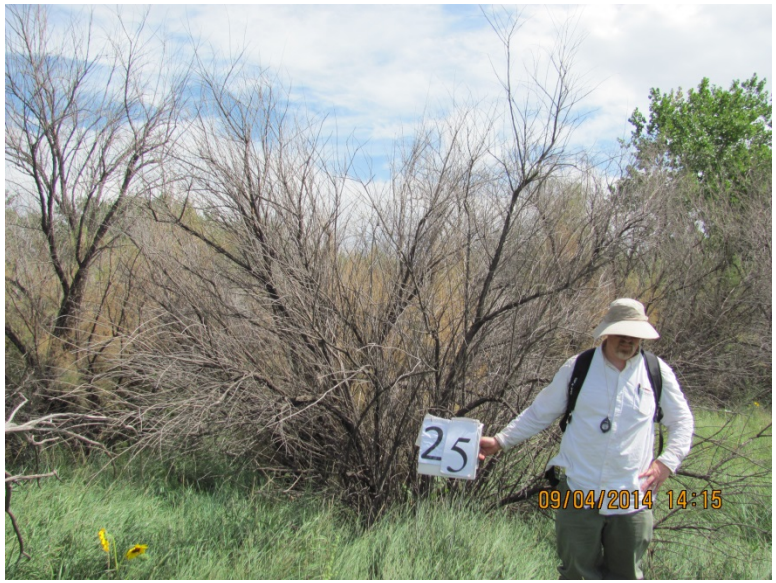
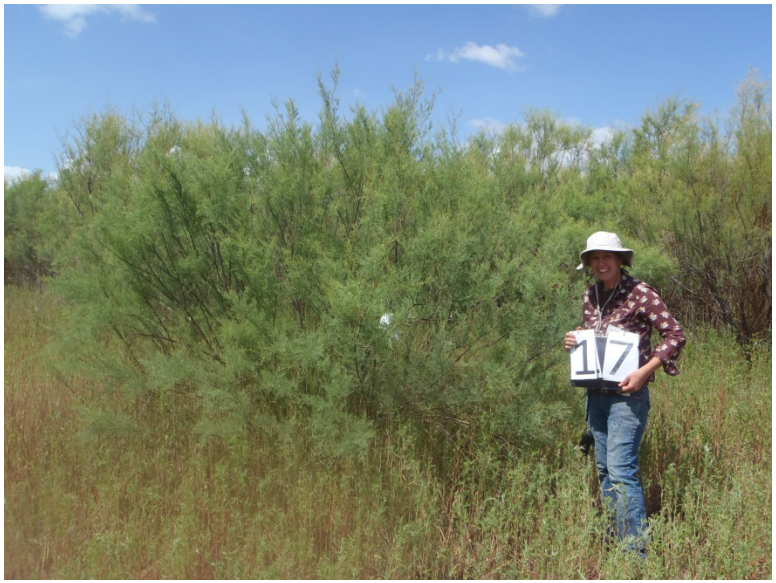
Diorhabda: the good, the bad and the ugly

Upper Arkansas Cooperative Weed Management Area
Annual Workshop, November 8, 2017
Cañon City, CO

Dan Bean
Biological Pest Control
Conservation Services
Colorado Department of Agriculture



The good: defoliation on Fountain Creek



The bad: no beetles left at Sweetwater (near Eads)

The Ugly: Biological and legal interference with tamarisk biocontrol

Ants (near Holly)

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEVADA
Las Vegas Division

CENTER FOR BIOLOGICAL DIVERSITY
351 California Street, Suite 600
San Francisco, CA 94104,

MARICOPA AUDUBON SOCIETY
4619 East Arcadia Lane
Phoenix, AZ 85018,

DR. ROBIN SILVER
1333 North Oracle
Tucson, AZ 85705,
Plaintiffs,

v. Civ. No.

TOM VILSACK, Secretary
U.S. Department of Agriculture
1400 Independence Avenue SW
Washington, DC 20250

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bad

good

ugly

The Good (Blondie)

The Bad (Tammie)

The Good (Blondie)

The Bad (Tammie)

Tamarisk is still an invasive species with negative economic and environmental impacts.

Aren’t introduced plants just an additional element added to our existing riparian ecosystems?

Tamarisk has properties that make it a driver of ecosystem change

1. Tamarisk in dense stands **increases evapotranspiration (ET) and lowers water tables**, which may help it to out compete native vegetation (Nagler et al 2014 Remote Sensing of Environment 140 206-219)

2. Tamarisk is fire adapted and with its fine structured leaves and branches **carries fire in riparian ecosystems** (Drus 2013 in "*Tamarix*: a case study of ecological change in the American West").

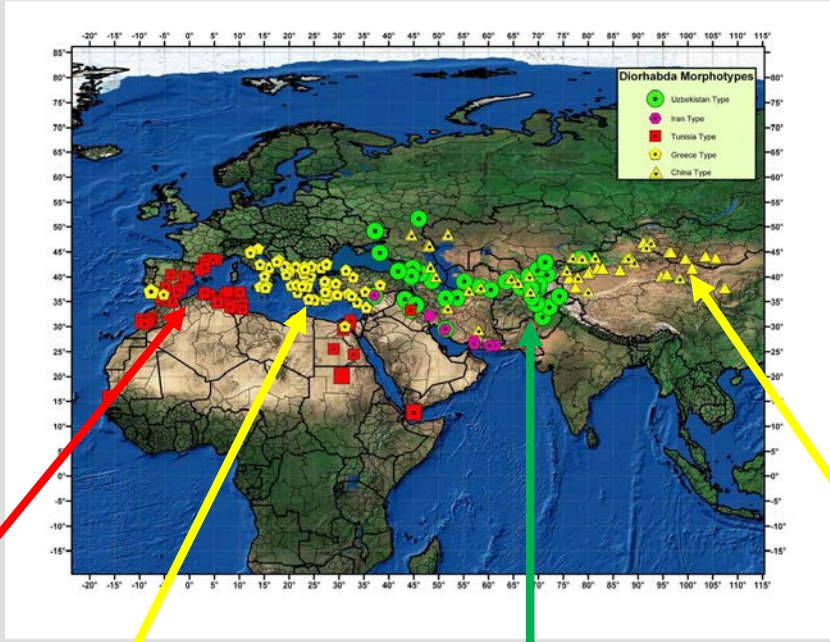
3. Tamarisk **alters soil chemistry** leading to unfavorable conditions for mycorrhizae associated with native vegetation, particularly cottonwoods (Meinhardt, KA and Gehring, CA 2012 Ecol App 22:532-49)

Cottonwood death following tamarisk-carried fire, San Pedro River, AZ

Topics

- Tamarisk biocontrol in the US
- The history of tamarisk biocontrol in the Arkansas Basin
- Why is it so hard to get tamarisk biocontrol going?
- Two ways to improve biocontrol prospects in the Arkansas Basin

