



**TX/NM/Mexico Saltcedar Biological Control Consortium Meeting
Hawthorne Hotel, El Paso, TX - Oct 30-31, 2012**



**PROCEEDINGS OF THE 2012 MEETING OF THE TEXAS/NEW MEXICO/MEXICO SALT CEDAR
BIOLOGICAL CONTROL CONSORTIUM.**

October 30-31. Hawthorne Hotel, El Paso, TX

Co-Chairs of the 2012 Consortium Meeting:

Allen Knutson, Professor, Entomology Dept. Texas A&M University, Dallas, TX

Christopher Ritzi, Professor and Chair, Department of Biology, Sul Ross State University, Alpine, TX

The eighth annual meeting of the Texas/New Mexico/Mexico Saltcedar Biological Control Consortium was held October 30-31 in El Paso with about 45 people in attendance. Represented at the meeting were two international agencies (the Comision Internacional de Limites y Aguas (CILA) and the International Boundary Waters Commission), five U.S. federal agencies (USDA-Agricultural Research Service ARS, USDA-Natural Resource Conservation Service NRCS, U.S. Fish and Wildlife Service USFWS, National Park Service and Bureau of Reclamation), four Texas state agencies (Texas Parks and Wildlife Department (TPWD), Texas Commission on Environmental Quality TCEQ, Texas Agrilife Extension Service TAES, and the Texas Forest Service TFS), two state universities (Entomology Dept., Texas A & M University, College Station, TX and Biology Dept., Sul Ross State University SRSU Alpine, TX), two nonprofit organization (Rio Grande Institute RGI, Marathon, TX and the Tamarisk Coalition, Grand Junction, CO) and New Mexico Department of Agriculture. The program agenda, listed in the Appendix, included presentations by 18 speakers, breakout sessions and reports by three subcommittees (Science, Wildlife/Environment, Federal, State, Private and Mexican Cooperative Relations) and a discussion on developing a plan to mitigate the impact of saltcedar leaf beetle defoliation on the endangered western willow flycatcher. The attendees agreed to return to El Paso and the Hawthorne Hotel for the 2013 consortium meeting.

These proceedings consist of:

Abstracts: Those presenting at the consortium were encouraged to submit an abstract of their presentation for inclusion in these proceedings.

Reports from the Subcommittees on Science, Wildlife/Environment, Federal, State and Private Liaison, and Mexican Cooperative Relations

Discussion on means to mitigate the impact of leaf beetle defoliation on southwestern willow flycatcher concludes these proceedings.



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Abstracts of Presentations

The full meeting agenda is listed in the appendix. Following are those abstracts submitted by the presenters; not all presenters choose to provide an abstract.

Status and Implications of the Tamarisk Beetle (*Diorhabda sublineata*) on Tamarisk and Athel along the Río Grande River in Presidio County, Texas. Chris Ritz, Biology Dept. Sul Ross State University, Alpine

In 1823, Tamarisk (*Tamarix* spp.), a small deciduous shrub, was brought from the eastern Mediterranean and southern Europe to the east coast of the United States (Di Tomaso 1998, Graf 1978) and cultivated as ornamentals and planted as windbreaks, shade trees, and to prevent erosion (Di Tomaso 1998, Hudgeons et al 2007). By 1854, tamarisk was being sold in nurseries across the western U.S. and sold by the U.S. Department of Agriculture by 1868 (Di Tomaso 1998). Tamarisk was reported to have escaped cultivation in the 1870s, and by the 1920s was posing a serious threat to riparian ecosystems across North America (Di Tomaso 1998, Hudgeons et al 2007). Additionally, due to a high reproductive potential and the absence of natural predators, saltcedar has become invasive on many river systems in the western United States. Since the 1960s, the United States Department of Agriculture-Agriculture Research Service (USDA-ARS) has been actively pursuing research in using tamarisk leaf beetles as a biocontrol agent against these invasive plants. In their native habitats, the use of leaf beetles as biological control can suppress tamarisk by 75-85% without damage to native vegetation. Their release has proven to be a low cost method of control in other areas of Texas and the western United States (DeLoach et al. 2000).

Currently, several species of invasive and exotic tamarisk trees (*T. ramosissima*, *T. chinensis*, *T. canariensis*) and their hybrids occupy more than 100,000 hectares of riparian area in the Río Grande Basin of western Texas (USDA SCS 1987). The banks of the Río Grande are choked with tamarisks, reducing surface water availability and negatively impacting native riparian flora (Bender et al. 2005). Some of the densest stands on the Río Grande occur along the 460-km stretch between El Paso and Lajitas, known in part as the Forgotten River (Everitt et al. 2006). Invasive tamarisks degrade wildlife habitat by forming dense monotypic thickets, contributing to reduced floral and faunal biodiversity, and increased channel aggradations with development of less diverse, narrow, deep-run habitats (Tracy and DeLoach 1999, DeLoach et al 2000).

In 2006, efforts to establish the Tamarisk leaf beetle (*Diorhabda* spp.) along the Río Grande were conducted in an attempt to control the spread of saltcedar and restore the riparian corridor. By this time, the river had become dominated by a monoculture of this invasive exotic plant. Two species of leaf beetles (*D. elongata* and *D. sublineata*) were released at five sites along a 47-mile stretch of the Río Grande River. Additional sites were selected for field releases, and as of 2012, ten sites along the Texas Río Grande River are being regularly monitored.

Results thus far have indicated that the subtropical beetle, *D. sublineata*, is well-suited for this region of West Texas. Ecological modeling also suggests that the subtropical *D. sublineata* is best suited to this region of West Texas (Tracy and Robbins 2009, Moran 2010). Adults have successfully overwintered and survived three winters, with the exception of the loss of some beetles during the February 2011 freeze. During 2012, fires and late summer flooding also negatively affected population numbers. Over the time period during which the beetles have become established, they have defoliated and began to control saltcedar over 160 km (100 mi). As of August 2012, defoliation is evident ~ 40 km/ 12 miles south of El Paso.

