

# Update of Saltcedar Biological Control in New Mexico

Field release site and natural dispersal monitoring

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## Introduction

The saltcedar leaf beetle (Fig. 1) *Diorhabda* spp. (Coleoptera: Chrysomelidae) has been released in the Western United States as a biocontrol agent for saltcedar (*Tamarix* spp.). In New Mexico, *D. elongata* and *D. carinulata* releases were conducted at multiple sites in the Pecos River valley near Artesia from 2003 to 2008 and at Holloman Air Force Base from 2007 to 2009. These releases resulted in varied success.

In 2009, *D. carinulata*, migrated from Utah and/or Colorado into the San Juan River Basin in northwestern NM. Beetles have established very well and have defoliated thousands of acres of saltcedar along the San Juan river and its tributaries.

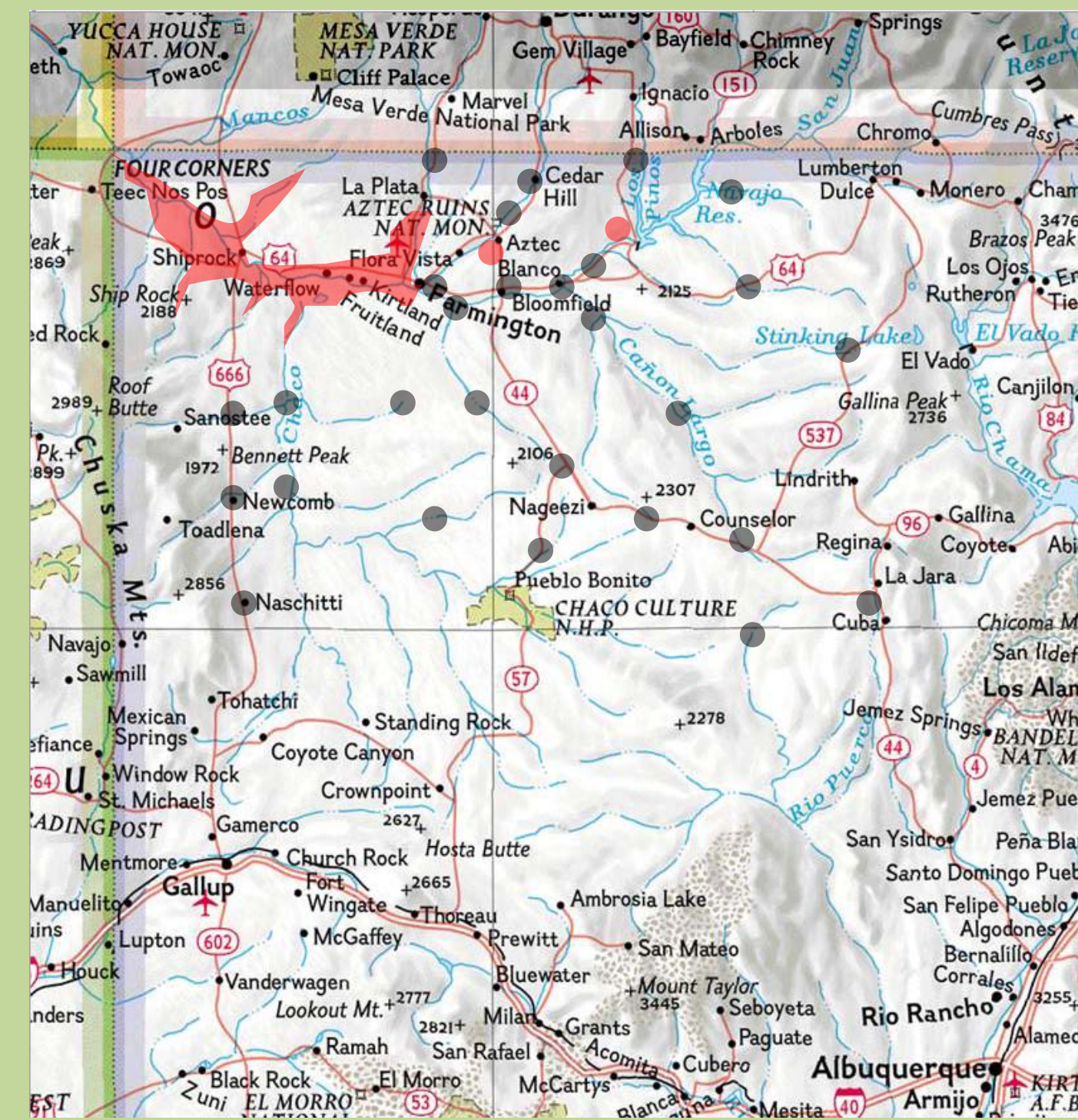
Following is a summary of field monitoring efforts of the various beetle populations conducted by New Mexico State University personnel.



