

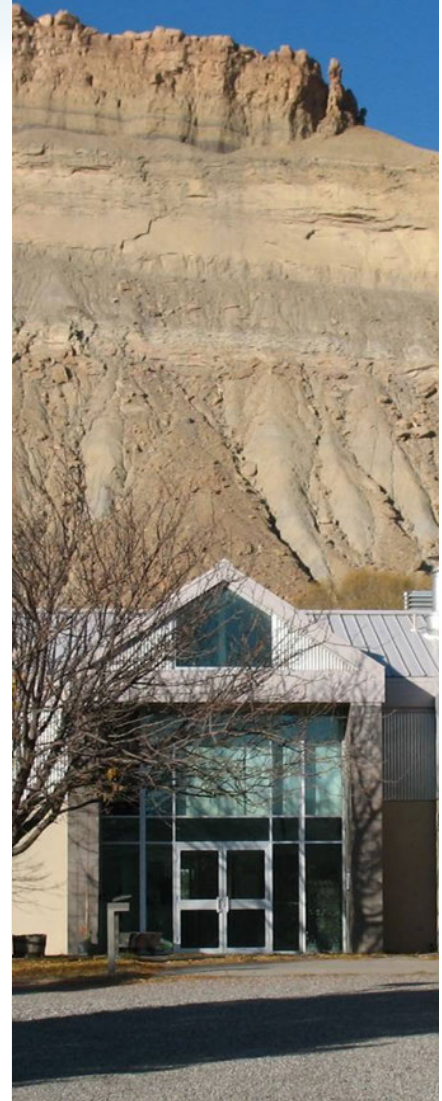


# BIOCONTROL

**B**iological control (biocontrol) is the use of natural enemies, including insects, mites and pathogens, to control pests, including insect pests and noxious weeds. At the Palisade Insectary we rear or collect biological control agents for release and monitor and evaluate the progress of agents in pest control. We also provide information to the public, including pest control professionals and natural resource managers, concerning the use of biological control as a safe, effective and economical control method. We have a number of long standing programs that have been very effective. These include the collection and release of mites for field bindweed control, flea beetles for leafy spurge control, weevils for diffuse and spotted knapweed control and weevils for Dalmatian toadflax control. We also release a parasitoid wasp for use against Oriental fruit moth, a devastating peach pest. In 2012 we released about 1.8 million of these wasps in Mesa County as part of a program which has been going since the 1940's. In addition to the "old" programs we are developing new programs as biocontrol agents become available for new targets, such as Russian knapweed and yellow toadflax. We are also planning to develop new and novel agents for some long standing weed problems. The Canada thistle rust fits into this category and



we are very hopeful that this fungus might help make a dent in infestations of one of Colorado's worst weeds. We also keep an eye on possible future biological controls such as controls for Russian olive, hoary cress, perennial pepperweed, oxeye daisy and houndstongue. Please give us a call or visit our website with the Colorado Department of Agriculture for more information.



## INSIDE THIS ISSUE

Tamarisk.....	2
Russian knapweed .....	3/4
Yellow toadflax.....	4/5
Canada thistle .....	6
Subscription Service ....	7



Nina Louden trims tamarisk



Fountain Creek Monitoring Site 23 near Pueblo



2008



2012

## Tamarisk

The tamarisk biocontrol program continues to be a success in Colorado with declining tamarisk stands in most parts of the state. On the western slope most river drainages have experienced a tamarisk decline as beetles (the northern tamarisk beetle, *Diorhabda carinulata*) had been defoliating the shrubs for the past 4-6 seasons. 2011 had been a poor year for beetles with the first major defoliations occurring in late July. We attribute this to the floods of 2011 which probably killed large numbers of overwintering beetles in the leaf litter and the cooler than normal spring which slowed the emergence of the first summer generation. The low levels of defoliation allowed plants to survive 2011 quite well and we didn't see much increase in mortality in 2012 (see graph). In 2012 the situation was very different. We had an early spring and, unfortunately, very low water. Beetles thrived, reproduced early and we had two strong generations and major defoliation along most waterways. It will be very interesting to see if this brings about a jump in mortality in 2013.