In July 2010, leaf beetles defoliated a non-target species of tamarisk, athel (*Tamarix aphylla*). This raised concern about the impact of defoliation on this more widely-accepted tamarisk species. Although athel is valued for



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windbreaks and used as shade trees in southwestern Texas and Mexico, recent trends show a more invasive nature in the Trans-Pecos region and Lower Rio Grande Valley. Observations indicate that the leaf beetles will lay eggs and feed on the non-target athel but prefer the invasive saltcedar. Athels, while suffering from initial heavy defoliation during their first year with the beetles, recover from these non-target defoliations and the amount of subsequent damage has been observed to decrease in following years. In addition, the region experienced record-breaking low temperatures in February 2011, which affected athels previously impacted by leaf beetles, as well as trees with no prior observable damage. Continued monitoring of athels is underway to assess the long-term effects from tamarisk beetle defoliation and from the February freeze.

As these beetles continue to disperse and defoliate saltcedar, continued monitoring and study are necessary to assess the long-term impacts on saltcedar, athel, and the native flora and fauna of the region.

Release, Establishment and Impact of Leaf Beetles along the Pecos River. Mark Muegge, Texas A&M AgriLife Extension, Ft. Stockton, Tx.

Saltcedar leaf beetles, *Diorhabda elongata*, were first released on the Pecos River in 2006 at three locations and established at one site in Reeves County. The population, on the Zeman Ranch, quickly increased and by 2010 had defoliated all of the saltcedar along 11 miles of the Pecos River. A second population of Crete beetles was established at the Cooper Ranch in 2010. However, following the extreme cold experienced in early February, 2011, the Crete populations could not be detected in 2011 and were presumed extinct.

Based on climate-matching studies conducted by USDA-ARS, *Diorhabda sublineata*, the Tunisian beetle was considered better adapted to the Pecos River watershed than the Crete beetle, *D. elongata*. The Tunisian beetles were initially released in 2010 at three locations (Iraan, Leon Springs and Imperial). Although Crete beetles apparently did not survive the winter of 2011 Tunisian beetle adults and larvae were detected in the spring of 2011. Tunisian beetle population densities increased sufficiently enough at the Iraan location that beetles could be collected and redistributed to other sites.

In 2011, a total of 84,000 adult Tunisian beetles were collected for redistribution from the Iraan and Rio Grande sites. Approximately 27,000 beetles were collected from Iraan and 57,000 from the Rio Grande site. About 13,000 were released at Lake Ivie and Lake Spence on the Colorado River. The remaining beetles were released at sites near Toyah, Pecos, Mentone, Grandfalls, Imperial, Iraan and Leon Springs.

In 2012 the Tunisian beetles continued to expand their range on the Pecos River as well as Toyah Creek, Balmorhea Reservoir and Leon Springs. By 29 Oct all visible saltcedar at all the established sites were defoliated in addition to saltcedar at N31 40' 06.94" W103 37' 35.07" near Mentone, TX. Adult beetles and larvae were also found on all examined saltcedar along the Pecos River at N31 52' 21.44" W103 49' 54.02" near Orla, TX but no defoliation was observed, and adult and larva Tunisian beetles were found at Red Bluff Reservoir N31 53' 58.91" W103 54' 45.06" with 80% defoliation of visible saltcedar. Most of the Tunisian beetles collected for redistribution came from Balmorhea Reservoir. A few thousand were also collected from Toyah creek near Balmorhea. A total of 116,000 beetles were collected and distributed at new and existing beetle locations along the Pecos River in 2012.



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Release, Establishment and Impact of Leaf Beetles in the Upper Colorado and Brazos River Watershed.

Allen Knutson, Texas A&M AgriLife, Dallas, Tx.

Beginning in 2006, Texas AgriLife Extension has field collected and released ca. 800,000 tamarisk beetles at sites on the Rio Grande, Pecos, Colorado and Upper Brazos Rivers for the biological control of saltcedar. In the Upper Colorado River basin, 515,000 adults of the Mediterranean tamarisk beetle, *D. elongata*, were released during 2006-2010 at 9 sites. Populations established and defoliated trees at most sites in 2010. However, populations were reduced following a very severe and prolonged period of below freezing weather in early February, 2011. In 2011, no or only a few beetles could be found at seven of the ten sites. During 2012, defoliating populations were present in Martin County and at Lake Thomas, While populations of *D. sublineata* and *D. carinata* increased and dispersed rapidly in 2012, populations of *D. elongata* persisted but did not. During 2010, *D. elongata* were released at Lake Thomas and Lake Ivie but none were recovered in 2011. In 2011, *D. sublineata* were released on these two reservoirs but only a few beetles were found at one site in the spring of 2012. During 2012, *D. sublineata* were again released at Lake Spence and at Lake Ivie.

In the Brazos and Red River watersheds, 85,000 *D. elongata* were released during 2006-2010 at five sites. Following the early February freeze, populations could be detected only at White River Lake. In 2012, the beetle population on in King County rapidly increased and defoliated saltcedar along several miles of the Wichita River. *D. elongata* was well established here in 2010 but could not be detected in 2011. *D. carinata* defoliated all of the saltcedars along the Pease River in Motely County. This species was released in Motely County in cooperation with NRCS in 2008 but was not observed again until 2012. It is not known if the 2012 population in Motely County originated from the 2008 release there or from beetles dispersing from the release made in Palo Duro Park in 2006 (see Erin Jones summary below). To better understand the distribution of *D. carinata* and *D. elongata* in this region, beetles were collected from 14 sites in late August in a survey of Stonewall, King, Crosby, Motely, Garza, Lyn and Martin Counties and submitted to James Tracy for identification.

Release, Establishment and Impact of Leaf Beetles in the Texas Panhandle. Erin Jones. Texas A&M Research Center, Amarillo, TX.

The Mediterranean tamarisk beetle, *D. elongata*, was established in the summer of 2010 and a population was still present at Lake Meredith in 2012, however the population is small and is spreading slowly. This population originated from beetles collected at from the Big Spring population.

