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

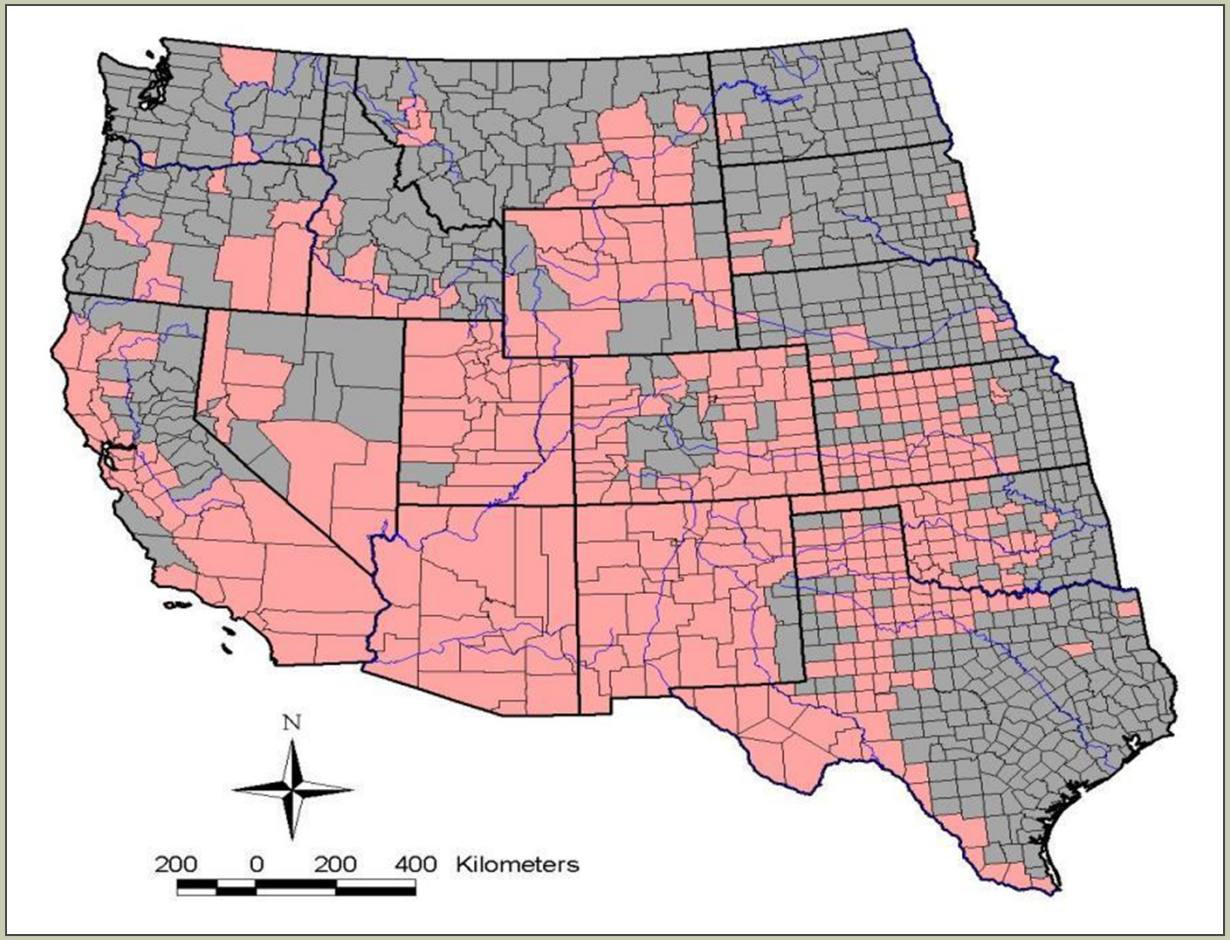
Tamarisk Coalition

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

Distribution



Tamarisk covers millions of acres of riparian lands within the western United States