---

*“In the Arkansas Basin we once again saw extensive tamarisk defoliation in 2012.”*

---

We have seen dramatic differences in tamarisk mortality from one monitoring site to another (see graph). At some of our sites we have no mortality of marked trees while at other sites we have high mortality. Our explanation is that the condition of tamarisk and the ecological setting varies greatly between sites. At some locations there is no surface water and at some locations the tamarisk plants are older and appear to be senescent. These factors may cause a more rapid decline in the plants once they become beetle-stressed. It is important to keep in mind though that even at sites where mortality is low overall green biomass has declined dramatically following repeated defoliation cycles. In addition, flowering has also declined dramatically.

In the Arkansas Basin we once again saw extensive tamarisk defoliation in 2012, even more so than in 2011 (the first year of major defoliation). Beetles spread up many of the major tributaries of the Arkansas and we found them as far east as Two Buttes State Wildlife Area and as far south as the Purgatoire near Trinidad. At our monitoring sites tamarisk had started to die back (see before and after photos). There are still large stands of tamarisk on the lower Arkansas where beetles have yet to establish but generally they are doing very well.

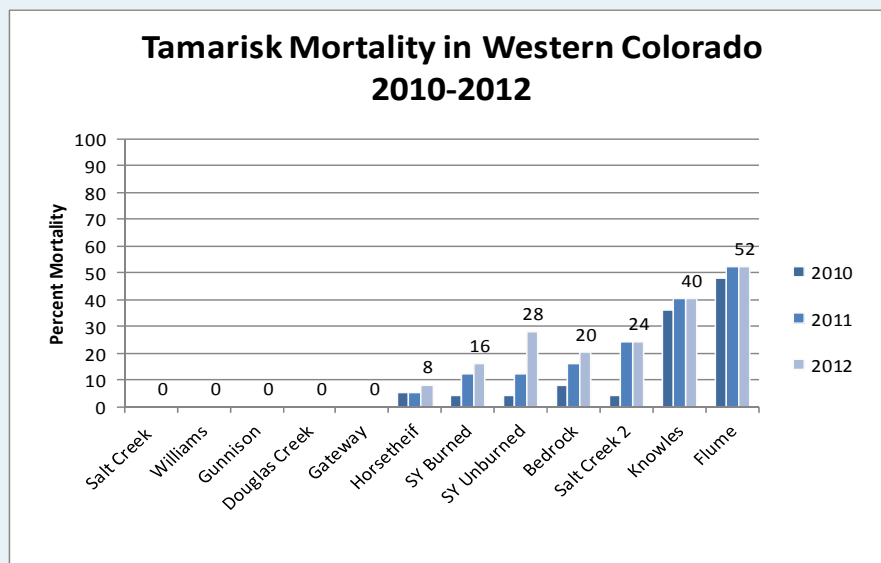
We will continue our monitoring program in 2013 and if you have potential monitoring sites, particularly in the Arkansas Basin, please contact us. A monitoring site consists of 5-10 acres of tamarisk (it can be stretched out along a river or stream) that is not slated for herbicide or mechanical treatment. We will mark 25 trees and monitor 1-2 times per season. Our goal is to measure the rate and extent of tamarisk decline in Colorado. Please contact Nina Louden, program director, if you have sites that could be used for long term monitoring of tamarisk beetle impact ([nina.louden@state.co.us](mailto:nina.louden@state.co.us), (970) 464-7916).

2012

2008



Fountain Creek Monitoring Site 10 & 11 near Pueblo



*Diorhabda carinulata*



Top Left: Infested field Las Animas County. Bottom Left: Russian knapweed plant with galls on multiple stems Above: Monitoring Russian knapweed biological control on a farm in Montezuma County

## Russian knapweed

Biocontrol releases for Russian knapweed increased in 2012; more planned for 2013.