In the summer of 2012, *D. carinata* were found on the Prairie Dog Town Fork of the Red River, the Red River, the Canadian River, etc. Mapping was done by Texas AgriLife Research and *D. carinata* were found in Hutchinson, Roberts, Hemphill, Gray, Wheeler, Armstrong, Donely, Collingsworth, Childress, Randal, Cottle, Motley, Briscoe and Hall counties. The range of the agents expands into Oklahoma however no report was given at this meeting. Tom Royer at Oklahoma State University has been mapping the spread of the beetles in Oklahoma. This population is thought to have originated from a small release done at Palo Duro Canyon State Park in 2006. *Coniatus splendidiulus* were also found in many of the counties and for some it was a new county record for the insect.



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Revegetation Following Saltcedar Control Along the Pecos River. Alyson McDonald, Extension Rangeland Specialist, Texas A&M AgriLife Extension, Ft. Stockton, Tx.

Beginning in 1999 and continuing through 2005, saltcedar along the Pecos River was aerially sprayed by helicopter with the herbicide imazapyr. Approximately 160 river miles were sprayed over that six year time period. There was a concern that in the event of a flood the dead saltcedar trees would destroy bridges and other structures as they washed downstream. In an attempt to solve this problem the Texas Forest Service conducted prescribed burns to remove the dead saltcedar. To date, approximately 30 miles along the river have been burned. To control the saltcedar regrowth, saltcedar leaf beetles were released in 2006 and 2010. It was also hoped that reducing the saltcedar population would allow more desirable plants to re-establish along the river and create a filter to slow runoff and capture sediment before entering the river.

Vegetation was sampled in 6 treatments: untreated, sprayed/unburned, sprayed/burned at 6, 9, and 11 years post-treatment and sprayed/burned/beetles. Saltcedar density and canopy cover, soil surface features, and herbaceous plant cover were measured. Saltcedar canopy cover can be greatly reduced with spraying and burning. The reduction can be expected to last for at least two years after burning. The data indicate reduction of canopy cover could be accomplished with spraying alone; five years after burning the canopy cover was no different than an untreated stand of saltcedar. Sufficient time between spraying and prescribed burning allowed treated saltcedar to regrow and new growth saltcedar to establish. Within the treated areas along the Pecos River, it appeared that herbaceous vegetation characteristics were also no different between treated and untreated saltcedar five years after burning. Unfortunately, herbaceous cover has not significantly increased from saltcedar removal and may require more energy input to get a significant increase. Because of the lack of herbaceous revegetation, erosion of the river bank causing sediment loading in the river may further reduce water quality

Hydrologic Impacts of Saltcedar Control Along the Pecos River. Alyson McDonald, Extension Rangeland Specialist, Texas A&M AgriLife Extension, Ft. Stockton, Tx.

Tens of millions of dollars have been spent to control *Tamarix* (saltcedar) trees along waterways in the Southwestern United States for the purpose of increasing streamflow yet no increase in streamflow has been demonstrated. The Pecos River Ecosystem Project (PREP) served as a case study to characterize surface and groundwater interaction along the Pecos River in Texas, assess the influence of saltcedar transpiration on stream stage and water table fluctuations, and evaluate the impacts of large-scale saltcedar control on baseflows. This is the first study that has investigated the influence of saltcedar transpiration on surface and groundwater interaction and the first to provide a mechanistic explanation for the lack of measurable increase in streamflow.

Neither saltcedar transpiration nor saltcedar removal influenced hydraulic gradients, streambank seepage, or stream elevations. The results of the plot scale studies indicate saltcedar transpiration along the Pecos River is lower than reported elsewhere and therefore may not yield detectable increases in baseflow. To extend the study to a much larger scale, we analyzed annual baseflows at the downstream end of 340 km river reach from 1999 (pretreatment) through 2009. Surprisingly, baseflows declined for four years after the project began despite additional acreages of saltcedar treatment each year. However, baseflow surged in 2005 and remained higher than the pretreatment year (1999) through 2009. Additional detailed analyses of reservoir release and delivery records and rainfall are needed to better understand contributions of rainfall and flow regulation to this increase.



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Dawson TE, Ehleringer JR. 1991. Streamside trees that do not use stream water. *Letters to Nature* **350**: 335-337.

Forrester DI, Collopy JJ, Morris JD. 2010. Transpiration along an age series of *Euclayptus globulus* plantations in southeastern Australia. *Forest Ecology and Management* **259**: 1754-1761, doi:10.1016/j.foreco.2009.04.023.

Hatler WL. 2008. *Water loss and potential salvage in saltcedar (Tamarix spp.) stands on the Pecos River in Texas*, Master thesis, Tarleton State University.

Hatler WL, Hart CR. 2009. Water loss and salvage in Tamarisk (*Tamarix* spp.) stands on the Pecos River, Texas. *Invasive Plant Science and Management* **2**:309- 317.

Owens MK, Moore GW. 2007. Tamarisk water use: realistic and unrealistic expectations. *Rangeland Ecology & Management* **60**: 553-557.

Impact and Management of Saltcedar on the Lower Rio Grande Valley National Wildlife Refuge. Kimberly Wahl, Plant Ecologist, Lower Rio Grande Valley National Wildlife Refuge.

Surveys were completed on nearly 93,000 acres of the Lower Rio Grande Valley National Wildlife Refuge in 2009. These surveys documented *Tamarix aphylla* and *Tamarix ramosissima*, as well as other invasive tree species found in south Texas. Populations of both *Tamarix* species did not appear to be increasing or spreading to new areas, but rather were planted and contained within small populations. Flooding occurred during the summer of 2010, induced by Hurricane Alex and subsequent tropical depression affecting the Rio Grande watershed in Mexico. Flood waters inundated 16,000 acres of refuge lands from July 2010 through September 2010, with some areas still holding flood waters until the summer of 2011.

As a result of the flood, mature riparian brush was killed, decreasing competition for light. This increased light, along with moist soils from flood waters allowed for the germination and rapid growth of saltcedar along the banks of the Rio Grande, ultimately spreading salt cedar onto an additional 16,000 acres of Refuge lands, and increasing acres infested with salt cedar by at least an additional 2,000 acres. Although saltcedar existed prior to the flooding, the seed source of many of the seedlings has not been determined but can be assumed to have traveled by both wind and water, and may have originated both locally and non-locally. *Tamarix ramosissima* has been documented to flower just three months after germination and *Tamarix aphylla* has been documented to flower just two years after germination on Refuge lands.

