BioControl

The Insectary

The Colorado Department of Agriculture released tamarisk beetles on private property along East Salt Creek, Mesa County, as part of a successful tamarisk control project.

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COLORADO
DEPARTMENT OF AGRICULTURE

INTRODUCTION

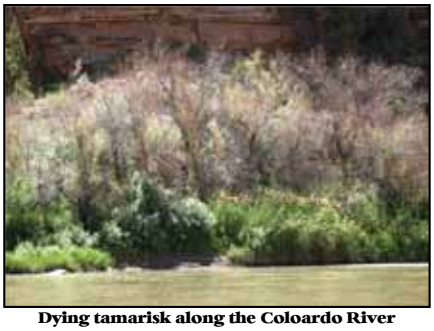
Biocontrol is the use of predators, herbivores, pathogens and parasitoids to control insects, weeds or other pests. The advantages of natural controls is that they are inexpensive, safe for human health and the environment and that in most cases, self propagating. The Colorado Department of Agriculture has been active in biocontrol since the 1940's and promotes biocontrol as a key element in integrated pest management. The Palisade Insectary is the center for the Biological Pest Control program within the Conservation Services Division of the CDA. The Insectary helps develop methods for rearing and storage of biocontrol agents, collects and distributes agents, and monitors biocontrol agent populations and impacts on target pests. Most of our work is done in cooperation with farmers, ranchers, other landowners, agencies such as the USDA APHIS, NRCS, BLM, National Park Service, National Forest Service, State Forest Service, CSU Extension as well as Conservation Districts and county weed and pest managers. We also cooperate with researchers at CSU, CU, Mesa State College and other colleges and universities around Colorado. We depend on all of these connections to better serve the pest management needs of Colorado.

The 2010 field season was a good one. We saw the continued expansion of tamarisk leaf beetle populations in western Colorado and establishment of beetles at a few sites in the Arkansas River drainage. We continued to monitor tamarisk conditions and recorded the first mortality of tamarisk plants at several of our field plots. Two new programs look very promising; the Russian knapweed gall fly and the stem boring weevil on yellow toadflax. We released large numbers of the bindweed mite and at some of our release sites in western Colorado we saw significant reductions in the field bindweed problem. Our first program, which started in the 1940's, was the use of a parasitoid wasp, *Macrocentrus ancylivorus*, against the Oriental fruit moth *Grapholitha molesta* which is a serious pest of peaches. That program continues to this day with 1.3 million wasps released in the peach orchards of western Colorado this year. We also continued to release biocontrol agents for a number of weeds this year including leafy spurge, Dalmatian and yellow toadflax, spotted and diffuse knapweed, puncturevine and Canada thistle.

Tamarisk Biocontrol Update

Tamarisk (saltcedar) has invaded most riparian systems the western US. In Colorado we have over 70,000 acres of tamarisk along river and stream corridors and in isolated patches on farm ponds, springs and seeps. Tamarisk competes with native vegetation, provides poor wildlife habitat, uses water, is a major riparian fire hazard and is a nuisance for recreational users of lakes and streams. Tamarisk is a "list B" weed species on Colorado's noxious weed list, meaning that it should be controlled and prevented from spreading. Tamarisk can be controlled using mechanical and/or chemical methods but it is well known to come back vigorously through resprouting or propagation through seed.

This is where biological control enters the picture. The tamarisk leaf beetle, *Diorhabda carinulata*, once in the system, will feed on resprouted tamarisk or seedlings. They can also defoliate and knock back mature stands of tamarisk. The tamarisk leaf beetle was first released into the open in 2001 at a test site below Pueblo Reservoir. In 2005-2006 there were several more releases in Colorado and a surge of beetles that crossed into Colorado from Utah along the Dolores and Colorado Rivers. By 2008 beetles were widespread in western Colorado but had not become well established in eastern Colorado. In 2009 and again in 2010 we turned most of our tamarisk biocontrol implementation efforts to eastern Colorado by releasing 300,000 beetles in the Arkansas drainage and extensive sweep sampling to see how well past releases had done. We discovered some established beetles left from our 2009 releases in the upper reaches of the Purgatoire and Apishapa Rivers. We had released beetles near the town of Boone, but a sharp-eyed collaborator alerted us to a defoliated patch several miles from our release site. We'll continue to keep an eye on the spot. To help the beetle become established and to lower predation, we released beetles into a cage Near Sugar City and treated areas with ant bait to help prevent the heavy beetle losses caused by ant predation.



Dying tamarisk along the Coloardo River

All of the beetles that we have in Colorado were originally collected from central Asia, either near the town of Fukang, China or Chilik, Kazakhstan. Other closely related species of the tamarisk leaf beetle have been collected in Tunisia, Greece and Uzbekistan and these could be a better match for eastern Colorado.

