and pensioners from Canada, who object to having their retirement funds used to help pay for the tank. The opposition, like the tank itself, is both unique and common, normal but not. Given the kind of climate solutions likely to be offered

by settler-colonial institutions, it might be a glimpse of the future.

SINCE TIME IMMEMORIAL, the Tideflats have been the Puyallup's home. The tribe came to the water to fish, traveling by canoe to gather plants for food and medicine. Prior to colonization and industrialization, shellfish were abundant at low tide. "When the tide was out, the table was set," said Puyallup Councilwoman Annette Bryan. "So you can imagine all of the tidelands without any industry as just very, very beautiful."

In the mid-1800s, Gov. Isaac Stevens forcibly dispossessed the Puyallup of their lands, though the resulting Medicine Creek Treaty preserved their rights to fish and hunt. Case said that with the treaty, Stevens made a two-part, largely unspoken, promise: "One, that these treaties shall remain intact as long as the trees grow and the rivers run, and two: You'll sign these treaties or you'll walk knee-deep in the blood of your people." In the 20th century, the tribe won a series of legal and legislative victories, first and foremost against the state of Washington regarding fishing rights, culminating in the Land Claims Settlement Act of 1989, which required the signatories, including the city of Tacoma, to consult with it on projects impacting tribal members' way of life, especially their right to fish.

The Tideflats are not only vulnerable to sea-level rise and tsunamis; residents are also

already in the 80-90th percentile in the nation in terms of cancer risk from air pollution. Toxic releases from industrial facilities, waste treatment storage and disposal, diesel emissions and wastewater discharges have disproportionately impacted the area as well. "It's my belief that we cannot afford one more facility, especially another fossil fuel facility, that adds to the impacts that are already there," Bryan said.

The Tacoma Human Rights Commission agreed in a letter it wrote to Tacoma Mayor Victoria Woodards in April 2019, after the city issued a final supplemental environmental impact statement. It warned that "the operation of the (liquefied methane gas) facility would potentially expose the South Sound community to grave environmental risks," adding that the city had omitted the tribe "from more integral involvement" in the environmental impact scoping and drafting process. A month later, in May, Washington Gov. Jay Inslee withdrew his support for the project.

According to the governor's press official, however, in a response emailed to *High Country News*, Inslee lacks authority over the permitting, which lies in the hands of the city. The Tacoma City Council, meanwhile, passed a series of ordinance amendments last November that limited new petroleum infrastructure but still allowed for PSE's tank. Bryan believes that the federal government failed to uphold its trust responsibility; even if it delegates regulatory authority

to local jurisdictions, it doesn't delegate its trust responsibility. And the government's responsibility, and the lack of it, can have very real consequences. "If it's going to impact our inherent way of life, our salmon — anything to do with us — you have to consult with us," Case said. "We have to give you permission."

PSE claims that its facility, which would be supplied by pipeline with gas extracted by

hydraulic fracturing from Alberta and British Columbia, qualifies as a climate solution because, instead of diesel, it would supply methane gas for cargo ships and construction trucks, as well as gas for PSE's pipeline network to local customers during periods of high demand. "In the maritime industry, there are currently no other options that can offer the same environmental benefits, so (liquefied methane gas) is the best alternative

we have today," PSE said in an emailed statement to *High Country News*.

Tacoma's supplemental environmental impact statement similarly claimed that the project would offset diesel emissions from ships, resulting in a net greenhouse gas benefit. And the Puget Sound Clean Air Agency declined to conduct a Health Impact Assessment, stating that emissions of toxic air pollution would be "acceptable under all applicable requirements." According to Peter Erickson, an internationally recognized climate expert based in Seattle, the city's review was fundamentally flawed and misleading. Erickson testified in front of the Pollution Control Hearings Board on March 19, 2021, saying that project-associated methane emissions are inconsistent with state, national and global commitments to reduce emissions because they would increase gas consumption and hinder decarbonization.

The Puyallup aren't the only people affected by the region's continued commitment to extractive energy. Immigrants in the Northwest ICE Processing Center, an immigrant detention facility owned by the GEO Group, are also at risk. The center was built next to an EPA Superfund site, now a metals recycling facility. In 2018, lithium-ion batteries in the facility ignited, burning car remnants and emitting fumes that the detainees could smell, according to Maru Mora Villalpando, an immigrant advocate with La Resistencia. "Everybody is saying, 'This is gonna be terrible if something happens. Tacoma is in danger,'" Villalpando said. "Just think about the people that are detained right here." The GEO Group did not respond to multiple requests for comment.

The poor air quality means that Ivan Sanchez, who is detained at the facility, has to use an inhaler. He said air filtration isn't properly maintained and the bad air comes and goes. The drinking water is often brown and doesn't taste right, he added, and bottled water costs detainees \$2 a bottle. Conditions are already bad, and the thought that they could be worsened by yet another fossil fuel facility has brought La Resistencia and the Tacoma Human Rights Commission into the fight. In the same 2019 letter to the mayor, the commission found that the tank would "potentially subject (Puyallup) Tribal members and (NWICEPC) detainees, in particular, to a disparate environmental impact in violation of their human rights."

The Puyallup Indian Reservation is heavily developed and includes almost the entire Port of Tacoma (top left). Dakota Case in front of the methane gas terminal on the edge of the Puyallup Indian Reservation (left).





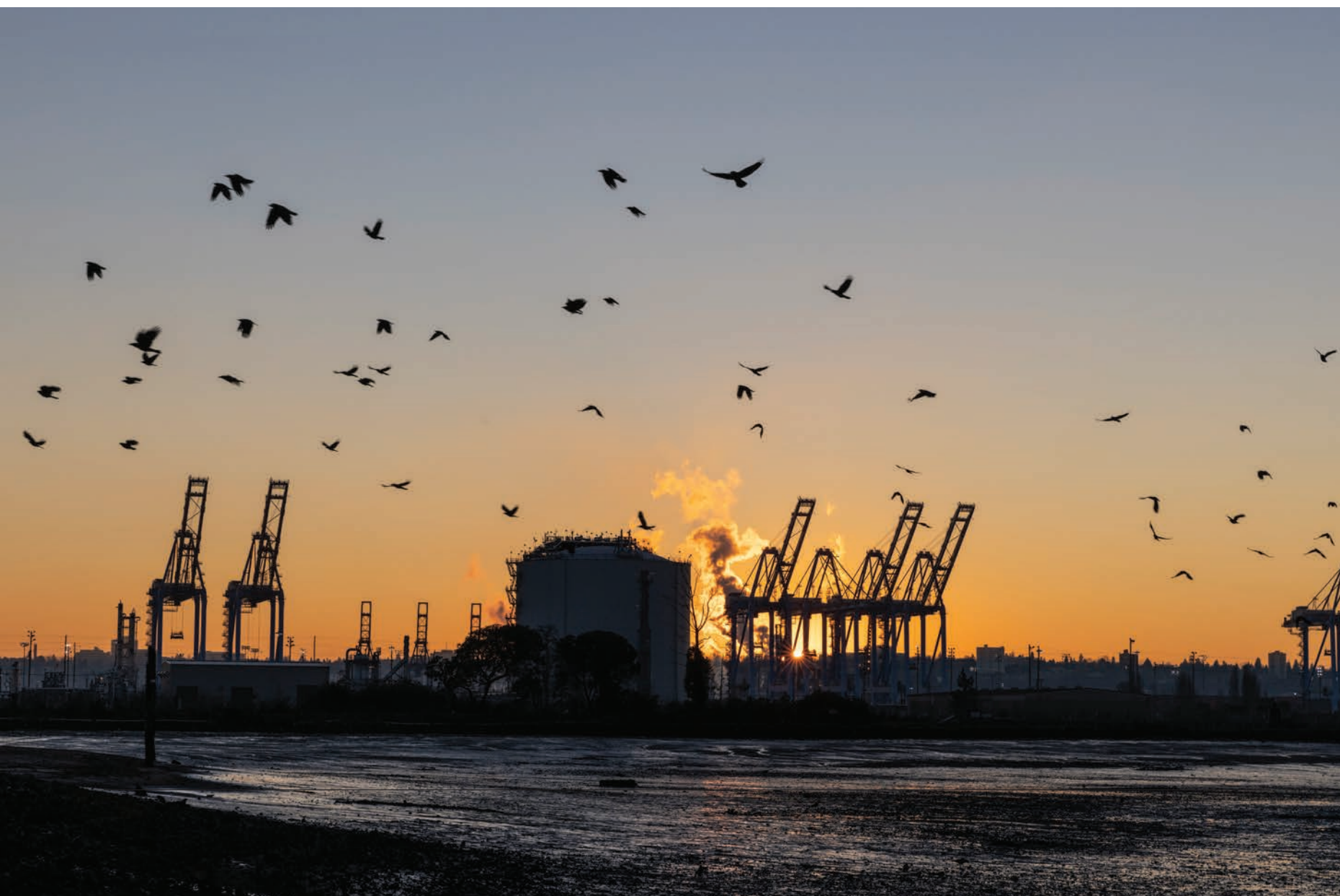
PSE is owned by the Macquarie Group, a global financial services group, and a consortium of pension funds: the Alberta Investment Management Corporation, British Columbia Investment Management Corporation, the Ontario Municipal Employees' Retirement System, the Ontario Teachers' Pension Plan and PGGM Vermogensbeheer B.V. of the Netherlands. The funds either declined to comment or didn't respond to questions regarding the project's potential human rights violations. The pensioners themselves include public service employees from Canada and the Netherlands, and at least two are unhappy with the way their funds are being used.

James Rowe, a professor of environmental studies at the University of Victoria in British Columbia, said these pension funds represent a massive amount of capital, which could be used either to accelerate or slow decarbonization.

Rowe, who draws a pension from BCI, said it angers him that his retirement money is funding the methane gas facility, given that he teaches his students about the importance of climate action and respecting Indigenous sovereignty. Mary Lynn Young, a professor at the University of British Columbia who recently co-authored a book on Indigenous representation in the media, was likewise concerned to learn her pension fund was being invested in the project. She told *HCN* that she is in the process of moving her funds to a fossil-free investment option offered by BCI.

But short of the city forcing PSE to pull the plug on the gas tank, there is no clear or immediate solution in the offing. The project instead leaves Tacoma as a near-perfect symbol of the climate crisis: An American city ignoring a sovereign Indigenous nation, waving a climate emergency declaration about in one hand and a massive tank of methane gas in the other. ☀

Maru Mora Villalpando in front of the ICE detention facility, where she works with incarcerated individuals (*left*). Mudflats are exposed at low tide near the methane gas terminal and loading cranes for container ships in the Port of Tacoma (*below*).



Climate justice comes home

An activist collective in Portland, Oregon, says making buildings carbon-free is just the start.

BY SARAH SAX

ON A COLD December morning, Anjeanette Brown sat inside a Shari's restaurant, nursing a cup of coffee and casually pushing sharp objects out of the reach of their 1-year old daughter. Brown, a Black environmental activist, grew up in northeast Portland, once home to a thriving Black community. The area's cornerstones — the Cotton Club, Joe's Place and Geneva's Shear Perfection — survive only as historical posters, replaced by faux French cafes and vegan restaurants. Brown now lives farther east, around an hour's commute from downtown.

Every winter, Brown worries about energy bills. Their rental home heats with a wood stove — the cheapest option — but this year, they told me, pulling a fork from their daughter's fist and smiling at her antics, "I'm not going to use my wood." That's mainly for the safety of the child, who gurgled happily and turned her attention to the creamer packages. The only other option, however, is space heaters, which are also problematic: They're expensive, running just under \$400 a month for the three coldest months of the year, and they're also potentially dangerous; a space heater in a Bronx high-rise, where tenants had previously reported problems with the heat, sparked a fire this January that killed 17 people. Portland lacks standards for energy, health, efficiency or climate resilience in existing buildings, so Brown has little recourse to demand more options.

On average, Black, Latino and low-income families live in less energy-efficient homes and pay more for their energy, with low-income households spending the most, up to 38% of their income, according to the Oregon Energy Fund. But access to the energy needed to heat and cool homes isn't just a matter of cost. It's also a matter of survival: Climate change,

created by the burning of fossil fuels, has made extreme weather and wildfire smoke increasingly common and severe. This summer, a record-breaking heat dome killed at least 95 people in Oregon, a disproportionate number of them people of color and those living on lower incomes. At its core, safe, clean and affordable heating and cooling has become a justice issue.

"I see year by year the fires are getting closer to our neighbors, the smoke is taking people out, and the heat is killing people," said Brown. "I feel like if we don't champion this work now, there's nothing. There's nothing left to really fight for. This has to be fixed, now."

Brown is part of a collective that is working to address the health, climate and equity issues associated with homes. The Build/Shift Collective, which stands for "Building relationships, shifting power," is a grassroots group in Portland made up almost exclusively of people of color, many of them low-income renters. Buildings are one of the largest sources of greenhouse gas emissions in the U.S., but the push to decarbonize them needs to involve more than just emissions, the activists believe. Decarbonization should also account for the unequal effects of climate change, racist housing policies and air pollution on communities of color, and it should strive to make sure everyone has access to a healthy home, not just an energy-efficient one.

LATE LAST NOVEMBER, I logged onto a virtual meeting with some of the core members of Build/Shift. The collective came out of the Zero Cities Project, developed in 2017 as an initiative to help cities develop practical, equitable road maps to achieving a zero-net-carbon building sector by 2050. Since the fall of 2020, the participants have gathered about once a



week to discuss, among other things, a set of building standards they're developing with the city of Portland. Around 10 people popped up on screen, some at home or in offices, a few in their cars.

Ezell Watson joined from the lobby of his apartment building. A man with a big smile who chooses his words carefully, Watson works as the director of diversity, equity and inclusion for Oregon's Public Utilities Commission, although he joined the collective as a private citizen. "Energy or the restriction of it or the placement of non-clean energy has been systematically used to



Members of the Build/Shift Collective (from left): Anjeanette Brown, Derric Thompson, Ezell Watson, Taren Evans, Nikita Daryanani, Samantha Hernandez, Alma Pinto, Bretto Jackson and Jona Davis. Photographed in Portland, Oregon, in February. **Will Matsuda / HCN**

“I feel like if we don’t champion this work now, there’s nothing. There’s nothing left to really fight for. This has to be fixed, now.”

devalue certain communities,” explained Watson, who is Black. “We’ve always had to live on the margins. That’s where all of the pollutants are.”

Watson’s parents, who live in Atlanta, have health problems that he believes are connected to their exposure to dirty energy. “It is critically important for my mom to have clean energy. ... She needs good clean air because she’s already struggling some days to get out of the bed,” said Watson. “My father, 60 years old, has suffered multiple strokes.” The World Health Organization has called air pollution a “silent public health emergency” that’s linked to higher rates of depression and suicide as well as to asthma, lung damage and a slew of other health problems. This also applies to the air indoors: A growing body of research has found that the same fossil fuels behind climate change also cause significant indoor air pollution, especially from sources like gas stoves.

Scientists, activists and local governments have made reducing buildings’ carbon emissions a major focus of climate action. Dozens of municipalities and cities have started to restrict the use of natural gas and limit the amount of energy new buildings can use. Late last year, the Eugene, Oregon, City Council approved starting a process that could lead to a ban on natural gas hookups in all new commercial and residential buildings.

But there’s one problem with that approach: It doesn’t limit current emissions, only future ones. “There’s no emissions coming from buildings that haven’t been built yet,” said Olivia Walker, technical strategist at the Natural Resources Defense Council. The focus on new buildings is also more likely to help higher-income people and white residents. “They’re not the ones facing the issues that a low-performing building stock has brought about,” said Walker.

Many people living in older, energy-inefficient and low-quality housing are there because of racist policies like redlining and decades of discriminatory lending and development. In the early 20th century, for example, the city of Portland effectively restricted African Americans to a single neighborhood, which it later razed under the guise of urban renewal, displacing many of the families. Now, some community members fear energy incentives will also be used to evict people, especially if communities of color are not involved in designing the new policies. Studies generally concur, showing that shifting to more renewable energy consumption can inadvertently drive up energy poverty.

“We’re going to always be on the end of the stick that gets oppressed,” said collective member Bretto Jackson. “In this case, it’s just that this energy is clean energy,”

One common problem with trying to make rental housing more energy efficient is that landlords who don’t pay the utility bills often have little incentive to make energy improvements in rentals. When they do, however, they often use it as an excuse to evict tenants, contributing to displacement. It’s something energy experts refer to as the “split-incentive” barrier.

“When the value goes down, they swoop in and push these people out, then they’re gonna build it up again,” said Derric Thompson, another coalition member, during the Zoom call. “In northeast Portland, they’re gone. But now there’s condos, so why couldn’t those things have been built with the Black people in the community?”

THE BUILD/SHIFT COLLECTIVE is fighting to make sure that history is not repeated, in part through the new rules they are working on with the city: the Health, Equitable Energy, Anti-Displacement, Resilience, and Temperature

control, or HEART, standards. The requirements would apply to the city’s largest existing commercial and multifamily residential buildings. They would require landlords to insulate all units properly and have air conditioning installed. They would also make sure that renters have the resources to push back whenever housing isn’t up to code, without fear of eviction.

In the first months of this year, Portland’s Bureau of Planning and Sustainability will prepare draft rules and begin getting public input. If the city council approves the rules, a version of the HEART standards could be implemented within the next few years.

While that would be a huge step forward for the collective’s energy policy, Build/Shift has its eyes set on a bigger vision: shifting more of the political power to people of color. “You look around this room, you see diversity in here,” said Watson at the end of our Zoom call last November. “Build/Shift had to be intentional about that. It’s intentional that certain groups are excluded from the discussion.”

The collective wants more BIPOC representatives to help draft and make policy, but also to change where and how policy is made. “We do need our people at these tables,” said Brown, who volunteers as an urban forestry commissioner and spends a lot of their time attending meetings far from their home. “The problem is not people can’t or they won’t. It’s because it’s not accessible.”

Back at Shari’s, Brown talked about Build/Shift’s ideas for a truly equitable energy future. For them, a lot of it comes down to the kind of world they can leave their children. “I envision that we are champions in saving our environment at whatever cost for our benefit, for our future generations,” they said, looking at their daughter. “Hopefully, she can have her own problems. And she can champion them herself.” ✨

THE LATEST

Hazing the howlers

Backstory

In 2020, Coloradans voted for wolf reintroduction. But you can’t establish wolf packs unless you ensure their survival, and that requires human tolerance and landscape-wide protections. Scientists traced the Green River wildlife corridor from Wyoming to Colorado in order to understand the political and physical obstacles that wolves face, and the reasons why they haven’t repopulated the West on their own (“A Hostile Country,” September 2021).

