

BIOLOGICAL CONTROL

TECHNICAL GUIDANCE DOCUMENT

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INTRODUCTION

Biological control of invasive plants typically involves host specific biological control agents (insects and plant pathogen's) that evolved with the invasive species in its native range. Common biological control agents include aphids, weevils, flies, moths, bacteria and fungi. Biological control agents are subjected to extensive quarantine and research prior to being selected as potential candidates. Risk assessment is critical to selecting the most viable control agents for use in invasive plant biological control programs in North America. Most biological control organisms are researched for 5-10 years to ensure their level of host-specificity to a particular invasive species. Generally, the more host-specific the biological control agent, the greater opportunity for desirable control and less risk for non-target effects. Insect biological control programs have been successfully implemented for leafy spurge, spotted knapweed, and purple loosestrife through the Minnesota Department of Agriculture and Natural Resources. Additionally, many landowners have combined traditional plant management strategies , including insect biological controls with goat and sheep grazing in many parts of the state. Both goats and sheet can be acclimated to feed on many weedy species and have been used successfully to manage leafy spurge in pasture situations in combination with chemical and insect biological controls.



Biological control of invasive plants is usually best applied to larger established stands. It is recommended to try to eradicate smaller stands of invasive plants with mechanical and/or chemical means. Biological control is not intended to eradicate the target plant and should be implemented with the knowledge that a few plants will continue to exist at a much more acceptable level within the landscape. This also allows the host-specific biological control agents resources to coexist and fluctuate with the invasive population over time, thus providing long-term control.

APPLICATION

SPECIES WITH AVAILABLE BIOCONTROL AGENTS

Minnesota's weed bio-control programs focus on managing purple loosestrife (*Lythrum salicaria*, *L. virgatum*, hybrids, and cultivars), spotted knapweed (*Centaurea biebersteinii*), and leafy spurge (*Euphorbia esula*) infestations. These programs are cooperative and bio-agents are a shared resource in Minnesota among agencies and private landowners. Biological control for garlic mustard, buckthorn, and common tansy is in development.



WHEN TO USE BIOLOGICAL CONTROL

Biological control is an excellent management tool for large infestations and/or environmentally sensitive areas. Large continuous infestations or many scattered infestations over a large area often make good biological control sites. This is the case when the infestation has been established for many years and there is a considerable seedbank present. If the infestation is small, control is best achieved by another method such as hand-pulling or chemical treatment. Biological control can be a good choice for environmentally sensitive areas. For example, if the water table is too high for a safe, effective chemical treatment or if there are desirable plant species present that could be negatively impacted by a chemical treatment. Integrating biological control with other methods can be effective.

STARTING AND MAINTAINING A WEED BIOLOGICAL CONTROL PROGRAM

- 1) Weed bio-agents are field collected at sites with established populations then distributed to new sites.
- 2) Determine the infestation size and density. This can be a rough visual approximation if there is insufficient time for more exact measurements.
- 3) For leafy spurge and spotted knapweed bio-control, call your county agricultural inspector (CAI) www.mda.state.mn.us/plants/weedcontrol/caiist.htm to obtain a starter bio-agent population. The CAIs have a well established network that coordinates with multiple agencies to ensure that bio-agents are distributed where needed. For purple loosestrife bio-control, call your DNR Aquatic Invasive Species Specialist http://files.dnr.state.mn.us/contact/eco_invasivesstaff.pdf. Consult with the CAI or DNR specialist to determine the quantity of bio-agents and number of releases for your site.
- 4) There is no charge for leafy spurge, spotted knapweed, and purple loosestrife bio-agents.
- 5) Release the bio-agents. If the bio-agents are in containers, place the contents of a single container all in one spot and record the date, species and quantity released, and location information. Multiple releases may be beneficial for large sites.
- 6) Take photos of the site so you have images to compare with several years following bio-agent release.
- 7) Check for bio-agent establishment two years after release. A sweep net may be a necessary tool for finding the bio-agents. Do not be discouraged if you do not find bio-agents in the first two years. Bio-agent populations build over time. If you do not find any bio-agents three years after release, call

your CAI or DNR specialist for advice. Augmenting bio-agent populations may be a good option if bio-agents are not found at your site after two years.

8) If you see the target weed starting to decline, call your CAI or DNR specialist to report the progress. It is possible that your site has a collectible population of bio-agents that can be moved to new sites.

9) Minnesota's weed biological control programs depend on sharing bio-agents. If you think you have a collectible bio-agent population, contact your CAI or DNR specialist. This is necessary for the successful continuation of these statewide programs.

INTEGRATING BIOLOGICAL CONTROL WITH OTHER MANAGEMENT TOOLS

Biological control can be integrated with other management tools such as herbicides and prescribed fire. The general rule of thumb is to not use another management tool while the adult stage of the bio-agent is present. For example, spotted knapweed bio-control sites can be burned in the spring because the adult bio-agents do not emerge until summer. Herbicides are often used to spot spray infestation perimeters and outlier populations to prevent target weed spread.

OTHER CONSIDERATIONS

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COSTS

The costs of biological control typically vary depending on the source and availability of control agents. For some projects, biocontrol agents will need to be purchased, often costing a few hundred dollars for a project. In other cases, insects can be collected from existing release sites (such as for leafy spurge, spotted knapweed and purple loosestrife) and staff time for collection and introduction to the project site will be the primary costs.

ADDITIONAL REFERENCES

Biological control is available for leafy spurge, spotted knapweed, and purple loosestrife. General information is available at:

Leafy spurge bio-control www.mda.state.mn.us/plants/badplants/leafyspurge.htm

Spotted knapweed bio-control www.mda.state.mn.us/plants/badplants/knapweed.htm

Purple loosestrife bio-control
www.dnr.state.mn.us/invasives/aquaticplants/purpleloosestrife/biocontrol.html