INTERNATIONAL WOLF

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WINTER 2017

Wisconsin Study Shows Wolves Benefit Forests PAGE 4

Apex Carnivore Competition: What does the return of the wolf mean for cougar populations in Oregon? PAGE 8

Wood River Wolf Project Helps Idaho Sheep and Wolves Share the Landscape PAGE 11

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VOLUME 27, NO. 4 THE QUARTERLY PUBLICATION OF THE INTERNATIONAL WOLF CENTER **WINTER 2017**

Wisconsin Study Shows Wolves Benefit Forests

"Trophic cascade" is the term used to describe the effect predators may have on an entire ecosystem. Trophic refers to nutrition, and when wolves prey on other animals to get their food, the effects can cascade throughout the environment. Scientists have not reached agreement on the topic, but a recent study in Wisconsin supports the notion that wolves—and their nutritional needs—do benefit the ecosystem.

By Tracy O'Connell

Apex Carnivore Competition: What does the return of the wolf mean for cougar populations in Oregon?

Cougars have rebounded in Oregon since the 1960s, and wolves have expanded into the Pacific Northwest since reintroduction elsewhere in the 1990s. Now, important questions arise as to how these carnivores will coexist and what effects they may have on prey species. Researchers from Oregon State University and the Oregon Department of Fish and Wildlife are collaborating to find answers.

By Beth Orning

Wood River Wolf Project Helps Idaho Sheep and Wolves Share the Landscape

When a shepherd in northeastern Oregon is awakened by barks and snarls, he knows his dogs are facing off with predators—and because of the Wood River Wolf Project, he may now have tools to protect his flock and preserve the wolves. No wolves have been killed in the project area since 2008, and while the project is not the only deterrent, it appears to be a significant one.

By Avery Shawler

Exhibit Pack member Grayson plays in the snow.

On the Cover

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Departments

3 From the Executive Director
14 Tracking the Pack
18 Wild Kids
20 Wolves of the World
23 Personal Encounter
26 A Look Beyond
28 Book Review

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Rob Schultz

Peanut Butter-Flavored Bubbles

Throughout the year, our wolves at the International Wolf Center endure many of the same challenges faced by wolves in the wild—rain, wind, snow, and cold and hot temperatures, to name a few. And as anyone who has visited northern Minnesota can attest, there's one more factor our wolves face—bugs!

For most wolves, flying bugs are just a seasonal nuisance. But for one of our ambassador wolves, Boltz, they are a seasonal nightmare. Over the years, he's developed a strong dislike for them. During the short summers in northern Minnesota, visitors often see Boltz twisting and turning as he tries to knock them out of the sky.

All that activity got our staff thinking about what they could do to help.

Enter peanut butter-flavored bubbles.

Daily enrichment is something our staff takes seriously, even when talking about something as silly sounding as bubbles. Each summer day at noon, staff members lead enrichment activities for the wolves. On hot days you may find our wolf curator, Lori Schmidt, tossing ice cubes or frozen beaver tails to the wolves. Other days they could be treated to canid-friendly cupcakes or tufts of fur from animals they've never encountered. And then…there are the bubbles.

To help Boltz develop a positive association with things flying around his head, staff experimented with blowing bubbles around him. Eventually, when the bubbles became peanut butter flavored, the positive association took hold.

I wish I could say that Boltz no longer has a fear of things flying around his head, but that isn't the case. Through the work being done by our wolf care team, though, we hope to keep reducing his anxiety about these pesky critters.

Boltz and the bubbles.

Other wolves also benefit from the daily enrichment provided by the wolf care team. They're stimulated by the exercises, as are our staff and volunteers who dream up the enrichment activities. One hot day this summer, our visitors watched in wonder as Axel shot into the air, excitedly chasing after a stream of water from a hose. Yet another time, Lori had the wolves scrambling to catch a beam of light emitted from a handheld pointer. Just like us, wolves are curious creatures and enjoy experiencing new things.

If you have a great idea for a new enrichment experience for our wolves, our curator would love to hear about it! Share your ideas with Lori by emailing them to: curator@wolf.org. ■

Sincerely,

Rob Schultz
Executive Director

MISSION

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Wisconsin Study Shows

By TRACY O'CONNELL

Trophic cascade is a phrase that refers to the effect predators have on the environment by controlling the population and habits of prey species, which in turn cause dramatic changes in the ecosystem. It is the topic of several popular videos making the rounds online. The videos contend that the wolves' return to Yellowstone National Park has benefitted vegetation, streams, and bird, insect and animal life. However, some scientists believe that the evidence for these claims may be faulty or unconvincing. (See "Do Wolves Cause Trophic Cascades?" Fall 2014 *International Wolf.*)

Several Yellowstone studies were based on correlations (events happening at the same time), which do not necessarily prove causation. Thus other types of studies are needed. One such study was recently done in Wisconsin, and the same benefits to the environment as those above were found to result from the relationship between wolves and white-tailed deer. In the case of elk in the Rocky Mountains, the presence of wolves was said to benefit the growth of aspen.

With moose on Isle Royale, the carnivores' presence enabled more growth of balsam fir (although correlations included winter severity and other events, such as declining numbers of

Wikimedia Commons/H. Zell

The Wisconsin study of wolves and deer addressed the degree to which wolves reduced the impact of white-tailed deer on saplings and other vegetation such as rare wildflowers in a northern forest.

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Wolves Benefit Forests

wolves on the island, which affected the results.)

Trophic cascades have also been examined in marine populations where the presence of sharks was found to benefit coral reefs because the population of grouper fish, if not held in check by sharks, feed more heavily on the parrot fish that clean the reefs of algae. Without the parrot fish, the algae damage the reefs. Examples of cascades are believed to exist in the African savannah, too, although they have not been formally studied.

The Wisconsin study of wolves and deer addressed the degree to which wolves reduced the impact of white-tailed deer on saplings and other vegetation such as rare wildflowers in a northern forest. The study took place at the University of Notre Dame Environmental Research Center on land composed of forest, bogs and conifer swamps, located near the small, rural community of Land O' Lakes in Vilas County, Wisconsin, on the border of Michigan's Upper Peninsula.

White-tailed deer were the only ungulates in the study area, with densities substantially higher than when their numbers were historically maintained by natural predation, dense forest habitat and hunting by Native Americans. Starting in the 1850s, logging created open forests favorable for deer habitat, and removal of predators and protective hunting laws led to sharp increases in the deer population in this region. Targeted persecution of wolves resulted in the complete disappearance of the predator from the study area by the late 1950s.

"White-tailed deer numbers in this region dramatically increased in the absence of gray wolf predation, and the subsequent increased grazing had significant negative impacts on forest sapling growth" and plant biodiversity, researchers noted. A new wolf pack established a territory partially in the study area just over a decade ago, and additional packs use surrounding territories outside the study area. Data suggest there are about three to five wolves per 1,000 deer in this region.

Researchers, with the help of wildlife managers, radio collared and tracked via GPS three members of the local wolf pack to determine high use areas—the places where they hunt the most—which were considered the places where deer were most at risk of predation. They also carried out weekly scat surveys along all the accessible roads in the area from May through October in 2008, and from 2010 through 2013, to verify their GPS findings.

The research team next compared sapling growth and wildflower richness in areas of high and low wolf-use. Sugar maple and red maple are the area saplings most preferred by deer. Wildflower communities consist mostly of Canada mayflower, Canadian bunchberry, ferns, forbs (wildflowers) and grasses. Deer in

this region also feed on rarer plants, such as blue-beaded lily and Solomon's seal.