Followup

It’s now legal to use rubber bullets, guard animals and more to defend Colorado livestock from wolves. Colorado Parks and Wildlife commissioners passed an emergency resolution allowing hazing in January, after a wolf pack from Wyoming killed cattle and rancher Carlos Atencio’s dog. Atencio remains wary of reintroduction. “If there was any sort of legal way we could put it to a revote,” he told *The Colorado Sun*, “or maybe the governor could put it on pause for now.” — Kylie Mohr

Hunter hopscotch

Why four friends were charged with trespassing on land they never set foot on.

BY KYLIE MOHR

THE BOUNTIFUL BIG GAME in the alpine meadows and timbered ravines of Wyoming's Elk Mountain drew four Missouri hunters to the area last fall. They encountered several points where the corners of four land parcels met: two public and two private plots, alternating like the squares of a checkerboard. The camo-clad bow hunters tried to move as if they were checkers on the landscape, stepping diagonally between the Bureau of Land Management parcels where they were hunting in order to avoid lots that belonged to the privately owned Elk Mountain Ranch.

Land ownership in southern Wyoming, like much of the West, is a patchwork of interspersed parcels. Wyoming's checkerboard originated when the federal government took land from the Shoshone, Arapaho, Lakota, Cheyenne and other tribal nations, often by breaking treaties, and gave alternating parcels to railroads to encourage development. The result resembles a neat grid on paper, but a messy landscape in real life.

The men had numerous encounters with an irate ranch manager, as well as with Wyoming Game and Fish officers and Carbon County sheriff's deputies. According to the hunters, officials told them they'd done nothing wrong. But on Oct. 4, a deputy greeted them in camp with criminal trespass citations that carried up to six months in jail and a penalty of up to \$750.

The hunters never actually

set foot on private land; they used a stepladder to hopscotch over the corners. But in doing so, they violated the airspace above the land, which belongs to the landowner. The case, now pending in Carbon County Circuit Court, sheds light on what's called "corner crossing," traveling between public land parcels where the corners touch. The verdict could clarify if, and how, the public can access millions of acres of public land. A 2018 report from the Theodore Roosevelt Conservation Partnership and the map app company onX found 2.28 million acres of federal and state land in Wyoming are inaccessible due to checkerboarding — effectively turning some public lands into an extension of the surrounding landowners' private backyards.

Like other Western states, Wyoming has no statute explicitly allowing or prohibiting corner crossing. Opponents say it's a problem because even if the land isn't physically impacted, invading its airspace erodes private property rights. Phone calls to the ranch, owned by wealthy businessman Fred Eshelman, weren't returned. A 2004 Wyoming attorney general's opinion states that while corner crossing doesn't violate the state's hunting laws, it "may still be a criminal trespass" — something game wardens lack the authority to enforce and must refer to the local sheriff or county attorney.

It's messy elsewhere, too: Washington Department of Fish and Wildlife officers won't cite



Detail from the Bureau of Land Management's State of Wyoming Land Status map, showing a checkerboard pattern of public (yellow) and private (white) lands.
U.S. Department of the Interior, Bureau of Land Management

people for corner crossing, but attorneys general in Utah and Colorado have informed their state wildlife agencies that it's illegal. "This is a murky legal area, due in part to the failure of Congress to ensure access to landlocked federal public lands," said Martin Nie, a professor of natural resource policy at the University of Montana.

That's why the Wyoming chapter of advocacy group Backcountry Hunters and Anglers decided to support the hunters. A GoFundMe page started by BHA raised over \$65,000 for their legal fees, with any leftover funds promised to a Wyoming program that facilitates cooperation between landowners and hunters and anglers. With more people using onX or similar GPS services, Buzz Hettick, the Wyoming BHA co-chair, expects the problem to continue. "Ten years ago, you had to stand there with a map and hope for the best," he said. "Now people can walk up and say, 'Yep, right here's the corner crossing point.'"

While this case involves hunters, anyone wanting to access public land — whether for climbing, hiking, foraging or bird watching — has an interest in the outcome. A hunter's attorney filed a motion to dismiss the charges in

January, arguing that federal law prohibits people from preventing free passage through public lands. A jury trial is currently scheduled for April.

If they're found guilty, the men could appeal the decision to the Wyoming Supreme Court, but even then, any ruling would apply only to Wyoming. "The hopes of what this would resolve might be overblown," said Joel Webster, vice president of Western conservation for the Theodore Roosevelt Conservation Partnership. "And, in fact, it could make it harder to work constructively with landowners."

Then there's the chance of political pushback. "My fear is that it inevitably lands at the Legislature, which historically hasn't been the place to solve this," said Jess Johnson, the Wyoming Wildlife Federation's government affairs director. Bills to legalize corner crossing died in Wyoming in 2011, Montana in 2013 and Nevada in 2017. Johnson thinks the conversation will be more productive when tension from the October dispute dies down. "(The way) to change really hot-button policy issues that have lots of emotion around them is not by lighting a bonfire," she said. "It's a slow burn." 🌱



The place that coal built and fire burned

Extractive industry laid the infrastructure for the suburban sprawl that fueled Colorado's destructive Marshall Fire.

BY KATE SCHIMEL | CONTEMPORARY PHOTOS BY CALEB SANTIAGO ALVARADO

WHEN SHE FIRST SAW THE SMOKE, Gurjeet Dhanoa thought it was a dust storm. She watched it as she pumped gas at a Conoco off the highway between Boulder and Denver, Colorado. But when she got back in the car, a cop car pulled out in front of her. The officer told her to turn around and go back. "Something is very, very wrong here," she thought.

She turned, drove to a ridge a few minutes away, and, for the first time, saw clearly what would soon be called the Marshall Fire. Pushed by winds so strong she could barely stand upright, the fire cut through the suburb of Superior toward the home where her mother, a recent cancer survivor on oxygen, lived. Dhanoa called her brother, who lived with their parents and cared for their mother, and told them to evacuate now; there was no time to grab anything. They jumped in the car and escaped to Dhanoa's house, a couple of miles away. From Dhanoa's perch on the ridge, she watched the smoke plume of the burning houses grow so large it hid the flames.

When Dhanoa got home, the fire had not yet made the TV news. The danger seemed to have faded. "It's not real," she remembers thinking. "Your mind keeps trying to joke about this." Her brother said they should prepare, just in case, so she packed up some photo albums and a chest filled with childhood memorabilia. She called her son and husband, who were on a hunting trip, and asked what they'd save. Arjun, 14, asked for a jersey and his Wayne Gretzky card, and Dhanoa's husband requested a trophy elk mount and his old stick-shift Bronco. "All those years you've

had that Bronco, you've never taught me how to drive it," she reminded him. They left it behind.

UNLIKE SO MANY of Colorado's wildfires, the Marshall Fire began out on the plains. The flames tore through grasslands and shrubs and burned more than 1,000 homes, making it the most destructive in the state's history. Boulder County, once a coal-mining hub, now faced a destructive fire regime, fueled in part by the carbon that was mined there a century ago.

Boulder and the suburbs surrounding it sit at the divide between the Great Plains and the Rockies. The Flatirons — the steep rock faces west of town — draw the eye, but the low roll of the plains rising up to their base is just as significant. This is the shortgrass prairie, stretching north into Canada, south into Texas and east into Kansas, the Dakotas and Oklahoma. It was once the home and hunting grounds of Arapaho and Cheyenne communities, before the Sand Creek Massacre and treaty violations drove them into Oklahoma in the 1800s.

The Front Range plains are scruffy, typically sparser than the tall and mixed-grass prairies to the east. From the steep hogbacks of the foothills, they look like a smooth sea of green in the spring and gold in the winter. Before the towns were built, wildfires were infrequent but massive, spreading swiftly through the grass.

Housing developments now dominate the Front Range. In Boulder County, the suburbs were often built on the scaffolds of old coal-mining towns. A map from 1915 shows the



Northern Coal Field of Colorado running beneath much of the Marshall Fire burn area: Louisville, once the heart of that coal field, now a quiet suburb where more than 500 homes burned; Old Town Superior, home to people who worked at the Industrial, Enterprise and Monarch mines; and Marshall Mesa, a swath of open space where trail signs remind hikers of the coal seam fires that burned underground. It's also where the Marshall Fire may have started.

In the early decades of the 20th century, the miners repeatedly went on strike, sometimes for years, over pay and working conditions. In an oral history recorded in 1978, Thomas Kerr, a former miner, described how they used explosives underground in the 1930s: "Couldn't breathe. Dust and smoke. That black powder — awful lot of smoke." In 1936, an explosion killed eight men working the graveyard shift at the Monarch #2 coal mine. Nearly a century later, in Superior, even Dhanoa and her family knew of that tragedy.

A disaster recovery researcher told me that what we call catastrophes, whether fires, floods or collapsing coal mines, are essentially change, compressed in time. Monarch closed a decade later, and many of the nearby mines followed suit,

Gurjeet Dhanoa peers into the foundation of her burned home in Louisville, Colorado (*left*).

Winston Morgan, son of the Industrial Coal Mine foreman, is seen in a photograph taken in Superior, Colorado, around 1923. The water tank for company housing is in the background (*right*). **Carnegie Library for Local History, Boulder**



The Hecla Mine operated in Louisville, Colorado, from 1890-1920. Pictured, Hecla Heights was built by mine owners in 1910 to house 75 miners who were hired to break a strike. A fence was built as protection from angry striking miners (*left*).
Carnegie Library for Local History / Museum of Boulder Collection



Mailboxes on the street in Louisville, where Dhanoa's home, her brother's home and her mother's home all burned (*right*).

clearing the way for entirely different settlers.

The prairie makes way for the coal mine. The coal mine becomes a suburb. Most people in Boulder today have jobs in tech or health care or service work. They are often drawn to the area by the promise of the Rockies, dreaming of exploring those high mountains, but they build their lives on the prairie.

Since the 1970s, new housing developments have transformed the shortgrass prairie. Driven by rising prices in Boulder and Denver and the desire to escape the city's perceived woes, or more land or a larger home, people flocked to the suburbs. From an airplane, the houses form an irregular grid that stretches from horizon to horizon.

In June 2012, during a hot, dry summer, lightning started a fire that quickly burned right up to the crest of the Flatirons that form Boulder's back wall. From the windows of my childhood home, I saw the wind blow embers over the ridge, igniting the trees on our side. My father explained that fire was far less likely to burn downhill, but we still packed up to leave. Later, after the fire was under control, I watched the smoke plume from the plains. At least nine other notable fires started that month in Colorado, including two that set new state records for how many homes they destroyed.

Looking back, that fire seems like the start of a new era for my hometown, a time when the decisions of the past — the development of the prairie and our dependence on fossil fuels — finally found their consequences. Back then, I could imagine living with fires like that, finding ways to survive and prepare, to be resilient and tough as we faced the climate crisis. The woods surrounding Boulder continued to burn — in 2018 down Bear Creek and then again in 2020 through the north edge of town. Alongside the floods and waning snows, they came to feel like habitual crises.

In a video made after the Marshall Fire, Dhanoa's brother Mandip tallied the family's losses. "You see the trailer and mom's car? That's all that's left. Those stairs going up to the right, that's where my office was," he quietly narrates. The view shifts to Dhanoa's house, miles from the start of the burn. "That's all that's left, that little fence. That fence is all that's left."

Dhanoa's home burned to the ground. She rescued that one carful of treasured things and no more. The house where her parents and brother lived was lost, along with all their belongings. Across the street from her parents, a house she once lived in and now rented out burned, too. Her tenants couldn't get back in time, and they





lost their pets and everything in the home.

When I spoke with Dhanoa two weeks after the fire, she was at her restaurant, the Tandoori Grill, as her staff deep-cleaned the kitchen. We talked for nearly two hours and, for the most part, she spoke enthusiastically and with great precision about her life. She told me affectionately of the close, warm community that grew out of the old mining town, between the strip malls and sprawl. “Some of them had no idea that this little small town existed in what they thought was a giant suburb,” she said.

But when she talked about her restaurant, she sounded tired. I ate there often when I was growing up; I remember the neat silver trays of the buffet and the crisp white tablecloths next to windows that looked out on a quiet south Boulder mall. When Dhanoa looks around now, though, she sees the evidence of what they survived: the booths they shoved together to sleep on, and the clothes strewn about from when they briefly lived there after evacuating.

“It’s a disaster in the restaurant. I have no ability to deal with it,” she told me. Everything

that was stored at the house, from her checkbooks to her menu templates, burned. She can no longer find the answers to even the routine questions her staff has.

It had already been a hard year. Dhanoa, her husband, Paul, and the staff worked long hours to stay afloat during the pandemic. Then her mother was diagnosed with an autoimmune disease and with cancer, now in remission. The fire scattered her once tight-knit neighborhood to the winds, and she doesn’t know if the people will return.

“People keep reaching out and trying to help. They don’t know how to help, and they keep asking. I don’t know what to ask for,” she said. “They feel guilty they can’t help. Because I see they feel guilty, I feel guilty.”

The day after the fire, the smoke blew away. Snow finally fell. It arrived too late to stop the flames from sweeping through town, but it laid a quiet blanket over the wreckage. A few weeks after that, investigators announced they had narrowed down the fire’s suspected causes. One possibility: an underground fire still burning away in one of the region’s abandoned coal mines. ☀

In nearby Superior, Colorado, two men stand with an automobile in the 1930s (*left*). **Carnegie Library for Local History, Boulder**

Paul and Gurjeet Dhanoa stand on their property after the Marshall Fire (*right*).



Tech wreck

Our likes, Zoom calls, photos and transactions in cyberspace have real-world environmental impact.

BY JONATHAN THOMPSON

THE GRADUAL SHIFT of life away from the three-dimensional space to cyberspace once promised a *Jetsons*-style efficiency, a tidy transition from physical stuff's environment-harming ways to a clean and impact-free digital world. We would telecommute through cyberspace rather than along dirty highways in polluting cars, working in paperless offices where no trees were sacrificed to print memos and correspondence. And, instead of using coins made from mined metals, we'd switch to digital currency — no mines, no blasting, no gouging required.

The Jetsons had it right, sort of: The COVID-sparked Zoom Boom has left many physical offices empty and drastically reduced mind-numbing, gas-guzzling commutes. Cash and coins are increasingly passé. And when was the last time you received a paper interoffice memo? The mass migration from physical to digital, however, has yet to take all the pressure off the

physical environment. That's because what happens in cyberspace doesn't stay in cyberspace.

Every office email, every social media "like," every credit card transaction and telecommuter call still has to be processed by physical computers — real machines that use real energy and water and have real environmental impacts. Even cryptocurrency, or Bitcoin, which lacks a physical presence of its own, must be "mined" in an energy-intensive way.

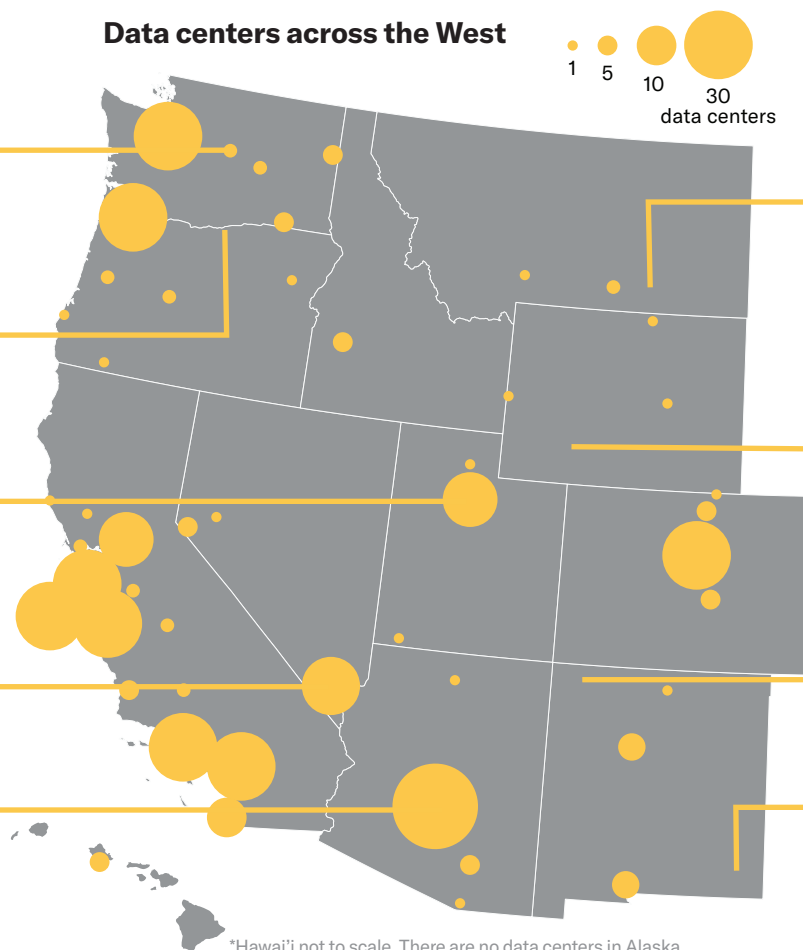
Thousands of servers, storage units and network devices stacked up in sprawling warehouses across the West — on the fringe of Phoenix, Arizona, along the Columbia River, and even in Wyoming's hinterland — suck juice from the grid to process millions of transactions. The electricity becomes equipment-straining heat, which must be shed using water or more electricity. Instead of seeking veins of gold or silver, cryptocurrency miners chase cheap energy — even setting up

shop on oil and gas pads to utilize methane that otherwise would be flared — because more power use equals greater computing capacity, which equals higher profits.

