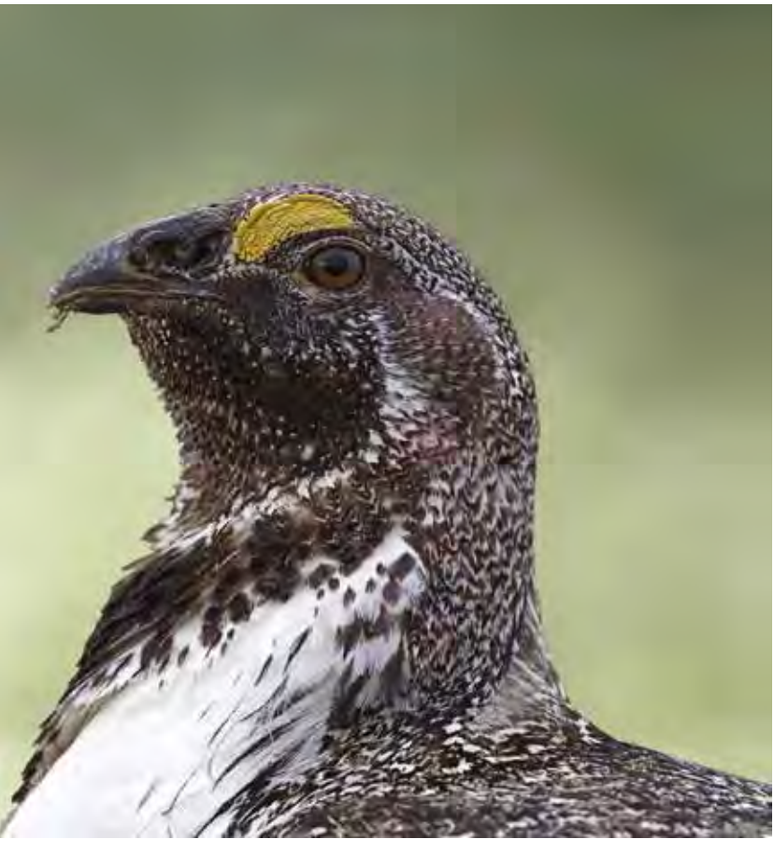
Charlie Reinertsen

BIRD v. B

The complicated relationship between sage grouse and their avian predators



IRD

By Sarah Gilman

Rancher Truman Julian says he has "a place in his heart" for greater sage grouse. A former wildlife biologist who still works land his family homesteaded near Kemmerer, Wyoming, around the turn of the 19th century, Julian has piped spring water to troughs at the dry edges of his private ground that he says benefit both sage grouse and livestock, and has installed special ramped screens the birds can climb to escape drowning should they fall in.

Sage grouse, best known for males' elaborate chest sac-puffing mating displays, need all the help they can get. Though the species persists in 11 western states and two Canadian provinces, it occupies less than half its historic range; its numbers have fallen from historic estimates in the millions to as few as 200,000 today. Environmentalists, ranchers, government officials, sportsmen, scientists, and others have been rushing to bolster sage grouse populations in advance of the U.S. Fish and Wildlife Service's decision this fall about whether the bird deserves special protections under the Endangered Species Act.

Because sage grouse declines stem from habitat fragmentation and loss, much of the recovery work has focused on protecting and restoring what's left. But Julian wondered about another variable. "Over the last 10 to 15 years, we've built up a lot of ravens," he says—whole fields black with them. "They raid everything. They kill our lambs. We had a rancher that lost five calves when ravens pecked into their hind-leg joints." Local producers were increasingly calling on Wildlife Services—a federal agency tasked with managing human-wildlife conflicts—to poison ravens at calving and lambing time. Since ravens also gobble sage grouse eggs, Julian thought, why not ask researchers to look into whether the agency's effort to protect livestock boosted local sage grouse as a side effect?

Jonathan Dinkins ended up with the project as a Utah State University PhD student in 2008. It's normal for sage grouse to get eaten, says Dinkins, now a post-doc at University of Wyoming: they're the natural prey of many different species, including ravens. But a raven boom could be contributing to a grouse bust. So in part, he would try to determine whether killing ravens actually helped more sage grouse nests succeed—that is, let more eggs hatch into chicks. It was a good opportunity, he says, "to look at management as it would occur."

He also wanted to investigate whether avian predators in general—ravens and magpies as well as raptors that kill adult grouse—had broader impacts by affecting sage grouse behavior. Could they change how the birds used the landscape? Even make otherwise choice nesting and brooding habitat unusable by *scaring* sage grouse away?

In other words, could the mere threat of predation be eating away more of the habitat the already struggling grouse so desperately needed?