- Tamarisk biocontrol in the US



Diorhabda sublineata

Tunisia

Diorhabda elongata

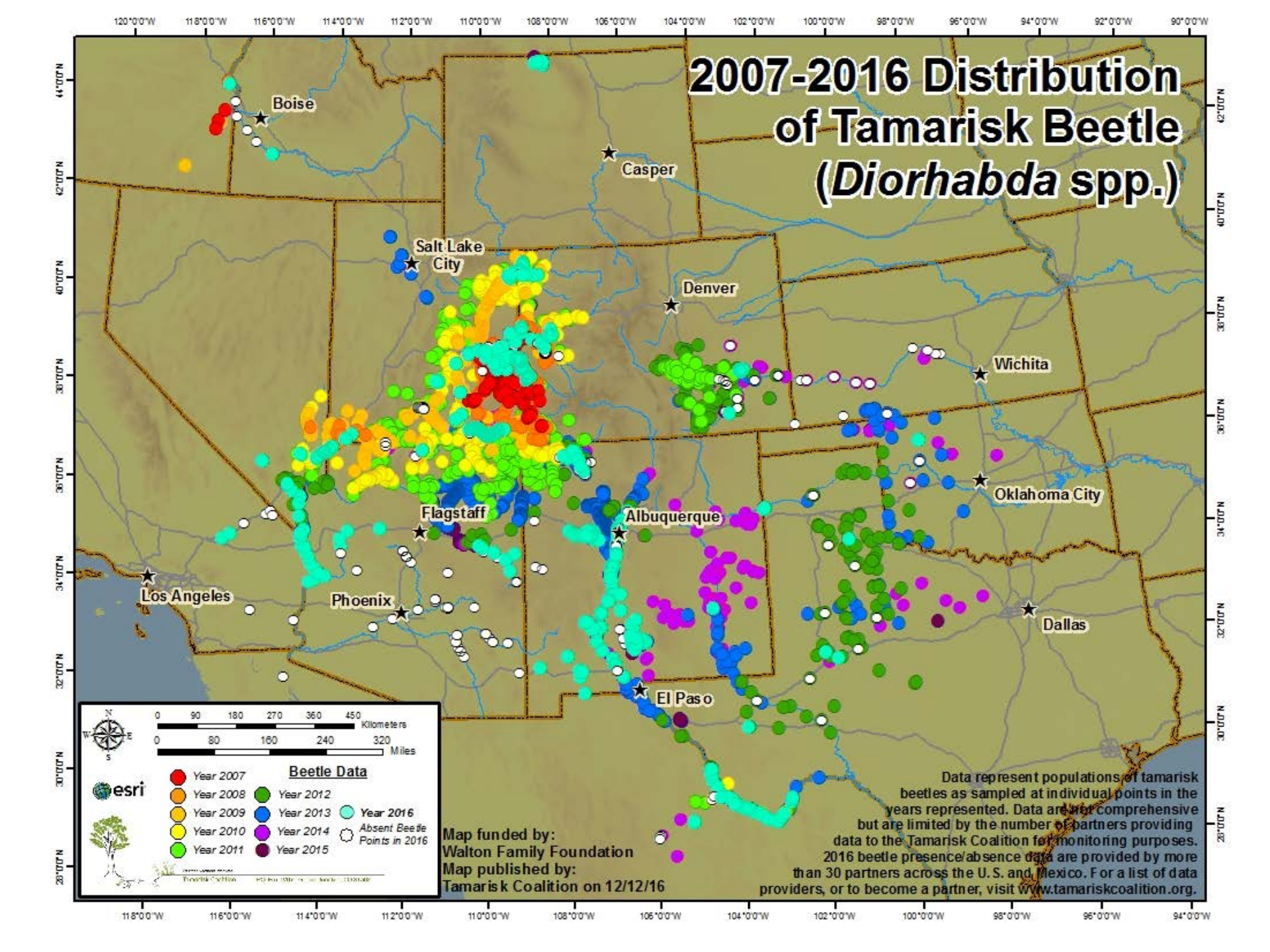
Crete

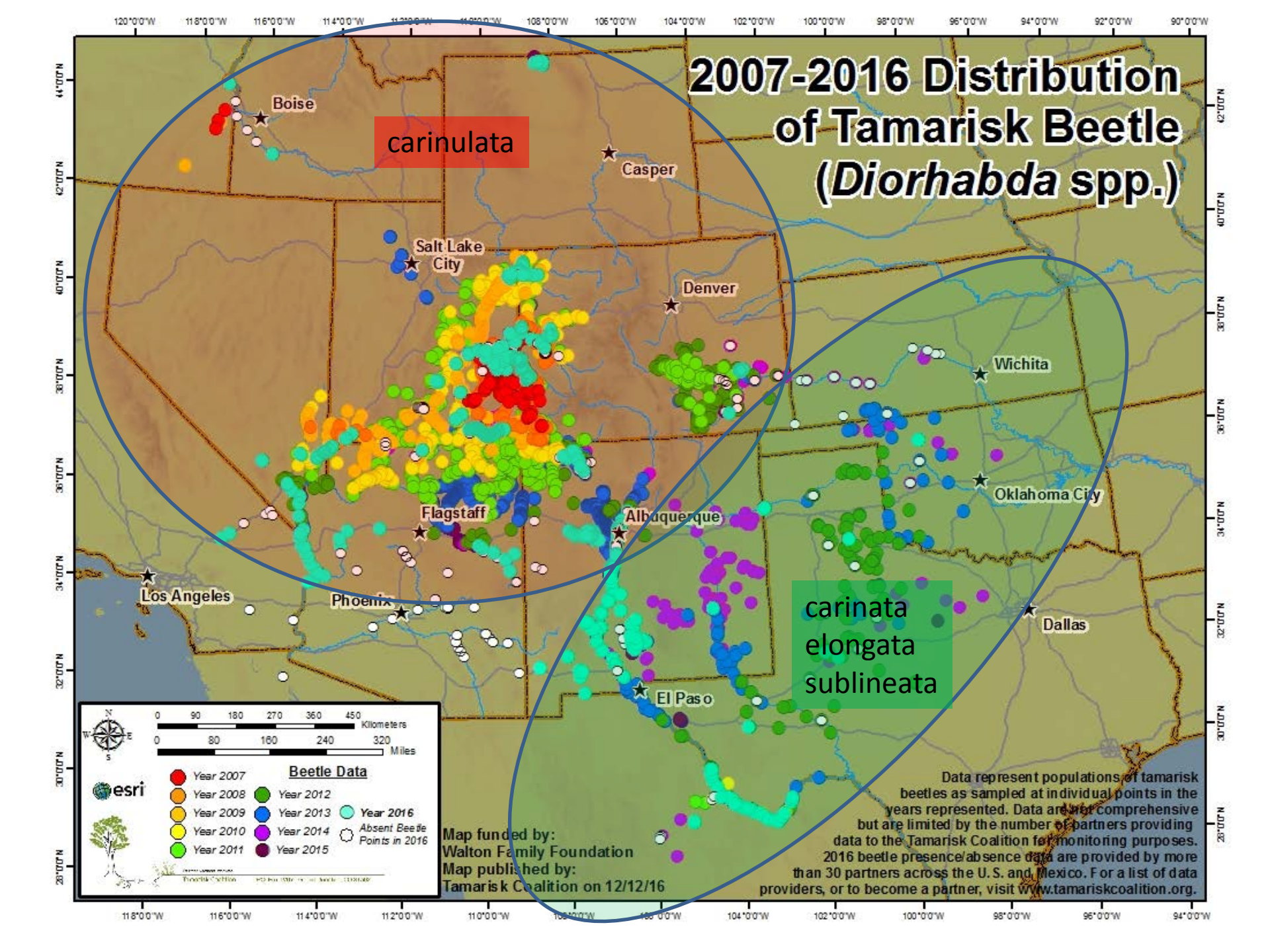
Diorhabda carinata

Uzbekistan

Diorhabda carinulata

Chilik, Fukang, Turpan


2007-2016 Distribution of Tamarisk Beetle (*Diorhabda* spp.)
Boise
Casper
Salt Lake City
Denver
Wichita
Oklahoma City
Flagstaff
Albuquerque
Los Angeles
Phoenix
Dallas
El Paso
0 90 180 270 360 450 Kilometers
0 80 160 240 320 Miles
Beetle Data
Year 2007
Year 2008
Year 2009
Year 2010
Year 2011
Year 2012
Year 2013
Year 2014
Year 2015
Year 2016
Absent Beetle Points in 2016
esri
Map funded by:
Walton Family Foundation
Map published by:
Tamarisk Coalition on 12/12/16
Data represent populations of tamarisk beetles as sampled at individual points in the years represented. Data are not comprehensive but are limited by the number of partners providing data to the Tamarisk Coalition for monitoring purposes. 2016 beetle presence/absence data are provided by more than 30 partners across the U.S. and Mexico. For a list of data providers, or to become a partner, visit www.tamariskcoalition.org.


