INTERNATIONAL WOLF

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FALL 2019

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VOLUME 29, NO. 3 THE QUARTERLY PUBLICATION OF THE INTERNATIONAL WOLF CENTER **FALL 2019**

New Exhibit Opens to Rave Reviews

A new experience awaits you at the International Wolf Center in Ely! The colorful, sensory-rich new exhibit combines technology and creativity with sights, sounds and activities to teach and entertain at the same time.

Chad Richardson

Women and Wolves

These four female biologists study different aspects of wolf behavior and survival. In part one, the author looks at their backgrounds and research topics—and shares fascinating stories about the realities of field research on an apex predator in the wild.

Debra Mitts-Smith

Wolves and Moose Calves in Minnesota's Arrowhead Region

The author explores the relationship between wolves and moose in Minnesota, where a declining moose population is not entirely attributable to predators. Minnesota DNR research shows how wolf predation affects those numbers—and how it does not.

Bill Severud

My Time with Male 911

Veteran wolf researcher Doug Smith reflects on one of his notable subjects—Wolf M911, a denizen of Yellowstone and a pack leader in his younger days—and on the ways in which nature affects wolves, and wolves affect the humans who study them.

Doug Smith

On the Cover

Photo: Adobe Stock/Dvorakova Veronika

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A Gala to Benefit the International Wolf Center.

Thank you, Lori Schmidt, for 30 years of leadership

Ely Echo

Lori Schmidt (left) and Nancy jo Tubbs

It would be hard to decide, after Lori Schmidt's three decades as curator at the International Wolf Center, whether her strongest talents lay in the skilled observation of the wolves in her care, or her charismatic instruction of the humans who come to learn about them. Wolf Care staff, volunteers, visitors, web-watchers and hundreds of supporters rely on Lori's logs and commentary, webinars and pup-year events as they follow each wolf, its personality and its behaviors.

Lori is at the top of her game, whether kneeling in the snow at 20 below zero to check a wolf's injury or keeping an eye on pack dynamics that can change over time—in a month, in a day or in a minute.

In 2020 Lori will work with a team of volunteers, staff and paid participants to socialize and introduce yet one more generation of wolves to the Center's pack.

Lori notes that the introduction of new pups to the International Wolf Center's resident pack has always been a challenge, lightened by the sometimes-surprising behavior of these social carnivores. One such moment was the touching welcome of young Shadow and Malik by the pack leader, MacKenzie, who simply lay on her back in submission to the pups, reaching up to hug Shadow. In another surprising development, the older, experienced Shadow chose the timid, low-ranking Maya as a mate—the duo, pair-bonded, often seen walking in parallel step.

A "lifetime moment," Lori noted, happened after she removed Luna to the retirement area, and then watched Luna's mate, Aidan, the dominant male of the Exhibit Pack, take a strong role in raising incoming pups, Grayson and Axel.

Lori has guided introductions to the pack for most of the Center's 19 wolves, and handled the departures of those who are "gone but not forgotten." On one of the hardest days for wolf-care staff, the beloved white wolf, Shadow, was euthanized after a struggle with cancer. He was held in Lori's lap in the final moments of a profoundly trusting relationship between wolf and curator.

Former Center Executive Director Walter Medwid, who worked with Lori for 14 years, said of Lori, "She manages and cares for the Wolf Center's wolves like the rest of us might ride a bike. Her display of confidence, supreme knowledge and wisdom while surrounded by a few hundred pounds of wolves is a test that Lori passes with flying colors every day. She navigates with grace the tricky terrain of each wolf expressing its personality toward her and its pack mates. And always, the stakes are high with these most complex of critters."

Playing Pied Piper to her many, many human fans, and excelling as wolf expert and wolf wrangler requires a compelling combination of character traits. The Center has been gifted with Lori's dedication to her work and her generous sharing of those unique traits.

We hope that these 30 years are just a beginning. ■

Nancy jo Tubbs

Nancy jo Tubbs
Board Chair

INTERNATIONAL WOLF CENTER

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New Exhibit Opens to Rave Reviews

Discover Wolves! debuts at the International Wolf Center

By CHAD RICHARDSON *Photos by International Wolf Center staff*

Visitors to the new *Discover Wolves!* exhibit at the International Wolf Center have declared it a howling success.

The immersive and hands-on experience opened to the public in mid-May. With both wolf biology and exhibit technology changing, the Center board knew an update to its *Wolves and Humans* exhibit was necessary and eventually decided to develop a completely new exhibit.

"Visitors today expect a different experience from those in the 1980s or 1990s," said Krista Harrington, the interpretive center manager. "Here they'll get a hands-on, technology-rich experience that entertains and educates kids and adults."

"As the first visitors explored the exhibit, it was thrilling to see the smiles on their faces," she continued. "The new exhibit brings a creative spark to their educational adventure in the world of the wolf."

Discover Wolves! was funded primarily by the Legislative-Citizen Commission on Minnesota Resources, along with a major commitment by the Center's board of directors and donors.

"Planning for this project started four years ago, so to see the wolf den, the science lab and artifacts in place at last was a magical experience," said the board's chairperson, Nancy jo Tubbs. "It's more fun than I could have imagined."

Exhibit Features

A stunning photo mural leads visitors down a ramp and into the new exhibit space. The mosaic, which looks from afar like a wolf resting, is made up of thousands of small images. The closer one gets, the less like a wolf the mural appears, as individual images reveal themselves. Once you step back, those individual images fade and the bigger picture of the wolf is again visible.

Learn how wolves were important to various cultures over time.

Take a seat in a simulated airplane cockpit, push a button, and take off on a pack-tracking mission over a frozen lake.

Just inside the new wide-open exhibit hall, a wolf den is built into a rocky cave. Visitors are able to step up to the den and look inside to see video of real wolves in a real den.

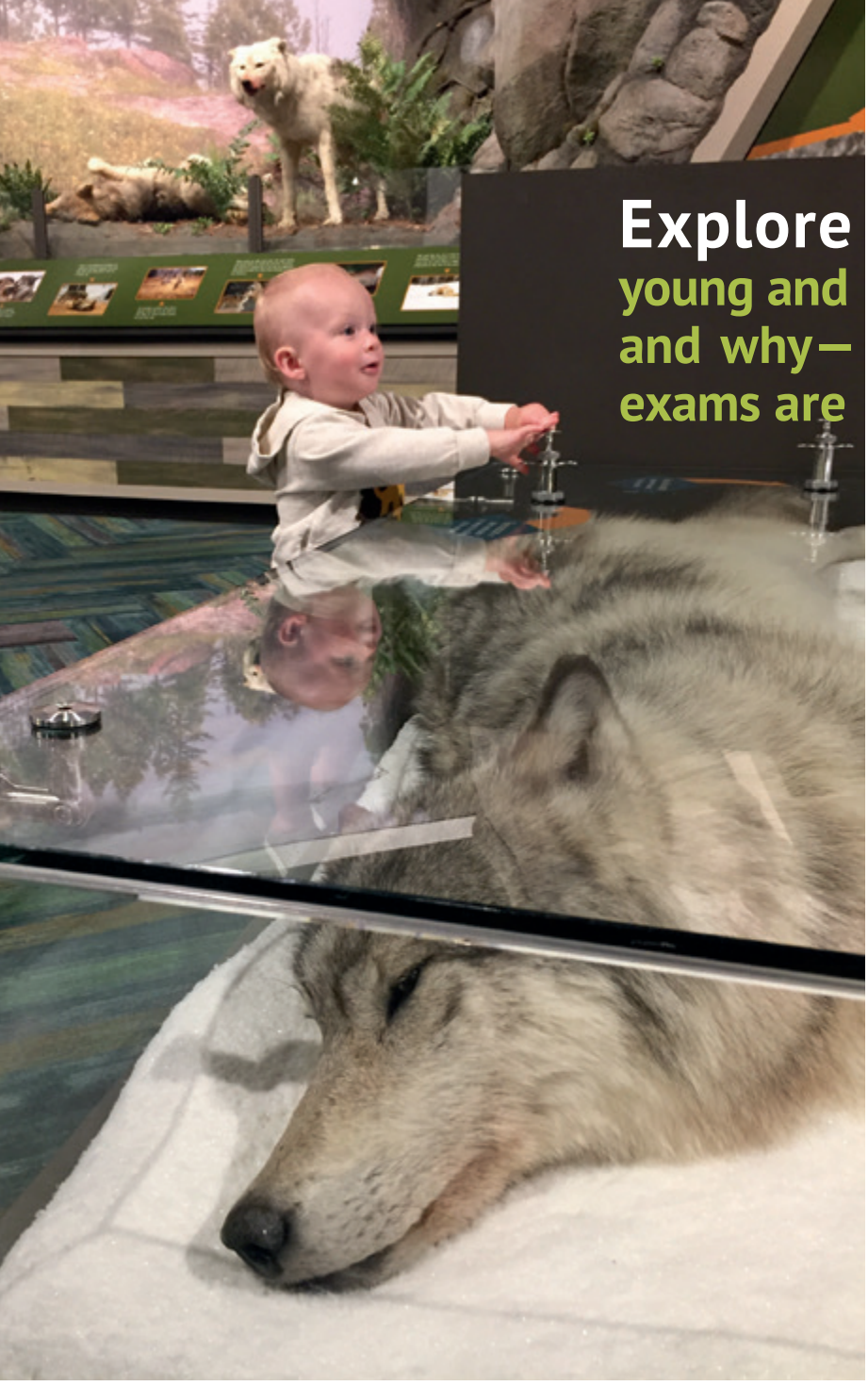
In another display, the distance covered by a wolf on a given day is highlighted on a map of the northern United States. The distance, 30 miles, is but a small trek across the vast north country. That illuminated track grows considerably when visitors press the second button, showing how far a wolf can travel in a month (600 miles). The third and final track shows what 3,000 miles looks like on a map of North America—the distance wolves can travel in a year. The display also notes wolves sometimes travel much farther, up to 8,000 miles a year, if prey is scarce.

Nearby, a simulated airplane gives visitors a chance to see how researchers track wolves from the air. Once a guest takes a seat in the cockpit and pushes a button, the adventure begins. Four screens encircle the guest, making it appear as though he or she is in the cockpit of a small airplane. The plane takes off from an ice-covered lake in Ely with Dr. Shannon Barber-Meyer appearing to ride in the front seat next to the pilot. Barber-Meyer, a United States Geological Survey wolf biologist with Dave Mech's wolf and deer research project in the Ely area, explains how she uses radio telemetry to track wolves in the wild. Near the end of the adventure, Barber-Meyer and the visitor successfully locate the wild pack.

