THE TAMARISK LEAF BEETLE –
MONITORING EFFORTS IN THE COLORADO RIVER BASIN

January 25, 2011

Rebecca Carlson
Tamarisk Coalition
Outline

- Who is the Tamarisk Coalition?
- Overview of tamarisk control methods
- Biological control
  - Beetle distribution
    - Monitoring & Mapping
  - Ecological effects
- Southwestern willow flycatcher
  - Issues and opportunities
  - Recovery efforts
The Tamarisk Coalition’s mission is to provide education and technical assistance in the restoration of riparian lands.

- Local, state, & regional strategic watershed planning efforts
- Tamarisk and Russian olive research and management symposiums/conferences
- Complete inventory & mapping
- Partner with numerous organizations to plan and implement restoration activities
- Native plant materials program
Tamarisk is a non-native phreatophyte that can dominate riparian lands
Tamarisk covers millions of acres of riparian lands within the western United States.

Courtesy of Fred Nibling, Bureau of Reclamation
Tamarisk characteristics
Competes with native plants

Colorado River near CO/UT border
Can provide poor habitat for wildlife
Increased fire intensity and/or severity
Channel morphology

Tamarisk Induced Changes in Channel Structure and Associated Habitats

Tim Carlson, Greg Newman, Tom Stohlgren
1 The Tamarisk Coalition
2 Natural Resource Ecology Laboratory, Colorado State University
3 United States Geological Survey, Fort Collins Science Center, Fort Collins, Colorado

Before Invasion

Floodplain
Upland
Riparian Zone
Mesquite, Saltbush, arrowwood, saltgrass:
(Typical of CA, AZ, NM, TX)

Historical Heterogeneous, Wide, Braided Channel Habitat

Upland
Riparian Zone
Sage, Rabbitbrush, Grasswood, bunchgrass:
(Typical of UT, CO, KS, SD, WY, NV, OK, MT, OR)

Riparian Zone
Cottonwood, Willow

Sandbar

After Invasion

Floodplain and Channel Modified by Tamarisk into a Homogeneous, Narrow, Deep Run Habitat

Tamarisk Thicket
Sedimented Backwater
Reduced Channel Width

Groundwater

Acknowledgements:
Principal Investigators: Tim Carlson, Tom Stohlgren, Greg Newman
The many helping us out: Jim Graham, Catherine Janewich, Tracy Davey, Paul Evangelista, Alycia Waters-Crall, Rick Shory
Key Partners: The Tamarisk Coalition, United States Geological Survey, National Aeronautics and Space Administration, Natural Resource Ecology Laboratory, Colorado State University
Water usage
Reduction of recreation possibilities
So – What is being done?

- Mapping & inventory
- Education
- State strategic planning
- Watershed initiatives
- Tamarisk control & restoration
- Identification of existing funding mechanisms
- Legislation
Tamarisk control options

- Mechanical
- Chemical
- Prescribed fire
- Biological control
Classical weed biological control

The reunification of host specific natural enemies with invasive plants

Tamarix spp

1850?

Tamarisk

Leaf beetle

2001

Diorhabda elongata
Biocontrol results in an equilibrium between plant and herbivores
Tamarisk (*Diorhabda* spp.) leaf beetle

Photo courtesy of Ed Kosmicki

Photo Sonoran Joint Venture
First tamarisk biological control agent
Released in North America in May 2001
Beetles and larvae defoliating tamarisk

Courtesy of Dr. Dan Bean, Palisade Insectary
Tamarisk biological control timeline

- **1987:** Overseas exploration and research to find agent or agents

- **1989-1994:** Host specificity testing

- **1994:** APHIS Technical Advisory Group (TAG) approval

- **1998-2000**
  - Field cage tests and monitoring plan put into place

- **2001:** Limited open releases
Potash boat launch near Moab, Utah; photo taken 8/15/2006, two years after release
Stan Young ranch along East Salt Creek in Mesa County before and after beetles released.

2007 pre-beetle

2010 post-beetle
Salt Wash confluence with the Colorado near Moab

photo: Dr. Dan Bean- Palisade Insectary
Dolores River near Bedrock, CO 2010
Cataract Canyon along the Colorado River
<table>
<thead>
<tr>
<th>Date</th>
<th>GPS Point ID</th>
<th>UTM Coordinates</th>
<th>River Dist. (m/km)</th>
<th>Sweep 1</th>
<th>Sweep 2</th>
<th>Sweep 3</th>
<th>Sweep 4</th>
<th>Sweep 5</th>
<th>Eggs</th>
<th>Defoliation</th>
<th>Refoliation</th>
<th>Photo</th>
<th>Comments</th>
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Distribution of: Tamarisk Leaf Beetle
(Diorhabda carinulata)
Colorado Plateau - 2008