2007-2016 Distribution of Tamarisk Beetle (*Diorhabda* spp.)
carinulata
carinata
elongata
sublineata
Boise
Casper
Salt Lake City
Denver
Wichita
Oklahoma City
Flagstaff
Albuquerque
Los Angeles
Phoenix
Dallas
El Paso
Beetle Data
Year 2007
Year 2008
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Absent Beetle Points in 2016
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Miles
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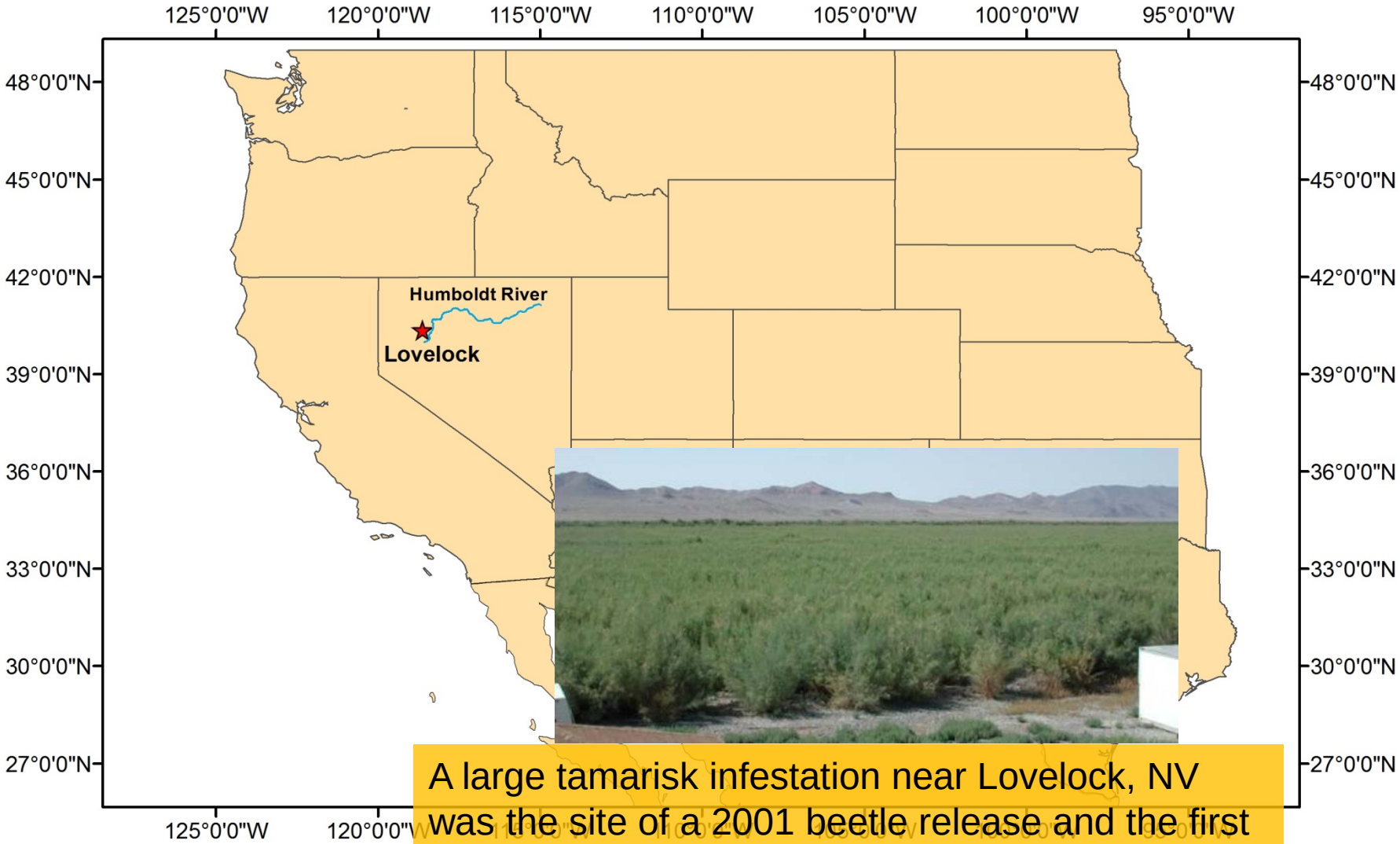
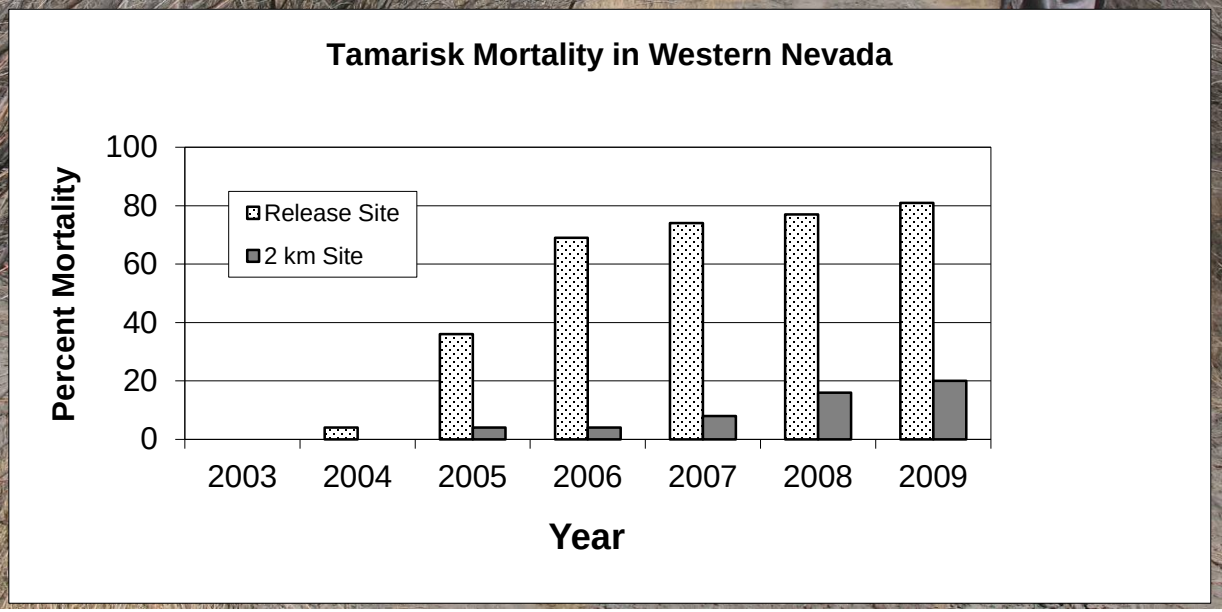


A large tamarisk infestation near Lovelock, NV was the site of a 2001 beetle release and the first large scale population expansion of *Diorhabda*. Tens of thousands of acres of tamarisk were defoliated over the next five years.

Humboldt Basin, NV




Dolores River near Gateway, July, 2008


Gateway site, Dolores River

- The history of tamarisk biocontrol in the Arkansas Basin

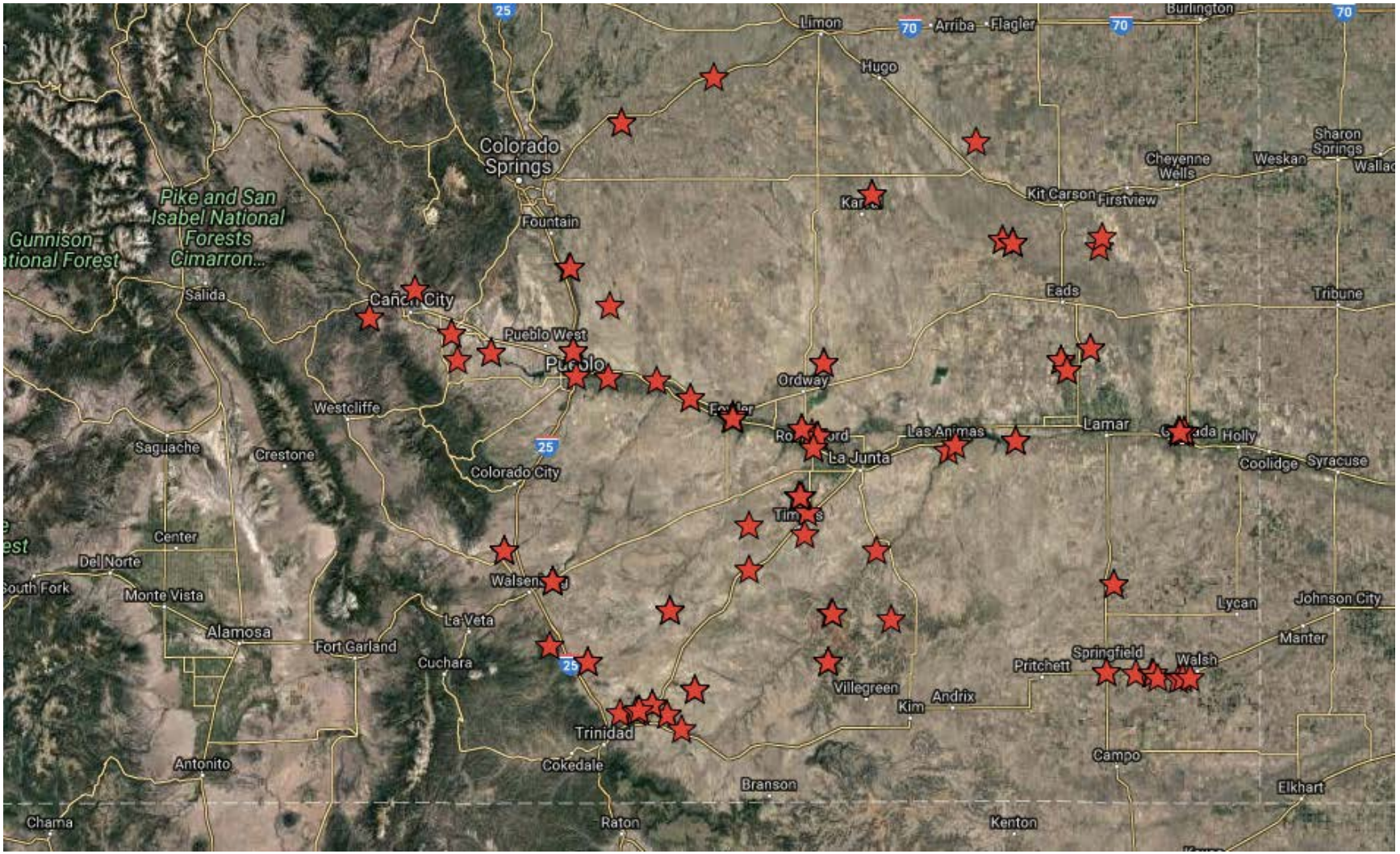
First cage site near Pueblo Reservoir with Deb Eberts (USBOR) photo taken in 2006