Imagine hearing the rising howl of a wolf pack in a northern lights-themed room. Upon stepping inside and closing the door, visitors simply hit a button and the exhibit comes to life with surround-sound speakers and the mesmerizing colors of the aurora.

Outside the howling room, sets of headphones allow visitors to hear a defensive wolf howl, a lonesome-sounding wolf call and then a coyote howl. Hearing them all so clearly shows how wolves communicate vocally and how different coyotes sound compared to wolves.

The role of wolves as apex predators is illustrated in bold detail with a display of taxidermy that includes a deer and two wolves. Visitors see how large prey animals like bison and elk are in



Explore a field exam station where young and old alike can learn how—and why—these field exams are done.

comparison to the wolves that must kill them for food.

In another area of the exhibit, three screens depict in videos the varied human perceptions about wolves. Visitors hear from a Wisconsin farmer who believes farmers should be able to use lethal control to defend their livestock against wolves. An Oregon rancher who operates a predator-friendly farm also shares his family's values about predators. A biologist then appears on screen to address the issue from a scientific perspective.

At a science lab within the exhibit, a microscope allows young and old to get a close-up view of wolf, moose, deer, snowshoe hare and beaver fur.

Historic artifacts illustrate how important wolves were to various cultures over time. Included in the display is a stunning hand-beaded mask in the shape of a wolf's head. The mask had been presented to the Center's founder, Dr. L. David Mech, who in turn donated it to the Center for display.

As visitors leave the exhibit, they're encouraged to take a quick, 10-question quiz about wolves to see how much they learned from the discovery adventure.

Exhibit Creation

The project began in earnest in February 2018 during a planning meeting in Ely with the designers and center staff and board members. An additional meeting was held in Minneapolis for staff and board to further determine the overall approach to the exhibit. A smaller team then worked closely with the designers, Split Rock Studios in St. Paul to put ideas on paper. During the next year, every educational fact and design detail was pored over until final approval by the Center team.

Installation of the new exhibit began in mid-April and was finished by mid-May. The Center hosted a ceremonial grand opening on June 28 in an event that included Ely dignitaries, state legislators, Ely-area residents and business owners, staff and board members, and Center members and donors

The previous exhibit, *Wolves and Humans*, was viewed by hundreds of thousands of visitors to the Center since it opened in 1993. Prior to its installation in Ely, the exhibit, created by the Science Museum of Minnesota, was on display there and then toured the United States and Canada, where it was viewed by 2 million people. Many pieces of the former exhibit were used in the new installation. The former exhibit can still be viewed online by visiting www.bit.ly/wolvesandhumans. ■

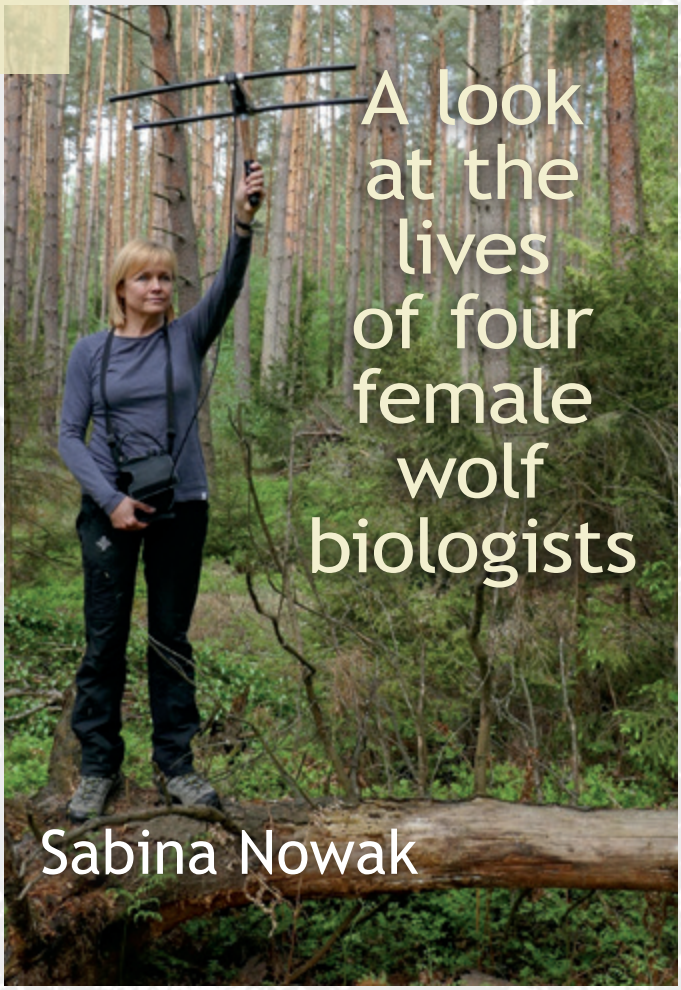
Chad Richardson is the administrator at the International Wolf Center.

Courtesy of Diane Boyd

Courtesy of Yolanda Cortés

Women and Wolves

Courtesy of Shannon Barber-Meyer



Robert Mysłajek

By DEBRA MITTS-SMITH

Wolf biology research is often thought of as a male profession. Yet women have played, and continue to play, a leading role in the study of *Canis lupus*.

To highlight their contributions, *International Wolf* interviewed four female wolf biologists: Diane Boyd, Yolanda Cortés, Sabina Nowak, and Shannon Barber-Meyer. Although many women are involved in wolf research, the background and experiences of these women offer a sample of the kinds of work being done. Each of these biologists works for a different type of agency in a different part of the world. Although political, geographical, historical and sociological aspects of their research make parts of their work unique, many activities and challenges involved in studying such a controversial species are similar. Several of these women are pioneers; not only are they women in a predominantly male profession, they also performed some of the earliest research on wolves in their respective countries. This first part of a two-part feature focuses on their educational backgrounds and most memorable work experiences.

Education and work:

Intellectual interest and concern for animals led each of these women to become a wildlife biologist. The profession requires not only a bachelor's degree in a demanding field, but also advanced degrees. Volunteer work, paid internships, work on research projects and independent research provide necessary field experience while expanding a scientist's knowledge of wolves and wolf conservation.

Diane Boyd is one of the female pioneers in wolf research. Although she grew up in the Twin Cities of Minnesota, Boyd loved nature, being outdoors and learning about wolves. In the early 1970s, the Como Zoo in Saint Paul opened a new wolf exhibit that provided a more realistic landscape and living space than was typical for that time. Boyd remembers going to the zoo and watching those wolves.

She began college as a pre-veterinary student, but after working for a veterinarian, decided that she wanted to do more than spay and neuter pets. She switched her major and graduated from the University of Minnesota with a BS in wildlife conservation.

After graduation, Boyd pursued opportunities to work with wildlife. As a volunteer at a University of Minnesota captive wolf colony in Forest Lake, she gained experience working with captive wolves and learned from Dr. Jane Packard, an animal behaviorist who was studying wolf reproduction. Her next job took her to northern Minnesota where, under the direction of Dr. L. David Mech, she helped live-trap, radio-collar and count the last viable wild wolf population in the lower 48 states.

In 1979, Boyd headed to Montana to help the Wolf Ecology Project track Wolf W114, the first radio-collared gray wolf from Canada to recolonize the western United States. At the same time, she began graduate studies in wildlife biology at the University of Montana, successfully defending her dissertation *Dispersal, Genetic Relationships, and Landscape Uses by Colonizing Wolves in the Central Rockies* in 1997. Over the next two decades, Boyd studied and lived among wolves recolonizing Montana. To this day, when she talks to Montanans about wolves, she stresses that these wolves are not like the wolves of Yellowstone. "These wolves came on their own; nobody brought them here."

Chad Richardson

In 2016, after a brief retirement, Boyd returned to studying and working with wolves as the wolf management specialist for Montana Fish, Wildlife and Parks, Region 1. She continues that work today.

Yolanda Cortés knew, even as a child growing up in Madrid, Spain, that she wanted to study animals and become a zoologist or a veterinarian. "Of all wildlife, mammals were my favorite, particularly carnivores. And wolves have always been one of the most fascinating and attractive species to me," she says.

Cortés credits Spanish naturalist Felix Rodriguez de la Fuente's nature documentary with further inspiring her interest in wolves. Even before completing her undergraduate degree in biology at the Faculty of Biological Sciences, Complutense University of Madrid, Cortés was involved with research projects investigating other carnivore species such as European badger *(Meles meles)*, Euroasiatic otter *(Lutra lutra)*, stone marten *(Martes foina)*, Genet *(Genetta genetta)*, Euroasiatic wild cat *(Felis silvestris)*, and Iberian lynx *(Lynx pardinus)*.

Aside from a few scientific papers and books by Spanish researchers, there was very little research on wolves in Spain then. In 1997, Dr. Juan Carlos Blanco, a well-known wolf researcher, asked her to work with him on a project to study wolves in Cantabria, an autonomous region of Spain. This marked the beginning of her research on wolves and her longstanding collaboration and friendship with Dr. Blanco.

In 2001, Cortés earned a Ph.D. in Biology from Complutense University of Madrid. Her dissertation, *Ecology and Conservation of Wolves in Agricultural Habitats of Central Spain,* was about the radio-collaring of eleven wolves that lived in central Spain, in environments inhabited and altered by humans—and only the third thesis about wolves written in Spain. Since then, she has continued to study wolves and wolf conservation for non-governmental and public agencies.

Cortez (left) holds a mastiff pup—one of the livestock-guarding dogs that help make possible farmers' coexistence with wolves.

Sabina Nowak grew up in Katowice, in southern Poland, an urban area where mining and metallurgy made it one of the most industrialized and polluted places in the country. Resultant damage to wildlife spurred her interest in wildlife protection. In the 1980s she earned bachelor's and master's degrees in biology from the Faculty of Biology and Environmental Protection at the University of Silesia.

For most of her career, Nowak has worked independently, leading local and national conservation efforts targeting the protection and conservation of large carnivores. In 1996, she helped found the Association for Nature-Wolf, a non-governmental agency that advocates for the protection of the wolf in Poland. During this same time, Nowak conducted independent research on wolves in the Bialowieza Primeval Forest and the western-most edge of the Carpathian Mountains. Wlodzimierz and Bogumila Jedrzejewski, two of Poland's top wolf biologists, encouraged her to pursue a Ph.D., and in 2003 she successfully defended her dissertation, *Population Dynamics, Ecology, and Problems of Wolf Canis Lupus Conservation in the Silesian and Zywiec Beskid Mountains.* Today she continues advocating for wolves through teaching, wolf-habitat conservation, research, developing methods to prevent livestock depredation, and helping rescue wolves injured by traps or vehicles.