During the past two years, the Refuge has worked extensively to mechanically and chemically treat saltcedar and has successfully controlled saltcedar on 425 acres, with over 485,000 individual trees removed. Work has also been done to compare commercially available herbicides, compare seasonality of treatments, and compare treatment methods.



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Leaf Beetles in El Paso—Alerting the Citizens. Allen Knutson and Salvador Vintanza, Texas A&M AgriLife Extension.

The subtropical tamarisk beetle, *Diorhabda sublineata*, was released at sites between Presidio and Candelaria, TX during 2009-2010. The dispersal of this species along the Rio Grande northwest of Candelaria could not be monitored due to lack of roads along this ‘Forgotten River’ section. On August 15, 2012, a rancher reported finding tamarisk beetles upriver at Indian Hot Springs. Surveys by this rancher and S. Vintanza estimated saltcedars across 200 acres were defoliated by tamarisk beetles in this area. In September, pecan growers in Ft. Hancock and Esperanza noticed saltcedar trees turning brown and contacted S. Vintanza concerned that the trees were dying from a disease that might spread to their pecan orchards. Surveys in this area found most of the saltcedar defoliated by tamarisk beetles. Samples submitted to J. Tracy were confirmed as *D. sublineata*. In late October, tamarisk beetles were found in El Paso County, about 40 miles from the city.

Texas Agrilife Extension identified the need to disseminate factual information in advance of beetle arrival to minimize over-reaction to beetle presence and tree defoliation. An educational plan was developed to alert landowners and the public about the tamarisk beetle, its identification and biology, its beneficial role as a biocontrol agent and its risk of injury to non-target plants (athel). Beginning early in the spring of 2013, this information will be disseminated by S. Vintanza through the Texas A&M AgriLife Newsletter distributed to 440 farmers, growers and agribusiness in the El Paso area. Information will also be distributed through news releases for newspapers and radio and through Extension programs presented to Master Gardeners, Pest Control Operators, school IPM coordinators and pesticide applicator trainings. This information and efforts will be shared and coordinated with partners including the Texas Forest Service, El Paso City Parks Department and in Mexico via International Boundary and Water Commission. Coordination and cooperation with IBWC is vital to reaching citizens of Juarez who will no doubt have similar questions and concerns about the arrival of this new insect.

Tamarisk Coalition Biological Control Monitoring Program: Past and Present. Jesse Lanci, Tamarisk Coalition, Colorado

Tamarisk Coalition (TC) is a regional non-profit organization based in Grand Junction, CO working to help people restore riverside habitats in the American West with a focus on invasive plant species. Our key strategies are to: 1) Act as an Information Clearinghouse - Develop and connect our partners with important resources, methods, and solutions necessary for restoring riparian landscapes. 2) Empower Practitioners - Support our partners by fostering communication, assisting with problem solving, and refining approaches to effectively restore riparian areas. 3) Enhance Frameworks for Restoration - Improve opportunities and establish programs within governance, policy, economic, and information systems that will support and benefit our partner's ability to conduct riparian restoration. A few examples of our projects include, but not limited to:

- Riparian Restoration Connection: A website created by the TC to provide training and funding opportunities. <http://www.riparianrestorationconnection.com/>
- 2013 Research Conference: Occurring in Grand Junction, CO in early March <http://www.river-management.org/river-management-workshop>
- Coordinate and support landscape-scale restoration partnerships
- Making information and resources available through the web



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- Support the development of a cross-watershed collaborative network

TC's Biological Control Monitoring Program

The TC, University of California Santa Barbara and Colorado Department of Agriculture: Palisade Insectary began monitoring for the Tamarisk Leaf Beetle (TLB) in 2007, focusing originally on the Colorado River Basin. Since 2007, TC's program has: Informed land managers of the TLB and encouraged integration of TLB into management practices; pressured APHIS, USFWS, and BOR to take responsibility and respond to the impacts of the TLB; and garner public and private support to enhance habitat in Southwestern Willow Flycatcher critical habitat in the Virgin River.

At the end of the 2011 monitoring season, the TC began a program evaluation for the Biological Control Monitoring Program in order to ensure the program was meeting partners' needs. At the completion of this evaluation, three program areas were established: Dispersal Population Zone Monitoring, Intensive Monitoring of the Established Population Zone and Data Management.

TC recognized that presence/absence monitoring was still very useful in the areas where the TLB was dispersing. The dispersal population zone monitoring program area focuses on establishing and training new monitoring partners within focus areas and creating an end of the year TLB distribution map.

Data organization for the biological control monitoring program is becoming increasingly challenging. The monitoring area has expanded to seven states, three major watersheds (Colorado, Rio Grande, and Arkansas), over 30 partners and the TC houses 10,000 presence/absence monitoring points. TC anticipates the database to expand even more in the coming years.

In addition to presence/absence monitoring, a more intensive analysis of the impacts to the ecosystem is necessary. There are many individuals and groups that are interested in establishing more intensive long-term monitoring protocols, but are lacking appropriate protocols. The TC is organizing a meeting in the coming months that will focus mainly on creating these protocols that can be used by the interested parties; if you are interested in participating in this meeting, please contact the Tamarisk Coalition.

Restoration in the Presence of *Diorhabda* spp. Audrey Butler. Tamarisk Coalition, Colorado

As land managers and restoration practitioners start to conduct restoration in areas of beetle establishment, Tamarisk Coalition (TC) is starting to see the benefits and drawbacks of a number of different approaches. This is due, in part, to the fact that the beetle will not completely eradicate tamarisk but rather bring it into equilibrium within the ecosystem. As such, many people are assessing their options for restoring riparian areas and managing the dead and living tamarisk biomass.

Many different approaches to riparian restoration have been practiced for years with varying levels of success, active tamarisk control, active revegetation and passive restoration. A handful of examples of restoration practices in areas of beetle establishment exist, but information sharing about these types of projects is critical to ensure effective and efficient restoration. Drawing off the experiences of others doing similar projects can save time and resources by avoiding 'reinventing the wheel'.



