High Country News
For people who care about the West

THE ELWHA, UNLEASHED

Six years after its dams came down, a new river has emerged

By Kate Schimel

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CONTENTS

Sediment built up at the mouth of the Elwha River in May 2016. More than 20 million tons of sediment have been released and flushed down the river from the old dam lakebeds. JOHN GUSSMAN

On the cover

An aerial view of former Lake Mills on the Elwha River in 2015 shows old river channels, scattered wood placed as part of the revegetation effort, and anoxic, iron-rich water filtering down the waterway.
ANDY RITCHIE

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FEATURE

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DEPARTMENTS

Editor's note

Compromise amid the canyons

This past weekend, I went to Wyoming to witness the total eclipse. As luck would have it, the moon's shadow was to pass just north of my boyhood home, Pinedale, and so on Monday morning, my father and I shoved off in his aluminum jon boat to spend the totality on Willow Lake, fishing. We wondered whether the fish would be confused by the dusky, dwindling light — and I'm proud to report that 20 minutes before totality, my dad reeled in a respectable 2.5-pound lake trout. "Well, that was well worth it," he declared, marking the day a success.

After the eclipse (and a late lunch of grilled fish), I headed for Colorado, driving south through the red-sand, juniper desert of Flaming Gorge Reservoir. As the sun set, haze from wildfire smoke created a blazing light that exploded across the water, and I recalled days of skipped school, cheap beer, and daring dives into cool water. But where Willow Lake is wild, glacier-carved and snow-fed, some see the Gorge as an aberration, an embolism in the artery of the Green River on its way to the Colorado.

There are those who would have such dams come down, who see them as monuments to hubris and ecological ignorance. The dams enable humans to survive in what mapmakers once called the Great American Desert, but they do so to the detriment of other species, flooding desert cathedrals and clogging salmon runs. To a purist, they are unsightly and unnecessary. But to a pragmatist, they are critical to our survival and a symbol of progress. For all their faults, dams provide clean hydropower and irrigation, a way of harnessing the life-giving power of snowmelt, allowing a great many people to enjoy life west of the 100th meridian.

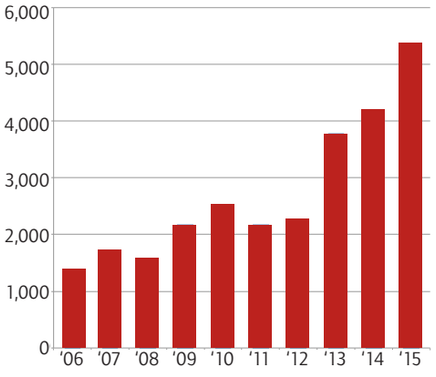
In this issue, we try to look past the contentious symbolism of dams and see what we can learn from rivers, dammed and otherwise. We examine the lessons learned on Washington's Elwha River, whose dams came down six years ago, and Utah's Bear River, where a diversion is still being planned. And we look at the surprisingly scant science behind calls to take down Glen Canyon Dam, which would be a major win for preservationists but a potential disaster for many Westerners.

Dams are a divisive issue, to be sure, but do they need to be? We are in troubled times, and I think we should all be looking for areas in our lives to practice compromise. Dams might be one place to start. Surely there are some rivers we could set free. And just as surely, there are some we should manage. Common sense might tell us which is which, where we might find compromise. But compromise, even partial compromise, seems as rare these days as a total eclipse of the sun.

—Brian Calvert, editor-in-chief

◀ **A crowd of hikers fills Conundrum Hot Springs in the White River National Forest above Aspen, Colorado. Since 2011, when this photograph was taken, the number of overnight visitors to the site has almost tripled.** DUNCAN LOWDER

Overnight visitors to Conundrum Hot Springs



SOURCE: U.S. FOREST SERVICE

Forest Service confronts wilderness loved to death

At Conundrum Hot Springs, an extremely popular area in western Colorado's White River National Forest, rangers hope a new overnight permit system will mitigate the impacts of overuse. Despite requiring a nearly nine-mile uphill hike into a designated wilderness area, Conundrum has developed a party atmosphere, with visitors carrying in speakers and cases of beer. In the last decade, visitation to the hot springs has increased nearly fourfold, from just 1,395 overnight visitors in 2006 to 5,372 in 2015. Problems include human-bear conflicts, trash and noncompliant campsites. Many visitors fail to bury or carry out their own waste; rangers packed out 344 "unburied poops" in 2015. Amid soaring popularity, many other places in the West are grappling with how to limit use. Permit systems already exist for a number of other wilderness areas as well as parts of national parks like Canyonlands. If Conundrum can rebound from such intense use, it could serve as a potential model. **REBECCA WORBY** MORE: hcne.ws/loved-to-death

"I don't really want to go through life, personally, feeling like nothing I do matters. And yet I don't necessarily believe that the human race is going to make it. So where is the sanity in that? How do you live a life in service to something inside of that belief or that despair?"

—Brian Calvert, editor-in-chief of High Country News*, speaking on the* West Obsessed *podcast, "Finding our way through the Anthropocene."*
MORE: hcne.ws/surviving-ecocide

Wildfire season by the numbers

6.4 Millions of acres burned in wildfires in the U.S. by mid-August. This larger-than-normal fire season (recent mid-August average is 4.7 million acres) kicked off with grassfires in places like the Great Basin, eastern Montana and Southern California.

56 Number of large fires actively burning in the U.S. as of press time. Oregon — where 17 large fires are burning — Alaska and Montana have the greatest amount of acreage on fire.

1 Number of large active wildfires that aren't in the West. (There's one in Florida.)

164 Percent of average snowpack in California's Sierra Nevada this winter. While that was good news for delaying the start of large timber fires, it resulted in an abundance of what firefighters call "fine fuels" — grasses and small brush — which fed the early-season fires, allowing flames to cover a lot of ground.

20,000 Number of people — including firefighters and support personnel — who are battling large fires as of press time.

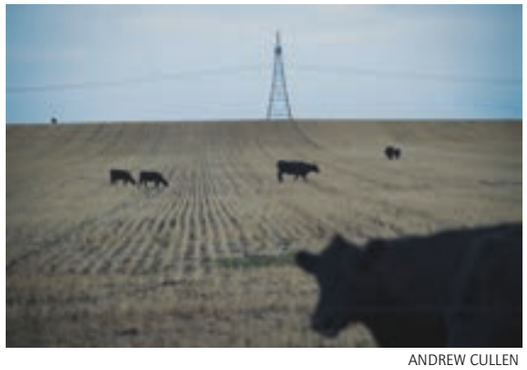
84 Percent of wildfires in the U.S. caused by humans.

EMILY BENSON MORE: hcne.ws/2017wildfires

DATA FROM THE NATIONAL INTERAGENCY FIRE CENTER, THE CALIFORNIA DEPARTMENT OF WATER RESOURCES, THE NATIONAL INTERAGENCY COORDINATION CENTER, AND BALCH ET AL., DOI: 10.1073 PNAS.1617394114.

200,000

Approximate number of acres of lithium claims staked by corporations in the Paradox Basin, which spans much of southeastern Utah and spreads into neighboring states. With demand for lithium expected to more than double by 2025, due in large part to the projected growth of the market for electric vehicles and e-bikes, the search is on for a domestic source.
REBECCA WORBY MORE: hcne.ws/ETgold



ANDREW CULLEN

Photos

"Any additional precipitation is not going to fill the gaps."

—F. Adnan Akyüz, North Dakota state climatologist and a professor at North Dakota State University, speaking about the "flash drought" that hit the Great Plains this spring, reducing yields for some crops by half. See a slideshow, with photographs by Andrew Cullen.
MORE: hcne.ws/flash-drought

Trending

History tells us Trump is doomed

After President Donald Trump sympathized with "alt-right" hate groups following the violent protests in Charlottesville, Virginia, he lost his ability to govern, Mark Trahant argues in an opinion piece. A look at history shows us that Trump is the latest in string of political and public figures who have fumbled their handling of racial tensions. Trahant says the questions now are "How fast will the Trump administration crumble? When will people resign in good conscience? How quickly will Congress act to limit or remove some executive powers?"
MARK TRAHANT/ ***TRAHANT REPORTS***

You say

MIKE TUREK: "It's not just Trump. The Republican Party has been courting racists since (Barry) Goldwater was a leader in the Senate against civil rights legislation."

ROBBIE EMMET: "There were so many things during his election that should have ended his campaign, but didn't. I think we're stuck with him."

ROB SHANDER: "The Republicans took the House, the Senate, the Supreme Court, the White House and the governor races in the states. Just because the left and the colluding media can cry the loudest doesn't mean everyone else shares your opinions."

MORE: hcne.ws/is-potus-done and Facebook.com/highcountrynews

Send letters to editor@hcn.org or
Editor, HCN, P.O. Box 1090, Paonia, CO 81428.

WITNESSING INJUSTICE

Ruxandra Guidi's exceptionally good piece "Los Promotores" (*HCN*, 8/7/17) could be subtitled "Welcome to America! Harvest Our Food and We'll Give You a Nice Little Place Next to the Dump." Her article takes us into the remote desert corners of Southern California where the nearly concealed sins of environmental and social injustice become so terribly visible. Given the facts of toxic waste, open sewers, and human exposure and exploitation, this could have easily become another liberal rant against the dark forces of our agro-industrial machine and institutional indifference. But to her credit, Guidi raises up the voices of those who want to cast off their cloak of victimhood and take matters into their own hands.

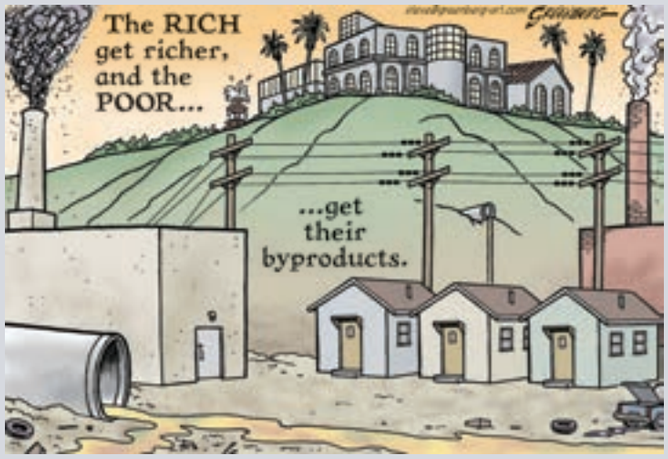
The best line is from community organizer Griselda Barrera, who asks Guidi, "Please tell me you won't write a story about how poor we are, how we can't help ourselves." And Guidi complies, by revealing the ways that people in these isolated communities have chosen to exert agency in the face of conditions so deplorable they'd be an embarrassment in an impoverished nation.

I love it when *HCN* "goes deep," bears witness to injustice, and lifts up the humanity of those whom society has abused and neglected. That is how we create empathy; that is how change begins.

Mark Winne
Santa Fe, New Mexico

HEALING THE LANDSCAPE, HEALING OURSELVES

I felt compelled to share these thoughts with you after I read "Down the Dark Mountain" by Brian Calvert (*HCN*, 7/24/17). I spent seven years working for the U.S. Forest Service cleaning up logging slash in clear-cuts. Although I actively provided input to timber-sale projects, the decision was always to log. My personal answer to my feelings of despair was to decide that people needed to see this damage. I led groups of friends through clear-cuts and camped with them in the late '90s on the Sierra National Forest in central California. I thought that people seek out places of beauty, but they really need to go to places of environmental damage to confront unabashedly the landscape after it has been damaged. We would walk around the clear-cut and give thanks for the trees and what they had given us, ask for forgiveness and welcome and encourage the new trees and other returning vegetation. I am not a very touchy-feely person, but I felt called to do this after hearing a logger congratulate himself for not cutting down a tree with a raven's nest in it — not, that is, until after the young birds had fledged.



