



# BIOCONTROL

This past season we continued to release biocontrol agents against tamarisk, Russian knapweed and yellow toadflax. Our efforts to control these weeds have been ongoing for several years but we have not yet gotten full coverage of Colorado with the agents, nor have we probably seen the full impact on the target weeds. We've made progress on all three projects, briefly summarized in this newsletter, but more work is needed to make full use of available biocontrol agents in combating these weeds. Our Canada thistle control project is in the early stages of development but we were able to release the rust fungus *Puccinia punctiformis* at locations around the state and we were also able to confirm that we got establishment of the fungus at multiple sites where we released spores in the late summer of 2013. One definition of biocontrol is the use of natural enemies, including insects, mites and pathogens, to control pests, including insect pests and noxious weeds. Up until 2013 the Insectary worked primarily with mites and insects as biocontrol agents and had no large scale programs that utilized pathogens. We're happy to say that changed with the implementation of a Canada thistle control program using the fungus, and we're optimistic that it will become a highly useful tool in Canada thistle control. We strongly encourage the use of biocontrol the context of integrated pest management (IPM). We are working within the framework of a large scale IPM effort to bring weeds under control following the High Park/Hewlett fires of 2012. The Poudre Partnership is a resource management coalition that is using a suite of methods to bring invasive weeds under control following the devastating fires. We have joined the group and are working with them to help implement biological control of Dalmatian toadflax over many thousands of acres of rugged terrain burned in the fires.



nor target



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*John Kaltenbach collects  
Diorhabda at Blue Lake*



*Defoliated tamarisk at John  
Martin Reservoir*



*Defoliated tamarisk at Smith  
Creek*

In 2014 large stands of tamarisk growing in the Arkansas River Basin had a rough summer thanks to continued attack by northern tamarisk beetles (*Diorhabda carinulata*). The CDA Insectary began releasing the beetles in 2007 in effort to halt further spread of the troublesome weed.

collect approximately 280,000 beetles for redistribution within the basin. This is great news for the project. Collection and re-release of populations established on the eastern slope may allow for movement and establishment of beetles more suited to the Arkansas River Basin and give easier

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*“As of 2013, over 1.5 million beetles had been shipped east from collections made in western Colorado.”*

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As of 2013, over 1.5 million beetles had been shipped east from collections made in western Colorado. It took time for the beetles to establish and begin defoliation but by 2011 the impact of these releases was observable on several drainages including Horse, Chico, and Fountain Creeks. Since this time damage by beetles has steadily increased. Although it is hard to see the impact of the tiny insects in places where tamarisk covers thousands of acres, the CDA is pleased to report that large numbers of third instar larvae were observed at John Martin and Neesopah Reservoirs this year. Beetles have also continued to defoliate tamarisk further west with slow but steady movement along the Arkansas and Purgatoire Rivers.

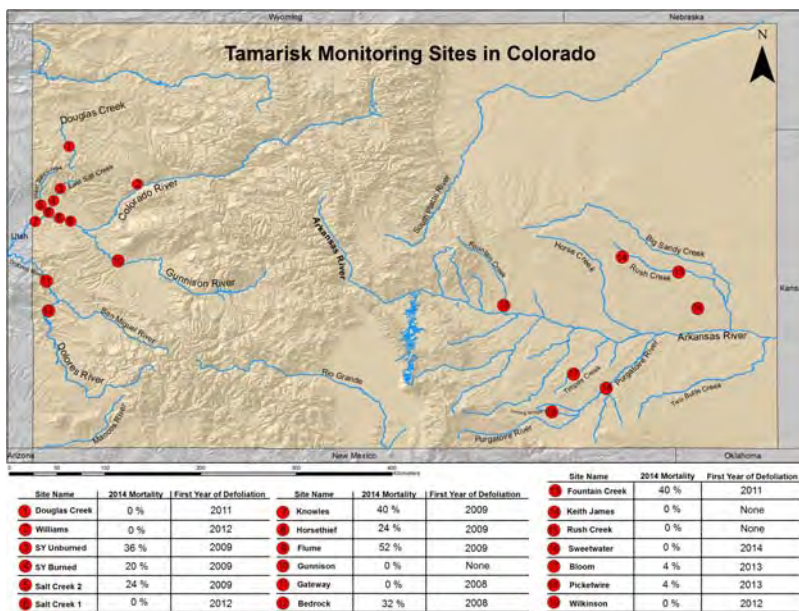
2014 was the first year in which we could collect and redistribute large numbers of beetles within the Arkansas River basin. We had scouted out potential collection sites and worked with our excellent collaborators to find and

