SERDP
Strategic Environmental Research and Development Program

Allelochemical Control of Non-Indigenous Invasive Plant Species Affecting Military Testing and Training Activities

Conservation
CS-1388

Background:

Large areas of the western United States are infested with exotic and invasive plant species. These noxious weeds are of particular concern for military bases where training activities cause soil disturbances that can result in weed infestations. To continue to train and test the military in a realistic and safe manner, the Department of Defense (DoD) must maintain the natural resources that are needed for military operations. DoD also must comply with environmental legislation and regulations designed to protect the nation's natural resources. Thus, it is imperative to identify economical and ecologically sound methods for the control of exotic and noxious weeds so that military testing and training can continue unimpeded.

Notable among the many exotic plants in the western U.S. are knapweeds (*Centaurea maculosa* and *C. diffusa*), which occupy over 4.3 million hectares in 14 western states and two Canadian provinces. Knapweed and other invasive species such as leafy spurge (*Euphorbia esula*) and Canada thistle (*Cirsium arvense*) are particularly difficult to manage because these plants release allelochemicals (i.e., natural herbicides) into the soil, which act against competing native species. When these invasive species are removed, revegetation efforts may be hampered by residual allelochemicals in the soil.

Objective:

The objective of this project is to investigate the chemical properties of alleopathic invasive weeds and subsequently utilize those chemical properties to control the spread of invasive species on military sites in both an economical and environmentally friendly way. Resistant native species also will be identified for use in revegetating sites dominated by alleopathic invasive species, or sites where alleochemicals are used as herbicides to control invasive species.

Process/Technology Description:

This research will investigate innovative methods for controlling some of the most notorious weed species infesting DoD training facilities. The effectiveness of allelochemicals produced by invasive weed species will be tested as environmentally-friendly herbicides against some of the most problematic noxious weeds on DoD installations. Field experiments will utilize findings and products from the proposed studies as well as from existing SERDP projects (CS-1103, CS-1143, and CS-1145). The effect of various management strategies on the allelopathic properties of weeds and the duration of these effects after the weeds' removal will be explored. Studies will be conducted on the mechanisms that allelopathic weeds use to resist their own chemical defenses and on identifying native reclamation plant species and resistant ecotypes of sensitive species that can tolerate these allelochemicals. These native plants will be used to revegetate sites dominated by allelopathic weeds as well as sites where allelopathic herbicides are to be used. These innovative control methods will be integrated with proven and emerging control strategies in field trials at military sites in order to develop prescriptions for the control, reduction, or elimination of exotic invasive plant species while effectively protecting native species and their habitats on DoD installations.

Knapweed Invasion (Missoula, MT)

Expected Benefits:

An integrated multi-tool approach to weed management will allow the DoD to continue to train and test in a realistic and safe manner, while maintaining the natural resources that are needed for military operations and complying with legislation and regulations designed to protect the nation's natural resources. Replacing stands of noxious weeds with native plants on military training grounds using novel integrated control techniques will reduce soil erosion, improve habitat for threatened and endangered species, create more sustainable ecological systems, and maintain mission readiness. (Anticipated Project Completion - 2010)

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