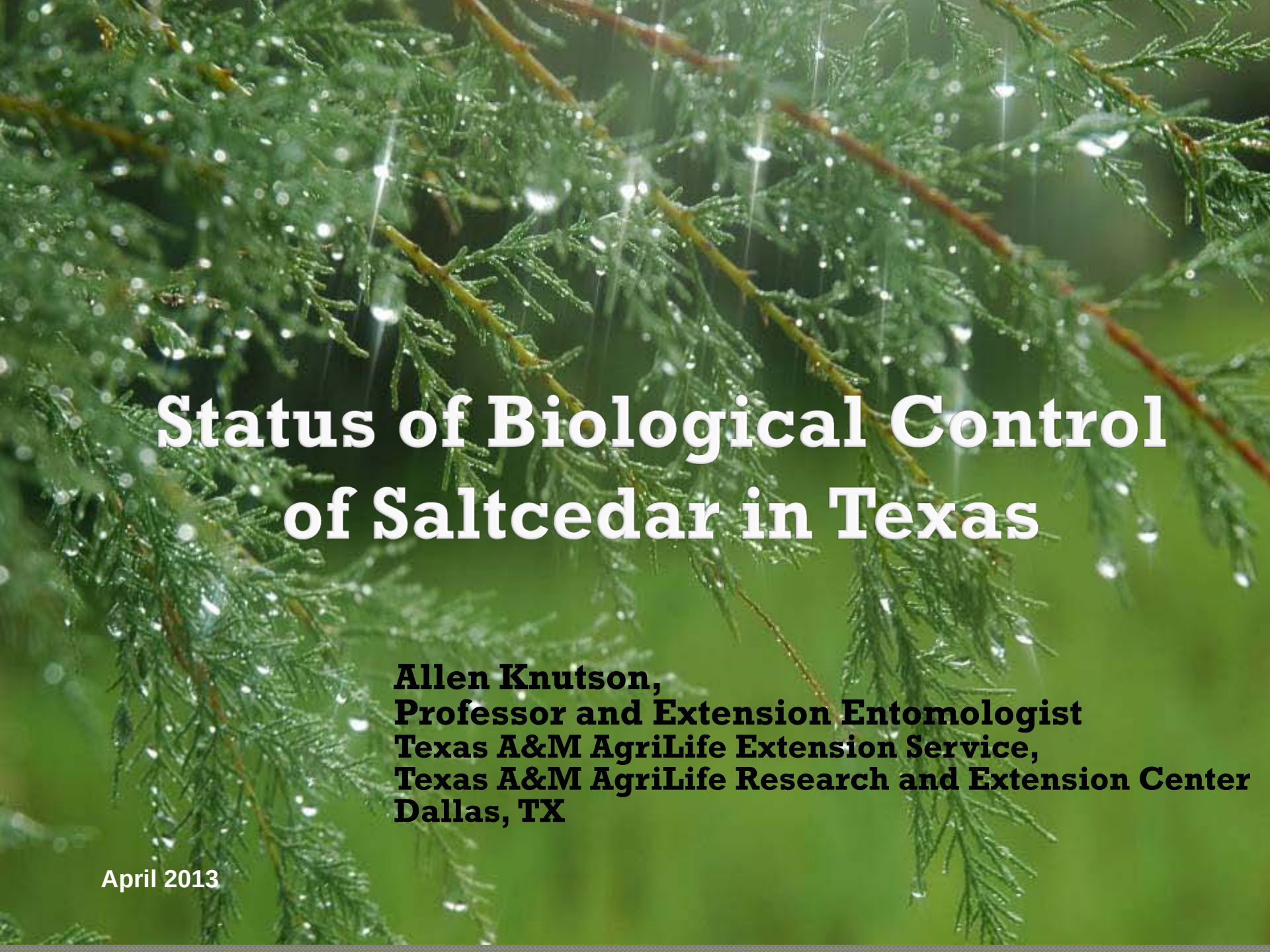

Status of Biological Control of Saltcedar in Texas

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April 2013

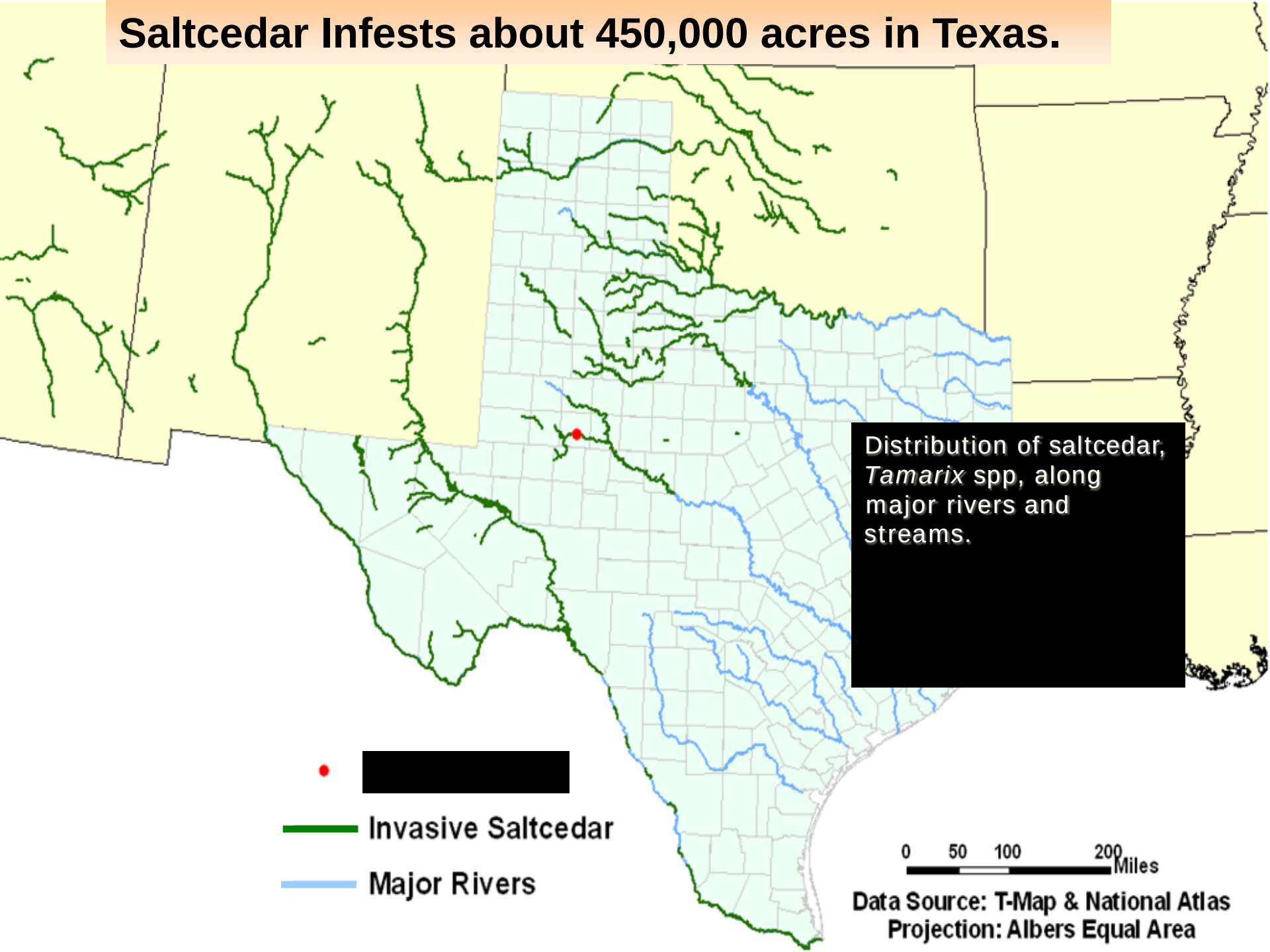
Saltcedar: *Tamarix* species

- Native to Asia and Mediterranean Region
- Introduced into the US as an ornamental.
- In 1870s, planted for erosion control along stream banks in the southwest.
- Naturalized and now infests 2 million acres from Mexico to Montana.

Impacts of *Tamarix* Invasion

- Loss of ground water due to transpiration from dense, extensive thickets.
- Estimates of 1-2 acre feet of water lost per acre of saltcedar.
- Loss of grazing.
- Displacement of native plant communities
- Flooding and alteration to stream hydrology

Saltcedar Infests about 450,000 acres in Texas.



Methods for Controlling Saltcedar

- Mechanical
- Chemical
- Biological

Saltcedar Leaf Beetles, *Diorhabda* spp.- Life Cycle

Larva

Pupa

Saltcedar Leaf Beetles- *Diorhabda* species, imported and released in the US

5 mm

Diorhabda carinulata **(Fukang, China /Chilik, Kazakhstan ecotype released May 2001)**

Diorhabda elongata **(Crete/Posidi, Greece ecotypes released August 2003)**

Diorhabda carinata **(Qarshi, Uzbekistan ecotype released July 2006)**

Diorhabda sublineata **(Sfax, Tunisia ecotype released July 2005)**


2 years of defoliation


5 years of defoliation, canopy cover reduced by 90%, about 20% of tres are dead

Branch Dieback, Epicormic Growth.

Above: White River Lake, Aug 2012. Third year of defoliation

How Beetles Impact Saltcedar Trees.

- Larvae eat leaves and tender bark. 3-5 generations per year.
- Stored carbohydrates are depleted due to lack of leaves and re-growth of leaves.
- Stress results in branch die back, reduced canopy.
- Flower and seed production is greatly reduced.
- Trees slowly starve to death
- Without saltcedar, beetles starve.

Big Spring TX: 2009.

Trees defoliated along 20-25 miles of Beals Creek in Howard County and Mustang Draw into Martin County.

Vegetation Recovery. Big Spring, TX.