access to land owners interested in releasing beetles on their property. This past season collections were made from the tamarisk infested areas around Blue Lake Reservoir and we will be on the lookout for additional sites in 2015. As the project continues across Colorado the CDA will continue to measuring tree mortality and defoliation events by beetles at monitored sites, as well as redistribute beetles in locations where establishment has not yet occurred.

For additional information please contact the project leader Nina Loudon [nina.louden@state.co.us](mailto:nina.louden@state.co.us) or call at (970) 464-7916)



Photos capturing initial beetle establishment amongst thousands of acres of tamarisk at John Martin Reservoir (top) and beetle defoliation observed on Smith Creek near the Purgatoire River in 2014. Map (bottom) showing monitored sites and tamarisk beetle damage across CO, 2014.





Left: Russian knapweed (top). Rearing cages (middle), Gall fly, (bottom). Above: Gall Wasp.



The Insectary has two biocontrol agents for use against Russian knapweed. One is a fly, the other a wasp and both form galls, which are swollen areas of the plant within which the insect develops. *Jaapiella ivannikovi*, the gall forming fly, is the more widely used of the two agents in Colorado. *J. ivannikovi*, otherwise known as the Russian knapweed gall midge, has been released throughout the state through a program that began in 2009. In 2014 we released about 4,260 galls at 92 sites around Colorado (see map) and these were either reared in our greenhouses or collected from sites where they have become established in the field. One reason why we rear galls in the greenhouses is to have wasps available for release in the spring. Since the gall midge females lay eggs on the growing shoot tips it is best if the adult flies are present in the spring, when the first major flush of foliage appears in Russian knapweed patches. Greenhouse reared galls can be ready for the field several weeks earlier than field collected galls which means that adult flies can hit the spring flush of foliage. Another advantage to greenhouse reared material is that whole plants can be taken out of the greenhouses and used for open field releases. Our early releases using greenhouse galls were made in April and May which is before field collected material was available. In the period from mid-May through September the Insectary garden plus field site provided a steady supply of galls for open field releases.

We did our first releases of the gall forming wasp *Aulacidea acroptilonica* in 2013 but no establishment was seen either that year or in 2014. We also began a greenhouse rearing program with the wasp in order to expand populations sufficiently for more open field releases. The gall wasp is slightly larger and more stout bodied than the gall fly (see photo). To rear the wasp we contained Russian knapweed plants within small cages (photo) and released wasps within the cages where they