Courtesy of Fred Nibling, Bureau of Reclamation

Tamarisk characteristics

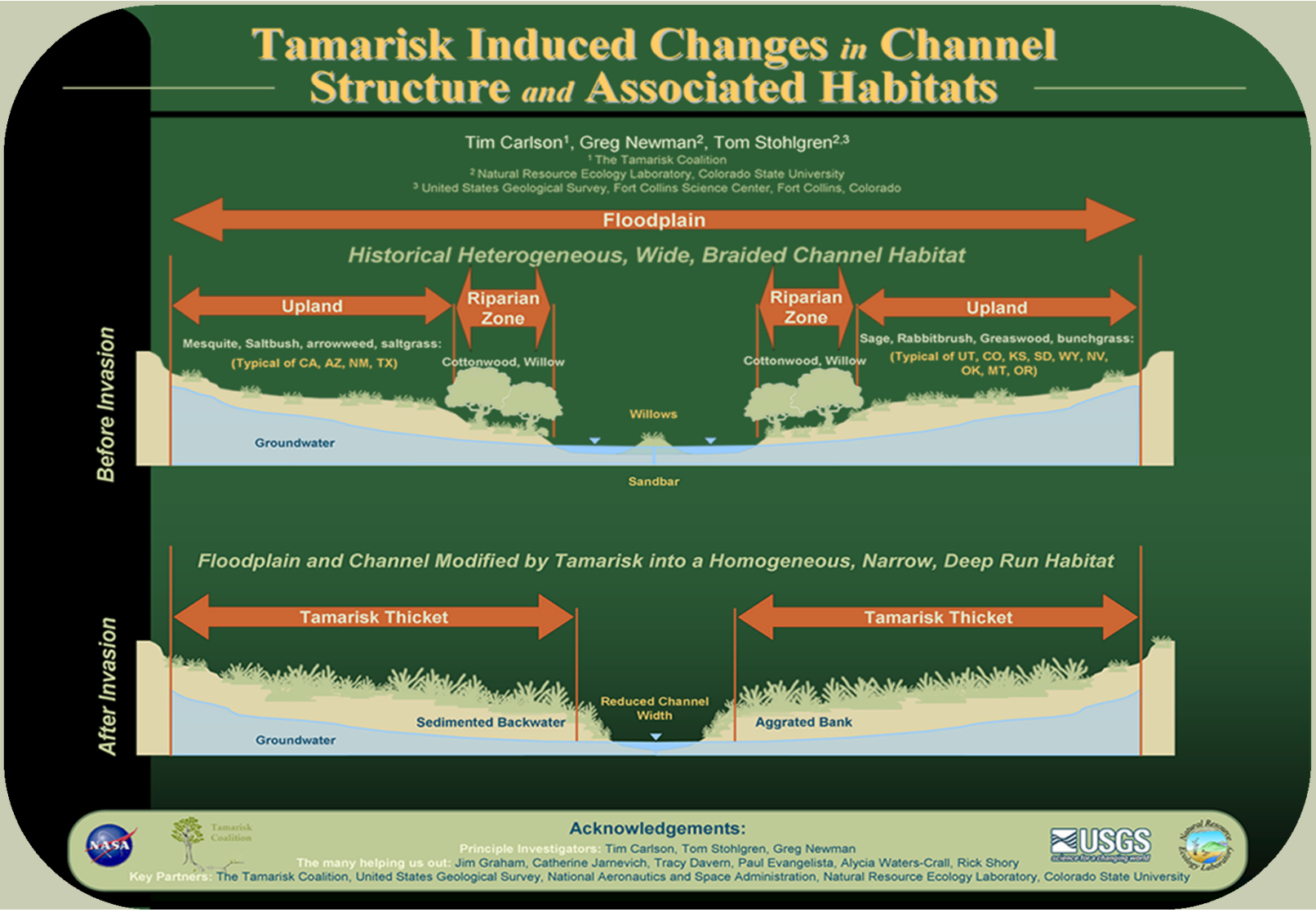
Competes with native plants

Colorado River near CO/UT border

Can provide poor habitat for wildlife

Increased fire intensity and/or severity

Channel morphology



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

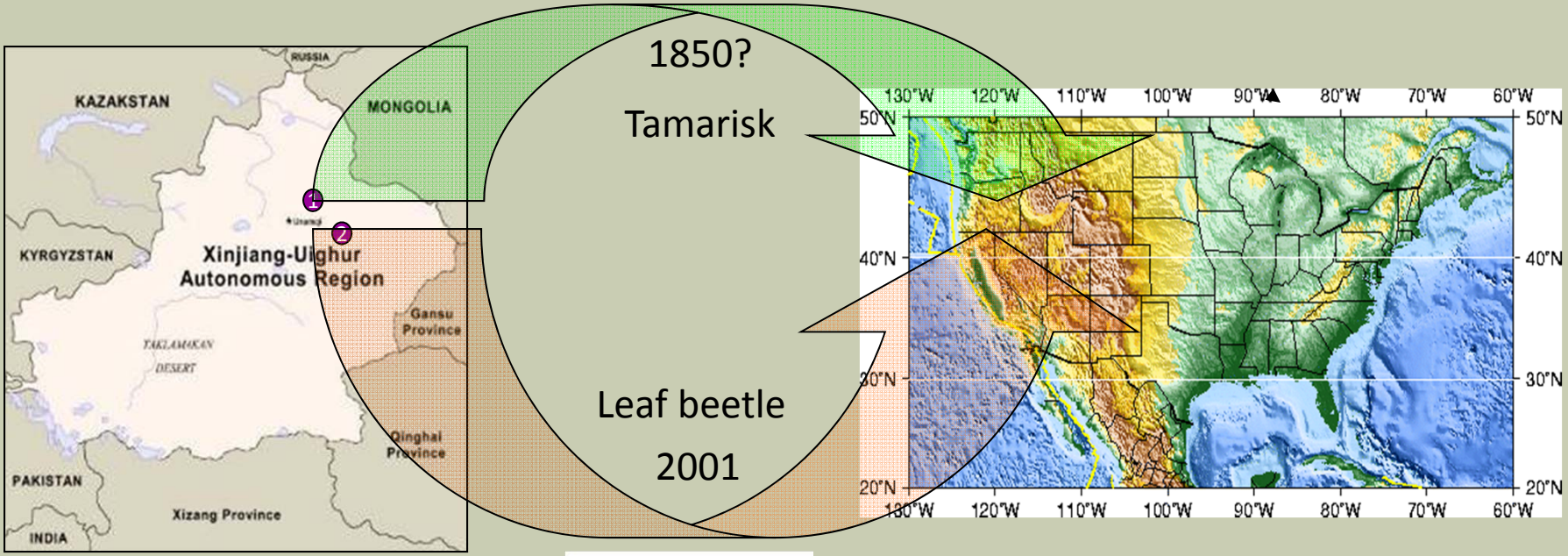
Tamarisk control options