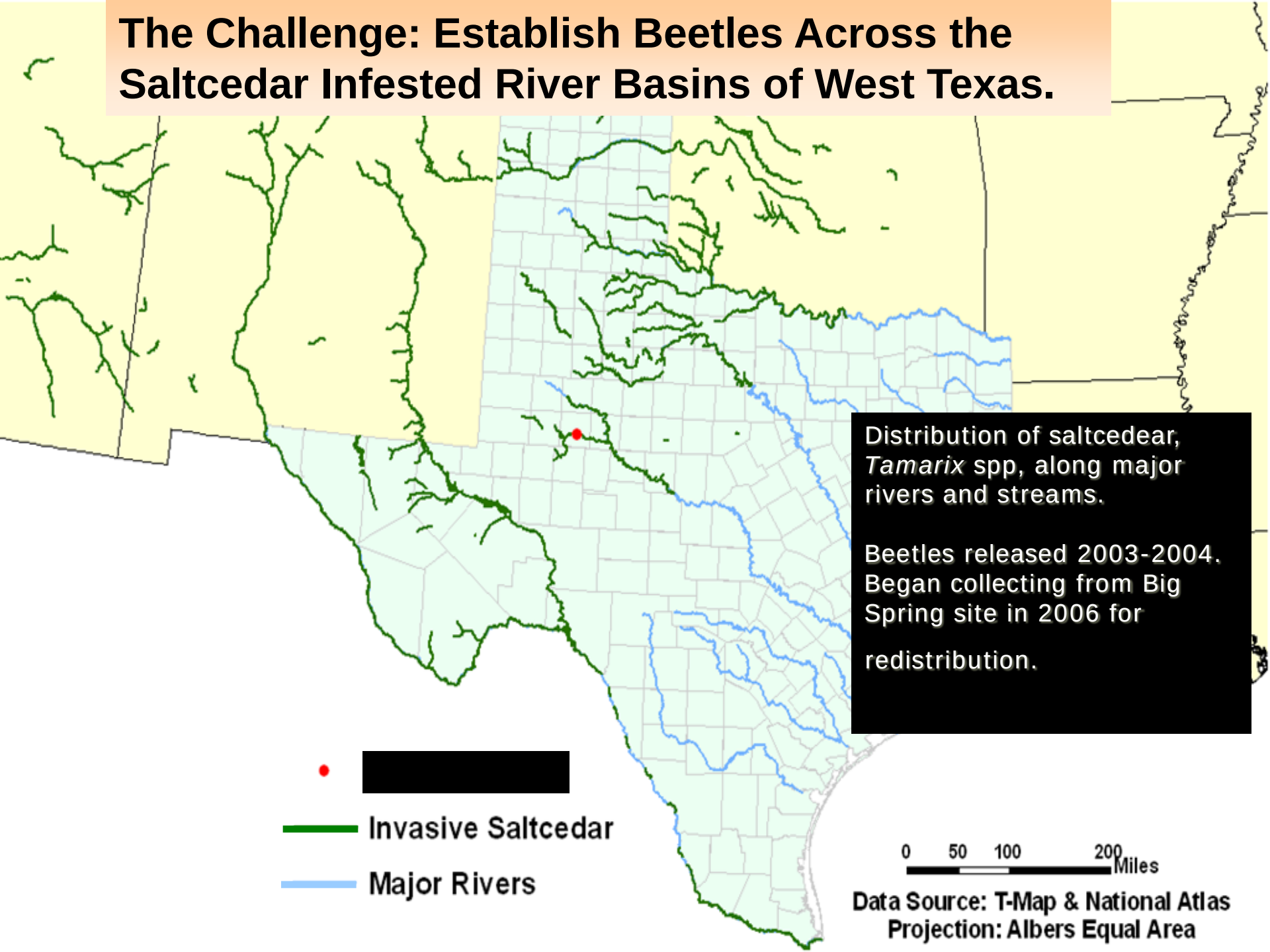
(Beetles 1st released 2004)

Benefits of Defoliation by Leaf Beetles

- Few or no blooms = fewer seeds
- Less water use due to lack of leaves.
- More sunlight allows other vegetation to recover.
- With repeated defoliation, some saltcedar trees die due to starvation after 4-5 years.

Beetle Redistribution Program.

The Challenge: Establish Beetles Across the Saltcedar Infested River Basins of West Texas.



Beetle Round-Up

- Beat bucket to collect adults
- Transfer beetles to paper bags, folded and stapled, and held in cooler in the field.
- Collect when adults are emerging. Look for aggregation trees.