Deer-proof fencing was used to enclose a dozen selected areas that reflected both high and low wolf-use to see how plant growth progressed in the absence of grazing. This step was considered crucial to control for how plants would grow without the deer present at all. Sapling size and wildflower presence in each enclosure was measured each August from 2009 to 2012, as was deer damage to vegetation outside the enclosures and, with the help of infrared cameras, the density and behavior of deer in both high and low wolf-use areas.

Notable differences seen

As expected, deer visited high wolf-use areas less frequently than low wolf-use areas, where they browsed a significantly higher proportion of maple saplings. The saplings grew substantially taller when protected by deer fencing in the low wolf-use areas, where deer otherwise grazed more extensively. However, there was no significant difference in the size of saplings protected from deer compared to those unprotected by fencing in the high wolf-use areas, showing that the wolves were taking the place of fencing to protect the vegetation.

Specifically, it was found that in areas of high wolf concentration, deer were 62 percent less dense, their visit duration was reduced by 82 percent, and time spent foraging was reduced by 43 percent. The proportion of saplings browsed was nearly sevenfold less. Average maple sapling height and the richness of wildflower diversity increased 137 and 117 percent in areas of high versus low wolf-use, respectively.

A different kind of trophic cascade

Carnivores create trophic cascades in two ways—by direct reduction of the herbivore population through kills, which is called *density mediation,* and by what is called *trait mediation*, meaning that the prey population alters its behaviors out of fear, changing habits and range, and maintaining a more vigilant attitude.

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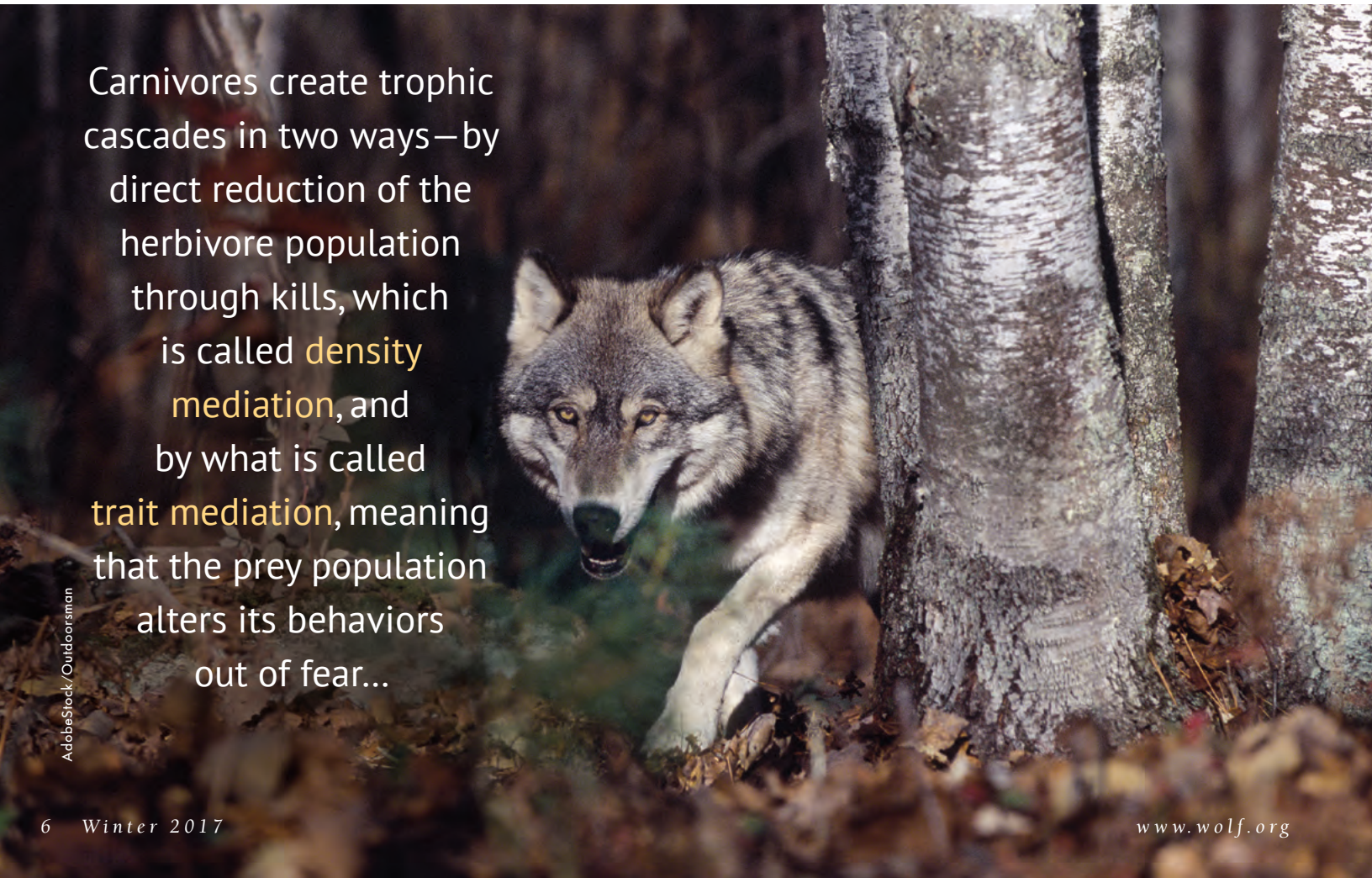

Carnivores create trophic cascades in two ways—by direct reduction of the herbivore population through kills, which is called density mediation, and by what is called trait mediation, meaning that the prey population alters its behaviors out of fear...

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These actions benefit vegetation in areas where herbivore presence is diminished because of possible predator activity.

Interestingly, while the trophic cascades in other wolf prey studies were mainly caused by density mediation due to predators killing the herbivores, the Wisconsin study found the benefits to vegetation resulted from trait-mediated responses (as when grazers get frightened and leave the grazing area). These benefits are more widespread, since the protective behavior is adopted by the entire population—a much larger number of animals than those killed.

Researchers suggest the difference in the nature of the trophic cascade created by wolves in Wisconsin, compared to findings in the Rocky Mountains and Isle Royale, is because differences in the setting, and the size and type of prey. The dense forest of Wisconsin protects deer with lower visibility than the elk and moose experience in their more open rangeland. Thus, predators don't see them as easily.

The research team stated that wolves also switch behavior based on habitat, prey visibility and prey size. The team suggested that wolves in relatively high-visibility Rocky Mountain systems with large elk as prey, act as "roaming chase predators" whereas wolves in low-visibility forest systems with smaller deer species as prey, such as in Wisconsin, act as "ambush predators." The latter approach further reduces the ability of prey to detect the predator from a safe distance and thus produces stronger protective, or trait-mediated, effects. (Other researchers, however, do not necessarily agree with these suppositions.)

The Wisconsin biologists hypothesized that since deer numbers were not declining as steeply as would be the case in density-mediated cascades, reductions in vegetation damage following wolf recolonization of the area meant that those wolves are generating trait-mediated cascades in Great Lakes forests. These should be stronger than density-mediated effects, given the behavioral changes of the deer extend to the entire population, rather than being limited to the numbers killed. In other words, the scientists assumed that wolves are benefitting plants without killing a lot of deer—and their data seemed to show that.

The researchers point to a different study that used camera traps to record red deer behavior in response to fresh wolf scat, suggesting these cues to the presence of wolves are sufficiently strong to increase deer vigilance—results in line with scat distribution and deer behavior in the Wisconsin study.

Some have questioned past wolf–ungulate–plant studies because it is difficult to eliminate compounding factors as alternative explanations. For instance, in Yellowstone National Park, droughts, increased winter severity, longer growing seasons, and human harvest could be more important factors affecting elk declines, and conditions such as elevation and water table could be responsible for differences in aspen growth. The Wisconsin researchers note they did their best to avoid or minimize confounding factors, for instance, examining growth in vegetation not preferred by deer to ensure deer did not change grazing preferences during the study.

