Wildlife biologists use dogs' scat-sniffing talents for good

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Maggie, a Labrador retriever mix, was one of two dogs trained by UC Berkeley researchers to detect the scat of certain species as part of a research project to improve wildlife surveys. She is shown here at the Hopland Research and Extension Center, a UC research field station in Mendocino County. Dogs are trained to lie down when they find their target, and their successes are rewarded with play sessions. Credit: Photo by Nancy Haggerty/Marin Humane Society

It will come as no surprise to dog owners that their four-legged friends have a flair for sniffing out the excrement of other animals. Now, biologists at the University of California, Berkeley, have trained dogs to detect the scat of other critters for the greater good – to conduct more accurate surveys of wildlife.

"Wildlife detection dogs have been mostly used in airports to detect

contraband, including endangered species and wildlife products, but in recent years, interest has grown in using the dogs to help scientists track biological targets in natural settings," said Sarah Reed, lead author of a paper documenting the dogs' performance that is published in the January issue of the *Journal of Wildlife Management*. "Working with dogs can greatly improve our ability to detect rare species and help us to understand how these species are responding to large-scale environmental changes, such as habitat loss and fragmentation."

Reed conducted the research while she was a graduate student in UC Berkeley's Department of Environmental Science, Policy and Management. She worked with study co-author Aimee Hurt, co-founder and associate director of Working Dogs for Conservation, a Montana-based nonprofit organization that promotes the training and use of dogs as a non-invasive tool for wildlife studies and management.

"Once the ability to extract and analyze DNA improved, researchers recognized the value of scat as a way to non-invasively monitor the location and population size of key species," said Hurt. "With scat, you can confirm the ID of species and even individuals, as well as analyze hormone levels and diet. It's a very valuable data deposit. So then it became a matter of finding ways to better track the scat, and dogs naturally came to mind."

But as with other tools and techniques used in science, the researchers wanted to calibrate the use of dogs in wildlife surveys.

"We wanted to record how far away dogs can detect the scat, and to determine how that is influenced by factors in the environment, such as wind direction, humidity and temperature," said Reed, who is now a post-doctoral fellow at Colorado State University's Department of Fish, Wildlife, and Conservation Biology. "One of the things we're trying to do is help design tests and create metrics that could be used to evaluate

dogs as part of a certification program."

The researchers searched animal shelters and rescue organizations in Northern California for candidate dogs to train. "The dogs that do really well in this type of work are high energy, which also makes them hard to live with as pets," said Hurt. "Those are often the types of dogs that end up in shelters. They are not kennel dogs. They need a job."

In the end, only one out of every 200-300 dogs is considered a candidate, she said, and of those, only 40 percent make the final cut. It takes anywhere from six weeks to three months to get the dogs ready for field work.

For this study, two dogs emerged from more than 600 candidates. A female Labrador retriever mix was trained to detect the scat of mountain lions (Puma concolor), bobcats (Lynx rufus) and domestic cats, and a male pit bull terrier mix was trained to detect red fox (Vulpes vulpes), gray fox (Urocyon cinereoargenteus) and kit fox (Vulpes macrotis) scat. When the dogs correctly located a target species' scat, they were rewarded with a play session.

Researchers obtained the sample scat from zoos and animal rehabilitation centers throughout California. For each species, the researchers collected scat from several individuals fed a variety of diets. This ensured that the dogs were cued to the species' scent rather than to what the animals ate.

The training and trials took place at the Hopland Research and Extension Center, a UC research field station in Mendocino County.

In a typical wildlife survey, a human researcher follows established paths called transect lines. For this study, the researchers placed scat at various distances from those lines and used GPS coordinates to keep track of

them. Both scat-sniffing dogs were able to detect samples placed 10 meters (33 feet) from the line at least 75 percent of the time. Even at distances of 25 meters (82 feet) from the line, the dogs were able to detect scat 30 to 40 percent of the time.

In contrast, the researchers estimated that humans in the same environment would be limited to visual searches and only manage to see scat 3-5 feet from the line.

Wind did not have a significant effect on detection rates, possibly because the dogs were allowed the freedom to search for scents from multiple directions.

Of the environmental factors studied, precipitation had the biggest influence on detection rates. During the winter rainy season (November-April), the dogs were less likely to detect scat the longer the excrement was out in the rain. During the summer dry season (May-October), the scat accumulated over time, and the dogs detected it in greater numbers.

Maggie, a Labrador retriever mix, is seeking out the scat of wildlife at the Hopland Research and Extension Center, a UC research field station in Mendocino County. Sarah Reed, in the foreground, trained Maggie to detect the scat of target species as part of a research project to improve the accuracy of non-

invasive wildlife surveys. Credit: Photo by Nancy Haggerty/Marin Humane Society

"Because of the potential for these environmental factors to bias results, at a minimum we recommend that researchers report the conditions under which wildlife detection surveys took place and analyze whether detection rates vary as a function of temperature, humidity, wind, precipitation and other locally-important environmental factors," said Reed.

The study authors also recommend that wildlife surveys be designed to maximize the abilities of the detection dog. For instance, tolerance to heat varies among individual dogs, which may explain why air temperature affected the dogs in this study differently, the authors said. Hotter temperatures slightly increased detection rates for the Labrador retriever mix, but they decreased rates for the pit bull terrier mix.

"A dog can't smell as well when it's panting, so dogs that do not tolerate heat will have decreased performance on hot days," said Reed.

The researchers suggested that, to assess detection distances and environmental thresholds of individuals dogs, controlled search trials should be conducted under a variety of conditions similar to those in the experiments described in the paper. This information will allow researchers to calibrate their survey design to suit individual dogs' abilities.

"Dogs aren't machines, they can't be turned off and placed on the shelf, and they vary as individuals," said Hurt. "They come with unique strengths: They are very mobile, they are able to problem-solve, they are able to learn and adapt. But when designing a study, these strengths

produce challenges, such as how well the dogs can be expected to work in this environment, and how to know how much area they are effectively searching. This paper is among the few that contribute to addressing these questions."

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