Canada Thistle Meets Its Match

As the costs of conventional controls escalate, range specialists turn to other ways to control Canada thistle.

Story & photos by ***Ed Haag***

Since its arrival from Europe in the 1600s, Canada thistle has been a major range management problem for the U.S. cattle industry. In North Dakota alone, it infests more than one million acres, and it now has topped its nearest rival, spurge, as the state's leading weed threat. On the 10 most wanted list in *The World's Worst Weeds*, the definitive classic of noxious forbs, this nasty customer is responsible for millions of dollars annually in crop and grazing losses, not to mention dollars spent on herbicide applications.

Now, as the costs associated with conventional controls escalate, range specialists turn to other ways to control Canada thistle. "There is more than one way to approach this problem," David Sands, Montana State University (MSU) plant scientist, says. "If we do it right, we can develop cost-effective controls."

Tenacious competitor

There are several reasons why this thistle has been so difficult to control. It can outcompete most grasses and forbs by shading them with its dense growth and by tapping deep into the soil to utilize water and nutrients that would otherwise be available to adjacent plants. It also has an allelopathic effect on many plants, reducing their vigor and their ability to compete for space.

Canada thistle is a seed-producing perennial that begins with a rosette the first year, followed in subsequent years by slender, freely branched, green stems attaining heights of 1 to 4 feet (ft.).

The female plant develops a pink flower head and, after pollination by the male plant, produces seed ideal for airborne dissemination, which can remain viable in the soil for 20 years.

In addition to its seed production, the Canada thistle also reproduces through vegetative spread from horizontally creeping roots. These can grow more than 19 ft. in one season and are capable of penetrating the soil to a depth of 22 ft. After a summer's growth, a single plant can produce 26 shoots, 154 root buds and 364 ft. of roots.

A personal touch

Bud Barta is a Lewiston, Mont., grain, hay and livestock producer who has gained a reputation for successfully turning ground infested with Canada thistle into productive pasture and cropland. "Bud understands that there is more to a plant than meets the eye," says Jim Sims, professor emeritus from MSU. "He knows what is going on with a weed, whether it's within the seedhead or in the root system."

For Barta, understanding an adversary is the first step to controlling it. This means knowing how Canada thistle functions on his 1,200-acre farm, how it spreads, when it is most vulnerable and what its natural enemies are.

Although it sometimes means additional work, Barta is a firm believer in isolating thistle infestations. "I never cut through a thistle patch with my combine or swather," he says. "That really spreads it."

Instead, he works around infestations and leaves those areas until he has finished cutting. "Then, I go back and cut those little spots off and wash the combine out thoroughly before it goes back in another field."

Butterfly larvae effective

Leaving the thistle patches to the end gives Barta an opportunity to inspect the areas for insect predators. In recent years, he has found several thistle patches infested with painted butterfly, whose larvae prey almost exclusively on the troublesome weed. "They just totally eat it," Barta says. "There is just a stem sticking up when they are done."

Barta has found that it is sometimes better to leave a stand intact. "When I see those bugs, I won't work those thistle patches," he confides. "I'll let them go, and let the bugs get them."

He finds that when he allows the insects to attack the patch, the long-term effects are far more favorable than if he disturbs the process. "If I work the thistle, the plants

►**Above:** Beneficial insects deposit eggs in thistle stem, creating a gall.

come back stronger than ever, but if the bugs get them, it really weakens the patch," he says. "I want to promote their life as much as I can, because they sure are helping me."

For Barta, it is a judgment call. One of his basic tenets in controlling thistle is to prevent it from flowering and going to seed. By watching the bug activity, he can make sure the larvae neutralize the thistle before the flowering stage; otherwise, he does the neutralizing.

Off with their heads

To Barta, neutralizing Canada thistle means swathing the plant after it has developed flower heads but before it can set seed. "This sets them back faster than practically anything else," he says. "It really shocks the plants and makes it very difficult for them to recover."

Promoting thistle adversaries is another cornerstone of Barta's weed-control philosophy. This applies to plants as well as insects. One of Barta's long-term controls is introducing competitive legumes in areas where the thistle has established itself. "Where I have a real bad infestation, I try to put it into alfalfa or clover," he says. "In most cases, alfalfas and clovers are so competitive [that] the thistle weakens, gets diseases and dies."

In an on-farm research study conducted with the MSU Extension service, Barta divided a thistle infestation into nine plots. Three were seeded with sweet clover and allowed to grow to maturity over the summer; three were summer-fallowed; and three were treated with the herbicide Curtail®, a 2,4-D clopyralid blend. In addition, an adjacent area was seeded with sweet clover but was cut intermittently over the summer. "The following year there was a lot less thistle in the chemically treated plot and in the plot where the clover was allowed to go to maturity," Barta says. He estimates that the thistle reduction in both plots was between 70% and 80%.

There was not a noticeable reduction in thistle in the summer-fallowed (control) plot, nor was there any change in the areas that had be sewn with clover and cut periodically during the summer.