Russian knapweed is a deep rooted creeping herbaceous perennial that often forms dense monocultures, crowding out native and crop plants. It is a serious and widespread problem in Colorado where it is often found in remote areas or in large dense stands, making control difficult and uneconomical. These features make Russian knapweed a prime target for biological control. The gall midge *Jaapiella ivannikovi* is a small fly that feeds on Russian knapweed by laying eggs at the growing tips of the plant enabling newly hatched larvae to form galls. Developing larvae cause the stem to stop growing and the leaves don't open up but instead they form a multi-layered struc-

ture with fly larvae living between the layers. Up to 30 larvae can live within a single gall. The Palisade Insectary received Russian knapweed gall flies from the USDA APHIS with shipments made from 2009-2012. We now have a large enough colony that we can continue to propagate the flies in our greenhouse as well as outside in our Russian knapweed "garden". Our goal is to supply flies to landowners in all parts of Colorado where Russian knapweed is a problem. In 2012 we produced over 1,800 galls and released them at 48 sites around Colorado (see map).

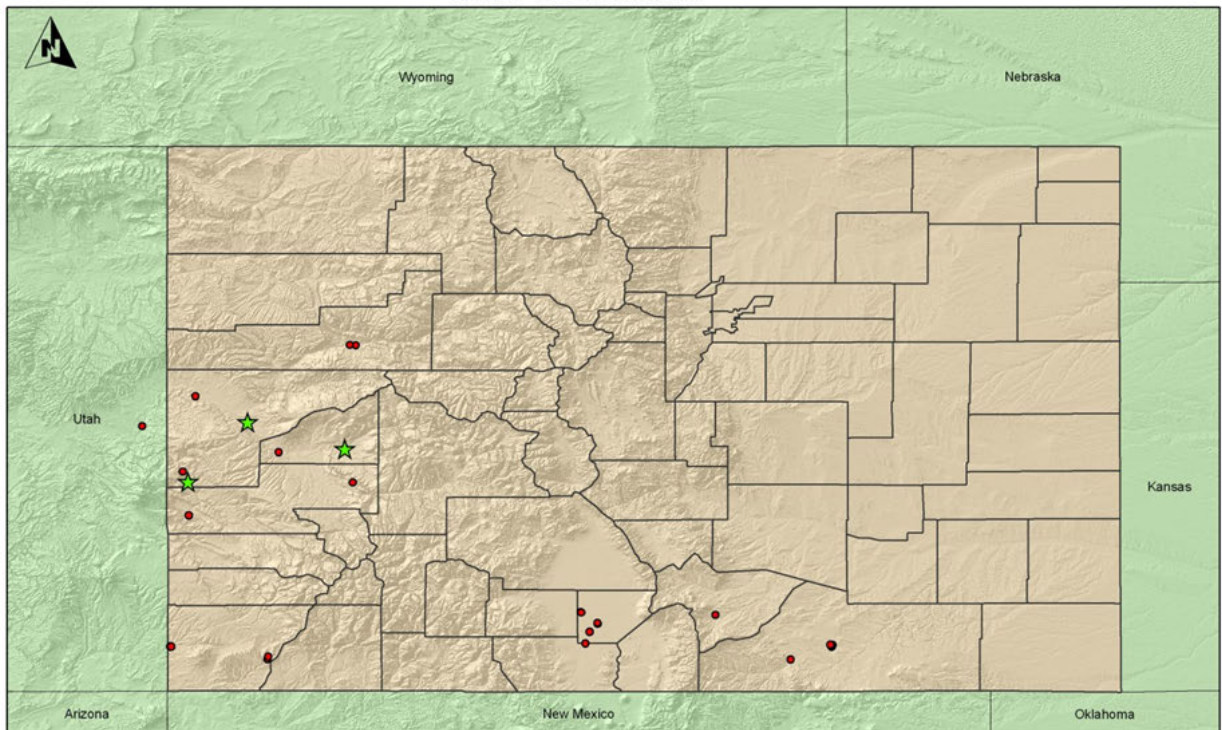
The release sites were chosen to cover most of Colorado's worst Russian knapweed infestations. We made releases on the Colorado, Gunnison and Dolores Rivers as well as at sites near Cortez and Mancos in the south-