Release program expands in 2009 as more beetles become available

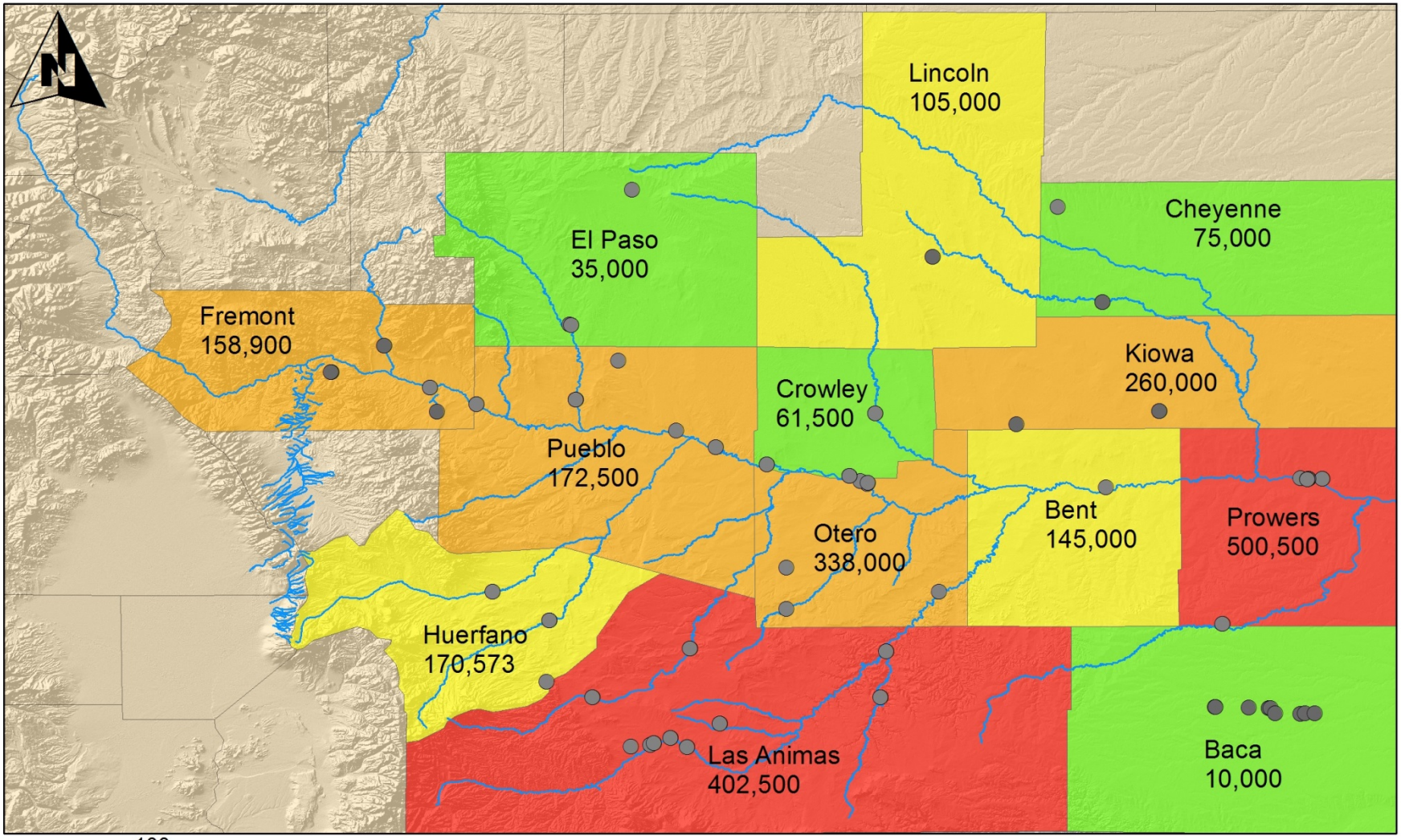
Arkansas River Basin

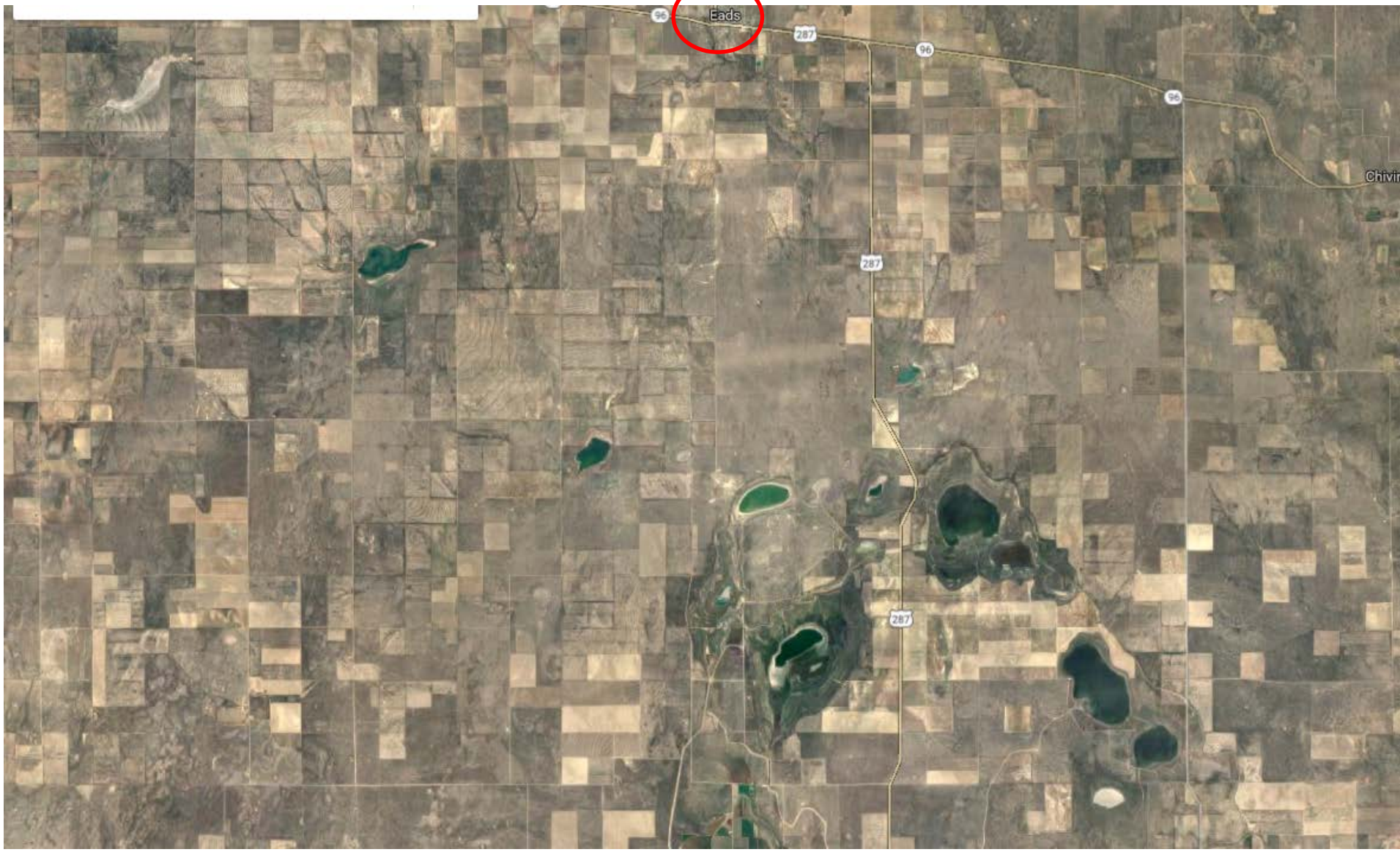
Adult

Ark Basin Releases to 2016



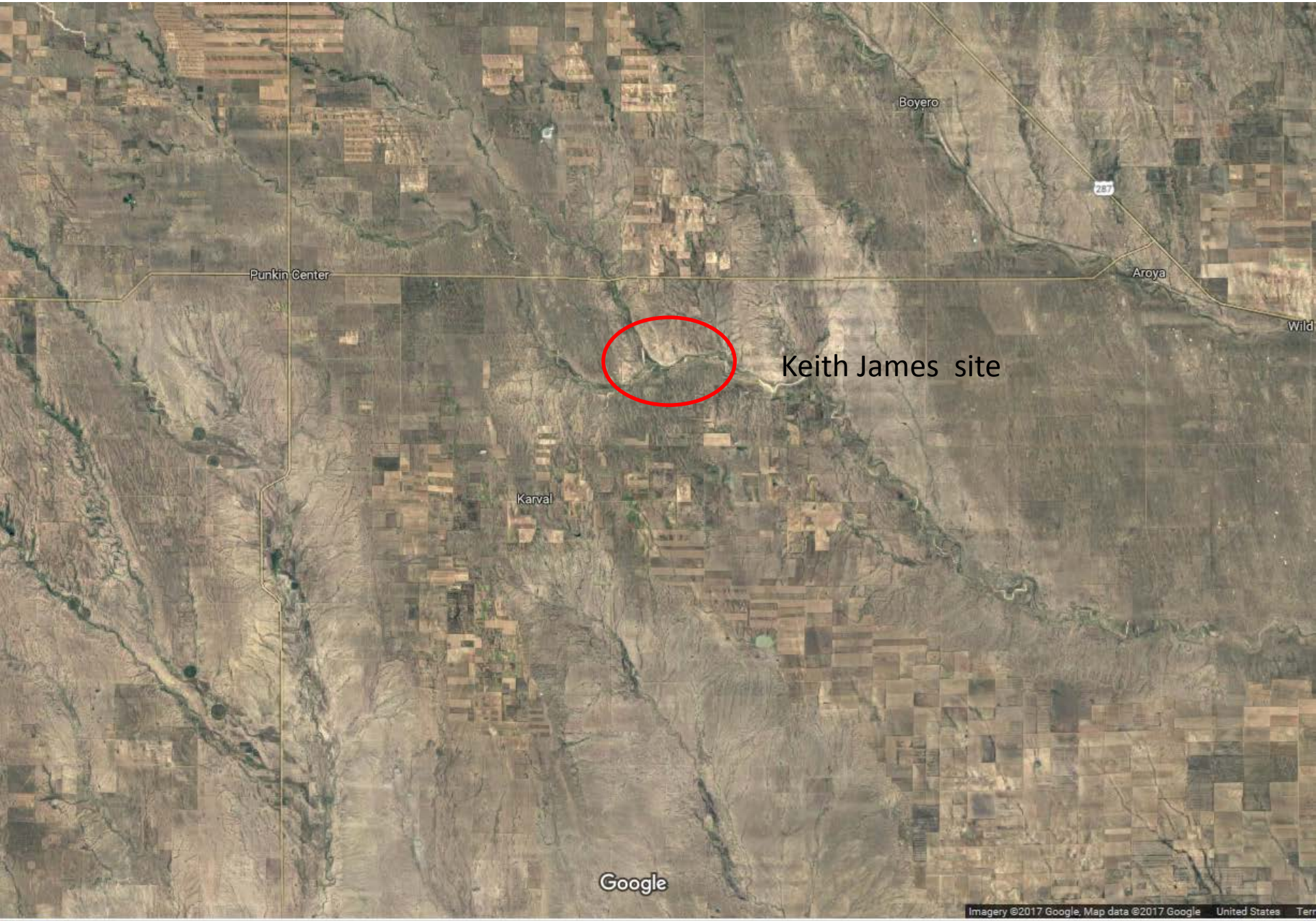
Tamarisk Beetle Releases in 2007 to 2017 in the Arkansas River Basin