Dave Wichman, superintendent of the MSU Central Agricultural Research Center and a participant in the study, sees Barta's observations as consistent with other studies done in the area. "What the sweet clover is doing is competing with the thistle," Wichman says. "It is using up the water the thistle needs for healthy growth."

Promising biocontrol agent

Both Barta and Wichman agree that promoting adversaries of thistle can be more labor-intensive and time-consuming than spot-treating infestation with a herbicide. However, research currently being conducted at MSU-Bozeman could change that.

Under Sands' direction, researchers have managed to isolate and mutate a fungus that attacks a wide spectrum of broadleaf thistle-related plants. As Sands explains, the advantage of what he refers to as "kamikaze" fungus is that it has a built-in self-destruct component that prevents it from spreading beyond the control area. "We made mutants that require compounds such as vitamin C," Sands says. "You release them with vitamin C, they kill what you release them on, and then they die."

Until now, most testing with the fungus has been on tiny test plots, but a two-acre thistle infestation has been treated. "We put it out in the first of July, and it killed nearly every thistle in the whole area," Sands recalls.

He notes that the fungus is currently being adapted for commercial application by a company in Pennsylvania. It will eventually be available as a biocontrol agent for Canada thistle.

Old world problem, old world solution

One of the real stumbling blocks behind establishing long-term Canada thistle control is that it is a nonnative, invasive plant that was accidentally introduced from Europe. Like so many out-of-control weeds, it failed to arrive with the insects that preyed on it. But now, researchers have realized that the very thing that provided Canada thistle with its competitive edge in North America is leading the way to cost-effective, long-term control.

"We need to reestablish a natural balance between the Canada thistle and the bugs that have evolved with the plant," says Lars Baker, supervisor at Freemont County Weed and Pest in Lander, Wyo.

He notes that one has only to look to Canada thistle's prickly cousin, Musk thistle, to see this as a viable solution. In the 1960s, the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) established a laboratory outside of Rome, Italy, that was mandated with the task of collecting insects that attack plants recognized as noxious weeds in North America. One of the first to be identified was *Rhinocyllus conicus,* a seed-feeding weevil that had an appetite for Musk thistle.

In 1968, it was released into Montana,

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►**Left:** Insect gall chokes off nutrients to the rest of the plant.

►**Below:** Beneficial insects feast on developing flower heads, reducing seed production.

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followed by several additional releases into other Northern-tier states. Although controversial — it was discovered that the insect did not discriminate between the musk thistle and some rare native species — it has proved itself a highly effective control agent for Musk thistle. Follow-up research in several states shows a 50% to 95% reduction in Musk thistle numbers after the weevils are established.

Baker says he has seen a marked change in the landscape since the introduction of the weevil. "[In] our county, we have gone from 11,000 acres of Musk thistle to under 1,000 [infested acres]," he says. "If you define a weed as one that interferes with management objectives, Musk thistle should probably [be] removed from the list in Wyoming."

Baker notes that their Musk thistle control program has received some additional help from another introduced insect — a crown-feeding weevil. "The two, working as a team, do a great job cleaning up the Musk thistle," he says.

Work in progress

As for Canada thistle, researchers are still in the early stages of finding the right insect match. Three types of insects imported from Eurasia are now, with the assistance of entomologists, making their way across the country, but the results are, to date, mixed. "We have had very limited success controlling the Canada thistle with introduced insects," Baker says, adding that one of the insects — a stem weevil — does reduce the weed in riparian areas.

One of the most well-documented examples of the influence these insects are having on Canada thistle is from a program initiated in Wind Cave National Park, South Dakota, in 1991 by entomologist Deborah Kendall from Fort Lewis College, Durango, Colo. She introduced three biological control agents: a gall fly (*Urophora cardui*), a stem mining weevil (*Ceutorhynchus litura*) and a seedhead weevil (*Larinus planus*). Results have varied, but reductions of the thistle by as much as 48% have been recorded in a single year.

In 1996, biological control insects were harvested for new sites throughout the park. Seven hundred seedhead weevils and 30 galls were collected from six sites and released in eight previously untreated sites.

In assessing the performance of biological control of Canada thistle in the Black Hills, Tom Warren, USDA district conservationist in Custer, S.D., says the weevils work best along waterways and in areas with native vegetation to compete with thistle when it's weakened. He reached this conclusion after a decade of observation.

Although not as exciting as the Musk thistle success story, it is still good news to ranchers who often have to endure Canada thistle because spraying hundreds of acres is cost-prohibitive.

Insect releases have merit as an alternative when chemical applications are impractical, Baker says. He believes the ag community should support the efforts to find more effective bugs to deal with existing problem plants. He adds that there is something to be said about a one-time effort that pays back dividends year after year as an exploding insect population literally eats its way through one large, well-established thistle stand after another, as they did with the Musk thistle.

►Critical plant nutrients are diverted to developing insect larvae in plant stem.