Open Field Release Protocol

- **Treat release site with Maxforce ant bait.**
- **Release 20,000 or more adults in July and again in August.**
- **Concentrate releases on adjacent trees.**
- **Establishment defined as adults overwintering and increasing to sufficient densities to defoliate trees without further releases.**

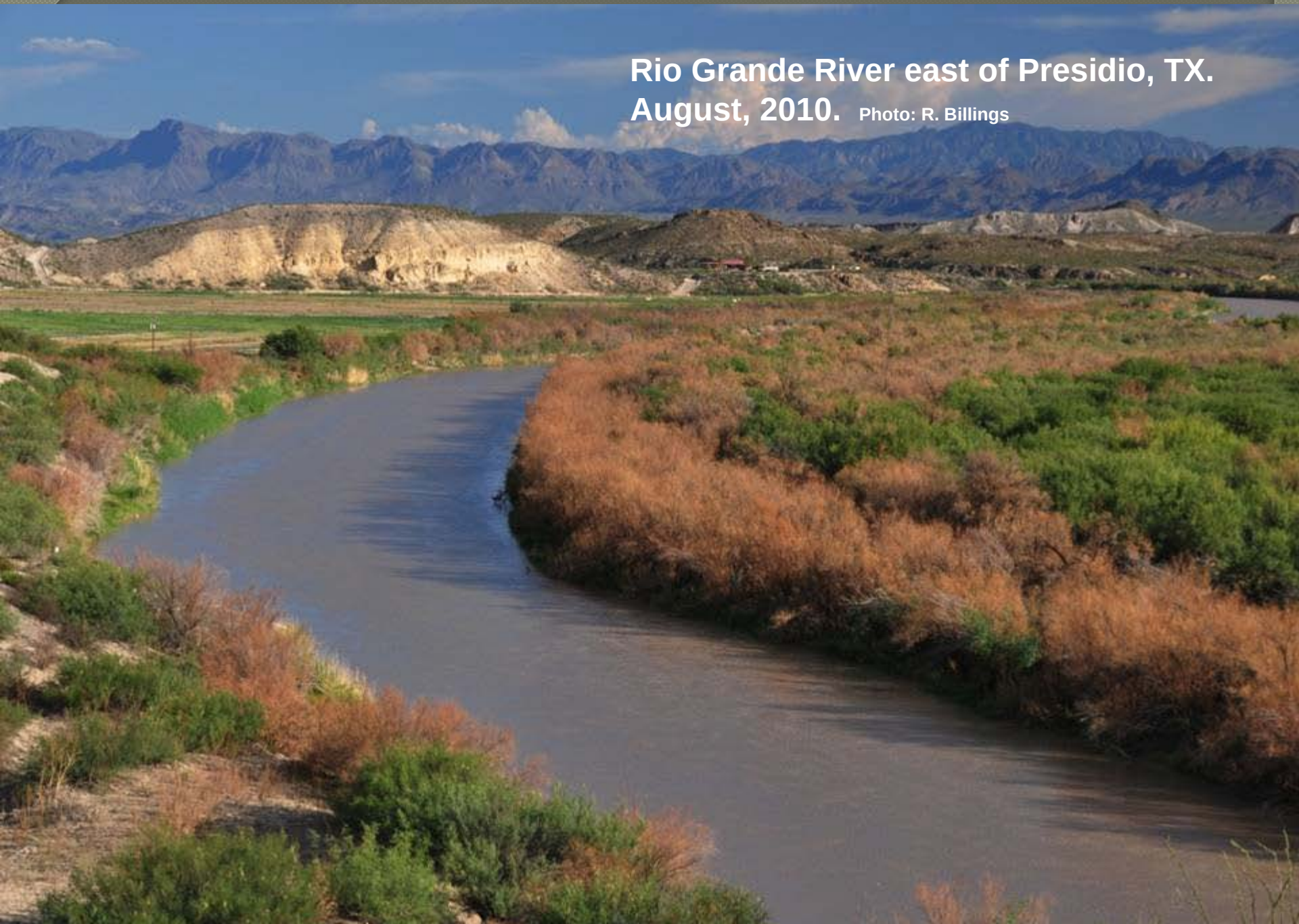
Texas AgriLife Program Beetle Releases 2006-2012

Year	No. Crete Beetles Released	Sites Crete species Established	No. Tunisian Beetles Released	Sites Tunisian species Established
2006	20,300	0	0	0
2007	6,200	2	0	0
2008	5,700	2	0	0
2009	300,000	3	14,300	0
2010	354,000	11	47,000	1
2011	0	4	84,000	3
2012	0	6	234,600	9
Total	686,200		379,900	

Following late spring freeze in 2011, D. elongata disappeared from 60% of the sites, while D. sublineata established at nine sites.

Where are beetles today ?

Distribution of the Saltcedar Leaf Beetles, Tunisian species, in the Rio Grande and Pecos River Watersheds



Rio Grande River east of Presidio, TX. August, 2010. Photo: R. Billings

Leon Lake, Ft.Stockton,
Sept, 2011


Leon Lake, Ft. Stockton.
Sept. 2011

Distribution of the Saltcedar Leaf Beetles, Crete species, in the Colorado River Watershed

Distribution of the Saltcedar Leaf Beetles, Uzbek species, in the Canadian, Red and Brazos River Watersheds

Wichita River, King County

- **Beetles overwintered in cages, 2008-2009. Released 9,000 beetles in July-Sept.**
- **Established in 2010.**

