APPENDIX 8
BIOLOGICAL CONTROL INSECTS

COLORADO DEPARTMENT OF AGRICULTURE
BIOLOGICAL WEED CONTROL PROGRAM

ABOUT THE PROGRAM

The Division of Plant Industry's Biological Pest Control Section has ongoing biological control programs for thirteen noxious or problem weed species. A total of 29 species of weed predators are being cultured, released, and established on weed infestations throughout the State. In addition to the biological weed control programs, this section conducts control programs for the alfalfa weevil, pea aphid, Oriental fruit moth, greenbug and Russian wheat aphid with a total of twelve beneficials.

The primary function of the Biological Pest Control Section is the rearing and releasing of natural enemies for control of specific plant and insect pests. This section also acts as the State's receiving station for biological control agents.

New biological control programs are continually being developed primarily by agencies of the United States Department of Agriculture. Foreign exploration produces several new species each year that are known to control introduced plant and insect pests. These exotic species are exposed to a strict quarantine procedure before they become available to cooperating states for general release. This insures that potentially hazardous species are not accidentally introduced with the beneficial insects.

ABOUT THE NATURAL ENEMIES

LEAFY SPURGE (Euphorbia esula)

In 1989, two leafy spurge predators, Aphthona flava and Aphthona nigriscutis, were obtained from collections in Canada and Europe. The adults of these flea beetles defoliate the spurge plants while the larvae feed on the roots. In 1991, a third flea beetle species, Aphthona cyparissiae, was obtained from Canada and released.

In 1992, a long-horned beetle, Oberea erythrocephala, was obtained and released. The adults of the beetle feed on the aboveground parts of the plant while the larvae bore into the stem and root crown.

In 1993, a fourth flea beetle, Aphthona czwalinae/lacertosa, was obtained and released in the state. The larvae of A. czwalinae/lacertosa feed on the roots and the adults feed on the leaves of leafy spurge. A gall forming midge, Spurgia esulae, was also released. This fly lays its eggs on the shoot tips of leafy spurge, and the larvae feed on the meristematic tips causing the plant to form a gall around them.

A final flea beetle species, Aphthona abdominalis, was released in 1996. This is the smallest of the flea beetles and causes similar damage to the plants as the other Aphthona species.

Aphthona nigriscutis, A. cyparissiae and A. czwalinae/lacertosa have all become established at field insectary sites and can be collected in large numbers. These beneficial organisms are now available for redistribution in the state and can be obtained by requesting releases through the Department of Agriculture.

DIFFUSE AND SPOTTED KNAPWEED (Centaurea diffusa and C. maculosa)

The Colorado Department of Agriculture initiated a biological control program for spotted and diffuse knapweed in 1989 with the release of Urophora gall flies.

Urophora affinis and quadrifasciata: These knapweed seed head gall flies attack the flowers of diffuse and spotted knapweed to produce galls and reduce seed production in infested plants. Both species are now well established in several locations in Colorado and can be collected for redistribution.

Agapeta zoegana: This root boring moth was first acquired by Colorado in 1991 for field release. The larvae of this knapweed predator feed on the roots of spotted knapweed reducing the vigor of the plant. It is presently available for release on a limited basis.

Metzneria paucipunctella: In 1992, the Insectary received this flower-feeding gelechid moth. Surveys have recovered Metzneria from one of two 1992 release sites. It has not reached populations that are large enough to allow for redistribution

Sphenoptera jugoslavica: Received and released in 1991, this buprestid beetle attacks diffuse knapweed. The larvae bore into the root crown and upper roots retarding the development of rosettes and stunting plant growth. This very effective beneficial organism has become established at a field insectary site and can be collected for use in a limited redistribution program.

Cyphocleonus achates: This predator is a large root-boring weevil received for rearing in 1992. Rearing attempts in a garden rearing plot have been successful enough to produce C. achates in numbers that allow for releases into the field. They can be acquired upon request.

Bangasternus fausti: This small seedhead weevil was released in Colorado for the first time in 1993. Adults lay eggs on the flowers of diffuse and possibly spotted knapweed. The larvae feed within the flower receptacle, destroying the seed. Recovery of this insect has not occurred and redistribution will be unlikely.

Larinus minutus: Initial releases of this seedhead weevil occurred in 1995. Preferring diffuse knapweed, the larvae of this species feeds on the seeds of the plant reducing seeding potential. Post-release surveys for this insect have revealed establishment and overwintering, but population numbers are not large enough to allow for collection for redistribution.

Larinus obtusus: Larvae of this species prefers spotted knapweed and consumes the majority of seeds. Introduced in 1996, this species has not been recovered in Colorado.