STEVE GREENBERG

I also have observed a wonderful one-woman 30-minute performance piece called *Ode to the Polar Bear*. Allison Warden, an Inupiaq, is intimately aware of climate change but avoids the usual artistic handwringing and political haranguing. Her performance is based on traditional Inupiaq stories of the polar bear, which she takes a step further — not just recounting anecdotes of an honored old friend, but, more importantly, bidding it goodbye as it transitions. This last aspect is something we all need to start doing: saying goodbye to the creatures that will be moving on as a result of climate change, and welcoming the new ones that will come.

Although beauty can be a powerful incentive for protection, I believe a more comprehensive and psychologically mature tactic for we Euro-American types would be that after we have fought to change outcomes, to witness the effects with a detached and compassionate mindset, cultivating gratitude and respect for what is left and a renewed commitment to fight for what has not been damaged. The emphasis should be on turning toward the landscape to help it heal, and we will heal in the process.

Mary Kwart
Ashland, Oregon

INTO THE DARK MIASMA

As a former *HCN* board member and former journalist, I write to express my disappointment and frustration with the lead article "Down the Dark Mountain" (*HCN*, 7/24/17) which was headlined on your front page as a guide to the ongoing ecocide of the planet.

This article trivializes the coming disaster. For nine pages it wanders through a tale of irrelevant woe, including family incest, assorted adventures of a foreign war correspondent, and what appears to be a modern-day search in Spain for Don Quixote in the form of Robinson Jeffers.

Does the board and staff of *HCN* really believe this tale of miasma is relevant for our future efforts to deal with ecocide? I think your editor-in-chief needs an editor — and maybe an editorial board — that can separate journalism from self-indulgent meditation.

Mike Clark
Bozeman, Montana

LISTEN DEEP, BE SILENT

A Response to Brian Calvert's article "Down the Dark Mountain" (*HCN*, 7/24/17):

Yes, all these famous men
these deep thinkers
we revere
make laments
in beautiful words
while the world goes on.

While women give birth, nurse babies
care for sick and dying parents.
While nuns shelter the poor,
teach in ghettos, visit death row prisoners,
quietly, without fanfare
loving castaways.

And the world goes on.

Our Gaia soul, our planet,
what we are made of,
cannot be killed.

The feminine
in men and women
gives birth
takes care of life
no matter what.

My advice to these despairing men
is to get in touch
with our planet.
listen deep. Be silent.

Then and only then,
do what you can.

Onorina Vedovi-Rinker
Colorado Springs, Colorado

High Country News

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States restrict chinook fisheries

Extreme climate conditions have pummeled the king of Western salmon

BY ELIZABETH SHOGREN

This is the time of year when commercial and sports fishermen generally head into the coastal waters off Southeast Alaska in search of the largest and most prized catch of all — the chinook, also known as king salmon. Most years, they expect to haul in at least 30,000 fish over just a few days in a flurry of fishing. Chinook weigh at least 40 pounds, and fishermen get $5 to $8 a pound, far more than they get for other types of salmon. But in early August, the Alaska Department of Fish and Game made the difficult and unusual decision to cancel commercial and sport chinook fishing for the rest of the summer.

Chinook are born in rivers and spend between several months and two years in freshwater before heading out to the ocean. There, they bulk up on smaller fish for two to five years before returning to their home rivers to spawn.

Some of the chinook swimming off Alaska's southeast coast this time of year started their lives nearby, but others are from British Columbia or as far south as Oregon and California. Surveys off the coasts of Oregon, Washington and the Gulf of Alaska indicate that chinook stocks across the region are extremely low this year. Many of the fish have been hit by extreme climate conditions during their lifetime.

In fact, it's been a double whammy: When the chinook returning this year were juveniles, many of their home rivers were suffering from California's multi-year drought and the snow droughts that hit most of the West in 2014 and 2015. Both made rivers hotter and drier. Then, when the fish swam out to sea, they encountered an enormous mass of warm water in the northeastern Pacific Ocean. This unprecedented phenomenon, which scientists dubbed the "Blob," developed in late 2013 in the Gulf of Alaska. The next spring, it spread across the entire North Pacific. "It was warm and basically sterile water," says Laurie Weitkamp, a fisheries biologist who studies salmon for the National Oceanic and Atmospheric Administration. Normally, winter storms mix up the water in the North Pacific, bringing cold, nutrient-rich water toward the surface. But in 2014, that didn't happen. The lowest levels of nutrients ever seen in the surface waters of the North Pacific starved the phytoplankton, microscopic algae at the base of the food web, which in turn starved zooplankton, tiny aquatic animals that prey on phytoplankton. And that starved the small fish like herring that eat zooplankton.

Chinook eat those small fish. Surveys off the Washington and Oregon coast in 2015 showed extremely low numbers of forage fish for chinook and coho, another salmon species that has suffered in recent years. "The whole prey base got screwed up," says Weitkamp. These warm, depleted conditions persisted through most of 2016.

Both the drought and the Blob are over now, but the extent of the damage they caused will be revealed as the chinook that survived return to spawn. "Those climate conditions kind of ended this year, in 2017, but they're still going to impact our fisheries for several years," predicts Nate Mantua, who leads the salmon ecology team at the National Marine Fisheries Service's Southwest Fisheries Science Center in Santa Cruz, California.

Officials in Alaska believe unusually warm ocean temperatures also played a role in how poorly chinook fared. The decision to close the chinook fishery came after state officials determined that only about half as many fish as are needed to ensure sustainable fisheries were returning to Southeast Alaska's rivers this year. "If you don't adhere to your conservation principles, you're destined to exacerbate the problem in following years," Charles Swanton, deputy commissioner of the Alaska Department of Fish and Game, says.

California, Washington, Idaho and British Columbia also have severely restricted fisheries for chinook and other salmon species in response to critically low levels of returning salmon. On the Klamath River, poor ocean conditions, drought and disease all contributed to what are likely to prove the lowest numbers in more than 30 years. "We've been in a downward spiral in recent years, because the effects of the drought were building on the fishery," says Eric Schindler, who manages salmon for the Oregon Department of Fish and Wildlife. "This year is bad. I don't see next year being any better."

Tracking the cause of downturns in salmon populations is complex, and some researchers are not ready to blame the Blob for the dire straits of Southeast Alaska's chinook. "We don't know yet what the real effect of the Blob was on chinook salmon," Daniel Schindler, a fisheries professor at University of Washington, says. "The warm conditions in the last few years

Correspondent Elizabeth Shogren writes *HCN*'s DC Dispatches from Washington. @ShogrenE

A lone skiff floats beyond the fishing boats docked at the marina in Sitka, in Southeast Alaska, in 2016. This year, the chinook salmon season has been cancelled there.
EDUCATION IMAGES/ UIG VIA GETTY IMAGES

Snapshot

Fraser's faltering fish

The Fraser River in British Columbia, Canada, is one of the most productive salmon rivers in North America. Its basin is also home to two-thirds of British Columbia's population and a hub of economic activity, including a major port and other industries.

But now, its salmon are in decline. Last year's salmon return was a record low, with only 853,000 fish. This year, the Pacific Salmon Commission closed the Fraser River to commercial salmon fishing, due to low forecasted returns and poor river conditions.

Organizations like the Raincoast Conservation Foundation have been studying juvenile salmon populations in the estuaries where the river mixes with the Salish Sea. Their research could help untangle how young salmon activity is related to the survival of adult salmon and how to reduce impacts from future industrial projects. **BROOKE WARREN**

MORE: hcne.ws/salmon-decline

Charlie Clark, an intern with Raincoast Conservation Foundation, uses a seine net to capture juvenile salmon in a marsh as part of the group's Fraser Estuary Juvenile Salmon Project. MICHAEL SNYDER

Biologist Misty MacDuffee holds up a juvenile chum salmon caught during a seining session in the marsh of Westham Island, British Columbia. The group is tracking the numbers and health of fry and smolts in the delta. MICHAEL SNYDER

are unprecedented. But it's too early to tell if the poor returns this year are due to climate or not." The notion that Alaskan chinook would suffer from warmer oceans defies a historic rule of thumb that salmon from Alaska do better when oceans warm up, which usually increases prey. And other stocks of Alaskan salmon are thriving. "Sockeye salmon in Bristol Bay were having one of the strongest returns in history," Schindler says. Silver salmon in Southeast Alaska are abundant, too.

So while the multiyear Blob was harmful, scientists believe that at least some of Alaska's salmon fisheries won't be injured by the long trend of gradually warming oceans. But human-caused climate change clearly is bad news for salmon from California, Oregon and Washington, which contribute to Alaska's fisheries. "The growing influence of human-caused climate change is likely to make things tougher and tougher for salmon in the southern end of its range," Mantua says.

It may already be doing so: Scientists believe human-caused climate change exacerbated California's drought and low snowpacks. The drier hotter rivers of recent years are consistent with what scientists expect in the future. Climate change is gradually increasing average water temperatures in the North Pacific, raising the baseline for extreme heating events like the Blob. But there's no compelling evidence that the three years of persistent ocean temperature extremes linked to the Blob were consistent with human-caused climate change, Mantua says.

Although the Blob has dissipated, temperatures in the North Pacific this summer are still several degrees Fahrenheit above normal. And recent research by NOAA shows that salmon still are hurting. "We just did our ocean surveys; it doesn't look good," says Weitkamp. "There weren't many young salmon out there and there wasn't much for them to eat." The survey results are expected to be released in September.

Climate models don't project average water temperatures this warm in the Northern Pacific for decades. So cooler, more productive waters likely will return. The fishing community is hoping that's the case and that the restrictions on fishing this season will help ensure more robust numbers of chinook — and less encumbered fishing — in the future. "We strongly support sustainable management and can only hope that conservation will truly be served by this action," says Dale Kelley, the executive director of the Alaska Trollers Association, which represents the 1,000 or so businesses that fish for chinook with hooks and lines. In the meantime, though, they're hurting: She estimates the troll fleet and its processors will lose $6 million this year because of the cancellation of the chinook fishery. □

National Park Service staffers confront harassment

Agency-wide change has been slow

BY LYNDSEY GILPIN

Yellowstone National Park Superintendent Dan Wenk has spent the last year investigating allegations of sexual harassment and gender discrimination in his park. Now he's carrying out up to 12 "disciplinary actions" — which could range from letters of reprimand to firings — and is working to improve training and reporting processes for Yellowstone employees.

In 2016, multiple Interior Department reports found that sexual harassment and gender discrimination were pervasive in parks across the country, including Yellowstone, Grand Canyon and Yosemite. A yearlong *High Country News* investigation revealed that the National Park Service has failed for years to protect female employees from sexual harassment and has a history of retaliation against those who speak out. Interior Department leaders — including Secretary Ryan Zinke — promised Congress that they would take swift action to improve how the agency handles harassment.

Although Wenk's response is a step in the right direction for Yellowstone, the agency as a whole still hasn't delivered on many of its promises. To help employees address the issues from the ground up, the Park Service allowed seven staffers to start the Women's Employee Resource Group, which aims to create professional development resources and educate all employees on harassment and the processes for reporting hostile work environments.

"As an employee, it's my responsibility to hold all of us accountable to each other, to create a culture built on respect, accountability and transparency," said Lark Weller, chair of the group and a water-quality coordinator for the National Park Service in Minnesota. "That's something the organization has pledged itself to be accountable for as well."

As part of its broader response, the Park Service surveyed employees about their personal experiences with on-the-job harassment. The results of the first survey will be available by early fall, and a second aimed at more employees is still in progress. The agency also hired two ombuds who confidentially communicate with employees about problems in the workplace. Between December and June, the ombuds spoke with over 450 employees and received over 1,500 comments. "The National Park Service remains committed to eradicating sexual harassment from our culture," said spokesman Tom Crosson, adding that it's a top priority not just for the Park Service but for the entire Department of Interior.

