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New war on weeds: Bugs 2/Weeds 0

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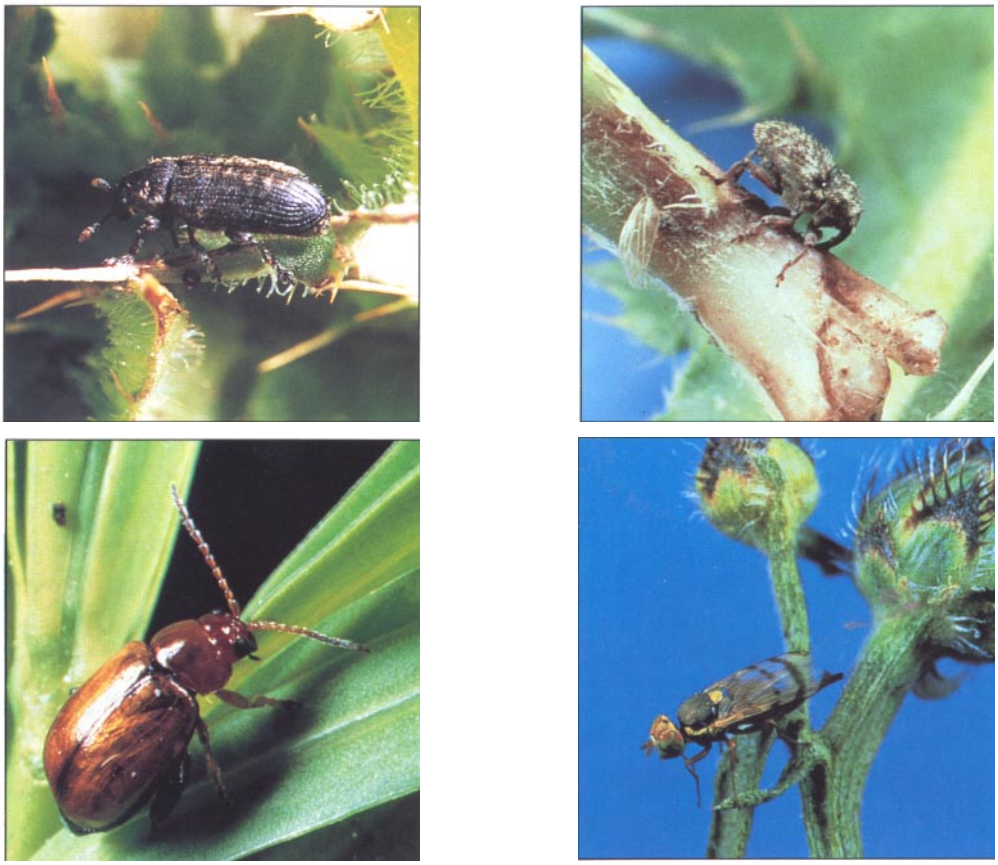
Is biological control an effective weapon for those fighting Wyoming's weed control war?

Wyoming's war on weeds entered a new phase about a dozen years ago. Pictures of exotic insects like *Trichosirocalus horridus* and *Oberea erythrocephala* began to appear on the walls of weed and pest district offices next to the promotional material for pesticides. Interest was building in a different approach to weed control.

Many of Wyoming's most troublesome weeds are imports from other continents. They were brought here accidentally or as potential crops and ornamentals. Once established in a new land, where their natural enemies did not exist, they rapidly spread. Weed scientists wondered if these exotic weeds could be controlled by seeking their natural enemies and bringing them to our shores. Care would be needed to prevent the introduction of new pests. If successfully established, biological organisms would reproduce and spread on their own. They would exist year after year without additional human effort. Balance would be restored.

Cooperation needed for biological control

Biological control of weeds depends on close cooperation between many groups worldwide. Initial research is conducted by the U.S. Department of Agriculture/Agricultural Research Service (USDA/ARS), AG Canada, and the International Institute for Biological Control. Locally, field release studies are initiated by USDA/ARS and the University of Wyoming. Site development, monitoring, and redistribution is handled cooperatively by USDA/APHIS, UW, Wyoming weed and pest districts, and local landowners.



From top left clockwise: *Rhinocyllus conicus*, musk thistle seed feeding weevil; *Trichosirocalus horridus*, musk thistle rozette weevil; *Aphthona nigriscutis*, leafy spurge root hair feeding chrysomelid; *Urophora affinis*, spotted knapweed seed feeding fly. (Noah Poritz photos)

The tasks for investigators are to determine a weed's land of origin and then go there to identify and collect organisms that feed on it, causing significant destruction. important bioagents are screened to make sure they attack only the target weed. Many organisms are not host-specific and are rejected. Cleared potential bioagents are then processed to prevent the introduction of harmful diseases/parasites along with the organism. Initial releases are made on suitable weed infestations. Many releases fail due to slight differences in climate, habitat, or the weed biotype. When a bioagent does establish, the university closely monitors its progress.