- Mechanical
- Chemical
- Prescribed fire
- **Biological control**

Classical weed biological control

The reunification of host specific natural enemies with invasive plants

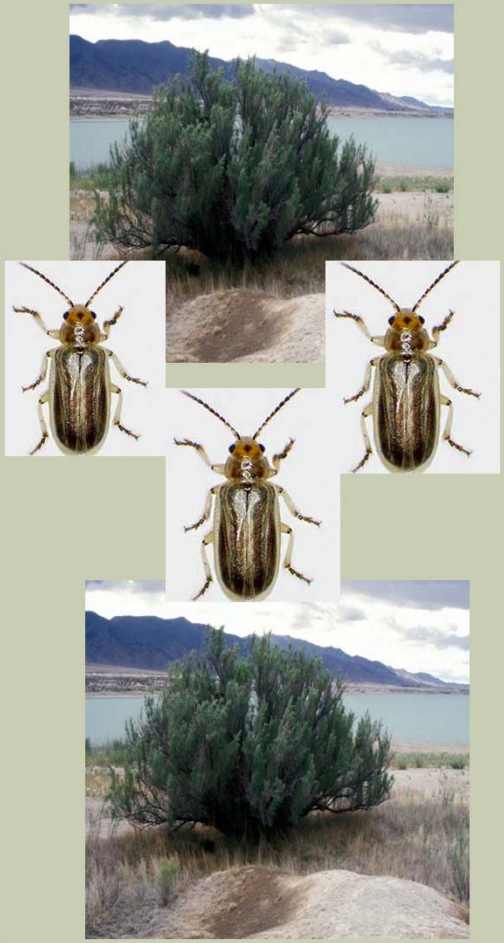
Tamarix spp



Diorhabda elongata

Biocontrol results in an equilibrium between plant and herbivores

herbivore added



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