Yellowstone is one of the first parks to publicly take action after its investigation found a "good old boy system" where women were subjected to abusive behavior and racist and sexist comments. Wenk said some of the original allegations were "inaccurate or exaggerated," but noted that he has taken proper steps to address the problems. "I'm not trying to downplay this at all — there are things we need to work on and need to fix and we are addressing — but I believe that our actions are appropriate."

In June, Yellowstone employees attended mandatory training on how to identify and report hostile work environments. Wenk said he traveled around the park, from Old Faithful to Yellowstone Lake, hosting open office hours. "I learned a lot," he said, adding that the Park Service system had "allowed obstacles to be created" for people who wanted to report problems in the workplace.

While Yellowstone's disciplinary actions are an important step, staffers say, they would like to see more employee-led programs. That's why Weller and six other women — including Kelly Martin, chief of fire and aviation management at Yosemite, who testified about gender discrimination in the park last year — took matters into their own hands. Last April, they formed the Women's Employee Resource Group with the support of the agency's Office of Relevancy, Diversity and Inclusion. The group now has 400 members representing every region of the country, gender and level of employee.

Already, the group has held bystander intervention training, and it plans to create educational materials to clarify processes for reporting harassment, and start a mentorship network in collaboration with other employee resource groups, such as those for LGBTQ and Indigenous employees. Weller said the challenge is figuring out how to make sure such groups have lasting impact. "Whenever we're talking about culture change, there are structural barriers that make it hard for change to stick."

Acting Park Service Director Mike Reynolds lauded the group's work to Congress in June, saying the agency has "endorsed and supported" it, but group leaders voluntarily work on the initiatives on top of their day-to-day responsibilities and have not yet received extra funding. Though it's gratifying that Reynolds thinks the group is good for the agency, Weller said, its success could be amplified if the agency invests more in the women's work.

"We think we can continue to provide even clearer value to NPS employees and the agency itself as we all work — together — to find ever more intentional ways to build in the changes to our workplace culture that we've all agreed we need," she said. □

Lyndsey Gilpin writes on climate, environmental justice and the intersection of people and nature, and is the editor of *Southerly*, a newsletter for the American South. @lyndseygilpin

Yellowstone Superintendent Dan Wenk has stepped up investigations into allegations of sexual harassment and gender discrimination in the park. NEAL HERBERT/NATIONAL PARK SERVICE

BUREAU OF LAND MANAGEMENT

THE LATEST

Backstory

Access to millions of acres of public land around the West depends on private landowners' willingness to allow easements or sell neighboring land. **East of Las Vegas, New Mexico, the 16,000-acre Sabinoso Wilderness Area, with its stark cliffs and deep canyons, is the nation's only legally inaccessible wilderness.** It's been off-limits since it was designated in 2009 because it's completely surrounded by private property ("Private property blocks access to public lands," *HCN*, 2/2/15).

Followup

Last year, the Wilderness Land Trust bought the 4,200-acre Rimrock Rose Ranch, adjoining the Sabinoso. This August, **Interior Secretary Ryan Zinke announced that the Bureau of Land Management will complete the processes needed to accept the Trust's donation of 3,595 acres of the ranch.** If it's approved, people will be able to reach the Sabinoso for hiking, elk and mule deer hunting, fishing, horseback riding and camping as early as late fall.

JODI PETERSON

Closeup of a set M-44 device, now banned in Idaho. USDA VIA WIKIPEDIA

THE LATEST

Backstory

The federal agency known as Wildlife Services killed 2.7 million animals last year to protect livestock and farm crops, including hundreds of wolves, mountain lions, coyotes, black bears, bobcats and foxes ("The Forever War," *HCN*, 1/25/16). The agency says it's working on non-lethal deterrence to decrease its reliance on deadly devices such as traps, guns and M-44 cyanide cartridges, which have accidentally killed eagles, other wildlife, livestock and domestic dogs. But half of its funding comes from states, counties, businesses and ranchers who often want predators killed.

Followup

In mid-August, **18 conservation groups petitioned the Environmental Protection Agency to outlaw M-44s in the Lower 48 states**. The devices, which shoot sodium cyanide into the mouths of carnivores that pull on bait, have already been banned, at least temporarily, in Idaho, after one injured a 14-year-old boy and killed his dog this spring. Back in March, Rep. Peter DeFazio, D-Ore., reintroduced a bill to ban sodium cyanide and another lethal predator poison, Compound 1080, nationwide.

JODI PETERSON

Interior overhauls sage grouse conservation

Trump administration considers rewriting grouse plans across the West

BY TAY WILES

On a windy morning in September 2015, Interior Secretary Sally Jewell stood at a podium on a patch of scruffy earth at Colorado's Rocky Mountain Arsenal National Wildlife Refuge to announce that the greater sage grouse would not need federal Endangered Species Act protection after all. "What does this mean?" she said to an applauding crowd. "It means certainty. For states, for communities, for ranchers, for developers, who want to know where they can develop without compromising the health of the amazing sagebrush landscape."

Now that certainty, or at least the prospect of it, has crumbled. Ninety-eight federal land management plans across 10 Western states, announced in 2015, were a key factor in the government's decision not to protect the iconic ground-dwelling bird. The plans and other state and private-land conservation measures provided a sufficient path to recovery without a listing, the Fish and Wildlife Service decided. But last month, President Donald Trump's Interior Department sent those plans — and thus the decision not to list the grouse — back into uncertainty. Interior Secretary Ryan Zinke ordered a federal panel to review the plans over the summer, and now its recommendations open the door to overturning many of their core elements. Zinke has said he wants to give states more flexibility to manage their pieces of the vast sagebrush ecosystem as they see fit, including whether to allow more energy development.

"While the federal government has a responsibility under the Endangered Species Act to responsibly manage wildlife, destroying local communities and levying onerous regulations on the public lands that they rely on is no way to be a good neighbor," Zinke said when he announced the review in June.

Conservationists see the recommendations as the first step in dismantling the plans, which took a decade of study and negotiations and were considered a massive, unprecedented collaboration between a variety of federal, state and local stakeholders. Ultimately, the sage grouse review signifies a pendulum swing in the West, toward extractive industry taking priority over the health of the sagebrush ecosystem that supports not just the grouse but hundreds of other species of wildlife and plants.

Zinke's decision should come as no surprise, considering his longtime dedication to job growth through mineral and energy extraction. In his autobiography *American Commander: Serving a Country Worth Fighting For and Training the Brave Soldiers Who Lead the Way*, published last year, he writes: "What the BLM does know is that false tears for the sage grouse offer a very real way to arbitrarily restrict energy exploration activities." His take on wildlife science also appears in the book. He writes: "It's entirely possible that there are man-made reasons for the sage grouse's population drop — if there has been a population drop at all, of course." (The bird's population, estimated to be 16 million in the 19th century, is now down to about 400,000, due to industrial development, wildfire and invasive species.) As early as March, rolling back sage grouse protections had reportedly made it to the top of a White House priority list.

Perhaps the most controversial element of Zinke's sage grouse management vision is one that bucks scientific consensus. The former Montana congressman puts more emphasis on meeting population targets than on maintaining or improving sagebrush habitat. The August report, authored by representatives from the Bureau of Land Management, U.S. Geological Survey, and Fish and Wildlife Service, does not say that habitat management will be entirely abandoned. But the new emphasis on population targets has raised concern from some state officials. Wyoming Gov. Matt Mead, a Republican who co-led the Sage Grouse Task Force, a group of state and federal officials that helped create the 2015 plans, criticized this shift. "We still strongly believe that management for habitat, based upon what science tells us, is the best way to do it," he says.

Most wildlife biologists agree that managing sage grouse primarily for population avoids addressing the underlying reasons for the bird's decline. San Stiver, a biologist and the sagebrush initiative coordinator for the Western Association of Fish and Wildlife Agencies, says, "Although we use population objectives for lots of critters we manage, it's more difficult and a little less useful to arrive at that for grouse, mainly because of large fluctuations in populations." Stiver says population counts are an important part of grouse recovery, but getting accurate numbers can be difficult: "In some of our states, you can't actually get to leks because of snow and mud, and it ends up being an extensive proposition to get people fielded to do the counts." Zinke also suggested in his secretarial order that captive breeding be undertaken to augment numbers. Yet experts say breeding has not been successful in the past: It's expensive for the small number of grouse it produces and runs the risk

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U.S. Fish and Wildlife Service workers listen as Interior Secretary Sally Jewell announces in Denver in 2015 that the greater sage grouse won't be listed as endangered, thanks to state-led plans to protect habitat and prevent extinction. KATHRYN SCOTT OSLER/THE DENVER POST VIA GETTY IMAGES

Wildlife biologists from the Bureau of Land Management and the Oregon Department of Fish and Wildlife team up for the 2016 lek count near Steens Mountain in southeastern Oregon's sagebrush steppe landscape, which is critical habitat for the sage grouse and shelters more than 350 other species.
GREG SHINE/BUREAU OF LAND MANAGEMENT

of creating a genetically homogenous bird.

The Interior report also recommends changing habitat area designations, which limit development to protect the bird. (The plans take a tiered approach to habitat protection, with the strongest restrictions on "focal areas," followed by "priority" habitat, and then "general.") Brian Rutledge, director of the Audubon Society's Sagebrush Ecosystem Initiative, points to the Montana Mountains in Nevada as one example of a priority habitat area where industry could benefit from changes to the sage grouse plans. "I know there are mining companies that want to develop there," Rutledge said. "Now they have a much better shot at it."

There's a related recommendation in the report that could further weaken protection for priority habitat: removing U.S. Fish and Wildlife from its role in approving waivers for energy development in those zones. "To have FWS not have input in policing this whole operation puts BLM as the fox in charge of the henhouse," Rutledge says.

Since the first rumors that Zinke was looking to rework the grouse plans this spring, most state officials have pushed to keep them intact. "Wholesale changes to the plans are likely not necessary at this time," Mead and Colorado Gov. John Hickenlooper wrote in a letter to Zinke in May. Multiple sources close to the closed-door review process this summer told *High Country News* that state officials stood up for the years of work it took to complete the plans.

John Swartout, a senior policy advisor for Gov. Hickenlooper, says it's "legitimate" that conservationists and others are worried the massive amount of work that went into the plans could be lost under the new administration. But Swartout sees a bright spot in Interior's review: He interprets it as a kind of scoping document that outlines a number of alternatives to choose from. He says that in places like northwest Colorado's Piceance Basin, management plans could use more flexibility: "Let's say an operator was technically less than four miles from a lek, but they're in a ravine and birds are at the top of a plateau, and you could drill that formation without disturbing the birds." Plans in Colorado were originally created with wiggle room for that kind of situation, he says, but "when the plan went to Washington, D.C., some of that got taken out."

In Idaho, Gov. Butch Otter has been receptive to the federal review. The report notes that some of the state's 3.8 million acres of "sagebrush focal areas" could potentially be "removed" — welcome news to many, since Idaho is already suing over focal areas that limit mining and grazing. Audubon's Rutledge says that getting rid of those areas "might remove some expansion space for the grouse but it wouldn't be terminally detrimental to the plans."

In Utah, Zinke's review is a boon for representatives who have long been critical of the Obama-era plans. The state has its own ongoing efforts to keep many federal lands open for grazing, off-road vehicle recreation and mineral and energy development. Utah representatives are working to weaken grouse protections from a number of directions. Republican Sen. Mike Lee introduced a rider to the National Defense Authorization Act that would prevent an endangered listing of the bird until at least 2027. Utah also has a $2 million contract with the group Big Game Forever, which lobbies members of Congress to weaken protections for the species.