Musk thistle takes a hit

The first successful biological control attempt of weeds in Wyoming began with the 1976 introduction of *Rhinocyllus conicus* on musk thistle. Musk thistle, native to Europe, is now widely distributed across Wyoming. *Rhinocyllus conicus* is a small dark beetle that lays its eggs on the bud of the musk thistle. The larvae burrow into the flower's flesh and reduce seed production. Musk thistle is a biennial, reproducing from seed. Reduced seed production means fewer plants the next year. The weak link in the control chain is

flowers that emerge after the beetles are gone for the summer. Some seed is always produced.

In 1986, another insect arrived in Wyoming. *Trichosirocalus horridus is* a weevil that lays its eggs in the crown of seedling musk thistle plants. The feeding of the larvae damages the root. Many plants die. Those that survive are short and have few flowers. The plant blooms early, helping *R. conicus* do a better job. The long-term result is a dramatic reduction of musk thistle stands in Wyoming.

Musk thistle infestation in 1981 outside of Sundance at time of release of *Rhinocyllus conicus*.

Same site in 1991 (R. Lavigne photos).

Has leafy spurge met its match?

Leafy spurge is a weed that was accidentally imported from Eurasia. It infests thousands of acres of crop and rangeland in Wyoming. A stem-boring beetle, *Oberea erythrocephala,* was introduced in Wyoming in 1981, but failed to establish. *Hyles euphorbiae,* a hawk moth, was introduced into Fremont County in 1982. It has established and a few large bright caterpillars are found each year. Unfortunately, *Hyles* arrived with a disease that limits population growth and accounts for little leafy spurge control.

In 1986, a tiny brown leaf feeder, *Aphthona nigriscutis,* was released in Crook County. More releases were made across Wyoming in following years. *Aphthona* beetles lay their eggs at the base of the leafy spurge plant. The larvae feed on the root hairs through the summer, fall, and winter. Pupation occurs in the spring; adults emerge in late June. When beetle populations reach high numbers, the combined damage to root system and foliage causes the death of the plant. In five years, leafy spurge control on an infested area can equal the performance of the best available herbicides.

In Campbell, Crook, Fremont, Johnson, and Sheridan counties, *Aphthona nigriscutis* is doing very well. USDA/APHIS estimates that many sites can be harvested for redistribution. The available numbers could exceed 500,000 insects in 1994, enough for 1,000 releases to other areas. It's estimated that 1 million beetles can be collected in 1995. The

Wyoming Weed and Pest Council has established an interagency steering committee to coordinate the collection and distribution of these beetles. Committee participants represent UW, USDA/ARS, USDA/APHIS/PPQ, weed and pest districts, the Wyoming Department of Agriculture, Bureau of Land Management, Bureau of Indian Affairs, and the National Park Service. Every county can benefit. The ultimate goal is to introduce *Aphthona* beetles to every square mile of Wyoming infested with leafy spurge.

Left: Leafy spurge infestation in Fremont County near Lander in 1991 prior to release of *Aphthona nigriscutis*. Right: Same site in 1993. (R. Lavigne photos).

Biocontrol for other weeds

A number of insects have been released for Canada thistle control without great success. Unlike musk thistle, Canada thistle reproduces by roots as well as seed. It will be necessary to attack this weed at many loci (roots, stems, seeds, and leaves) before control is achieved.

Another problem weed in Wyoming, Russian knapweed, infests tens of thousands of acres of once productive range and cropland. A stem nematode was successfully introduced into Hot Springs County in 1991 by USDA/ARS in cooperation with the Big Horn Basin Weed Steering Committee. The attack of this nematode causes the plant to form galls in the stem and leaves, producing a dwarfed plant less able to compete with desirable vegetation. Experimental plots have been cooperatively established on the Wind River Indian Reservation to seek ways to enhance the survival of the nematode and increase populations.

Work is also under way to find organisms to control other weed species like dalmatian toadflax and perennial pepperweed. UW research and follow-up studies by weed and pest districts on biological control of weeds will have a lasting impact in Wyoming. Inclusion of biological control into an integrated pest management program decreases reliance on herbicides and improves the environment. The reduced cost of weed control will benefit everyone.