Shannon Barber-Meyer majored in biology, with chemistry and mathematics minors, at Eckerd College in Florida. Although her original goal was to study dolphins, she became intrigued by the complex social lives of wolves during a wolf-ecology course in Minnesota, and a different dream began. In 2006 she earned her Ph.D. from the University of Minnesota, under the direction of Dr. L. David Mech, in wildlife conservation with specializations in ecology, evolution and behavior. While working on her doctorate, Barber-Meyer captured wolves for radio-collaring and studied summer feeding habits of wolves in Minnesota's Superior National Forest. Her 2006 dissertation, *Elk Calf Mortality Following Wolf Restoration to Yellowstone*, focused on the predation (by wolves and other carnivores) of elk *(Cervus elaphus)* calves in Yellowstone. Barber-Meyer's post-doctorate work included monitoring the Emperor Penguin *(Aptenodytes forsteri)* for the Scripps Institution of Oceanography and working on tiger *(Panthera tigris)* conservation for the World Wildlife Fund. Her first "real" post-graduate-school, wolf-biologist job was as the Mexican wolf field-team leader at the Arizona Department of Game and Fish. Barber-Meyer currently serves as a research wildlife biologist with the U.S. Geological Survey, studying wolves and white-tailed deer *(Odocoileus virginianus)* with Dr. Mech in the Superior National Forest.


Courtesy of Shannon Barber-Meyer

Expecting the unexpected

A "typical" day in the life of a wildlife biologist is never typical. Daily work may include tracking radio-collared wolves, writing a grant proposal or research report, analyzing data, attending meetings, speaking to a group of students, talking to a farmer in the aftermath of a wolf attack, performing a necropsy on a wolf or its prey, or even searching for an injured wolf in the wild. Still, there are days that are more memorable than others.

Nowak recalled, "When wolves started to recolonize western Poland, the first family groups preferred to reproduce on military training campgrounds, which are common in that region—remnants of Communist times and the Cold War. For most of the year, the overgrown buffer zones of shooting fields are left undisturbed by people, so the only inconvenience is the occasional noise of tanks and explosions, which the wolves have learned to ignore."

Every spring, Nowak and her team looked for wolf dens on the military bases. When they found one, they mounted cameras to monitor the site. On one late-May day, when one of the cameras failed to record, Nowak hiked out to check on the den where they had spotted wolf activity in April. As expected, the area in front of the den was covered with freshly dug sand, but no wolves were visible. "Suddenly, from a distance of several meters, I saw a heap of tiny bodies—four wolf pups, two-to-three weeks old, napping in the heather two meters from the den." Seeing no adult wolves, Nowak approached the pups to photograph them. Three of the pups woke up and sniffed in her direction. "They were beautiful, cute and fragile. Seeing them triggered a flood of affectionate emotions in my brain."


Robert Mysłajek

Nowak credited this experience for giving her insight on how wolves may have become domesticated. "Many thousands of years ago, we lived lives similar to those of wolves, in groups of kin, roaming through vast areas, foraging and hunting large prey. The human mothers collected fruits, bulbs and edible plants for their families. When they came upon a litter of wolf pups, they probably had an affectionate reaction similar to mine, which inspired them to bring some pups back to their camps. Perhaps they gave the pups to their children to play with, and the pups accepted their new families. Those that were calm and tame survived and likely became ancestors of the dog."

In 1997, Dr. Blanco offered Cortés the opportunity to work on a research project on certain bird and mammal species in the Cantabria, funded by the University of Cantabria. Part of Cortés's job would be to determine the status of the wolf population in the region and evaluate the challenges and risks they faced. Aware of the value of working with a well-known

researcher, she left Madrid and moved to Santander, Spain. On her first day, Dr. Blanco introduced her to Nardo, one of the rangers in the Cantabrian Mountains. Nardo showed Cortés around the area, including the site of a wolf pack's former den—a site that his father, also a ranger, had shown him. Supposedly the den was no longer in use, since there had been no wolves in the area for a long time.


Courtesy of Yolanda Cortés

"After some time searching below the trees and the heather, we found the den," Cortés said. Everything showed us that it was still in use. When we looked into the opening, we saw six small pups. I could not believe that on my first day as a wolf biologist, I would have pups in my hands! It was an indescribable experience. It was also the only time in my career that I caught wild wolf pups, as we never interfere with packs in this way, and it tied me forever to this species."

In 2002, Barber-Meyer experienced first-hand some of the challenges and triumphs of studying a species as elusive as the wolf. She and two technicians were studying the summer feeding habits of wolves in the Superior National Forest in northern Minnesota, using GPS collars to track the movements and locations of wolves. Unlike today's GPS collars, which can transmit data to a website accessible from any computer, most early GPS collars required researchers to retrieve the actual collar (and the wolf wearing it) before they could download data. Barber-Meyer and her team were lucky; twelve days earlier, the female wolf FW845 had been caught and fitted with a new kind of collar—one that allowed them to obtain information about the wolf's movements from a distance. It was still challenging, however, as it required an antenna and a receiver, and researchers had to be within a half-mile of the collar to download data. This meant that they had to hike to where the wolf was, hoping the wolf did not move before they reached it. The dense forests and few roads made signals difficult to locate and required arduous hikes over rough terrain. Barber-Meyer had programmed the collar to take location readings every 10 minutes.

"Each day, we attempted to download her location data, which told us where she had been the previous 24 hours, and we hiked that same day to investigate places she might have killed and eaten her prey."

On a late afternoon in June, having downloaded the data, the team geared up for a backcountry hike. The weather was 60°F and overcast with thunderstorms. By the time they reached the locations, deep in the heart of a cedar swamp, the daylight was quickly fading, and a thick canopy and heavy rain further reduced visibility. They searched the clusters but found no evidence of a kill.

Barber-Meyer recalled, "Finally, on hands and knees, I began scouring the wet dirt of the last location, in what appeared to be a wolf bed— desperately hoping we had not gone to all this effort for an 'inconclusive' entry in the database. And then I found it—a piece of flesh with fawn fur on it. It was less than 2x2 cm (about a square inch), but I held it up like a trophy and shouted to the two technicians, 'I've got it!'"

Prize in hand, the group moved quickly to get out of the woods before it became too dark to navigate the wet, rocky terrain. "Our study area is in the famed Iron Range, and our compasses spun wildly as we crossed over iron deposits. Our GPS unit was not reliable if it got wet, so we had it in a plastic sandwich bag, but the rain was so heavy it was hard to read the screen through the plastic," Barber-Meyer said.

Finally, they made it back to the road, soaking wet and full of joy.

It was after 9 p.m. when they got back to the field station. Drenched and exhausted, Barber-Meyer triumphantly held up the tiny piece of flesh—that one bit of evidence that showed FW845 had eaten a fawn yesterday—to the wildlife biologist in charge of field operations.

"Looking up at me from his desk, where he was working on a manuscript, he said with a wry smile, 'And you get to get up and do it all over again tomorrow morning.'"

For Boyd, working in in the wild provided a vivid reminder that humans are not always the top predators. In the summer of 1987, she and Kurt Aluzas, a volunteer, were in the field drugging, collaring, and checking blood and weights on wolves. They had finished their tests and were beginning to pack up. The drugged she-wolf asleep on the ground was beginning to stir. Then they heard it—a twig snapped. Looking up, they saw a grizzly bear *(Ursus horribilis)* running out of the woods toward them. Boyd believes that the smell of blood had attracted the bear.

"This was before bear spray, and the only way we knew to protect ourselves was to make noise. So I started yelling and slapping my hand against my clipboard and stomping my feet." The bear retreated.

Boyd and Aluzas had resumed gathering their gear—more quickly this time—when they heard it a second time. A twig snapped. The bear had returned, looking menacing. They grabbed their gear, picked up the now-awakening wolf, an exercise Boyd described as akin to "hauling a six-foot-long, 80-pound semi-conscious sack of potatoes," and ran for their vehicle. Throwing their gear and the wolf on the back seat, they drove off, leaving behind one very disappointed bear. ■

The second part of this interview will appear in the winter 2019 issue of International Wolf.

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

Wolves and Moose Calves in Minnesota's Arrowhead Region

Adobe Stock/ RockyGrimes

By BILL SEVERUD

Wolves eat moose calves. That's what wolves do. But are there ways to decrease calf vulnerability?

Wolves are opportunistic hunters. They prey on vulnerable animals, whether young, old, sick, or otherwise most easily captured, killed and consumed. Wolves and moose have coevolved in boreal forests around the globe, playing the eternal game of predator and prey for eons.

And recently, Minnesota's moose population has been declining. Scientists were unsure why. Could wolves killing calves have a strong negative effect on the population? A team of researchers set out to understand the impact of wolf predation on calf survival and overall population growth.

According to annual aerial surveys conducted by the Minnesota Department of Natural Resources (MNDNR), the moose population in northeastern Minnesota declined about 53 percent from 2006 to 2019, from 8,840 to 4,180. Over this same period, MNDNR surveys indicated wolf numbers remained relatively stable state-wide, although U. S. Geological Survey studies showed that, in at least part of the moose range, wolf numbers were greatly increasing as moose numbers declined. But black bears are also numerous there and can have an effect on calf mortality. Previous moose research in the same area (2002–2008) reported low adult survival rates, and many collared moose died of unknown causes.

In response to the alarming, more recent decline in moose population estimates, MNDNR initiated intense studies on survival and cause-specific mortality of adult and calf moose during 2012–2017. These studies employed GPS collars, which allowed researchers to track moose in almost real time. Each collar sent a text message to researchers when it stopped moving for six hours—a sign that the moose had likely died. Researchers

could then launch a team to investigate the collar to find out when, where and why the moose had died. The adult study, conducted by MNDNR's Wildlife Health Program, observed that about one-third of collared adult moose were killed by wolves. Remaining deaths were attributed to various infections, parasites, undetermined health issues and accidents. Those moose that were killed by wolves often had health conditions such as parasitic infections or previous trauma that made them more vulnerable to predation.