The oil and gas industry has been equally positive about Zinke's review. The American Petroleum Institute issued a statement: "We look forward to reviewing Interior's report, and continuing to work with the states and Department of the Interior to prioritize sage grouse conservation and local economic growth." Western Energy Alliance president Kathleen Sgamma couched her response to the plan in terms of states' rights, writing in an email that the report reveals "the Interior Department's new willingness to actually listen to states and localities instead of imposing one-size-fits-all plans." In a letter she sent to the Interior review team in July, Sgamma detailed the industry's qualms about the grouse plans. Almost every issue the letter raised, such as the "overly expansive" buffer zones around grouse breeding grounds, was later addressed in Interior's recommendations.

Zinke's vision for sagebrush country may have its day in the sun, enabled by a Republican-controlled Congress and a president whose executive orders show unwavering dedication to "energy dominance" through extraction on public lands. State and federal officials will continue to discuss the sage grouse plans in the coming months, with rounds of new recommendations expected this fall and again in early 2018. Swartout says it's important that the Sage Grouse Task Force is involved in any future reworking of the plans. "You're hearing from people on all sides that have concerns about what (the sage grouse review) means, but the truth is, we don't know what it means," he says. "What matters is what happens next." □

A pivot sprinkler in Mark LeValley's hayfield in western Colorado. The sprinklers limit runoff, a problem of traditional flood irrigating, which leaches salt from the ground that can eventually reach the Colorado River.
BROOKE WARREN/HIGH COUNTRY NEWS

How farmers can help keep salt out of the Colorado River

The solution to a basin-wide problem may fall to individual irrigators

BY EMILY BENSON

So much salt collects in the Colorado that the U.S. sustains hundreds of millions of dollars in crop losses, corroded pipes and other infrastructure woes every year.

Water spritzed from sprinkler nozzles suspended a few feet above the ground, wetting the grass below. The spigots dangled from a center pivot — an irrigation structure that rotates around a fixed point — slowly circling a field on Mark LeValley's family ranch, high on a mesa in western Colorado. Millions of years ago, a vast sea covered this area, creating the layer of salt-rich earth that lurks beneath LeValley's boots. Talking over the rush of water through the sprinkler, LeValley described what it took to irrigate this field before he and his brother, Hank, installed their first center pivot. Using shovels, dams and ditches, they shunted water from an open canal across the land, flooding it. Excess water ran into the ground, collecting and dissolving salt from the ancient seabed as it trickled toward the Colorado River.

Over the last two decades, the LeValleys have converted about a third of their irrigated hay fields and pasture to sprinkler systems, a more efficient method that helps them grow more hay and doesn't leave behind much surplus water — or sweep up extra salt. Today there are five center pivots on the ranch, the newest installed last year. They purchased it through a federal cost-sharing program created to help farmers in parts of the Colorado River Basin switch to more efficient irrigation systems. It's motivated not by water savings per se, but by salt.

Almost 40 million people rely on the Colorado for some or all of their drinking water. The river also supports millions of acres of irrigated farmland in the West, a handful of wildlife refuges and recreation areas, and nearly two dozen tribal nations, as well as farms and cities in Mexico. But its tributaries carry an unwelcome stowaway: salt. So much salt collects in the Colorado that the U.S. sustains hundreds of millions of dollars in crop losses, corroded pipes and other infrastructure woes every year. In 1974, Congress initiated a basin-wide program for dealing with the problem, spurring the construction of a few large projects designed to rein in some of the salt. But the best way to keep salinity in check might involve the combined effect of smaller, incremental changes to irrigation systems, implemented farm-by-farm and ditch-by-ditch, designed to keep salt in the ground and out of the water.

The Colorado picks up about 9 million tons of salt each year by the time it passes Hoover Dam below Lake Mead. Salt springs and rock erosion contribute about half of that. The rest derives from human activities like flood-irrigating fields and running water through leaky ditches, creating seeps that dissolve salt on their way to the river.

More than 800,000 tons of salt per year come from agricultural irrigation in a small area called the Lower Gunnison Basin, where LeValley's ranch is located. The basin is one of about a dozen places in Utah, Wyoming and Colorado that federal agencies have targeted for salt control, many of which have seen large improvements. Only about 10 percent of the Lower Gunnison's ditches are lined or piped, and efficient sprinkler or drip systems water only about 5 percent of the basin's irrigated acres. Relatively inefficient irrigation combined with the region's underlying layer of ancient, salty seabed make the Lower Gunnison a prime spot for further addressing salt, says Beth Karberg, the state salinity field coordinator for the basin. "We really stand head and shoulders above anybody else," she says.

As a result, the Bureau of Reclamation and the Natural Resources Conservation Service fund programs to help ditch companies run open canals through underground pipes and farmers irrigate more efficiently. Over the last decade, for example, the Bureau of Reclamation has poured about $60 million into canal improvements in the Lower Gunnison.

But while those changes represent water savings for farmers and ditch companies, they count as losses elsewhere. Water soaking through the ground from canals and flood-irrigated fields recharges aquifers and nourishes plants and wildlife. Those relatively lush ditch-side areas, however, are already altered ecosystems, says Jake Hartter, the watershed coordinator at the Western Slope Conservation Center in Paonia, Colorado. "Cottonwoods don't really belong on the sides of shale-y mesas in a natural environment," he says. Canal-piping projects often include money to restore habitat elsewhere. That can be an opportunity to rehabilitate the streamside areas where cottonwoods do belong, Hartter says, where they flourished before water was diverted into ditches.

Shifts in irrigation practices can alter local ecosystems and boost ranchers' bottom lines — but they also have basin-wide benefits. Every dollar spent reducing salt in the river upstream can save $3 or more in the lower basin, Karberg says. The savings come from averting salt-related costs like replacing corroded household and industrial pipes and appliances, crop losses and the expense of treating water. "The impacts are really significant to the downstream water users," Karberg says. "Salty water just costs money." □

Emily Benson is an editorial fellow at *High Country News*. @erbenson1

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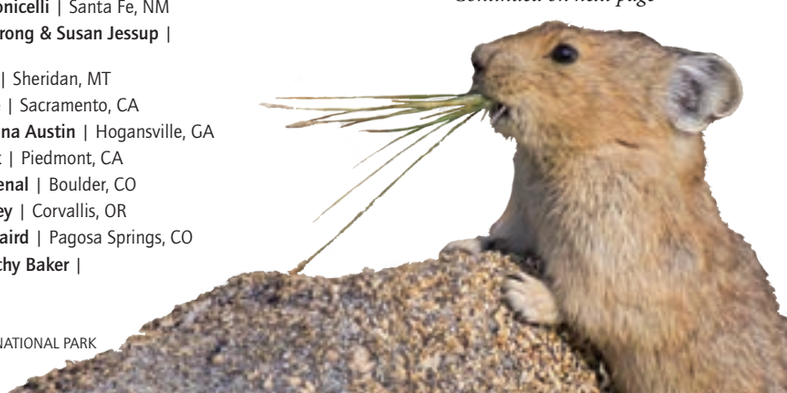

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THE ELWHA,

Six years after its dams came down, a new river has emerged

"(The Elwha) is reoccupying its historic floodplain. Some would say 'with a vengeance.' I would say 'with enthusiasm.' "

—Andy Ritchie, sediment researcher

The Elwha River starts at Dodwell-Rixon Pass, a high crack in Washington's Olympic Mountains. There, a hiker who crossed would find the Elwha Snowfinger, formed by heavy winter storms and the avalanches that pour off the surrounding mountainsides. Wedged into a steep-walled gully, it forms the upper reaches of the Elwha basin. If the hiker followed this snow down, eventually she'd find a stream, and that stream would widen and become the Elwha River. As she traveled down, as more streams joined its flow, she would find one of those messy rivers that characterize the Pacific Northwest: Wide, braided channels, scattered with logs and boulders, gravel bars strewn with detritus, a sense of a landscape half-finished. Then the river would round a corner and flow out into an area of high gravel banks stretching on for yards, dozens of feet above the water. These are what's left of Lake Mills, one of two reservoirs that once trapped the Elwha.

On a nippy November day, I look over the remains of Glines Canyon Dam, which formed Lake Mills, with sediment researcher Andy Ritchie. Snow has already begun to collect on the higher slopes; in the path of the wind whistling out of the river canyon, we struggle to talk without chattering teeth. Ritchie is introducing me to one of the largest experiments in ecosystem repair ever undertaken: Beginning in 2011, the federal government removed this dam and one lower down, blasting them away bit by bit over three years. Dozens of researchers from the U.S. Geological Survey and the Lower Elwha Klallam Tribe, University of Washington and the National Park Service, along with universities across the country, have since documented how that removal affected sediment in the water, small mammals, salmon, birds and the ocean the river flows into.

Ritchie's job was to watch the river's every move from Lake Mills, past the Elwha Dam site, to the river's mouth at the Strait of Juan de Fuca in the Pacific Ocean.

"The dam removal dwarfs anything done before," Ritchie says. A river trapped by a dam is predictable. But undammed rivers carry immense force in the form of sediment, logs and flows that can change course and volume rapidly and violently. He shows me how the freed Elwha dug up part of Lake Mills' bed and deposited it in front of the dam. Then it carved that new bed into huge stairlike gravel banks, finding its way into old channels but also slashing new ones here and far downstream.

"It was impressive," Ritchie says. The river's vigor surprised even the project designers and engineers, moving far more of the lakebed than predicted, devouring swaths of land and choking its own fish with fine sediments.

As the Elwha awoke from dormancy, what Ritchie and others found was not an orderly reassembling of the ecosystem that had been here before, but the emergence of a chaotic and wild river, whose movements were difficult to forecast and impossible to control. It's a hybrid wildness: Even with the dams gone, warming seas are taking a toll on the river's salmon, and construction has altered its banks. But the return of this unpredictable river offers a lesson for others looking to down dams that have passed their prime. In this wildness is resilience. Slowly, with human aid, the river is carving itself a new form with a better chance of weathering disruptions, including climate change. A new Elwha, unleashed.

BEFORE THE DAMS, the Elwha flowed out of the mountains, down a deep canyon, past rich bottomlands and grassy hills near its mouth. In 1880, the *Washington Standard* described it as one of those "rapid, cold mountain streams abounding with trout." All five Pacific salmon species spawned in its waters, sustaining the economy of the Lower Elwha Klallam Tribe. As many as 17,000 chinook returned each fall, along with 96,000 pink salmon. One week in early September 1893, a fisherman reportedly caught nine wagon-loads of salmon in a single net — about 3,000 fish.

That all changed in the early 1900s, when the Elwha Dam severed the river's headwaters from the ocean. The Olympic Power and Development Company built the dam during an era of rapid infrastructure expansion and economic change. The electricity it provided helped industrialize the town of Port Angeles, Washington, powering mills that processed logs from the forests of the Olympic Peninsula. The Elwha Dam's success led to the construction, in 1927, of the Glines Canyon Dam upstream.

Neither dam had any kind of fish passage, in violation of state law. The river's 45 miles were sliced down to just five. In the 1980s, the Lower Elwha Klallam, whose reservation sits at the river's mouth, began to defend their treaty rights to the Elwha's fish, pushing for the dams' removal. Congress determined that the fishery would have to be fully restored and the destruction of the dams, rather than fish passage or mitigation, proved the only way to do that. In 2001, the government purchased the dams with the intention of removing them. It took a decade to actually do so.

When the Elwha's dams came down, the removal of many other Western dams seemed likely. In some cases, the cost of

UNLEASHED

FEATURE BY KATE SCHIMEL

bringing aging dams up to date exceeded the profit from the electricity they generated. Environmental concerns became unavoidable as fisheries faltered. And tribes increasingly asserted their sovereignty and pushed back against long-standing violations of treaty agreements.