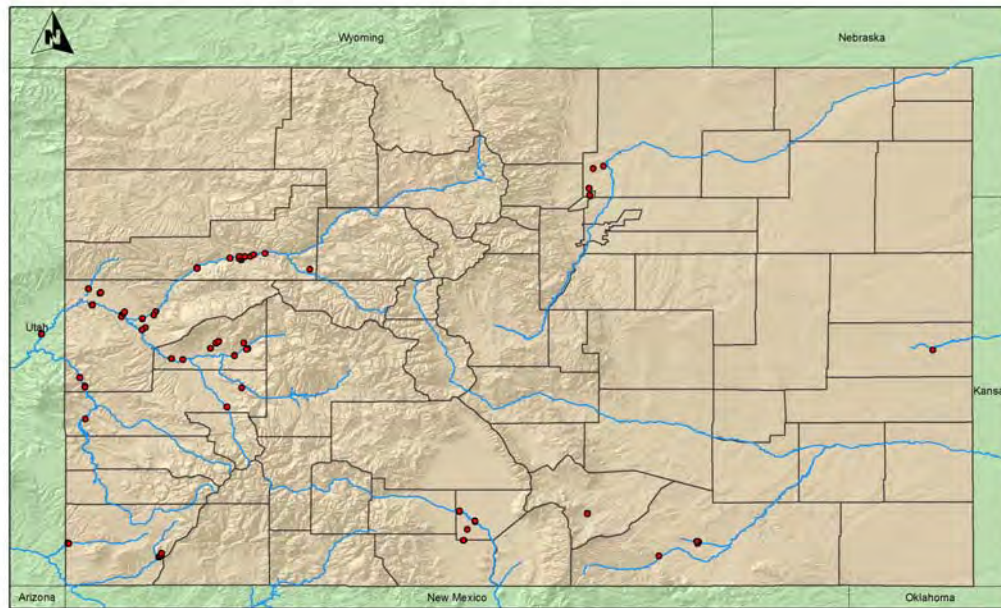
could lay eggs within the stems of growing plants. This approach worked well and we had dozens of large galls, which in the case of this wasp are swollen portions of the knapweed stem within which the larvae develop. The main problem with rearing this wasp is that they have only a single generation per season which limits population growth. We are still working on ways to speed up gall wasp development so that we can get multiple generations per season in the greenhouse.

This project, as well as the yellow toadflax project, has been a cooperative effort between the United State Department of Agriculture Animal and Plant health Inspection Service (USDA APHIS) and the Insectary. USDA APHIS scientists based in Ft Collins have assisted the Insectary in obtaining the knapweed control agents and in finding areas for release of the agents. In addition, USDA APHIS scientists have helped us by collecting both yellow and Dalmatian toadflax agents. Clearly biological control requires a team effort in order to achieve success.

For more information on the Russian knapweed project please contact the project leader, Jess McKenney [jessica.mckenney@state.co.us](mailto:jessica.mckenney@state.co.us), or (970) 464-7916)



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



**Legend**  
 • Russian Knapweed Total Release Sites



*Systemically Infected plant*



*Karen Rosen & Mike Racette  
perform experimental  
inoculations*

The Canada thistle (CT) rust project got off to a great start in 2013 when we located rust at several sites in Colorado. We used these local sites to collect rust spores, known as teliospores (see photo), for distribution to uninfected Canada thistle patches. We were then able to



use the collected spores to infect four CT plots on the Western Slope and five on the Front Range and plains in the fall of 2013. In the spring of 2014 all four plots on the Western Slope contained infected plants while three out of five on the Front Range/plains showed evidence of successful inoculation. With the help of resources from a cooperative agreement between the USDA ARS and the CDA we dramatically expanded our program in 2014. Plant pathologist Dr. Dana Berner, from the Ft. Detrick Maryland, United States Department of Agriculture, Agricultural Research Service (USDA ARS) labs, travelled to Colorado in the spring of 2014 and answered questions about the rust fungus and assisted in finding locations for future inoculations. With a network of cooperators and collaborators we were able to set up, infect and monitor 90 sites across Colorado during the summer and fall of 2014 (see map). The project will give us a large amount of information concerning the efficacy of the rust fungus as a biocontrol agent and the methods for collecting and spreading the

infective spores. So far we have been very encouraged by our results and observations following rust fungus inoculation. We were successful at infecting previously healthy plants. This means that the fungus is in the root system and infected plants are very likely to die. Another way to put it is killing the roots of Canada thistle is key in controlling the plant.