western part of Colorado. The San Luis Valley has serious Russian knapweed infestations which were the target of several gall fly releases in 2012. Finally the Arkansas River basin has some of the largest Russian knapweed infestations in the state so releases were also made there. Many of the release were made during the summer, when Russian knapweed had finished growing. This is not the optimal timing for releases since the female flies require growing shoots in which to lay eggs. Even so we did have three sites where gall formation was seen within the growing season. We will check all sites this spring for the first real test of establishment: overwinter survival of the insects.

In 2013 we plan to expand the gall release program and cover more sites statewide. Our goal is to get out another 1,800-2,000 galls to areas where we have already released as well as to new sites. Since we have a thriving population of the gall flies in our greenhouse we will be able to release flies earlier than we did last year when we were dependent on the growth and maturation of galls in the garden prior to releasing them in the field. This will let us distribute galls about a month earlier than we did in 2012 which will help in establishment. If you have potential field sites for gall fly release and monitoring please contact us (Dan Bean [dan.bean@state.co.us](mailto:dan.bean@state.co.us), or Andrea Judson [andrea.judson@state.co.us](mailto:andrea.judson@state.co.us))



**Biocontrol Species: *Jaapiella ivannikovi***  
**Target Species: *Rhaponticum repens***  
**State of Colorado**



1 cm = 39 km

**Legend**

- ★ Release Site with Gall Recovery
- 2012 Russian Knapweed Gall Fly Release

## Yellow Toadflax

Yellow toadflax stem boring weevils establish in Colorado

Yellow toadflax infestations continue to expand in Colorado including into inaccessible areas such as mountain forests and meadows. This makes the weed difficult to control using conventional methods and an ideal target for biological control. Unfortunately we don't yet have an effective control agent but with the addition of a new weevil in 2009 we may be on the verge of success in the yellow toadflax biocontrol program.

The story of yellow toadflax biocontrol is interesting since we have had success using the stem boring weevil *Mecinus* in controlling Dalmatian toadflax and it was thought that the same weevil would also be effective against yellow toadflax. This was not the case and after hundreds of releases of *Mecinus* against yellow toadflax we ceased our release program. At that time reports came from Montana that *Mecinus* weevils were thriving on yellow toadflax and we initiated a program, in cooperation with the US Forest Service and USDA APHIS to bring yellow toadflax weevils to Colorado. Meanwhile researchers had discovered that the stem boring weevils found on yellow toadflax were actually a different species than those found on Dalmatian toadflax. The differences between the species were so subtle that the best way to tell them apart was through DNA sequence differences. We now know that we have two nearly indistinguishable species of stem boring weevil; *Mecinus janthinus* which feeds on yellow toadflax and *Mecinus janthiniformis* which feeds on Dalmatian toadflax. In this case the host specificity of these closely related weevils limited each to a single toadflax species. With this in mind we can now proceed with the yellow toadflax biocontrol program using the proper weevil species.

We received our first small shipment of *M. janthinus* from established populations in Montana in 2009 and released them into a cage at the Oak Ridge Wildlife area in Rio Blanco County. The adult weevils immediately laid eggs in the stems of yellow toadflax and larvae and pupae were recovered in the stems by the end of the 2009 field season. Weevils successfully overwintered and were present at the beginning of 2010. In 2010 and 2011 we received more adult weevils from Montana through the US Forest Service and USDA APHIS. We were able to release at four new sites in 2010 and another seven in 2011. These sites are scattered across the mountainous areas of seven different counties and they range in elevation from 1,524-2,835 meters (5,000 to 9295 feet). Although we didn't get weevil shipments in 2012, we continued to survey our release sites looking for large enough weevil populations to allow redistributions. We found weevils at the first release site (Oak Ridge Wildlife Area) and at the Burro Mountain site, also in Rio Blanco County. Weevils have established at a site near Minturn (Eagle County) and we were able to recover adults after two seasons. There weren't enough weevils at any of the three established sites to allow us to begin redistribution within Colorado.