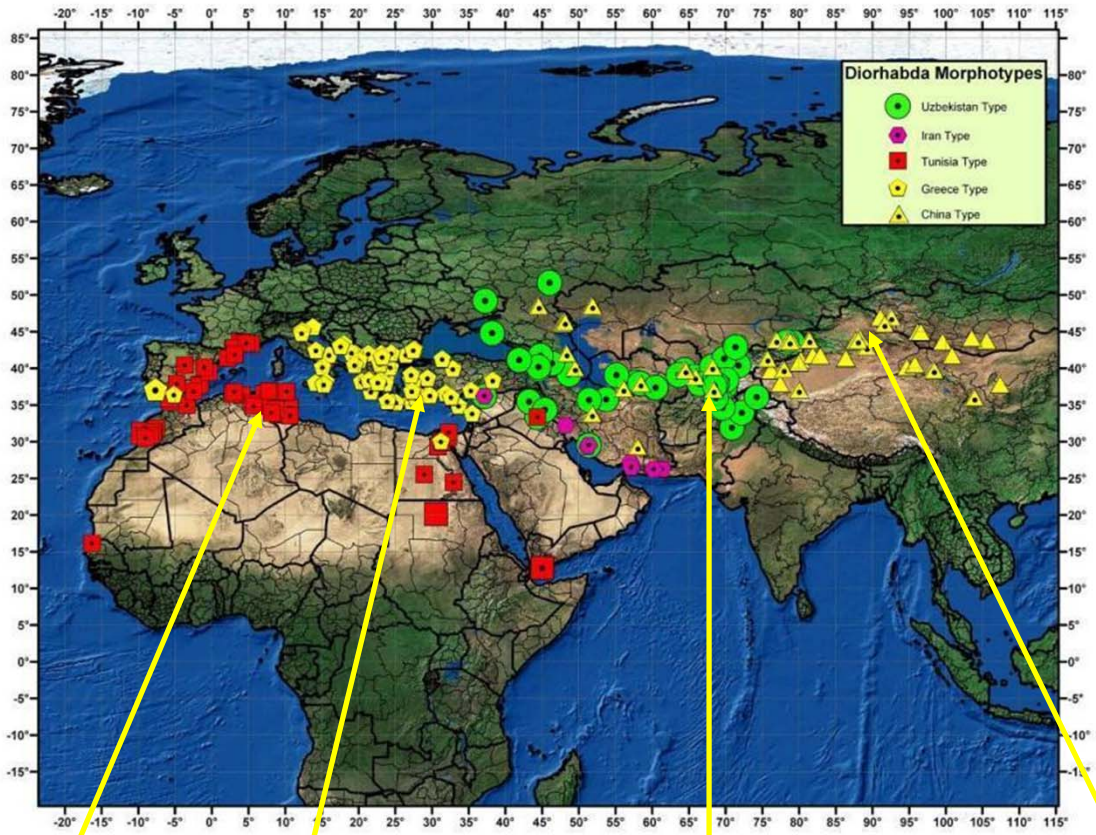
☐***1987:***
Overseas exploration and research to find agent or agents

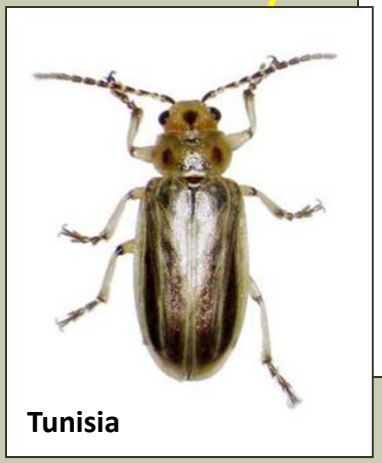
☐***1989-1994:***
Host specificity testing

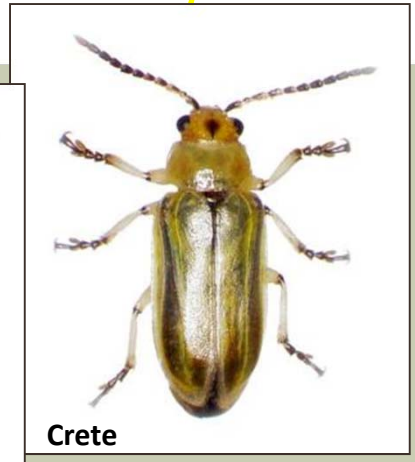
☐***1994:***
APHIS Technical Advisory Group (TAG) approval

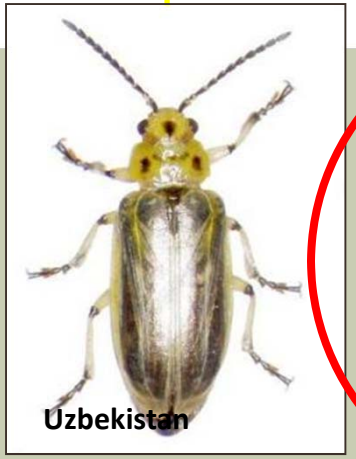
☐***1998-2000***
Field cage tests and monitoring plan put into place