While the political climate regarding dams has shifted under President Donald Trump, more removals are likely in coming years. In Utah, officials removed the 14-foot-tall Mill Creek Dam, as part of an effort to restore Bonneville cutthroat trout. In August, crews began removing Cline Falls Dam on the Deschutes River near Redmond, Oregon. And the Karuk, Yurok, Hoopa Valley and Klamath tribes have secured a deal to remove four large dams on the Klamath River in southeast Oregon and Northern California, starting in 2020 — a project that will surpass even the Elwha in scale.

The Elwha remains one of the most closely watched removals. In the past, most research has focused on isolated elements of what happens after a river returns, rather than the ecosystem's overall response. As early as the 1990s, researchers discussed treating the Elwha as a "living laboratory"; they began to monitor the river prior to dam removal, accumulating over a decade of data. Every few years at the Elwha River Science Symposium, many of them share findings, plan further research and collaborate. There have been surprises along the way: For example, engineers failed to predict the effects of the bedrock rebounding after the weight of Glines Canyon Dam was lifted. After the initial blasting, the cliff that held up the dam collapsed, blocking fish passage and slowing sediment movement. In May, Elwha researchers and officials met with Klamath-area researchers, officials and tribal representatives to discuss what insights they might draw from the Elwha.

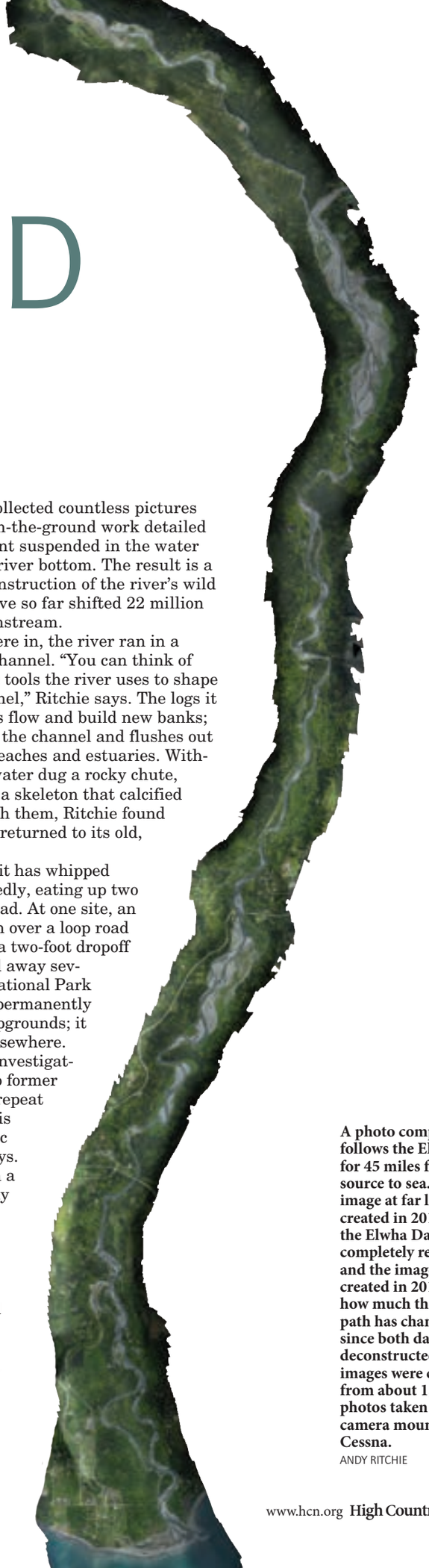
Ritchie's research has provided some of those lessons. He was a last-minute hire, added to keep up with the river's dynamics on a daily basis. Ritchie, a stocky, scruffy Washington native, grew up along the Elwha; his first memory of the river is of his father carrying him there in a backpack. When he got his driver's license, he used it to go straight to the Elwha and fish. He calls the river his muse, talks about it like a sentient creature: "When my heartbeat matches her heaving breath at Goblin's Gate / And tumbling boulders shake polished upturned teeth of slate," he wrote of the Elwha in one poem, "I know I'm home."

When Ritchie joined the Elwha project, his tools were rudimentary: 20 gauges placed along the river's 45-mile length and handheld lasers and GPS to measure the river's width. But he quickly realized that he could construct a more complete model of its movements by mounting a pair of cameras on the bottom of a plane and taking aerial photographs at rapid intervals. Over the course of five years and more than 100 flights, he collected countless pictures of the river's flows. On-the-ground work detailed the amount of sediment suspended in the water and deposited on the river bottom. The result is a month-by-month reconstruction of the river's wild movements, which have so far shifted 22 million tons of sediment downstream.

While the dams were in, the river ran in a straight and narrow channel. "You can think of sediment and wood as tools the river uses to shape and reshape the channel," Ritchie says. The logs it carries can redirect its flow and build new banks; sediment builds up in the channel and flushes out to the ocean to form beaches and estuaries. Without these forces, the water dug a rocky chute, and the forest formed a skeleton that calcified the river's course. With them, Ritchie found that the river quickly returned to its old, winding ways.

Below Lake Mills, it has whipped back and forth repeatedly, eating up two campgrounds and a road. At one site, an outhouse stands watch over a loop road that abruptly ends in a two-foot dropoff where the river ripped away several campsites. The National Park Service was forced to permanently close the popular campgrounds; it plans to rebuild one elsewhere. This spring, it began investigating moving the road to former Lake Mills to avoid a repeat washout. The Elwha "is reoccupying its historic floodplain," Ritchie says. "Some would say 'with a vengeance.' I would say 'with enthusiasm.' "

DOWNSTREAM, where the Elwha Dam once formed Lake Aldwell, the forest that marked the reservoir's edge is creeping back over its now-dry bed. I visit on a rainy November morning with a group of researchers from the Park Service, the



A photo compilation follows the Elwha for 45 miles from its source to sea. The image at far left was created in 2012, after the Elwha Dam was completely removed, and the image at left, created in 2017, shows how much the river's path has changed since both dams were deconstructed. These images were compiled from about 1,000 aerial photos taken with a camera mounted on a Cessna.
ANDY RITCHIE

U.S. Geological Survey and the Lower Elwha Klallam Tribe. We step between young willows and dogwoods to the edge of a gravel precipice. Here, the river has cut through the sediment to reveal the stumps of trees felled before the dams were built. As we slide down the loose face, I note old tree trunks wider than my armspan. The notches where loggers stuck springboards to stand on and saw are still visible high on the stumps.

While the river is reshaping the landscape, people are working to restore an intact ecosystem on the lakebeds. Researchers from the tribe and park botanists have seeded over 400,000 native plants in the footprints of Lake Mills and Lake Aldwell, from Douglas fir to crabapple and dogwood. Plants have started to come back on their own, too, carried by the critters reoccupying this spot. Birds fly out of the scruffy new growth on the banks and perch on the scattered logs, some placed expressly for that purpose. They poop out seeds that germinate and grow in the leeward side of the logs, little gardens protected from the wind.

When the Elwha began muscling away decades of accumulated debris, the destruction it unleashed was shocking.

"These former reservoirs look quite barren but there's a lot of life coming back to them," says Rebecca McCaffery, a USGS wildlife researcher. The two restoration efforts — one conducted by researchers, the other by non-human residents — do not always work in concert: elk and deer have returned to the lakebed too, browsing down the native plants that researchers are trying to get rooted in some plots. But it's a benevolent competition: "Ultimately, elk and deer are not the bad guys," McCaffery says. "They're just shaping the architecture of the system."

The river itself is delivering another source of flora: the seeds it is once again carrying downstream. This phenomenon, known as hydrochory, helps the riparian plant community maintain a diversity of species and genes. Studies conducted prior to dam removal found that there were 90 percent fewer seeds in the water below Glines Canyon Dam than above, and 84 percent fewer species represented. After the dam came down, the numbers equalized all along the channel.

Other mammals have started to return, too. Kim Sager-Fradkin, the Lower Elwha Klallam Tribe's chief biologist, has seen otters moving more freely around the old lakebeds, as well as smaller, hard-to-track creatures like ermines, bushy-tailed woodrats and mice.

The lakebed is quiet when we visit: I see one mouse, but no other animals, and the overcast weather mutes the greenery. But that dormant appearance belies an environment in flux, one that occasionally stymies research efforts. "I'm working in an environment that's more temporally active," Sager-Fradkin says. Before the dams went, winter storms were the only things that disrupted research plots and access trails with fallen trees, floods or landslides. "Now, it could be anytime."

LAST YEAR, BIOLOGISTS SPOTTED chinook, steelhead, coho, bull trout and sockeye spawning upstream of the Glines Canyon Dam site for the first time in nearly a century. Pacific lamprey have returned unaided. And salmon have already begun to reshape the river's ecosystem: The diets of American dippers, little bobbing birds that feed on insects and fish eggs, already show traces of the marine nutrients that salmon carry upstream.

But biologists always knew that this comeback would be stuttering and potentially incomplete. As resilient as rivers are, 100 years' worth of damage is not so easy to roll back. And when

the Elwha began muscling away decades of accumulated debris, the destruction it unleashed was shocking.

In the dim morning hours of a cool April day in 2013, a Washington Department of Fish and Wildlife-run hatchery released nearly 200,000 juvenile chinook salmon into the Elwha just a few miles from the river mouth. Similar releases of chinook, coho, pink and chum salmon take place each year from two hatcheries operated by the Department of Fish and Wildlife and the Lower Elwha Klallam Tribe. They're intended to ensure that the fish populations survive the sediment pulses and eventually provide a financially viable fishery.

But the river that in the morning had been just murky was by evening thick with sediment, as it swelled into flood. Over the next week, people found dead smolts piled by the hundreds like used matches on the river's banks; they had stranded as the waters retreated, suffocated as their gills choked with grit, or starved when the turbid waters made it impossible to hunt. It's unlikely that many made it to the sea.

The Elwha was loosed to save its imperiled fish. But the river's new upsets have hit those fish the hardest.

They "were really subjected to some hostile conditions," says Patrick Crain, fisheries biologist for Olympic National Park. Even now, many salmon populations are likely to decline — or at least stay flat — as the generations most impacted by dam removal begin to return. Crain estimates it

A remote camera recorded the landscape's changes around Glines Canyon Dam, below, from September 2011 to June 2016 as the dam was deconstructed, the lake drained and plants sprouted along the formerly bare lake shores. NPS/USBR/USGS/ELWHA RESTORATION PROJECT

Andy Ritchie, sediment researcher for the Elwha Restoration Project, stands on a stump that was exposed after the Elwha Dam came down and Lake Aldwell drained, far left. Old-growth forests were cut in the 1900s before the dam was constructed. Washington Department of Fish and Wildlife researchers net chinook salmon from the Elwha in 2012, left. They will bring the fish back to a hatchery to strip the eggs, then raise brood stock to supplement natural populations in the river. STEVE RINGMAN / THE SEATTLE TIMES; JOHN GUSSMAN

could be five years or more before populations truly begin to rebound and many more to reach anything approaching pre-dam levels.

Even that will depend on factors far beyond the river's bounds. The same year as the catastrophic die-off, a mass of unusually warm water formed off the Pacific coast. The high temperatures decimated the cold-water nutrients that salmon and steelhead rely on. The "Blob," as it was called, began to dissipate last year, but the spawning salmon from Washington to California were few and underweight.

Still, the fish will have a bit more of an edge in a world that is changing around them. On the Elwha, "the future, even with climate change, is going to be much, much better for salmon," says Nate Mantua, a National Oceanic and Atmospheric Administration researcher who studies the impacts of climate change and the Blob on salmon. Temperatures in some stretches of the river were already rising, due to the reservoirs; with the dams in, the hot, shallow river may have proved fatal. Now, the river will run faster and cooler — better for cold-loving fish as climate change advances. And as populations stabilize and climb, their greater numbers will help ensure they weather the floods and sediment events that are part of the river's natural cycle. "We got those dams out just in time," says Anne Schaffer, executive director of the Coastal Watershed Institute.

