

# BIOCONTROL

THE INSECTARY  
SPRING 2012

## INTRODUCTION

The 2011 field season was a busy one with two new agents getting a lot of attention. The yellow toadflax stem weevil and the Russian knapweed gall midge were the focus of our attempts to establish new biocontrols on old and familiar weeds. Both programs are off to a good start but are still in need of work before we can begin large scale redistributions. The tamarisk beetle has done very well on the western slope but until 2011 it had not defoliated large areas of tamarisk in the Arkansas Basin even though we have more tamarisk there than the rest of the state combined. The successes of 2011 included large scale defoliation of tamarisk on the main stem of the Arkansas and dramatic tamarisk defoliation on a number of tributaries. At our monitoring sites on the western slope we have seen a steady increase in mortality associated with repeated tamarisk defoliations by the beetle. At one site we have over 50% mortality of marked tamarisk plants. We have also continued with some of our older programs, like the field bindweed mite. Mites have been released across Colorado and have become established almost everywhere. The impact has been variable but in some locations mites have nearly eliminated field bindweed. We look forward to this coming field season and hope that biocontrol can work for you in your weed and pest management programs.

## YELLOW TOADFLAX STEM BORING WEEVILS ESTABLISH IN COLORADO

Yellow toadflax, *Linaria vulgaris*, is native to Europe and Asia where it is not a weed but is considered a rare native plant over some of its range. In Colorado it has no natural enemies and has escaped to cover tens of thousands of acres of forest and range lands, providing poor forage and crowding out native vegetation. Yellow toadflax continues to invade new and remote regions of the state

causing major headaches for ranchers and resource managers. Fortunately there are biological control agents for controlling this invader.

We had been releasing the stem boring weevil, then known as *Mecinus janthinus*, on Dalmatian and yellow toadflaxes and while it did well on Dalmatian it never established on yellow. Scientists have now determined that our weevil was too host-specific and that it doesn't have a taste for yellow toadflax. Fortunately there is a close relative that does, and it now has the scientific name *Mecinus janthiniformis*. We have both of them and our newest acquisition, the yellow toadflax feeder, was sent to us from Montana where it was collected by folks from the US Forest Service. This insect is a small bluish-black weevil (3.6 to 4 mm) with a long curved snout, and it originally came from Europe before being released in Montana in the 1990s. Eggs are deposited in the stems from June through mid-July and after a short incubation period of six to seven days, larvae emerge to begin mining out the stem. After 23 to 34 days of feeding, pupation occurs in the larval mine and adults overwinter in the pupal case within the mine. Adults emerge in May to continue the univoltine life cycle.

Field releases and monitoring of *M. janthinus* continued into the third season with encouraging results. So far we have made 12 releases; one in 2009, four in 2010 and seven in 2011. The initial 2009 release of 200 adults at Oak Ridge Wildlife Area, Rio Blanco County, near Meeker, established and overwintered for two consecutive years. Two of the four release sites for 2010 also showed the successful overwintering of the weevils, at Upper Burro Mountain in Rio Blanco County where we released approximately 200 adults and near Minturn in Eagle County where we released about 400 adults. In 2011 we released weevils in Gunnison County (3 releases), Delta County, San Miguel County (2 releases), and Archuleta County. These sites



Toadflax weevil pupa taken from stem



Release of *M. janthinus* on yellow toadflax

Insectary  
750 37.8 Road  
Palisade, CO 81526  
1-866-324-2963





*M. janthinus adults*

back to the sites this year, look for establishment and also survey for populations large enough that we can collect and redistribute insects to other sites. We are also measuring the impact of weevils on stands of yellow toadflax and looking at the response of native plants to changes in yellow toadflax densities. What we have seen so far is that weevils cause the tops of infested plants to die back as they bore into the stems. We don't yet have large enough populations of the weevils to measure an impact on toadflax densities.

This project is a cooperative effort between the CDA, the US Forest Service and USDA APHIS. The Colorado Department of Agriculture is a partner in the toadflax consortium, an international group dedicated to the study of toadflaxes and their biological controls. If you have questions please contact Terri Locke at the Palisade Insectary ([terri.locke@ag.state.co.us](mailto:terri.locke@ag.state.co.us)).

## RUSSIAN KNAPWEED BIOLOGICAL CONTROL TO EXPAND IN 2012



*A female Russian knapweed gall midge next to a ruler marked in millimeters.*

flowers which can be found from June through September. Russian knapweed has no value as forage to either wildlife or livestock, and is toxic to horses. This weed invades farmland, grazing land, and open spaces including grasslands and riparian corridors. The large and damaging infestations of this weed make it an ideal target for biological control.



