

IN THE COMPANY OF *wolves*

Linda Rutledge has learned a thing or two about wolves, much of it gleaned from evidence of their presence. From samples of scat, she's able to build genetic fingerprints and has identified eastern wolves as an independent species

By David Hayes Illustration by Tara Hardy

At first glance, the animal in the video clip looks like a dog, seen from the rear, squatting and defecating on a trail in a park. With a greyish-brown coat and burnt-umber highlights around the ears, muzzle and legs, the canine looks like a handsome — some would surely say cute — mutt. Not too big, maybe 26 kilos. Perhaps part German shepherd and part something smaller, like a Siberian husky or Australian shepherd. Whatever the case, it finishes its business, then turns and matter-of-factly walks on.

“Oh, the poor fellow,” says Linda Rutledge, laughing. “That wasn’t a very dignified moment.”

Rutledge is a post-doctoral researcher and instructor in the biology department at Trent University in Peterborough, Ont. The short video clip she’s showing me on her laptop wasn’t made by someone obsessively recording their pet. It’s of an elusive eastern wolf in Killarney Provincial Park, caught on a trail-cam set up as part of the eastern wolf survey, a research project led by Rutledge and supported by a variety of partners, including the Ontario government’s Ministry of Natural Resources, the Ontario Species at Risk Stewardship Fund and Trent’s internationally respected Wildlife Forensic DNA Lab.

Undignified though it may have been, the footage captured the very essence of Rutledge’s work. We’re sitting in a meeting room at Trent’s DNA Lab, a cutting-edge research facility that houses the Wildlife Forensic DNA Lab, staff from the Ministry of Natural Resources and other facilities for genetics work and research. Rutledge has been explaining to me the complex genetic fingerprinting she’s been doing to establish that the eastern wolf is, indeed, a species unto itself, not just a subspecies of the larger grey wolf, the one that most of Canadians probably visualize when they hear the word “wolf.” When it comes to conservation, the distinction matters. It led to the eastern wolf being

designated a species at risk in Canada, likely saving it from extinction. Elsewhere in North America, though, the debate continues, and the fate of a species of wolf lies in its outcome.

I ask Rutledge to explain the process of her work. Some researchers track eastern wolves on foot or by helicopter, shoot them with anesthetizing darts and then examine them, take blood samples and, finally, fit them with high-frequency radio collars before they’re released, Rutledge prefers non-invasive sampling techniques. She uses scat — that is, feces — and urine found in the wild to provide her with enough DNA material for a profile. It’s serious scientific work, no different from that done by researchers using DNA to gather information that may lead to a cure for diseases such as HIV/AIDS, tuberculosis or the many forms of cancer.

Still, it’s a good thing Rutledge has a sense of humour. One day, the parents of one of her daughter’s friends introduced themselves and the mother said, “My daughter tells me you’re a shit scientist.”

Rutledge laughs at the memory. “I said, ‘well, yes, I am.’” →



Anyone might have

mistaken that eastern wolf for a dog. From the most costly purebred to the most ordinary mutt, dogs and wolves aren't that different. Recognizing that, biologists named dogs *Canis lupus familiaris*, which translates to "familiar wolf." And the folklore surrounding wolves may run deeper than any other mammal. In the Bible, the prophet Ezekiel describes evil leaders as behaving "like wolves ravaging prey, shedding blood, destroying souls and receiving dishonest gain." Wolf imagery is found throughout Egyptian, Roman, Greek, European (the human who shape-shifts into a "werewolf" is an enduring legend to this day) and Native American history. Many Canadians remember the wolves in Farley Mowat's book *Never Cry Wolf*.

Social, adaptable and territorial, wolves and humans share many traits. In fact, they co-existed reasonably well until the domestication of animals, when cattle became prey and wolves became enemies. (Although today the eastern wolf feeds on deer, moose and beaver and it's the look-alike eastern coyote that most likely attacks sheep and other barnyard fare.) But there is much that is confusing about wolves, and the eastern wolf is a perfect example.

In the late 1990s, Bradley White, the founder of the Wildlife Forensic DNA Lab, and his then-graduate student Paul Wilson studied DNA from wolves found in Algonquin Park and red wolves from the southern United States. They compared their findings with DNA from grey wolves (found in northern Ontario and the Northwest Territories) and from coyotes from Texas. Their results proved that not only were the wolves in Algonquin Park genetically different from grey wolves but they were most closely related to the endangered red wolves from the U.S. south. So, if the wolves in Algonquin Park weren't a mere subspecies of a grey wolf, they needed a name. Thus, they were christened the eastern wolf.

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Meanwhile, Rutledge had completed her unusual undergraduate history (three BAs, in music, zoology and biology from the University of Western Ontario) and her MSc in biology at the University of Northern British Columbia in Prince George, where she lived with her husband, a doctor, and their first child. Now she needed to choose a PhD program. Her advisor at UNBC said Trent's biology department was first-rate and highly recommended White.

Having moved to Peterborough and started her first year course work in environmental and life sciences, Rutledge found out from White that someone needed to work on the ongoing eastern wolf genomic program. Rutledge had a flashback to the bookshop in Prince George where she had found, and read with great interest, *Wolf Country: Eleven Years Tracking the Algonquin Wolves*, by John Theberge and Mary Theberge. She re-read it,

loved it even more the second time, and talked to Brent Patterson, a research scientist with the Ministry of Natural Resources and adjunct professor at Trent, who was starting a new wolf project. Rutledge began work on her PhD thesis on the origins, social structure and hybridization patterns of eastern wolves in Algonquin Park.