The calf study was conducted by MNDNR's Forest Wildlife Populations and Research Group. The Moose and Deer Project Leader, Dr. Glenn DelGiudice, led a team of graduate students (Tyler Obermoller and me). The calf study also used GPS collar technology. In northeastern Minnesota, most moose calves are born in May; we looked for adult females whose movement patterns indicated they were giving birth (long-distance movement followed by relative stillness for many days). Once we suspected a mother moose had given birth, we allowed mother and calf to bond for several days before capturing and collaring the neonate. (We needed to handle the calves before they were too swift for us to catch them!) Mothers and calves typically stay together from birth until the calf is about one year old, when the mother may give birth to a new calf and chase off the previous year's young. Because we had GPS collars on mothers and calves, we could see how closely they stayed together. The collars also allowed us to know more precisely where, when and how calves died. We also could delay investigations until the mother was away to avoid stressing her.

Photo this page: Bill Severud

Once we received a text message that a calf was likely dead, we launched an investigation team. These typically were dispatched within a day so we could retrieve fresh evidence. On the scene, we spread out to comb the surrounding area for clues. Our first job was to determine if the calf was killed by a predator or was already dead due to another cause and simply scavenged. To establish this, we looked for signs of a struggle, bruising under the skin and blood sprays, all indicating the animal was alive when injured. If we found that a predator had killed the calf, we looked for species-specific patterns of feeding along with other evidence. Bears will peel hide from the carcass and then selectively feed upon organs before caching leftovers for later. Wolf packs generally consume all available tissues except the stomach contents, patches of fur, or hoof and bone fragments. These are

Minnesota DNR volunteers Roberta Ryan and Bradley Smith gather saliva from bite wounds on a moose calf carcass. DNA will aid in identification of the predator involved.

generalizations, so we also searched for corroborating evidence such as predator tracks, hair and scat. In a few instances, we were still stymied, so we swabbed bite wounds for saliva and tested the swabs for DNA to assign predator species. We used the preponderance of evidence to assign cause of death.

Nearly half of all calves born in May were dead by August. Predation by wolves and bears accounted for 84 percent of deaths. Wolves were responsible for 77 percent of these, outnumbering bear kills 4:1. This finding was particular to our study area. Other studies in Ontario and nearby Grand Portage, Minn. recently reported 50:50 bear:wolf predation.

Why were our moose so much more impacted by wolves? In light of the high rate of wolf predation on calves, we decided to investigate this further. We knew what was killing calves and where it was happening, but we wanted to know why and how.

Some predator-prey research has observed that prey will alter their activity patterns in response to predator activity. For example, animals may avoid watering holes during certain times of day when predators are most active. To investigate this, we looked at average speeds of calves and their mothers during May over a 24-hour cycle. We then compared the calf activity patterns to wolf movements. The wolf movement data were supplied by USGS scientists Dr. Dave Mech and Dr. Shannon Barber-Meyer. Calves' movement peaked in early evening and right after midnight. But during May, they were moving little. Wolves

also showed a peak in movement in early evening, but were moving almost twice as fast as calves.

So, if calves and wolves are both moving a lot in the early evening, is that when they likely encounter each other? Contrary to that logic, we found that most wolf kills happened early in the morning between 3 a.m. and 8 a.m. It did not seem that calves were trying to avoid moving when wolves were most active, but overall, wolves were moving much more than calves in May. Research from Canada reported that wolves moved much more than moose in winter. The difference in movement helped explain variation in kill rates.

To see how landscape may influence calves' vulnerability to wolf predation, we compared locations of wolf-killed calves to locations of calves that survived to that same age. Wolves use roads, trails, streams, forest edges and other travel corridors to move more efficiently through the thick woods of the north. Think of hiking through the boreal forest; would you rather bushwhack through a thick stand of small balsam fir, or take a groomed path? Plow through chest-deep snow or travel on a packed snowmobile trail? We measured distances from wolf kills to features we predicted would be used by wolves. We did not find that distance to habitat-edge affected wolf kills, but wolf-kills occurred farther from wetlands, contrary to our prediction. We think this can be explained by cows and calves using wetlands as escape from predators.

Roads told a more nuanced story. Roads can be easy routes of travel but can also be hazardous. Minnesota's legal wolf harvest occurred while we were doing our studies (2012–2014). We had assumed that wolf kills would happen closer to roads, but we found that wolves avoided roads; they appear to have used fine-scale trails and ATV trails to gain access to calves. We surmised that wolves were avoiding roads with higher human use, perhaps in response to the legal harvest, as documented in other places. Research from Canada has shown that wolves, bears and moose will use roads and trails even decades after the trails have been decommissioned or revegetated. The impact of such human-made features has a long-lasting influence on wildlife.

Our GPS- collar data suggested that wolves do not chase calves and their mothers when preying upon them. Rather than chasing down prey as they typically do in open landscapes, wolves here are presumably "ambushing" mobile prey such as calves.

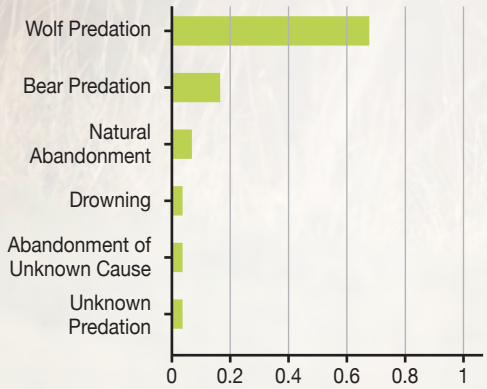
When wolves encounter cow-calf groups, it is up to the mother moose to protect the calf. Despite the logical conclusion that protecting twin calves from a pack of wolves would be more difficult than protecting a single calf, we did not observe any differences in the survival patterns of single versus twin calves. We did observe that calves at birth sites were relatively safer than when they departed from these sites. Birth sites tended to have more evergreen cover, and mothers moved from birth sites to forage spots when nursing demands dictated better nutrition—usually 21 to 31 days postpartum. Foraging areas also made detecting approaching predators more difficult, perhaps contributing to wolves catching mothers off guard.

MNDNR moose research has shown that wolf predation is a minor threat, compared to health issues, for adult moose, but is the major threat to calves. There are likely complex interactions among nutrition, habitat, disease, climate change, deer density and predation acting in concert to influence the moose population. But as stated at the onset, moose and wolves have coexisted for millennia, and we hope our research will guide natural-resource management practices that will allow these populations and this relationship to continue. ■

Bill Severud is a postdoctoral associate at the University of Minnesota. He studied moose calf survival and causes of mortality in northeastern Minnesota for his doctoral research with the Minnesota DNR, and beaver ecology in Voyageurs National Park and Michigan's Upper Peninsula for his master's research.

Northeast Minnesota Moose Population

Proportion of Calf Mortality, 2013 - 2014



Graph data: Bill Severud

For more information about MNDNR's moose research: www.dnr.state.mn.us/moose/index.html

Photo: Adobe Stock / Gellewa

My Time with Male 911:

This Yellowstone wolf was safe from people, but not from nature

By DOUG SMITH

Every year I sit alone with a wolf. The wolf doesn't agree to this, as I catch it as part of a research program on wolves in Yellowstone National Park. The wolf is sedated, but we still sit together, alone, looking out at the great park.

I cherish these moments. The quiet beauty all around and the wolf's presence; it almost seems as if the wolf is talking to me. A look into wolf eyes will make you think deeply about life. The incessant, drowning-out noise of humanity gets turned off. I strain to understand what this life might be like. One time, when others were boarding the helicopter to fly out, leaving me alone with a wolf, I said: "If you don't come back it's okay. Leave me here forever with the wolf."

I was hired to restore wolves to Yellowstone in 1994, after they had been eradicated early in the 20th century. I am still at it, although they have recovered, and I mostly study them now. Doing this, I have caught so many wolves that I cannot remember if I sat alone with wolf 911. For the purposes of this story I will say I did. I also can't remember what those eyes said to me, but I do remember what happened afterward. This is his story, probably not unlike that of many wolves.

In one respect, male 911 (they are numbered sequentially as we catch them here and across Wyoming) was lucky. Wolves are heavily persecuted in most places where they live, and 911 was born in Yellowstone, where he was protected. Protected from people, but not necessarily from life. But I'll get to that in a bit.

He was born in April 2010 to the Blacktail pack with five other pups. If it was a typical litter, several of these pups would die that first summer. 911 made it, however, and matured quickly, as most wolves do. Once grown, most male wolves leave their pack. When varies. 911 left as a yearling.

Leaving is risky because dispersing wolves die at a higher rate than others, but the payoff can be worth it—finding a mate, starting a pack, fathering pups. He found a female and formed a pair; he helped start a new pack called the Junction Butte pack. We usually name packs after a geographic feature within their territory.

After some back-and-forth (he returned to his natal pack for unknown reasons), he led his pack for several years, a good run by wolf standards. Most wolves die by age 5 or 6 in Yellowstone, outside of parks even earlier, so two to three years leading is typical. People are surprised by how short a life wolves

Brad Orsted/Horsefeathers Photography

have, but they evolved this way and compensate by having many offspring.

By all appearances, 911 was a strong leader. He did not lead alone, however. His mate, female 970, led with him, and he probably deferred to her, as most male wolves do. Research suggests that the females ultimately run the show, though the subtlety of wolf behavior makes it hard to know for sure.

That first year, 911 bred with 970, but two other males also bred with her, a rare event as most wolves are monogamous. Two other females produced pups, and all together they had 12 pups; eight of them survived. This is a bumper crop of pups. Usually, three or four pups per pack survive with one female breeding, but with three litters, more pups made it. It is hard to know whether any of these surviving pups were 911's, but some probably were.

The next year he had no surviving pups. Three females had pups in the pack—again rare for wolves—and his mate, 970, denned alone away from the other females. She died, and all of their pups died, too. This was just the beginning of his troubles.

That April 2016, when 911 was 6, he began looking bad. He lost weight and started to limp. He was not always with the pack, and his fur looked ratty. His condition worsened over the summer.

By September, he was in terrible shape. Split off again from his pack, he found a cow elk in the Lamar River that had already been chased by another wolf pack. Elk are in their best shape of the year in September and hard to kill, usually requiring four or more wolves. Commonly when attacked, they run to water; it can rebuff the wolves.

Why 911 decided to attack this elk, alone, is unknown. He was in no shape to do so, especially then, but no matter how much we study animals, their thinking will forever be a mystery. Driven by forces that have evolved over eons, he only knew forward—keep fighting. Survive.