FROM THE MESSY GLINES CANYON DAM SITE, Andy Ritchie and I drive to the Elwha's mouth, north of Port Angeles. There, we walk out along a shady dike, one of a few manmade barricades still standing; a matching dike intended to stop erosion has been moved and larger boulders removed to allow the beach to naturally rebuild. At the end of the dike, we see that it has done just that. Sand stretches north and south where boulders and debris once repelled surfers, swimmers and fishermen, as well as crabs, rockfish and kelp. And the sediment that flowed downstream has settled to form a 150-hectare estuary.

Despite the chilly wind, a lone surfer waits for a wave that now regularly breaks near the mouth. Families stroll up and down and a seal cruises by, peering at the beachcombers. Clouds of birds drift overhead, disturbed by waves and walkers, then resettle in bobbing flocks on the water.

In an era of grim stories about the non-human world, Ritchie finds reason for hope in today's understated show. "Our planet's history is punctuated by disturbance and recovery," he says. "Just because we have a bunch of impacts currently happening and a lot of infrastructure, it doesn't preclude opportunities for restoration."

And the Elwha is doing exactly what it is supposed to. "Life strives to grow and increase complexity, so much like the Elwha," he says. "Isn't that the goal for life? To go against its boundaries." □

Kate Schimel is the deputy editor-digital at *High Country News*.
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BUSTING THE BIG ONE

Activists claim that decommissioning Glen Canyon Dam will save water and restore a wild canyon. Are they right?

BY KRISTA LANGLOIS

"I just read what everyone else had forgotten."

—Jack Schmidt, watershed scientist who evaluated water savings and loss from Lake Powell and Lake Mead

In 1963, Glen Canyon was pronounced dead. Glen Canyon Dam had submerged its fabled grottoes, Ancestral Puebloan cliff dwellings and slickrock chutes beneath the stagnant water of Lake Powell, and forever altered the ecology of the Grand Canyon just downstream.

For wilderness lovers, the 710-foot-tall concrete wall stuck out of the Colorado River like a middle finger — an insult that helped ignite the modern environmental movement. In 1981, the radical group Earth First! faked a "crack" on the dam by unfurling a 300-foot-long black banner down the structure's front. The Sierra Club's first executive director, David Brower, considered the dam's construction a personal failure and spent the rest of his life advocating for its removal. And in his iconic novel *The Monkey Wrench Gang*, author Edward Abbey imagined a group of friends secretly plotting to blow up the dam and free the Colorado River.

In real life, though, Glen Canyon Dam and Lake Powell made it possible for millions of people to live and grow food in the arid Southwest. Together, the dam and the reservoir store precious snowmelt for year-round use, help generate electricity for 5.8 million homes, and enable states from the Upper Colorado River Basin to fulfill their legal obligation to deliver water to downstream states. Last year, the federal government underscored its support for the dam by finalizing a plan that will guide management for the next two decades.

Even so, an unprecedented interest in dam removals and the specter of climate change have created fresh hope for those who want to see the drowned canyon resurrected. From 1990 to 2010, the population of the American Southwest grew by 37 percent, even as the amount of water flowing into the Colorado River system shrank amid a historic drought. More people using fewer resources means that neither Lake Powell nor Lake Mead, the downstream reservoir created by Hoover Dam, have been full since 1999. And climate change promises to squeeze the water supply even further, with future droughts expected to bring even hotter and drier conditions.

Meanwhile, Lake Powell may be squandering the very resource it was designed to protect. Every day, water slowly seeps into the soft, porous sandstone beneath the reservoir and evaporates off its surface into the desert air. When more water flowed in the system, this hardly mattered. But in an era where "every drop counts," says Eric Balken, executive director of the nonprofit Glen Canyon Institute, it calls for a drastic re-evaluation of the Colorado River's plumbing. "The Colorado River can no longer sustain two huge reservoirs," Balken says. "There isn't enough water."

That's one reason the Glen Canyon Institute is pushing an audacious proposal called "Fill Mead First," which calls for the U.S. Bureau of Reclamation to drain Lake Powell and send the water downstream to Lake Mead. In theory, combining two reservoirs into one would shrink their surface area, reducing the amount of water that's lost to evaporation. It would also mitigate seepage, since Lake Mead is surrounded by hard volcanic rock rather than sandstone. The Colorado River would run freely through Glen Canyon and the Grand Canyon, but Glen Canyon Dam would stay in place to store water if cooler, wetter conditions return — a compromise of sorts.

Not long ago, the idea of breaching Glen Canyon Dam was laughably unrealistic. Since 1999, though, more than 850 dams have been removed from U.S. rivers, and ecological restorations that once seemed pie-in-the-sky are looking increasingly probable. There's just one problem: The science behind Fill Mead First is as muddy as the Colorado River itself.

IN 2013, THE GLEN CANYON INSTITUTE commissioned a study of Fill Mead First from advisory board member and hydrologist Tom Myers. The results, published in the *Journal of the American Water Resources Association*, found that Lake Powell loses enough water each year to supply Nevada's annual share of Colorado River water. Journalists and conservationists eagerly cited Myers' findings; for many, they offered the first compelling argument for decommissioning a dam that environmentalists have had in their sights for decades. In 2016, journalist Abrahm

BROOKE WARREN | SOURCE: BUREAU OF RECLAMATION; OPEN SOURCE MAPS

WEB EXTRA
Find a story and photos, old and new, about revisiting an undammed portion of the Snake River through Hells Canyon, at hcn.org.

Glen Canyon Dam, far left, with Lake Powell spreading out behind it. Lake Mead, behind Hoover Dam, left, has walls of hard volcanic rock that don't lose as much water as the sandstone walls of Lake Powell. Some theorize that filling only Lake Mead would be a more efficient way to store water.
PETE MCBRIDE/GETTY IMAGES

Lustgarten wrote in *The New York Times* that Fill Mead First offered "a solution hard to ignore."

From his office at Utah State University, however, watershed scientist Jack Schmidt watched the growing support for the idea with professional caution. A former chief of the U.S. Geological Survey's Grand Canyon Monitoring and Research Center, Schmidt has played a crucial role in efforts to mitigate Glen Canyon Dam's ecological impact. He came up with the experimental "pulse flows" that sent floodwaters raging through the Grand Canyon to redistribute ecologically vital sediment, and he believes that solving the West's water shortage will require similar out-of-the-box thinking. So he wanted to know: Was this really a viable plan?

Last spring, Schmidt and his students began digging up every study they could find on Lake Powell. Schmidt corresponded frequently with Myers to make sure he understood how Myers had reached his conclusions, and he met with representatives from the Glen Canyon Institute and the Bureau of Reclamation. He spent months tracking down a single obscure paper by a USGS scientist "who just wouldn't answer his damn phone."

"I didn't go out and run new models or do anything new," he says. "I just read what everyone else had forgotten."

In November 2016, Schmidt reported his findings in an 80-page technical assessment released by Utah State University's Center for Colorado River Studies. Contrary to Myers' results, he concluded that, based on the available data, Fill Mead First would not result in significant water savings.

In part, this is because Schmidt was able to plug more data into his analysis than Myers had, including relatively new evaporation data. But it's also because Schmidt and Myers used different projections for how much water seeps out of Lake Powell. The most recent studies of seepage were conducted in the 1970s and '80s, when Powell was new and the desert beneath it was like a sponge that hadn't yet soaked up much water. Over the years, as the sandstone became more saturated, seepage rates have likely decreased. The problem is that nobody knows exactly how much, or how much of that water eventually drains back into the river.

"There's very little data," Myers says.

Yet although Schmidt and Myers reached different conclusions about the merits of draining Lake Powell, both scientists agree that the exercise underscores how little we know about the impact of one of America's most controversial dams. "I was genuinely surprised by how little research goes on on Lake Powell," Schmidt says. Compared to Lake Mead, where state-of-the-art science allows water managers to understand exactly how much water is lost, much of the data on Powell are decades old. That means any conversation about saving water by decommissioning Glen Canyon Dam is riddled with uncertainty.

That same uncertainty swirls around the social and environmental repercussions of draining the West's second largest reservoir. Over its 50-year life, Glen Canyon Dam has blocked hundreds of millions of tons of sediment from being carried downstream. That sediment now sits at the bottom of Lake Powell, much of it contaminated by agricultural runoff, mining waste and even uranium. Some people believe a drained reservoir could be eligible for Superfund status, others that it would soon rebound to a natural state. And while draining the reservoir could benefit native fish by rebuilding habitat and restoring warm, naturally fluctuating flows to the Grand Canyon, it would end the year-round whitewater trips that are possible thanks to regular releases of water from the dam. It would also devastate the residents of nearby Page, Arizona, who depend on the tourism the reservoir supports.

To get a sense of what this all means for the future of Glen Canyon Dam, I called political scientist William Lowry, who has written extensively on dam removals. He said that although the West has embraced river restoration with a fervor unimaginable a few decades ago, no one proceeds with a task as monumental as decommissioning Glen Canyon Dam without agreement on the dam's true costs and benefits.

Today, a lack of good data means those trade-offs are subject to interpretation. Which means that until the federal government invests in new research, the Colorado River stands little chance of being unshackled. □

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WILL UTAH DAM THE BEAR RIVER?

As the Wasatch Front faces drier times and a growing population, the future of the Great Salt Lake is at stake

BY EMILY BENSON

Does it make sense to build a new dam project, decades after the heyday of big dams is over? How do you decide?

Amid the wave of dams coming down across the nation, several places are bucking the trend. New dams have been proposed in California, Colorado, Utah and other Western states. The motivations behind the projects are complex, but in some cases the same fears drive dam defenders and detractors alike: a drier future and rising populations.

Utah is seeking additional water sources to address its growth. There, legislators decreed in 1991 that the Bear River, the Great Salt Lake's largest tributary, should host a water development project. Two and a half decades later, scientists, policy experts, environmentalists, residents and water managers are still grappling with whether or not — and how — to move forward with damming the Bear.

The answers they come to will have consequences for the $1.3 billion generated each year by industries reliant on the Great Salt Lake. The lake's ecology, its wetlands and the millions of migratory birds that depend on it are also at risk — as is the health of the more than 2 million people who live nearby and could breathe in harmful dust from a drying lakebed. Caught between the dire costs of construction and the specter of dwindling water supplies, the Bear River diversion forces uncomfortable questions. Does it make sense to build a new dam project, decades after the heyday of big dams is over? How do you decide?

The Bear River wends 500 miles through Utah, Wyoming and Idaho, fed by runoff from the Uinta Mountains. The three states share its water, storing and diverting it to supply homes, generate power and irrigate fields. What's left drains into the Great Salt Lake, delivering about 60 percent of the freshwater that flows into the lake each year.

Utah doesn't use its full allotment, so the state Division of Water Resources is studying how to divert some of that water for nearby communities. The agency is currently evaluating possible reservoir sites and other project details. The final plan will likely include one to four dams, as well as pipelines to divert enough water to supply about 440,000 households. Official 2014 cost estimates for the overall project range from $1.7 billion to $2 billion.

Why consider building it? Population growth, says Marisa Egbert, program manager of the Bear River Development Project at the Utah Division of Water Resources. More than 2 million people already live in the areas served by the county and the three water districts that would receive the water, and that population number is expected to rise. Critics of the proposal say future needs could be met by water conservation, but Egbert says that alone won't be enough if the population keeps growing, which is why the division is looking for new water sources. "Preparation's in the lifeblood here," she says. "It's important to know what's going on and what to expect."

But what to expect can be a moving target. When the Bear River Development Act was first passed, supporters said the state would need the water by 2015. As population and water-use projections shifted, the deadline slipped to 2040. In January, the Utah Department of Natural Resources announced that it could push the project off even further, thanks to conservation and slower-than-anticipated growth.