As is the case with any sort of profligate energy use, the impacts depend upon where the electricity comes from. Google, Amazon and Facebook purchase solar and wind power, even build their own renewable energy facilities, to run their data centers. And a few Bitcoin miners have promised to power their operations entirely with excess solar power during times of low grid demand. That would certainly help solar — but so far the promise has yet to be realized on any large scale. ☼

Sources: Cambridge Centre for Alternative Finance, Digiconomist, Joule, Google, U.S. Energy Information Administration, U.S. Department of Energy, Carbon Brief, Wyoming Hyperscale White Box, EZ Blockchain, Salt Lake Tribune, Casper Star-Tribune, Data Center Dynamics, Berkeley Lab, City of Mesa, Arizona, Marathon Digital Holdings. **Data visualization design:** Luna Anna Archey / HCN

Data centers across the West



Chelan County, Washington: In 2014, crypto-miners began flocking to this central Washington community in search of cheap hydropower, operating out of shipping containers and vacant businesses — even, in one case, filling apartments with remotely operated mining rigs. They pulled so much juice from the grid that distribution equipment failed, resulting in outages and fires. In response, the local utility raised rates and asked for upfront payment from crypto-miners. That, combined with the rising cost of hydropower, has dissipated the local crypto-mining rush.

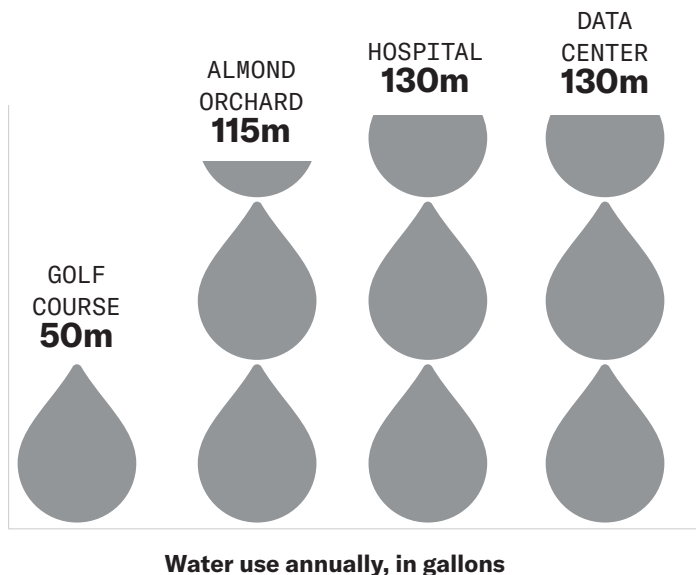
The Dalles, Oregon: Google's data center on the bank of the Columbia looks about three times the size of a nearby Home Depot. Now the tech giant wants to build two more facilities here, and residents are concerned about the impact on water. Google and other tech companies rarely disclose water or power use numbers, saying they are trade secrets.

Bluffdale, Utah: The National Security Agency's massive data center near this town of 8,000 is shrouded in secrecy, but it reportedly has a 65 megawatt power capacity, enough to electrify a town of 20,000 or so, and it can use as much as 1.7 million gallons of water per day. The 1 million-square-foot facility has its own water treatment plant, an electricity substation and 60 diesel backup generators.

Henderson, Nevada: Google hoped to get some of the power for its \$600 million, 750,000-square-foot data center in this Las Vegas suburb from the huge Gemini solar project proposed for public land north of it. But last year the solar project was dropped in the face of stiff opposition from environmentalists and recreational users.

Goodyear, Arizona: Phoenix-area cities and suburbs are competing for data centers, regardless of their profligate water use. Amazon recently purchased 91 acres in Goodyear for almost \$20 million where it plans to add to the city's data center cluster, which already houses Microsoft, Compass, Stack and Vantage Data Centers.

*Hawai'i not to scale. There are no data centers in Alaska.



1.25 million gallons

Estimated amount of water a Facebook data center in Mesa, Arizona, will use each day when it is fully built out.

135.5 billion gallons

Estimated direct and indirect water consumption by U.S. data centers per year.

Hardin, Montana: The Hardin coal-fired power plant in southern Montana was set to close in 2018 for economic reasons. Then Marathon Digital Holdings, a cryptocurrency miner, set up shop next door, and now it buys power from the plant's owner, Beowulf Energy.

Aspen Mountain, Wyoming: Wyoming Hyperscale White Box is building a liquid-cooled, "hyperscale" data center near Evanston, Wyoming, which it claims will be powered by a nearby wind power facility. The firm promises to use zero water and run no HVAC or CRAC units, and it says it will use waste heat at an associated indoor farm.

Shiprock, New Mexico: Canadian company WestBlock is mining bitcoin on the Navajo Nation with 7 megawatts of Navajo Tribal Utility Authority power that was going unused. While the project supplies much-needed jobs and tax revenue, it has also been accused of "crypto-colonialism" for taking advantage of cheap power while some 15,000 Navajo Nation homes still lack electricity.

Permian Basin, New Mexico: One of the most prolific oilfields in the nation draws more than roughnecks; it attracts miners — of the crypto variety. Bitcoin mining firms are installing mobile mining rigs on oil and gas well pads and producing electricity to power the rigs by using methane that would otherwise be flared or vented. Crypto-mining rigs, which resemble shipping containers filled with row upon row of fan-cooled computer servers, are also popping up in Utah, North Dakota and Wyoming oilfields.

73 billion kilowatt-hours

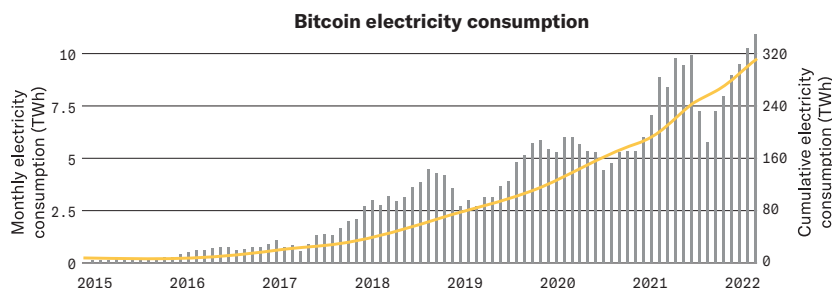
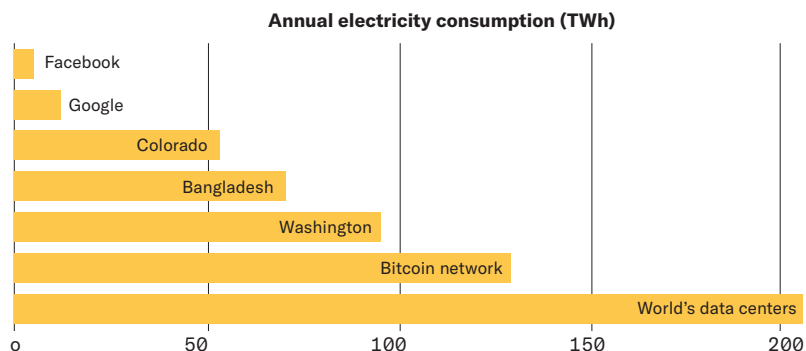
Estimated amount of power U.S. data centers collectively use each year, enough to power 6.7 million households.

Power-guzzling and cryptocurrency: an inseparable pair

Cryptocurrency mining is often characterized as an act of solving a set of complex equations, evoking images of a Red Bull-guzzling genius hunched over a calculator searching for the Bitcoin-creation formula. But actually it's less about calculation than it is about trial and error — making guesses in hopes of landing on a random, 64-digit number. Whoever has the most energy-intensive computing power can make the most guesses in a short time frame, and whoever makes the most guesses likely will solve the puzzle first, and will be rewarded for their "proof of work" with one of a finite number of bitcoins. Or, to put it another way, the more power one uses, the more likely they are to hit the jackpot. As the value of each cryptocurrency increases, so

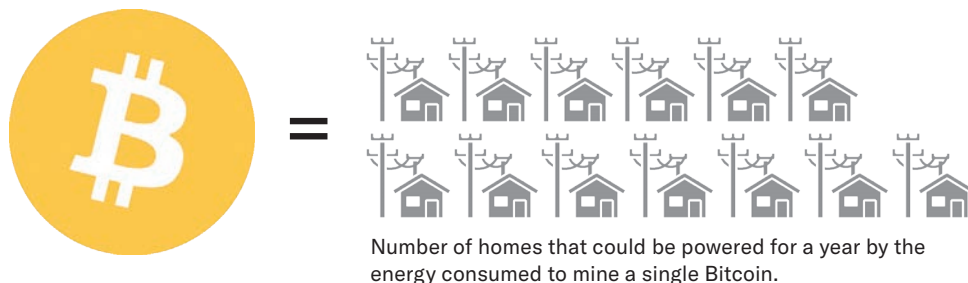
does the number of miners. More miners means more computing power means more electricity consumed. Some cryptocurrencies are considering moving away from "proof of work" to a "proof of stake" system that uses less electricity but is also less secure.

In the early days of Bitcoin's creation, people could "mine" the coins using a powerful standard desktop computer. But with each bitcoin that is mined, the process of acquiring the next one requires more computing power and therefore more energy. Now that 18.5 million of the 21 million bitcoins in existence have been mined, only huge banks of cryptocurrency mining "rigs" can provide enough computing power to be successful. That, in turn, requires huge amounts of energy.



Number of credit card transactions that could be powered by the energy consumed by a single Bitcoin transaction:

1.45 million





We care about the West.

“Like many of you, I’ve spent much of the past two years in isolation, working out of my house and communicating with colleagues on my cellphone and laptop. So it’s been especially touching to spend some time in the *HCN* offices in Colorado recently. There’s a lot of history in this sunny former feed store. It’s full of reminders of the

REMARKABLE PEOPLE

who have passed through here, and the amazing community of readers that have sustained our work for 52 years.

It’s a special feeling to be able to serve this far-flung community, and to advance the organization’s mission of informing and inspiring people to act on behalf of a truly unique part of the world. Working at *High Country News* has been my ticket to the West, an opportunity to meet an amazing array of people who care about this place — and to explore a few of its communities and landscapes. And for that, I have you to thank.

HCN readers provide three-quarters of the revenue that keeps this place running, year after year. Some of that money comes via your subscription dues, of course, but a few times a year, we reach out and ask you to make a tax-deductible contribution in support of our nonprofit journalism. Much like public radio or your local food bank, our work relies on the generosity of our community.

Please give generously during our Spring Campaign. Your gift allows us to bring you the stories you just don’t find anywhere else and connects you to a larger community of like-minded lovers of the West. The quickest way to donate is at our website, hcn.org/giveinmarch, but you can call or mail us a check if that’s easier.

Thank you. Thank you for showing up, for your support (both your words and your dollars!), for spreading the news and for sharing your ideas, tips and feedback. ”

Greg Hanscom, executive director/publisher

HCN readers: Funding our work for 52 years

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“Thank you for all of the incredible journalism you provide; it makes me feel more connected to the West and the myriad of environmental and social issues we’re confronting here. I’ve developed a ritual of reading it in the morning while I drink my coffee, and it is one of my favorite parts of my day. I look forward to it.” –Jacqueline A. Slocombe, Lakewood, Colorado



“Thanks for shining the
light in places others don’t.”

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Want to tell us why you support *HCN*?
Email development@hcn.org

We're getting better at staying in touch

DEAR FRIENDS: When I was coming up as a journalist at *High Country News* in the '90s and early 2000s, we had a beloved annual rite: the reading of the reader surveys. The surveys went out by mail, festooned with cartoons featuring our mountain goat mascot and various other creatures, drawn by longtime HCN staffer Diane Sylvain.

We asked readers what they liked and disliked about our work that year, the topics they cared about and the stories that were playing out in their corner of the region. Readers dutifully filled them out and mailed them back to us by the hundreds. And we read every one. It was like being swept up in an avalanche of mail from far-flung friends across the West and the country.

But printing and mailing surveys is time-consuming and expensive, and it uses a lot of paper. And besides, we want to hear from you more than once a year. So last summer, we revived the survey after years of dormancy, this time in a digital format. We ran ads, sent emails, had a banner on our website and solicited responses on social media, casting a wide net to get feedback on our work and learn more about you. Then we repeated it a few months

later. And now, a third survey is live and waiting for your input: hcn.org/survey

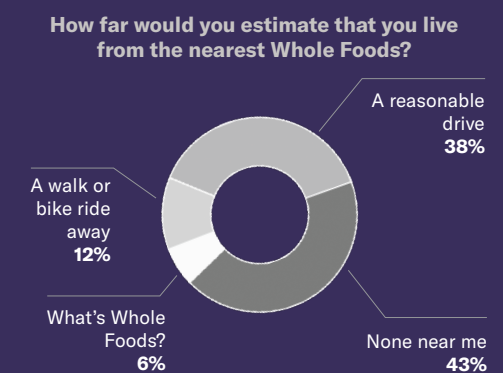
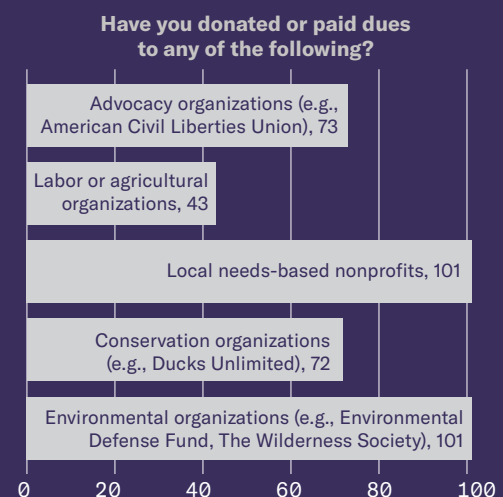
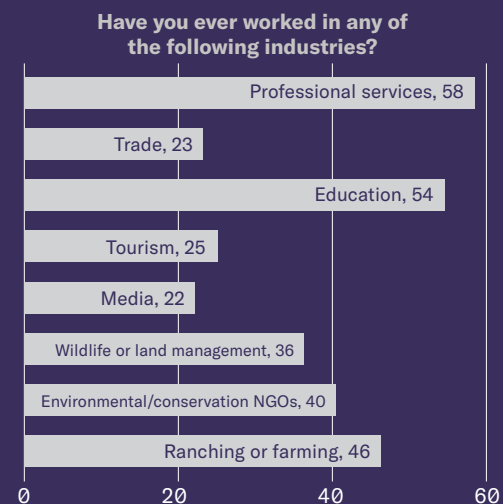
We hope to make our reader surveys an ongoing part of our correspondence, which, as I wrote last month, is a work in progress that will span these pages and wander down byways we have yet to imagine. My hope is that these surveys will enable us to take the temperature on recent issues more accurately and get to know you better, too.

Your responses to the past two surveys have shown me we share a lot of the same concerns. We're seeing similar stories play out in our communities, assessing the same needs and clocking the same rising perils. That's exactly why *High Country News* exists — to weave what might otherwise feel like isolated threads into a tapestry of the West's shared present and future.

Join our open reader survey at hcn.org/survey and let us know how we're doing and what you're thinking about these days. Get in touch at dearfriends@hcn.org. And yes, we still love getting real mail as well: P.O. Box 1090, Paonia, CO 81428.

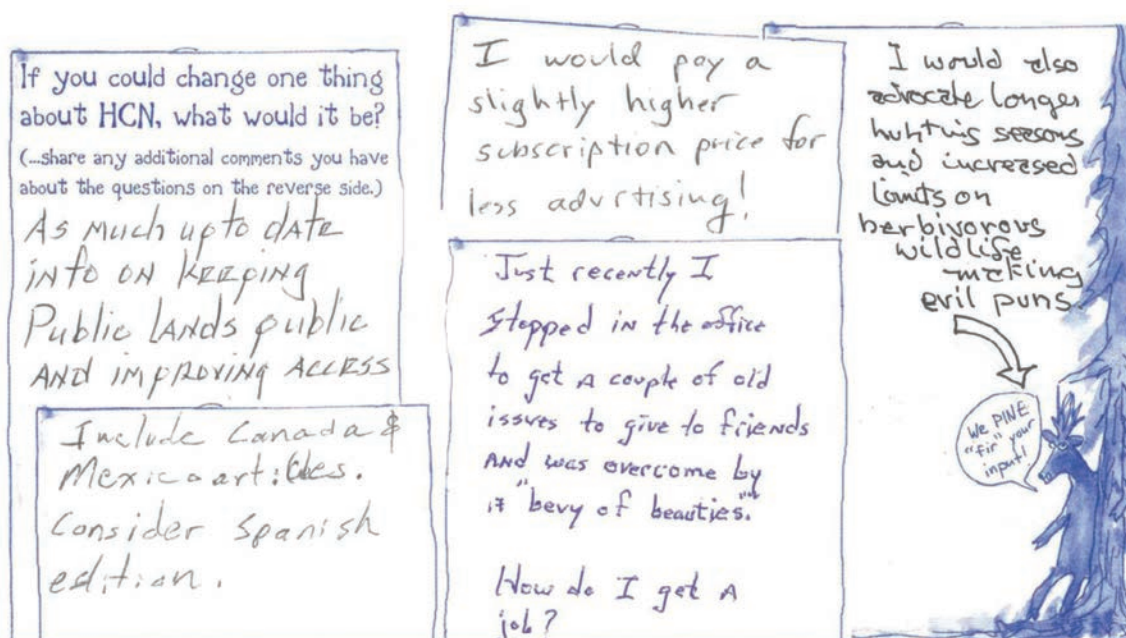
—Greg Hanscom, executive director & publisher

Some things we learned about you from your survey responses:



Some questions that you'd like to see HCN explore in the future:

- ▶ How are normal ranching families getting along?
- ▶ From folks with a long view of water in the West, what should we be doing to prepare for the coming centuries?
- ▶ Where are jobs going to come for displaced coal miners?
- ▶ How do communities rebuild after fire?



Tribes of the Colorado River Basin

SALT LAKE CITY

Ute Indian Tribe of the Uintah and Ouray Reservation

COLORADO RIVER

GLEN CANYON DAM

Shirawits Band of Paiute Indian Tribe

Moapa Band of Paiute Indians

Las Vegas Tribe of Paiute Indians

Kaiabab Band of Paiute Indians

LAKE POWELL

San Juan Southern Paiute Tribe

Ute Mountain Ute Tribe

Southern Ute Indian Tribe

Jicarilla Apache Nation

Navajo Nation

COLORADO RIVER

Havasupai Tribe

Hualapai Indian Tribe

Hopi Tribe



Zuni Tribe

ALBUQUERQUE

Navajo Nation

LITTLE COLORADO RIVER



Fort Mojave Indian Tribe

Yavapai-Apache Nation

Chemehuevi Indian Tribe

Yavapai-Prescott Indian Tribe

Tonto Apache Tribe



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Gila River Indian Community

Quechan Indian Tribe

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Tohono O'odham Nation

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Stolen River

Indigenous nations have been an afterthought
in U.S. water policy for over a century.
That was all part of the plan.