Painfully, he went at the elk in the water. Soaked, he attacked her, grabbed at her hindquarters, neck. She threw him off. A small cluster of park visitors had gathered, and I later watched on film what happened. People were aghast, some were crying. Six times he attacked, resting in between lunges, water pouring off him and the elk. Finally, he got a fatal hold on her neck.

One observer, a veteran of thousands of hours of wolf observation, said 911's attack on the elk was the most courageous and heroic thing he had ever witnessed.

Then the unthinkable happened. A rival pack wandered in—eight wolves. They saw the meal, and they saw that only one wolf defended it. Milling around, assessing the situation, intermittently feeding on the elk 911 had killed, the eight wolves took claim of the elk and carefully watched the sickly male. Then three of them broke for him—one was a young male and one of the others was the lead female. Then two more joined.

A look into wolf eyes will make you think deeply about life. The incessant, drowning-out noise of humanity gets turned off. I strain to understand what this life might be like.

He was clearly outnumbered. Together they lifted him into the air stretching him in an end-to-end pull.

There was no living through this. Sixty-six minutes after killing the elk alone, 911 was dead. The rivals dragged him around, ate the elk and left. No looking back, no remorse. They had killed a competitor and gotten a meal.

As we always do, we hiked in to necropsy him. He had lost 35 pounds since we had captured him. His condition indicated he was starving. His radio collar slipped off over his head. He had many wounds, old and new.

And as we normally do, we sent his skull to a taxidermist as the park has a wolf skull collection. Then our taxidermist called. What was it? 911's jaw was broken in two, and it had been like that for months. You could see that the bone had tried to mend itself; flecks of bone around the break made it look swollen. The pain all summer must have been awful.

So what happened?

We surmised that 911 had gotten kicked by an elk or bison in April, hunting for his pack, and this kick broke his jaw. Getting kicked is common; we see it often, but usually the wolf bounces back. When his skull came back to the park and I held it in my hand, I was shaken, overcome by emotion. What would it have been like to live with this? What kind of pain was he in? How did he carry on for four months?

So each year I wait, wait for that time I get to sit alone with a wolf.

Those eyes. What would 911's have said if I had looked into them on his last day? We can never know a thing like this. Just another life gone unnoted. This is all of nature, mostly unnoticed by humans. In a way, it's uplifting. Just go on, get on with things, try hard, work hard, and if life does not go well, well it could go a lot worse with no one paying attention. No one at the end to give you comfort.

For us, it's rarely that bad. I have things pretty good.

I have looked into a lot of wolf eyes and think I know some of their stories. You should think about them out there—unnoticed by all. ■

This article appeared in the *Washington Post* on June 1, 2019

Douglas Smith is a senior wildlife biologist in Yellowstone National Park. He has studied wolves for 40 years, working at Wolf Park, on Isle Royale, in Northeast Minnesota and in Yellowstone, beginning with the 1995 wolf reintroduction there.

Balancing the Pack

by Lori J Schmidt

Kelly Godfrey

International Wolf Center

Above: In 2005, dominant male Shadow selected Maya over Nyssa and the two displayed a bonding behavior called parallel gait.

Left: Aidan and Denali, the last set of northwestern subspecies added to the exhibit pack, were adopted in 2008.

In the spring of 2020, the International Wolf Center will again introduce a pair of pups into the existing exhibit pack according to our Wolf Care Management Plan. We have successfully integrated pups every four years for the last two decades, and we have learned from every positive and negative factor of each previous introduction.

The first option we consider is the subspecies*. The Center's exhibit currently maintains three of the five subspecies of North American wolves, with Grayson and Axel representing arctic wolves, Boltz representing the Great Plains wolf and Denali representing the northwestern wolves. While behaviorally, these wolves have similar ways of interacting, their physical characteristics align with wolves in the geographical areas of their natural subspecies locations. By selecting unique subspecies, we increase understanding of wolves in places outside Minnesota, like Yellowstone National Park and the Canadian arctic. Our wish to educate about various subspecies led to a decision to not breed the wolves on site, and to implement, instead, a spay-and-neuter program. In 2020, we plan to adopt two pups representing the northwestern gray wolf subspecies.

The second component to contemplate is number of pups. To maintain quality vegetation in our exhibit and avoid overpopulating the enclosures, we find it best to introduce two pups every four years. In our non-natural, non-breeding pack, where the dominant wolves are not the parents, pups mature to yearlings and often test for status. Two pups can be distracted by the adults from status-seeking behavior; with more than two pups, the status-focus can be more intense.

The third component to look at is gender. The current exhibit pack consists of four male wolves. In 2020, we plan to balance the pack gender roles by adopting at least one, if not two, females. With a female in the pack, the pack leadership is shared by two wolves—a dominant male and a dominant female—which in our experience creates a calmer, more balanced pack structure. We are still pondering the question of two females versus a female and a male pup. Two females would allow the dominant male of the pack a choice to select a female, and may initiate a stronger pair-bond, as witnessed in 2005 with Shadow and Maya.

The pup plan is not a document that gets dusted off every four years, but is a plan rich in reflection and applied experience that helps us ensure the most socially cohesive, well-balanced group of resident wolves.

To learn more about the wolf care program, consider visiting the online Wolf Den Store at www.wolf.org to purchase a Highlights DVD, where you'll find a review of the Center's wolf care history. ■

**Subspecies are very subjective divisions of wolves into local geographic varieties. For example, scientists recognized 24 North American wolf subspecies until 1995. Then science lumped those 24 into just five subspecies. Some researchers think the five should be lumped into four.*

Lori Schmidt is the wolf curator at the International Wolf Center and an Environmental Studies instructor at Vermillion Community College. She received the VCC Foundation's 2019 Lifetime Achievement Award for her outstanding accomplishments in the field of natural resources.

Member Profile

Ely Echo

"For the strength of the pack is the wolf, and the strength of the wolf is the pack." – *Rudyard Kipling,* The Jungle Book

By Susan Ricci

Wolves hold a special place in the hearts of our International Wolf Center supporters, but one young member has found an even deeper connection.

Twelve-year-old Jiena Lee has fanconi anemia, also known as FA, a rare and life-threatening genetic disorder that can lead to leukemia and many cancers. The disease took the life of her little brother, Mason, three years ago. While Jiena has spent many long months in the hospital undergoing tests and procedures, one thing has remained constant through it all—her passion for wolves.

Jiena's mom, Maly, said her daughter has always loved animals but she really, truly loves wolves. "She had to have everything with wolves—wolf this and wolf that. She wanted to know everything about them."

When Jiena needed a bone-marrow transplant, she was not allowed to have many visitors, and her family wanted to make her hospital room more comfortable, so they filled her room with everything she loved. "Jiena had a wolf blanket, wolf pajamas, wolf socks," Maly says. "Her whole room was decked out in wolves."

At the time, the Lee family did not know about the International Wolf Center, but Jiena's uncle found the Center online and contacted the office.

"Jiena was so excited!" Maly remembers. "She was in the midst of her transplant, chemotherapy and radiation; she was so sick she couldn't eat. And Carissa and Chad (from the International Wolf Center's communications department) came to visit us. Even though Jiena had hardly any energy, she was thrilled that representatives from the International Wolf Center actually came to see her."

After that visit, Jiena made her mother promise that when her transplant was complete, she would take her to the Center.

"It was risky because of the recovery process," Maly said. "She was on multiple medications, and she was depressed from being inside for so many months. A possible trip to International Wolf Center was a light at the end of the tunnel for her. It really helped her get through her ordeal."

During her hospital stay, Jiena started following the ambassador wolves on the webcams and webinars.

"There were some days she didn't want to take her medications," Maly's voice fills with emotion. "It was so hard. Jiena struggled to go on. But the wolves…they really helped push her through all of that." After six months her family got the doctor's okay, and they started to make their plans.

When they arrived at the International Wolf Center, Jiena raced past her family and headed straight to the front door.

Maly said, "I think she had it in her head that it may never happen—that she wasn't going to make it. She lost her brother Mason to this disease, and I think she was shocked that she was actually there."

Jiena and her family sat through all of the programs and asked Lori Schmidt, the Center's wolf curator, lots of questions.

"She had always wanted to be a veterinarian, but now she wants to be a wolf researcher," Maly said. "Or she may want to have Lori's job someday. Right now, Aidan is Jiena's favorite wolf. She tells me, 'Mom, I think Aidan was grooming Grayson to take over for him.'"

Since the marrow transplant, Jiena has been transformed. She will be 13 in December. She is healthy and doing well, but she will need to be closely monitored for the rest of her life. She loves school, being with her friends and family, and creating beautiful artwork. Jiena's inspirational story is rewarding for all of us who love and support wolves, and made possible by the help and support of an entire "pack" of family, friends, doctors and, of course—the wolves! ■

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Thank You!

Notes from the Field

Grown-Up Pup!

Wolf Care Staff

Wolf pups that were born in late April or early May are now approaching six months of age.

A lot has changed since spring. For the first few months of their lives, they were very dependent on the adults in the pack. They spent most of their time in or around the den, and later, in summer rendezvous sites. These pups are now traveling within the pack territory in a nomadic lifestyle with the adults. They have also started to observe the large prey animals in their wide, new world. These pups still have some growing up to do, but soon enough they will be full-grown members of the pack. ■