Eads
96
287
96
96
287
287
Chivi

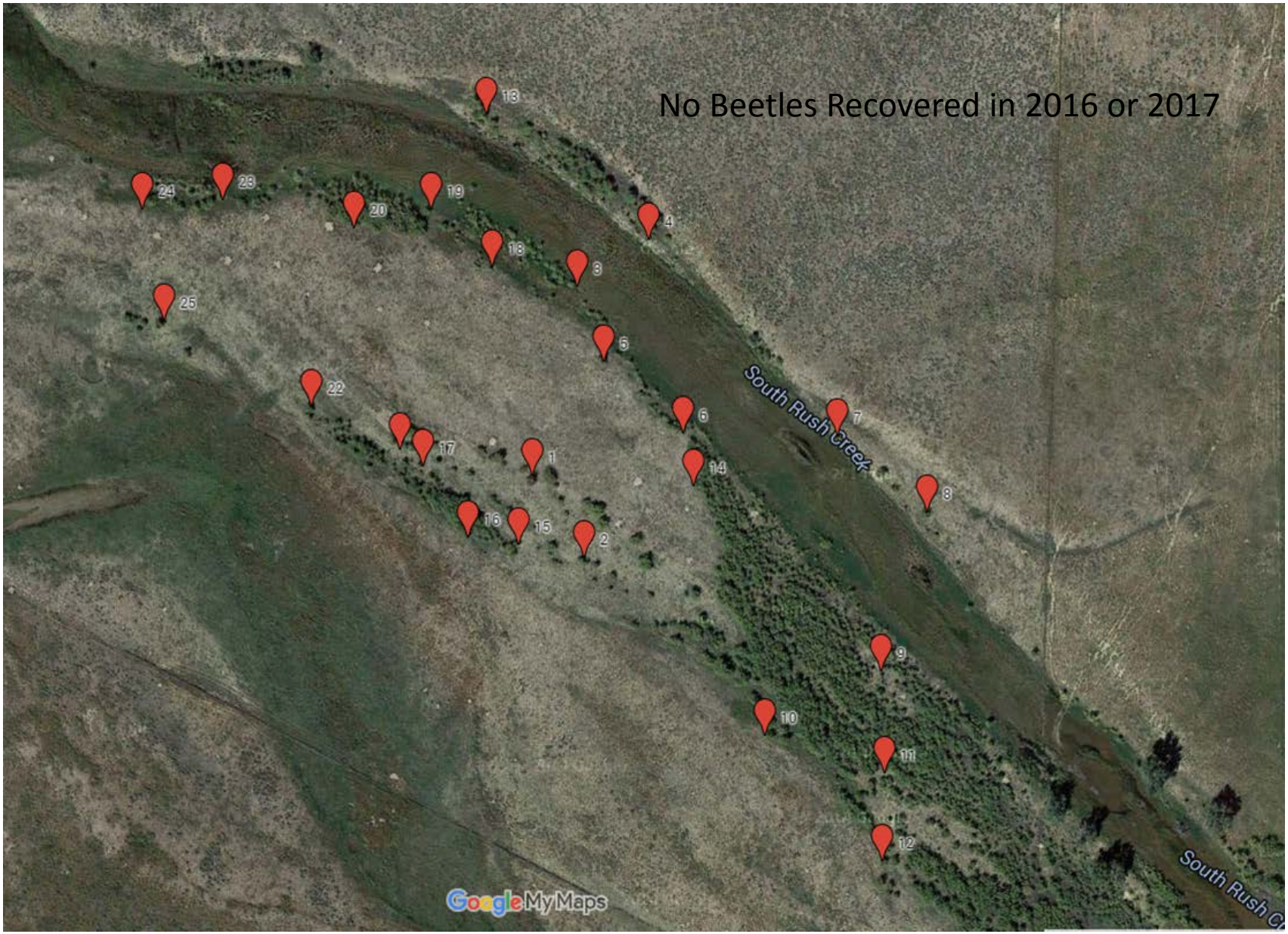
Neesopah means black water or “entrails water”

Defoliation seen in 2014, then no beetles in 2015!


Boyero
287
Punkin Center
Aroya
Wild
Keith James site
Karval
Google
Imagery ©2017 Google, Map data ©2017 Google
United States