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The type and number of variables at any given sites often differ greatly. Increasingly we are seeing practitioners approaching restoration more holistically by using multi-faceted approaches and considering many variables instead of only assessing a few.

Several different approaches of tamarisk control and revegetation that are currently being used in several projects that TC is aware of.

- Active Tamarisk Control
 - Dolores River Restoration Partnership - The Dolores is a stretch of river with many remote areas. They are actively controlling tamarisk through mechanical mulching and no herbicide application. They are allowing *Diorhabda* to take care of the tamarisk resprouts and leaving pockets of tamarisk to support the beetle population.
 - Arkansas River Basin – Many areas along this river corridor have been aerially sprayed with herbicide and *Diorhabda* is being used to treat resprouts after removal.
- Active Revegetation - Tom Dudley and Dan Bean (2012) note that “landscape scale reduction of tamarisk biomass is not feasible and in the opinion of some, not necessary unless a fire hazard or other concern.” Several active revegetation approaches limit the resources available to tamarisk by manipulating natural disturbance and successional processes:
 - Virgin River is one of few areas where *Diorhabda* and the endangered southwestern willow flycatcher coexist. Therefore restoration practitioners are encouraging low impact restoration strategies:
 - Propagule Islands, the development of native plant patches that have the potential to mature and produce enough seed to regenerate a native-dominated riparian habitat. This revegetation method is derived from the premise that “plants develop better when coming from taproots of germinating seed than from transplanted trees and natural recruitment depends on availability” (Dudley, T. and D. Bean, 2012). The idea is to create a series of islands or native plant patches within a given area. This could be particularly valuable on a landscape scale as the beetle progresses and tamarisk is weakened, consequently giving native plants a chance to outcompete other resident non-natives. This method also helps minimize soil disturbance, which helps reduce the likelihood of secondary weeds taking over.
 - Staged Restoration - “Riparian restoration should be done on a landscape scale, mimicking the natural successional processes and promoting conditions in which there is a shifting mosaic of vegetation patches with area of early successional stands consistently present” (Dudley, T. and D. Bean, 2012).
 - Green and Yampa Rivers
 - A study was conducted in 2010 on the Green and Yampa Rivers in which John Dewine and David Cooper describe box elder overtopping and outcompeting tamarisk by intercepting light resources. They observe that “box elder success was significantly higher under tamarisk canopies, suggesting that the protection facilitates seedling survival.” This could also be useful as the beetle makes its way through an area and weakens the tamarisk even further. This study is



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particularly unique in its suggestion that native plants can be used to control tamarisk without first removing the standing dead biomass.

- Passive Restoration
 - Cataract Canyon
 - This is an extremely remote canyon where the only tamarisk control is through *Diorhabda* establishment. After repeated defoliation cycles the tamarisk are dying back and willows are starting establish underneath the standing dead tamarisk. The National Park Service is leaving the tamarisk biomass and monitoring the re-establishment of natives.

Citations:

Dudley, T.L. and Bean, D.W. 2012. Tamarisk biocontrol, endangered species risk and resolution of conflict through riparian restoration. *BioControl* **57**:331-347.

DeWine, J.M. and Cooper, D.J. 2010. Habitat overlap and facilitation in tamarisk and box elder stands: Implications for tamarisk control using native plants. *Restoration Ecology*. 18:349-358.

Tamarisk beetles, endangered flycatchers, and riparian restoration. James L. Tracy and Robert N. Coulson, Knowledge Engineering Laboratory, Department of Entomology, Texas A&M University, College Station, TX 77843.

Four species of tamarisk beetles (*Diorhabda* spp.) introduced for biological control of tamarisk (*Tamarix ramosissima*/*T. chinensis*) in arid and semiarid riparian habitats of western North America are dispersing and producing widespread defoliation and dieback of tamarisk. Three *Diorhabda* species are established in western Texas and Oklahoma: *D. sublineata*, mainly in the TransPecos region, *D. carinata*, mainly in the northeastern Texas panhandle region and far western Oklahoma, and *D. elongata*, mainly in southwestern Texas panhandle region. *D. elongata* has hybridized with both *D. sublineata* and *D. carinata* in some areas. Hybrids can be distinguished through novel and intermediate morphological diagnostic characters, primarily involving the genitalia. Hybrids appear to primarily represent backcross hybrids that predominantly exhibit traits of one of the parental species. Hybrid populations overall exhibit a strong bimodal distribution of hybrid traits (traits predominantly represent one of two species) which is typical of strongly reproductively isolated but interbreeding species.

Active riparian restoration may be needed in some tamarisk woodlands to ensure return of native plant biodiversity providing desired ecosystem services that can mitigate for loss of services provided by tamarisk. Restoration of cottonwoods and willows will be necessary in some areas to replace bird nesting habitat lost to tamarisk biological control and protect the endangered southwestern willow flycatcher (*Empidonax traillii extimus*, flycatcher). Projections of the timing and locations of interactions between the four species of tamarisk beetles and flycatchers are being developed through tamarisk beetle continental species distribution models linked to cost-distance connectivity dispersal models. At selected sites where tamarisk beetles and flycatchers should interact, patch-level flycatcher Habitat Suitability Index (HSI) models are being developed to simulate impacts of tamarisk beetles on flycatcher habitat, and plan the restoration of cottonwood/willow woodland needed to mitigate habitat loss. HSI simulation models for flycatcher critical habitat at Tonto Creek, Arizona project a 56% loss to 19 ha of suitable flycatcher habitat the first year of tamarisk beetle herbivory. Habitat loss in subsequent years may be less if willows are available to flycatchers as alternative nesting sites. Models project that flycatcher habitat lost to beetles at Tonto Creek could be mitigated within three years by addition of eight ha of artificial side pools with five ha of willow patches. Patch-level HSI models for cottonwoods, willows and other native riparian plants are proposed to facilitate site specific restoration planning to follow up tamarisk biological control.



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The relatively new regional USDI Landscape Conservation Cooperative (LCC) grant programs are potential sources of funding for studying ecosystem impacts of tamarisk biological control and developing decision support tools for following up control with riparian restoration. Proposals should be developed for both the Desert LCC and Great Plains LCC areas concentrating on impacts and restoration for habitats for priority sensitive riparian/wetland species such as the flycatcher and snowy plover, respectively.