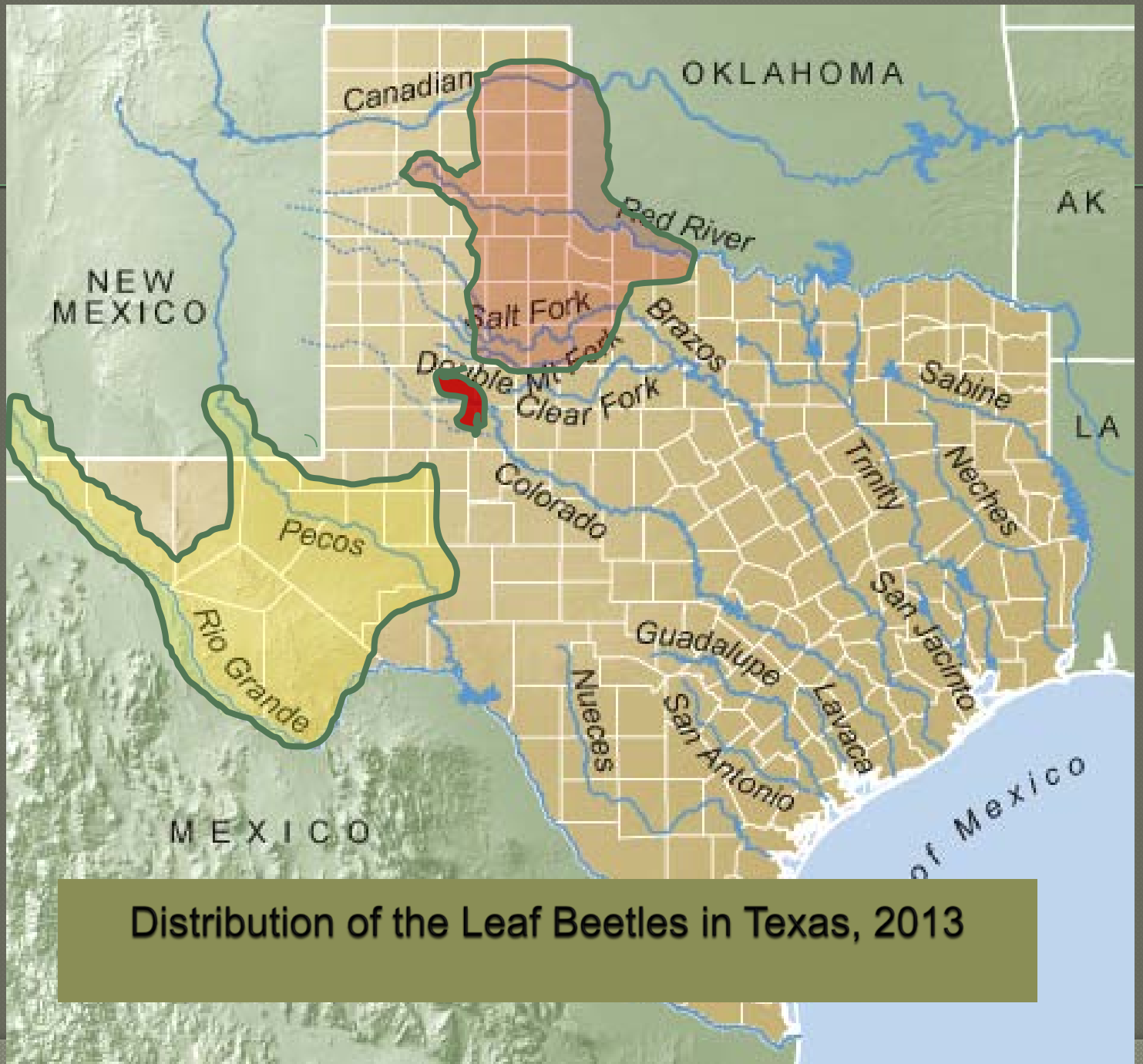
South Wichita River, King Co. Aug 2012.
Defoliated saltcedar along 8 miles of river

Wichita River, King Co. Aug 2012

Are we making progress ?