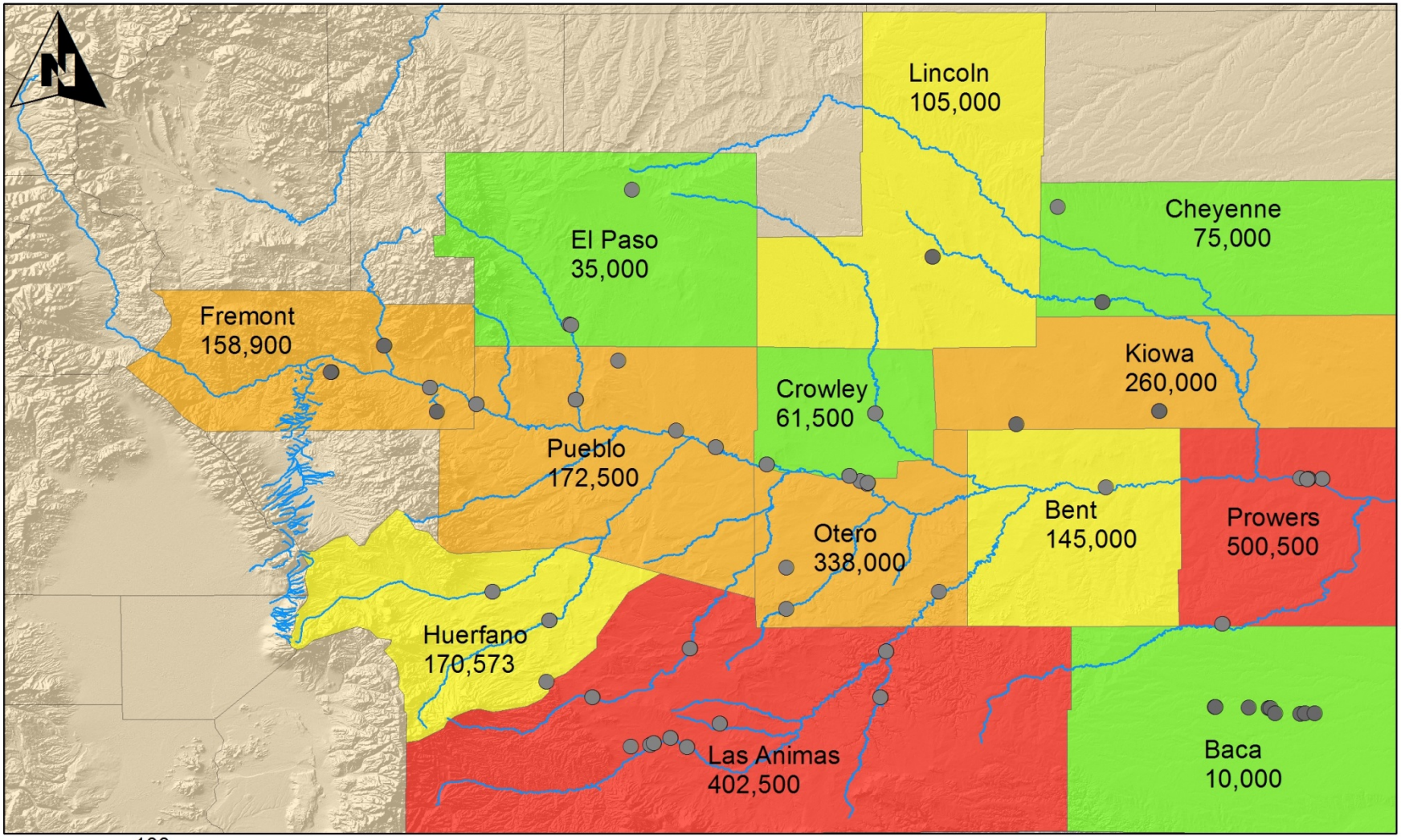
Keith James Site

Monitoring and Keith James releasing beetles



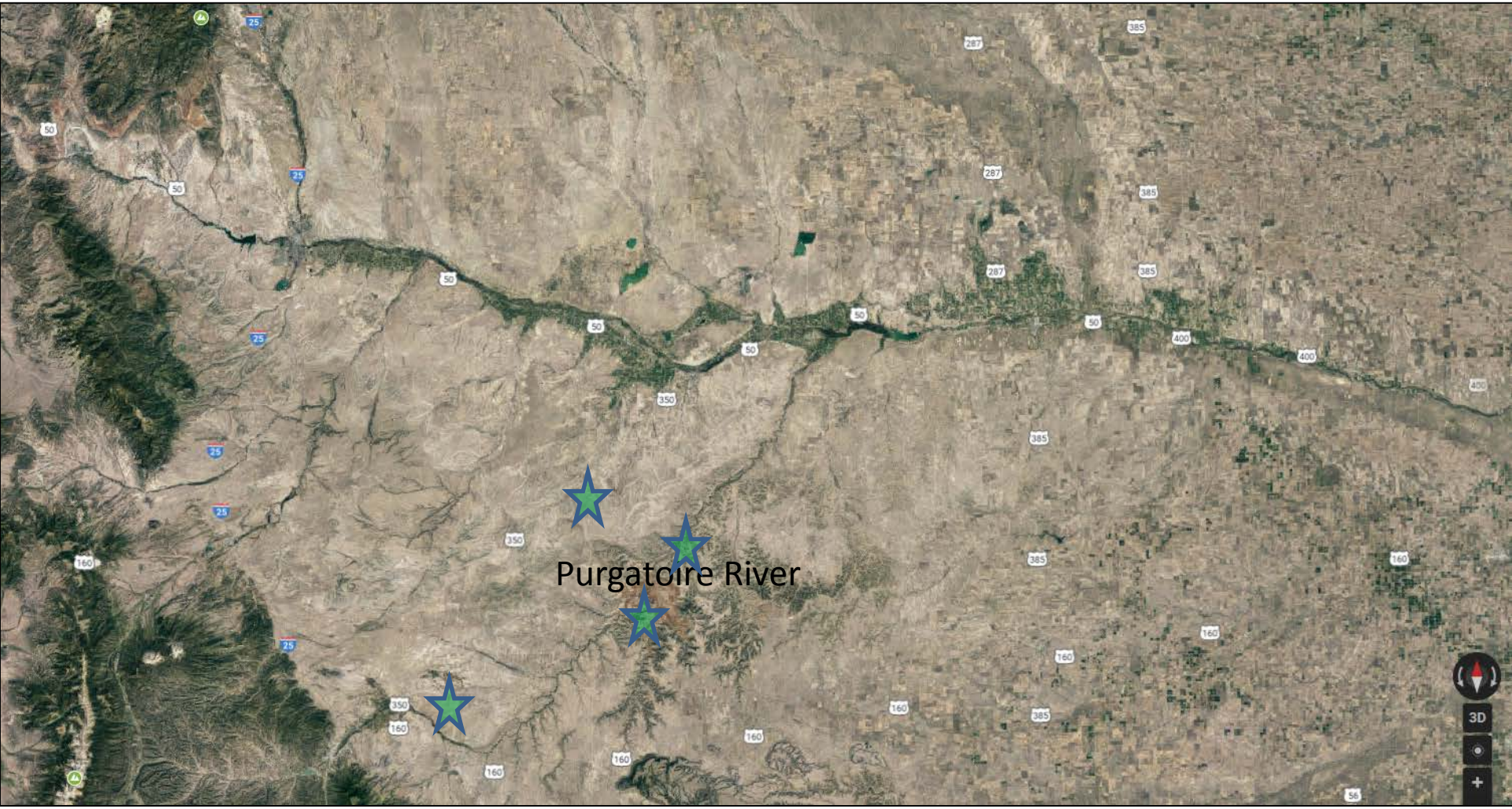
Keith James Site

Tamarisk Beetle Releases in 2007 to 2017 in the Arkansas River Basin

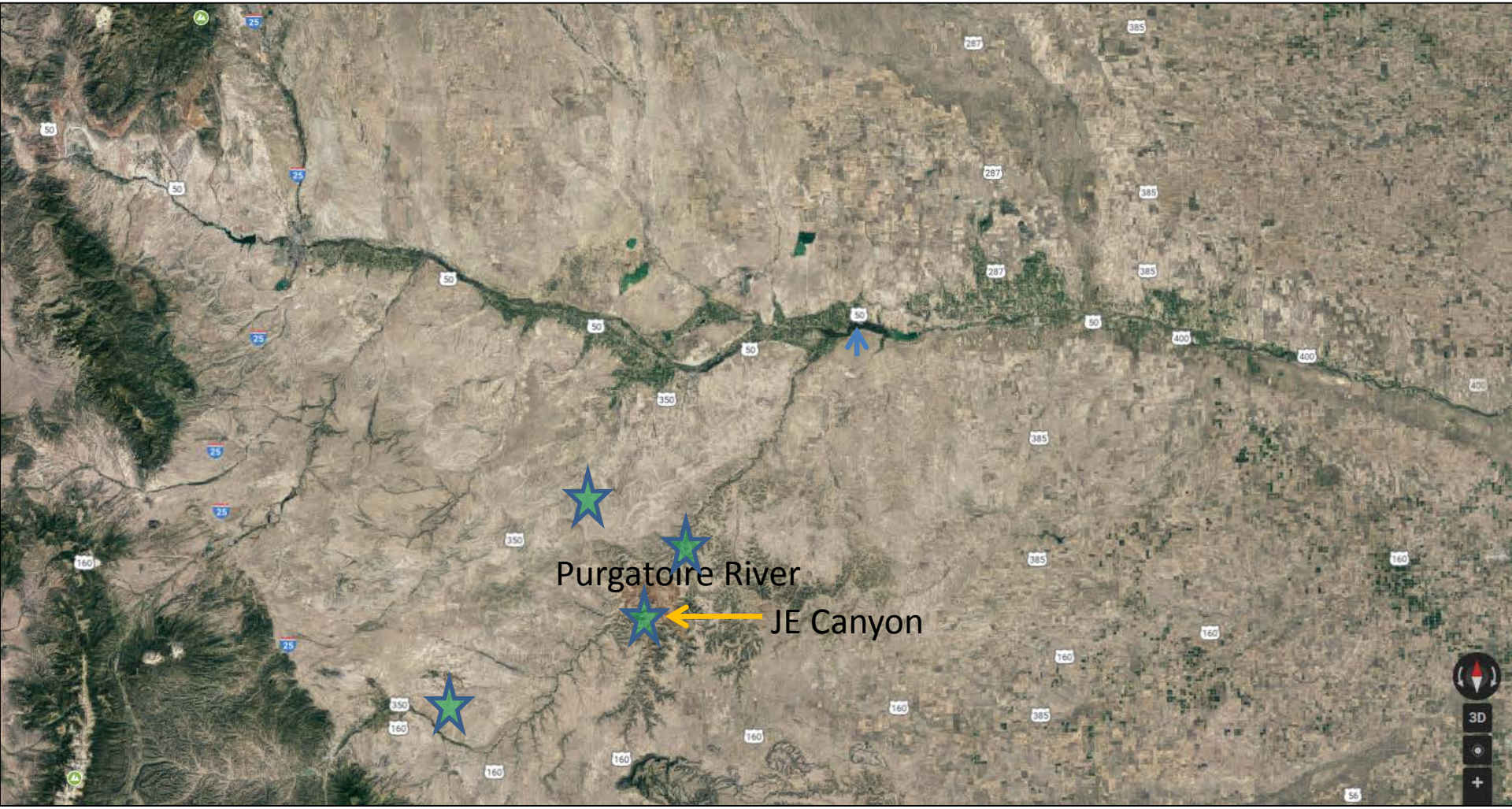


