

## **Mapping tamarisk biocontrol monitoring sites and the expansion of *Diorhabda elongata* populations.**

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Mapping and monitoring tamarisk at release sites for the tamarisk leaf beetle *Diorhabda elongata* as well as following population expansion after beetle release are critical components of the tamarisk biocontrol program. In this study we tested the feasibility of using relatively simple and low cost methods for routine mapping and monitoring of biocontrol releases. Beginning in 2006 the Colorado Department of Agriculture has used GPS and GIS to establish and monitor *Diorhabda elongata* release sites in Mesa County, CO and at Dinosaur National Monument. Hand-held GPS units containing mapping software, maps and aerial imagery were used to set up monitoring sites, store coordinates of marked trees and collect data throughout the season. In addition, we have used mapping software and aerial imagery to follow the dispersal of *D. elongata* in Nevada and Utah.

Release and monitoring sites were selected by first examining aerial photos, choosing a potential site or sites and selecting trees based on distance from the potential release site. Our protocol calls for monitoring 25 trees comprising a release tree, 12 trees within 100 meters of the release and 12 trees between 100 and 200 meters of the release. Trees were selected and coordinates were programmed into the hand-held units prior to going into the field, which allowed us to rapidly locate potential release and monitoring trees once in the field. This was possible, in part, because we were able to check the points with a downloaded aerial photo or DRG (topo map). The results were an even distribution and correct spacing of monitoring trees and increased efficiency of the process such that an entire site could be set up and initial monitoring done in less than 4 hours. Using a drop-down menu monitoring data, such as condition of the plant, presence and stage of the beetles and the presence of predators, were entered directly into the hand-held GPS units which simplified data collection and later storage and analysis.

GPA and GIS has proven useful in the fine scale mapping of monitoring sites. Stands of tamarisk as well as isolated individual trees were mapped at a monitoring site where tamarisk density is very heterogeneous, some areas having solid monocultures and other areas having more open and dispersed stands. The movement of beetle populations through these areas will provide information on host selection as a function of stand density.

Large scale dispersal of *D. elongata* was also mapped using GPS and GIS. Using previous observations the expansion of *D. elongata* from the Lovelock, NV site was mapped over a three year period. Two release sites near Moab, UT have experienced

major expansions of *D. elongata* populations in 2005-2006 following initial releases in 2004. These dispersal events, as well as major defoliations that have accompanied beetle population expansion, were mapped. There were less than 2 acres of defoliated tamarisk at the end of 2005. By August 2<sup>nd</sup>, 2006 there were 109.02 acres defoliated, covering 4.09 river miles upstream of the primary release site, and the defoliated area was still expanding. Final results for 2006 will be compiled in mid September and presented. These results will be used to predict the timing of entry of the beetles into Colorado from release sites on the Colorado River in Utah. We anticipate that *D. elongata* will enter Colorado through the Colorado and Dolores River corridors by mid summer, 2007.