As the project proceeds we are learning more about rust spore collection, processing and storage. The rust fungus has a complex life cycle and only the teliospores (one of the five spore types found in this rust) can be used to initiate a systemic infection of an uninfected plant. We have learned how to collect, process, and store large amounts of infective teliospores but we are still working on delivery methods to bring the spores into contact with susceptible Canada thistle plants (see photos). We are also working throughout Colorado which will let us know if there are areas in the state where the fungus works better or doesn't work. We're looking forward to checking on the 90 inoculated sites next season to see how many have become infected.

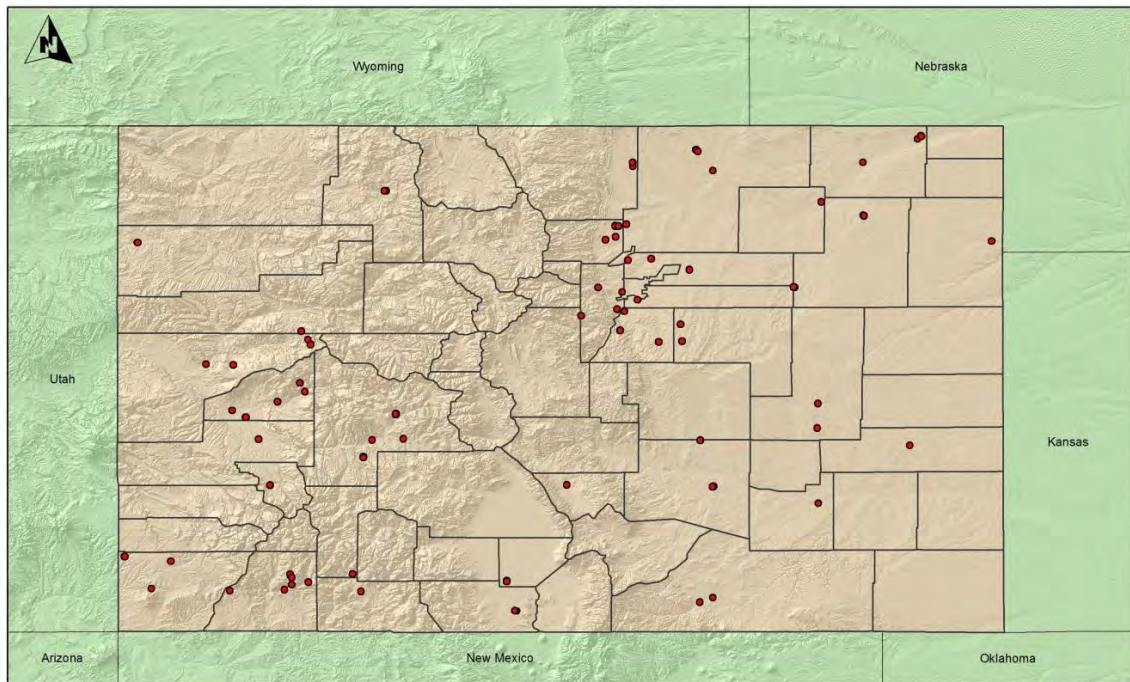
For more information, or if you have a Canada thistle patch that you would like us to use for inoculation and monitoring please contact the program directors [joel.price@state.co.us](mailto:joel.price@state.co.us) or Karen Rosen [karen.rosen@state.co.us](mailto:karen.rosen@state.co.us).



Left: John Kaltenbach, Amanda Stahlke, and Mike Racette monitor Canada thistle. Right: Joel Price inoculates experimental plot.