By Pauly Denetclaw

Illustrations by Gabriella Trujillo

THE TURBULENT, CHOPPY WATERS of the Colorado River pull from tributaries as far north as Wyoming before they race south for hundreds of miles, crashing together as they churn through the Grand Canyon, then smoothing out as they roll south. In southwestern Arizona, where the Sonoran and Mojave deserts meet, the river gently makes its way through Aha Makhav lands.

In the Mohave language, Aha Makhav means “the Water People.” The Mohave, Chemehuevi, Hopi and Navajo — the four tribes that comprise the Colorado River Indian Tribes, a federally recognized tribe that is also known as CRIT — have relied on floodplain and irrigated agriculture along the Colorado for 4,000 years. The CRIT Reservation was established in 1865 for the “Indians of the Colorado River and its tributaries.” (That vague language made it easier for the tribe to welcome people from the Hopi and Navajo nations in the ‘40s.) Today, the reservation’s green, lush farmland stands out against the dry desert that surrounds it.

“These valleys have always been traditional lands to us,” Amelia Flores, CRIT’s chairwoman, said in January. “It is evident in our clan songs that follow along the river.” The water from the Colorado helps the mesquite tree — a tree of life for the Mohave people — flourish. “The roots provide, for the babies, the cradle boards that they are cradled in, and when a person dies, we

use the wood for the funeral, for the cremation,” Flores said. “It goes from birth to life.”

The Colorado River sustains the culture, economy and future of 30 Southwestern Indigenous nations. And in a just world, these nations — the river’s most senior users — would be central to its management in a postcolonial society. But for the past century, the United States has repeatedly ignored the river’s original managers, despite the fact that 10 tribes within the Colorado River Basin hold 20% of the river’s total water rights. With a drought stretching into its second decade and the impacts of climate change now undeniable, the tribes are working together to ensure a future of inclusion.

Modern water policy sits on a 200-year-old foundation of laws written and executed by non-Indigenous politicians. The modern reservation system, which is the foundation of Indigenous water rights, was formed in 1851 under the Indian Appropriation Act. Meanwhile, the Indian Intercourse Act, passed and updated throughout the 18th and 19th centuries, held that while Indigenous nations were guaranteed land and water rights when reservations were created, they lacked the right to sell that water. Instead, they had to save it for what the federal government considered a necessary use. (Unsurprisingly, the federal government also got to determine what qualified as necessary.) These policies simultaneously ensured and hindered

the tribes' sovereign authorities — giving them, in theory, legal rights to water without the means to access the water or even advocate for utilizing those rights, typically for farming, personal and cultural use.

U.S. water policy, like the reservation system, was crafted to eradicate Indigenous ways of life and people. As reservations confined tribes to one location, forcing them to transition to agrarian lifestyles, the federal government, as their trustee, failed to build or provide funds for up-to-date water infrastructure, allowing the U.S. to effectively control Indigenous water access. In 1867, two years after CRIT's modern reservation was established, the Bureau of Indian Affairs authorized \$50,000 for building the Colorado River Indian Irrigation Project. The project was ultimately never finished, a recurrent theme when it comes to Indigenous water infrastructure.

"We don't have the full rights to our water," Flores said. "That's the bottom line."

But by establishing tribes as the senior-most water right users in the basin, the U.S. tied itself into a legal knot. The *Winters* doctrine, which became law in 1908, confirmed the seniority of Indigenous water rights. *Winters v. United States* was a Supreme Court case that focused on Montana settlers who built a dam on the Milk River, which interfered with agriculture on the Fort Belknap Reservation. It established that the reservation's creation reserved water rights, and that those rights were exempt from appropriation under state law. In effect, it meant that tribes were not subject to the "use or lose it" policy that defined state water law.

This landmark case established today's legal footing for Indigenous water rights, while leaving many practical questions unanswered, and it was immediately ignored by American legislators. In 1922, seven states — Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming — negotiated the Colorado River Compact without any input from Indigenous nations, even declaring, "Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes." State officials claimed that the Compact was designed for the "equitable division and apportionment of the use of waters of the Colorado River System."

As the federal government slowly realized over the coming decades that it was bound by trust responsibilities to advocate on the tribes' behalf, state and local governments, as well as private entities, repeatedly fought tribes over water rights. This led Indigenous nations, including the Colorado River Indian Tribes, to take them to court. One of those cases was



Arizona v. California, in which the Supreme Court decreed water rights for the CRIT and five other nations in 1964. "If it wasn't for the federal government stepping in, Arizona and California might have taken all the water," Dwight Lomayesva Jr., the vice chair of the Colorado River Indian Tribes, said.

The Supreme Court's action was a limited victory. Its usefulness lies in its permanence. Whereas water rights settlements — in which Indigenous governments willingly enter into legal negotiations with state and local shareholders to more quickly establish and access their claims — can be appealed and challenged even after they're signed, the precedent in *Arizona v. California* is locked. But while the

court's decision defined the amount of acre-feet of water per year that each nation could use, it also saddled tribes with the subsequent management and infrastructure costs.

"There was no infrastructure attached to (*Arizona v. California*) so that the tribe could make beneficial use of that water — it was just a number," Devin Rhinerson, a federal representative for the Colorado River Indian Tribes, said. "It is very secure, in that the Supreme Court has already acted. So it's not really subject to a legal challenge in the same way that a settlement may be, but it's also not flexible."

Arizona v. California also did not require the state or federal governments to provide funding for maintenance, either — a problem,

since many Western irrigation canals were built over a century ago. As a result, the CRIT has been unable to update any of its roughly 250 canals — this, in a nation that uses most of its water for agriculture and every year pulls nearly 640,000 acre-feet for farmland that is both leased to non-Natives and used by its own citizens.

“We have hundreds of miles of canals, and we’re losing a lot of water to the dirt canals and water going back into the river,” Vice Chair Lomayesva said. “Our whole infrastructure has been put together haphazardly.”

This story is echoed up and down the river. Water access and lack of infrastructure is a direct result of federal Indian water laws being written and then ignored ad nauseam. According to the U.S. Department of Health and Human Services, 9,500 homes on the Navajo Nation lack access to running water. Indigenous leaders realized that no single state agency or federal department needed overhauling; instead, as Daryl Vigil, the water administrator for the Jicarilla Apache Nation, explained, the law of the river itself must change. The knot of principles and policies enacted by Congress and the Supreme Court were designed without input from the nations they were supposed to serve. But changing laws and guidelines requires time, money and political strength: Time, to navigate drawn-out court proceedings and settlement processes; money, to help tribes access, transport, sell and save their water; and the political strength to convince policymakers that Indigenous water rights are not optional.

In 1992, 10 nations — the Colorado River Indian Tribes, as well as the Ute Tribe, Southern Ute, Ute Mountain Ute, Jicarilla Apache, Navajo Nation, Fort Mojave, Chemehuevi, Quechan and Cocopah — created the Colorado River Basin Tribes Partnership, later renamed the Ten Tribes Partnership. Vigil said the Partnership idea gained steam as the nations realized that the time-consuming legal process was not the only way to leverage their power as senior water-rights holders.

“My tribe started its settlement process in the ‘70s,” Vigil said, referencing a bill passed by Congress in 1992 that secured 45,682 acre-feet per year for the Jicarilla, along with a small amount of funding. “It took almost 20 years to finalize.”

Despite the Partnership’s formation, the Colorado River Water Users Association (CRWUA), an organization representing the states along the river whose membership wields a huge political influence over basin water policy and management, sought to discourage settlement tribes from joining. In 1996, the



Amelia Flores

“We all come from different reservations. ... But we can come together and support one another when it comes to our water rights.”

Partnership applied for membership. The association offered each basin state three seats on its board of trustees, but gave tribes just a single one. According to Vigil, Indigenous leaders from the Partnership confronted the association in Las Vegas, where members gather for an annual meeting. The confrontation paid off in the short term, earning them membership and three board seats. “That was a really, really big deal back in that time,” Vigil said. (Crystal Thompson, the association’s public affairs committee chair, said she hadn’t heard about the confrontation and added that the group is working to better document its history.)

The tribes hoped that being a part of the association would encourage state and federal officials to include them in conversations around water rights. But, by the late 2000s, the Ten Tribes Partnership was mostly limited to sharing information internally between the tribes. Vigil ascribed this to the partnership’s ad hoc nature and the fact that Indigenous

leaders were already stretched thin by their commitments as government officials. Then, in 2007, the Bureau of Reclamation issued its 56-page interim guidelines for Lower Basin water shortages, laying out an 18-year plan for how to manage reservoirs during sustained drought. Echoing the original 1922 agreement’s hollow promise of equity, the authors claimed they had “conducted government-to-government activities” with the Indigenous nations along the river and that the tribes “were notified of the action.” According to Vigil, proper consultation sessions never happened. Two years later, Reclamation, the seven Upper and Lower Basin states and other stakeholders embarked on a basin-wide supply-and-demand study of the Colorado River Basin that would later guide water policy. Once again, Indigenous nations were left out.

“With a quarter ownership of the Colorado River, it was just unconscionable,” Vigil, a former chairman of the Partnership, said. He called the group’s exclusion a “turning point.” Indigenous leaders recognized that they needed a way to leverage their combined strength and support one another. So the Partnership undertook its own water study to ensure that the tribes’ perspective was heard. The 362-page report, published in 2018 with the assistance of the Bureau of Reclamation, details the specific needs and plans of Indigenous nations in the Colorado River Basin and how those plans have been affected, first by existing U.S. policy and now by climate change. “Even under the most favorable of circumstances for rapid tribal water development, the amount of water that will be used by the Tribes is dramatically overshadowed by the effect of climatic conditions on the overall supply of water in the Basin,” the Partnership wrote in the foreword.

Flores, CRIT’s chairwoman, called the Partnership “a plus” for the nation. Along with other leaders from the Ten Tribes Partnership, Flores attended the annual Colorado River Water Users Association conference in Las Vegas last December, where, according to the *Arizona Republic*, the nations’ flags were flown alongside those of the other federal and state association members, and Indigenous officials were incorporated into the conference’s full schedule, rather than siloed as they had been before.

“As a collaboration, a partnership, our voice is stronger,” Flores said. “We all come from different reservations. Our needs, our water needs, or our water situations — we’re all different. But we can come together and support one another when it comes to our water rights.”

The path forward requires working with

three federal governmental entities to secure water rights, while continuing to strengthen relationships between the state and local governments that will be crafting the new drought guidelines. The Colorado River Indian Tribes are currently working with Arizona Sens. Mark Kelly and Kyrsten Sinema to pass the Colorado River Indian Tribes Water Resiliency Act of 2021, which would allow the nation to tap into a potential source of revenue by leasing its water rights. At the same time, the Partnership is looking ahead to 2025, when the 2007 interim drought guidelines — the ones created without Indigenous input — expire, and, as Vigil said, “a new management framework will need to be created.” The tribes will have to work individually to ensure their specific needs are addressed, while continuing to employ the strength found in collaboration.

The future will, in many ways, resemble the past, with sovereign nations still forced to prove their senior rights every time they want to move closer to water independence. But both Flores and Vigil pointed out that their strength in the ongoing fight is grounded in seeing the Colorado River as more than a plumbing system. It is the giver of life, flowing from one generation to the next. Securing water rights is about the future — of both the tribes and the river.

“The river has taken care of us for many, many years,” Flores said. “We need to, in turn, do our part, so the water can continue to flow along (its) banks.” ☼



Velvet Mesquite

Negotiating a Fairer Future

The Colorado River Interim Guidelines will expire in 2025 and Indigenous officials like Daryl Vigil are pushing to replace them with a more inclusive framework.

By Christine Trudeau

IT IS DIFFICULT TO IMAGINE more extreme conditions for negotiating a monumental water compact, but that’s where we find ourselves. A pandemic, now entering its third year, has economically and culturally stressed communities up and down the river. A drought, now in its second decade, has sapped the Colorado River of its once-dependable snow-pack and thus its water flow. And America’s history of excluding Indigenous nations from river management talks, now in its second century, has left tribes with little time and few options to ensure that their people have the permanent homeland so many in Indian Country are seeking to rebuild.

Standing squarely in the middle of these ongoing crises is Daryl Vigil, water administrator for the Jicarilla Apache Nation and co-facilitator of the Water and Tribes Initiative. Vigil has been at the forefront of Indigenous water rights in the U.S. for nearly a quarter-century. During a recent conversation with *HCN*, as he took stock of the renegotiations from his home in Dulce, New Mexico, Vigil offered an urgent yet calming reminder: The tough place Indigenous nations are in isn’t new; what is new is that they finally have the opportunity to do something about it.

This interview has been edited and condensed for length and clarity.

Tribes have been fighting for decades to fortify their position as water and drought policy leaders. What does that mean in the simplest terms?

(The) Biden administration has made some incredible commitments, verbally. Some of these processes still need to be built (while) imagining ourselves, tribal sovereigns, as partners in helping to create that. There is no formally recognized institutional place for tribal sovereigns to say we’re trying to participate in the policymaking process for the Colorado River. That place does not exist.

There’s an assumption that the seven (Colorado River) Basin states and the federal government are going to speak and protect and advance tribal water rights. That’s just fantasy. And so, where we’re at right now is incredibly critical — talking about creating a new framework of operational management for the Colorado River Basin as a whole.

In the past, you’ve spoken about the core ideological differences in how the tribes and the U.S. value water on the Colorado River, between viewing water as a delivery system and addressing matters issue by issue, versus addressing the cultural, environmental, traditional values of the river. Were you able to integrate those two mindsets in negotiations?

The structure doesn’t accommodate that at all. With the Water and Tribes Initiative, in 2019, we did a tribal water study, and not



Daryl Vigil

wanting to let the momentum drop after two years in the last administration, (we) really wanted to get a feel of where our people are. So we've created a document called *Toward a Sense of the Basin*, the result of close to 100 interviews that we did across the basin: tribes, NGOs, Mexico, agriculture groups, municipalities, water providers, the federal government. What we found when we asked the first question, "What is your personal and professional relationship to the river?" almost consistently, across the board, everybody wanted to see a healthy, living, sustainable Colorado River. That was revealing, because it showed that people really do value those things. That was a huge part of the work (of) the Ten Tribes Partnership through the Tribal Water Study and their mission to educate, collaborate and communicate about tribal water rights in the Colorado River Basin.

What's on the horizon for the Water and Tribes Initiative?

Part of what we've done is to inform the broader base and engage in a series of policy briefs. We developed a document that listed the current status of all the 30 tribal sovereigns in the Colorado River Basin (showing) the history (and) where they're at now. Another policy brief we're working on is around "flexible tools." We started this particular policy brief almost two years ago and called it "Water Sharing," but the (political) climate really wasn't conducive to have that conversation then. Now it is. We're saying, "Let us have access to those flexible

tools." Things like forbearance agreements, water banking, interstate marketing, compensated forbearance, access to conservation programs.

People don't understand what is happening in the Upper Basin. There's almost half a million acre-feet of unused tribal entitlement that's just going down the river for free that we don't get compensated for, and nobody wants to address that issue. (At the Bureau of) Reclamation, that's the big elephant in the room right now. They don't want to address this because that's been their security all this time, and that somebody else gets to utilize that unused entitlement as some problem-solving issue, that's just got to stop. All we're asking for is (to) either be compensated for those things, or to acknowledge that we're going to put those to development. And therein lies the collapse of a conversation, because they say, "Well, no, if the tribes develop that half a million acre-feet in the Upper Basin, what's going to happen?" It will be that the tribe actually gets to use its own water.

What does the lease agreement between the Jicarilla Apache Nation and the state of New Mexico mean for economic development?

Jicarilla just recently completed a transaction two years in the works with the state of New Mexico and The Nature Conservancy. Jicarilla is going to lease water to the state of New Mexico for the strategic water reserve. And we had to create that from scratch, because we were no longer able to lease a huge portion of our water from Navajo Dam because of shutting down coal-fired power generation. And so we were able to create this transaction that actually empowers the sovereign-to-sovereign relationship between the state and the tribe — the first of its kind.

Each year for the last three years, we've had about 25,000 acre-feet of water flowing down the river without any compensation, without any credit, and no ability to develop that in any shape or form given the geographics of where our water is stored. Two years later, two water evaluations and a whole bunch of engagement and work (later), we were able to pull that off.

How are tribes holding up under the current drought contingency plans, and are you optimistic about good outcomes when the Colorado River Interim Guidelines expire in 2025?

It's not written anywhere that we're on an equal basis to be able to participate in all the federal subgroups of the drought response operation agreement, like the state is. So no matter how much they say they're going to take

(tribes) into account, we can't count on that. We need something more formal, absolutely pushing the federal government to make sure that they understand what we're saying, because we keep telling them what we want, and they keep coming back doing the "What do you want?" Hopefully, (we're) making some headway in that process. I have a direct line of communication with the Upper Basin regional director, and these connections and these relationships are absolutely vital, because they didn't exist before. And my hope is that once we build those relationships (on) a real human level, it's a lot easier to execute policy.