*A Russian knapweed gall sliced open to show developing larvae and pupae within.*

give us a wide range of yellow toadflax habitat, from 5,000 ft elevation along the Gunnison River up to nearly 10,000 ft elevation near Telluride.

We'll go

growing and the developing leaves don't open up but instead form layers around the developing larvae. The gall flies 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". In 2010 we produced about 150 galls and in 2011 we doubled that to over 300 galls.

The Insectary has released galls at five locations in western Colorado. Releases were made in Mesa County near the town of Palisade and on BLM land in the McInnis Canyons National Conservation Area. A release was also made in Horsethief Canyon State Wildlife Area in Mesa County. One release was made near the town of Gateway on the Dolores River and one was made in Garfield County at Mamm Creek. We also supplied galls for a release made in Canyons of the Ancients National Monument in Montezuma County. So far we have not seen establishment of the flies but this year we are planning to release at ten sites which should increase our chances. In Wyoming, where releases started three years ago, they have seen es-



*Russian knapweed with a gall at the growing tip. There are 10-20 developing larvae within the gall.*



*A Russian knapweed gall midge on a plant.*



*Russian knapweed galls*



*Russian knapweed flowering*

establishment and spread of the flies.

The Russian knapweed bio-control program is a collaboration between the Colorado Department of Agriculture's Palisade Insectary and the USDA Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine

(PPQ). The Palisade Insectary has received galls from USDA APHIS PPQ including the galls used to establish the Insectary colony. The Insectary also works with USDA APHIS to find strategic areas for gall fly release. This partnership is critical for the expansion and distribution of the gall flies.

Over the next two to three years the Insectary will be looking for sites with large Russian knapweed infestations where we can release flies and return for post-release monitoring. If you know of sites or have further questions please contact Dan Bean at dan.bean@ag.state.co.us.

## BEETLES BEGIN TO DEFOLIATE TAMARISK ON THE ARKANSAS RIVER



*Defoliated tamarisk along Fountain Creek*

Beetles also defoliated several miles of tamarisk along Horse, Chico and Fountain Creeks. It remains a mystery why beetles did so well in 2011. We know that there are high ant densities that take a toll on *Diorhabda* beetles and we also know



*A release of tamarisk beetles*



*Defoliated tamarisk along Fountain Creek*

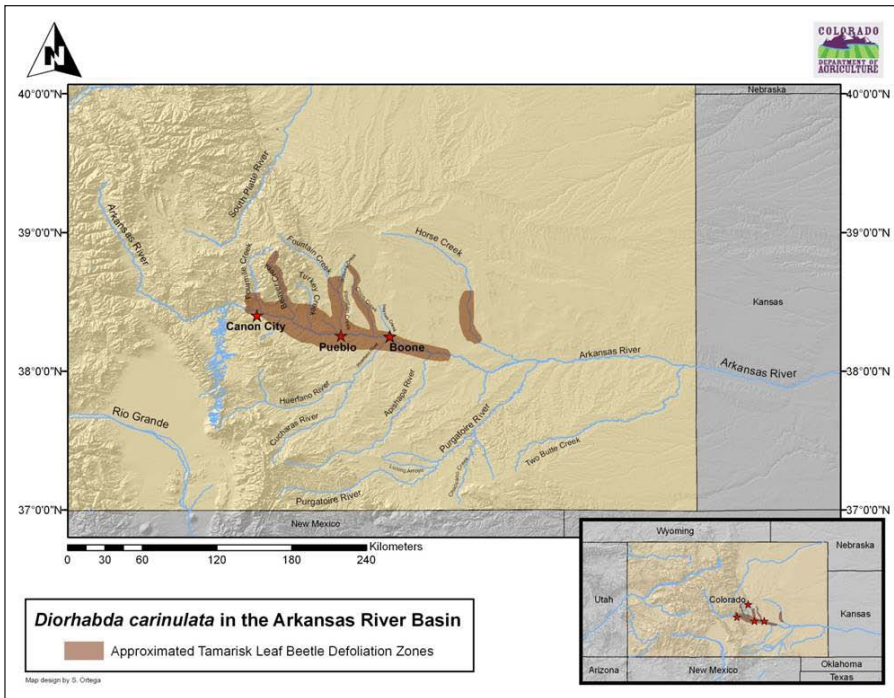
that there are other predators that may have a negative impact on beetles. We don't know why beetles seemed to overcome these predators in 2011 or if beetles will continue to do as well into 2012. Even though we have seen major success we still need to get good beetle establishment along the lower stretches of the Arkansas, so our work is cut out for us.