Enstrom property, Prowers County

Purgatoire and neighboring drainages have been moderately successful

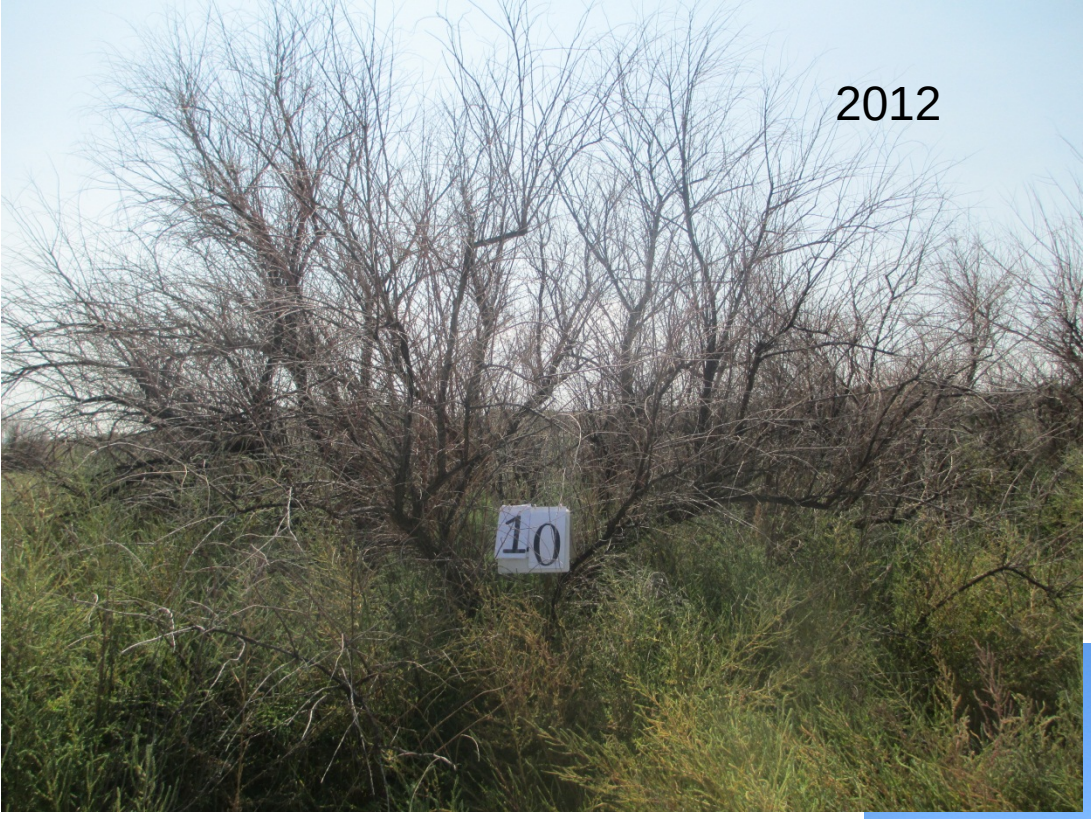


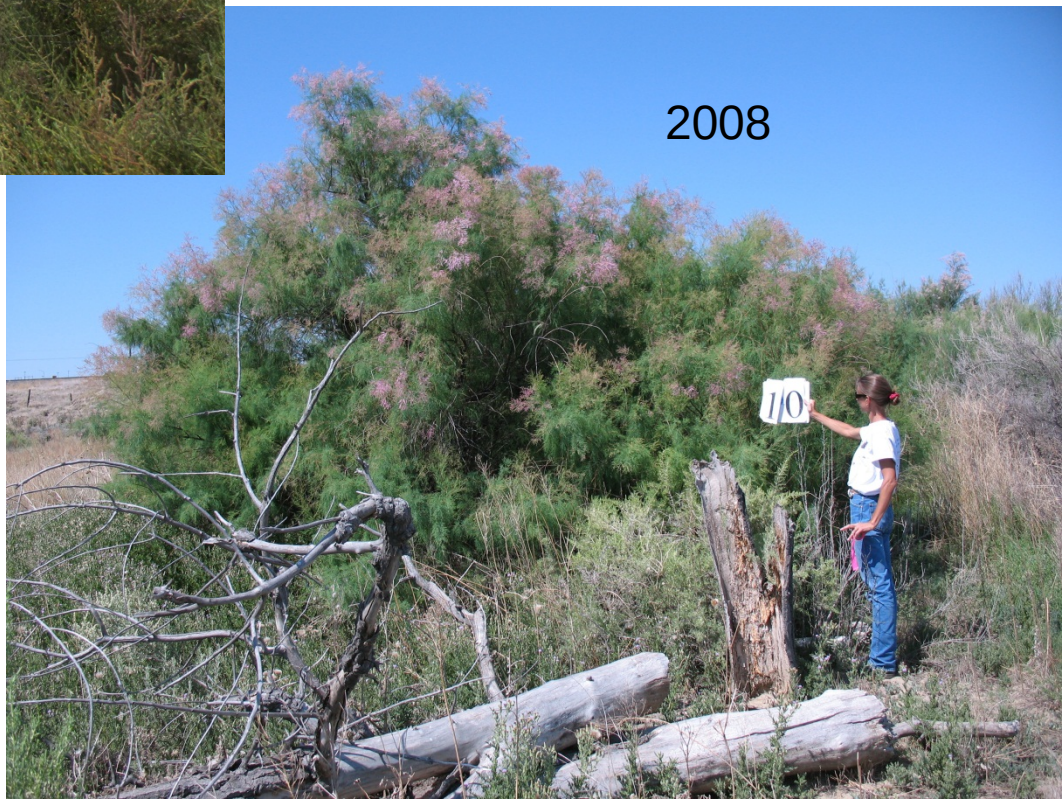
Purgatoire and neighboring drainages have been moderately successful