They conclude, "The ability of predator-free ungulates to become drivers of environmental change…is becoming increasingly recognized as a major conservation issue. There is also a rising awareness that predator removal and reintroduction can have dramatic impacts on ecosystems. We suggest that wolves and other large mammalian predators have the potential to be useful tools for forest ecosystem restoration, promoting the regeneration of ungulate-preferred species and/or increased forb diversity through the generation of density-mediated and/or trait-mediated trophic cascades." ■

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Tracy O'Connell is professor emeritus at the University of Wisconsin-River Falls in marketing communications and serves on the Center's magazine and communications committees.

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Apex Carnivore Competition:

What does the return of the wolf mean for cougar populations in Oregon?

By BETH ORNING

Oregon Department of Fish and Wildlife

GPS-collared male wolf OR26 from the Meacham pack in the Mount Emily WMU of northeast Oregon, spring 2014.

A pile of fur and bones juts out from a rock bluff next to a game trail, across a long, open finger of a ridge. As I dig through the prey remains, deciphering the species, when and why it died, and what predator killed it, I know that answers to bigger questions may be hidden in these details. The feeding habits, distribution and interactions of top predators like wolves and cougars can vary greatly from ecosystem to ecosystem, and that knowledge is being recognized by wildlife managers as critical for effective conservation and management of carnivores.

Wolves and Cougars in Oregon

As in other parts of the western United States, predator eradication efforts in the mid-20th century removed all wolves from Oregon by the late 1940s

and greatly reduced cougar populations by the 1960s. Cougars have since rebounded, and stable populations are widely distributed across the state. In 2016, the Oregon Department of Fish and Wildlife (ODFW) estimated there were 6,300 cougars statewide.

Wolves have been expanding their range into the Pacific Northwest since reintroductions in central Idaho and Yellowstone in the mid-1990s, with the first breeding pair in Oregon documented in 2009. OR7's famous 2011 dispersal and eventual colonization in the Cascade Range of western Oregon drew national media coverage that emphasized the expansion of Oregon's wolf population. As of late 2016, Oregon had 10 to 13 known packs and statewide minimum estimates of 112 wolves.

There is a scarcity of ecological information on intact predator-systems in Oregon, and the return of wolves to the landscape has raised questions about competition between wolves and cougars, and the effects these two carnivores might have on prey populations (elk and mule deer). These historically coexisting carnivores are once again sharing habitat and prey resources in Oregon, making them competitors. But their interactions remain difficult to document due to both species' general shyness, secretive tendencies (like nocturnal activity), wide-ranging movements and low population densities. Nevertheless, information on the nature of interactions between top carnivores like wolves and cougars is crucial to understanding the population dynamics of both predators and their prey.

How do wolves and cougars compete?

Interactions among top carnivores are typified by competition defined as direct (e.g. one species kills another) and indirect (e.g. one species reduces food resources available to another). If the outcome is always one-sided (one species always wins the encounter), the winner is considered "dominant," while the other is considered "subordinate."

For a subordinate competitor, results of unequal competition include three possibilities:


Grand Canyon National Park/Flickr

- The subordinate competitor may be killed outright by the dominant competitor.
- Food acquired by the subordinate competitor may be stolen by the dominant competitor.
- The subordinate competitor might actively avoid the dominant competitor to reduce the risks of food loss or direct mortality.

These types of interactions have important effects on the space use, distribution, and population dynamics of the subordinate competitor. The group structure of a pack presumably gives wolves an advantage in their interactions with cougars (a pack of wolves outnumbers a solitary cougar), so the direct threat when the two species interact is assumed to be greater for cougars than for wolves.

Research has documented that wolves can steal cougar kills, and that they occasionally kill adult cougars and cougar kittens, providing some evidence that interactions favor wolves, and suggesting that cougars are the subordinate competitors in wolf-cougar systems. But wolf kills by cougars have also been documented, so the relationship may be more complex than that, and subject to the specific context or ecosystem in question. Further, competitive interactions may have little effect on populations if interactions are rare, or if cougars can avoid interaction by eating alternate prey or using habitats unoccupied by wolves.

Knowledge about carnivore interactions is critical because they can influence the population dynamics and spatial distribution of prey species, which can cascade to positive or negative effects to plant species, shaping the distribution

and composition of species that make up entire communities.

Mount Emily Wolf-Cougar Project

Wolf recolonization in Oregon may have changed the predation patterns (composition and characteristics of species in cougars' diets), the distribution, or the demography (survival, reproduction, mortality) of cougars—elements that have important implications for management of both carnivores and the deer and elk populations they prey upon. In particular, the situation in northeast Oregon provided ideal circumstances in which to examine competition between apex carnivores, allowing collaborative researchers from Oregon State University (OSU) and ODFW to evaluate changes in predation patterns that might come about from wolf-cougar interactions. It also gave us the opportunity to investigate the effects multiple carnivores may have on prey populations now that wolves have recolonized an area occupied solely by cougars for the last 60 years.

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The Mount Emily Wolf-Cougar project was started in 2014 as a collaborative effort among ODFW, OSU and the Confederated Tribes of the Umatilla Indian Reservation. The goal of the project is to address several questions about systems where wolves and cougars interact, including these:

1) What ungulate prey (species, age, sex, physical condition) are in wolves' diets across different seasons in northeast Oregon?
2) Has the ungulate prey cougars consume or the space cougars use in northeast Oregon changed with the recolonization by wolves?
3) Does the addition of a second top carnivore (the wolf) increase the risk of direct predation on elk or mule deer populations?

To answer these questions, the Mount Emily Wolf-Cougar Project is using GPS collars to obtain continuous and accurate location data on a sample of wolves and cougars in Oregon. Cougars have been monitored in time periods with and without wolves, providing unique, high quality before-and-after information which will allow us to identify potential changes in their diet, how they move through space, and how they are distributed across the landscape as a result of competition with wolves. Results will enhance management and conservation decisions on carnivores and prey by providing information on how expanding wolf populations affect cougar populations, and how the effects of this re-established multi-carnivore system could extend to elk and mule deer populations. Knowledge gained from this study could be useful in other states and western Canadian provinces that face similar situations as wolves continue to expand their range.

Preliminary Findings

We examined wolf and cougar diets before (2009-12) and after (2014-16) wolves recolonized the Mount Emily Wildlife Management Unit in northeast Oregon. We identified the remains of 1,213 and 541 prey items, used by cougars in the pre- and post-wolf periods, respectively. We also identified 158 prey items used by wolves. Cougar diet was similar between the pre- and post-wolf time periods. Cougars preyed predominantly on deer (mule deer and white-tailed deer, 58 percent and 53 percent of all ungulate kills pre- and post-wolf, respectively) and primarily killed fawns (53 percent and 44 percent of all deer kills, pre- and post-wolf, respectively). When cougar preyed on elk, they primarily preyed on calves, in similar proportions from pre- (77 percent) to post-wolf (71 percent) recolonization. Wolves preyed predominantly on elk (61 percent) and primarily killed the calf age class of elk in summer (83 percent and winter (49 percent), but used adult elk nearly as often as calves in winter (46 percent).

What's next?

Further analysis is planned to evaluate potential changes in predation patterns (where kills occur), space use and movement, and survival responses of cougar populations in the presence of wolves. Location data collection from GPS-collared wolves and cougars is continuing through the end of 2017, with project completion expected by the end of 2018. ■

Beth Orning is currently a PhD student with the Oregon Cooperative Fish and Wildlife Research Unit at Oregon State University, where she is studying wolf-cougar interactions for her dissertation work under Dr. Katie Dugger. Prior to starting her PhD program, she studied predator-removal effects on greater sage-grouse populations in Wyoming for her Master's research at Utah State University with Dr. Julie Young. In her career, she has helped reintroduce Mexican gray wolves in Arizona and assisted studies of elk calf mortality in Idaho, burrowing owl reproduction and migratory raptor populations in Colorado and Idaho, and re-emerging bobcat populations in southern Iowa. Beth began her career in carnivore research in 2004, working with Drs. Mike Nelson and Dave Mech on the Wolf and Deer Project in Minnesota.