☐**2001:**
Limited open releases

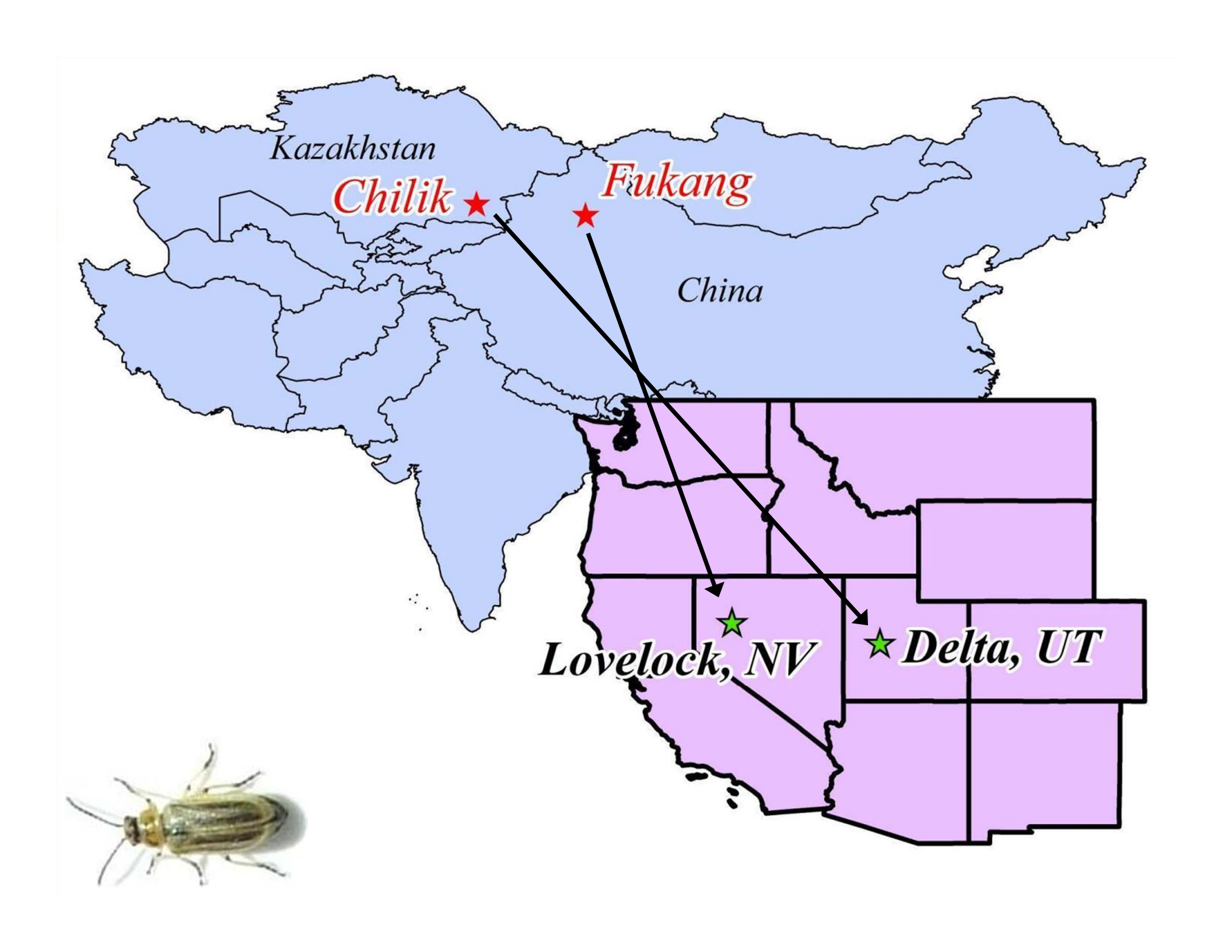


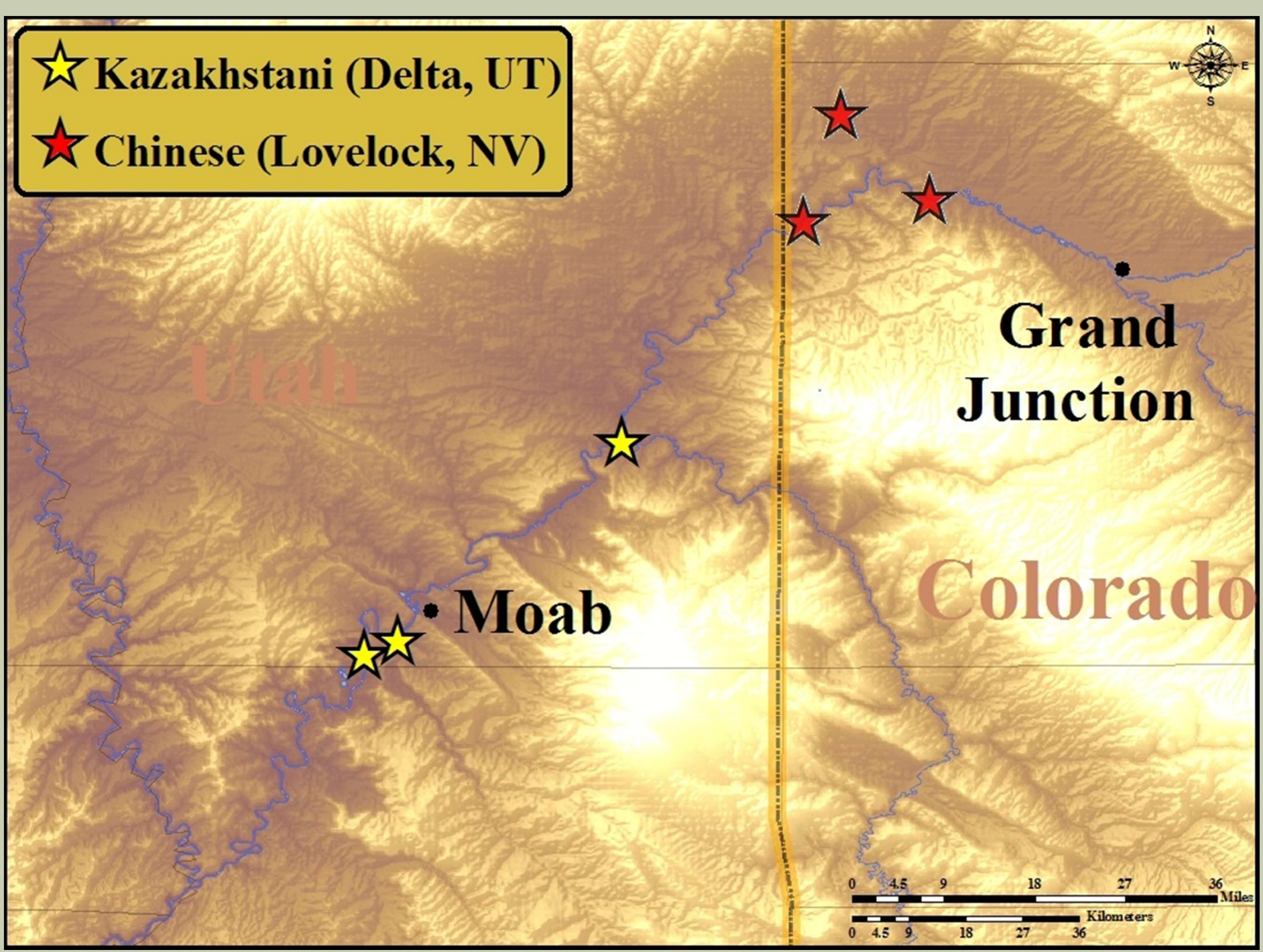

Tunisia


Crete

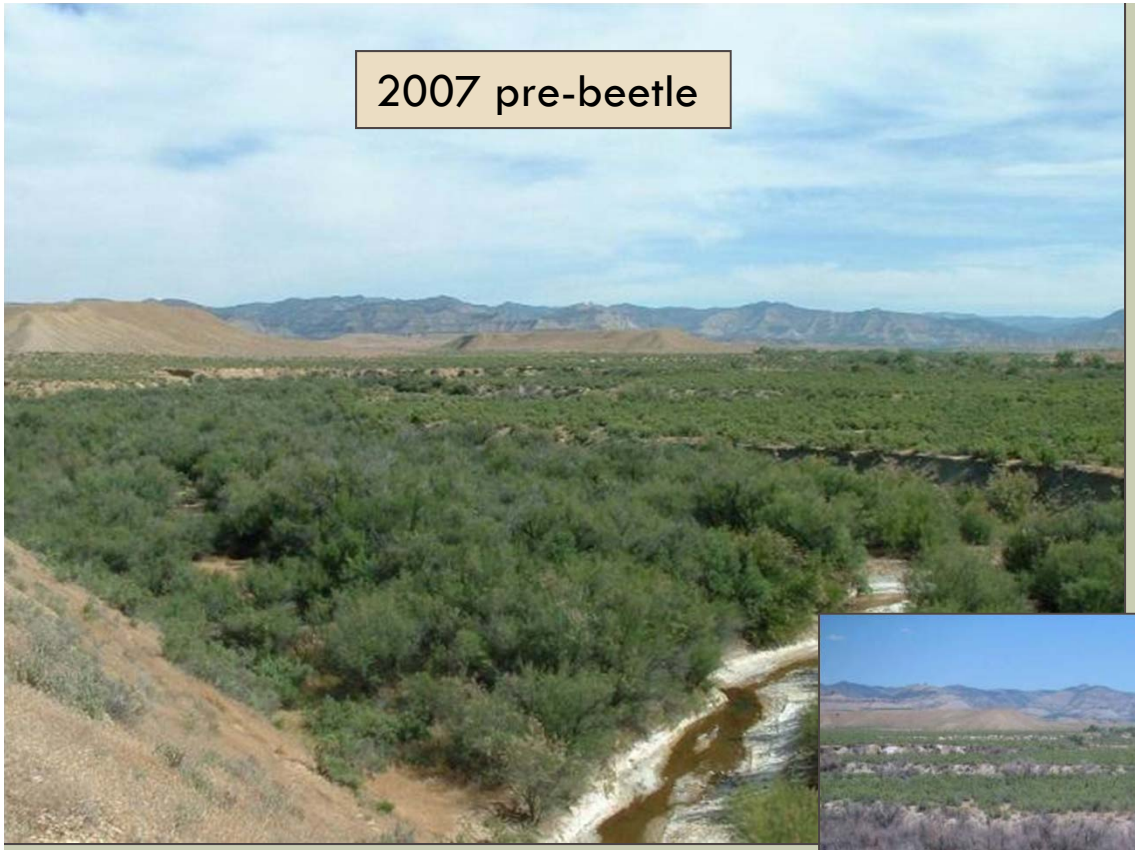

Uzbekistan