Figure 1. *Diorhabda elongata*

### 1 San Juan River Basin Dispersal-

Beetle (*D. carinulata*) defoliation was detected in June 2009; presumably a result of natural beetle dispersal from Utah and/or Colorado. By September 2009, approximately 34 river miles and the mouths of most tributaries in that stretch were 80-100% defoliated. By September of 2010, an additional 32 river miles along the San Juan was 50-100% defoliated, an area from the Four Corners to Farmington, NM. Eighty to 90% of the saltcedar in the La Plata River canyon was defoliated in 2010 as well. Although beetles were not detected from Bloomfield to Navajo Dam along the San Juan, a satellite population was detected near Navaho Dam in Simon Canyon. Beetles were detected at only one survey point along the Animas River near Aztec, NM. Dispersal should continue east and south unless beetle requirements can't be met due to latitude, elevation or the lack of saltcedar.



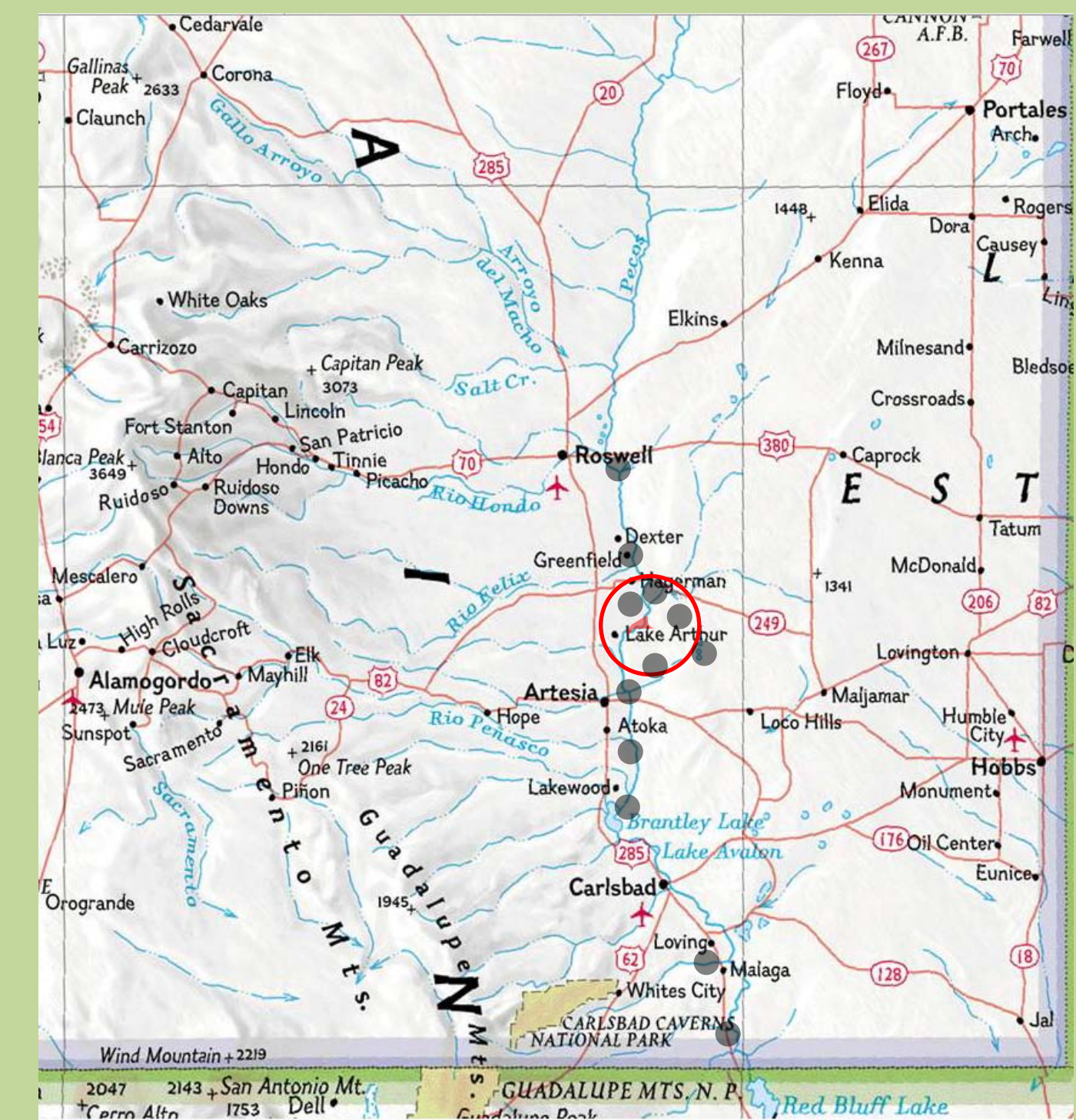
- 2010 area of defoliation
- 2010 beetle satellite populations
- 2010 survey points where beetles were absent