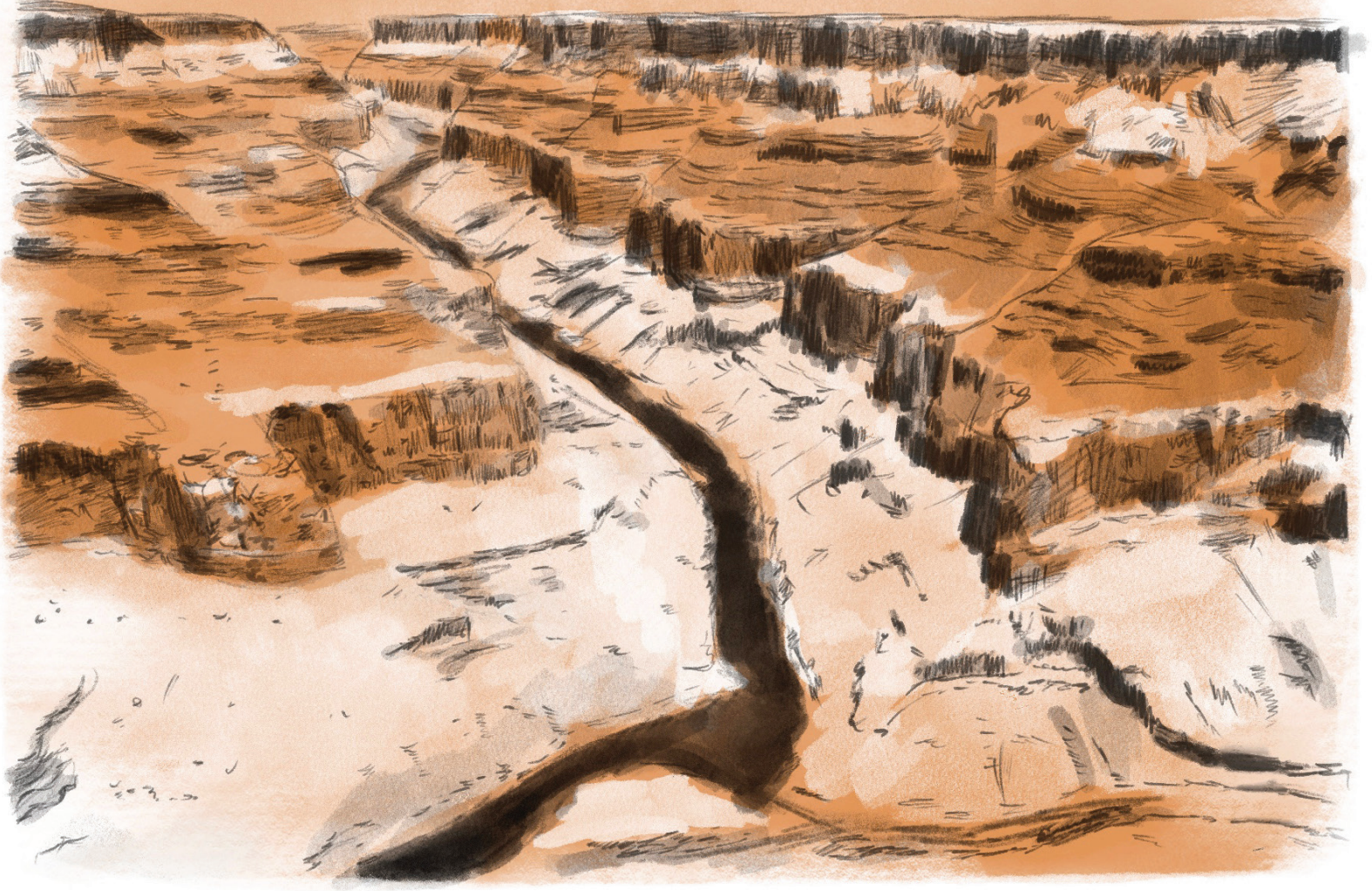
Understanding that there hasn't been a good track record but being incredibly hopeful and optimistic that people will do the right thing — I think that's the spirit that tribes are bringing to the table. It's touched me so much. I'm part Jemez and Zia Pueblo, and I was listening to the governor at Acoma Pueblo talk about the sacredness of water and the springs that they go to still to get water, and sometimes when those springs haven't produced very much, they'll leave it for everything else to drink out of that. So they'll go thirsty, so other life-forms can get what they need. That is just so beautiful to me.

A lot has been covered in the news around the drought and the Colorado River Basin in the last year, particularly as it concerns the projected snowpack and water flow for the coming years. What do you think is still missing from that conversation?

The (1922 Colorado River) Compact called for equal distributions of (the river's) 16.5 million acre-feet. That (number) was based on, it's been acknowledged, false hydrology. They went with a higher number. We're still trying to operate on the premise that the (river's water flow) is going to support these complex compact obligations in terms of the deliveries, and it can't. And so there's talk about, "What is a realistic number?" (It) kind of shifts to (about) 12 million acre-feet. That's what we need to divvy up. And if we're going to divvy up that, tribes absolutely need to be at that policymaking table.

I think there's finally a recognition of the need to create that certainty by the inclusion of tribes, and it's taken 10 years of yelling and screaming and doing whatever we need to do. This has to be driven by the tribes themselves — and (the) investments; the momentum that's taken place in terms of our participation. Every time tribes have participated in any of these processes, it's been meaningful, it's been impactful, it's been a positive thing. ☀

Little Colorado River



Settlements on Settlers' Terms

Tribes along the Colorado River have struggled to reach settlements for their water rights, leaving those nations in an unjust state of limbo.

By Pauly Denetclaw

IN EARLY JANUARY, Lake Powell, a reservoir fed by the Colorado River, reached critically low levels. The bathtub ring around its receding edges has spent the last year gracing the pages of news publications across the nation, accompanied by increasingly panicked concern about Glen Canyon Dam's hydropower turbines, which cannot operate reliably if the lake is lower than 3,490 feet. At the start of 2022, Powell's water levels were just 46 feet above that threshold.

The drought is an emergency, and water cuts are coming. But the drought is also compounding another emergency. Indigenous nations within the river basin, left out of the 1922 Colorado River Compact, have been working through state and federal courts to settle their water rights, anticipating a situation like this. The settlement process takes time and money to resolve, however — resources that, like water, the drought saps daily. As is the case for the Rio Grande's pueblos, tribes along the Colorado River without defined water rights still face a daunting colonial gantlet. Right now,

the Navajo Nation and Hopi Tribe are working to quantify their rights in Arizona. The lengthy and costly adjudication process, in tandem with frequent legal opposition from private users and state and local governments, presents the two nations with a familiar choice between short-term concessions and a long-term gamble.

“We do believe a settlement of Hopi water claims is a forever sort of settlement, in the sense that it has to provide for a future permanent homeland for the Hopi people,” Fred Lomayesva, general counsel for the Hopi Tribe, said. “We see the need for water to be able to provide sufficient water for the future Hopi.”

For years now, Hopi communities in Upper Moenkopi and Kykotsmobi have banned heavy water users, like car washes and laundromats, in order to conserve groundwater from the N-aquifer, the primary water source for all of Hopi and a large swath of the Navajo Nation. But, as the laundromat ban shows, Hopi leaders have long recognized that the N-aquifer cannot meet their growing water needs. In 2004, then-Chairman Wayne Taylor Jr. said in a press release that in order to build a permanent homeland — the goal of Diné and Hopi leaders — they “must look outside our reservation.”

But the state of Arizona already had a plan to minimize the reach of the seven tribes that lacked settlements or decreed rights. In 2004, the same year as Taylor’s call to plan a future beyond the N-aquifer, the Arizona Water Settlements Act was passed by Congress thanks to the support of a bipartisan Arizona delegation. With a stroke of George W. Bush’s pen, the bill set a maximum annual quantity of 67,300 acre-feet for all future settlements between tribes and Arizona.

When reflecting on such a move, context matters. A settlement process skewed toward the state, through federal legislation, is the colonial process working as planned. As established in *Infrastructure as Colonial Beachheads*, a 2021 paper by Diné geographer and University of Arizona assistant professor Andrew Curley, the 2004 Arizona bill was only possible because the state was able to rapidly boost its population, and thus its strength in Congress, in the latter half of the 20th century. That growth was a direct result of the Interior Department’s decision in the 1960s to build the coal-powered Navajo Generating Station on Navajo lands in order to power the Central Arizona Project canal system. CAP then diverted Colorado River waters to the city of Phoenix, while the water-rights agreement devised by the federal government limited the Navajo Nation’s water claims for a half-century.

The decade following the Arizona bill’s passage was defined by failed settlement negotiations. In 2012, Sen. Jon Kyl introduced the



Michelle Brown-Yazzie

“We don’t have the ability to use very much (water), and when we do have water, we’re very conservative with it, because we don’t know when we’re going to get it again.”

Navajo-Hopi Little Colorado River Water Rights Settlement, but said he would not advance the bill without approval from both tribes. After an initially decisive “No” vote, the Hopi Council narrowly flipped and supported the legislation by an 8-7 margin. The Navajo Nation Council, however, voted against it for a myriad of reasons, among them the fact that it would have continued leasing water to the since-shuttered Navajo Generating Station, waived future claims to the Little Colorado River, and failed to include \$800 million in water infrastructure funding for western Navajo communities.

“The question comes up, ‘Well, exactly how much water do Navajos need, because they don’t use very much?’” Michelle Brown-Yazzie, assistant attorney general for the Navajo Nation Water Rights Unit, said. “We don’t have the ability to use very much, and when we do have water, we’re very conservative with it, because we don’t know when we’re going to get it again.”

Despite the recent failed negotiations, both

the Navajo and Hopi governments are again open to considering a settlement. The drought and the pandemic have had an undeniable influence on those decisions. But it’s also tied to the length and unpredictability of the adjudication process. Consider: It has been six years since an Arizona Superior Court decided to separate the Hopi and Navajo cases into sub-proceedings. The Hopi’s closing arguments for that particular sub-proceeding wrapped in October 2021. And still, it could be another decade or more before the special master appointed to the case completes the necessary hydrographic survey reports and the Superior Court issues a final decree for all the shareholders. According to Brown-Yazzie, the Navajo Nation is scheduled to begin its sub-proceeding for the Little Colorado River Adjudication in 2023. That will continue for up to a year, followed by the next two phases in the process, which could likewise take over a decade to complete.

“There’s often good reasons to try to settle a case when you don’t know what the courts are going to do,” Lomayesva said. “You may have a good idea or an educated guess, but sometimes, fundamentally, you don’t know. To reduce the risk of uncertainty, one might move towards settlement.”

While it has reached a variety of fund- and project-based settlements in New Mexico and Utah, the Navajo Nation is still being forced to defend its water rights against appeals. In New Mexico, challenges to that settlement continued until winter of last year, when the nation received a final order by the New Mexico Supreme Court. “We’re hoping that it won’t be too much longer before we can say that the cases in regards to the New Mexico settlement are finally completed,” Brown-Yazzie said. The Navajo Utah Water Rights Settlement Act, recently signed into law, is in the process of being finalized. The language in the act and the settlement agreed upon by the parties has to be confirmed together, after which the final language will be reviewed by the court. Brown-Yazzie said she is knocking on wood that there won’t be any challenges to the settlement.

As for Arizona, the Navajo Nation and the Hopi Tribe have remained open to settlement talks, even engaging in meetings last April. But both Brown-Yazzie and Lomayesva reiterated that while the drought and the pandemic have increased the pressure for everyone to come to an agreement as soon as possible, there are certain lines that won’t be crossed.

“We think it is important to try to continue to negotiate with the parties,” Brown-Yazzie said. “Of course, the Navajo Nation is not going to accept a settlement that we don’t think is fair and reasonable.” ☀

birth of "Elizabeth Ann,"

Ferret cloning using different methods for

Method of nuclear transfer	Donor cell (type)
Microinjection	Fibroblast
	Cumulus cell
Cell Fusion	Fibroblast
	Cumulus cell



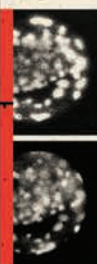
or cell types

Embryo transfers (no. recipients)	3-week implantation (%)	3-week fetal development (%)	Birth rate (%)
15	7.2 (25/349)	3.4 (12/349)	0 (0/111)
15	14.2 (44/310)	4.2 (13/310)	1.2 (1/81) ^a
14	5.5 (18/326)	3.1 (10/326)	0.96 (1/104) ^b
14	4.3 (16/375)	3.2 (12/375)	1.8 (2/112) ^c



2020

lived more than 30 years ago.



1985

SB2

SB10

Willa

RW10

Elizabeth Ann



Hours after activation	Interphase	PCC ^a	PN ^b
2	23.8% (5/21)	71.4% (15/21)	4.8% (1/21)
4	5.9% (2/34)	41.2% (14/34)	52.9% (18/34)
6	3.7% (1/27)	11.1% (3/27)	85.2% (23/27)

AN ANKLE-HIGH FOG OF LIQUID NITROGEN drifted over the floor of the Frozen Zoo, coasting around the keg-like cryotanks that host the world's largest collection of living cell cultures. The fog immediately lowered the room's temperature, a reprieve from the sultry June day in Southern California. This room — about the size of the beer cave at my local gas station — is probably the most biodiverse room in the world. (Well, this one and a duplicate collection assembled in some discreet facility in a different Southern California fire zone.)

Marlys Houck, the zoo's curator, climbed a stepstool and peered through protective goggles into one of the tanks, which steamed like a frozen hot tub. She waited for the carousel within it to spin to the correct quadrant.

When I parked at the San Diego Zoo Safari Park in Escondido that morning and asked an attendant for directions to the Frozen Zoo, she clearly thought I was joking. Did I mean the polar bear's tundra habitat? I found my own way, walking the fence line to the facility next door. The Beckman Center for Conservation Research includes the 20,000-square feet of laboratory space where the international nonprofit San Diego Zoo Wildlife Alliance makes good on its conservation mission. The Frozen Zoo is its crown jewel.

"Come see," Houck said to me as the frosty carousel stopped.

I tipped to my toes to see into the tank, and she rummaged through the racks in what appeared to be ski gloves. The racks resembled model skyscrapers, with each floor removable like a drawer and full of vials. Inside the vials were 1 million to 3 million gooey living cells. And inside each cell were tens of thousands of genes, some of which have endured decades in suspended animation, just one thaw away from reentering the gene pool of an extant endangered species. It's no wonder, as Houck said, that "the safety of this collection literally keeps me awake some nights."

When she found what she was looking for, Houck wielded foot-long forceps with her cryogenic gloves and transferred the rack to a stainless-steel table. Houck ran her eyes over a hundred vials until she ID'd it: *Ceratotherium simum cottoni*, male. Northern white rhino.

Houck admired her decades-old script on the vial. "It's funny seeing my handwriting — to think, what was going on in my life when I wrote the label for this one?"

Someone mentioned that 1988 was the summer she first learned to spay mice as a zoo intern. Another person remembered it as one of the Frozen Zoo's last years with its late founder, Kurt Benirschke. I wasn't alive yet. Like time capsules, once the vials are submerged, they don't reemerge until authorized. When they are called up, it's because one of the wildlife alliance's partners has a specific genetic project in mind, one that promotes species recovery or extinction risk management.

Take the vial of northern white rhino, for instance. When a veterinarian snipped a lentil-sized notch from the rhino's ear decades ago — mixing it with enzymes, antifungals, antibiotics and nutrients before incubating it in a flask, letting its cells cleave and multiply for a month, then be cryopreserved indefinitely — there were two dozen or so northern white rhinos left in the world. But now, when a technician prepares those same cells for thawing, the species is critically endangered, more than likely extinct in the wild. The two known living specimens, Najin and Fatu, are at a conservancy in Kenya.

How to Clone a Black-Footed Ferret

From petri dish to prairie
with North America's most
endangered species.

By Lawrence Lenhart
Illustrations by Klawe Rzeczy

As both are female, the species is at least functionally extinct, with no male to sire another generation. That vial beneath my nose is as close as one can get to a living male northern white rhino. The researcher-recipients of these living cells might use them for applications in embryology, in vitro fertilization, stem cell technology, even — one day — cloning.

To produce a new northern white rhino, scientists would need to complete genome sequencing, create rhino sperm and oocytes from stem cells, and develop new assisted reproductive technologies. “We’ll be long gone by the time that happens,” Houck said, referring to her colleagues. I couldn’t tell if it was a euphemism for retirement or death.

The process — from thaw to clone — was much quicker for the black-footed ferret, or BFF, which, in December 2020, became the first endangered species native to North America to be genetically duplicated. And not just any endangered species; it was prematurely declared extinct on two separate occasions, and many consider it North America’s most endangered mammal. Its membership within an endangered ecosystem (prairie grasslands) and its specialized diet of endangered prey (prairie dogs) make its survival that much more precarious.

It all began with an email from Seth Willey, U.S. Fish and Wildlife Service recovery coordinator in the Mountain-Prairie Region, entitled “Out of the Box.” He asked his addressee, the biotechnology company and resurrection biologists Revive & Restore, if the technology was “ripe” enough to genetically enhance the BFF. Ryan Phelan, Revive & Restore’s co-founder, and Ben Novak, its lead scientist, spent the better part of a decade as biotech ambassadors, convincing Fish and Wildlife officials, led by BFF Recovery Coordinator Pete Gober, that genetic restoration was in the best interest of the ferrets. When Phelan and Novak were told to “slow

down” at working group meetings, they realized it was because of the way the agency guards each and every ferret, especially following a devastating plague in 2008 that vectored through South Dakota’s Conata Basin, once home to the only self-sustaining population of BFFs. Phelan explained, “We told them we’ll take the criticism, we’ll raise the money.” And they did.

Once it was discovered that the Frozen Zoo curated a special cell line that belonged to a non-reproductive ferret known as Willa, it was clear that Escondido would become the auspicious starting line for the genetic restoration. The current BFF population, which numbers about 600 — half of them wild, half in captivity — all originate from a measly seven founders from Meeteetse, Wyoming, a stark fact that severely limits genetic diversity. Willa’s decades-old genes, however, can’t be found in any living ferret, meaning she signifies the potential of an eighth founder.

When the last extant wild population was infected with canine distemper in 1987, conservationists trapped the willow weasels for safekeeping, jumpstarting one of the most comprehensive pedigree charts in the biological world. A studbook keeper at the Smithsonian acts as matchmaker for all captive ferrets, making breeding recommendations based on data. Genetically speaking, opposites attract. But there’s only so much one can do for a species with seven founders. Over time, most of the BFFs have become the genetic equivalent of siblings, or cousins at best. Remarkably, in 1988, Fish and Wildlife had the wherewithal to collect cells from non-reproductive ferrets in Meeteetse in the event technology would later enable them to reenter the population. Or to cop the Frozen Zoo’s well-worn maxim, quoting historian Daniel Boorstin: “You must collect things for reasons you don’t yet understand.”

Arlene Kumamoto, a prolific technician during whose tenure the Frozen Zoo’s holdings rapidly

expanded, received the cells. After growing those cell lines, she deposited a few vials in the freezer, where they’ve been boiling in a cauldron of liquid nitrogen for 34 years.

Conservationists have cast *Mustela nigripes* as an ambassador species — a charismatic *minifauna*, if you will — whose bonny features have been leveraged to convince the public that the prairie ecosystem is worth saving. Show someone a video of unremarkable tufts of swaying grass, and they’re bound to shrug, but sprinkle in a few pop-going weasels, and suddenly, people give a hoot about the landscape. In this way, the ferret is an unwitting agent of the prairie, protector of grasses whose 15-foot root systems reliably sequester carbon. At a time when drought and wildfire threaten other precious carbon sinks, such as forests, researchers wager that grasslands, with their fixed carbon, will be the most resilient and adaptive ecosystem of the future. BFFs are even the ironic protector of their own prey, the prairie dog, a keystone species that acts as a vital ecosystem engineer. Researchers at the United States Geological Survey have demonstrated how prairie dog foraging, nibbling, and digging provides essential services, like mixing the topsoil with subsoil, effectively fertilizing the prairie, keeping it moist.