Heidi Pinkerton

Vocabulary

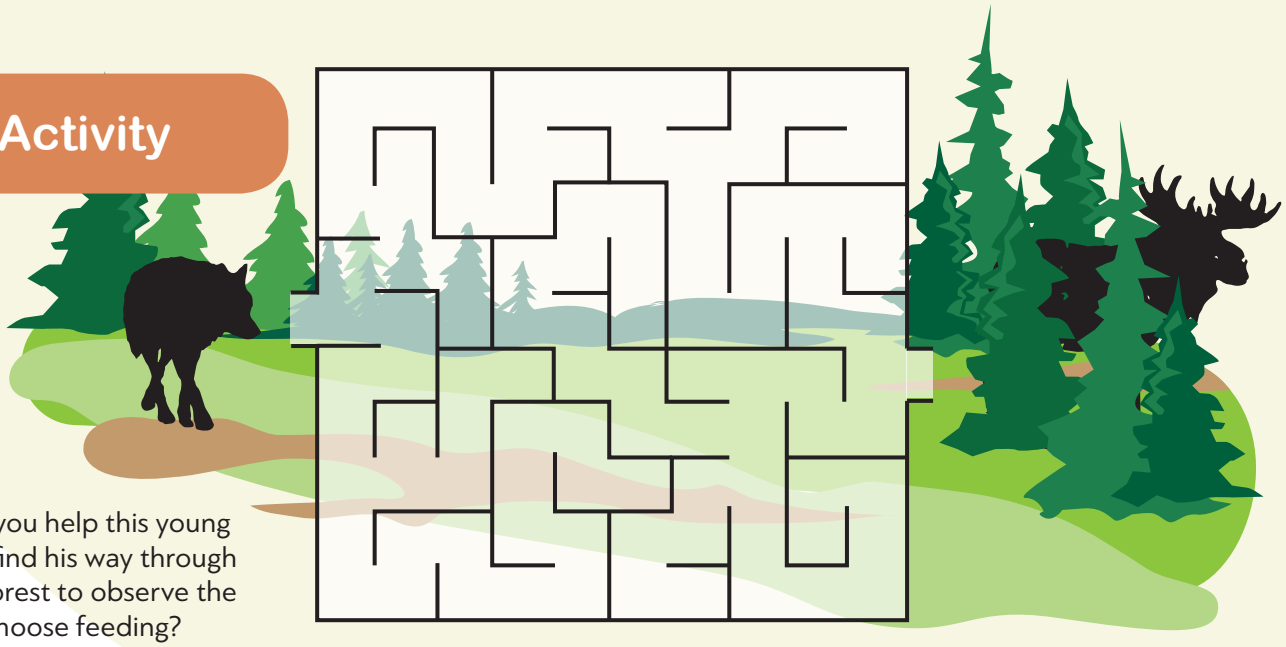
Subspecies Members of a species that live in a specific geographic area. Scientists have disagreed over the years about how many subspecies of wolves there are. Before 1995, scientists thought 24 subspecies lived in North America. In 1995, they "lumped together" those 24 into just five.

Rendezvous A place chosen especially for assembling or meeting others

Nomadic Having no home; moving from place-to-place in search of food or shelter

Observe To watch carefully

Activity



Can you help this young wolf find his way through the forest to observe the moose feeding?

Meet the Pack:

Boltz came to the International Wolf Center in 2012 and is now seven years old. He is a member of the Great Plains subspecies of the gray wolf, which means he looks like the gray wolves found in Minnesota, Northern Wisconsin and the Upper Peninsula of Michigan. Boltz weighs about 110 pounds.

Kelly Godfrey

The Littlest Great Predator: Wolf Hunts Observed

By Ilona Popper

It was a cold February day near the Slough Creek Road in Yellowstone National Park. A group of us was watching wolves hunting—two different hunts. We could see the Slough Creek pack to the north, testing a herd of elk, but I trained my spotting scope on 527's group. The three wolves were attacking a bull elk on the south side of the road, a half mile from where I stood.

The animals were deep in snow. A black adult, informally called The Dark Female, bit and held on to one back leg. 527F, the leader of this group, a sturdy black 5-year-old female wolf that had been radio-collared and numbered by the Yellowstone Wolf Project, closed her jaws on the middle of the bull's throat. The bull dropped to his knees. After a second or two, he hauled himself to standing. As he did, 527 was lifted off her feet, hanging from the elk by her teeth.

Wolves' teeth cannot always shear muscle. Instead they mash, bruise and hemorrhage tissue. Hanging on to the throat is a different strategy: crushing the airway and suffocating the animal. 527 held on even as the bull rose up with her and held on when he collapsed, but she couldn't keep her jaw-grip when he lifted and battered her against his shoulders. The third wolf, a yearling gray male, stood in the rear, taking in the scenery.

At least three times the bull elk got to his feet and flung off 527. He had a full rack and to me, he seemed tall and strong compared to the three wolves at his side.

Once when the bull fell, the female wolves let go and just sat where each had been holding him, as if to catch their breaths. They seemed to float on the crust of the snow, nearly leaning up against the bull, who was sunk in to his chest. The animals—the two wolves and the bull elk—panted together, breaths steaming, like athletic teammates sharing a break.

After a bit, the bull stood and the wolves resumed trying to kill him.

At one point, the young Gray Male joined The Dark Female at the bull's back legs.

Repeatedly, the bull rose from his knees and shook free of the wolves. The wolves trailed him, still winded, but when he stumbled in snow up to his

Chad Richardson

neck, the two female wolves bit and held on again. The bull was bleeding from his rectum. It was eye-opening to watch this hunt. Until I came to Yellowstone and watched wild wolves, I'd never pictured that it might be exhausting and difficult for them to kill their prey. I knew wolves chose "the weak." "Survival of the fittest"—people bat around this phrase a lot. But what does that really look like?

If I'd thought about it at all, I'd have assumed that once they'd settled on their "weaker" prey, predators found killing pretty easy. But to my eyes, 527 and the Dark Female threw everything they had at killing this elk—and still they struggled. They were apex predators, but they were the ones who looked vulnerable.

Wolves can appear strong, athletic, tough, focused and driven. Wolves of all ages can be playful, goofy and unstintingly caring with their young.

Our image of predatory animals is often demonic. They have no fear, but instill fear in their prey—and in us. They walk the earth troll-like, confident of their power, full of malice or even sadism. Wolves kill for fun, some say. We use the word predator to describe a type of human monster: sexual predator; financial predator. Serial killers are predators. These concepts equate prey with victimhood and predators with evil and death. With that logic, we assume that prey animals are at a disadvantage, even innocent. Far from it.

Elk and other prey have evolved to give wolves a run for their lives. Literally. Wolves get prey like elk running, partly to assess fitness and to stay clear of front-hoof strikes; elk run close together, making it harder to get picked off. Yet, wolves succeed on average in 5 to 15 percent of their attempts to take down prey, says Doug Smith of Yellowstone Wolf Project. "Any healthy ungulate usually wins against a wolf…underline healthy." Prey get away about 85 percent of the time.

Imagine that the only way to feed your babies, let alone yourself, is to kill an animal five to ten times your size; an animal that, no matter how compromised, still fights fiercely.

As I watched 527 and the Dark Female work, it dawned on me that living as predators places wolves at the edge of their strength, because they prey on animals much larger than themselves. The conclusion among researchers and native peoples for centuries has been that, to kill an animal, wolves must find one that has something wrong with it.

Generally, adult females and smaller males make the first attacks. Once the faster adults in a pack have weakened and slowed an animal, a heavier male wolf may speed up death by delivering a killing bite. If he can pull it off, the wolf closes off the elk's throat, as 527 did.

But 527 had no beefy male wolf to help with kills. The Gray Male was not old or big enough to play that role yet. Male wolves do not reach full size until they are three years old. The Gray Male, between one and two, was still mastering hunting strategies. Though some yearlings distinguish themselves, most, like the Gray Male, aren't the best hunters.

In this hunt, he didn't seem to have a clue. He ran around 527, play-bowing, dropping his head between his front paws, his butt high and tail wagging: more pup than mate. Soon, 527 would be in estrus. The Gray Male showed signs of interest, though he probably didn't yet know what was driving him. Since he was not related to her, perhaps 527 saw him as her best prospect.

So 527 relied on the Dark Female, who repeatedly latched onto and then dropped off the bull's hamstrings. Sometimes the elk dragged her.

Why did 527 choose this animal? The bull had some fight in him. He shook her off, depleting her so that she rested several times during her attack. But she and the Dark Female must have discerned the bull's limits. We saw him plunge down a hill, the Dark Female and the Gray Male latched on his back legs and 527F locked on his throat. All four vanished as the bull collapsed just out of sight in a gully. Soon ravens zoomed in, and the wolves reappeared with blood on their faces.

On that winter day when 527F and the Dark Female killed a bull elk, a different hunt was failing a few miles north of them. Seconds after 527F climbed away from the carcass and wandered out of sight, I turned my scope 180 degrees to see one gray and ten black wolves of the Slough Creek pack ascend a rocky knob. Five wolves began chasing a bull elk. The bull ran downhill, wolves streaming after it. It was fast, this bull: the wolves tried to clamp onto his thighs, but fell off.

The bull wheeled and aimed his antlers low at the wolves, which scrambled backwards. One wolf circled and tried again to bite the bull's back legs. Yet, I noticed the wolf flinched back even before the bull spun around. The wolf kept making the slightest of lunges with her head, but always retreated before

Dan Stahler

biting. Another wolf did the same, feinting with his head.

The hunt lasted three minutes. The bull turned on each wolf in the pack, forcing them to dodge and weave. Though the Slough pack was larger than 527's group, the bull was one of the 85 percent that get away.

Anyone who observes wolves accepts they are predators, and predators kill to survive. Watching a hunt, I feel riled up, shocked and awed. Adrenaline swamps my reasoning, cataloging mind.

Also, I am curious. Not ghoulish, but wanting to learn. We humans are hardwired, like other animals, to learn through paying attention to life and death. In recent history, people shared the landscape with wildlife. In certain circumstances, remembering a hunt might keep me alive. Humans scavenged on wolf kills, and some think we borrowed hunting techniques from wolves.[1]

Neuroscientists have discovered "mirror neurons" in our brains which, in combination with our life experiences, may allow us to sense what it feels like for a wolf to be kicked by an elk or for an elk to be suffocating in a death grip. Primatologist Frans De Waal says, "Anthropomorphism may not be as problematic as people think. To rail against it…often hides a pre-Darwinian mindset, one uncomfortable with… humans as animals." He warns against "anthropodenial."

"The herpetologist Gordon Burghardt has called for critical anthropomorphism," using "human intuition and... an animal's natural history to formulate research questions."[2]

Life as a mammal helps me interpret other animals' behaviors. What looks like contentment on a nursing pup's face might be oxytocin-fueled happiness. If a dying animal seems distressed or wobbly, I can trust my experience and speculate that it may feel pain or shock.

One day I observed a cow bison that had just died. She'd been ailing for days and succumbed without withstanding an actual attack. A bison is a massive prey, and this time the wolves waited her out. A large gray wolf turned from feeding on her carcass. He seized the cow's calf, wandering nearby. The little creature feebly twisted and kicked in the wolf's jaws. Those small movements stick with me today—more than a bloody battle. Without her mother, that calf was doomed. Yet, what a short life; what a sweet face.

Years later, I saw a similar situation: a cow bison died, leaving behind her 2-day-old calf. But the wolves never found the carcass or the orphan. Day after day, the calf circled, softly pressing, seeking the milk she had first tasted 48 hours earlier. It took her 10 days to die of dehydration.

