



Efficacy of Weed Biological Control Agents

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Problem Statement

Exotic plant invasions threaten the biological diversity and ecological integrity of natural ecosystems around the world. Biological control, the intentional introduction of exotic insects for the control of invasive species, is one of the few tools proven effective in controlling widespread invasive plants. However, because biological control agents are themselves exotic species, great care must be taken to ensure they do not become exotic pest species in their own right. Although safety measures are currently in place to prevent weed biological control agents from feeding on native and agricultural plants, more complex threats of biocontrols are not currently recognized. This study explores the potentially complex outcomes of biological control within native systems to better identify and protect against unintended deleterious effects of biological controls.



Deer mouse climbing a spotted knapweed plant to forage on larvae of biological control agents within the seedheads. Photo courtesy of Milo Burcham.

Research Approach

Our goal is to understand how insect biological control agents interact with both their target exotic pest species and the overall native communities where they are introduced in order to better understand: 1) when biological controls are most likely to be effective, and 2) when biological control agents are most likely to present undue risk to humans and natural systems. Because the success or failure of a biological control agent involves not only the interaction between the biocontrol agent and the pest, but also all the other organisms within the community, we strive to understand the outcome of biological control introductions in the context of the range of interactions within the systems where these agents are introduced.

Results

Our research shows that biological control agents have the potential to negatively impact both native species and humans even when they do not directly attack nontarget species. For example, two gall fly biological control agents introduced for the control of spotted knapweed, a noxious weed of western North America, have become an important food source that serves to subsidize and thus increase deer mouse populations by more than two-fold. Doubling deer mouse populations over the large region of western North America inhabited by knapweed has potentially significant consequences. For example, deer mice are aggressive predators of seeds of native plants, and they are the primary reservoir for the Sin Nombre hantavirus, which is fatal to humans. Therefore, food subsidies that increase deer mouse populations could amplify mouse predation on native plant seeds, thereby increasing rather than decreasing negative impacts of spotted knapweed on native plants. Similarly, increasing deer mouse populations may also increase the prevalence of hantavirus thereby elevating the risk of humans contracting this deadly disease. This research shows that we need to further our understandings of biological control in order to maximize the success and minimize the risks associated with this powerful management tool.



Deer mouse being tested for hantavirus. This deadly virus may be increasing as some biological control agents feed and thereby elevate mouse populations.

Partners

This project is partnership between RMRS, The University of Montana, Montana Department of Natural Resources and Conservation, Montana Fish Wildlife and Parks, the City of Missoula, Bitterroot National Forest, Lolo National Forest, Confederated Salish and Kootenai Tribes, and Plum Creek Timber Company.