The story of ravens and sage grouse is, in ways, one of diametric opposites. The raven, a remarkably adaptable and intelligent generalist scavenger and predator, flourishes in human-altered landscapes. Transmission lines, oil and gas infrastructure, and buildings provide perches and nest sites in formerly raven-scarce habitats like the sagebrush steppe and the Mojave Desert. Industrial sites, railroad bridges, overpasses, and trees provide shelter where they can ride out harsh winters that once drove them away. And livestock operations, roadkill,

and rural landfills provide windfalls of previously unavailable food. Raven populations grew 300 percent in the West between 1980 and 2007; in some areas, they increased 1,500 percent.

Sage grouse, though, are notoriously intolerant of human disturbance. They favor unbroken habitat so vast that, if you surveyed it from a hilltop, you'd see "sagebrush from horizon to horizon," says Oregon State University researcher Christian Hagen. The vastness insulates ancestral sage grouse mating grounds, called leks, and gives the bird options for finding sagebrush, among its staple foods, if, for example, a snowstorm buries its usual haunts. The bird also relies on sagebrush as camouflage. Hens' mottled plumage melts into the dappled leaf shade and litter beneath the shrub's overhanging branches, where they prefer to build nests against the trunk behind a screen of grasses. And wide swaths of unbroken land offer microhabitats that support the grouse during different life stages: hens nest in dry uplands, for example, and then take their hatchlings to wetter areas to eat insects, wildflowers, and other forbs. None of these habitat functions have been served well by spreading energy infrastructure, roads, ranchettes, wildfire, or other alterations of the sagebrush sea, and sage grouse have suffered.

As interest in the bird's predicament grew through the early 2000s, a graduate student named Peter Coates set out to document the most important nest predators of sage grouse. He and his advisor kept tabs on 87 sage grouse nests in northeastern Nevada, 55 of them with cameras. Nearly half failed due to egg snatchers. Of the depredation events caught on video, ravens were responsible for more than half. Not only that, but the more ravens were nearby, the more likely a nest was to fail. And nests under thinner shrub canopies were much more vulnerable; degraded habitat clearly gave ravens a leg up.

"It wasn't surprising that ravens were depredating sage grouse nests, because they're a well known nest predator," says Coates, now a wildlife biologist for the U.S. Geological Survey's Western Ecological Research Center. "What was surprising was just how *many* of the depredations they were responsible for, and how related that was to lack of cover. Even in areas with low raven abundance, you can end up with high predation if cover is lacking."

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> *Peter Coates, wildlife biologist U.S. Geological Survey Western Ecological Research Center*

Coates' work landed sage grouse on the long list of sensitive species harmed by ravens' human-abetted expansion, including desert tortoises and snowy plovers. As he continued research in the Great Basin, he found sites with high raven abundance where the percentage of grouse nests that succeeded averaged 22 percent or lower, significantly below the range-wide average of 40 to 50 percent. "The data suggest that some areas," he says, "are in desperate trouble."

But ravens are themselves native and protected under the Migratory Bird Treaty Act. And was killing them even a real fix? Dinkins hoped to find out.

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To assess whether killing ravens was helping sage grouse, and answer his bigger questions about how predators shape sage grouse habitat use, Dinkins would need to cover a lot of ground. Combining forces with a University of Wyoming master's student who was beginning a different research project, he set up 12 study sites that encompassed about a million acres in southern Wyoming. Seven were in areas with no raven control. Five were near lambing and calving grounds and landfills where Wildlife Services was killing the birds using dog food laced with a poison called DRC-1339 that only works on ravens and other members of the corvid family, such as crows and jays.

Each spring from 2008 through 2011, the researchers and techs boarded ATVs in the night, used spotlights to freeze female sage grouse in their tracks, then netted and fit them with little radio-transmitter necklaces. (One tech has since listed on her resume the "badass 4x4 skills" she acquired.) They checked in on the grouse weekly through the summer, locating their nests with binoculars, then using radio telemetry to track when hens were done incubating so they could confirm whether nests succeeded or failed without alerting predators to their locations. Then they kept tabs on where hens traveled with their chicks for several more weeks.

At nest and brood spots, researchers spent 10 minutes each week counting ravens, golden eagles, hawks, and other avian predators in order to calculate local densities. For comparison, they repeated this procedure at randomly selected locations. They also amassed data on vegetation and terrain, as well as the density and proximity of human structures such as power lines, oil and gas sites, and roads. There were, says Dinkins, a lot of 10-hour days.

Given Coates' and others' work, Dinkins expected predators would have some effect on where grouse chose to be. But when he and his colleagues began crunching numbers, he was surprised by just how profound that effect was. Hens nested and raised their young in spots with significantly lower densities of avian predators—including ravens—than random locations had. In fact, predators appeared to be the most significant factor influencing grouses' nesting and brood locations, above and beyond the other measures of habitat quality and human disturbances.