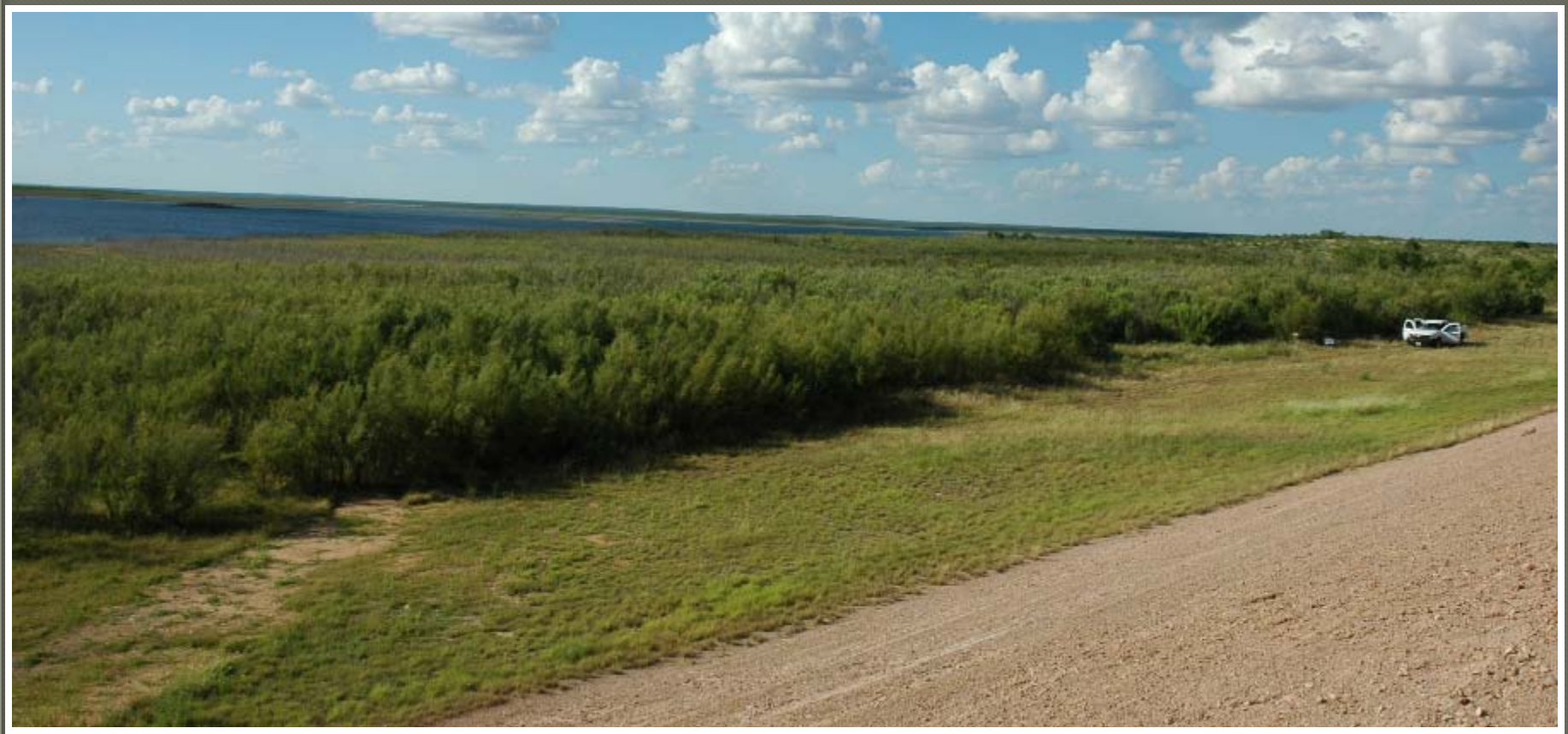
River and Tributaries	River Miles with Saltcedar	% of miles with Beetles
Canadian	268	10
Red River	759	56
Brazos	485	11
Colorado	210	24
Pecos	435	89
Rio Grande	540	63
Lower Rio Grande	240	0
Total	2937	**44%**

River miles estimated from Google Earth using map in Robinson 1965



Distribution of the Leaf Beetles in Texas, 2013

2013 Focus: Lake Spence (7,000 acres) and Lake Ivie (9,000 +acres). Reservoirs on the Colorado River.



Lake Ivie Reservoir, Saltcedar invasion following 2011 drought. Aug. 2012

Lake Ivie, July 26, 2012

Lake Ivie

- During 2010-2013, 170,000 leaf beetles have been released at Lake Ivie, but no establishment to date.
- Research suggest red imported fire ants are preying on beetles.
- Is an exotic ant from Brazil preventing an exotic, insect from north Africa from controlling an exotic shrub from southern Europe in west central Texas ?

Biological Control of Saltcedar, Status 2013

- **Saltcedar beetle populations are well established and defoliating saltcedar in all of the watersheds of west Texas.**
- **Leaf beetles are present on an estimated 40% of the saltcedar infested rivers miles in Texas.**
- **Flowering and seed production is greatly reduced, limiting re-invasion, branch dieback and canopy reduction is occurring, and tree death is anticipated.**
- **Biological control is slow, but is an inexpensive, sustainable, target specific approach to saltcedar management.**
- **Efforts continue to establish beetles at Lake Spence and Lake Ivie. International efforts needed to initiate releases in Lower Rio Grande.**

Texas AgriLife Saltcedar Biological Control Implementation Program

Organization and Partners

- **Texas A&M AgriLife Extension**: Coordinate implementation program, applied research, technical assistance and educational programs.
- **Agricultural Research Service**, Temple and Weslaco.
- **Texas A&M AgriLife Research**, Amarillo.
- **Biology Dept. Sul Ross University**, Alpine.
- **Natural Resource Conservation Service** and Soil and Water Conservation Districts. Local assistance
- **Colorado River Municipal Water District** and other water and irrigation districts. Local assistance and Financial support.
- **Pecos River Restoration Project**, Tx Soil and Water Conservation Board and Texas Water Resources Institute
- **Tamarisk Coalition**, Colorado

Grant Support for this project provided to Texas A&M AgriLife Extension by:

- Colorado River Municipal Water District
- Rio Grande Basin Initiative
- Texas Soil and Water Conservation Board
- Wal-Mart Stores, Inc.
- Texas Parks and Wildlife Foundation.
- Natural Resource Conservation Service

Implementation Program: Saltcedar Biological Control.