Fountain Creek site

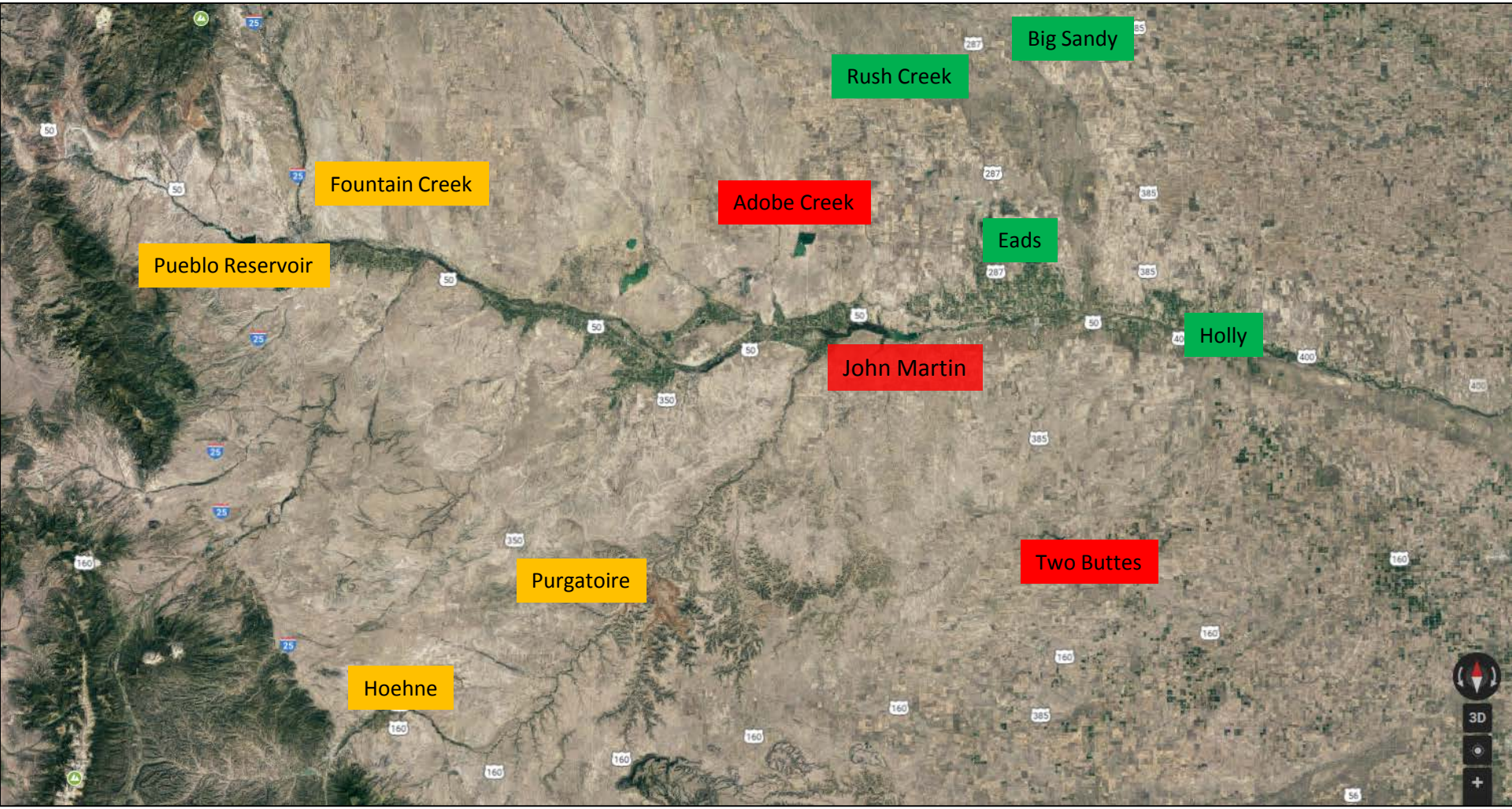

Near Fountain Creek


2012
10


2008
10

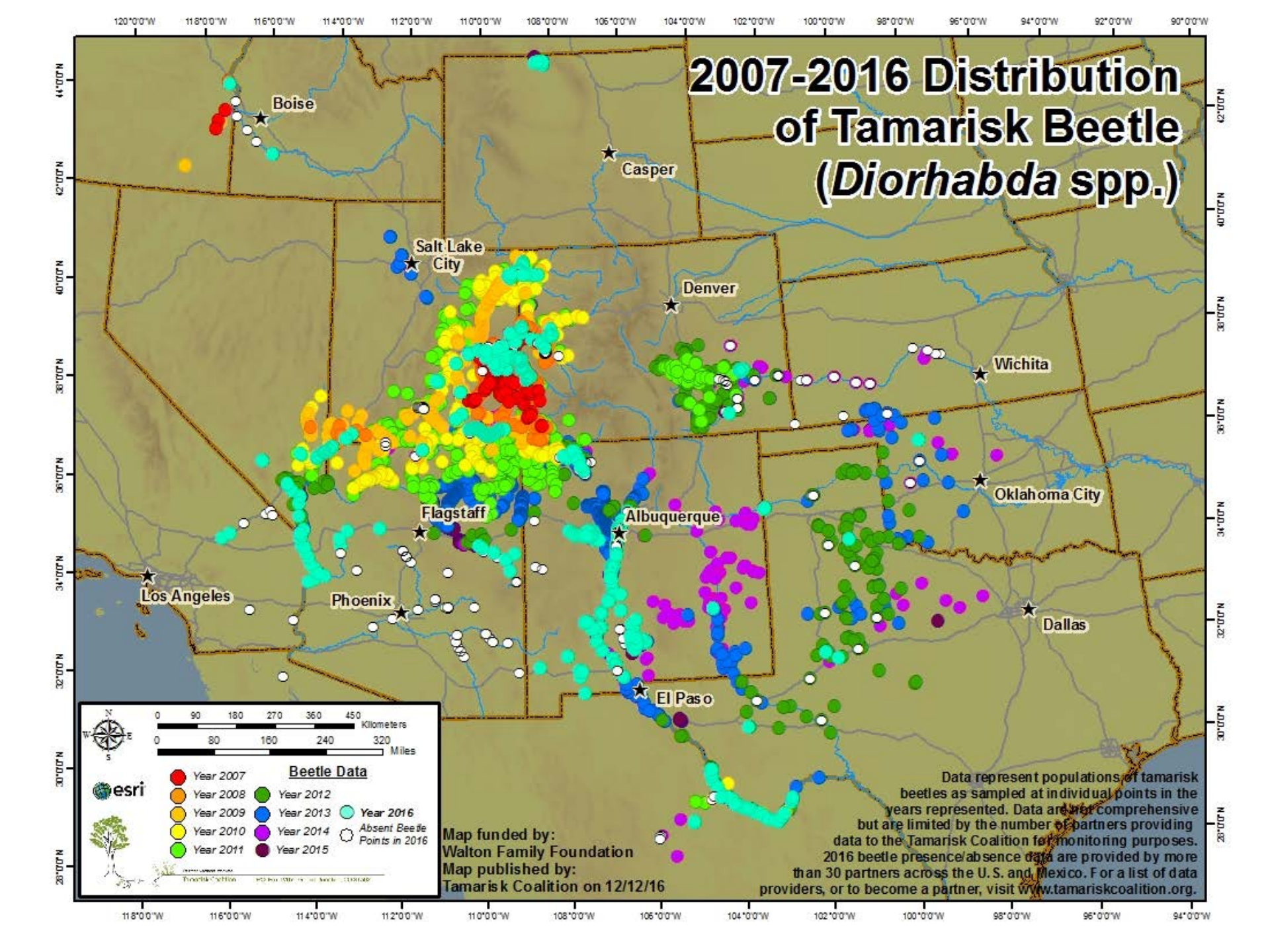
2014 collections at Adobe Creek Reservoir

Arkansas River Basin
Green= does not persist
Red= low persistence
Yellow= established



Tamarisk biocontrol solutions for the Arkansas River Basin

1. New beetles from Texas/Oklahoma/Kansas
2. New beetles from native range
3. Better beetle “herding” using semiochemicals (pheromones and plant compounds)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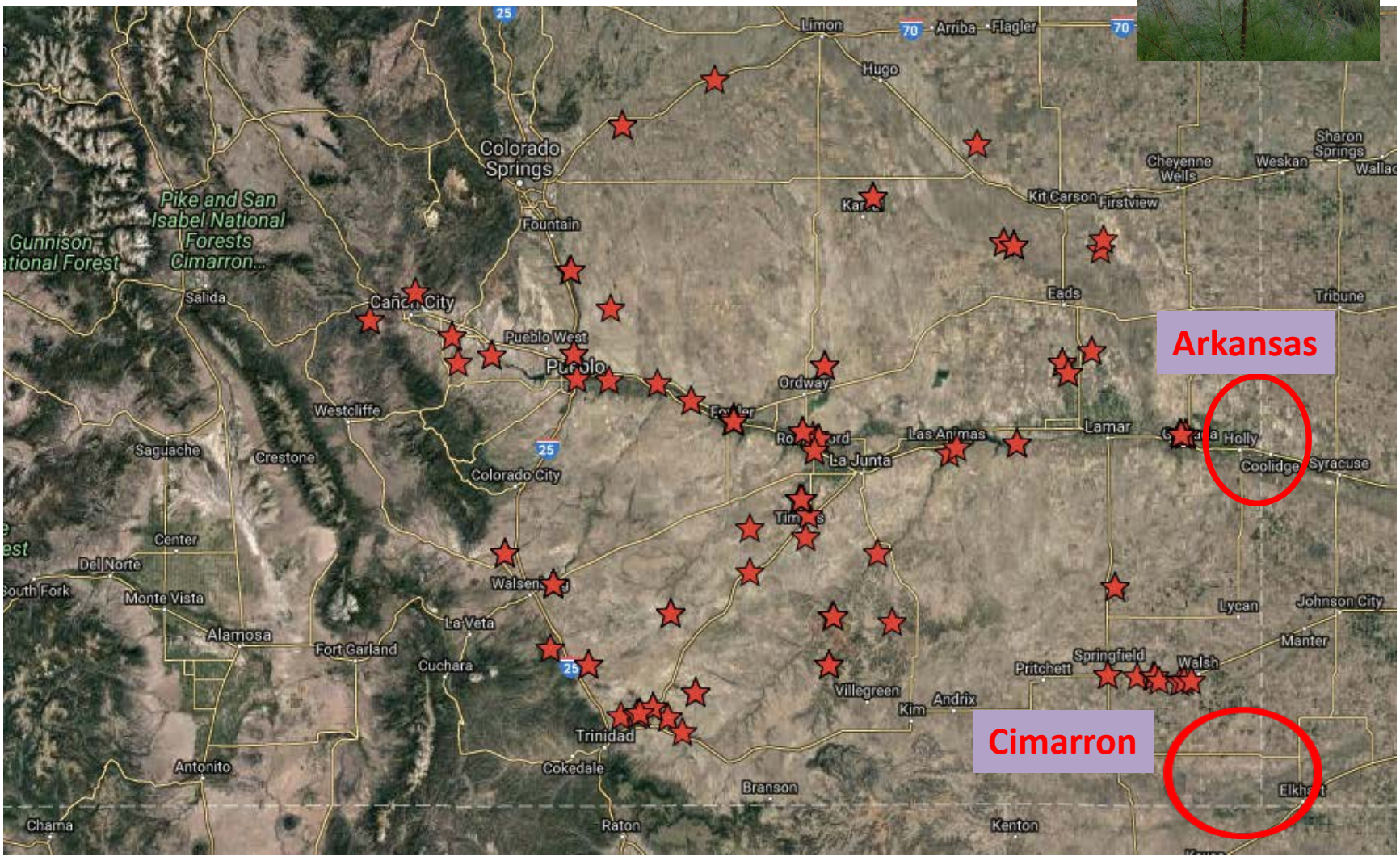
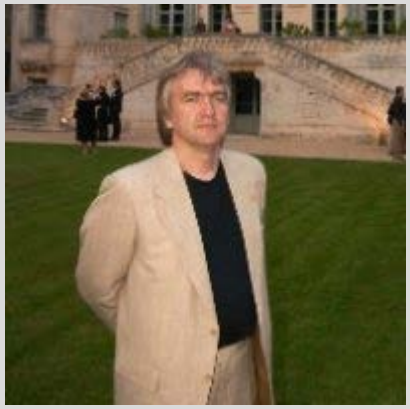
Sentinel traps baited with pheromone





Roman Jashenko

Diorhabda carinata

Massimo Cristofaro

Urs Schaffner


grassland adapted?

Chemical communication brings about aggregation

pheromone produced by male

volatiles given off by tamarisk foliage (tamarisk odors)

Beetles attracted to pheromone and tamarisk odors are caught on yellow sticky card and counted

Pheromone treated

No pheromone

Gaffke et al 2017 in review


EXIT
HEINZ

Pheromone baited tree- Sweetwater , 8-18-2014

Coniatus splendidulus?

A new tamarisk feeder enters the system

Coniatus larva on tamarisk, highly cryptic

Woven basket where *Coniatus* pupates
This offers protection from predators found in the leaf litter.

Coniatus enter Colorado in 2011 and are now widespread

Coniatus damage
Bill Williams River, AZ

Thanks to:
The Arkansas Basin land owners and resource managers
Palisade Insectary
Sonya Ortega, John Kaltenbach, Nina Louden, Mike Racette
Seasonal Staff
Overseas scientists
The Colorado Department of Agriculture