RUSSIAN THISTLE (Salsola iberica)

Control agents to reduce this weed population consist of two predators, Coleophora klimeschiella, a foliage feeding case bearing moth, and C. parthenica, a stem boring moth. Both of these species minimize the spread of Russian thistle by reducing seed potential and are established in Colorado. They are available for release upon request.

TALL LARKSPUR (Delphinium occidentale)

The larkspur mirid, Hoplomachus affiguratus, is a true bug that feeds on the stems, leaves and flower buds of tall larkspur. After being damaged by the insect, the plant is no longer grazed on by cattle. Collection for this natural enemy occurs in a field nursery site located on the Flat Top Mountains above Rifle. It is available for release upon request.

PUNCTUREVINE (Tribulus terrestris)

The most successful biological control agents are Microlarinus lareynii, a seed feeding weevil, and Microlarinus lypriformis, a stem boring weevil. M. lareynii and M. lypriformis have been collected from established colonies around the state. Redistribution of M. lareynii and M. lypriformis is available upon request. As part of two beneficial insect exchange programs, these weevils were sent to Oregon and Washington State.

MUSK THISTLE (Carduus nutans)

The primary predator of musk thistle, Rhinocyllus conicus, was first received and released by the Insectary in 1974. Musk thistle seed weevil has proven very effective. The production of viable seeds is greatly reduced, thus slowing the spread of this weed.

Since the first release of R. conicus in 1974, the Department has established seed weevil in musk thistle sites throughout Colorado. Musk thistle seed weevil has successfully colonized thistle sites around the State and can be found established at all previous release locations. It is readily available for release upon request.

Trichosirocalus horridus attacks the crown of the thistle by killing the apical meristem and reduces the flowering potential of the plant. This beneficial insect is well established in many areas around the state and can be obtained upon request.

A third species added to the complex of musk thistle predators is the Cassida rubiginosa, a leaf-feeding tortoise beetle that causes considerable damage to musk thistle plants by skeletonizing the leaves. Because this beetle's feeding habit does not compete with R. conicus or T. horridus, C. rubiginosa should complement the other species to give more complete control of musk thistle. It is limited in numbers and is not available for general release.

TOADFLAX - Yellow and Dalmatian (Linaria vulgaris and L. genistifolia ssp. dalmatica)

Calophasia lunula, a predatory noctuid moth, has been reared and released by the Colorado Department of Agriculture for control of the toadflax species. The C. lunula larvae feed extensively on leaves and flowers of toadflax, severely damaging the plants. It has been recovered in Colorado and is available on a limited basis upon request.

Two more species of predators have recently been received to be reared for release on the toadflaxes. Eteobalea intermediella, a root boring moth, and Mecinus janthinus, a stem boring weevil, are currently in early stages of production.

BULL THISTLE (Cirsium vulgare)

Urophora stylata, a fly predator, is used to help control this thistle. The female fly lays eggs in the seed head of the thistle. The maggot then consumes the seed in the flower. This species has overwintered in Colorado but the limited numbers will not allow for general redistribution.

CANADA THISTLE (Cirsium arvense)

Ceutorhynchus litura, a predator of Canada thistle, feeds on the plant externally as an adult, while the larvae mine the leaves and stems. In addition to feeding damage, the entrance and exit holes made by the larvae provide infection sites for diseases that stress the plant even further. This predator has been released in several locations in Colorado but has yet to become established making it unavailable for general release.

A second predator, Urophora cardui, has been released to help combat Canada thistle. This gall forming fly has become established in Colorado and is available on a very limited basis upon request.

Cassida rubiginosa has also been released on Canada thistle. Recovery of this species has not occurred and it is not available for release at this time.

RUSSIAN KNAPWEED (Centaurea repens)

Shipments of the Russian knapweed loving nematode, Subanguina picridis, have been received by the Biological Pest Control Section for the last several years. This nematode will stimulate gall formation on the leaves and stems of the plant causing a general decline which may result in death. It is a slowly dispersing organism that will require great patience before it can be spread to all knapweed infestations. It is now established in three locations in Western Colorado but is not available for general release.

PURPLE LOOSESTRIFE (Lythrum salicaria)

Hylobius transversovittatus is a large long-lived weevil that helps control purple loosestrife plants. The adults overwinter in the soil close to the location of loosestrife plants. They are nocturnal and feed mainly on the leaves. The larvae do the most damage to the plant by feeding on the root cortex and then entering the root itself and packing the roots with light brown frass. This species is being reared at the Insectary and will be available for release when numbers increase.

The Insectary also received a culture of Galerucella calmariensis and Galerucella pusilla, which are foliage feeding beetles of purple loosestrife. These insects are being reared in the laboratory for general release. Galerucella are voracious feeders and can completely defoliate a plant, thus eliminating any seed production. It is available upon request.

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