Carol Waller

Wood River Wolf Project Helps Idaho Sheep and Wolves Share the Landscape

By AVERY SHAWLER

Phoebe Bean

It is late June in the Blue Mountains of northeastern Oregon, and a herder and a band of sheep have bedded down for the night after a long, hot day. At 2 a.m., the herder is jarred awake; one of his dogs barks in distress. The herder jumps out of his sleeping bag in the sheep wagon, grabs his high-beam spotlight and air horn, and runs toward the noise. He sees his dog and a gray wolf facing off. The dog is barking at the wolf, and then the wolf jumps on the dog. The herder shines the spotlight on the snarling pair and deploys the air horn. The wolf freezes in terror before it darts away into the night, as fast and as far from that air horn as it can go.

The wolf got a good scare in that scenario—but that's much better than being injured or killed by a gunshot. The wolf was given another chance at life—and if it's smart, it will stay away from those sheep.

A few days before this wolf encounter, the herder had participated in a Nonlethal Coexistence Training workshop in the Blue Mountains, where he was given nonlethal tools along with proper training to use the tools effectively. That training, initiated by local sheep ranchers, could not have been better timed.

Last winter the ranchers obtained permits to graze sheep in a new allotment of U.S. Forest Service land in the Blue Mountains,

Lauren Hennelly

Fladry is a string of flags on temporary stakes used to deter wild animals from moving beyond it.

Avery Shawler

Avery Shawler

knowing that it is a place of heavy wolf activity. Not wanting to resort to lethal control, a ranch manager called Brian Bean at Lava Lake Land & Livestock, a ranching operation in Central Idaho, and asked about using nonlethal tools. Bean is one of the founders of the Wood River Wolf Project (WRWP), a collaborative promoting the coexistence of livestock and wolves by using nonlethal tools and techniques to prevent wolf depredation on sheep.

At Bean's suggestion, the ranch manager talked with me, in my role as WRWP coordinator, and with Suzanne Stone, the Senior Representative for the Northwest Program for Defenders of Wildlife. Together, Suzanne and the manager organized the Nonlethal Coexistence Training workshop, bringing together ranchers, sheep herders, and the Oregon Department of Fish and Wildlife. The WRWP sent Claudio Oriheula, one of Lava Lake's seasoned camp-tenders, who has used nonlethal tools for many years, and Reid Hensen, a Spanish-fluent Lava Lake intern to translate for workshop participants. Oregon's newly formed Blue Mountain Wolf Project collaborative is following a model created in 2008 by the WRWP in central Idaho to address predator-livestock conflicts in a new way.

Wood River Wolf Project History and Background

By the 1930s, gray wolves had been eliminated from the lower 48 states, excepting Minnesota, Wisconsin and Michigan. But in 1974 wolves gained protection under the Endangered Species Act, and were reintroduced in the West in the mid-1990s. Sheep ranchers in Idaho began to experience wolf depredation on flocks as early as 2002. In 2007, the wolves of Sun Valley's famous Phantom Hill pack began killing sheep in significant numbers along Idaho's "sheep driveway" that runs from the Snake River Plain to the Sawtooth Valley—a situation that would normally result in some or all of the pack members being killed. But Blaine County, Defenders of Wildlife, the U.S Forest Service and local sheep operators worked together to adopt policies supporting the use of nonlethal tools—and the Wood River Wolf Project was born.

Since the inception of the WRWP in 2008, no wolves have been lethally removed in the project area. In recent years, wolves have been less active than they were in the earlier years of the project. As WRWP project coordinator, I hope this is partially due to the success of the WRWP's nonlethal tools and techniques, "teaching" the wolves—and in turn, their offspring—that sheep in that area are not easy prey.

Other deterrents to wolf activity in the area include heavy recreational use and a hunting season established in 2011, after the wolf was delisted so, conceivably, increased wolf harvesting in this more accessible area could also have helped reduce sheep losses. In any event, a combination of factors has resulted in fewer instances of wolf-livestock interaction—a fact borne out by extensive WRWP monitoring that includes camera-trap surveys and howl surveys.

Band Kits

Even though wolf activity has decreased in the project area, the WRWP remains vigilant and constantly prepared for increased wolf activity near the sheep. Last year we created and piloted our Band Kit system: a bag with all the tools sheep herders need to protect their sheep band (band flocks are those with large numbers of sheep—often 1,000 to 1,500 ewes) from wolves and other predators. Herders are trained, and thereby empowered, to protect their sheep from predators without having to use lethal means.

Herder interviews reveal that they especially like using the Foxlights (computerized lights that randomly blink to simulate humans on patrol) and

U.S. Forest Service

Andrew Kane

starter pistols. Our field manager, Kris Thoreson, frequently checks in with herders to make sure they have everything they need and ask if they've noticed any predator activity. The herders are the first line of defense against predators, and they really appreciate having these extra tools and support from our staff to help them do their jobs effectively. In times of heightened wolf activity, the WRWP recruits volunteers to camp with the sheep, increasing human presence—the most effective defense against predators.

Scientific Backing

How effective are these nonlethal tools and techniques? In February 2017, the internationally recognized *Journal of Mammalogy* published a study conducted over the first seven years of the WRWP. Results showed that sheep losses to wolves in the project area were 90 percent lower than in the rest of Idaho. Sheep losses to wolves in areas adjacent to the project area were 3.5 percent higher than within the project area where nonlethal tools were used. Further, no wolves were lethally controlled in the project area, and sheep depredation losses to wolves were just 0.02 percent of the total sheep present—the lowest rate among sheep-grazing areas in Idaho's wolf range.

Outreach Efforts

It is exciting to be celebrating year 10 of the Wood River Wolf Project. It's even more exciting to see other communities using us as an example and a resource for promoting predator-livestock coexistence. The WRWP has given presentations at several workshops, symposiums and conferences, and members have spoken before the House Committee on Natural Resources. Our website shares information on our Band Kit and protocols. Instructional videos in English and Spanish, created with help from Andrew Kane at Backcountry Image, will appear on our website soon. The WRWP's goal is to expand our outreach and educational efforts to other communities dealing with livestock predation issues, addressing not only wolves, but coyotes and bears, and refining tools and techniques to address predation on cattle.

How Can You Help?

Ranching is part of the cultural landscape of the West, and an important livelihood for practitioners and communities. The WRWP collaborative includes conservationists, ranchers, government agencies and the public in an attempt to demonstrate that wildlife and livestock *can* co-exist. It is an example of creative problem-solving rather than polarizing rhetoric—and offers a model that extends beyond the issue of sheep and wolves.

If you want to stay updated on the Wood River Wolf Project, sign up for our newsletter at www.woodriverwolfproject.org. You can also find us on Facebook and Instagram. Donations are much needed and greatly appreciated. Please contact our project coordinator, Greg Hill (greg@woodriverwolfproject.org), for more information. ■

Avery Shawler has served as the WRWP's Project Coordinator for two years and is beginning her Ph.D. program in the Department of Environmental Science, Policy, and Management at UC Berkeley this fall, where she will study predator-livestock conflict in the Greater Yellowstone Ecosystem.

Avery Shawler

Kelly Godfrey

Summer Enrichments

By Lori Schmidt

Arctic wolf Axel, Exhibit Pack member.