The CDA made has released over 750,000 beetles since 2007. Other groups, including researchers from CSU Ft. Collins and Denver University have also released beetles in the Basin. These efforts have been assisted by numer-

**T**amarisk beetles (*Diorhabda carinulata*) were first released into the open in Colorado in 2001. The release was made below Pueblo Reservoir and beetles established there and defoliated tamarisk but didn't expand out into the Arkansas Basin for several years. By 2008 there was some defoliation along the Arkansas above Pueblo Reservoir and up Beaver Creek and in 2009 and 2010 there was more expansive defoliation in areas above Pueblo Reservoir. In 2011 the beetles finally took off and defoliated tamarisk from Cañon City to Boone and along several tributaries of the Arkansas. Beetles were initially released near Hoehne in 2009 and are now established there along the Purgatoire.



*Defoliated tamarisk along Horse Creek near Sugar City*



ous people working to control tamarisk in the Arkansas Basin, including people from the NRCS, Colorado State Forestry and US Fish and Wildlife Service. Early in the program the US Bureau of Reclamation was instrumental in establishing beetles below the Pueblo Reservoir. Private landowners have played a huge role in establishing beetles. Many of the releases made in the basin have been made on private lands with excellent landowner support.

**Total Number of beetles released in the Arkansas Basin by the CDA**

Year	Total Beetles Released
2007	10,000
2008	125,500
2009	290,000
2010	234,900
2011	92,573

Most of our work in the Arkansas Basin has been conducted as part of the Arkansas River Watershed Invasive Plant Plan (ARKWIPP). For more information please consult their highly informative website, <http://arkwipp.org>, where you can get information about tamarisk and other problem weeds in the Basin, and efforts to control them. Beetle presence in the Arkansas Basin was monitored by the Tamarisk Coalition in 2011 and the results of the monitoring program are available on their website, [www.tamariskcoalition.org](http://www.tamariskcoalition.org).

**FIELD BINDWEED**

Biological control of Field bindweed began in Colorado in 1997 with 10 releases of the eriophyid mite, *Aceria malherbae*, in the CDA Insectary gardens. In the beginning, pots of bindweed plants infested with *A. malherbae* were planted and monitored for successful estab-

lishment. As mites became more abundant, further releases were performed by twisting the galled leaves of bindweed directly on to the uninfested bindweed plants. From this point on we began a successful campaign of redistribution across the state of Colorado and neighboring states with thousands of releases.

The bindweed mite feeds on the leaves of field bindweed and causes the formation of galls which are protective enclosures within curled and deformed leaves. In the fall as temperatures drop mites go down into the extensive root systems of bindweed. With bindweed the vertical roots can reach depths of 20 ft. or more although 70% of the total mass of root structure occupies the top 2 ft. of the soil and since mites overwinter on the root buds of the plant, this root system provides great overwintering sites for the mites. Mites are then in a perfect position to infest new vines in the spring. Mites prefer hot and dry climates which is why they are well suited to the Grand Valley and much of Colorado. Mesa County was the first place in Colorado where mites became established, allowing us to collect and redistribute mites from large stands of infested bindweed. Our earliest collection sites are now devoid of bindweed to



Heavily damaged bindweed. All leaves are curled and no vines or flowers will be produced.



Mites living inside of a gall. They are approximately 0.1 mm long.



Field bindweed damaged by mites. Note the curled leaves. This plant will not send out the long vines typical of bindweed.