A hunt—osprey-fish, weasel-squirrel, blue bird-bug, wolf-elk—is an event, especially for the principals. So is death. I can tell myself all sorts of stories about it, but in the end, it lies beyond my reckoning. ■

Acknowledgement:

Thanks to Yellowstone Wolf Project members for their research and for making it possible for naturalists and citizens to better study wild wolves.

Ilona Popper is a freelance writer and editor, poet, naturalist, and wildlife advocate, who lives near Yellowstone National Park. ilonapopper.wordpress.com

[1] *Raymond Peirotti and Brandy R. Fogg,* The First Domestication: How Wolves and Humans Coevolved. *Note that wolves rarely attack people, though rabid animals can and did.*

[2] *Frans De Waal,* Are We Smart Enough to Know How Smart Animals Are? *pp. 26, 159*

Chad Richardson

Bringing Wolves to Scotland, as with Other Locales, Proves Contentious

By Tracy O'Connell

Efforts to re-wild the Scottish Highlands with (among other features) the return of wolves, remain vigorously debated by people who, in some circumstances, might be on the same side of such a discussion.

Wealthy Englishman Paul Lister wants to bring the predators to his 23,000-acre estate northwest of Inverness to advance efforts he has made since he purchased the land, which he named the Alladale Wilderness Reserve, 16 years ago.

He is "hoping to see the ancient Caledonian Forest of Scotch pine, alder and mountain ash regenerated, and wildlife long absent from the Highlands return," National Public Radio reported on May 2018, noting that the Highlands were heavily forested "before humans wiped out the trees to feed a voracious appetite for timber."

Lister has planted hundreds of thousands of trees and restored dried-out peat bogs but found that the area's approximately 750 red deer (similar to North American elk), which share space with Highland cattle, golden eagles and foxes, have no local predator and were eating his young trees before they had a chance to grow. Reserve personnel see the deer as a success story—forest animals that adapted when the trees were gone—but they want to give the young trees a shot at maturation by cutting the population to 300 and allowing the presence of wolves to keep the wary deer moving.

Lister's vision would involve a 9-foot fence to keep the wolves, which would be radio-collared so they could be tracked, contained on his property. But fears of escaped wolves and the incursion of fencing have both farmers and outdoor enthusiasts opposed, since fencing would challenge the public-access rights that Scots staunchly defend. Some consider Lister "a rich guy building a zoo" so he can charge people to visit his property. He does intend to do that, and already offers a variety of experiences at the reserve, from bare-bones to luxurious. Golfing, wine tasting, fine dining, a spa, and the chance to book weddings and corporate events are among the touted opportunities—and he notes that increased tourism would be an economic benefit to the region.

Adobe Stock / Anadman

Opponents, while supporting the tree-planting and other measures, stop short of seeing a need for wolves, noting that hunting would be another approach to controlling deer. While currently banned on the reserve, Lister contends that historically, hunting has not harvested enough animals. And while some see the environmental recovery Lister envisions as similar to the multi-pronged recovery in Yellowstone National Park, some scientists question whether the complexity of results, called a trophic cascade, has actually caused the results often attributed to wolf reintroduction there.

Some researchers have weighed in to support the proposed fence and the Scottish wolf reintroduction, saying that while fencing is not a perfect solution, it is a good compromise, and suggesting 80 wolves per 1,000 square kilometers (386 square miles) would be a good number to contain the burgeoning deer population, now estimated at 40 per square kilometer (247 acres). Writing in the peer-reviewed journal *Restoration Ecology*, using what they term "simulations made from the safety of a desk," biologists from universities at Kent and Sussex endorse the plan they believe will support tree regeneration and boost rural tourism.

Photos: Adobe Stock / Johanna

Genghis Khan is believed to have descended from the union of a wolf and an elk

Photos: Adobe Stock / Fotokon

MONGOLIA

The wolf is revered here, where Genghis Khan is believed to have descended from the union of a wolf and an elk. It is considered a potent symbol of Mongolian identity and nationhood, writes Rebecca Watters in *Mountain Journal*, a non-profit publication focused on the Yellowstone region of the American west. Watters, who has worked on conservation and human rights issues in Mongolia, Kenya, Cambodia and India, as well as the western U.S., is executive director of the Wolverine Foundation and founder of the Mongolian Wolverine Project. She explains that in Mongolia, wolves are considered by some as Heaven's Dogs and emissaries of Tengri (the Sky), who is the chief deity of the Mongolian people.

Describing the complex relationship between Mongolians and the wolf, she cites a proverb: *"If you see a wolf, your destiny is as great as the wolf's, but if you kill a wolf, your destiny is greater."*

Seeing a wolf conveys good luck, she writes, increasing a person's energy. The animal is seen as smart, strong and powerful, a worthy adversary, and a national symbol that improves herds by taking the weakest animals. It is seen as taking disproportionately from the wealthy, leveling social equality. Names given to the wolf to show respect include Father of the Mountains, Sable-Tail, Frost-Mouth, the Wanderer, Wearer of Fancy Boots, and Takes-Livestock-From-the-Rich, Watters says, translating material provided by a local conservation warden. While herders there suffer losses to predation, and hunt wolves—for 70 years exporting thousands of pelts to Russia annually—they recoil at the thought that in most of the U.S. and elsewhere, the predators were once poisoned to extinction.

Defending your herd against wolves makes one a *real* herder, a real man, Watters explains, noting that to Mongolians, "Living without wolves is cheating." She contrasts that view with the ones she finds in the U.S. which range from what she terms distorting, vitriolic hatred and ecocidal mania against predators, on one hand, to the impossible and idealistic notion that nothing need ever die for humans to live.

SCANDINAVIA

Ancestry of wolves here has been studied closely to determine the extent to which they might be inbred, on one hand, and hybridized with dogs on the other. Wolves returned to Sweden and Norway in the 1980s and 1990s, after it was commonly believed they had been extirpated in both countries. Today they account for an estimated 430 animals that are known to be highly inbred due to their small population and so few incoming wolves—only five known immigrants since 1991—bringing new bloodlines from elsewhere.

A study of the DNA of 100 wolves, undertaken by American, Norwegian and Swedish scientists in 2017, was published in the journal *Nature Ecology & Evolution* and reported in the online *Nordic Science*. Co-author Øystein Flagstad, a geneticist at the Norwegian Institute for Nature Research, said inbreeding does not seem to have hurt population numbers so far, but its indicators exist in the form of dental and skeletal defects, family sizes and sterility in some males.

Adobe Stock / Jarun011

Those who do not want to see wolves protected raise concerns over the possibility that local wolves are hybridized with domestic dogs, which might affect the legality of hunting them. One such animal was found in Katrineholm, near Stockholm, in 2017, while another was found in Oslo 20 years ago.

It was believed these wolf-dog hybrids were the result of male dogs mating with female wolves. But researchers traced

the Y chromosome, passed from father to son, in wolves from Finland, Denmark, Norway and Sweden as well as other parts of the world, and from dogs.

"The lines of descent found in the Scandinavian wolf population haven't been found in any dogs," according to Hans Ellegren, a professor of evolutionary biology from Uppsala University, who led the study that nixed that line of thinking.

CHINA

Visitors to the Wuhan Mt. Jiufeng Forest Zoo in the Hubei Province city of Wuhan complained of being duped when a sign indicated a cage held a wolf, but instead they saw a dog. A media flurry ensued over the "deception" until zookeepers explained the male wolf, separated from his pack because of frequent fighting, was indeed in the cage, but inside a shelter, napping. The female dog was put in with the wolf to keep him company after he was isolated from his pack and displayed signs the zookeepers took to be depression. The pair has shared space for two years. Reportedly, come meal time, the wolf lets the dog eat first. ■

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.

Do the Mexican Wolf and the Red Wolf Deserve Distinct Classification?

by Dr. Diane Boyd

I recently was privileged to serve on a committee appointed by the National Academy of Sciences (NAS) to tackle a nearly five-decade-old challenge: assessing the taxonomic status of the Mexican gray wolf and the red wolf. No small task! The committee comprised nine top-notch scientists (geneticists, population/evolutionary ecologists, and conservation biologists), and three NAS professionals who skillfully facilitated the process.

This review was a result of an appropriations bill of the U.S. Congress directing the U.S. Fish and Wildlife Service to obtain an independent assessment on the distinctness of two endangered wolves: the Mexican gray wolf as a subspecies *(Canis lupus baileyi)* and the red wolf as a species *(Canis rufus)*. Scientists disagree on whether each is a valid taxon, different from other North American gray wolves. The review was critical because the findings could have significant conservation implications for both.

The committee reviewed studies published over the last 100 years, watched presentations by numerous scientists and reviewed written comments by other experts. The first challenges were to define a species and a subspecies—questions debated since before Darwin. A species is always evolving, so the designation is only a snapshot at a given moment. Complicating this is that hybridization is far more common in the evolution of many species than previously recognized. This has led to much debate about whether the Mexican gray wolf and the red wolf are really different enough from other wolves.

Historically, species and subspecies were defined through physical and structural characteristics, behavior, and ecological roles. Advances in genetic techniques to assess plants and animals have complicated the scientific classification of many organisms, including wolves. Our committee used a combination of all historic and modern techniques to assess the distinctness of Mexican gray wolves and red wolves. The assessment of the red wolf was more complex that of the Mexican gray wolf.

Following are the highlights from the report:

Jacquelyn Fallon (left), Valerie Abbott (right)

Mexican Gray Wolf

Whether the Mexican gray wolf is a valid subspecies hinges on the strength of evidence to answer two questions: (1) Is there evidence for distinctness of Mexican gray wolves from other North American *Canis* populations? (2) Is there evidence for continuity between the historic Mexican gray wolf line and the present managed population?

Findings: The Mexican gray wolf has, from its discovery, been considered a distinct wolf. Its size, physical traits and coloration pattern distinguish it from other North American wolves.

Findings: Genetic studies confirm that the Mexican gray wolf is genetically distinct—it is the most genetically distinct subspecies of gray wolf in North America. Arguments against recognizing the Mexican gray wolf as a subspecies are based on a subspecies definition that is not widely accepted by science. There is no evidence that Mexican gray wolf genetics has been tainted by domestic dogs.

Findings: Today's wild Mexican gray wolves behave similarly to other North American gray wolves in the current Mexican gray wolf recovery area; their behavior before their 1970 disappearance in the wild is unknown. The Mexican gray wolf represents a smaller form of the gray wolf, which inhabits more arid ecosystems. At present, Mexican gray wolves are behaviorally and ecologically distinct.