More information:

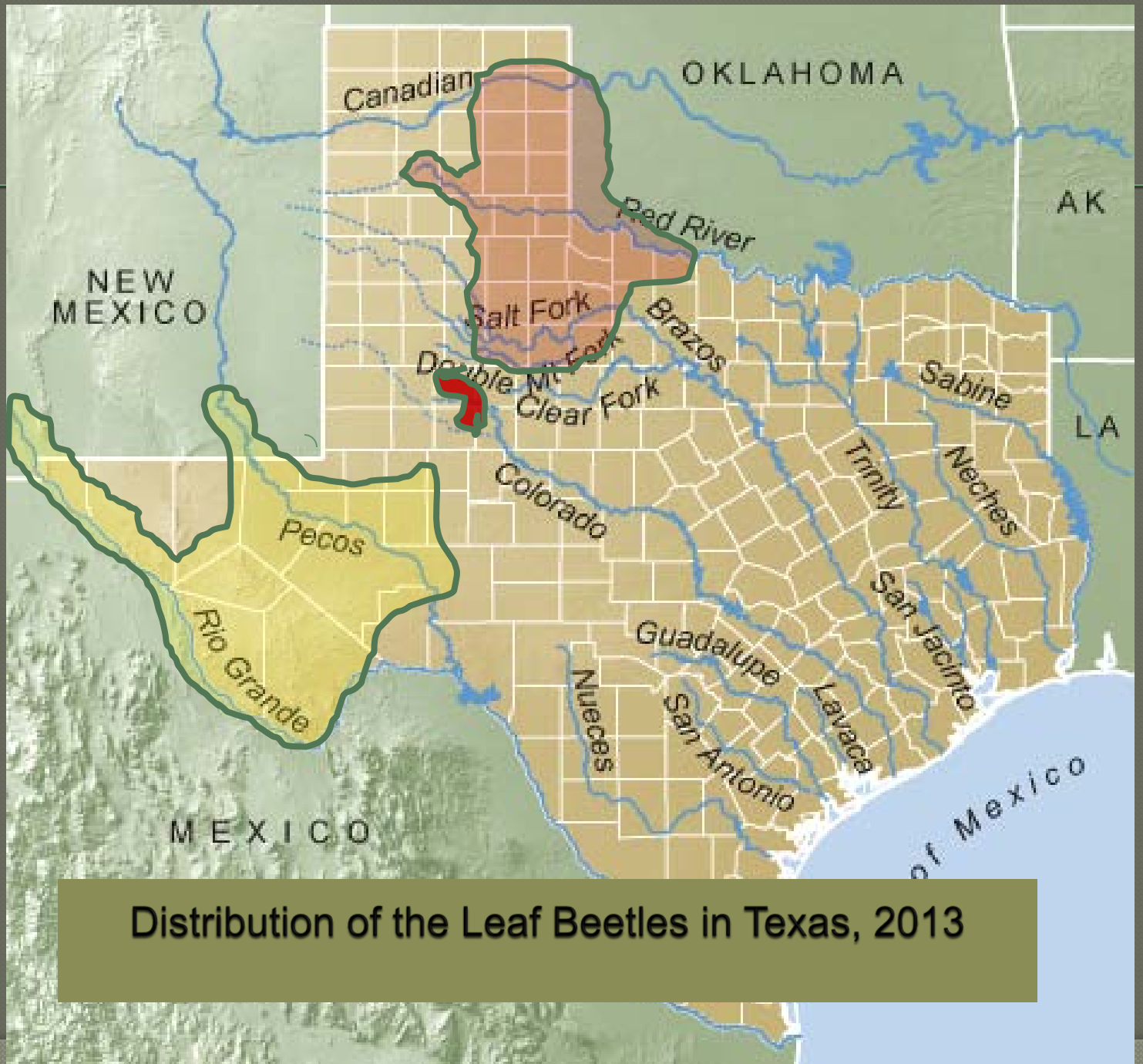
- **http://bc4weeds.tamu.edu**
- **“Beetle-mania” Newsletter**
- **a-knutson@tamu.edu**