**Biocontrol Species: *Puccinia punctiformes***  
**Target Species: *Cirsium arvense***  
**State of Colorado**



**Legend**

- 2014 Canada Thistle Rust Fungus Releases

1 cm = 39 km



Monitoring infested hill near Pagosa Springs



Terri Locke tends Yellow toadflax in greenhouse

The Insectary released 1,855 adult yellow toadflax weevils (*Mecinus janthinus*) in 2014. These included 394 weevils that were reared in the Insectary greenhouses and 1481 that were obtained from the US Forest Service in Montana. Releases were made at ten sites including five sites in Colorado’s Front Range and two sites in the San Juan National Forest. This is a large number of weevils, but our problem continues to be supply. While we have steadily expanded our number of release and monitoring sites we could use **50 to 100 times** as many weevils as we released this year in Colorado. Yellow toadflax weevils have always been in short supply and we depend on our collaborators with the United States Forest Service and the USDA Animal and Plant Health Inspection Service (APHIS) for weevils. They collect them from a few sites in Montana where the weevils have been established in the 1990s and these collection sites have to supply all the biocontrol users in the US. It’s clear that the weevils are fairly slow to reach high population densities and that we will need multiple field collection sites if we are to have enough of them to distribute to all locations in Colorado where they are desperately needed.

We have started a greenhouse rearing program to produce additional yellow toadflax weevils for open field release. Terri Locke, who is leading our effort to rear weevils in the greenhouse, collected yellow toadflax stems during the fall of 2013 from our field sites in Rio Blanco and Eagle Counties and the stems contained sufficient weevils to start a colony in the Insectary greenhouses. We used potted yellow toadflax in the greenhouse to rear weevils, which lay eggs on and develop within the stems of the plants. The field collected weevils were dormant (in diapause) when Terri first brought them in and they were not laying eggs even after being warmed and supplied with fresh toadflax foliage. To solve this problem Terri gave the weevils 4 weeks of cold treatment

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*“Over the winter we reared nearly 400 yellow toadflax weevils which we were able to distribute in the spring of 2014.”*

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which helped them break dormancy and begin laying eggs. Over the winter we reared nearly 400 yellow toadflax weevils which we were able to distribute in the spring of 2014.

For additional information please contact the project leaders Terri Locke [terri.locke@state.co.us](mailto:terri.locke@state.co.us) or Mike Racette [michael.racette@state.co.us](mailto:michael.racette@state.co.us) or call at (970) 464-7916).







Steve Ryder releases *Mecinus janthiniformis* near Poudre River

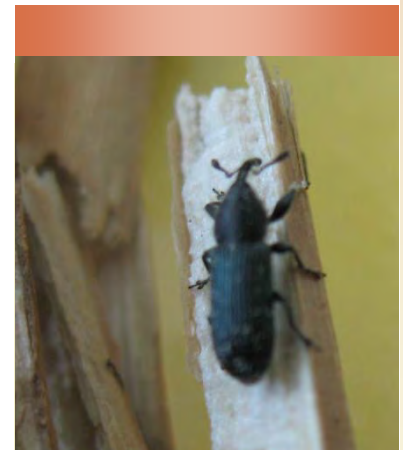
## INSECTARY TARGETS DALMATIAN TOADFLAX AS PART OF THE POUDRE PARTNERSHIP

The Poudre Partnership is a consortium of agencies, local governments and landowners acting together to help bring weeds under control following the devastating High Park and Hewlett fires of 2012. The Insectary joined in the weed control effort, mainly through the release of the Dalmatian toadflax weevil, *Mecinus janthiniformis*. We also established long term monitoring plots to evaluate the impact of the weevil on Dalmatian toadflax as well as on plant communities at sites where we believe Dalmatian toadflax will be controlled.

Our portion of the project began in 2013 and included areas burned by the Hewlett fire in May of 2012. Our release and monitoring sites were located west of Seaman Reservoir which is on the North Fork of the Cache la Poudre River (see map). Following the fire Dalmatian toadflax rapidly came to dominate several thousand acres (see photos). The vast size of the infestation and difficult access made this area an ideal location

for the use of biological control. Seaman Reservoir supplies drinking water to Greeley which means that chemical control options near the lake are also limited. The strategy for Dalmatian toadflax control was to make multiple weevil releases spaced over as much of the remote landscape as possible, given the limited number of weevils at our disposal. As part of the program we set up four monitoring sites and an additional 20 release sites that are relatively easy to access. We monitor annually and will use the additional weevil releases sites as potential collection sites to obtain large numbers of weevils in the future. We also made three releases in more remote and difficult terrain in order to establish self-propagating populations in areas that are difficult to reach, even by foot.