During summer, wolf care staff conduct a daily program called "Wolf Enrichment" to provide stimuli to the Exhibit Pack during the noon hour, when members are typically less active. This program allows wolf care staff to get a mid-day assessment of the wolves' conditions related to biting flies, heat and humidity. The guaranteed presence of the wolves also draws a large crowd at the auditorium windows to watch the behavioral responses to a variety of enrichment activities.

Scent-related enrichments will usually result in a scent roll. This type of enrichment stimulates the wolves' tendency to mark and scent-roll on an unfamiliar object. Ethologists interpret this behavior as a method of marking a foreign scent within a territory as their own, but ethologists also see it as a method of communicating about a treasured find to their fellow pack members. Some of our scent enrichments included fox urine, mink oil, catnip, peppermint, and lavender oils. The latter two enrichments had a profound effect on Aiden, our dominant pack leader, who, after rolling for several minutes, chose to calmly stretch out and rest in the peppermint oil for over 20 minutes. A little research on peppermint oil suggests that when applied to the skin, it can cause surface warmth, which relieves pain beneath the skin. Since Aidan is nearing 10 years of age, there may be an added health benefit for the aging pack leader.

Pond-related enrichments during the heat of summer will usually result in wading, swimming and even a head dunk. We use a variety of stimuli to get the wolves to immerse themselves in the 4,000-gallon Exhibit Pack pond. We portion out deer legs, beaver tails, beaver feet, bison hides, bacon bits, bone dust or whatever else may be lurking in the carcass freezer into treats that are easily tossed, frozen, into the middle of the pond. The wolves strategize, leaping from rock to rock to be the first to possess one of the floating treasures. Since wolves have evolved to be covered with hair rather than sweat glands, this enrichment is bound to cool them on a hot summer day. Apples and oranges floating in the pond can cause the same response—with a quicker delivery over the fence.

To see the wolves in action, check out our YouTube channel for the summer of 2017 Enrichment video as well as other updates on the International Wolf Center ambassador wolves. ■

Kelly Godfrey

Exhibit Pack member Boltz

A Rendezvous with Ann Beyer

by David Kline

Heidi Pinkerton / Root River Photography

When wolf enthusiasts think of the word "rendezvous," they probably picture a wolf pack's meeting site. But to long-time International Wolf Center member Ann Beyer, it has another definition.

Ann participates in historic reenactments called Rendezvous, in which she and others gather to celebrate a time when there were more wild places. Typically she portrays a mid-1700s colonial woman or an early 1800s mountain/pioneer woman, using clothing, a tent, gear and activities that reflect those periods. She enjoys the primitive, familial nature of the camps, as well as learning—and helping others learn—skills like blacksmithing, Dutch-oven cooking, finger weaving, throwing a tomahawk or shooting a muzzle loader. She's been known to slip in a history lesson on wolves, too.

If geneticists could identify a gene for teachers, Ann would probably have it. Her parents were teachers and she followed in their footsteps by becoming a middle school math teacher. Ann said, "I loved helping students and watching that expression, like a lightbulb popping on, when they grasped a concept." Middle school students were Ann's favorites because they were starting to transition to adult thinking and discovery. At the district level, she served as a coordinator for gifted/talented education and mathematics. After 37 years as an educator in Iowa and then Michigan, Ann retired in 2008.

She became acquainted with wolves when her son, Avery, worked for Dr. Rolf Peterson, who directs the wolf-moose study on Isle Royale in Michigan. When Avery moved to Ely, Minnesota and worked as a sled dog guide for Center board member Paul Schurke, he introduced his mom to the Center. In short order, she became a pup care volunteer, and she has worked with all of our current ambassador wolves.

Ann credits her husband and son for nurturing her love of the outdoors. Today, she supports organizations focused on protecting wildlands and endangered species. Because she views the wolf as a symbol of the wild, she endorses the Center's educational approach—sharing facts about wolves and turning the lightbulb on for others. This approach was well received at a recent dinner where she shared the stories of Carter Niemeyer, 2017 *Howl at the Moon Gala* speaker, about wolf management and misperceptions in the western United States.

As a member of the Center, Ann enjoys the educational offerings at the interpretive center (especially the ambassador wolves), in the magazine and at wolf.org. For Ann, being on the pup care team has been a "…transformative and thrilling experience." We're grateful for the helpful support Ann and members like her who help us teach the world about wolves. ■

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Thank You!

Leanne Martin

Wild Kids

Ambassador Wolf Behavior

International Wolf Center visitors often ask our staff what the ambassador wolves might be thinking—especially when the wolves come up to the windows and peer inside. People assume they may be interested in food or looking for wolf care staff, but in fact, we have no way of knowing exactly what animals think or feel.

Some people believe they think or feel the same things humans do, but it's not that simple. In fact, there is a word for this kind of thinking: *anthropomorphization*. That big, hard-to-pronounce word means "giving human qualities to something that is not human," whether it's an object or an animal such as a wolf.

We must remember that wolves are *not* human, and because of that, we cannot assume they feel the same things we feel. To learn about animal behavior, we watch them over and over again, looking for patterns that might explain what they are trying to do—and why. So, whenever you hear people assign human thoughts or emotions to animals, remember that this is not always accurate. We reach conclusions about animal behavior based only on repeated observations. ■

Andrew Broz

Above: Axel peeks over the window ledge into our auditorium.

Left: Denali looks at the visitors inside the building. Ambassador wolves are socialized, so they're comfortable with having humans nearby.

Right: Grayson stands alertly, showing us those typical gold eyes.

Below: Axel munches on deer ribs.

Q: Do wolves eat in a certain order, and is the order based on dominance?

A: Not really. Dominance is important in wolf packs, but mainly for keeping order among pack members and ensuring that every member cooperates with others while hunting. Wolves take down prey that can outweigh them by 500 to 1,000 pounds or more. One kick by a bison or a moose can kill a wolf, so pack members need to work together work together to take down such large prey without getting injured.

With large prey, all the pack members might be able to eat from it simultaneously. With smaller prey, the parents take charge and see that the pups are allowed to eat; the yearlings and any other sibs are allowed to eat later. Sometimes the hungriest wolves may jump on a carcass, as well—and typically, the wolf that happens to be standing directly over a small carcass has the right to defend it or share it.

Q: What is the usual eye color of wolves? Can they be blue?

A: Most wolves have golden-brownish eyes as adults. Wolf pups start out with blue eyes, but they usually do not stay blue. They change to gold or turn amber or brown after a few weeks. They can also turn to light hazel.

WOLF F.A.C.

Wolves: Revered, Reviled, Researched, Robotized

By Tracy O'Connell

CANADA

Someone seems to be poisoning wolves in East Kootenay in British Columbia. The poison was first reported in early spring by the owner of a dog that became ill after ingesting it, but survived. Since then, 17 packets of strychnine were found, all in areas traveled by wolves, in white containers believed to have been placed to blend in with the snow, and only becoming visible after the snow melted. The bodies of two wolves found in May had died from the poison. Under the Wildlife Act anyone convicted of intentionally poisoning wolves could face a fine of up to $1 million and more than a year in jail.

JAPAN

Proponents of reintroducing wolves in Japan to counter destruction by herbivores have had a difficult time gaining public support. Now a robot has been developed to help counter the destruction—or at least part of it. According to *The Japan News*, a wolf-like robot to drive away wild animals that cause damage to agriculture has been introduced on a trial basis in Kisarazu in southwest Chiba Prefecture.

Named Super Monster Wolf, and almost the same size as an adult wolf, the robot is covered by fur. It detects wild animals with an infrared ray sensor when they approach and intimidates them, flashing the red lights of its eyes on and off, and blaring 18 sounds in rotation, including a wolf's growl, a human voice and a gunshot. Developed by a company in Hokkaido to keep bears and deer away, the robot was borrowed by an agricultural cooperative, and reportedly there has been no sign of wild animals or birds nearby since it was installed in July. The company that developed the prototype plans to manufacture more models as they are ordered and sell them for ¥200,000 (nearly $2,000 US).