Findings: The physical, structural features of the Mexican gray wolf have remained the same since their first discovery by humans

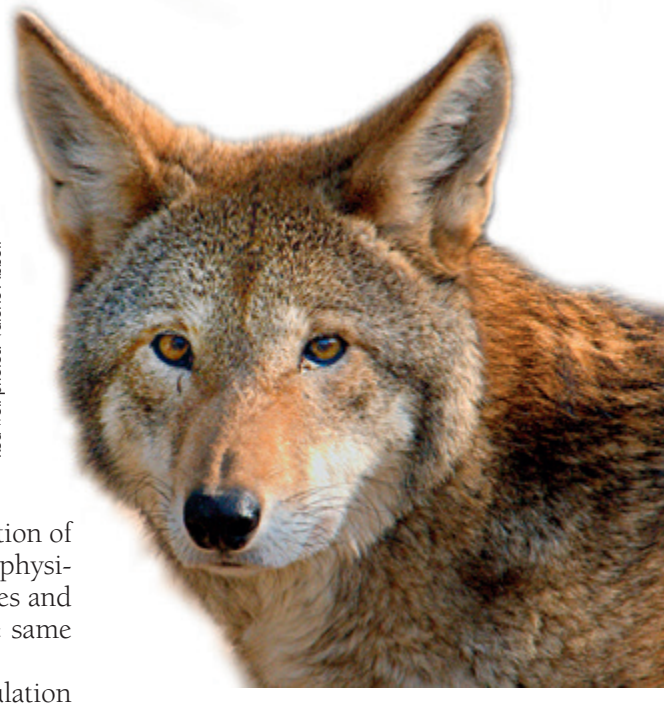
Findings: The analysis of ancient DNA reinforces the conclusion that the historic population of Mexican gray wolf represents a distinct evolutionary line of gray wolf. Further, the current Mexican gray wolves are direct descendants of the last remaining wild Mexican gray wolves. The known history of the current Mexican gray wolves suggests that there is continuity between them and their ancestors.

Conclusions: Mexican gray wolves are distinct from other North American gray wolves physically, paleontologically, genetically, behaviorally and ecologically. The Mexican gray wolf is a valid subspecies of the gray wolf as currently classified as *Canis lupus baileyi*.

Mexican wolf photos: Jacquelyn Fallon

Red Wolf

Whether the red wolf is a valid species hinges on the strength of evidence to answer three questions: (1) Is there evidence that the historical population of red wolves was a distinct line? (2) Is there evidence for distinctiveness of contemporary red wolf populations from gray wolves and coyotes? (3) Is there evidence for continuity between the historic red wolf population and contemporary, managed populations?



Red wolf photos: Valerie Abbott

The four possible taxonomic options for the red wolf are: (1) it is a distinct species of wolf *(Canis rufus)* (2) it is a subspecies of gray wolves (3) it is a subspecies of coyotes, or (4) it is a group of recently admixed individuals belonging to neither wolves nor coyotes.

Findings: Fossil evidence suggests that at least five subspecies of the gray wolf *(Canis lupus)* were present in North America 1 million years ago. The earliest fossils attributed to *Canis rufus* were found in Florida and dated at 10,000 years ago.

Findings: Fossil evidence indicates that the coyote *(Canis latrans)* arose in North America and spread across the continent, but that it disappeared from eastern North America approximately 10,000 years ago and returned in the 1900s.

Findings: Based on the limited specimens available for analysis, prior to contact with modern coyotes, populations of *Canis rufus* could be distinguished physically and structurally from *Canis lupus* using special statistical methods. Although conclusions from studies based on skull structure differ as to whether *Canis rufus* represented a subspecies of *Canis lupus* or a distinct species, an analysis of the brain supports recognition of *Canis rufus* as a historically distinct species.

Finding: North American canid species are genetically very similar to each other and have substantial amounts of shared genetic variation.

Finding: Some of the genetic material from historic wolf-like canids (previous to the recent range overlap with coyotes) in the eastern United States appears to be the same as that of coyotes.

Finding: The current population of red wolves in North Carolina is physically distinguishable from coyotes and red wolf–coyote hybrids in the same geographical area.

Finding: The red wolf population shows evidence of past genetic contributions from populations related to gray wolves, coyotes or both.

Finding: The red wolf is genetically more closely related to coyotes than to western gray wolves.

Finding: Just when red wolves and other canids mixed is still unknown, but red wolves were distinct before European colonization.

Finding: The red wolf has some degree of genetic ancestry not found in reference populations of western gray wolves or coyotes.

Finding: Red wolves have a social organization and reproductive behavior that is more similar to gray wolves than to coyotes, and when red wolf mates are available they prefer them.

Findings: Analyses of physical traits suggest cohesiveness among red wolf specimens from about 12,000 years ago to the early 1900s, but it remains unclear if this continuity is shared with the current captive and managed populations.

Finding: Genetic continuity between the managed red wolf population and the historic wolf in the eastern United States cannot be firmly established without full genetic data from ancient specimens. However, the patterns of genetic variability are compatible with the hypothesis that the red wolf shares a fraction of its genetic history with a canid distinct from modern coyotes and gray wolves.

Finding: The reported social behaviors of the natural and restored populations are very similar.

Finding: The original distribution of red wolves seems to have been tied to the distribution of the Eastern temperate forests. Red wolves require larger home ranges to obtain their prey than coyotes. This requirement of larger home ranges is consistent between the original, natural population and the current managed population in North Carolina.

Finding: The diet of red wolves in the restored population includes more deer than the natural population. However, this may be a function of prey availability and body size. Red wolves and coyotes in North Carolina consume similar types of prey, but they differ in the proportions of deer, rabbits and other small mammals in their diets, and in their seasonal consumption of these prey types.

Conclusions: Available evidence suggests that the historic red wolves constituted a valid species. Present red wolves are distinct from gray wolves and coyotes. Available evidence suggests that red wolves trace some of their ancestry from the historic red wolves. Although additional genetic evidence from historic specimens could change this assessment, evidence available at present supports species status *(Canis rufus)* for the red wolf. ■

Diane Boyd is a large-carnivore specialist for Montana Fish, Wildlife & Parks, and a faculty affiliate at the University of Montana.

"Return of the Wolf: Conflict and Coexistence" by Paula Wild

Book review by Debra Mitts-Smith

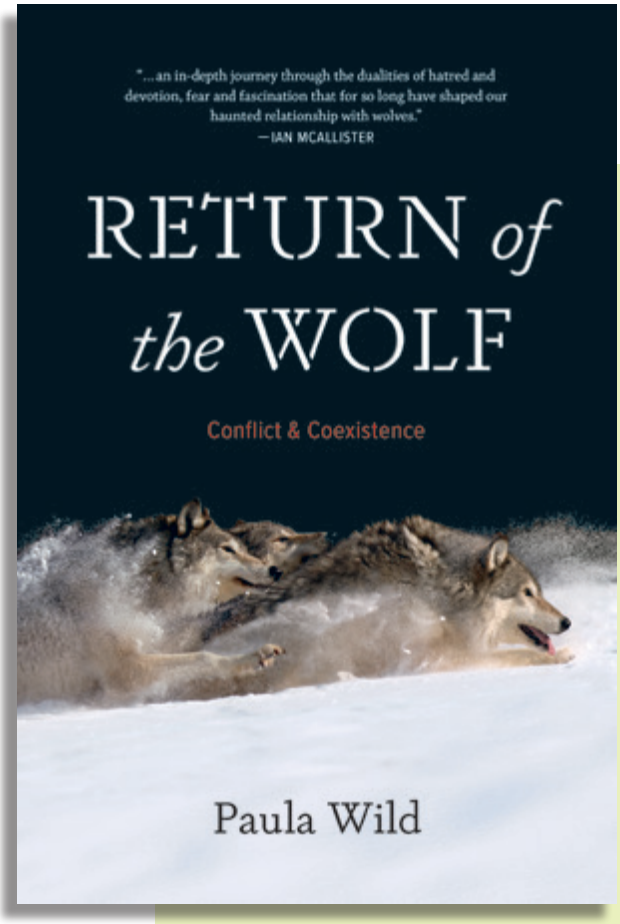
Paula Wild's *Return of the Wolf: Coexistence and Conflict* provides a provocative updated look at the human-wolf relationship. Although her topics range from myths and legends to scientific information about the wolf, her main focus is on current policies and attitudes toward the wolf. And though she includes updated information on the wolf's recovery in Europe and its status in Asia, her main focus is the wolf in North America—especially Canada.

What makes Wild's work unique is her approach to coexistence and conflict. In a time when wolf populations continue to recover, opportunities for conflict with humans increase. For Wild, coexistence takes on a broader meaning than ranchers, farmers and shepherds accepting the presence of the wolf on or near their lands. Instead, Wild's view of coexistence encompasses how people—even those who idealize wolves and want to save them—can inadvertently create points of conflict that lead to potentially dangerous situations.

A chapter titled "Coywolves and Wolf-Dogs" explores not only coyote-wolf hybridization, which under particular circumstances occurs naturally, but also wolf-dog hybridization induced by people breeding dogs with wolves. Her visit to Wolf Haven International, a sanctuary for wolves and wolf-dog mixes in Washington, provides many examples of the unintended, tragic consequences of people trying to make pets of wolves or wolf-like animals. As she points out, the animals at Wolf Haven are the lucky ones—they were rescued.

Her chapter "A Myth as Big as a Mountain" examines another unintended consequence of people seeking to connect with wolves in the wild. The myth that Wild refers to in her chapter title is the now outdated view that healthy, wild wolves in North America pose no danger to humans. Using two reports from 2002 (one by the Alaska Department of Fish and Game, the other by the Norwegian Institute for Nature Research), as well as 30 recent "verifiable accounts," Wild takes a look at wolf attacks on humans in Canada. In the end, she attributes most of these attacks to people feeding wolves and to wolves that have become habituated to people. Wild argues that, just as park rangers and nature guides helped teach people how to behave responsibly when visiting or living near bear country, they must also teach safe behavior to those who live near or visit wolf territory.

Readers may find some of Wild's viewpoints controversial, such as her questioning the Canadian government's policy of killing one species—wolves—to protect another endangered species—caribou. Nevertheless, her up-to-date research and wide-ranging analysis make this work a compelling read for anyone interested in the changing relationship between humans and wolves. ■



Return of the Wolf: Coexistence and Conflict

Author: Paula Wild

Publisher: Douglas & McIntyre

272 pages

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

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Kelly Godfrey

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