Weed Hound

PHOTO COURTESY WDCF

Man's longtime companion is enlisted in the quest to preserve pasture quality.

by ***Ed Haag***

It's a beautiful sunny morning with a slight chill in the air, the perfect day to take to the field. The dogs, Camas and Tsavo, already sensing the thrill of the hunt, anxiously fidget in their crates in the rear of the pickup. They are more than ready to seek out their quarry, a quarry that lurks beneath the shrubs and in tall grasses, a quarry that is hidden from human sight and is only brought to ground by a creature that possesses that superior sense of smell.

The truck stops at the edge of a greening pasture. As its two occupants exit the cab, the excited dogs can be heard whining in anticipation. It is at this point, in a more conventional scenario, that the shotguns would be pulled from their cases and loaded and the dogs released, marking the beginning of the hunt, but instead, in this scenario the driver and the passenger are in possession of nothing more than bundles of marker flags.

Once in the field, unlike their bird-dog relatives, these specially trained canines will ignore the scent of pheasant, quail and partridge, and instead seek out subtler odors specific to plants that have barely emerged out of the ground; plants that will, if undetected and undisturbed, continue to grow and reproduce until they emerge as the dominant species in the ecosystem.

Stakes are high

It is estimated that invasive, nonnative plants cost the U.S. economy more than $34 billion dollars per year. The bulk of that is attributed to control measures and lost production in the agricultural sector.

Joe DiTomaso, professor and researcher at the University of California (UC)-Davis and co-author of five books on weed science and invasive plant-related topics, lists at the top of the losses associated with weeds the reduction of forage quality and quantity in relation to livestock and wildlife.

"Ranchers clearly have a great deal to lose, over the long term, when a known invasive species establishes itself in their pastures," he says, adding that many species of weeds, once established in an area, have blatantly defied all eradication efforts no matter how much money and resources are thrown at the process.

For DiTomaso the most cost-effective solution in dealing with invasive plants is preventing them from establishing themselves in the first place. One of the primary tools in this strategy is early detection of plants that have moved into an area that has historically been free of the targeted species.

It is now the general consensus among weed scientists and plant ecologists that cost-effective eradication of an invasive species is therefore only possible in a very early phase of an invasion when the population size and infested areas are still small.

Catch it early, get it all

Kim Goodwin, weed prevention coordinator and graduate student at

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►**Above:** Detection dogs often wear WDCF field vests.

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Montana State University (MSU), Bozeman, agrees.

"One problem with invasive plants is that they may spread to new sites," Goodwin says, adding that even though weed scientists have learned to better manage established invasives, they have been less effective in preventing them from moving into and establishing themselves in new territory. "We can be more effective with invasive plants with early detection and rapid response."

While many weed scientists have been strong advocates of such an approach, until recently, some have had reservations about the practicality of its implementation. Goodwin notes that in any successful eradication program you have to detect and eliminate 100% of the viable plants. This means finding the adult plants and the smaller juveniles that are more difficult to detect.

In weed eradication projects that relied on human visual detection, Goodwin and her colleagues at MSU saw that, while trained weed spotters may detect a large percentage of the plants, there is always a small percentage that goes undetected.

Gone to the dogs

To Goodwin, successfully preventing the migration of invasive species into new areas requires additional help.

"Because of this limitation we looked at literature on detecting weeds early and came across the Beagle Brigade," she says. "These were dogs that were trained to detect biosecurity risk materials coming into the country."

►Tsavo prepares to find weeds.

PHOTO BY LIZ BRADLEY

As a weed prevention coordinator, it isn't difficult for Goodwin to view invasive plants in terms of a biosecurity risk. "Once a plant becomes established, the costs to control it can be expensive," she says.

One weed high on Goodwin's priority list is diffuse knapweed: a tall, fibrous Eurasian native that produces pink and white flowers. The tenacious perennial has already infested more than 5 million acres of Montana rangeland at an estimated annual cost of $42 million in lost production and control expenditures.

With a proactive program to prevent knapweed's expansion already in place, Goodwin saw it as a natural target for her initial work with dogs and weed detection. Enlisting the expertise of trainer Hal Steiner of Rocky Mountain Command Dogs, Goodwin initially focused on larger, 10-acre parcels.

"We originally thought we could have teams of dogs searching areas to hunt down new infestations," she says. "But we are finding that their detection sensitivity is better used in helping us eradicate known populations."

Total eradication involves not only removing all adult plants but also monitoring for new plants over the period of time it takes to exhaust an existing seed bank.

Goodwin adds that in this capacity, weed-detection dogs, with their extraordinary sense of smell, have proven superior to their human counterparts.