Photo illustration based on imagery from 朝日新聞社 Digital

A robotic wolf was developed in Japan to scare away wild animals that cause damage on farms.

Mark Weber

DENMARK

The return of wolves to Denmark has been met with a flurry of predictable, conflicting responses. Queries about how many wolves lived in the country have arisen since the first wolf of recent times was documented five years ago. There have been reports of as many as 40 at various times and places, but typically, there is agreement on four males and one female in separate sightings. While numbers are still sketchy, videos confirm a mated pair in Jutland, the area where Denmark's first wolf in 200 years was seen in 2012. It is believed the female, named GW675f, likely came to the area from Schleswig-Holstein, in northern Germany, in the summer of 2016, traveling more than 300 miles (500 km) to her new home in Denmark. The history of her mate is not yet known, as suitable DNA material has not been found.

Researchers, while debating if there are pups from this pairing this year or not, contend that Denmark is a wolf paradise, with ample deer and suitable environment for them to settle in. Meanwhile, video shot in West Jutland shows what appears to be a family of wolves with up to eight pups, prompting the head of the Danish Agricultural and Food Council to call for the country's 2014 wolf management plan to be updated to allow wolf hunting. The plan allows compensation to farmers who lose domestic animals to wolf attacks, and incentives to install wolf-proof fencing. However, wolf opponents say more than two dozen sheep have already been attacked, and 21 of them killed, in the five years since wolves returned. Danish farmers were paid a total of 50,200 Danish kroner ($7,200 U.S.) in compensation for animals lost to wolves between 2013 and 2016.

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INDIA

There has been no evidence of wolves in an area designated for a major new airport, according to the development company involved. Environmentalists were concerned that the airport siting would adversely affect Indian wolves in the area (see *Wolves of the World, IW*, Spring 2017) along with other endangered species. Discounting the concern that a buffer zone is needed to protect wolves and other wildlife, an airport spokesperson told the *Times of India* that such measures are not required. At least one wildlife enthusiast is not convinced, saying three reports showing the presence of wolves had been submitted to the forestry department. The airport will encompass an area of 2,376 hectares (nearly 6,000 acres) and serve Pune, in the wealthy, populous, western state of Maharashtra, the capital of which is Mumbai.

FRANCE

In July, the French government gave the go-ahead to cull up to 40 wolves in mountain areas, mostly in the southeast, where they allegedly have killed about 8,000 farm animals, mostly sheep, over the past year. Forty wolves amount to 10 percent of the country's total population, which ranges across 30 of the nation's 100 departments, as units of local government are called. The action came after French shepherds brought their flocks to Paris to protest their predicament, and is part of an ongoing struggle to balance the European Union's effort to protect wolves with the needs of local agriculturalists to preserve livestock.

Adobe Stock / Vincent Kessler_REUTERS

MEXICO

A wolf sacrificed 500 years ago and adorned with fine Aztec gold has been found buried in the heart of Mexico City. According to lead archaeologist Leonardo Lopez, "These are, without a doubt, the largest and most refined pieces of gold discovered so far," comparing them to more than 200 items discovered over 40 years of excavations around the site.

It is believed it represented Huitzilopochtli, the Aztec war god and solar deity. Wolves were said to help guide fallen warriors across a dangerous river in the netherworld.

The wolf sacrifice and burial were conducted during the brutal 1486 to 1502 reign of King Ahuitzotl, the most feared and powerful ruler of the Mexica, as the Aztec called themselves, who extended the empire to present-day Guatemala. Lopez believes the wolf's heart was torn out as part of the sacrifice, just as captured warriors were ritually killed in Aztec temples.

NEPAL

Efforts to determine if the Himalayan wolf is a different species than the gray wolf were said to have advanced with a paper published in June that claims the Himalayan wolf deserves recognition as *C. lupus himalayensis,* establishing it as a subspecies while its recognition as a fully separate species is determined.

Co-authors David Macdonald and Claudio Sillero, who between them have chaired the International Union for the Conservation of Nature/Species Survival Commission Canid Specialist Group since its inception 30 years ago, credit their doctoral student Geraldine Werhahn with the task of "mastering the molecules" that they feel will prove that the wolves roaming Central Asia and the Himalayas are distinct from the gray wolf. ■

Tracy O'Connell is professor emeritus at the University of Wisconsin–River Falls in marketing communications and serves on the Center's communications and magazine committees.

Personal Encounter

Mollies in the Moonlight

By Laurie Lyman

As an elementary school teacher, I began studying wolves through the books and films of Dave Mech and Jim Dutcher more than 20 years ago, and I've been watching the wolves in Yellowstone National Park, documenting their travels and behavior ever since. I followed their reintroduction to Yellowstone, never thinking I would ever see wolves in the wild. But I took classes and purchased a spotting scope, and soon I was hooked. I decided that my heart was in Yellowstone and retired early to move near the park so I could watch the wolves.

Wolves wake me from sleep while it is still dark every morning of the year. Every day there is something new to see and learn. I never know from day to day what I will find as I make my way through the darkness to reach the park at first light.

I write a daily, online journal for *Yellowstone Reports* to share the wolves' stories with everyone. The following is a journal entry I made January 22, 2016. My entry exemplifies the true magic of Yellowstone and its wolves.

Lamar Valley in the Northern Tier of Yellowstone

We found the Mollie's Pack early this morning in the Old Druid Rendezvous, howling to beat the band. Soon after, they took off to the east, making their way along the bank of the river— nothing too serious, with lots of play. There was a lone howler west of them; it was a missing gray, somehow separated from its family. It howled and howled this pitiful, mournful howl. The group howled back a few times but was not intent on going back or attending to one wolf lagging behind. After the Mollies had gone quite a way to the east, it finally abandoned its howling and sprinted for the group. We did not see any aggression when it arrived to rejoin the pack.

After a trip down to the river where it curves sharply at the end of the cottonwoods, the pack re-emerged and bedded on the river bank east of the Chalcedony Fan that stretches to the Lamar Valley floor. The wolves remained there until about 5:45 in the evening.

The Lamars were not seen by anyone today, though many people looked for them. They were in the trees southeast of the Soda Butte Cone, one of Yellowstone's many active thermals in the Soda Butte Valley adjacent to the

Vision Hawk Films

Doug McLaughlin

Lamar Valley. It was not until evening that we heard from them.

Around 4 p.m., someone spotted a carcass on a distant slope with rolling hills. Most clearly visible were the antlers of a good-sized bull elk.

Often as the day comes to an end, the puzzle pieces fall into place. The Lamars had made a kill; perhaps they heard the Mollie's Pack howling and headed for the hinterlands. We also saw golden eagles eating on a coyote carcass on the flats close to where the Mollies had been this morning. The coyote must have gotten just a little too close to the pack.

Around 5:45 p.m., everyone else had departed for the day. Only one couple and I remained. The Mollies had begun to stir and there was a big group howl. This time, the Lamars howled back from where we had been looking, but deep in the trees. The Mollies howled a few times, and then the pack headed east. I was glad that the Lamars appeared to be in a safe place. It was getting darker and darker. The full moon was obscured by some thin clouds but I could still see the wolves.

By 6:30 I was there alone. All the stars had lined up for me. There was a full moon, and I have a great scope that lets me see in very low light. The clouds had parted, so the moon was lighting up the whole valley. I had the warmth of my car and a window mount for my scope. Perfect!