Committee Reports

Wildlife/Environment Committee.

Chair: Annaliese Scoggin,, Texas Parks & Wildlife Dept.,

Participants: Gene Richardson, Texas Farm Bureau, Kristen Madden, New Mexico Game & Fish, Cyndie Abeyta, USFWS, James Tracy, TAMU, Ernesto Reyes, USFWS - LRGV NWR

Issues/Questions:

1. Could saltcedar biocontrol along the Upper Brazos River benefit the sharpnose (*Notropis oxyrhynchus*) and smalleye (*Notropis buccula*) shiners? These species of shiner have been listed as candidate species under the ESA since 2002 and a proposed rule is expected to be published before early 2013. Invasive salt cedar encroachment is listed as one of the threats to this species. These species were heavily impacted by the drought of 2011, with portions of the populations removed to hatcheries to preserve the species when large portions of the Upper Brazos River dried up. **If** saltcedar biocontrol can improve in-stream flows in this area, then it could be a great benefit to these species.

2. Biological control of saltcedar will affect the habitat of the endangered southwestern willow flycatcher (SWFL) and the (Western) yellow-billed cuckoo (WYBC). There is currently no plan to address this issue. WYBC and SWFL share similar habitat requirements (flooded riparian zones with areas of dense willows or saltcedar near water) and both will nest in saltcedar when willows are not available. Both species begin nesting in early spring before beetle activity begins and nests are exposed following the saltcedar defoliation. This has been shown to decrease nesting success in SWFL significantly during at least the first two years of defoliation (J. Tracy), though the impact was less in the second year. The beetles are affecting large areas of SWFL habitat already, and they are expected to reach several important nesting areas next year, including Elephant Butte Reservoir. Several committee members expressed the need for a coordinated plan with biologically sound habitat management and restoration techniques to mitigate the beetle impacts on nesting habitat. A few restoration projects were mentioned that could be examined for further ideas (Gila River Bird Area, El Paso Valley). Most of the major habitat issues are not caused by the beetles, but by the altered system inputs that have changed the historic ecosystem (channelization of stream beds, lack of sedimentation and flood cycles, limited in-stream flow due to irrigation and water diversions, and decreased river surface area) and hinder the establishment and survival of native willow stands. How can willows be established and saltcedar selectively thinned or protected to support the birds' reproductive success during the transition to a beetle-maintained saltcedar population? The committee agreed to poll the group for recommendations on management activities, funding sources, and an action plan when the meeting reconvened.

3. Effects of saltcedar biocontrol (and other exotic plant control) on water savings and in-stream flows. There needs to be further study on the effects of saltcedar biocontrol (and other exotic plant control) on water savings and in-stream flows. Because this is such valuable information and a timely topic in the southwest, this research needs to be widely disseminated once completed.



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4. **Monitoring for SWFL and WYBC.** It was suggested that other organizations, like the Tamarisk Coalition, should be brought in to help set up monitoring for SWFL and WYBC, modeling habitat suitability indices (HSI), and developing action plans.

5. **Funding Needs.** It was suggested that we search out funds for additional restoration projects.

6. **Need to “sound the alarm”.** It was suggested that each agency employee needs to “sound the alarm” to their respective natural resource agencies that deal with watersheds, SWFL, beetles, and restoration, that a crisis is at hand and they need to act now.

Science Committee.

Chair: Allen Knutson, Texas A&M

Participants: Matthew Pool, Texas Parks and Wildlife, Erin Jones, Texas A&M, Jessi Lanci, Tamarisk Coalition, Mark Donet, NRCS (retired), Joe Franklin, NRCS, Robert Coulson, Texas A&M, Mark Muegge, Texas A&M, John Burch, Colorado River Municipal Water District.

Issues/Questions:

1. Determine degree of hybridization between *Diorhabda* species in the field. James Tracy has estimated hybridization based upon morphological characteristics of adults collected from several areas of Texas in 2012. He and Robert Coulson are planning studies to use molecular methods to more rapidly and precisely estimate hybridization. Erin Jones is also developing molecular methods for identifying hybrids. Dan Bean is working on a manuscript reporting molecular studies done by Dave Kazmer that identified four species of *Diorhabda* now present in the US.

2. Develop remote sensing technology to measure distribution and impact of tamarisk beetles. The ARS Laboratory at Weslaco, Tx was closed in 2012 and the Remote Sensing Laboratory was relocated to the ARS lab at College Station. C. Yang is interested in continuing to provide aerial photographs of beetle defoliation. Matt Pool reported on a project underway by Texas State University at San Marcos to use a drone airplane to collect environmental information and its possible use for remote sensing beetle activity. The Forest Health Enterprise System was mentioned as a possible source of funding.

3. Document the impact of tamarisk beetles on athel. Reports of Chris Ritzi and Joe Sirotnek indicate the first year of impact was considerable due to the very high numbers of beetles, but less defoliation has been observed in the second and third year along the Rio Grande. Efforts are underway to work with colleagues in Mexico to evaluate soil applied system insecticides in Mexico to protect valuable athel trees from defoliation.

4. Standardize monitoring protocols for rapid assessment of beetle dispersal and impact. For rapid assessment, reporting the mean number per two minute visual search of the foliage has worked well. Surveys in northern states have used sweep nets as the sampling methods. The Tamarisk Coalition is working with groups to suggest methods for monitoring. Also, while current maps show beetle presence and relative abundance, maps showing areas of defoliation are needed to demonstrate impact.



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5. Habitat assessment and restoration for western willow flycatcher. James Tracy will be researching this topic as part of his Ph.D. program with Bob Coulson, Texas A&M. They are focusing on the Rio Grande and Pecos River basins and associated flycatcher habitat, both current and historical.

6. Research Projects Planned. Erin Jones is planning studies on the life history and biology of *Coniatus*. Allen Knutson and Mark Muegge are planning field studies to evaluate impact of beetles on Tamarisk flowering and documenting recovery of vegetation.

Federal, State, Private and Mexico Cooperative Relations Committee:

Chair: Joe Sirotnek, Big Bend National Park

Participants: (notes by Allen Knutson)

Issues/Objectives.