This fall I visited Texas and saw some of the defoliation along the Rio Grande caused by the tamarisk leaf beetle from Tunisia (*D. sublineata*), that have gone through four to five generations in south Texas and are now well adapted to the new environment. I also saw photos of major defoliation in west central Texas caused by the tamarisk beetle from Crete (*D. elongata*). The success of these beetles, especially in areas of west Texas that are climatically similar to eastern Colorado, gives us hope that we could get another leaf beetle for tamarisk biocontrol after some of the regulatory issues have been worked out. (See below)

We are beginning to see tamarisk mortality at some sites in western Colorado. At some of our 15 monitoring plots in western Colorado we saw up to 48% tamarisk mortality this season. Most plots had much lower mortality (4%) but plants did not send out much new foliage and native species are growing up under the canopy. At every plot, except one, we saw major defoliation this year and expect mortality to continue to increase over the next few years.

Torrent mulching head

At one site in Mesa County a landowner has started to experiment with a new piece of equipment for talking down dead and dying trees. The Torrent mulching head did an excellent job of grinding up large plants without damaging native plants or disturbing the soil.

Regulatory Update for the Tamarisk Leaf Beetle

In June of this year, the USDA APHIS issued a letter declaring a moratorium on interstate movement of beetles and revoking all remaining permits for such movement. They also stopped most open field experiments that had acquired permits. This is in response to tamarisk beetles moving into the breeding territory of the endangered southwestern willow flycatcher in northern Arizona. The flycatcher nests in tamarisk at some locations, but not in Colorado. After carefully considering the issues we decided to continue with our tamarisk biocontrol programs since we continue to avoid releasing beetles in the southwestern corner of the state, which is within 200 miles of flycatchers nesting in tamarisk.

Releasing tamarisk leaf beetles

Information is now becoming available on nest success in areas where flycatchers and beetles overlap, down in northwestern Arizona and southern Nevada. Flycatchers had a poor year in 2009 when they built nests in tamarisk stands which were later defoliated at the peak of nesting season. In 2010 they returned from their southern wintering areas and selected other plants to nest in, and they had a good year. A large scale re-vegetation program is now being planned for the lower Colorado River which will provide nesting sites for flycatchers and add benefits for wildlife in general. Once tamarisk control and restoration are underway there may be an easing of restrictions nationwide on use of different Diorhabda populations, opening up more possibilities for tamarisk biocontrol in the Arkansas River drainage.

A biocontrol agent for Russian knapweed

Russian knapweed, *Acroptilon repens*, is a widespread invader of grazing land, crop lands, roadsides and riparian corridors in Colorado. The weed is a perennial often reaching 2-3 feet in height, with an extensive and branching root system. Flowers are pink to lavender in color and in Colorado can be found from June through September. Dense stands of Russian knapweed are difficult to control, they crowd out native vegetation and the foliage is toxic to horses. Western Colorado has seen a spread of dense stands of Russian knapweed in a few years. Other areas, such as the San Luis Valley and the Arkansas basin have seen a similar rise in the density of the weed.

Russian knapweed in bloom and Russian knapweed gall fly Jaapiella ivannikovi (inset)

The USDA has recently approved the release of a gall midge, *Jaapiella ivannikovi*, for use against Russian knapweed. This fly lays eggs in the growing tips of the knapweed plant and the developing larvae cause the stem to stop growing and form a gall. The gall is a swollen portion of the stem that protects the developing larvae. The first field results from Wyoming show that the gall flies greatly reduce seed production and cut down on overall size of the plant. The Palisade Insectary received Russian knapweed gall flies from the USDA and we're now propagating the flies in our Russian knapweed "garden". The flies did very well this year. Starting in June with just a handful of galls we ended the season with over 150 galls in the garden. We'll begin open field releases as early as next May, if the flies successfully overwinter or if we can propagate them on live plants indoors. Larger scale distributions could begin as early as 2012.

Yellow Toadflax Biocontrol on the way!

The toadflaxes are perennial forbs known for their attractive bright yellow flowers. They have agreeable common names such as wild snapdragon or butter and eggs and are often used as ornamentals. Unfortunately two species *Linaria vulgaris* (yellow toadflax) and *Linaria dalmatica* (Dalmatian toadflax) have escaped from cultivation and have become invasive exotics that continue to spread, covering tens of thousands of acres in Colorado and hundreds of thousands of acres throughout the west. Both Dalmatian and yellow toadflax are designated as noxious weeds in the state of Colorado and **<u>can no longer be used as ornamentals</u>**.