That delay reflects recent shifts in both public attitudes toward conservation and Utah's water politics, says Daniel McCool, a retired professor of political science at the University of Utah. McCool was one of about 40 people — state and local wa-

Wilson's phalaropes murmurate over the Great Salt Lake. The lake is the largest feeding ground in the world for this species, and millions of other migratory birds depend on it, as well.
MIA MCPHERSON

ter managers, environmentalists and academics — who contributed to Utah's 50-year water plan, released in July. Four years ago, when the group first met, support for large projects like damming the Bear River and constructing a pipeline from Lake Powell was a foregone conclusion, McCool says. But that started to change as fiscal conservatives joined environmental groups in citing concerns over economics and air pollution.

Egbert's own title recently changed from project manager to program manager. "If there is a project, it'll be beyond my career," she says with a rueful smile, "so I'm not really managing a project." Even so, the division is planning ahead, evaluating options for preserving utility corridors ahead of housing developments. Space is limited along the narrow I-15 corridor that runs between the Great Salt Lake and the Wasatch Front, and new houses are popping up every year.

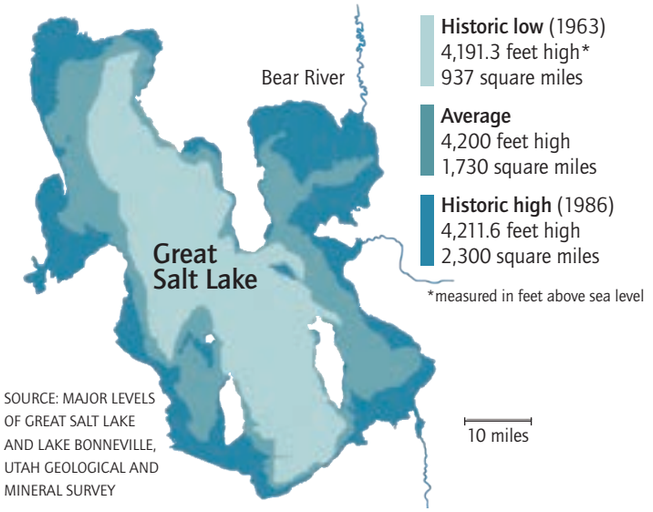
The division estimates that about 60 percent of the water drawn from the Bear River would eventually return to the lake as treated wastewater. But the loss of the other 40 percent would cause the lake to fall by 8.5 to 14 inches, exposing between 30 and 45 square miles of lakebed, according to a 2016 study. That's on top of the 11-foot decline humans have caused — mostly thanks to agriculture — since the mid-1800s. The additional drop could hurt the industries that rely on the lake. It would also be an ecological disaster, especially for the birds that rely on its marshes as migratory rest stops. The flow of people who visit the lake now because of its water and the wildlife it attracts — birdwatchers, recreational rowers, duck hunters — might dry up, too.

That flow includes people like R. Jefre Hicks, who took me out on the lake on a cold day in early April. As the intermittent rain went from light drizzle to jacket-soaking, Hicks kept one gloved hand firmly on the steering lever of his airboat. He gazed out at a mix of water and low grass called Willard Spur, near the mouth of the Bear River. Hicks, who is 56, grew up exploring the sea of cattail islands that was the Great Salt Lake during the 1970s, hunting waterfowl with his father. As teenagers, Hicks and his buddies would bring their decoys, waders and guns to school, then hurry down to the marshes along the lake for an hour at lunchtime before heading back to class.

The diversion would destroy an ecosystem around which he's arranged his life. "If you have a connection to the Great Salt Lake, or to wetlands, or to birds or bird hunting, then it's a big deal," he told me. "A really big deal."

The mountains of the Wasatch Range rose in the distance, their snowy slopes disappearing into hazy clouds. The noise and motion of the airboat suddenly stirred up thousands of birds, avocets, stilts, gulls and other water birds that swooped and darted in every direction, a mad scramble of motion above the surface of the Great Salt Lake. To think that Willard Spur "could go the way of a dust bowl —" Hicks said, pausing. "It just hurts to see it." □

Emily Benson is an editorial fellow at High Country News.



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Sweet peaches and summer reunions

Circulation Associate Pam Peters, left, stepped across the street from the *High Country News* office to view the eclipse, which was at about 87 percent in Paonia.
GRETCHEN KING/ HIGH COUNTRY NEWS

Fresh, succulent Delta County peaches and weekly concerts at the town park have made August a sweet month in *High Country News*' hometown. The nights are beginning to cool down, but warm summer days have brought an exciting array of adventurous visitors to Paonia.

Steve Cross, a subscriber and monthly giver from Omaha, Nebraska, stopped by while in town for a class on solar power. Not a bad way to spend a few weeks!

Christine Peterson, managing editor of the *Casper Star-Tribune*, came by while on vacation in Colorado. Christine ended up in Paonia because she needed internet to file a story after a night of camping at Redstone. She was a reporter at the *Star-Tribune* for about 10 years before taking on an editor's role. A staunch supporter of print media, Christine was heartened by *HCN*'s rising circulation numbers, and her encouraging words to the editorial fellow who gave her a tour — "Keep writing!" — were much appreciated.

Subscribers **Ed Brennan**, a soil scientist, and **Grisel Ponciano**, a plant biologist, of Castro Valley, California, stopped by the office while on a trip to Colorado. Ed originally hails from these parts; he has family roots in nearby Marble. Grisel loves the statistics and graphs that appear in our pages — we'll keep 'em coming!

Longtime subscriber (at least 20 years) **Warren Schafer** was on a road trip through the Southwest with his family when he decided they should see where the magazine is put together. Warren, who is 97, grew up in nearby Hotchkiss and remembers watching silent films in Paonia. He gives *HCN* subscriptions as Christmas presents, though he knows the recipients don't always agree with what they read. Still, he says, "Let me tell you about agreeing and disagreeing: Every pancake has two sides." Thanks for your ongoing support and the wise words, Warren.

We've also had a few enjoyable visits from past *HCN*ers. **Bryce Gray**, who wrapped up an internship here last summer, spent a few days here while road-tripping to a wedding. Bryce now covers energy and the environment for the *St. Louis Post-Dispatch*. **Lyndsey Gilpin**, who finished her fellowship in December, visited from Louisville, Kentucky. She now edits *Southerly*, a newsletter about environmental and cultural issues in the South. Having these two in town made for a lot of happy reunions, both in the office and over backyard beers, and our newer recruits were pleased to be able to put some faces to names.

Finally, a correction: Bees are the major pollinators of golden paintbrush, not hummingbirds, as we stated in "Flirting with extinction" (*HCN*, 8/7/17). Perhaps that explains our flower friend's lack of dating luck. We regret the error.

—Rebecca Worby for the staff

Shutting out the public hurts natural resource management

OPINION BY AMANDA C. LEITER

A subcommittee of the House Committee on Natural Resources recently held a hearing with the curious title: "Examining impacts of federal natural resources laws gone astray."

The title reflects the reality that "regulation" is now a dirty word in the nation's capital. Indeed, White House budget director Mick Mulvaney recently spoke of "that slow cancer that can come from regulatory burdens that we put on our people."

I couldn't disagree more. Laws and regulations can always be reformed and improved, but the real threat to America's natural resources, and to the health of our democracy, is the Trump administration's nontransparent, one-sided assault on commonsense regulation. The administration's efforts are ostensibly aimed at giving industry — particularly the energy industry — a voice in rulemaking, and at eliminating rules with excessive costs.

But the administration exerts little effort to solicit the views of communities that benefit from regulations — those who rely on the government to protect America's air, water, lands, wildlife and sacred places from the threats of population growth, climate change, and uncontrolled, first-come-first-served development.

Moreover, the implication that industry was shut out of rulemaking efforts during prior administrations is simply false. The United States has one of the most balanced, transparent and science-based resource management regimes in the world. The Obama administration's adherence to that regime meant that everyone had a seat at the table during development of resource management rules.

Complicated rulemakings took the administration years to complete, because agencies had to notify stakeholders that their interests could be affected, hold public meetings, and consult with affected tribes as well as industry players, trade associations and non-governmental organizations. Public comments had to be solicited, read and reviewed. To give one example, in developing a 2016 rule that limits wasteful and polluting emissions of natural gas from oil and gas operations on public lands, we received, read and responded to over 330,000 public comments.

Moreover, once a rule becomes final, the outreach process must be repeated, and regulated industries must be given a reasonable amount of time to come into compliance before the rule becomes effective.

This is a painstaking process. But this participatory regime serves a vital purpose: It ensures that agencies are aware of the many competing demands on public resources in a country as large, diverse and resource-rich as the United States. Now, the Trump administration seems intent on elevating development interests above all other resource uses.

For example, a recent *Washington Post* review showed that in March and April of this year, Interior Secretary Ryan Zinke held more than a half-dozen meetings with executives from oil and gas firms and trade associations to discuss reversal of Obama-era policies. And a *New York Times* and *ProPublica* examination of more than 1,300 pages of handwritten sign-in sheets from Interior Department headquarters found that, from February through May, at least 58 representatives of the oil and gas industry signed their names on the agency's visitor logs.

Back in early May, Zinke suspended upcoming meetings of the Bureau of Land Management's 30 Resource Advisory Councils. For more than two decades, those councils have given diverse local interests, including recreationists, an opportunity to give feedback on BLM regulatory proposals and policy changes.

Zinke's halfhearted "outreach" efforts are similarly one-sided. According to the *Salt Lake Tribune*, for instance, during the secretary's May trip to Utah to "review" the designation of Bears Ears National Monument, he "traveled extensively with anti-monument heavyweights" yet held only two "meetings with pro-monument activists." He also failed to hold a single public meeting.

Similarly, a recent Interior Department call for comments on reforming agency regulations asked only for suggestions of regulations to be thrown out or revised. The call provided regulatory opponents with a checklist of rationales for deregulation, yet offered no similar guidelines to backers of regulations.

In short, our natural resources laws have not gone astray; what has gone astray is our commitment to protecting our natural resources and our public lands from uncontrolled energy development. This administration's disdain for open and participatory rulemaking is unlawful and undermines our democracy. □

The Rocky Mountain Resource Advisory Council tours a solar energy zone in the San Luis Valley. The citizen group provided recommendations to the Bureau of Land Management on the management of public lands and resources in Colorado's Royal Gorge, San Luis Valley and Gunnison area. Secretary Ryan Zinke suspended meetings for groups like this in May. BLM

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Writers on the Range is a syndicated service of High Country News, providing three opinion columns each week to more than 200 media outlets around the West. For more information, contact Betsy Marston, betsym@hcn.org, 970-527-4898.

WEB EXTRA
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A grazing allotment near Steens Mountain in southeast Oregon, where the Bureau of Land Management uses prescribed burns, fencing, water developments and juniper control to maintain rangeland health.
GREG SHINE, BUREAU OF LAND MANAGEMENT

How we risked losing the West

The Politics of Scale: A History of Rangeland Science
Nathan Sayre
288 pages, softcover: $40.
University of Chicago Press, 2017.

Longtime readers of *High Country News* are familiar with the long debate over grasslands and public-lands grazing in the West. Former publisher Ed Marston came to see these controversies as key to the heart and health of our changing rural communities and landscapes. He guided many of us through tense stories about the sometimes-violent eruptions of the Sagebrush Rebellion in the 1980s and '90s, along with surprising accounts of the unexpected alliances forming between ranchers and environmentalists. At the same time, he gave us an intimate look at the lives of ranching families anxious about their uncertain future. All of these stories were ultimately concerned with theories of how the land works and how knowledge of the land is gained. So many questions seem to come down to who knows what, on what authority do they rely, and exactly what does that knowledge and authority empower them to do.