Figure 3. Map of northwestern New Mexico indicating beetle defoliation, satellite populations and survey points where beetles were absent in 2010.

### 2 Lake Arthur Releases- *D. carinulata*

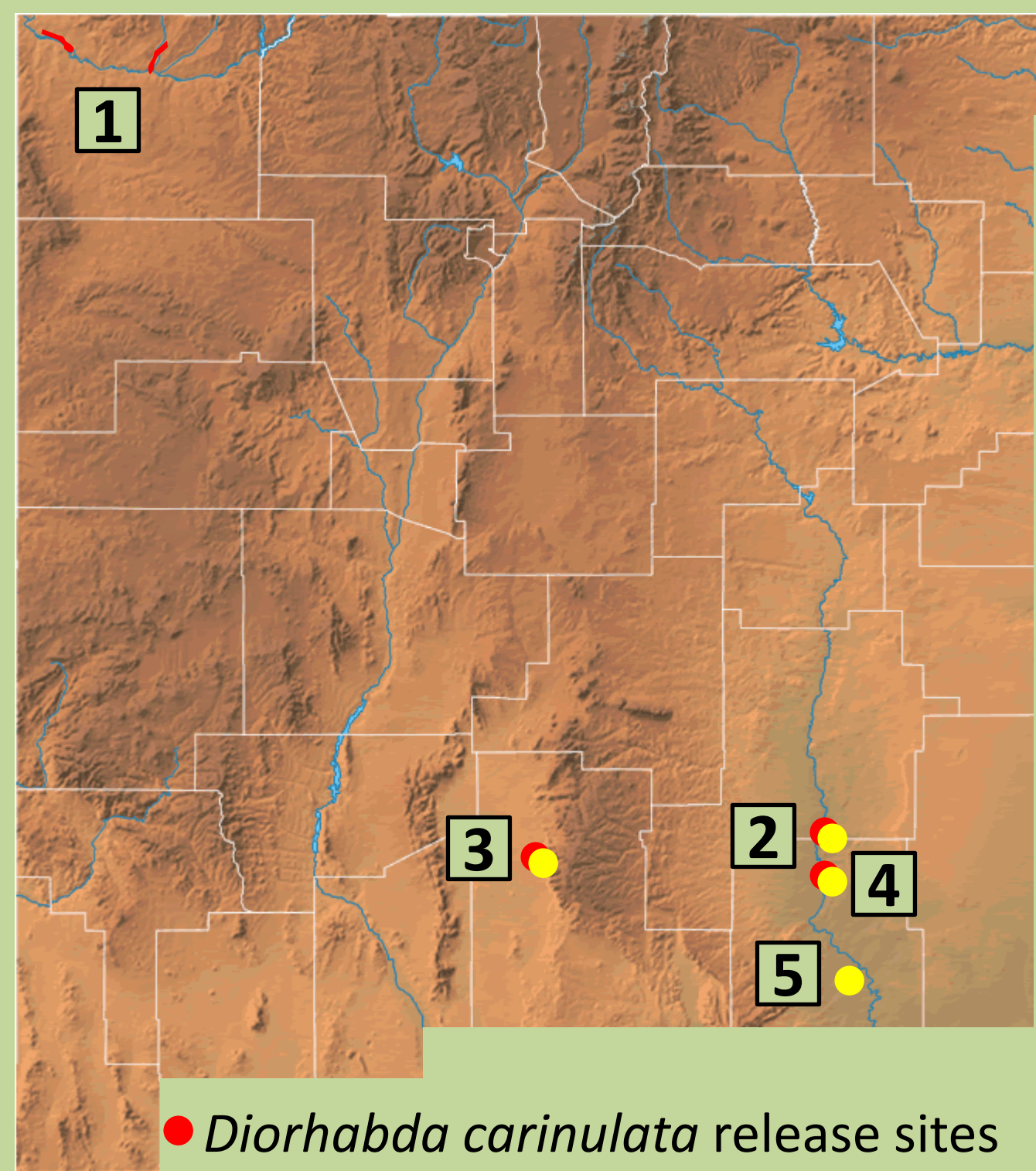
failed to establish at this site after multiple years of release, most likely due to inadequate day length. After 6 years of surveying without detecting these beetles, it is apparent they do not exist along the Pecos River.