Chilik, Fukang, Turpan


Kazakhstan
Chilik
Fukang
China
Lovelock, NV
Delta, UT


Kazakhstani (Delta, UT)
Chinese (Lovelock, NV)
N
W
E
S
Utah
Grand Junction
Colorado
Moab
0 4.5 9 18 27 36
Miles
Kilometers
0 4.5 9 18 27 36

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.

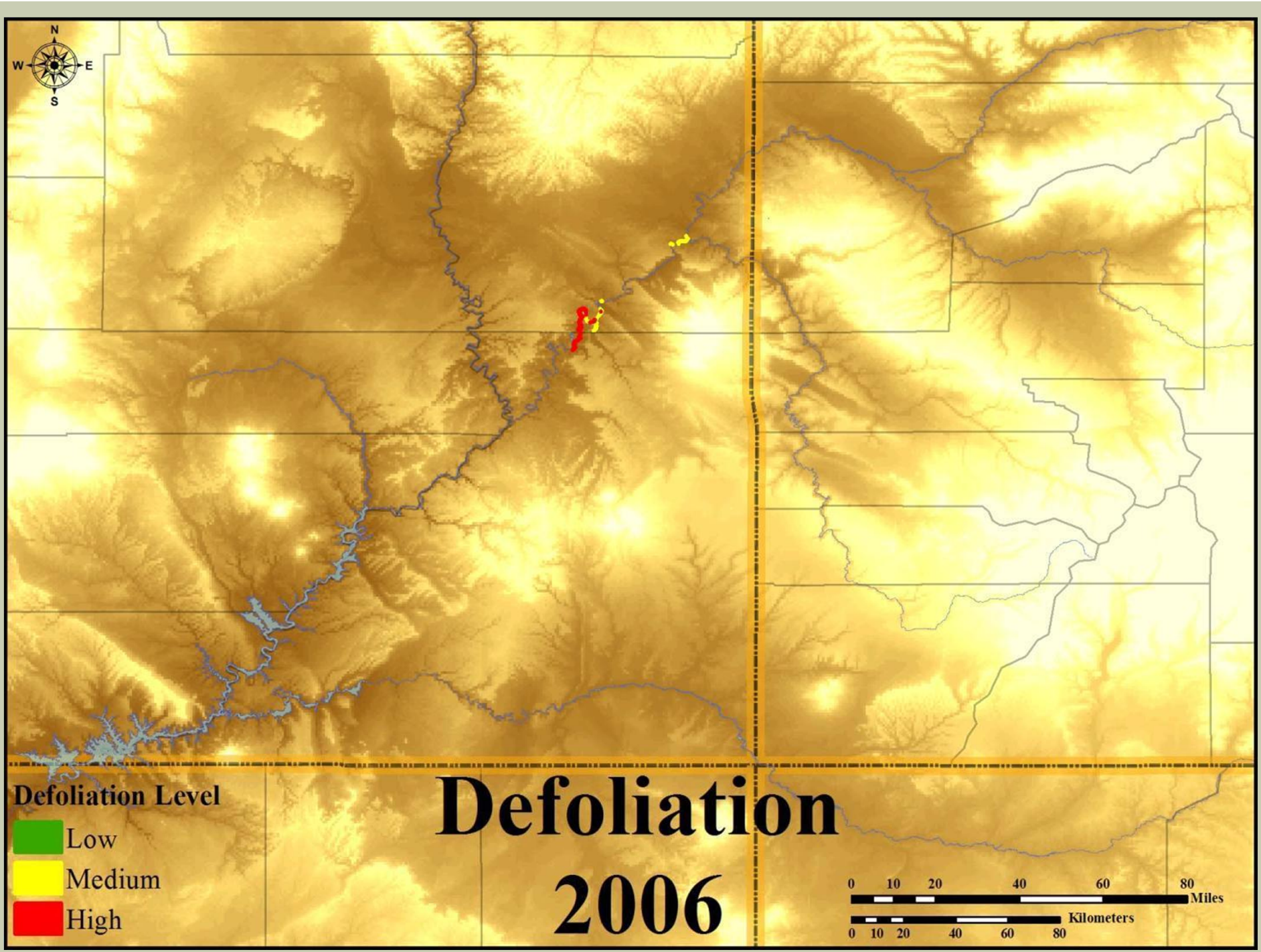
Salt Wash confluence with the Colorado near Moab