In *The Politics of Scale*, the first real history of the field, geographer Nathan Sayre argues that the range science at the center of many of the decisions and debates in these controversies was itself a perfect engine of controversy, an algorithm for generating conflict. Its formulas were known to be flawed at best, flat wrong at worst, and misleading in almost all cases. But for many decades they were used to set policies region-wide, to regulate ranching families and corporations using the land, and to manage ecosystems — even when it was obvious that the methods for determining the appropriate "carrying capacity" of public lands were ill-suited to the land in question. Part of the problem was that nobody really knew what "appropriate" land use meant. No wonder there was so much controversy and confusion, anxiety and anger, and hope and futility for *High Country News* to write about.

"Mistaking the model of reality for reality itself," Sayre writes, range science "disguised normative abstractions as positive facts and then set about to make reality conform, whether by dictating management to ranchers and pastoralists, applying the brute force of machines and chemicals, or bureaucratic sleight of hand."

How did this happen? The short answer is that the theory of ecological succession, which sort of worked on the Great Plains, was adopted everywhere by the nascent field of range science in the early 20th century, even as it was being discredited by ecologists. Why? Range science was a crisis discipline, meant to address the real problem of overgrazing, and it needed a theory and a method. And succession did describe some aspects of changing plant communities — except when it didn't, which was in most places at most times.

Moreover, range science was under pressure to provide numbers that would enable ranchers to take out loans and buy and sell ranching properties. Ranchers had to know what their grazing allotments were worth. So range scientists invented the concept of carrying capacity. To calculate this number, however, they had to exclude other important factors — the role of predators and fire, variation in precipitation, and the behavior of herders.

"What confounded the models," Sayre writes, "was less the West's celebrated aridity than its variability." The formulas that the science provided to manage grazing, measured in "animal unit months," did not account for variability across the actual scale of grazing over time and space. So nobody is ever happy with the numbers range science generates. Ranchers think they are too low, especially in good wet years. Environmentalists think they are too high. Both sides pressure public-land managers to adjust the numbers to their satisfaction.

Sayre sees hope in an emerging "nonequilibrium" range science that embraces complexity and constant change. This theory recognizes that rangelands may transition between different states — grasslands, shrublands, weedlands — that do not follow a predictable successional path and never exist in a state of equilibrium. This calls for adaptive management. Sayre also believes range science outside the United States taught researchers to understand the deep knowledge and practices of pastoralists. This respect for local knowledge is increasingly embodied in collaborative groups around the West.

Sayre acknowledges that it is not yet clear whether adaptive, collaborative approaches can manage landscapes in the West at the scale required to address the biggest challenges, including climate change. And bringing the factors left out of range science formulas back to the land — predators, fire, and herders with local knowledge — across property lines is proving a formidable challenge. While range scientists have "overthrown the old theory," Sayre writes, "most rangeland conflicts are still fought in (and on) its terms."

Sayre hopes his history will help change that, but I came away from it with the depressing feeling that while scientists have fiddled with formulas, and ranchers, environmentalists and land managers have fought over numbers, and publications like *High Country News* have chronicled their stories, we have all been missing the bigger picture and putting the West we love at risk.

BY JON CHRISTENSEN

Jon Christensen is an adjunct assistant professor and a founder of the Laboratory for Environmental Narrative Strategies at UCLA. He has contributed to *High Country News* for more than three decades.

Overheard in Montana

When I heard the jet, I checked the clock on my nightstand. Right on time, I thought. The last flight out of Missoula for the night was heading south, up the Bitterroot Valley and almost directly over our house. I looked to make sure my dog, Scout, was indoors. In the clock's green glow, I saw her sprawled near an open window. She seemed oblivious as the jet filled the room with its roar and whine. But I knew her peace would soon be disturbed. I lay back in bed, and waited.

The song began with a single howl, long and loud, a reminder that only delicate window screens lay between us and the warm night. I heard a little growl from Scout, then the clicking of toenails on hardwood as she scrambled into a gap between the wall and bed. The coyote was close, probably just downhill from the house in a wooded gully. Others joined in, yipping, barking and wailing in high-pitched cascades of notes. Coyote music leans towards excess; even one coyote can sound like quite a few. But this crazy chorus must have been the work of at least a quartet.

Somewhere across the gully, a dog barked, then another, their deep voices off-key as they tried to shout down the coyotes. In less than a minute, the plane's roar faded into the dark. The coyotes finished their piece with a couple of soft yaps and went silent. Soon the neighbors' dogs quieted, too, leaving only the chirping of crickets and the sound of Scout snuffling from her hiding place. I fell asleep thinking about the passengers on the plane, far above, pondering their beverage selections and the relative advantages of cookies versus seven tiny pretzels. And I wondered whether any of them were aware of the ribbon of sound unfurling below their flight path, as it had under every jet that passed that summer.

For more than 15 years, my family and I have lived on that same patch of sagebrush and bluebunch wheatgrass, a dry ridge sloping down to a small ravine thick with ponderosa pines. We often wake at night to the conversations of animals — the screeching of foxes, the hooting of great horned owls, and at least every week or two, the howling of coyotes. After a lifetime spent living in coyote country, I knew they howled to reunite with pack members or assert their property rights. But until that noisy summer, I had never heard them answer the territorial cries of an internal combustion engine.

Once our coyote neighbors cut loose on that first airplane, they seemed to set aside all their inhibitions. They raised a ruckus for every low-flying jet on its way to Salt Lake. They activated their own alarm for every fire truck or ambulance that sped past, sirens blaring, on the highway a mile to the west. Perhaps they were simply answering each noisy challenge with one of their own. Or maybe they were just having fun: Their singing seemed to express a certain gleeful silliness and lack of menace, as if they were only practicing.

I started to wonder. In all that yipping and yapping, I thought I heard a puppyish note that reminded me of Scout's early days with her littermates. And the coyotes' frequent fits of howling always seemed to erupt, day or night, from the same general area in the gully. There must be a family with pups out there, I decided. And I thought I knew just where they were living.

At the base of our hill lay an enormous dead ponderosa, old enough to have witnessed generations of Salish gathering bitterroot on these hillsides. The tree's heavy trunk, almost four feet across, lay twisted and rotting over a large depression hollowed out by the paws and claws of many different species. Nearby I had once found a flurry of deer hair and a scrape of dirt topped with mountain lion scat. Still, it seemed to be an ideal place, at least when unoccupied, for raising pups.

I avoided the tree that summer. I didn't want to disturb the family of coyotes that may or may not have been living there.

After a couple of months of howling on a hair trigger, the coyotes gradually became less consistent. Sometimes the sound of a jet tore through our neighborhood, and I waited in vain for their fanfare. Nothing. They didn't even call out to sirens anymore, though I had learned that their behavior was not unusual. By fall, the singing stopped entirely. The puppies grew up, I told myself. Or the coyotes moved away. Or, perhaps, they were dead.

We still hear coyotes every now and then, but not on any particular schedule. When summer comes and we start to leave our windows open to the night, I listen for those last flights out of Missoula, and I wait for the singing. I'm still waiting. □

Julie Gillum Lue is a writer in western Montana.

***Howl,* from the "Domesticated" series by artist Amy Stein, who says her photographs "serve as modern dioramas of our new natural history. Within these scenes I explore our paradoxical relationship with the 'wild' and how our conflicting impulses continue to evolve and alter the behavior of both humans and animals."** AMY STEIN

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HEARD AROUND THE WEST | BY BETSY MARSTON

CALIFORNIA

Leath Tonino writes in *Camas*, the University of Montana's environmental magazine, that whenever he goes outdoors into the "condo-sprawl" of Palm Springs, California, "I am buckling up for some kind of borderline hallucinatory experience." Not the experience you might think; he spends a half-hour watching a long-eared owl, entranced by its every feature: "Dinosaur feet. Shaggy sheep legs … the face is part human, part cat, part seal, and affixed to a head that twists 360 degrees." And then: The surprising liftoff "on 40 inches of wing!"

Unfortunately, long-eared owls and other cavity-nesting birds like kestrels and woodpeckers face dangers too awful to contemplate. They like nesting in tight places, and when they find open ventilation pipes on vault toilets in the outback, they fly in "and then continue down the pipe to the opening they see ahead, only to find themselves stuck in the toilet's bowels." *Wyoming Wildlife* magazine says it's a terrible way to die, covered in muck. In one case, more than 200 dead birds were discovered in a California vault toilet. In 2010, after the Forest Service drew attention to the issue, the Teton Raptor Center in Jackson, Wyoming, rose to the challenge with what it calls the "Poo-Poo Project," which started in Wyoming and now has spread across the country. It's a simple solution: Just install $30 screens on top of the open vault pipes. This saves untold numbers of birds and small mammals, says coordinator David Watson. The project hopes to screen vault toilet pipes throughout all 50 states, and eventually tackle open pipes in general, including uncapped PVC and mining claim pipes.

If you have ever contemplated owning an owl, perhaps inspired by Harry Potter and his elegant snowy owl Hedwig, think again, warns the International Owl Center. The Houston, Minnesota-based group lists "Top 10 Reasons You Don't Want an Owl for a Pet." One is that "a Great Horned Owl could live 30 or more years," which might test your relationship with your human significant other. Owls don't like to be cuddled, so no petting, but they do like to hoot and holler at night, especially during mating season. Moreover, "keeping owls involves nonstop cleaning" of bird poop and molting feathers, not to mention the towels or blankets the birds love to shred. But the number-one reason you don't want an owl in your household — something that's illegal without special permits in most countries anyway — is their high-end diet of whole foods. That's "whole foods" from tip to tail: For proper health in captivity, owls need to eat entire gophers, rats, rabbits and mice. "If you're not prepared to thaw and cut up dead animals every night of your life for 10 years or more, you aren't up for having an owl."

COLORADO **Going postal?** ANDREA HOLLAND

MONTANA

Recreationists in inner tubes were happily floating the Missouri River when a mischievous sharp-toothed otter came barreling toward them through the water. "The animal punctured the tube and then bit the swimmer in the water," reports the *Missoulian*. Though the wound was minor, signs telling recreationists of "an aggressive otter" were posted in the area. The ornery animal might be a repeat offender; last summer a group of tubers was also targeted by an otter with big teeth.

TEXAS

A man walked outside his Marietta, Texas, home at 3 a.m., saw an armadillo, took out his .38 revolver and shot at it three times. Not smart: "The animal's hard shell deflected at least one of the bullets, which then struck the man's jaw," reports CBC News. The unidentified man was airlifted to a hospital, where his jaw was wired shut. As for the well-armored armadillo, it could not be found and probably never noticed the commotion. Talk about successfully "standing your ground."

ALASKA

Stubbs the cat, lifetime mayor of Talkeetna, Alaska, has died at age 20, reports CNN. Running successfully as a write-in in 1997, because no humans in the town of 800 wanted the job, Stubbs was usually found asleep at Nagley's Store. "He was a trouper until the very last day of his life," said his owner. A kitten named Denali, after the mountain, is rumored to be next in line for the job.

COLORADO

Thanks largely to their jaunty appearance — they wear tiny backpacks and are buff in a birdy way — 10 homing pigeons still have jobs in Fort Collins, Colorado, flying digital photos of rafters ripping through rapids back to the home office. Ryan Barwick, owner of the rafting company Rocky Mountain Adventures, keeps the birds on the wing because customers enjoy taking pictures of the "Pigeon Express, Fastest Delivery in the West." Occasionally, reports the *Coloradoan*, the pigeons dawdle in the trees. That's when technology saves the day: Barwick carries backup copies of the photos for those times when the birds slack off.

WEB EXTRA For more from Heard around the West, see **hcn.org**.

Tips and photos of Western oddities are appreciated and often shared in this column. Write betsym@hcn.org or tag photos #heardaroundthewest on Instagram.

"Who needs money when you have *Carnegie gigantea* and all its resilience before you, **when you can access the entirety of the Sonoran Desert just by standing still**, next to a saguaro?"

Kimi Eisele, in her essay, "How many golf trips is public funding for the arts worth?" from Writers on the Range, hcn.org/wotr