*D. elongata* established after multiple releases over several years. In September of 2009, two trees were defoliated just prior to the beetles overwintering. During the summer of 2010, 40 acres adjacent to the release site was defoliated. Beetles were detected 4 miles up and down stream on the Pecos River as well as in areas of upland saltcedar ½ mile west of the river and 1 ½ miles east, although in non-defoliating numbers. It is very likely this population will continue to disperse along the river in 2011 and beyond. No distant satellite populations were found during surveys in 2010.



- 2010 area of defoliation
- 2010 survey points where beetles were absent

Figure 4. Map of southeastern New Mexico indicating beetle defoliation and survey points where beetles were absent.



- *Diorhabda carinulata* release sites
- *Diorhabda elongata* release sites
- *Diorhabda carinulata* dispersal sites

Figure 2. Locations of *Diorhabda* spp. release sites and populations of naturally dispersed populations in New Mexico.

### 3 Holloman Air Force Base-

Both *D. carinulata* and *D. elongata* were released into field cages in 2007. *D. carinulata* failed to establish in the cages and *D. elongata* developed very slowly. In 2008 they were released into the field, but do not occur at detectable numbers. Further releases were stopped due to permitting issues.

Low nutrient content of the trees were a factor in the failure to establish. Foliar nitrogen less than 2.5% reduces egg production, lengthens development time and decreases larval survival (Guenther et al. 2011).

Very large populations of the leaf-hopper, *Opsius stactogalus*, also contributed to the lack of beetle establishment. They occurred in densities high enough to impact foliage quality through their feeding and created "sticky traps" with their honeydew that proved to be fatal to *Diorhabda* larvae as they became trapped in the honeydew.



Figure 5. *Opsius stactogalus* and its associated honeydew.

### 4 Artesia- *D. elongata*

defoliated 144 trees of mixed accessions at the NMSU Ag. Experiment Station in 2010. These trees were made up of 12 trees of each accession consisting of: *Tamarix ramosissima* from 7 locations (NM and CA), *T. parviflora* from 3 locations (CA and NV) and *T. aphylla* and *T. aphylla/T. parviflora* hybrids from Lake Mead, NV. Certain accessions were initially preferred by the beetles (Zens 2008), but once the population became large, no preference was noted.

The nearest saltcedar from these trees is 3.5 miles. Monitoring will be conducted in

the future to determine whether or not beetles establish on larger saltcedar stands along the Pecos River from this isolated population and to gain information on dispersal mechanisms of the beetles.

