

# Tamarisk Leaf Beetle Monitoring Protocol

## Colorado Department of Agriculture, Tamarisk Coalition, and University of California-Santa Barbara

Updated May 26<sup>th</sup>, 2011

The goal of this biocontrol monitoring protocol is to define **when**, **where**, and **how many** *Diorhabda* spp. are in existence across an objective area. Within that we then want to have a good idea of where defoliating sized populations exist, where newly aggregated populations are rising, and where beetles have yet to colonize. This sweep protocol is designed to be fast and efficient and answer only simple questions about *Diorhabda* spp. distribution, density and abundance. It can be utilized on and off river corridors and should be a basic protocol for establishing the degree of beetle presence in a region. In general the amount of sweep samples taken within an area can vary, but the more sweeps the greater the resolution of the data. Due to reports stating that *Coniatus splendidulus* (tamarisk weevil) is being found within our monitoring area, we have incorporated a quick search to our monitoring protocols.

### General Sweep Surveys:

Using standard 38 cm diameter cloth insect sweep nets (**Photo 1**) and doing ~1 m sweeps through the foliage, a total of 25 sweeps are done per sampling location/GPS point. All of these sweeps should be swept with an upward direction, so that the beetles will fall into the net. Between every 5 sweeps the contents of the net is recorded using defined parameters (**Table 1**), and every set of 5 sweeps is roughly ~ 5 m apart. Such that 5 sets of 5 sweeps, each roughly 5 meters apart will be done per sampling location/GPS point (1 Sweep x 5 = 1 Set...1 Set x 5= 1 Sample...1 Sample/GPS pt).

If more than 25 sweeps are accomplished, 1 GPS point must still be recorded for each set of 25 sweeps. Thus sampling involving 100 sweeps in an area would result in 4 individual GPS points (or sample locations) attributed with a separate data record for every round of 25 sweeps/1 sample location. If marginal tamarisk is present at a sample location, sweeps should still be completed on whatever tamarisk is present.



**Photo 1:** Insect Sweep Net and GPS unit

### Sweep Net Data:

When counting net contents take care to not let beetles escape or fly away when possible. Shaking the net vigorously or tapping the sides can sometimes knock beetles into the bottom of the net aiding in the count. All adult beetles should be counted. Larvae will be counted as either “Early” (1<sup>st</sup> and 2<sup>nd</sup> Instars: small & black with no yellow stripe) or “Late” (2<sup>nd</sup> & 3<sup>rd</sup> Instars: larger body, with noticeable yellow stripe).

During sweep sets observers should be observant for egg clusters laid near the end of leaves. If no eggs are spotted during the sweeps a 15 second “egg survey” should proceed scanning the canopy for the creamy pink/white clusters. After the “egg survey” conduct a 15 second *Coniatus splendidulus* survey looking for *Coniatus splendidulus* adults and their silken pupae cages. For photographs of *Diorhabda* spp. and *Coniatus splendidulus* please refer to the Appendix A.

We have found in the past that the *Diorhabda* spp. are generally found in greater numbers on branches that are higher off the ground, dry, warmer from sunlight, full of green foliage and not over water. The beetles should fall directly towards the ground when the branches are shaken or hit with the net.

Little is known about the characteristics of *Coniatus splendidulus*, we do know that they hide from the observer and that they do not fall off the branches as easily during sweeping. The easiest way to note their presence on a tamarisk is by spotting their silken egg cages (Appendix A).

### Defoliation:

Defoliation will be categorized for each sampling location as the average level of defoliation within the sample location (~0.25 km<sup>2</sup>) and recorded as a percentage in 10% increments. Percent defoliated is defined as % of canopy currently brown from tamarisk leaf beetle damage (See Photo 4A for 100% defoliated). Keep in mind that the bright yellow tinge that tamarisk get mostly in the later end of the season is leaf hopper (*Opsius stactogalus*) damage and should not be confused or recorded as *Diorhabda* defoliation (see Appendix A).

In concurrence with defoliation, refoliation will only be recorded as “Present/or Absent,” this is to avoid confusing partially defoliated trees as fully defoliated trees that are partially refoliated. Refoliation is best noticed by the “fireworks puffs” that are the signature of tamarisk re-sprouting on the stems and branches. Note that refoliation will not occur until mid-season, and without previous records it can be hard to truly validate. If an area is revisited multiple times in a season and valid identification of refoliation is ensured, refoliation can be recorded as a percentage similar to defoliation. Thus the average % of refoliation within ~0.25 km<sup>2</sup> (recorded in 10% increments) can be recorded.