The most effective biocontrol for Dalmatian toadflax in Colorado is the stem boring weevil, *Mecinus janthinus*. This beetle lays eggs in the stems of plants and the developing larvae bore down toward the roots, hollowing out and killing the stem. They overwinter in the stem and emerge as adults in the late spring. Adults feed on foliage and lay eggs for several weeks in late spring and early summer. They don't kill the plant right away but damage to the stems can weaken the plant and the beetles have been very effective controls in some areas of Colorado. For many years these beetles have been released on yellow toadflax in Colorado but they haven't become established. Studies show that there are biotypes of the beetles that prefer Dalmatian and probably came from Dalmatian during the initial collections in Europe. We also know that some of the beetles released in North America came from yellow toadflax in Europe. Recently there have been populations (biotypes) of *Mecinus janthinus* found in Montana that prefer yellow toadflax and this is cause for celebration.

The Colorado Department of Agriculture has been cooperating with the USDA APHIS and the US Forest Service to obtain, release and establish the toadflax stem boring weevil on yellow toadflax in Colorado. *M. janthinus* was collected on yellow toadflax in Montana and brought to Colorado for release at a site in Rio Blanco County, near the White River. Initial releases were made in 2009 within a field tent. Usually releases of *M. janthinus* on yellow toadflax are not successful with minor to no damage and no overwinter survival. Shortly after our release of weevils from Montana we found holes in the stems of yellow toadflax, indicating the presence of eggs. Later in the season we recovered large larvae from the stems of some plants, and in the spring of 2010 we recovered adults that had developed on yellow toadflax and had overwintered in the field. We found adults from spring to mid summer at that location so we're hopeful that we have establishment.

Nina Louden tends yellow toadflax in the Insectary greenhouse

Our cooperators in Montana sent us more beetles this spring that we released at four more sites in Eagle and Rio

Blanco Counties, on or near Forest Service land. Two of the release sites were at high elevations (above 8,500 feet) to get an idea of the potential of these beetles to work in Colorado's high country sites where yellow toadflax has become a serious problem. At one site we have confirmed an in season establishment by recovering larvae from the stem of a plant.

We'll continue monitoring and release the weevils in 2011 with a site in the San Juan Mountains to broaden the geographic scope of the program. If we're successful in establishment with increasing numbers of beetles at established sites, we will distribute beetles around the state in 2012.

Biocontrol Subscription Service

The Colorado Department of Agriculture, Palisade Insectary, now has the authority to collect a voluntary "subscription fee" from counties and municipalities in exchange for biocontrol agents, information and instructions. This program is designed for counties and municipalities who wish to utilize biocontrol to a greater extent and who want to work with and support the Insectary. The subscription service can be obtained at four levels in exchange for four different levels of support.

Who may participate? The subscription service is open to counties and municipalities only. In the future we hope to expand to include conservation districts, state agencies and other organizations with a stake in pest control, but this requires permission from the Agriculture Commission.

The Insectary buildings

This subscription service is completely voluntary. The service provides a completely optional mechanism for supporting biological pest control and receiving increased service. For those counties and municipalities that do not wish to participate there will be no decrease in services or other penalties. Money collected from the service will be used to pay for the service.

What does subscription money pay for? The state of Colorado pays for the infrastructure of the Palisade Insectary as well as salaries for a core group of employees. All seasonal help and most equipment, supplies, monitoring, and new project development are funded through grants, cooperative agreements, gifts and fees. This includes the seasonal employees who do much of the collection, packaging and distribution of biocontrol agents to weed and resource managers as well as the general public. Money from subscription fees will be spent primarily on hiring seasonal help to increase our ability to collect and distribute agents. It will also be spent on supplies, shipping and compiling monitoring data on releases and efficacy of the agents.

How do we participate? Please contact the Insectary if you wish to participate and you will be sent an invoice for the Biocontrol Subscription Service at the level you requested. We will contact communicate with you to determine which agents and what information you would like. We will also ask about future biocontrol needs and about sites that could be used for new projects.

Four levels of participation. We're making the service available at four levels to give weed managers flexibility in choosing a plan to fit their needs and budgets.

$250 annual fee: An assessment of biocontrol needs for the weed manager, 5 releases of biocontrol agents for up to two weed species accompanied by brochures/information for distribution to landowners that will be receiving the releases, and an easily performed monitoring protocol.

$500 annual fee: An assessment of biocontrol needs for the weed manager, 10 releases of biocontrol agents for up to three weed species accompanied by brochures/information for distribution to landowners that will be receiving the releases, and an easily performed monitoring protocol.

$750 annual fee: An assessment of biocontrol needs for the weed manager, 15 releases of biocontrol agents for up to four weed species accompanied by brochures/information for distribution to landowners that will be receiving the releases, and an easily performed monitoring protocol.

$1000 annual fee: An assessment of biocontrol needs for the weed manager, 15 releases of biocontrol agents for up to five weed species accompanied by brochures/information for distribution to landowners that will be receiving the releases, and an easily performed monitoring protocol. At this level you will also receive new agents as they first become available for introduction in Colorado, such as the yellow toadflax stem boring weevil and the Russian knapweed gall fly.

Questions, comments, ideas, or do you want to submit an article for a future newsletter? Contact Dan Bean via email at dan.bean@ag.state.co.us