- **Questions ?**

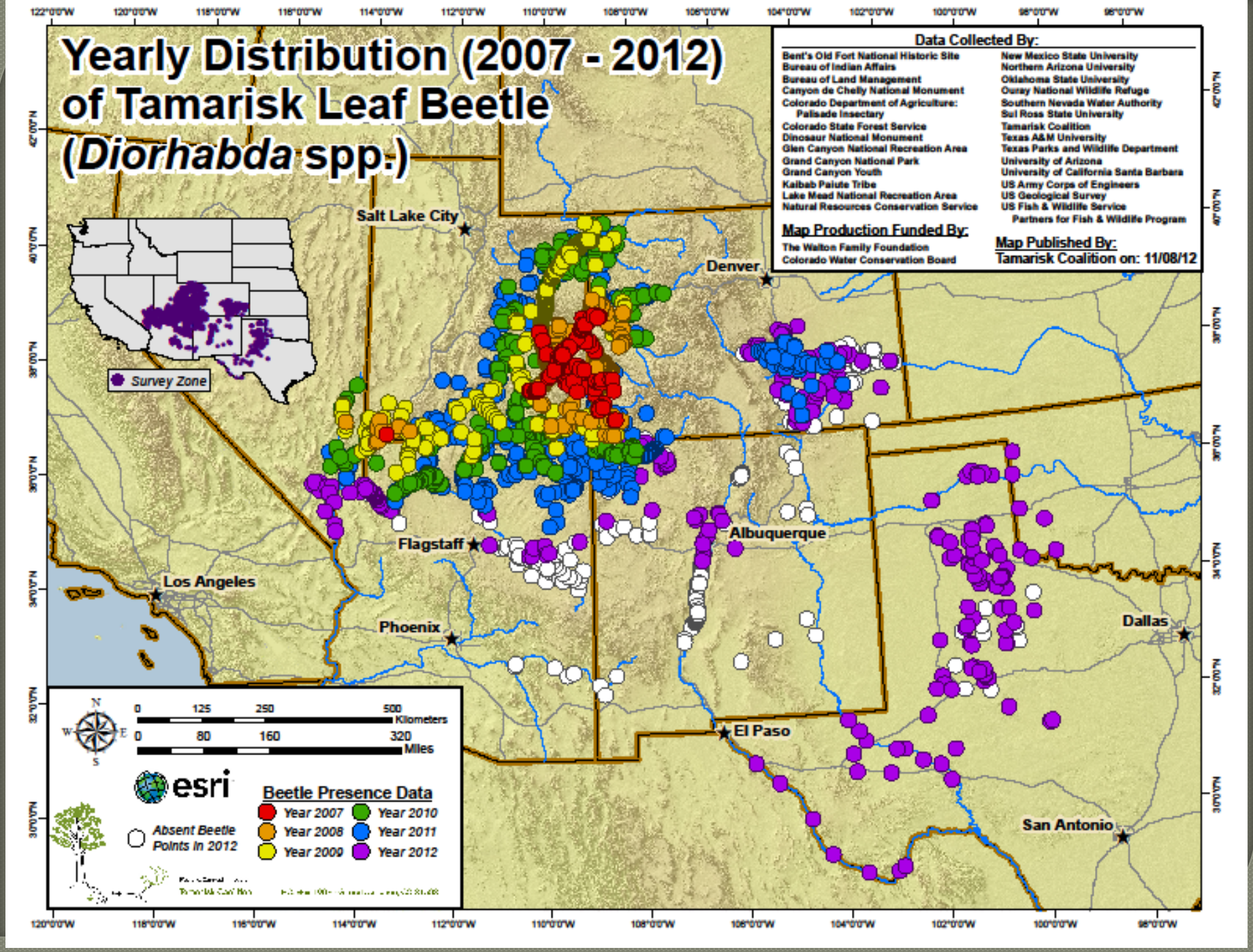
Questions ?

Biological Control of Weeds

- Use of a living organism (a natural enemy) to reduce the economic loss resulting from a pest species.
- Re-establishes the “balance of nature” when exotic pests arrive without their natural enemies.
- Once established, the natural enemy is usually self-sustaining.
- It is not Eradication



Distribution of the Leaf Beetles in Texas, 2013


Yearly Distribution (2007 - 2012) of Tamarisk Leaf Beetle (Diorhabda spp.)
Data Collected By:
Bent's Old Fort National Historic Site
Bureau of Indian Affairs
Bureau of Land Management
Canyon de Chelly National Monument
Colorado Department of Agriculture: Palisade Insectary
Colorado State Forest Service
Dinosaur National Monument
Glen Canyon National Recreation Area
Grand Canyon National Park
Grand Canyon Youth
Kaibab Paiute Tribe
Lake Mead National Recreation Area
Natural Resources Conservation Service
New Mexico State University
Northern Arizona University
Oklahoma State University
Ouray National Wildlife Refuge
Southern Nevada Water Authority
Sul Ross State University
Tamarisk Coalition
Texas A&M University
Texas Parks and Wildlife Department
University of Arizona
University of California Santa Barbara
US Army Corps of Engineers
US Geological Survey
US Fish & Wildlife Service
Partners for Fish & Wildlife Program
Map Production Funded By:
The Walton Family Foundation
Colorado Water Conservation Board
Map Published By:
Tamarisk Coalition on: 11/08/12
Survey Zone
Salt Lake City
Denver
Flagstaff
Albuquerque
Los Angeles
Phoenix
Dallas
El Paso
San Antonio
0 125 250 500 Kilometers
0 80 160 320 Miles
esri
Beetle Presence Data
Year 2007
Year 2008
Year 2009
Year 2010
Year 2011
Year 2012
Absent Beetle Points in 2012