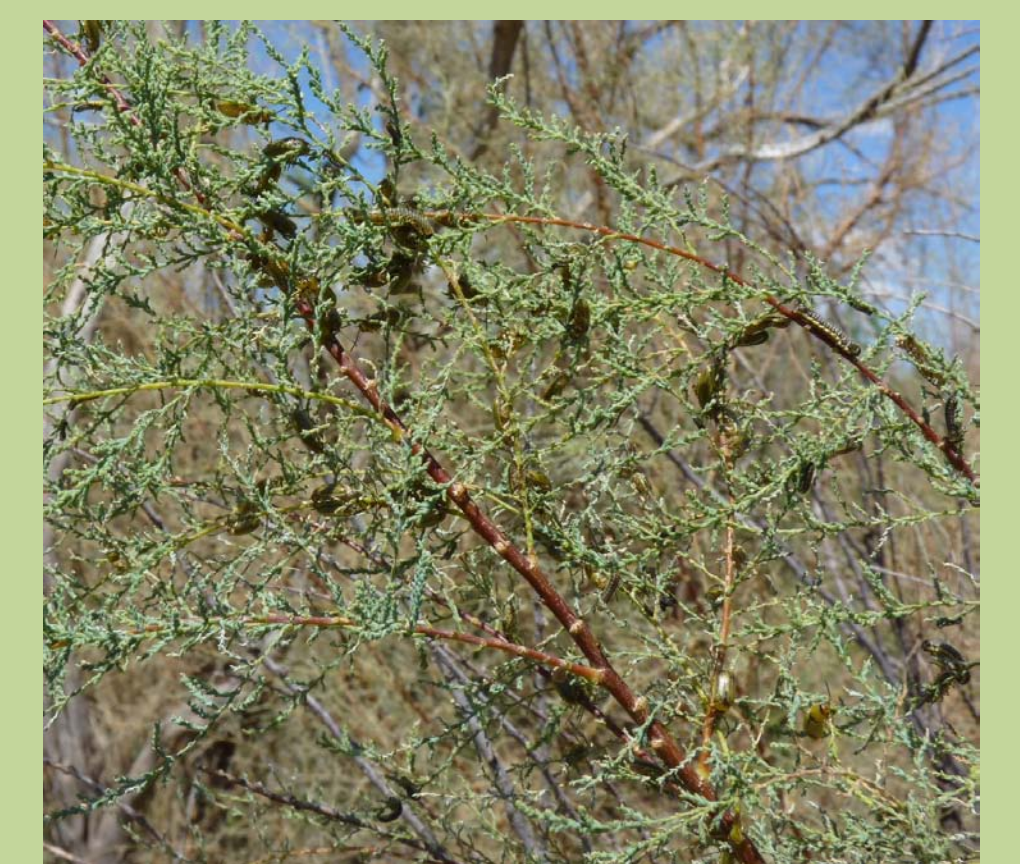


Figure 6. *Diorhabda elongata* congregating prior to dispersal.



Figure 7. Defoliation by *Diorhabda carinulata* along the San Juan River near Shiprock, NM. September 2009.



Figure 8. Defoliation by *Diorhabda carinulata* in Salt Creek at the junction of NM state highway 491. September 2009.



Figure 9. Defoliation by *Diorhabda carinulata* in an unnamed tributary of the San Juan River near Farmington, NM. September 2010.



Figure 10. Defoliation by *Diorhabda elongata* along the Pecos River near Lake Arthur, NM. August 2010.

### 5 Willow Lake-

Five thousand *D. elongata* were released at this dry lake in August 2007. In late September of that year, the saltcedar was treated with an aerial application of Arsenal. As a result no establishment occurred. Monitoring of this site suggests that 40% of the saltcedar has re-sprouted, but no beetles have been detected.

## Literature Cited

- Guenther, D.A., K.T. Gardner and D.C. Thompson (in press). Influence of Nutrient Levels in *Tamarix* on *Diorhabda sublineata* (Coleoptera: Chrysomelidae) Survival and Fitness With Implications for Biological Control. Environ. Ent. 40(1)
- Zens, B. 2008. Variable Fitness of *Diorhabda elongata* Feeding in a Common Garden of *Tamarix* from the Western United States. M.S. Thesis. New Mexico State University. 109 pp.