"While the people and the dogs could find, with equal accuracy, small patches of a knapweed in a newly infested area," she says, "the dogs outperformed humans in finding the juvenile plants as well as the small adult plants that the people just overlooked."

According to Goodwin, in 2004 the MSU detection dog Nightmare was the first canine to detect a plant species in a plant community. In a series of field trials conducted by the university researchers in 2006, it was revealed that three dogs working individually found an average of 92% of the knapweed, while humans found 76%. Using multiple dogs as a team, however, the dogs were able to locate 100% of the knapweed present.

►A close working relationship is established between trainer and dog.

PHOTO BY CAROL FLAHERTY, MONTANA STATE UNIVERSITY

►Effective weed detection is the result of months of training, WDCF trainer Alice Whitelaw says.

PHOTO BY CAROL FLAHERTY, MONTANA STATE UNIVERSITY

Special noses for special jobs

The advantage dogs have over humans in detection is their incredibly well-developed olfactory senses. Dogs are capable of identifying 1 part urine to 144,000 parts water. Their talents extend to the macrosomatic — the ability to differentiate one specific smell from another when presented with a spectrum of scents simultaneously.

"Properly trained dogs can actually locate plants that have just emerged from the ground," says Alice Whitelaw of the Working Dogs for Conservation Foundation (WDCF). "Even the smallest plant gives off a scent, which is detected by the dog."

Whitelaw has been involved in dog training for more than 21 years and has focused on canine detection disciplines since 1998. She and her colleagues at WDCF — a nonprofit entity she helped found — have dedicated much of their effort to developing noninvasive methods for wildlife monitoring and research through the use of canine-human detection teams.

These teams have worked worldwide locating and monitoring endangered animal species through scat detection and other dog-assisted means. Animals monitored have ranged from cheetahs in Africa to kit foxes in California to black-footed ferrets in the Dakotas.

Whitelaw notes that the acquisition of scat samples is particularly useful to researchers studying endangered animals. It can confirm a species' presence, help estimate population and range and determine food habits, parasite loads and habitat use. An analysis of the DNA in scats can verify species and sex, and also contribute to determining population size, home range, paternity and kinship, while endocrine samples extracted from scats can determine the sex and reproductive status of individual animals.

Training is no simple process

While much of their work has focused on the monitoring of endangered predators, Whitelaw and her associates in the WDCF have also successfully participated in an effort to help locate surviving colonies of Kincaid's lupine, a threatened plant native to Oregon.

Recently, Whitelaw began working with Kim Goodwin on developing a canine-based component in a larger strategy to prevent the invasive plant, Dyer's woad, from becoming established in the state of Montana.

Whitelaw is currently working with Camas, a 10-year-old German Shepherd, to identify the distinctive scent of Dyer's woad.

"Camas has been working since she was 2 years old and now has 13 scents she can target, including black bear, grizzly bear, mountain lion, wolf, swift fox, kit fox, Kincaid's lupine, Dyer's woad, pine marten and desert tortoise," Whitelaw says, adding that this does not mean that training a dog to detect plants is, by any means, a simple process. "We are talking about a very special dog to start with."

What Whitelaw is referring to are those rare canines that are totally obsessed with a single object that then can be associated with a particular scent.

"These are the kinds of dogs that if they have a tennis ball in their mouth they will not put it down on the ground, even to drink," she says. "The dog will put the ball in the bowl of water, take a sip and immediately grab that ball again."

One method used to screen for potential detection dogs in animal shelters is to walk down the central alleyway bouncing a tennis ball.

"The dog that isn't paying attention to what the other dogs are doing and has its eyes riveted on every bounce that ball makes and is oblivious to everything else that is going on around it is the dog we are going to pull out of the kennel first for further testing," Whitelaw says. "And out of 300 of those dogs tested we will find one dog with the qualities we are looking for."

She adds that this just brings the selected dog into the training process. More than half of those chosen for training will wash out in the first six weeks. For Whitelaw, the prime objective in the training process is to develop, in the dog, a strong association between an object or activity it enjoys and the scent it is required to detect.

To accomplish this with dogs that are fixated on a particular ball or toy, Whitelaw uses a series of hollow cement blocks with one block containing a scent source. When the dog reaches and sniffs the block with the scent it is being trained to detect, its beloved object immediately appears.

"In this way you are solidifying, in a very controlled situation, what the toy equals," she says, adding that through the trainer's actions the dog is being told. "You just stuck your nose in block three and block three contains the scent sample. Here is your ball."

Over a period of three to four months that association is strengthened. This represents hundreds of hours of work presenting the candidate dog with ever more complex search-and-find scenarios. Whitelaw is clear that, in her view, if trainers and researchers expect success in tracking down invasive plants in the complex environment that exists in the field, the relationship between the dog and scent must be nothing less than second nature.

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