I watched as the Mollie's Pack came toward me. They were soon on the open Middle Flats. As they traveled along the creek bank, I could hear them muttering in squeaks and muffled growls as they shuffled through the crusted snow. They let loose another robust howl, much closer, which startled me at first. The Lamars returned the howl and seemed further away again. The Mollies kept coming. It was like watching them in the daylight. They came to the edge of the Middle Flats and dropped down to the Soda Butte Creek Flats, which brought them even closer to me. They were scent trailing, and I am thinking they were on trail left behind by the Lamars during their elk hunt. It was steep, and many of the Mollies had to take a leap of faith into the powdery snow, with some of them just holding on and sliding down. (As with all wolf packs, there are a few laggards who exhibit extra caution.)

Around 8 p.m., the wolves rallied

Photo courtesy of Laurie Lyman

Doug McLaughlin

together with wagging tails and had another resounding group howl. It filled the car—just unbelievable. I hadn't had a group howl that close, ever. I felt it bring me right out of my seat.

The Lamars did howl again, ever so faintly, to this pack that greatly outnumbered them. The next thing I knew, the Mollies had their tails up and began to run. I thought for sure that they had smelled that carcass. Up they went, onto the slope—in the totally wrong direction. I lost them for a few minutes while they might have changed directions. Then I located the carcass and waited a bit to see if they would come out near it.

Sure enough, there they came. This was it. They found the carcass, and I was celebrating in the car.

Oops—they went right under it and passed it. How could they miss it, with their noses?

They went up the hill again, most likely in the footsteps of the Lamars. One gray hesitated; it knew the way to go to the carcass, but did not follow its senses, and returned to the others as they disappeared into the trees. Luckily, they were in scattered trees, so I could see the pack sniffing and sniffing. Now they were just above the carcass, and finally got the scent and turned downhill. They went into a stalk position as they approached the carcass. (Can't be too careful; you never know who could be there!) The youngsters bolted as many of the adults watched.

By this time it was 9 p.m. and getting very cold. I watched them for a while longer. They were all at the carcass when I left. I hope they will be there tomorrow.

I will never forget and always treasure this special moment I spent with the Mollie's Pack in the Yellowstone moonlight. ■

As an elementary teacher, Laurie Lyman began to study wolves through books and films by Dave Mech and Jim Dutcher. Following the reintroduction of wolves to Yellowstone, she decided her heart was there and retired early to watch the wolves. She writes a daily report for the online Yellowstone Reports. This article is based on a journal entry from January 22, 2016.

Photo courtesy of Laurie Lyman

Laurie Lyman poses with the 2013 "Who Speaks For Wolf" award presented to her by the International Wolf Center.

Gregg Zimmerman

What Will Happen When Wolves Show Up?

By Nancy jo Tubbs

Dr. L. David Mech asked in the title of his 2017 paper in the journal Biological Conservation, "Where can wolves live and how can we live with them?" It's a pithy, key question, the answers to which will determine the future of wolves in places dominated by human populations.

The piece is an 11-point primer on "the recovery of wolves, their benefits and values, the ways in which they conflict with humans, and the potential for their expansion into new areas. It concludes that wolf conservation will best be accomplished by each responsible political entity adaptively prescribing different management strategies for different zones within its purview. Some zones for some periods can support total protection, whereas in others, wolf numbers will have to be reduced to various degrees or removed."

In the U.S., as in Europe, dialogues about management strategies include those who want wolves to be recovered and protected ...or just to be managed for sustainability... those who want to hunt and trap wolves for sport, and some who would like wolves to be extirpated, period.

That excerpt from the abstract will lure a curious reader into the extensively footnoted paper that lays out the case for the compromises necessary among humans to continue to allow wolves on the landscape. The paper is also peppered with specifics that illustrate the challenges wolves face in the United States and Europe.

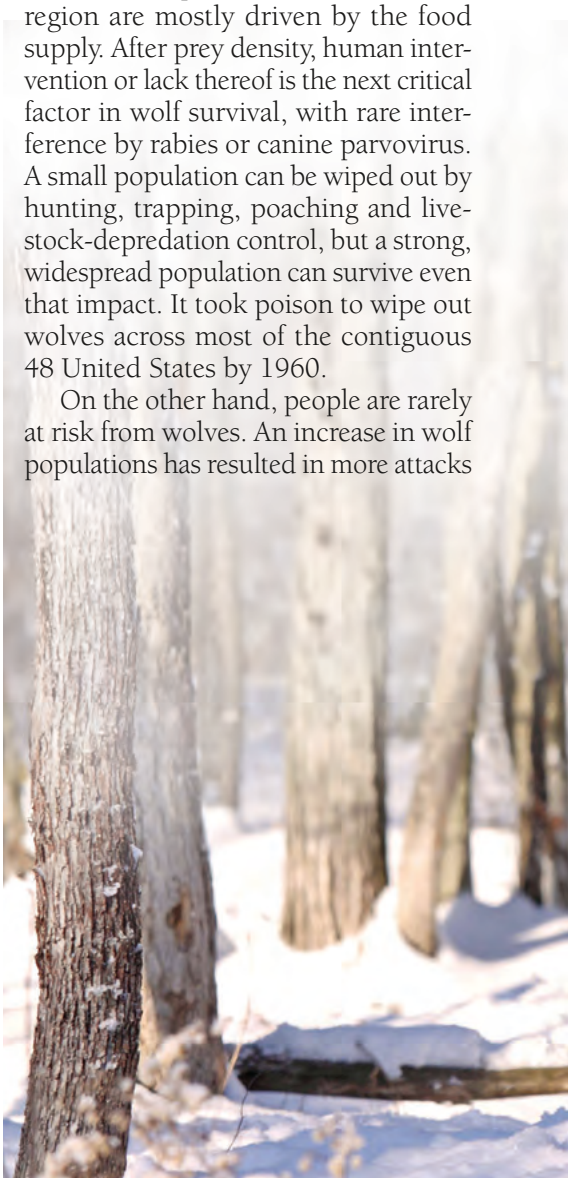
"In France, for example, shepherds were so irate over wolf depredations that a group of about 50 shepherds kidnapped both the president of the National Park of Vanoise in the French Alps and the director, demanding that five wolves in the middle of the park be killed. Sweden, with about 400 wolves, has established a wolf hunting season in violation of European Union Law. Switzerland recently spent $44,000 to kill a single wolf."

In the U.S., as in Europe, dialogues about management strategies include those who want wolves to be recovered and protected everywhere in their original range or just to be managed for sustainability where they are minimally in conflict with human needs, those who want to hunt and trap wolves for sport, and some who would like wolves to be extirpated, period.

Ideally those dialogues would be influenced by the scientific findings of 50 years of research, and the paper lays out those pertinent facts as they are currently understood.

For example, wolf numbers in a region are mostly driven by the food supply. After prey density, human intervention or lack thereof is the next critical factor in wolf survival, with rare interference by rabies or canine parvovirus. A small population can be wiped out by hunting, trapping, poaching and livestock-depredation control, but a strong, widespread population can survive even that impact. It took poison to wipe out wolves across most of the contiguous 48 United States by 1960.

On the other hand, people are rarely at risk from wolves. An increase in wolf populations has resulted in more attacks



on humans by healthy, non-rabid wolves than in the past, although, as Mech says, "they are nowhere near as prevalent as some thought they would be. Still wolves have chased bicyclists and motorcyclists, and in several areas, people have fed wolves, habituating them and ultimately promoting attacks. Even close encounters foster the widespread and exaggerated perception that wolves are far more dangerous to humans than they are."

Wolves tend to be afraid of humans and avoid them, evidenced by the fact that in Canada, with 50,000 to 60,000 wolves, only one person has been killed by wolves in the last 50 years.

In response to "where can wolves live?" the answer is not likely to include suburban or urban areas. Even places like Los Angeles that somewhat tolerate coyotes are unlikely to accept the presence of a wolf pack. But as wolf populations increase and some individuals disperse they are more likely to approach such areas.