### Data Sheet Recording:

When sweeping an area 1 GPS point should be taken for every 5 sets of sweeps (or equivalent 25 sweeps). Upon taking data at each GPS point, the date, GPS ID (including lat/long in NAD83) and distance number (if on a river survey) should be recorded followed by the number of adults, early larva, and late larva for each sweep, presence/absence of eggs, presence/absence of *Coniatus* spp., percent defoliation, and presence/absence of refoliation. When possible photos of the sweep area should be taken at the GPS point location and recorded by their respective ID number with a compass bearing for the direction of the shot. At any data collection point written comments about geographical location,

note worthy net samples, or other significant information should always be recorded. Anything is better than nothing.

**Table 1:** Data recorded per GPS point

Date	GPS Point ID	UTM Coordinates	River mi/km	Sweep					Eggs	Coniatus Spp.	Defoliation	Re-foliation	Photo	Comments
				1	2	3	4	5						
		Lat:		Adults									ID:	
		Long:		Early Larvae					<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	Direction	
				Late Larvae										

**Data Sharing:**

To ensure that the data you’ve collected will be incorporated into our maps and datasets, please email your field data to Season Martin (smartin@tamariskcoalition.org) by **September 1**. If you know this is not possible for you, please let us know so we can make appropriate plans.

We would prefer the data to be sent to us as one of the three following options listed in order of preference:

1. Shapefile
2. Excel File
3. Scanned Data Sheets

This is purely based upon your capabilities. The better the data format that you can provide us, the quicker we can transfer your work to our datasets. If you require assistance in getting your information into a different format, please feel free to contact the Tamarisk Coalition.

We’d also appreciate any high quality photographs you may have taken during your field season. Aside from any general photographs of the field work, we also find time series and before and after photographs very useful. With all photographs you provide use, please include the location and GPS coordinates.

**For Questions, please contact:**

Season Martin  
 Restoration Coordinator  
[970.256.7400](tel:970.256.7400)  
[smartin@tamariskcoalition.org](mailto:smartin@tamariskcoalition.org)  
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# Appendix A

***Diorhabda* spp:** (A) The pinkish egg masses of *Diorhabda* spp. usually laid near the ends of the branches. (B) 1<sup>st</sup> instar larvae compared the larger 2<sup>nd</sup> instar larval stage. (C) The much larger 3<sup>rd</sup> instar larvae compared to a dime. (D) Note the 3<sup>rd</sup> instars highly noticeable yellow stripe. (E) The adult beetle is yellow to straw colored with roughly 4 brown stripes running down their dorsal elytra.



***Coniatus splendidulus***: (A) The adult tamarisk weevil is approximately half the size of an adult *Diorhabda* beetle. This beetle is composed of multiple hues of colors, light green being the most dominant, but also has blotches of tan, speckles of black, all topped off with a shimmering metallic touch. (B) The globe-like pupae cages are about the same color as defoliated tamarisk leaves and are the easiest way to note weevil presence. (C) The cages are generally exposed on the foliage of the tamarisk; this picture gives you a good idea about the size of the cages. (D) A size comparison between the weevil and an empty pupae cage.



**Tamarisk Defoliation:** (A) Tamarisk leaf beetle defoliation is very brown colored with many straw like desiccated leaves still attached to the plant, the tree in Photo A is 100% defoliated. (B) Following defoliation many tamarisk will resprout largely from the along the stems of the tree. (C) Yellower senescent leaves found in the fall when leaf hopper damage is most apparent are very different compared to the much dryer/brown canopies of defoliated trees, these trees have no tamarisk leaf beetle damage.

A)



B)



c)



**Compiled by:** Levi Jamison - Colorado Department of Agriculture, Tamarisk Coalition & University of California Santa Barbara. Updated 6/9/2010

**Revised by:** Jesse Lanci - Tamarisk Coalition, 5/26/2011.

Date	GPS Point ID	UTM Coordinates	River m/km		Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 5	Eggs	Coniatus Spp	Defoliation	Re-foliation	Photo	Comments
		Lat: Long:		Adults										ID: Direction	
		Lat: Long:		Early Larvae						<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	ID: Direction	
		Lat: Long:		Late Larvae										ID: Direction	
		Lat: Long:		Adults										ID: Direction	
		Lat: Long:		Early Larvae						<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	ID: Direction	
		Lat: Long:		Late Larvae										ID: Direction	
		Lat: Long:		Adults										ID: Direction	
		Lat: Long:		Early Larvae						<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	ID: Direction	
		Lat: Long:		Late Larvae										ID: Direction	
		Lat: Long:		Adults										ID: Direction	
		Lat: Long:		Early Larvae						<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	ID: Direction	
		Lat: Long:		Late Larvae										ID: Direction	

Early Larvae: Lacking yellow stripe

Late Larvae: Yellow stripe present

% Defoliation: % of canopy currently brown from tamarisk leaf beetle damage

Collect Data in NAD 83

Recorder(s):

Monitoring Area: