



COLLECTING AND RELEASING BIOLOGICAL WEED CONTROL AGENTS IN WASHINGTON STATE

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Integrated Weed Control Project

Washington State University's Integrated Weed Control Project (IWCP) was developed to help educate landowners and land managers about biological weed control, and expand the availability of biological agents for the suppression of non-native noxious weeds across the state.

As a statewide program, the IWCP provides on-site recommendations and biological control agents free of charge to those with appropriate release sites. This publication will help you decide if biological control is appropriate for your land, and assist you in combining it with other methods in your integrated weed management (IWM) plan.

What is Biological Weed Control?

Classical biological weed control (often referred to as biocontrol) is the intentional use of an invasive plant's natural enemies to reduce its vigor and reproductive potential. Many of Washington's noxious weeds are native to Europe and Asia. When introduced into North America, they often arrive without the insects, mites, and pathogens that keep their populations in check in their native ranges. By releasing biocontrol agents, we aim to restore the balance found in the weeds' native ranges, thereby shifting the competitive edge back to native or more desirable vegetation, such as forbs and grasses.

Safety of Biological Control Agents

In order to find biocontrol agents, researchers travel to the plant's native range and survey for biocontrol species that may eventually be approved for release in North America. Potential agents are tested for their effectiveness against the weed and their host-specificity is assessed to ensure they will not attack commercial crops or native species.

Biocontrol agents are not available for use until they have undergone rigorous testing and have been approved for release by the United States Department of Agriculture—Animal and Plant Health Inspection Service—Plant Protection and Quarantine (USDA-APHIS-PPQ).

This process can take ten years or more to complete. The IWCP has adopted the International Code of Best Practices for Classical Biological Control of Weeds (Balciunas and Coombs 2004), meaning that only safe, host-specific, effective, and USDA-APHIS-PPQ-approved agents will be used for biological control. One example of an approved insect is *Larinus minutus* G., also known as lesser knapweed flower weevil, which is widely used on diffuse knapweed.

Expectations

Not all noxious weeds have approved biological control agents, but if they do, biocontrol can be an effective and important part of an IWM strategy. Biocontrol agents are most appropriate in situations where weed infestations are large and well established, and on sites where other control methods are not feasible. They are not appropriate for small weed infestations or on sites where weed eradication is the goal. Weed infestations can be brought under control and managed effectively with biocontrol agents, but this tool alone will not eradicate them.

Biocontrol agents often take a minimum of four years, and sometimes more than ten, to make an impact, so this method should be regarded as a long-term management strategy, not a short-term fix.

Choosing an Appropriate Release Site

There are several things to consider before proceeding with a biocontrol agent release. It is important to have the weed properly identified to ensure that the correct biocontrol agent is used. Representatives of the IWCP, your county WSU Extension office, and county noxious weed board control board (CNWCB) office can assist you with noxious weed identification.

In addition, it is critical to determine whether your other management techniques are compatible with biocontrol use. As a general rule, biocontrol cannot be used directly with herbicides or such physical control methods as mowing, but can be used directly with cultural control methods, such as revegetation. It is best to discuss your IWM plan with IWCP personnel to maximize your biocontrol results.

Specific release sites should:

1. Have a large infestation of the target weed (Figure 1). Small or new infestations should be controlled by other means.
2. Be ecologically suitable for the biocontrol agent, which will increase chances of its establishment.
3. Fit the goals of the landowner. Since it can take several years for biocontrol agents to build up and begin reducing weed infestations, they may not be useful for all sites.
4. When appropriate, be easy to access for monitoring or for future collections.
5. Be relatively undisturbed (not heavily grazed, plowed, etc.) for at least five years, but preferably ten.



Figure 1. Example of a large Dalmatian toadflax infestation suitable for biological weed control. (Photo credit: Jennifer Andreas, WSU Extension)

How to Acquire Biological Control Insects

A list of biocontrol agents, their availability, distribution, and roles can be found in the [Pacific Northwest Weed Management Handbook](#). If you would like to be placed on the list to have biocontrol agents released on your land, please contact the IWCP, your CNWCB, or county Extension office. For more information, please visit <http://invasives.wsu.edu/>.

There are also several private businesses that sell biocontrol agents online. Regardless of the source of the agents, we encourage you to let IWCP project personnel and/or your local CNWCB know of all biocontrol releases.

Be aware that you cannot ship or transport biological weed control agents across state lines without a USDA-APHIS-PPQ 526 permit. To learn more about permits, go to <http://www.aphis.usda.gov/wps/portal/aphis/resources/permits>. Landowners do not require permits if releases are coordinated through the IWCP. Be sure you have landowner permission before collecting and/or releasing insects.

How to Collect Biological Control Agents

If large numbers of biocontrol agents are available at a field site, they can be collected for redistribution. The correct insect stage, time of year and day, and collecting technique vary by biocontrol agent, so it is advisable to contact a biocontrol specialist to determine what is required for your system. Below is a description of common techniques.

1. Aspirating:

An aspirator is a small device that uses a vacuum to pull an insect into a container (Figure 2). They are useful for separating the species of interest from other insects. Aspirators work well for smaller, hard-bodied insects. The vacuum can be created by lung power (inhaling) or a vacuum pump.

To aspirate an insect, inhale on the plastic or rubber tube (a) while pointing the open metal tube (b) close to the insect. Be sure to keep the screen on the tube you are inhaling through so as not to inhale insects or other particles (c). Filters that catch small particles (d) can be purchased from agricultural suppliers.

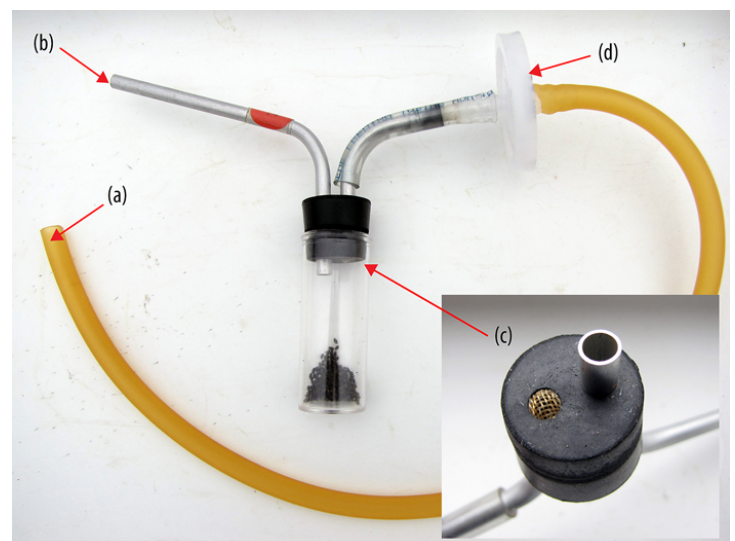


Figure 2. An aspirator is used to collect and sort insects. Parts are the suction tube (a), insect tube (b), and screen on suction tube (c), to prevent inhaling of insects. Finer particle filters (d) are available. (Photo credit: Jennifer Andreas, WSU Extension)

2. Sweep netting:

Many insects are best collected with a sweep net during the heat of the day. A sweep net is a heavy canvas net attached to a sturdy wooden pole, and is used to sweep through weed infestations to collect biocontrol insects. To collect, sweep the net back and forth through the weeds using a figure-eight pattern (Figure 3). Be careful not to pick up debris or rocks that will damage the insects in the net. Also, do not hit sharp objects, such as barbed wire fences or tree branches, as these may tear the net.

In addition to the biocontrol agents, sweep nets will capture many other insects and spiders if present. The contents of the net will need to be separated, either by aspirating or hand-picking out of the net, or by dumping into a sorting tray. It is important to thoroughly sort the biocontrol agents to avoid transporting such material as pest insects or invasive seed material to the release site.



Figure 3. Using a heavy canvas sweep net to collect purple loosestrife biological control agents. (Photo credit: Dale Whaley, WSU Extension)

3. Hand picking:

This method involves collecting the insects off the target weed by hand. It can be quite laborious and time-consuming, and should be used only when other methods are less suitable. A good example of a hand-collected insect is the root weevil *Cyphocleonus achates*, which attacks diffuse and spotted knapweed.

4. Tapping or pan collecting:

Using your hand or a tool, such as a badminton racquet, shake or tap the weed onto a beat sheet (Figure 4), or into a sweep net, bucket or insect sorting tray/pan (such as pans used in the kitchen) (Figure 5). The insects in the collecting apparatus can then be counted and aspirated, or dumped into a suitable container.