At first she did a lot of the sampling herself, which meant field trips in the fall, winter and spring. (Once she had a second child, she began relying on grad students, although she still loves to go into the field.) Promising areas were identified by reported sightings or data gathered by the radio collars. Wolves congregate at rendezvous sites, and if they spend a lot of time in one area it probably signals a kill site where they've been feeding on a white-tailed deer carcass. Researchers look for scat, the fresher the better, to get the mucus from the intestinal lining with its rich cache of DNA. After it's swabbed with what looks like a tightly wound Q-Tip, it is then put in a buffering solution.

Sampling is a bit of a crap shoot. Sometimes Rutledge gets wolf, sometimes eastern coyote, and sometimes scat from dog being walked in the forest. Eventually she decided sampling in winter was best. Using skis or snowshoes, it's easy to follow tracks, especially after a fresh snowfall. Follow the trail, and there will be scat as well as urine, another source of DNA. (Rutledge gets a laugh at presentations when she mentions that sometimes she tests urine and it's human.)

"The grey wolf evolved in Eurasia," she says. "So we think of it as an 'Old World' species and the eastern wolf and coyote as 'New World' ones." Pausing, she adds, "I'm not fond of those terms, since we call North America 'New World' because it was new to us. I think First Nations people might be sensitive to that. So I think of the wolves as Eurasian and North American."

Her point, though, is that grey wolves are morphologically different from eastern wolves — they're a lot bigger, for example — and with the DNA work confirming



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a genetic difference, you might think the case identifying eastern wolves as a species was resolved. You'd be wrong. At one time, Ernst Mayr's simple definition of "species," published in 1942, was widely accepted — Rutledge mentioned it to me three times: "a species is a species if it can interbreed with each other and produce fertile offspring."

But the science of genetics is at least partially to blame for sparking a complex debate raging within scientific circles to this day. "There really aren't any rules or regulations governing what is or isn't a species," says Rutledge. Or, as Jody Hey, an evolutionary biologist at Rutgers University wrote in his 2001 book, *Genes, Categories and Species*, "We work as if the species problem were one of those hand puzzles in which two or more intercalated parts must somehow be untangled from one another, and the only method is to fiddle about."

Rutledge doesn't

have a lot of time for angels-on-the-head-of-a-pin debates. She cares about the majestic creature she's come to love and the genetic fingerprinting she and her colleagues have been doing. For example, it's because of genetics that she can say with authority that 11,000 years ago, when glaciers covered Canada, wolves migrated into southeastern regions and then north again as the ice melted. When European settlers arrived, they saw wolves as predators killing their livestock and tried to exterminate them. Those left in Ontario mainly retreated into Algonquin Park.

Pointing at a graphic on her laptop screen, Rutledge says, "We think there are maybe 500 to 1,000 individuals left. More importantly, only about half of those are adults and approximately 100 of those are breeders. That number isn't high enough for long-term survival."

Once Brad White and Paul Wilson's genetic results were published in the early 2000s, the Committee on the Status of Endangered Wildlife in Canada listed the eastern wolf as a species of special concern, and the Ontario government temporarily banned hunting and trapping of the wolves in Algonquin park and a handful of adjacent townships. But that was only a partial solution: in winter, wolves followed deer outside the park and were still killed in great numbers, whether by vehicles or when they ventured outside the banned areas. Finally, in 2004, Ontario permanently banned the hunting of both eastern wolves and eastern coyotes in the 30 townships surrounding Algonquin. (They look so similar that hunters would mistakenly kill wolves thinking they were coyotes.)

For Rutledge, a highlight of her research has demonstrated that although the numbers of wolves hadn't increased — something Rutledge attributes to death by natural causes — the structure of the wolf packs have changed for the better. Where before the hunting ban the majority of packs contained unrelated wolves, after the ban the vast majority consisted of a traditional

family unit: male and female breeders and their offspring — an optimistic sign since tight familial bonds are known to reduce stress and improve reproductive rates. The genetic research demonstrates that conservation concerns aren't just about numbers of animals.

In 2013, having reviewed several genetic studies including those of Trent University, the U.S. Fish and Wildlife Service classified the eastern wolf as a distinct species. But a year later, a new study out of the University of California, Los Angeles, challenged that idea, causing controversy in the worlds of biology and conservation. Having looked at it, Rutledge says, "There's nothing wrong with the data, it's just the interpretation of the data because they didn't have any representative samples from the wolves in Algonquin Park."

Rutledge is cooperating with one of the authors of the UCLA study, who is now at Princeton, and last year she took eastern wolf samples to her. "She's very open to the question, and we hope to move forward from disagreement to consensus."

Rutledge directs my attention to the laptop again. At first glance, it looks like a dog with a pup. The light is dim but I can recognize the size and shape well enough to know... well, that it's either an eastern wolf or an eastern coyote. (A wolf, it turns out.) The pup is hopping about, puppy-like, tugging repeatedly at the adult's mouth. Perhaps playing, I ask?

"The adult looks like it has a full belly," remarks Rutledge. "The pup probably wants the adult to regurgitate the food."

The video is part of a PowerPoint presentation Rutledge gives to groups interested in her work. Mixing the complicated science of genetics with heartwarming images of these beautiful wild animals plus a little humour, she tells me it has taken her 10 years to study the wolves, five years to truly get a grasp on the science and five years to boil it down to a 45-minute presentation.

Today, her work involves using a variety of genetic methods to continue studying the evolution and ecology of the eastern wolf, including using ancient DNA to record the historical distribution of the animals. "I want to understand how humans influence the behavioural and evolutionary trajectories of a species at risk, like this one," she says. "And then help educate people about it. 🐾"