Mech reports, "Wolves now live within a few km of Rome and have walked through the city streets in Romania, although with no reported conflicts. In 2016, wolves attacked a mare and her foal in Katzrin, Israel, the capital of the Golan Heights, and earlier rabid wolves attacked children in Katzrin. Similarly, in North America, wolves are becoming more habituated to humans. A pack of five recently killed a deer in the middle of Banff, Alberta, Canada (population 9,300) and dragged it down Cougar Street. In Wisconsin, a pack regularly headquartered along and on a state highway, and a wolf jumped into the back of a truck that had stopped to watch them."

Laws in the U.S and European Union allow wolves to move into new areas, with a major difference being that the states, unlike Europe, have more extensive wildlands where wolves could become established. As court rulings continue to sustain or change wolf protections and states' prerogatives to manage wolves, Mech's conclusion is that local culture and politics should determine conservation policies and management strategies for handling wolf numbers and distribution, minimizing conflict with people.

"What can we all do to promote human tolerance?" may be the next key question. Two strategies that Mech says have had somewhat discouraging results are objective education about wolves and exploring non-lethal means of reducing wolf depredation on livestock.

He concludes with the reality that no magic formula or perfect solution exists for humans and wolves living in proximity to one another. Instead, the answer to the key questions in this arena will require finding and instituting "more or less acceptable and often controversial compromises." ■

Nancy jo Tubbs chairs the Center's board of directors and owns Camp Van Vac, a summer resort near Ely, Minnesota.

Adobe Stock / Karlumbriaco

Book Review

American Wolf: A True Story of Survival and Obsession in the West

Book review by Debra Mitts-Smith

In *American Wolf*, Nate Blakesee begins his tale where the story of Wolf 06, one of Yellowstone's most famous wolves, ends—with a hunter raising his rifle, sighting his scope and choosing between O-Six (as the author calls her) and her mate, Wolf 755.

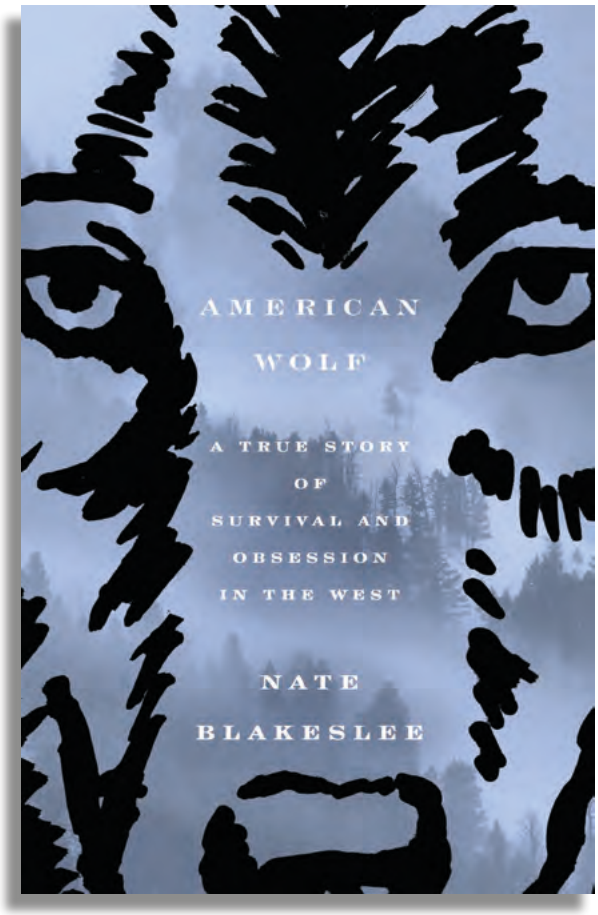
Nicknamed for the year in which she was born, O-Six is a descendant of two of the first wolves reintroduced to Yellowstone, Wolf 10M and Wolf 9F, members of the Druid Peak Pack. Drawing on notes and interviews from Yellowstone Park naturalist Rick MacIntyre and wolf watcher Laurie Lyman, Blakesee describes O-Six as she surmounts the critical challenges that wolves in the wild face, from finding a mate to hunting elk, leading her pack, defending territory and raising pups.

When O-Six and her mate succeed in claiming the Lamar Valley, her notoriety and popularity spread, causing wolf watchers and Yellowstone visitors to flock there to watch her and her pack. But not everyone is enamored with O-Six and what she represents—the return of the wolves to Yellowstone and the West. Guides, and subsistence hunters who depend on elk meat to survive, view wolves as competitors, while ranchers see them as dangerous to their livestock. All of them consider wolves to be threats to their way of life.

Blakesee intertwines the story of O-Six with those of Yellowstone Park Ranger Rick MacIntyre and Steve Turnbull (a pseudonym), the hunter who legally kills O-Six outside Yellowstone. Through the use of alternating perspectives, Blakesee crafts a compelling narrative that allows him to explore in a profound and intimate way the cultural, political, social and economic factors that keep the presence of wolves in the West controversial.

For those who have fondly followed and admired O-Six, Blakesee's work serves not only as a moving tribute but also an explanation of the circumstances and human fears that precipitated her death. For others who did not know of O-Six, or who are trying to comprehend the anti-wolf sentiments of the West, this book is an excellent introduction to the range of emotions that wolves engender still, more than 20 years after their reintroduction to Yellowstone. ■

Debra Mitts-Smith is a School of Information Sciences faculty member at the University of Illinois. Her research and teaching focus on visual culture and children's literature, history of the book and storytelling. Her book, Picturing the Wolf in Children's Literature, *was published by Routledge in 2010.*



American Wolf: A True Story of Survival and Obsession in the West

Publisher: Crown
320 pages

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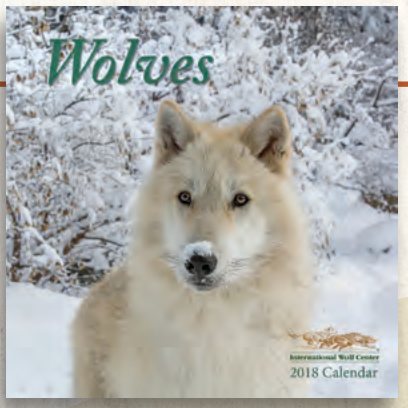

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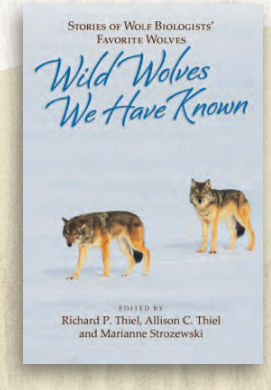

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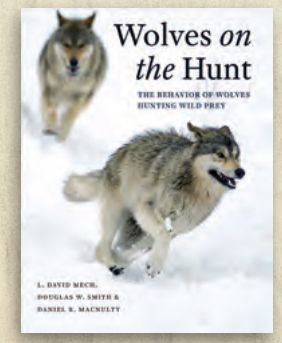

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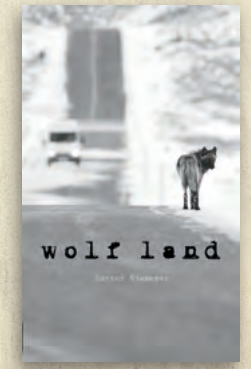

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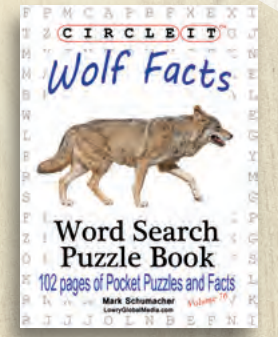

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Steven Hougium