Interpreted Population Boundaries
- Small Establishment (Pre-Defoliating)
- Large Establishment (Defoliating Level)
Distribution of: Tamarisk Leaf Beetle
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Distribution of:
Tamarisk Leaf Beetle
(Diorhabda carinulata)
Colorado Plateau - as of August 2010

Sample Locations
Beetle Presence
- Absent (0)
- Infrequent Individuals (1-4)
- Small Establishment (5-25)
- Large Establishment (26-500)

Interpreted Population Boundaries
- Large Establishment (Defoliating Level)
- Small Establishment (Pre-Defoliating)
Potential impacts and changes

- Changes in floral and faunal communities
- Changes in stream bank structure
- Enhanced river access
- Decreased shade availability from tamarisk
- Changes in fire regimes
Potential impacts and changes in plant riparian communities
Increased native plant communities

Dewey Bridge, UT 10-5-09

photos: Dr. Dan Bean-Palisade Insectary

Dewey Bridge, UT 8-31-10
Increased invasive plant communities

Russian knapweed / kochia
Need to plan for restoration & monitoring

In the absence of naturally occurring native plant populations, active revegetation must be planned and implemented.
Southwestern Willow Flycatcher (SWFL)

- Endangered bird
- Nests in tamarisk
  - Negatively affected by defoliation
  - Timing of defoliation coincides with nesting
Nest chronology and timing of defoliation

- Arrival
- Nest Building
- Eggs and Incubation
- Chicks in Nest
- Fledging from Nest
- Departure
- Migrate North
- Migrate South

April | May | June | July | Aug | Sept
Virgin River Valley 2010 – Before Biocontrol (June 1) and After (June 20)

Photos: Dr. Tom Dudley- UCSB
Distribution of *Diorhabda carinulata* surrounding the Virgin River: 2008-2010

**Population Boundaries**

- **2010**
  - Red: High
  - Green: Low

- **2009**
  - Pink: High

- **2008**
  - Blue: Low

*Project funded by University of California, Santa Barbara. Additional Support from Palisade Insectary, Tamarisk Coalition. Data Sources: ESRI Inc.*

Map Made: 8/12/10

By Levi Jamison (levisor7@hotmail.com)
Texas beetle establishment as of July 2010

- **Tunisia beetle:**
  Rapid expansion and well established along Rio Grande in both Texas and Mexico; also defoliating athel tamarisk

- **Crete beetle:**
  Rapid expansion and well established in central west Texas near Big Springs

- **Uzbek beetle:**
  Not well established
June 15, 2010

Subject: USDA APHIS PPQ Moratorium for Biological Control of Saltcedar (Tamarix species) using the biological control agent Diorhabda species (Coleoptera: Chrysomelidae)

To: PPQ State Plant Health Directors
State and Territory Agricultural Regulatory Officials

From: Alan K. Dowdy, PhD
Director of Invertebrate and Biological Control Programs

The saltcedar leaf beetle, Diorhabda species, (including all species, subspecies, or ecotypes in the Diorhabda elongata complex) was previously permitted for environmental release for the biological control of saltcedar (Tamarix spp. L.) in the United States by USDA APHIS.

Concerns about the potential effects to the critical habitat of the federally-listed, endangered southwestern willow flycatcher have resulted in the following actions by USDA APHIS:

1. The APHIS PPQ saltcedar biological control program in 13 states has been terminated. Survey and evaluation of PPQ program releases will continue to assess the impact on saltcedar density and reestablishment of native vegetation.

2. The PPQ Permit Unit has discontinued issuing new permits for field cage or greenhouse studies using the saltcedar leaf beetle outside of a containment facility.

3. The PPQ Permit Unit has discontinued issuing new permits for interstate movement
Southwestern Willow Flycatcher (SWFL) Recovery Efforts

- Multi-agency partnership; facilitated by the Tamarisk Coalition
- Striving to reestablish natives in SWFL habitat affected/potentially affected by the leaf beetle
Rivers with reaches for consideration in the Colorado River Basin

- Virgin River/Muddy/Pahranagat
- Verde
- San Pedro
- Gila
- Lower Colorado
# Site prioritization matrix