In Scott Weidensaul’s *The Ghost with Trembling Wings*, he describes a business of black-footed ferrets (the beguiling collective noun for a solitary species) like this: “phantoms: secretive, highly nocturnal, almost entirely subterranean. ... A prairie dog town is the ferret’s universe: shelter, larder, birthing chamber, and tomb, all in one.” At night, ferrets slink between colonies, diving through entrance mounds and ambushing tunnels, nests, latrines and turnaround bays. They’ll occasionally breach with emerald eyeshine, their nose, whiskers and chin slicked with blood, ready to waggle onto the next ingress.

A black-footed ferret obsessive,

I’ve spent a decade in thrall to the species. I’ve spotlit the sage steppe for their eyeshine and begged my way into biosecure breeding facilities. It’s long been my pleasure to gaze on their Mickey Mouse ears, bandit mask, champagne fur and sooty feet. I contacted Oliver Ryder, director of conservation genetics at San Diego Zoo Wildlife Alliance, to get the scoop on BFF cloning.

“You have to remember, when we got those ferret cells in ’88, there was no Dolly the Sheep, and the Human Genome Project wasn’t done yet,” Ryder said. In fact, it hadn’t even begun. “We might have wished it was possible to clone them, but it wouldn’t have been responsible to say it aloud.”

In other words, Benirschke’s concept of a biobank, the first of its kind, was aspirational. It seems that, at the Frozen Zoo, futurity necessarily drives present action. Conservationists must think two steps ahead to preempt any future incursions on biodiversity that are already in motion. And there are *many* in motion. In 2015, Paul R. Ehrlich, president of the Center for Conservation Biology at Stanford University, coauthored a paper in *Science Advances* that established, using very conservative assumptions, that the sixth mass extinction has officially arrived. This means we are likely at the dawning of a lonely era in which 75% of species will perish from the Earth.

In September 2020, the vial containing Willa’s cells saw daylight, its contents representing an untapped source of genetic diversity for the severely bottlenecked black-footed ferret population. A marvel of conservation-as-curation, this slurry of cells began as Willa and ended a few months later as the fang-baring Elizabeth Ann, the would-be eighth founder in *Mustela nigripes*’ gene pool.

And ain’t it just like the ferret to reappear triumphantly on the other side of a great lull? BFFs were declared extinct in the wild in 1974 — that is, until a blue heeler named Shep chanced upon one in 1981. Shep scuffled with that specimen



in a big ball of violence à la *Looney Tunes*. Imagine a smoke cloud with terrific growling and yowling, hissing and chattering, maybe a flash of canines or a tip of tail, until death was that ferret's end. But, as tends to be the case with ferrets, death is rarely the end. Instead, the carcass led conservationists to an extant business of ferrets, one of whom was Willa, whose every fiber now lives on in the clone, Elizabeth Ann.

EVEN AGNOSTICS who behold the cryopreserved snot-like cells of an endangered species, held up to fluorescence or clipped to the microscope's stage, have to reckon with the soul. How much of the immaterial spirit can stow itself away in this smudge of particles? In a paper exploring the meta-physical and moral implications

“Here is an orca whale next to a meerkat next to a hippopotamus next to a California condor next to a Galápagos tortoise next to a kangaroo rat next to an elephant next to a black-footed ferret. That just startles me.”

of cryopreservation, Jason T. Eberl asks, “Does cryopreservation thus involve ‘suspending’ the soul?” When Houck thaws the cells — of a ferret, or the white rhino in the vial I saw — are they at all ensouled? I looked around the vats of frozen tanks.

“When you think about it,” Ryder said, “to have 1,000 species in something the size of a trash can, that’s like a neutron star of biodiversity.” The zoo holds 1,224 species and subspecies, represented across 10,500 individuals. “Here is an orca whale next to a meerkat next to a hippopotamus next to a California condor next to a Galápagos tortoise next to a kangaroo rat next to an elephant next to a black-footed ferret. I could go on and on. That just startles me.”

It startles other biologists as well — and not always in a good

way. Ehrlich, the Stanford biologist, likened it to “anticipating a flood and planning to bail with a thimble.” He would prefer to see the immense resources of a \$561 million not-for-profit like the San Diego Zoo Wildlife Alliance go toward addressing the root causes of the conservation crisis, such as population growth and climate change. In *The Washington Post* in 2015, he said, “Screwing around with science to save a white rhino might be fun, and I would like to see it preserved and am all for biodiversity, but it’s so far down the list of things we should be doing first.” One has to admit, though, the cryotanks in the frozen zoo make for a pretty big thimble. But for every voice of caution, Ryder must contend with its eager counterpoint: those who wish the Frozen Zoo would go even further in its

genetic rescue. When he discusses genetic restoration with Revive & Restore, Ryder tries to temper their interest in de-extinction. Whether it's the passenger pigeon, the po'ouli (an extinct Hawaiian bird) or the woolly mammoth, a handful of biotech firms are intent on destigmatizing de-extinction.

If the Frozen Zoo was created to collect things for reasons not yet understood — well, then, “not yet” has suddenly morphed into the here and now. Biologist George Church is proceeding with plans to de-extinct the woolly mammoth from the Siberian tundra; paleontologist Jack Horner continues to genetically edit the chickenosaurus; and for an actual example of de-extinction, see the Pyrenean ibex, whose endling Celia was cloned for all of 10 minutes before the newborn succumbed to a lung defect, effectively resulting in a second extinction. If all of this seems tinged with ethical anxiety, then you might sympathize with actor Jeff Goldblum, who played Ian Malcolm in *Jurassic Park*. In response to online chatter about the chickenosaurus, he reprised his cautionary line from the film, this time via tweet: “Your scientists were so preoccupied with whether or not they could, they didn't stop to think if they should.”

One can't help but imagine Ryder doing his best to tune out all those competing voices as he considers what's best for the species represented in the zoo's holdings. Ultimately, he decided that the chickenosaurus and woolly mammoth, et al, were outside the scope of the zoo's charge, but he suggested two extant species that could benefit from some genetic rescue: Przewalski's horse (a Mongolian equid, also known as the “last wild horse”) and that perennial survivor, the black-footed ferret.

Back in the lab, Houck thawed the rhino cells in a bead bath while chatting with a technician who was stirring the eyeball of a white crown shrike. If the tech were to trade her white lab coat in for a witchy black cloak, the sight would send chills.

The lab is as antiseptic as one would expect: phenolic work stations, autoclave and fume hoods. And there is a prized sketch of a rhino. At the microscope, another tech karyotyped cells of an Indo-Pacific bottlenose dolphin that recently stranded itself nearby on the coast. Over her shoulder, I watched the crystal violet-stained ovoids round up, cleave, divide. On deck was a fossa, a relative of the mongoose, endemic to Madagascar. I asked if species are at all recognizable under the scope once they've been pureed into culture, into cells.

“I used to say ‘no,’” Houck said. “But the ferret really has an odd morphology.” It's one of the few species whose cells she could recognize under the microscope, she explained, “because it's more rounded. They don't have those long. ...” she trailed off while looking at the dolphin's spindly cells.

“I'd recognize your cells anywhere,” the eye-stirrer teased from the other side of the room.

Houck checked the clock and glanced my way.

“If the northern white rhino is functionally extinct, aren't any interventions to revive them categorically an attempt at de-extinction?” I asked.

“Well, no.” She paused. “Not precisely.” She went on to provide the International Union for the Conservation of Nature's definition of de-extinction, more or less. In 2016, the IUCN released a report called *Guiding Principles on Creating Proxies of Extinct Species for Conservation Benefit*, which defined de-extinction as “any attempt to create some proxy of an extinct species or subspecies ... through any technique, including methods such as selective back breeding, somatic cell nuclear transfer (cloning), and genome engineering.”

But Ben Novak of Revive & Restore would have liked a more nuanced definition. As a concept, “de-extinction” has enjoyed two stints in the popular imagination: first, through the Steven Spielberg franchise *Jurassic Park*, and more

recently, when *National Geographic* and Revive & Restore partnered to live-stream a TEDxDeExtinction event. Amid a media frenzy of specious reporting, the IUCN set out to define the phenomenon. Novak finds the definition too restrictive, based on a binary — extant versus extinct — that, for him, isn't intellectually honest.

As he pointed out in his 33-page redefinition in *Genes* — which reads like a manifesto for de-extinction — there are gradations of extinction, which are variously termed locally extinct, extinct in the wild, functionally extinct, evolutionarily torpid and globally extinct. “Such classifications of extinction are more helpful for conservation practice and intervention than a binary concept of extinction and survival,” Novak wrote. Somewhere between extant and extinct is the black-footed ferret, which Novak name-checked in the article. Ferrets are said to be “locally extinct,” as they have been extirpated from many sites across North America. All reintroduced black-footed ferrets, known as “replacement populations,” are translocated from captive populations. To reverse a local extinction, specialists use techniques ranging from husbandry to IVF to — now, starting with Elizabeth Ann — cloning. For Novak, these are all just part of the grab bag of conservation.

I asked Houck about the ferret genes. “What did you do after the cells thawed?”

“We regrew them, saved the newer ones, and then shipped the others out.”

“Shipped them how?”

“FedEx overnight.” She smiled.

It's hard to believe that the Earth's most precious genetic materials are shipped alongside America's pet supplies, yoga mats, board games, hair-care products and toothbrush heads. I imagined the ferret culture tempering in frozen cryovials on solid carbon dioxide, being loaded onto delivery trucks, forklifted onto cargo containers, shuttled to airplanes, stacked in boxcars before chuffing

off to the regional sorting facility, and finally to the local sorting facility in Rochester, New York, a few miles from the shrewd embryologist who awaited their arrival.

OVER THE PAST couple of decades, Dennis Milutinovich has worked in the agricultural, reproductive and pet industries, where he developed expertise in husbandry, in vitro fertilization and cloning, respectively. Currently an embryologist at ViaGen Pets and Equine (“America's Pet Cloning Experts”), he occasionally lucks into the “fun stuff,” as when he's on the receiving end of rare ferret, horse or snow leopard cells. While his work with pets is the science of the uncanny, one detects in his work with endangered species the art of the sublime.

It all happens in an 8-by-40-foot shipping container punctured with a few doors and windows. Milutinovich's name for it — the steel coffin — is a misnomer, considering it's designed for life-giving activities like embryogenesis and fertilization. Parked outside of a Rochester strip mall, the shipping container is crammed with high-tech equipment, including incubators and a cloning scope.

“In order to do the conservation projects, we need to make money. That's the dog-and-cat stuff,” he said.

Let's say your furry friend has one paw in the grave, and you'll wager anything — in this scenario, \$50,000 for a dog and \$35,000 for a cat — to “extend the special bond with your beloved pet,” as the website says. Just snip the tip of its ear or get a biopsy of its abdomen, and Milutinovich will take it from there. If your pet is already dead, act quickly: Transport its corpse to the shipping container and they'll cryopreserve the cells for you, prepping your pet for resurrection.

The majority are pets whose inconsolable owners can't imagine a world without them — or rather, without their genes. This anguish calls to mind a woman Errol Morris interviewed in his

1978 cinéma vérité documentary, *Gates of Heaven*, who, upon burying her dog at a pet cemetery, said: “There’s your dog; your dog’s dead. But where’s the thing that made it move? It had to be something, didn’t it?” Imagine if this woman had the option to not just purchase a burial plot, but a resurrection. As best I can tell, that’s the essential constitution of a ViaGen client.

“Is it all just an elaborate form of projection?” I asked during a video-conference with Milutinovich. “The pet owners are superimposing memories of Pet #1 over the genetically identical form of Pet #2?”

“I’m sure most of it is projection,” Milutinovich admitted. “As much as you can tell them, ‘You’re not getting your exact animal,’ in their minds, that’s what they want. There are very high expectations. There’s a lifetime of love they’re dumping on the animal.”

“They want to pick up where they left off,” I said.

“Yeah,” Milutinovich assented.

Milutinovich has cloned hundreds of dogs and a hundred or so cats in the past five years, which, based on advertised prices, comes to around \$20 million in just five years. Why so pricey? ViaGen’s website boasts its cloning services are “the ‘Cadillac’ of animal care and technology development.” It is just one of many companies in the global pet-cloning industry. And here’s where my ignorance shows.

I assumed Dolly the sheep (b. 1996) was the one and only of its kind — that, like the moon landing, we’d been there/done that and generally lacked the will or permission to do it again.

“Didn’t Clinton kibosh cloning in the ’90s?”

“Human cloning,” Milutinovich clarified, alluding to the Dickey-Wicker Amendment, which prohibited federal funding of research involving human embryos, including cloning. “At this point, it’s routine to clone mice for certain types of research. Pigs and horses are cloned, but the government doesn’t keep track of those. And there’s a self-imposed moratorium

for cattle companies who agreed not to put clones in the food source.”

But given China and Japan’s recent forays into pet cloning, with operations similar to ViaGen’s, there are by now tens of thousands of clones among us.

“Our clients sign a pretty airtight waiver,” Milutinovich said. “We tell them we can’t guarantee it’s going to look exactly the same. More than likely, it will not have the same personality.”

A stately house cat launched itself onto a fabric tower behind Dennis.

“Is that a clone behind you?” I asked.

“Cheeto?” He turned around to study his cat. “No, but she was a queen in our surrogate colony. We have to restrict the number of embryo transfers, so after her last one, I adopted her.”

When compared to conservation projects, pet stuff seems relatively low stakes. It’s easy to see why the chance to clone a black-footed ferret for the sake of genetic recovery would appeal to Milutinovich. “There’s a lot of cool stuff I want to do, like the woolly mammoth,” he said. For the black-footed ferret, Revive & Restore handled all the paperwork (“the hard part”) while ViaGen started establishing a protocol.

“So the black-footed ferret was a side hustle? Was it similar to working with a pet?”

Milutinovich had never done ferret cloning before this. In fact, before him, only one other lab had ever cloned a *Mustelo furo*, or a domestic ferret — the kind you can find curled up in a hammock at your local pet store, purchasable for around \$150. (I have owned four such ferrets.) That lab published a few papers on the protocol for cloning domestics, which became the blueprint for Milutinovich’s own protocol.

“It was quite an undertaking,” he said. “It’s very difficult to work with ferret oocytes on the scope, because they’re so soft.”

So difficult, in fact, it took him a



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year and a half to produce a litter of domestic ferret clones. As soon as he was successful, Marlys Houck received a call, greenlighting the extraction of Willa’s vial. She flipped on the frozen carousel, tonged and thawed the cells, 250,000 of which were put into a flask, grown out and frozen down for new vials — backups — in a process that could be repeated *ad infinitum*, though a little quality is lost each time. Once FedEx fulfilled the order, someone at ViaGen signed on the dotted line, and Milutinovich repeated the cloning protocol, this time using *Mustela nigripes* genes. The embryos imperceptibly divided, enlarged and differentiated until ready for transfer. When the time came, a licensed vet made a midline incision and pulled the ovaries out of the surrogate so Milutinovich could inject the embryos.

“That part is easier than a spay surgery,” he said.

“How was the surrogate chosen?”

“Well, she was an established mom, a proven mom, with a couple litters of domestic ferrets. She was a good mom of the right age and birth history who we knew would whelp out OK, and she’s good to her kits and everything. Oh, and she was in heat.”

I was gobsmacked that the surrogate was a domestic, a completely different species of weasel. In other words, the dime-a-dozen pet store variety carried this multimillion-dollar wild ferret fetus.

Milutinovich reminded me that it’s common to employ different species with similar morphologies in surrogacy, especially if, as is the case with black-footed ferrets, it’s difficult to obtain and risky to work with the actual species.

Three weeks after implantation, the vet performed an ultrasound on the pregnant jill, finding vesicles that resembled living tissue. At 25 days, they listened for the clone’s flickering heartbeat, which set the surrogate into motion. She was relocated to the Black-Footed Ferret Conservation Center (BFFCC)



in Carr, Colorado, to receive expert care from Fish and Wildlife Service staff. The trip began with a six-hour leg — Rochester to a hotel parking lot in Toledo, Ohio — where she swiftly changed hands, from one keeper to another, like a furry baton in a relay race.

From Toledo, Robyn Bortner and a technician from the BFFCC chauffeured the surrogate the rest of the way. Because of the coronavirus pandemic, Bortner, the center's captive-breeding manager, opted for ground transport to minimize risk of human-to-animal exposure. As someone who's repeatedly driven pet ferrets cross-country I know ground transport involves anal glands emitting oily skunk-like musk, pee with notes of battery acid, and a short digestive track voiding endless crud. By the time the surrogate arrived at the interstate

"It can be dangerous to let one species slip through the crack like that. If ferrets can't survive on this prairie, then the ecosystem is missing a piece of its puzzle."

facility in Carr, 10 miles south of the Wyoming border, I imagine the whole caravan sighing in relief.

THERE ARE 168 low, wide metal mesh enclosures at the center, most occupied by a single ferret. Arranged in tight aisles, a captive breeding colony is carceral, but ferrets — who are solitary anyway — are mostly indifferent to their neighbors' messy mastication, ecstatic clucking, the rapid battering of the lattice during a fierce scratch reflex. Enter the surrogate.

Nudged into a vacant coop, a domestic among a hundred-plus captive wilds, she whiffed the air with her coffee-bean nose as she warmed to her new space. Not yet inured to the ambient ferret business surrounding her, she reluctantly turned in, scuttling down the

corrugated tube to the nest box, which is partitioned into den and latrine. She needed the rest as the clone's fetal tissue tautened into a skeletal structure. Is there maternal dissonance in carrying another species? Does it resolve as the surrogate snoozes, knowing that what is within her now surrounds her completely?

By gestational day 42, a jill is usually ready to be whelped out. If the mom has a "healthy squeaky litter in there," Bortner said, there's no need for visual confirmation. She'll put up a literal red flag on the enclosure and let her be for four days. On very rare occasions, a mother will cannibalize her young; from a taxpayer's perspective, "baby ferret" is just about the most lavish meal one can eat.

"Usually, when breeding a wild animal in a captive setting,

you need to accept some losses,” Bortner said. “There’s only so much you can do in the process. For our expensive clone, though, we had a lot higher stakes.” It helps that a domestic surrogate is more tolerant of humans during labor, even permitting staff to handle her.

“We don’t usually stay up all night waiting for the ferrets to whelp,” Bortner said, “but for this one, we had a 24-hour camera vigil.” A dozen staff rotated on two-hour shifts, ready to alert the overnight veterinarian. And it was a good thing, because the surrogate needed an emergency cesarean section.

The clone kit was milked through an incision in the uterine horns. She was dried, warmed, and given oxygen therapy. At some point, she acquired the name Elizabeth Ann.

Elizabeth Ann was born outside of the black-footed ferret’s springtime breeding season, so her birthdate (Dec. 10) is an anomaly. Because the surrogate was recovering from a difficult labor and it’s impossible for technicians to hand-raise a kit, Elizabeth Ann was adopted by another domestic mother that the center arranged to have on hand. Born within hours of her foster litter of five, Elizabeth Ann nursed alongside them, nuzzled them, until she was about a week old.

So Elizabeth Ann is an endangered species clone who had an interspecies surrogate mother, wet nurse and foster siblings?

“I don’t think we ever put it quite like that, but yes. Essentially,” Bortner said.

That makes them oddkin, a colloquial term defined in Donna Haraway’s *Staying with the Trouble* as “other-than-conventional biogenetic relatives.” A clone has no biological parents, per se. It’s not the sexlessness that disqualifies this parentage, but the fact that Elizabeth Ann is isolated by twelvish generations from her parents.

I asked my mother-in-law, a keen genealogist, how such a thing might be represented by the software she uses. But Willa and Elizabeth Ann share an

uncoded kinship, a berserk in genetic spacetime: sisters once removed. Or rather, they are sisters once removed from a cryotank — thawed and shipped, duplicated and injected, transferred and born again — not exactly sharing the same tier on the family tree. “But I am a blasted tree,” says Victor in Shelley’s *Frankenstein*. “The bolt has entered my soul.” Elizabeth Ann’s existence is multidimensional, perhaps best represented as a twig floating spookily mid-air.

And, speaking again of the soul, in his article, “Questioning Cloning with Genealogy,” Emmanuel Ifeanyi Ani asked: “What is the status of a cloned being? Will it possess spirit or soul?” What becomes of a society sorted into clones and non-clones? Will natural beings regard artificial beings as superbeings or second-class beings? Such thought experiments might apply more readily to the dilemma of human cloning, but they still raise — on principle — the question of how Elizabeth Ann and the clones-to-come will negotiate kinship within their colony.

Meaning that when I asked, “So, how’s Elizabeth Ann doing *today*?” it’s kind of a loaded question.

“She’s doing really well,” Bortner replied. “If you put her on the floor with every other ferret in my building, I’d have to look very closely to tell her apart.”

The morphometrics are within range of other black-footed ferrets, and she’s of a typical size and weight.

“What about her behavior?” I asked.

“Ah, that’s the big one,” Bortner said. “I mean, she’s on the curious end of the spectrum — one of the more curiouser individuals, for sure. But even when she was very, very small, her nature was outcompeting her nurture.”

“How so?”

“Oh, when we came around, she would use a burrow as a refuge while her foster siblings popped up to say, ‘Hey, what’s up?’”

Elizabeth Ann is in the main building, the one with the backup generator and the best HVAC,

where she’s exposed to other ferrets, getting used to the routine of managed care. Because of her offset birthdate, she was too young to cycle into estrus during her first spring, and so mating was delayed until spring 2022. To state the obvious, Elizabeth Ann was born to breed. Technically, all the jills here were. The species’ studbook keeper is poring over genetic possibilities now, nearly ready to assign her to a surefire hob, a union that will create the most genetically differentiated BFF litter on the continent.

Technically, though, the best genes for hers are still in Southern California in an enigmatic vial that Revive & Restore can’t wait to get its hands on. After spending over 30 years together, frozen side-by-side in a carousel in a cryotank, as genes in cells in vials, it seems that cellular Willa and her cellular beloved are destined to meet again. The clumsily named “Studbook 2” (SB2) is the ninth and last of the potential founders of the species. Together, the two might just be the ones to find a way through the bottleneck.

It’s entirely possible that they met in life, zigzagging toward the same prey in Meeteetse, c. 1985. Maybe even in spring, when SB2 left his scent for her sensing, rubbing pelvis or dragging anus on prairie substrate. Did Willa’s nose ever lead her into a burrow only to find a randy SB2? Did they sniff at parts or just part ways? Whatever the case, they both died kitless, and notches of their ears were pulverized and preserved inches apart in Escondido in the hopes they’d one day reanimate and consummate, making viable progeny to be released in Meeteetse or whichever reintroduction site would have them.

It is, in my opinion, the greatest genetic love story never told.

If only it was as easy as pouring the vials into a cocktail shaker, mixing those genes up manually rather than technologically. Instead, SB2’s cells must be cloned in an intricate process resembling the one last year, but with an added hurdle: His genes tested positive for plague and canine distemper, the

signature bacteria and virus that killed him and so many ferrets over the years. According to Revive & Restore, a pharmaceutical company has been enlisted to test methods for the removal of infection from SB2’s culture.

Beyond her supervision of the husbandry team, Bortner also raises the kits, coordinates daily-care duties, including training them in pre-conditioning pens, at which point they might be ready for life in a zoo or, wilder yet, one of 30 reintroduction sites across North America. “It’s a lot of effort,” I said, “keeping these things alive.”

Bortner agreed.

“Is it worth it?”

She reminds me that the U.S. Fish and Wildlife Service is charged with conserving resources (endangered species) for the American public. “And it’s not just the ferrets that benefit from this work,” she said. “To save ferrets, you need ferret habitat. Ferret habitat means prairie dog colonies. It helps out the entire prairie ecosystem.”

“So why not just focus on prairie dogs if they’re the keystone species? Is it a PR issue? Nobody will rally to save varmint?”

“You know, you could just say that the prairie would be fine without BFFs. And it might,” Bortner said. “Other predators might take its place. But it can be dangerous to let one species slip through the crack like that. If ferrets can’t survive on this prairie, then the ecosystem is missing a piece of its puzzle.”

Of the 203 kits born in Carr this year, a limited number will be suitable for the prairie. With clones and their kits entering wild ecosystems, it shouldn’t be long until this genetic windfall comes to a prairie near you. Or me.

I think of the countless entrance mounds that stretch to the prairie’s horizons, punctures of earth where ferrets go to eat, sleep, die and give birth.

For a ferret, there are thousands of ways to vanish. And as many ways to return. ●

Additional reporting by Sam Yadron.

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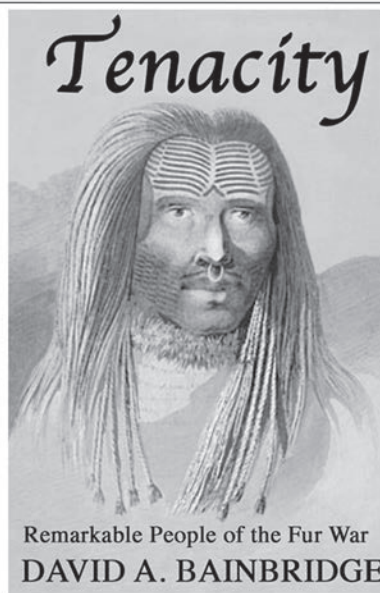
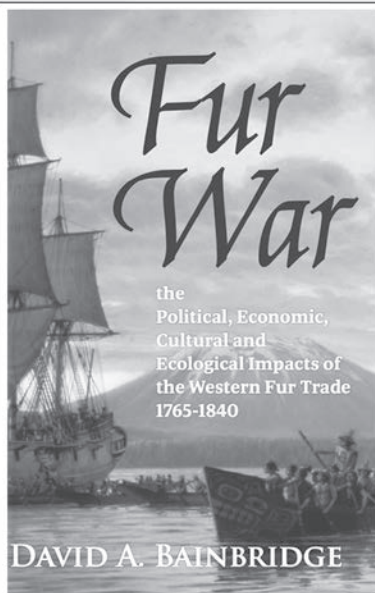
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ESSAY

Knee deep in shared water

When the violence of words reverberates through the history of a place.

BY PETER W. FONG | ILLUSTRATION BY HOKYOUNG KIM

ALTHOUGH I WAS BORN IN New York City and caught my first fish in Brooklyn's Prospect Park, I have spent more of my adult life in Montana than in any other state. Perhaps because our kids were born there, it feels more like home than any of the other places we've lived and worked: Aruba or Morocco or Mongolia or Japan, for example, countries with their own consolations and contradictions.

In the summer of 2019, however, something happened to me, only a few miles away from the Bitterroot Valley house that my wife and I had purchased 25 years earlier. For many months after this incident, I wondered if I would ever think of Montana as home again — or even think of it at all without an accompanying deluge of shame and anger.

Perhaps the timing had something to do with it: midday, on the Fourth of July. I'd just finished mowing the lawn and was ready for a break from yardwork. Because the weather was sunny and warm, I grabbed my fly rod and drove to a favorite spot — Poker Joe, a public fishing access on the western bank of the Bitterroot River.

I knew that it would be a busy place on a holiday afternoon, but I also knew that the river braids there into several channels, with plenty of room to wade. Sure enough, the nearer gravel bars were well-populated with sunbathers and their children, with ice chests, inner tubes, pool toys, dogs. So I walked downstream until I could cast, unencumbered, and stepped into the water.

That's when I noticed the raft — or, to be precise, when the men on the raft noticed me. Four of them, one at the oars and the others splayed atop the inflated hull, rounding the nearest bend. They were still about 50 yards upstream, too far away for my nearsighted eyes to determine the finer details of their persons, but I could hear their conversation plainly enough.

"What does that chink think he's going to catch?"

"Ssshhh. He can hear you, you know."

"What do I care? I ain't never seen no chink with a gun."

When I looked up, my face awash with heat, the man in the rower's seat pulled at the oars, steering the raft into the far braid, away from the channel where I stood, knee-deep in shared water. I stared after them — four white men in their 30s or 40s — my brain scrambled with rage. I turned to see if any of the nearby people had overheard, but none met my gaze. Not the young couple with the chocolate Lab, sipping their beers, or the older woman with sunscreen on her face, reading a book.

I took a few deep breaths then wound in my line, walked distractedly to the parking lot, and returned to the house. My mind was elsewhere and nowhere. I can't say I was really thinking, because my thoughts were too disordered, shorn of all words except the ones I still couldn't wrap my head around.

No chink with a gun? Although I have long been familiar with overt racism, this felt like something new. It was plain that the man recognized his talk as offensive — fighting words, indeed.

For the record, my hair — then, as now — is long and gray. Long as in over my ears and onto my shoulders. And gray as the windward side of our barn. So the speaker had declared his disdain for an unarmed man, aging but by no means feeble. Implying that he considered himself physically capable of defending himself against me, or was, in fact, packing. Which implies, in turn, that he believed he could speak with impunity, because he was prepared — even willing, if it came to that — to shoot me.

Because I've been a hunter for decades, I neither revere nor glorify the destructive power of a firearm. Not when I have used my own fingers to examine a deer's broken heart, or to realign the feathers on a duck's fractured wing. If it had been hunting season — the fourth of December instead of July — I might

*"I wondered
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still have repaired to the very same place. But instead of a fishing rod, I would have been carrying a shotgun.

WHAT CAN I TELL YOU about love and ignorance that you don't already know? Either you are in possession of ample supplies of both — or you are unaware of the fathomless depths of their abundance.

Anti-Chinese sentiment in the United States is nothing new, of course. When I was in the fourth grade, my parents moved from the city to Perry, New York, a town best known, if known at all, as the childhood home of Chester A. Arthur, the 21st president of the United States. Despite Arthur's initial misgivings, it was under his watch that Congress passed the Chinese Exclusion Act (1882).

Such legislative racism did not, however, dim the national appetite for more violent forms of action, including arson, shooting and lynching. For confirmation, just google "Rock Springs Massacre" (1885), "Tacoma Method" (1885), or "Deep Creek Massacre" (1887). Writing in *The New Yorker*, Michael Luo reports that Chinese workers were detested for being cunning, industrious and "nearly as white as Europeans." Immigrants of Chinese descent would remain ineligible for U.S. citizenship until 1943, when a wartime alliance with Nationalist China against Imperial Japan provoked a reassessment of the policy.

For reasons I still don't understand, I told almost no one about the incident at Poker Joe. After all, why taint the hundreds of memories I have of that treasured place with one disgraceful episode? The river there is handsome in all seasons. Our family has picnicked there, swum there, skipped stones, drunk wine. It's where I trained my first Lab to retrieve, where I once spent two hours tempting an extraordinarily large trout to a dry fly (only to botch the hookset), where a young moose once galloped so close that I dove into a rose thicket.

But along with avoidance went confusion. Try as I might, I couldn't

make sense of it. Why, I wondered, had it been so important for that individual to speak his thoughts aloud?

Then, just a week before the Fourth of July, 2021, a young man named Nathan Allen, recently married and in possession of a graduate degree from the MGH Institute of Health Professions, shot two people in the Boston suburb of Winthrop. One was a retired Massachusetts state trooper, the other an Air Force veteran. Neither was white. Both were about my age. The vet was shot three times, in the back, as she crossed the street. The former trooper, who may have tried to confront the man, was shot four times in the head and three times in the neck and torso.

Neighbors said the shooter “seemed like a normal guy.” Except that he drew swastikas in his notebook, wrote about the superiority of “the white race” and considered himself an “apex predator.”

As a boy, I read biographies of Revolutionary War heroes with the same enthusiasm that I collected baseball cards, and so the murderer’s amalgam of names immediately reverberated with the history of our nation’s origin. Nathan Hale was a spy for Washington’s Continental Army, captured by the British and hanged in the autumn of 1776. Ethan Allen, leader of one of North America’s first secessionist militias, was captured in 1775 and survived three years as a prisoner of war before gaining his release. Although Allen’s Green Mountain Boys are best remembered for capturing Fort Ticonderoga, they began their career harassing settlers from New York, who were themselves confiscating Native American territory through the colonial land-grant system.

Which brings me back to Poker Joe. The Montana Department of Fish, Wildlife and Parks acquired the site in 1973 and named it in honor of a member of the Nez Perce Tribe who was better known to the region’s Native residents as Hototo, or Lean Elk. He was said to be a small man with an uncommonly big voice, half French Canadian, with a command of English apparently honed at the card table. Along with Chief Joseph, Chief Looking Glass and others, Lean Elk led the Nez Perce from the Battle of the Big Hole on a deft and arduous escape, across many hundreds of miles of Montana Territory, to within a day’s journey of safety in Canada.

After U.S. forces — including the 5th Infantry, 2nd Cavalry, 7th Cavalry and a contingent of Cheyenne scouts — eventually caught up, Lean Elk was killed by one of his own warriors on the first day of what would become a five-day siege in the Bear Paw Mountains. You might say that his looks betrayed him: The Nez Perce marksman who fired the shot apparently mistook him for a Cheyenne. Later, Chief Joseph said, “We could have escaped from Bear Paw Mountain if we had left our wounded, old women and children behind. We were unwilling to do this. We had never heard of a wounded Indian recovering while in the hands of white men.”

After their defeat, the Nez Perce fighters were lauded by William Tecumseh Sherman as displaying “a courage and skill that elicited universal praise.” Such words did not, however, prevent Gen. Sherman from reneging on the terms of surrender. The U.S. commanders in the field had promised that the Nez Perce could return to a reservation in Idaho; instead, Sherman ordered the captives to Fort Leavenworth, in Kansas.

I don’t tell this story to equate the racism of the 19th century with that of the 21st. But the irony of naming a public fishing

“Personal history — like the history of place — is a sedimentary affair, accruing in layers that can be sometimes obscured, sometimes eroded.”

access for a man who died fighting against the wrongful taking of ancestral lands is not lost on me. Back in the 1990s, when I had just moved to Montana and was first learning to hunt, I was probably as naive as many of my neighbors. I didn’t know Poker Joe as the derogatory nickname of a famed military strategist, only as a beloved landscape, with expansive views of the same craggy peaks that — before a box elder tree overtopped our house — I could see from our bedroom window. A place where, if I looked sharp and kept quiet, I might be rewarded with beauty and nourishment.

I was ignorant then, but not hopelessly so, and I forgive myself now for not knowing better. Personal history — like the history of place — is a sedimentary affair, accruing in layers that can be sometimes obscured, sometimes eroded. Even if most of us declare that some truths should be self-evident — that all people are created equal and endowed with certain unalienable rights — others may choose a path destructive of these ends. I can’t guess what Nathan Allen might be thinking today, if he had lived. But shortly before his mind turned actively murderous, he wrote this in his journal: “Racism is healthy and natural. And holding it in is bad for you.” ☀

Peter W. Fong is the author of the award-winning novel Principles of Navigation. In 2018, he led an international team of scientists on a thousand-mile expedition from the headwaters of Mongolia’s Delgermörön River to Russia’s Lake Baikal. The Coconut Crab, a chapter book for children and adults, is forthcoming from Green Writers Press.

Plagues and earthly paradises

A haunting posthumous book about the parallels between climate change and human illness could be the wake-up call we need.