We haven't measured an impact of weevils on yellow toadflax at our monitoring sites which isn't surprising since we only have two monitoring sites



Nina Loudon tends Yellow toadflax





Yellow toadflax grows in remote locations in the White River National Forest, Rio Blanco County

*“Yellow toadflax infestations continue to expand in Colorado including into inaccessible areas such as mountain forests and meadows.”*

where beetles have established, and even at those sites the weevils are present in low numbers with little overall plant damage. We have our monitoring protocol in place which will enable us to measure changes in stem density, flowering and plant size. We also measure changes in the overall vegetation profile. If beetles have an impact we will be able to quantify it. At the Oakridge site where beetles have been established the longest we did see a major decline in the toadflax density but this is the one site where we are not using our monitoring protocol and therefore it is not possible to quantify the changes. If the population dynamics and impact of the yellow toadflax stem boring weevil are similar to what we've seen with the Dalmatian toadflax stem boring weevil then it will take about five years to really see an impact on the plant population. The beetles have only one generation per season and it takes large numbers of weevils to stunt, and then finally kill a plant.

In 2013 we will continue to monitor our sites for beetle density and impact and we will continue to seek new sites for release. Please contact the Insectary if you are interested in having a release and monitoring site on your yellow toadflax infestation (program manager Terri Locke, [terri.locke@state.co.us](mailto:terri.locke@state.co.us), (970) 464-7916).



Mecinus janthinus

## Canada thistle

Canada thistle rust as a biological control

Canada thistle (CT) is one of the most damaging and widespread weeds in Colorado. This perennial thistle spreads by lateral roots and forms large colonies that are very difficult to control. There are biological controls including the Canada thistle stem gall fly and the Canada thistle stem weevil which may provide control in some settings but in general there are no highly effective biocontrol options. The Canada thistle rust, *Puccinia punctiformis*, is very host specific rust and has been in North America for over a century, but it has failed to provide widespread control. Part of the reason is that the rust does not spread rapidly or over great distances and little was known about the rust lifecycle, so human-assisted spread was not efficient either. Dr. Dana Berner of the USDA ARS has been studying the rust in or-

der to better use it as a biological control for CT. He and his colleagues have found that plants become infected in the fall (rather than spring as originally thought) and the rust overwinters in the root system of the thistles and such systemic infections are almost always fatal, with the plants dying the following year. These observations have enabled Dr. Berner to develop a protocol for infecting plants and bringing about the decline of patches of CT which may provide landowners with a very effective biocontrol option for this weed. We are going to begin work on field trials of the rust this season. If the results look promising we'll expand the program so that CT biocontrol is available throughout Colorado. If you have questions about the rust or if you have a persistent patch of Canada thistle and would like us to test the rust and monitor the results please contact Dan Bean ([dan.bean@state.co.us](mailto:dan.bean@state.co.us))



Left: Infected Canada thistle plants have brown and black spotting.

Above: Canada thistle plants become systemically infected with *Puccinia punctiformis* in the fall and produce spores in the spring. Systemic infection means that the roots are also infected, which eventually kills the plant.



## Biocontrol Subscription Service

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. We had several counties and municipalities participate in 2012 and this allowed us to better assess biocontrol needs in the state. 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.

#### **Insectary**

750 37.8 Rd.  
Palisade, CO 81526

Phone: (970) 464-7916  
Toll Free: 1 (866) 324-2963  
Fax: (970) 464-5791

[www.Colorado.gov/ag/biocontrol](http://www.Colorado.gov/ag/biocontrol)