1. Information needed on how defoliation of saltcedar by leaf beetles effects aquatic organism, especially fish. Possible effects include increased water temp due to lack of shading.
2. An action plan is needed to prepare for arrival of beetles at SWW Flycatcher nesting sites to minimize impact of tree defoliation on nesting success. Plan could include removing saltcedar or cutting it to below minimum height accepted as a nesting site by birds, planting willows to replace saltcedar. Also, funding needed for this habitat modification.
3. Review and improve if possible practices and methods for anticipating impact of biological control agents prior to release in the US.
4. Continue to develop lines of communication with Mexico to share monitoring information on beetle density, dispersal and impact on athel and saltcedar on both sides of the border. This communication is coordinated by IBWC-CELA.



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**Notes on the Group Discussion Regarding a
Plan to Mitigate the Impact of Saltcedar Leaf Beetle Defoliation of Saltcedar
Discussion on a Plan to Mitigate the Impact of Defoliation due to Leaf Beetles on the Nesting
Success of the Southwestern Willow Flycatcher in the Middle Rio Grande of New Mexico
(Thanks to Chris Ritzi for providing the following text regarding this discussion)**

Vicky Ryan does most of the surveys on the middle Rio Grande. Her group will be able to locate the first nest at Elephant Butte in a defoliated tree. Debra Hill is coordinating SWFL nesting and success. Discuss possibility of pheromone trapping to try to locate beetles as they first come in. New Mexico Game and Fish is reporting defoliation, but don't know the beetles yet. Need to train them. Tamarisk Coalition and TX A&M AgriLife Ex. will be helping with training and informing. Corp of Engineers and Bureau of Reclamation might be the only group that could pay for replantings. USFWS is very concerned at regional level. Have had some training and meeting with folks about the beetle. How should they respond once they get into flycatcher territory? Beetles are here to stay, and restoration should have been started a while ago, not continued finger pointing as to who's fault this is and who should have started planting alternative trees years ago. USDA is being pointed as responsible, but SWFL recovery plan with USFWS never incorporated beetles into the plan (Cyndie Abeyta, USFWS-NM). IBWC is working on Restoration for 10 years, and it is hard to get water to maintain willow plantings. You just can't plant trees. Bureau of Rec did a replanting at El Butte, but we don't have their data with us today. The concern is with timing of defoliation and bird nesting. Can the birds handle the loss of degraded habitat over a couple of years? How will birds respond over 1, 2, and 3 years post defoliation. SWWF nest in saltcedar trees greater than 4 ft tall, so cutting (mowing ?) all saltcedar in potential nesting sites just before birds arrive could make saltcedar unsuitable for birds, encouraging them to nest in willows. Then when beetles defoliated sc, there should be no harm to the birds. Some mowing is being done in the lower parts already, this might be an option. Just stay out during nesting session. Problem is there is a buffer around SWFL nest, even during off season, which cannot be disturbed. Can't harm nest or anything in 1/4 mile? Need to get clarification on this restriction and modify to allow mowing of saltcedar if it will increase nesting success. Virgin river area has dealt with this already. Talk to folks at Tama Coal. They are also dealing with the levels of water and water rights. Talk to Sharon Hatch to get more info. Work on drafting a position paper in the near future to get info out to SWFY workers and planners. New Mexico is having a landowner/res meeting, and will be discussing this. The decision makers in these agencies need to be aware and work on this. USFWS is looking to open discussion and formal "consultation" with USDA again and revisit 2010 letter. We seem to have the same conversation year after year. We are at the 11th hour. Once animals are loose in the environment, it is difficult or impossible to put them back in the box. What and when can something be implemented. In 2007, Mexico asked for a contingency plan before we released near Mexico. Jack provided a plan that was deemed unsuited, and this was revisited in 08 and 09. Presidio meeting in 2009 asked again, and trunk injection was suggested. Problem is that there is no single group that is responsible or has money to do it. USFWS enforces Endangered Species law, fines and jail could be involved. Issues of concern are take of habitat, who is responsible. Who is responsible, release of beetles years ago from other areas, or folks who manage areas being impacted. Discussed use of adaptive management and efforts to get decision makers at this meeting to interact with scientists and land managers and develop a workable plan.

Audrey Butler - restoration in the presence of the beetle. Tamarisk biocontrol and restoration (by Tom Dudley and Dan Bean 2011 in Restoration Ecology or BioControl* 57: 331-347) It is generally insufficient to just get some green plants growing. Top-down vs bottom-up restoration. Top-down = removal of the species, mechanical, spray, etc. Dolores River Restoration project is keeping pockets of tamarisk to maintain beetles so the beetles can hit the resprouts. Arkansas River Basin - herbicide spraying and beetles to treat resprouts. Propagule Islands - native plant patches for seed development and natural recruitment. Virgin River - propagule island and staged restoration (mimicking natural successional progression). Diverse age class is more stable for the future. Green and Yampa River (Dinosaur National Monument) - Bottom up restoration - don't remove veg, have seedling push up and out compete saltcedar. less disturbance means less weed and invasive growth. Box elders are growing up while saltcedars are being defoliated. (DeWine and Cooper, 2010 - Restoration Ecology 18:349-358). Cataract Canyon - only beetles present and the loss of trees causing stream bank instability and large woody debris in river. Work here



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is passive restoration and removing large standing dead. See good willow growth coming in on its own. Nice when it happens to work. :) Need more sharing of actions so no one has to reinvent the wheel. Need to think about things watershed wide, not in a vacuum. Similar issues with beetles moving into Arizona from Utah. They have already dealt with the issue we are dealing with now. Tamarisk Coalition helped with info sharing and communication to smooth feathers. This sort of multipartnership approach is what is needed.

10 Bullet points regarding SWFL and beetles

Cyndie - 1/4 mile of suitable riparian, and 1/2 mile of suitable SWFL habitat. Activity Aug 16th thru April 30th is allowed. James found an email from 2009, following the 2009 Consortium meeting, suggesting the need for a 'contingency' plan from the Consortium but such a plan was not developed. A Section 10 permit could be issued for take on private land if a plan was in place. Rio Grande Consortium of soil and water districts needs to be contacted, Steve Harris has these contacts.