More fine-tuned analysis suggested grouse were taking it all into consideration, sticking close to denser sagebrush for food and cover and steering clear of predators they could see, as well as potential predator perch and nest sites like oil and gas structures or power lines. And little wonder: Dinkins found that hens in areas with denser power line development were more likely to die.

Increased predator access to the sagebrush steppe brought by human development looked like a one-two punch for the sensitive grouse. "Any feature that increases the abundance of avian predators on the landscape has the potential to reduce the amount of sage grouse there," Dinkins says—not only because more grouse get eaten, but also because they avoid predators and the structures that support them. "Those indirect effects of avoidance could have larger effects than predation itself."

"At all sage grouse life stages there is a predator that wants to eat them," adds Dinkins' advisor and co-author Jeff Beck, an associate professor at the University of Wyoming, so it makes sense that sage grouse would develop evasive maneuvers over millennia.

"Jon's work is cool because he's able to look at the interaction of that with the changing landscape."

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Ravens in particular had some alarming effects. Similar to what

Coates had found in Nevada, nests where Dinkins and his team observed a raven flying just above or nearby were vastly more likely to fail. That suggests that if ravens keep increasing in Wyoming as they are, Dinkins says, "it's like a train wreck coming."

But the jury's still out on whether killing them can soften the crash. Dinkins' preliminary analysis—which he's currently preparing for publication—does show that lowering raven density boosts grouse nest success. Yet that bump happened only after Wildlife Services significantly ramped up its efforts halfway through the study. And more favorable weather conditions also played a hefty role. Moreover, nobody has yet studied whether benefits imparted by lethal raven control persist in the long term, or whether they translate into sage grouse population gains. More chicks hatching only makes a difference for grouse numbers if they're surviving to breeding age and successfully reproducing, so if there's a bottleneck elsewhere, raven control may have no effect.

There's even anecdotal evidence from other areas that if territorial raven pairs are removed, they are replaced in much higher numbers by transients more tolerant of each other's company, suggesting that, to be successful, lethal control might require a never ending and expensive campaign. "If you want this to be your management strategy," says Dinkins, "it's going to have to be every year. And there are ethical boundaries—ravens are native and protected." For now, Dinkins says, lethal control looks at best like a short-term, emergency measure that may help buy time for pockets of grouse in especially dire straits, but is no substitute for habitat protection and restoration.

Wyoming Game and Fish in 2012 asked Wildlife Services to up raven control at some landfills for the benefit of sage grouse. Still, the state's Sage Grouse Coordinator Tom Christiansen agrees that killing ravens "is not going to solve the overall sage grouse problem" because "ravens are a symptom" of degraded habitat. He aligns with Dinkins, Coates, and others who think that getting at root causes of increasing raven predation will require limiting human development in swaths of the landscape that still support healthy populations of sage grouse, and restoring others so that they provide better protection. Strategies like Wyoming's "core areas" policy or private land conservation agreements—such as some recently enacted on hundreds of thousands of acres in Oregon—have worked toward that end, albeit imperfectly.

For inevitable development and existing development that's here to stay, managers should focus on limiting unnatural raven food sources and making perches harder to use, scientists say. That means removing roadkill from along roadways, dealing with livestock carcass dumps, and covering landfills, among other things. "Until you do those things, it's not going to do any good to control raven numbers," explains University of Washington corvid expert John Marzluff, "because they'll just increase again."

Wyoming's Upper Green River Basin Sage Grouse Working Group has mounted a successful program to replace windmills powering water pumps for livestock troughs with solar panels, which ravens can't nest on. Tubular transmission towers are less raven-friendly than latticework ones, Coates notes, and there are spiky comb-like structures that can be added to powerline cross-pieces to discourage perching. Marzluff also points to promising results from aversive conditioning experiments with corvids in the lab. Since territorial ravens live awhile and keep transient ravens out, teaching them to avoid grouse eggs by lacing similar-looking eggs with bad-tasting chemicals, or simply harassing them away from nests, he argues, may ultimately be more effective than lethal control.

But ravens' craftiness can keep them a step ahead of such efforts: They have, for example, turned some devices meant to discourage them from perching into handy anchors for their nests against the wind. And changing the way humans use a landscape in order to preserve intact habitat on broad scales is about as simple as controlling the weather. If the habitat and nonlethal fixes were easy, Dinkins points out, "this problem would have been dealt with already for shorebirds and desert tortoises."

"As we humans do, we managed to get ourselves into a corner," adds Oregon State's Hagen. "And now we have to manage our way out of a corner."

***Sarah Gilman** is an environmental journalist based in Portland, Oregon. Find more of her work at sarahmgilman.com.*

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