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The Question: Will the introduction of biological control insects for the control of invasive toadflaxes (*Linaria* spp.) threaten native plants in Rocky Mountain National Park?

Yellow (*Linaria vulgaris*) and Dalmatian (*Linaria dalmatica*) toadflax are two invasive plants of concern to managers at Rocky Mountain National Park (RMNP). Both species were introduced to North America from Eurasia as ornamental garden plants, but have since escaped cultivation and today infest many relatively undisturbed natural areas. Yellow toadflax tends to grow in moist places, such as in wet meadows and in riparian zones. Dalmatian toadflax is found in upland, arid areas like the important Bitterbrush-Sage habitat. Control of invasive plants with chemical herbicides is an undesirable management technique in some sensitive ecosystems, as well as has been relatively ineffective in reducing toadflax infestations in the park due to the waxy leaf coating of toadflaxes. An alternative strategy currently employed for managing undesirable, exotic vegetation is the use of natural enemies, or biological control insects. Biological control insects are collected from the same home range as an invasive plant and are specialist herbivores that weaken the competitive ability of invasive plants. The most promising biological control insect currently available for control of the toadflaxes is *Mecinus janthinus*, a small black stem-boring weevil from Eurasia.

Before introducing a non-native biological control insect to Rocky Mountain National Park such as *M. janthinus*, resource managers desired a greater level of confidence that the weevil would not also eat and reproduce on native plants closely related to the toadflaxes such as beardtongue (*Penstemon* spp.), monkey flower (*Mimulus* spp) and others in the Scrophulariaceae family.

The Project: In order to address whether *Mecinus janthinus*, the biological control weevil, might threaten native plants, we conducted caged force-feeding experiments in the greenhouse and the field using a variety of native plants we thought to be the most likely alternative host plants. In the caged experiments, weevils were monitored for 8 weeks and data was collected on the amount of feeding, number of oviposition scars and number of insect larvae found in plant stems. We also visited sites in Colorado and in the Pacific Northwest where the weevil is currently used to control yellow and Dalmatian toadflax to determine whether native plants in a field situation are being utilized by the weevil. Leaves and stems of closely related native plants growing at these field sites were inspected for evidence of feeding and reproduction by the weevil.

Results: Results of the greenhouse and field caged experiments demonstrated that native plants were not preferred host plants for the weevil, as compared to the invasive yellow and Dalmatian toadflaxes. In fact, the native plants presented to the weevil in the force-feeding experiments were rarely nibbled on nor oviposited on by the weevil. In most cases, the weevil expired within the cages with native plants before the end of the eight-week monitoring period. Assessments of native plants at field sites where the weevil has been released to control toadflax presented a

similar outcome. No evidence of weevil use was found on the native plants we examined at the weevil release sites.

Overall, results of this study provide good evidence to negate the concern that *Mecinus janthinus* will have negative impacts on native plants in the Scrophulariaceae family. This is good news considering that the weevil is currently used throughout the Western United States to manage toadflax, and may find its way into RMNP on its own.

Cages used in greenhouse force-feeding and reproduction experiments.

Photo by Nehalem Breiter

Assessing whether the biological control weevil, *Mecinus janthinus*, was also feeding and reproducing on native plants near this infestation of yellow toadflax in the White River National Forest, CO.

Photo by Nehalem Breiter