<table>
<thead>
<tr>
<th>Site Qualifiers*</th>
<th>Hydrology (1-4)</th>
<th>Open water or moist soil (1-3)</th>
<th>Existing Vegetation (1-5)</th>
<th>Soil Salinity (1-3)</th>
<th>Landowner</th>
<th>Site Access (1-3)</th>
<th>Presence or probability of SWFL colonization (1-3)</th>
<th>Restoration Technique (1-3)</th>
<th>Tamarisk leaf beetle presence (1-4)</th>
<th>Stressors</th>
<th>Past, existing, or planned restoration activities</th>
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<tbody>
<tr>
<td><strong>River/Reach</strong></td>
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<tr>
<td>1-Unregulated</td>
<td>1-Open water</td>
<td>1-Native</td>
<td>1-Good</td>
<td>1= 0-5 km</td>
<td>Private, state, federal, etc.</td>
<td>1</td>
<td>1-Not present</td>
<td>1-Passive</td>
<td>Development, grazing, water diversions, etc.</td>
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<tr>
<td>2-Moist soil</td>
<td>2-Mixed vegetation</td>
<td>2-Moderate</td>
<td>2-Moderate</td>
<td>2= 5-30 km</td>
<td>Private, state, federal, etc.</td>
<td>2</td>
<td>2-Anticipated</td>
<td>2-Hybrid</td>
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<td>3-Water not present</td>
<td>3-Tamarisk dominated</td>
<td>3-High</td>
<td>3-Difficult</td>
<td>3 = &gt;30 km</td>
<td>Private, state, federal, etc.</td>
<td>3</td>
<td>3-Establishing</td>
<td>3-Active</td>
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<td>4-Regulated</td>
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<tr>
<td><strong>Verde Valley</strong></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>private (dominate), state, FS, NPS, tribal</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>urban, groundwater pumping/depletion, rec, grazing.</td>
<td>planning efforts underway (not watershed wide), some good potential</td>
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<td>Wild and Scenic</td>
<td>2</td>
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<td>2</td>
<td>1</td>
<td>FS</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>grazing, mining, rec</td>
<td>some efforts underway/mgmt actions</td>
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## Prioritization Ranking Scheme

<table>
<thead>
<tr>
<th>Prioritization Level</th>
<th>Attribute</th>
<th>High Priority</th>
<th>Medium Priority</th>
<th>Low Priority</th>
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<tbody>
<tr>
<td>1</td>
<td>Existing Vegetation (1-5)</td>
<td>4, 5 &amp; 4-5</td>
<td>3, 4 &amp; 3-4</td>
<td>1, 2 &amp; 2-3</td>
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<tr>
<td>2</td>
<td>Probability of SWFL Colonization</td>
<td>moderate to high, high</td>
<td>moderate</td>
<td>low</td>
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<td>3</td>
<td>Hydrology/Open Water</td>
<td>1, 2 &amp; 2-3/open water</td>
<td>3 &amp; 3-4/spatially or temporally intermittent</td>
<td>4/dry</td>
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<td>4</td>
<td>Soil Salinity/Landowner/Stressors</td>
<td>low/federal or state/few stressors</td>
<td>moderate/mixed ownership/moderate stressors</td>
<td>high/mostly private/nervous stressors</td>
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<td>5</td>
<td>Site Access/Restoration Technique/Restoration Activities</td>
<td>good access/1/restoration activities occurring</td>
<td>moderate access/2/some restoration</td>
<td>poor access/3/no restoration</td>
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## High Priority Reaches

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<th>River</th>
<th>High Priority Reach</th>
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<tbody>
<tr>
<td>Virgin/Muddy/Pahranagat</td>
<td>Zion NP down to Virgin Gorge (encompasses St. George)</td>
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<td>Virgin Gorge to Gold Butte</td>
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<td>Gold Butte to Lake Mead</td>
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<td>Muddy River from Overton WMA to Lake Mead</td>
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<td>San Pedro</td>
<td>Narrows to Gila River confluence</td>
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<tr>
<td>Gila</td>
<td>Dripping Springs to Kelvin Bridge (includes San Pedro confluence)</td>
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<td>San Carlos Lake – Coolige Dam to Bonita Creek</td>
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<td>Duncan, AZ to Mogollon Creek, NM</td>
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<tr>
<td>Bill Williams</td>
<td>Alamo Lake margin - confluence of Big Sandy and Santa Maria</td>
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To Learn More…www.tamariskcoalition.org

**The Landscape Ecology of Tamarisk**

2011 Research Conference

- Ecosystem Services
- Ecology
- Control
- Restoration
- Biodiversity
- Social Values
- Urban & International Issues
- Climate Change Impacts

- Beetle monitoring training June 2011; contact the TC for more info

February 16 & 17 • Tucson Marriott University Park Hotel

Colorado State University

Tamarisk Coalition

USGS

science for a changing world
Colorado Plateau Tamarisk Beetle Monitoring - 2010
Data Collection and Funding Partner Acknowledgements

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Colorado Water Conservation Board
Dinosaur National Monument: Peter Williams

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Grand Canyon National Park: Lori Makarick
Kaibab Paiute Tribe: Sarah Burger
Kenny Brothers Foundation
New Mexico State University: Dave Thompson, Kevin Gardner
Tamarisk Coalition
Telluride Foundation
University of California Santa Barbara: Tom Dudley
US Geological Survey: Matt Johnson
Walton Family Foundation