Healthy field bindweed

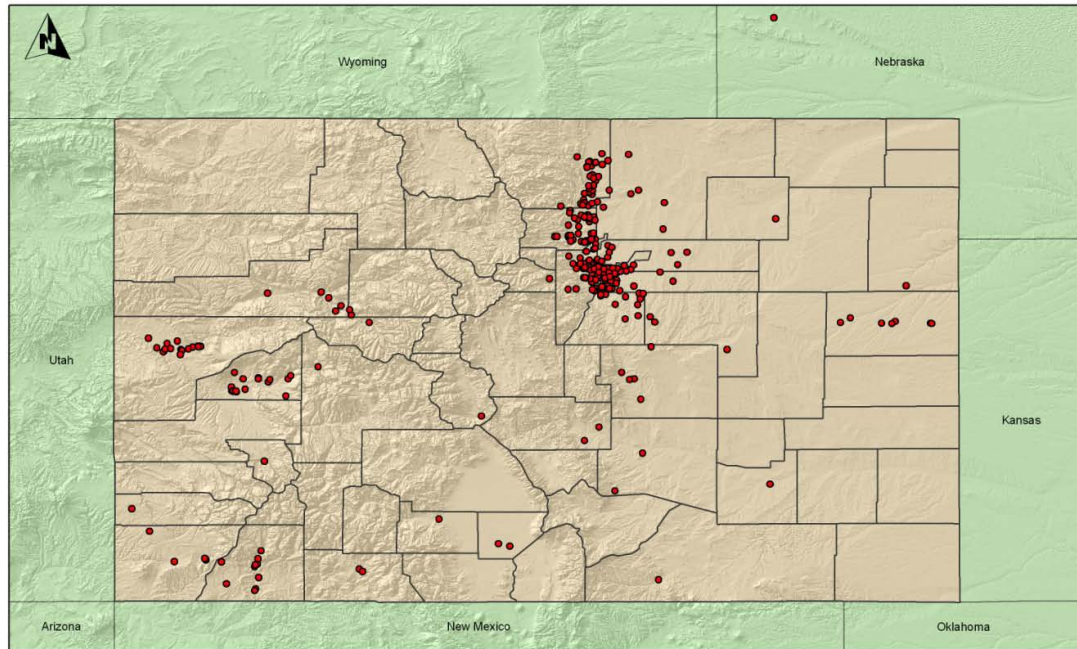
the point that we can no longer use those sites for making mite collections. We have seen mites reduce bindweed stands at a number of locations. At one site we used a point-intercept monitoring protocol to estimate bindweed density at 14% of ground cover and after two years this had dropped to 0%.

Mite distribution has been a cooperative effort. In the early years of gall mite releases, Colorado State University Tri River Extension partnered with the Insectary to make mites available for releases in Mesa and Larimer counties. In 1999, "field days" were held at the Orchard Mesa Research Station in Mesa County and at the Extension Office in Larimer County. With the help of Master Gardeners over 1,200 releases were made in these two counties. For the next two years CSU Extension assisted in fulfilling the large number of mite requests that came in to the CDA. After that the CDA has partnered with counties including Adams, Arapahoe, Boulder, Broomfield, Delta, Denver, Douglas, El Paso, Fremont, Garfield, Jefferson, Larimer and Weld. With assistance from these counties and their weed managers we were able to reduce the costs of shipments to individuals and greatly increase our ability to collect and distribute mites.

The Insectary will continue to collect and distribute mites and will partner with other organizations to help fulfill requests for the mites. For more information please contact Terri Locke at (970) 464-7916 or by email at [terri.locke@ag.state.co.us](mailto:terri.locke@ag.state.co.us).



**Biocontrol Species: *Aceria malherbae***  
**Target Species: *Convolvulus arvensis***  
**State of Colorado**



0 37.5 75 150 225 300 Kilometers

1 cm = 39 km

**Legend**

• 2011 Field Bindweed Mite Releases

## BIOCONTROL SUBSCRIPTION SERVICE

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The Colorado Department of Agriculture, Palisade Insectary has a voluntary “subscription” program which allows counties and municipalities to work more closely with us and to pay a small fee to support our programs. The subscription service can be obtained at four levels in exchange for four different levels of support.

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

What does subscription money pay for? All seasonal help and most equipment, supplies, monitoring, and new project development at the Insectary are funded through grants, cooperative agreements, gifts and fees. 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. You will be sent an invoice for the Biocontrol Subscription Service, charged at the level you requested, and the year will also be shown. We will contact you and ask which agents you need and what information you would like. We will also ask about future biocontrol needs. If you have sites that could be used for new projects, for instance yellow toadflax or Russian knapweed, we will ask permission to monitor new releases.

Four levels of participation. The service is available at four levels to give weed managers flexibility in choosing a plan to fit their budgets.

### \$250 annual fee

An assessment of biocontrol needs for the weed manager, 5 releases of biocontrol agents for one 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 one to three weed species accompanied by brochures/information for distribution to landowners that will be receiving the releases, and an easily performed monitoring protocol.

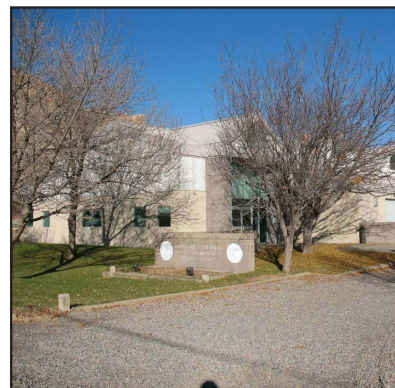
### \$750 annual fee

An assessment of biocontrol needs for the weed manager, 15 releases of biocontrol agents for one 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 one 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.



*The Insectary buildings*

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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](mailto:dan.bean@ag.state.co.us)

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