Bullet points for what we need in a mitigation plan (action items)

1. In advance of beetles, get more willows established in tamarisk SWFL habitat.
2. Discourage SWFL from using saltcedar (mowing or topping during non-breeding season to reduce saltcedar canopy to less than 4 ft, making such trees no longer attractive as nesting site). Can get permission to work within nest zones if it is for restoration.
3. Reduce existing saltcedar that is not currently used as nest habitat.
4. Make a fire break wall for the beetles - remove areas of saltcedar to slow beetle movement. Mechanic or herb treatment, possible insecticide on beetles. Beetles can fly long distance (miles) so this may be at best temporary. Also, questions as to treatment sites are allowed by pesticide labels
5. Habitat enhancement - supplement mixed willow/tamarisk stands to encourage willows.
6. Remove tamarisk and actively plant willows to offset loss of habitat. remove bad habitat and replace with better in nearby habitat.
7. Long term monitoring of beetles movement and activity in general and in presence of SWFL
8. Need to acquire funding to conduct work and long term restoration work.
9. Consider the develop a conservation habitat plan. Hoped that USDA would have done this.
10. Work with Tamarisk Coalition and USFW.



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**APPENDIX: PROGRAM AGENDA
TUESDAY, October 30**

Moderator: Allen Knutson

8:30 a.m. **Welcome and Announcement**

Presentations are 15 minutes each with 5 minutes for questions and discussion

8:40-9:00 a.m. **Some Observations on the Future of Southwestern Rivers.** Steve Harris. Executive Director, Rio Grande Restoration

9:00-9:20 a.m. Impact of Tamarisk Leaf Beetles on Saltcedar and Athel Along the Rio Grande in the Trans Pecos Region of Texas. - Chris Ritzi, Chair, Biology Department, Sul Ross State University, Alpine, TX

9:20-9:40 a.m. Release, Establishment and Impact of Leaf Beetles along the Pecos River – Mark Muegge, Texas A&M AgriLife Extension Entomologist, Fort Stockton

9:40-10:00 a.m. **Release, Establishment and Impact of Leaf Beetles in the Upper Colorado and Brazos River Watersheds-** Allen Knutson, Texas A&M AgriLife Extension Entomologist, Dallas.

10:00-10:20 a.m. **Release, Establishment and Impact of Leaf Beetles in the Texas Panhandle-**Erin Jones, Research Assoc.,A&M AgriLife Research, Amarillo

10:20-10:40 a.m. **BREAK**

10:40-11:00 a.m. **Expansion of *D. subliniata* from Candelaria to near El Paso.** Jack DeLoach, Entomologist, ARS (retired), Temple, TX.

11:00-11:20. **Revegetation Following Saltcedar Control Along the Pecos River.** Alyson McDonald, Extension Rangeland Specialist, Texas A&M AgriLife Extension, Fort Stockton, TX

11:20-11:40. **Hydrologic Impacts of Saltcedar Control Along the Pecos River,** Alyson McDonald, Extension Rangeland Specialist, Texas A&M AgriLife Extension, Fort Stockton, TX

11:40 a.m. - Noon. Q & A. Discussion.

TUESDAY, October 30 (continued)

Noon: Box Lunch Provided

Moderator: Chris Ritzi

1:00 -1:20 p.m. **Impact and Management of Saltcedar on the Lower Rio Grande Valley National Wildlife Refuge.** Kim Wahl, Plant Ecologist, Lower Rio Grande



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Valley NWR

- 1:20-1:40 p.m. **Status of SW Willow Flycatcher at Elephant Butte Reservoir.** Vicky Ryan, Bureau of Reclamation, Albuquerque
- 1:40-2:00 p.m. **Status of Biocontrol of Saltcedar at Big Bend National Park and Partnership with Mexico.** Joe Sirotnek, Botanist, Big Bend National Park
- 2:00 to 2:20 p.m. **Distribution of Leaf Beetles in New Mexico-** James Tracy, Ph.D. candidate, Entomology Department, Texas A&M.
- 2:20-2:40 p.m. Questions for Speakers. Discussion.
- 2:40-3:00 p.m. **Opportunities for Funding Saltcedar Research and Program Implementation.** James Tracy.
- 3:00 – 3:45 p.m. **Breakout Sessions**
- 3:45-4:15p.m. **Reports from Breakout Sessions and Discussion**
- 5:00 p.m. **Adjourn**

2011-2012 SUBCOMMITTEE CHAIRS

Science: Allen Knutson, Texas AgriLife Research, Dallas TX.

Wildlife/Environment: Annaliese Scoggin, Texas Parks and Wildlife, Midland, TX

Federal State, Private Liason: Bill Skeen, Rio Grand Institute, Marathon, TX

Mexican Cooperative Relations: Joe Sirotnek, Botanist, Big Bend National Park

WEDNESDAY, October 31

- Moderator: James Tracy
- 8:00 a.m. **Announcements. Suggestions for Topics and Meeting Site in 2013.**
- 8:20-8:40 a.m. **Leaf Beetles in El Paso: Alerting the Citizens.** Salvador Vitanza, IPM Agent, Texas A&M AgriLife Extension, El Paso.
- 8:40-9:00 a.m. **Tamarisk Coalition Biocontrol Monitoring Program - Past & Future.** Jesse Lanci and Audrey Butler. Tamarisk Coalition, Grand Junction, CO
- 9:00-9:20 a.m. **Restoration Projects in the Presence of Diorhabda.** Audrey Butler and Jesse Lanci. Tamarisk Coalition, Grand Junction, CO
- 9:20-9:40 a.m. **Tamarisk Beetles, Endangered Flycatchers and Riparian Restoration.** James Tracy, Ph.D. candidate, Entomology Department, Texas A&M.



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9:40-10:00 a.m. Questions and Discussion.

10:00- 10:45 a.m. **Agency Comments, Viewpoints**

The International Boundary Water Commission Perspective. Elizabeth Verdecchia. Natural Resources Specialist, IBWC, U.S. Section

11:00 Adjourn