One major challenge was to come up with sufficient numbers of weevils to ade-





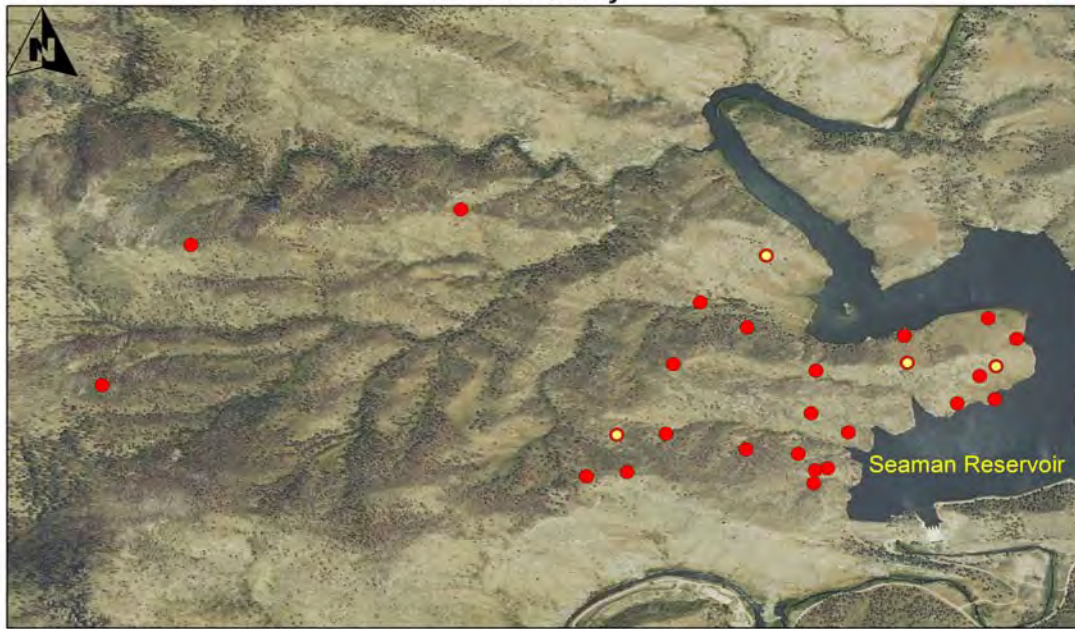
Steve Ryder releasing *Mecinus* weevils on Dalmatian toadflax

quately cover the burned areas. The *M. janthiniformis* that we released came from several sources including the USDA APHIS in Montana and Washington, the Bureau of Land Management in Idaho and from our own collection sites in western Colorado. With these multiple sources we were able to release 5,000 weevils divided into 27 releases (see map). Ideally we would have wanted about ten times this amount for the area west of Seaman Reservoir. One way around this shortfall is to use our 2013 release sites in the burn areas as nursery sites for future collection and redistribution of weevils. Beetle populations have expanded in 2014 and many of the toad-

flax stems contained developing weevil larvae. These larvae will overwinter as adults in the stems, and then emerge in the spring of 2015, providing insects for redistribution in the burned areas that currently have no established populations. We will avoid collection out of our four monitoring sites and out of the three remote release sites. We'll begin surveys in May of 2015 and we anticipate getting many releases of weevils from those areas. In the years beyond 2015 we hope to have very large weevil populations from which we can do large scale releases in the High park burned area and at other sites along the Front Range.



**Biocontrol Species: *Mecinus janthiniformis***  
**Target Species: *L. genistifolia* ssp. *dalmatica***  
 Larimer County



**Poudre River Dalmatian Toadflax Weevil Releases**

- Monitoring Sites
- Release Sites

## 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.

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