BY ANDRÉ NAFFIS-SAHELY

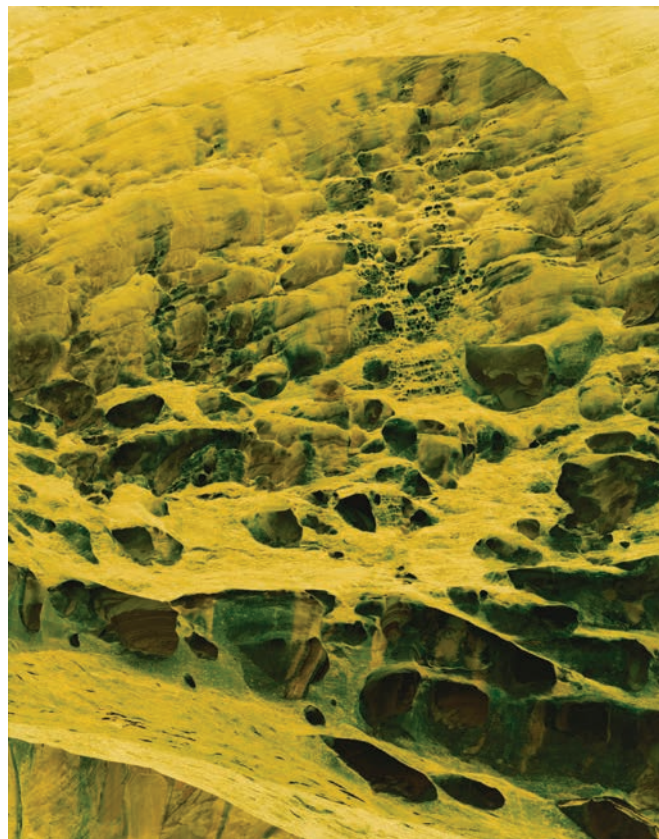
IN REQUIEM FOR AMERICA'S BEST IDEA, former park ranger Michael J. Yochim takes us on a tour of some of this country's most iconic national parks, from Washington's Olympic, to Arizona's Grand Canyon, Montana's Glacier and California's Sequoia, Kings Canyon and Yosemite. Along the way, he addresses the drastic impacts of climate change on their ecosystems, while regaling us with engrossing facts about the complex life they harbor, noting, for example, that a certain kind of lichen is found only on 400-year-old trees in Olympic's rainforests. Interwoven with Yochim's natural history is the chronicle of his own body's breakdown in the wake of his diagnosis with Amyotrophic Lateral Sclerosis (ALS). The book, Yochim's fourth, succeeds at drawing a parallel between his illness and the crisis facing our planet, but it's a somber success. Yochim's death from ALS just months prior to his memoir's publication underscores its urgent message: that the regenerative pleasures we draw from these parks may soon fall victim to our destructive impulses, cutting us off from these places, just as ALS eventually exiled Yochim from the trails and rivers he loved so dearly.

The thoughtful distillation of Yochim's 22 years of work with the National Park Service, *Requiem* excels in detecting likely gaps in our environmental awareness. Many readers will be well acquainted with the better-known and more dramatic consequences of climate change — rising temperatures, ever larger forest fires, mega-droughts and vanishing icecaps — but Yochim takes care to dive into its less frequently discussed aspects, such as the effects of global warming on vegetation patterns. Yochim's advice: Enjoy these parks (and their greenery) while you can. Citing a study commissioned by the Park Service, he tells us that, by this century's close, more than half of the West's present vegetation will have become incompatible with its environment and will vanish entirely.

It's impossible to read this book without feeling the cold shadow of the author's absence. In the book's foreword, William R. Lowry, who

stepped in to complete the manuscript following his friend's death in February 2020, writes that "within a couple of years, Mike, the man who led so many others on hikes into the most remote part of the country, couldn't even stand on his own." The book could bring solace to those experiencing debilitating illness and convince some readers of the many connections between human and ecological health. Yet it would be a mistake to overlook the fact that *Requiem* is also a subtle indictment of our collective apathy. In the book's early passages, Yochim describes the moment when he first noticed something was wrong with him. He went in for a checkup, only to have the neurologist prescribe him antidepressants: "Much like ignoring the signs that the climate is changing ... the neurologist chose again to ignore the indications that my body was actually in the early stages of something big, perhaps life changing." Although the blend of Yochim's personal and planetary narratives is almost seamless, they differ in one important aspect. "As much as my affliction is of unknown origin," he writes, "the other is very much self-inflicted."

Another recent book, Fred D'Aguiar's *Year of Plagues: A 2020 Memoir*, shares a conceptual kinship with *Requiem*, investigating the connection between personal and societal health by tackling three altogether different plagues: the COVID-19 pandemic, the author's prostate cancer, and institutional racism in America, viewed largely through the events surrounding George Floyd's murder. In this powerful work of nonfiction, the British-Guyanese poet and novelist, now based in Los Angeles, parts the curtain to reveal something resembling a private diary. We follow D'Aguiar as he collects information about his illness and its symptoms and describes his experience under the surgeon's knife, all while drawing connections between his situation and the civil unrest around him. In the third chapter, "Is this



Capitol Reef, Utah, 2014. **David Benjamin Sherry**

what dying looks like?" he ponders: "How is my cancer forged in the crucible of my race?" Then he proceeds to show how institutional racism leads directly to higher death rates among non-white cancer patients, later adding: "Just as I wonder if the personal always disrupts the bigger picture, I see that I am attuned to big events whose arc return our world to the dark days of slavery and Jim Crow. My cancer is not only my worry. My cancer runs this society as well."

In their own unique ways, both authors remind us how stories of personal suffering can teach us a great deal about our place in the world, and how little we understand that place. The times we live in call for this style of nonfiction, impassioned *cris de coeur* that can stir us out of our anodyne lockdown realities, and both *Requiem for America's Best Idea* and *Year of Plagues* deliver on that promise. ☀

Requiem for America's Best Idea

by Michael J. Yochim

296 pages, hardcover: \$34.95
University of New Mexico Press,
March 2022.

Year of Plagues: A 2020 Memoir

by Fred D'Aguiar

336 pages, hardcover: \$26.99
HarperCollins, August 2021.

The author and her daughter hiking in the Sonoran Desert in Tucson, Arizona, last year. **Roberto (Bear) Guerra**



When the little owl vanishes

What we talk about when we talk about extinction.

BY RUXANDRA GUIDI

BACK WHEN OUR daughter was 3 or 4 years old, we read the same picture book night after night: *El Valiente Búho* (*The Brave Owl*), the story of a baby bird who was worried about leaving the nest. Everyone — her parents, her siblings, the other animals in the forest — promised her that she wouldn't fall to the ground. When the time was right, they said, and if she didn't let fear overtake her, she would flap her wings and simply fly away.

No matter how many times we read it together, *El Valiente Búho* resonated with me. It was a perfect metaphor for our child's growing independence, a reminder of the worry that we, her parents, would experience as she grew. I imagine that worry is one that never leaves parents, regardless of their offspring's age. What if our daughter can't make it on her own? What if none of us can?

Once, our daughter got to meet one of the tiny cactus ferruginous pygmy-owls that are native to the Sonoran Desert where we live. The bird weighed about 2 1/2 ounces and stood less than 7 inches tall. It was as cute as a stuffed animal toy. It stared back at her with giant unblinking eyes, remarkably similar to her own, while she gently caressed its fluffy chest.

Pygmy-owls typically nest in the open desert, high atop the tallest saguaros. But they are increasingly hard to find, threatened by the rising temperatures

caused by climate change and the ongoing development and urbanization of southern Arizona. Since 1993, no more than 41 pygmy-owls have been seen in Arizona in any given year, though they can still be found south of the U.S.-Mexico border. Their old saguaro nests are occupied by ghosts, or taken over by more common birds like purple martins and brown-crested flycatchers.

OUR DAUGHTER IS an only child; before she was born, we'd made that decision, wary of overpopulation and painfully aware of the high cost of raising a family. Now a decade has almost passed since she joined us, and we can't imagine life without her. Every year of her young life, she's heard us talk about how the Earth is growing warmer. She knows that resources are limited and that natural disasters and extinction are a part of modern life. It's her normal. And ours, too, even though we've been slow to acknowledge it. It's hard for us to keep track of the ways our natural world has changed since we were kids; we're too sad to imagine how much worse everything could get.

But every parent knows that you cannot help your children find the right path if you cannot model good behavior yourself. We want to inspire our daughter; we want her to care for the environment even as it is falling apart, to work for conservation however futile it seems.

So we talk openly about these subjects, and we mourn the losses we see — the pygmy-owls in the Sonoran Desert, the white rhinos in Africa, the vaquitas of the Sea of Cortez. When we do this, we are talking about death. Some days are harder than others. We wake up without knowing the words to say, sometimes lacking the emotional fortitude to accept that so many species will not return — that we will only know of their existence through books and pictures and zoos. On other days, we feel foolishly optimistic. We indulge in fantasy. "What if it turns out that there are more vaquitas hidden somewhere? Or they were undercounted?" our kid says when we visit the Sea of Cortez. We take in its vastness and have a hard time imagining how a once-abundant native species could ever be gone. "That would be wonderful," I tell my daughter. On those days, I do not have the heart to pit my reality against her imagination. It is a quality that will help her cope as she grows up, I hope.

But increasingly, I wake up clearheaded, convinced that humans are well on the path to self-destruction. This knowledge makes me eager to slow the destruction however I can, through my actions and my words. On those days, we talk about the wonder of being alive, knowing our time is a finite reality we cannot waste. We talk and read about extinction. It's a part of life; it happened to the dinosaurs — why shouldn't it be our fate as well? We don't see these discussions as morbid. We see them as evolved, as necessary. Someone I know recently asked over Twitter: "Has grief become the new hope?" For us, I think, the answer is yes. Increasingly so.

I last saw my dear friend and mentor Eddie four years ago when he came over for dinner and stayed the night. He'd recently returned from a trip to Kenya, where he'd been reporting about poaching for *National Geographic* magazine. He told us about how hard it was

— seeing endangered mammals bludgeoned for their tusks. How do you deal with that pain? we asked him. How do you make sense of the climate crisis?

Eddie was a gentle giant — over 6 feet tall in his black leather jacket and worn-out jeans. "We'll need to find comfort in the fact that we may die," he said. "But life, in some form, will go on without us on this planet." Back then, I couldn't wrap my mind around his words. Our daughter was too small, too fragile still.

A year later, I got the news of Eddie's sudden death. As I mourned him, I began to understand what he'd meant during our last chat: That humanity needed to take a leap of faith. If we want to survive in this era shaped by the climate crisis and extinction, he believed, we need to accept uncertainty. This is our opportunity to circle back and rediscover the courage it takes to raise a child, knowing that your species might not survive. That may require the biggest leap into the unknown yet.

Like the little owl in my daughter's book, we have good reason to be fearful about what lies ahead. But as life passes, we have to learn to bear witness and accept what we see. I'm beginning to understand that when the last human is gone, some other form of life will take our place. Maybe they'll be huge, like dinosaurs, or even more fantastical, like dragons. But more likely, they'll be tiny — smaller than our daughter when she was a baby, even tinier than the little pygmy-owl. Seemingly insignificant and simple creatures. They may not be able to fly from the top of their nests. They won't let fear stop them. They will just be. ☀

Ruxandra Guidi was formerly a contributing editor for High Country News. She writes from Tucson, Arizona.

Note: Roberto (Bear) Guerra is HCN's photo editor and Guidi's husband.

Heard Around the West

Tips about Western oddities are appreciated and often shared in this column. Write tiffany.midge@hcn.org.

BY TIFFANY MIDGE

CALIFORNIA

What are the odds of twins being born on different days, different months *and* different years? According to the Natividad Medical Center in Salinas, California, where Fatima Madrigal welcomed her new babies, it's pretty stratospheric: 1 in 2 million. But that is exactly what happened on New Year's Eve. At 11:45 p.m., Madrigal's son, Alfredo Antonio Trujillo, arrived, weighing in at 6 pounds. And 15 minutes later, at exactly midnight, his sister, Aylin Yolanda Trujillo, landed at 5 pounds, 14 ounces. Will the new arrivals celebrate their birthdays on separate days? That remains to be seen. But it is nice to have a day all one's own.

MONTANA

Montana resident and wilderness devotee Mike Stevenson owes his life to a benevolent owl that came to his rescue over 40 years ago during a blinding snowstorm in the Bob Marshall Wilderness. That fall, Stevenson was working for an outfitter's crew, guiding clients on expeditions hunting elk, bear and deer. Stevenson, who relished the solitude that the backcountry offered, had planned to stay behind when the crew departed, setting traps, and wintering alone in "the Bob." "I always had a passion to get into the woods," he said. "I wanted to get into the wildest country I could." It was in the outfitter's camp that fall that the crew first took noticed an owl that was loitering in the area, hunting the mice attracted by the horses' feed. "The owl was pretty vocal. It would hoot all night," Stevenson told *The Montana Standard*. But when

everyone else packed up and left camp, the owl left too. Stevenson didn't hear it again until weeks later, when he found himself caught in an extremely precarious situation. He had snowshoed a few miles to Big Salmon Lake to check his beaver traps. It was late in the day by the time he started back, with nightfall and a snowstorm bearing down, and Stevenson, whose flashlight was broken, got disoriented and soon became lost. He tried to start a fire, but his fire-starting kit was wet from the storm. Stevenson knew that he needed to keep moving to stay alive, but he was overcome with fatigue, and he finally plopped down in the snow and almost fell asleep. "I thought I was going to die," he said. "I was getting scared. I was shaking and I wanted to go to sleep." But just as he was on the brink, he heard a

helpful *hoot*: The owl had returned. In desperation, he decided to follow the familiar sound, even though he wasn't sure just where it was coming from. Nonetheless, he kept following the hoots until he made his way back to camp, thereby affirming that the time-honored saying holds true, even for wilderness experts: "It's not *what* you know, but *who-who* you know."

NEVADA

A humongous creature that swam the Triassic oceans over 200 million years ago is the namesake of the top-selling Ichthyosaur IPA produced by the Great Basin Brewing Company in Sparks, Nevada. The brewing company, formerly owned by Tom and Bonda Young, was honored in December at a ceremony at the Natural History



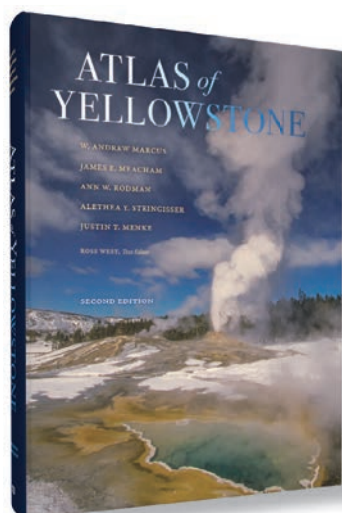
Armando Veve / HCN

Museum in Los Angeles. Not only did the Youngs provide donations and support for the excavation of some ichthyosaur fossils discovered in the Augusta Mountains outside Winnemucca in 2011, they also transported the skull of the 55-foot-long fossil to the museum in one of their Great Basin beer trucks. As of December, the ichthyosaur species on display at the Natural History Museum will be known as *Cymbospondylus Youngorum*, after the Youngs — though Tom Young told the *Reno Gazette Journal* that he'd had a different name in mind: "I was voting for '*Beerosaurus*,' personally."

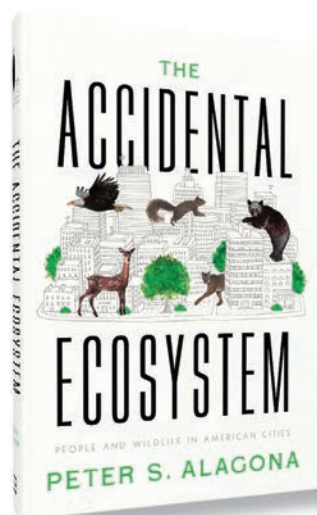
CALIFORNIA

On Jan. 26, the mighty reign of *Jeopardy!* champion, Amy Schneider, came to an end. Over the course of three months, Schneider racked up a 40-game winning streak, second only to fellow *Jeopardy!* legend Ken Jennings, along with \$1.3 million in total earnings, good for fourth all-time. Schneider, a software engineer from Oakland, California, is the first woman to pass the million-dollar mark, and the first transgender contestant to qualify for the annual Tournament of Champions, which will be played this fall. Schneider's media presence reflects positively for transgender communities, though she stressed on her Twitter account that it isn't paramount to her identity: "I didn't want to make too much about being trans, at least in the context of the show. I am a trans woman, and I'm proud of that fact, but I'm a lot of other things, too!" 🌸

THE PEOPLE AND THE LAND



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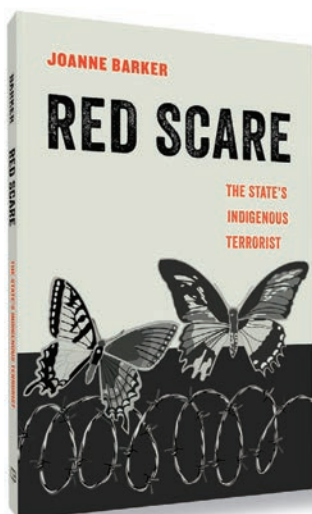
"The pleasures and perils of living so close to other species."

—Eric W. Sanderson, author of *Mannahatta: A Natural History of New York City*



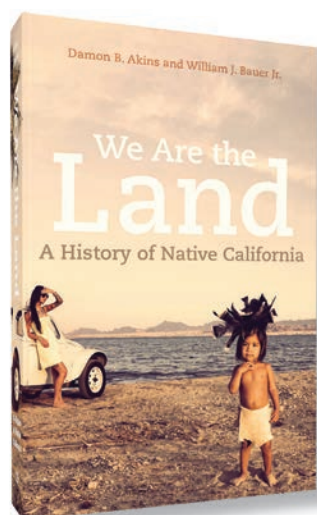
"One way to thank the firefighters and volunteers is to become more informed about fire. This book will help."

—Chico Enterprise-Record



"This book provides Indigenous peoples with the intellectual tools to see past our difference."

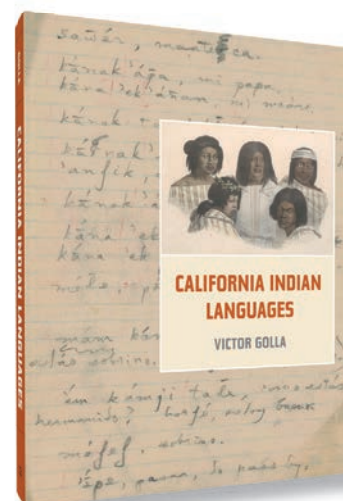
—Brenda Macdougall, University of Ottawa



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#IAM THE WEST

NICOLE GOMEZ
Executive Director,
Free Verse Writing Project
Missoula, Montana

I am the executive director of Free Verse Writing Project, a nonprofit that teaches creative writing to incarcerated youth. We believe that by amplifying these kids' voices and drawing attention to their stories and experiences, we can begin to counter the dehumanization of the justice system and help Montana move toward change. The most common offense for youth is theft. I can't read these statistics and not think about the kids who write about stealing food for themselves or their siblings — they write so much about worrying about their siblings. But the most common thing they write about is missing their moms. Which breaks your heart, because you realize they're just kids.

Do you know a Westerner with a great story?
Let us know on social.

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