Figure 4. Beating Scotch broom with a badminton racquet onto a beat sheet to collect biological control agents. (Photo credit: Ray Willard, WSDOT)



Figure 5. Tapping purple loosestrife biological control agents into a plastic tray. (Photo credit: Dale Whaley, WSU Extension)

5. Plant material collections:

Biocontrol agents such as eriophyid mites (rush skeletonweed mites, *Eriophyes chondrillina*, and field bindweed mites, *Aceria malherbae*) are too small to collect individually. Instead, collect infested plant material and place in a sealable plastic bag. Label the bag with the contents and follow steps 3 and 4 below.

Once biocontrol agents are collected, they need to be prepared for transportation before release.

1. Once sorted, biocontrol agents should be stored in containers. Prepare the containers before placing insects inside—insects are likely fast moving and the lid should be affixed immediately. Containers need to allow movement of air and to keep moisture levels low. Plastic or coated-paper containers should be avoided unless ventilation holes can be provided. Glass jars are not recommended.
2. If insects are to be transported over long distances or if they will be released in the following days, it is advisable to add some of the target weed for food (Figure 6). Shredded paper or a piece of dry paper towel should be added as a substrate for the insects to hold onto and to soak up any continued transpiration from the added plant material (Figures 7 and 8). Place a rubber band around the container to secure the lid. This will do less damage to the container than tape, and allow it to be used over many releases.
3. Once packaged, the biocontrol agents need to be kept cool, but not freezing. An ice chest with an ice pack at one side or on top of the containers will work for storage and transportation of biocontrol agents to the new release locations. Again, to avoid freezing, containers should not directly contact the ice pack. Wrapping the ice pack in a towel can help avoid this, as well as soak up any condensation to prevent the containers from becoming wet (Figure 9).
4. For storage, place insects in a refrigerator. Do not allow them to freeze. Generally, beetles can be stored for up to a week before release. Delicate insects, such as moths or flies, should be released within a day or two.



Figure 7. Putting sorted insects into a collection container. (Photo credit: Jennifer Andreas, WSU Extension)



Figure 8. Release of diffuse knapweed seed-feeding weevils. Note the dry napkin in the bottom of the container to soak up excess moisture. (Photo credit: Donna Duncan, Otis Orchards)



Figure 6. Plant material used as a food and water source for collected insects. (Photo credit: Jennifer Andreas, WSU Extension)



Figure 9. Example of how to transport biological control agents using an ice chest. (Photo credit: Dale Whaley, WSU Extension)

How to Release Biological Control Agents

Ideally, biocontrol agents should be released as soon as possible after collection. Releases should not be made during inclement weather (rain, extreme heat or cold).

To release most insect species, carefully open the container and place all of them in one spot in a densely weeded area. Do not sprinkle the insects around the site. When placed in one spot, they can find one another easily for mating, and will disperse on their own (Coombs, E. M. 2004).

When releasing from mite-infested plant material, scatter the material around the site by tucking the infested plant segments into areas of new growth at the crown and shoot tips of non-infested weeds. If possible after release, drive into the ground a wooden stake marked with the date, and the type and number of released biocontrol agents. Be careful not to step on or drive over released biocontrol agents as you leave.

If allowed, take a photo of the release area to help document the effectiveness of the biocontrol agent. The photo should contain enough background terrain, such as a distinct hillside, structure or tree, to allow easy comparison between before and after photos. Marking the camera location (or using GPS) will help you return to the exact spot over the next several years.

Information should be collected for each release to allow tracking of biocontrol agent releases and distribution. The weed species, the name and number of the biocontrol agents released, and date and location should be recorded. General site characteristics, such as weed density, slope, aspect, soil type, and the weather at the time of release, are also valuable.

Whenever possible, the site should be mapped using GPS waypoints, legal land descriptions, or, at minimum, a hand-drawn map. Record this information at the site on the day you make the release.

If the IWCP is providing biocontrol agents, this information is required. Release forms will be provided to the landowner if program personnel are not on site. Provide a copy of your site information to the IWCP and/or local CNWCB.

References

Balciunas, J.K., and E.M. Coombs. 2004. International Code of Best Practices for Classical Biological Control of Weeds. In *Biological Control of Invasive Plants in the United States*, 1st edition. Corvallis, OR: Oregon State University Press.

Coombs, E.M. (2004). *Biological Control of Invasive Plants in the United States*: 79-80. Corvallis, OR: Oregon State University Press.



Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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