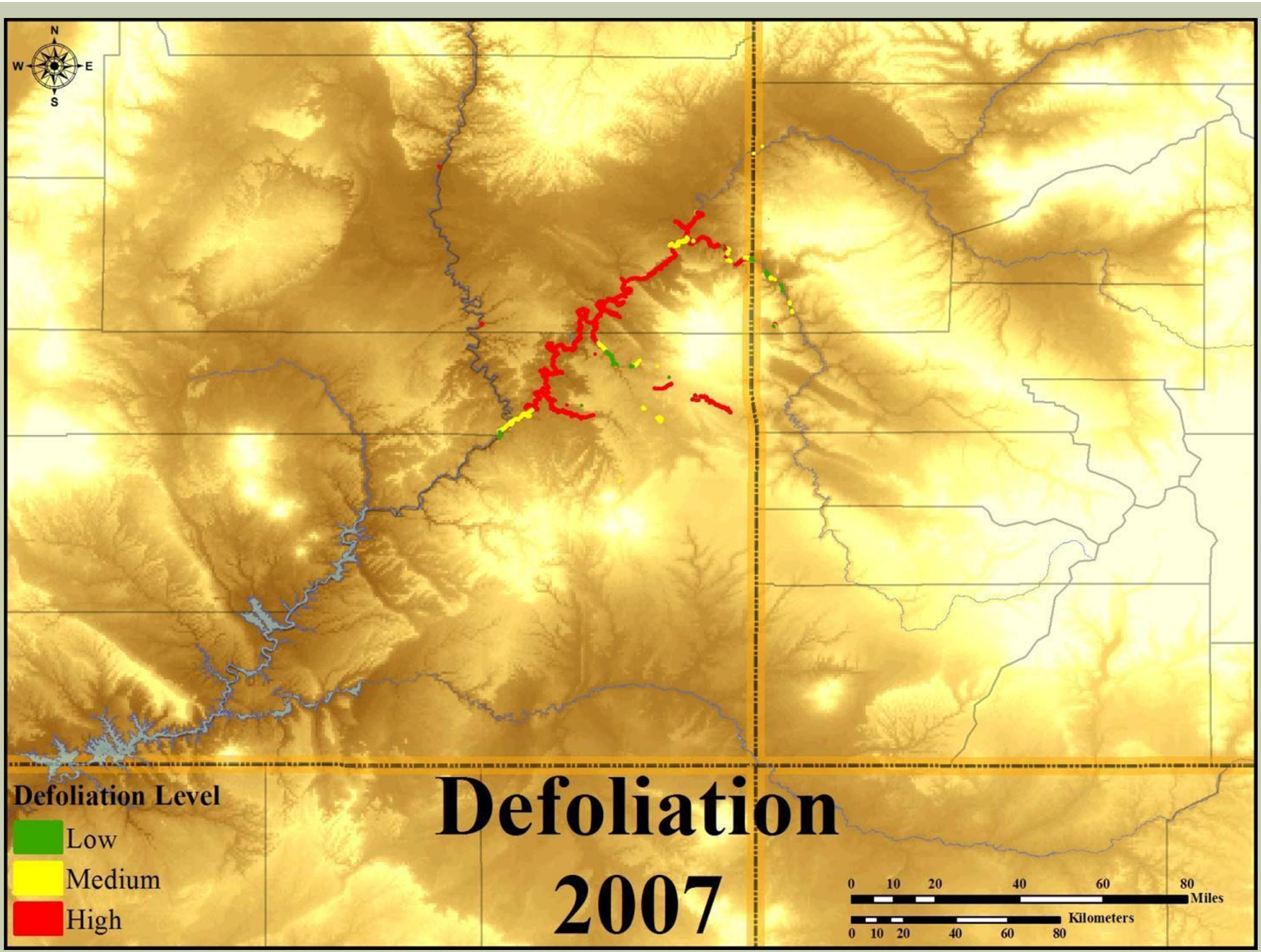
photo: Dr. Dan Bean- Palisade Insectary

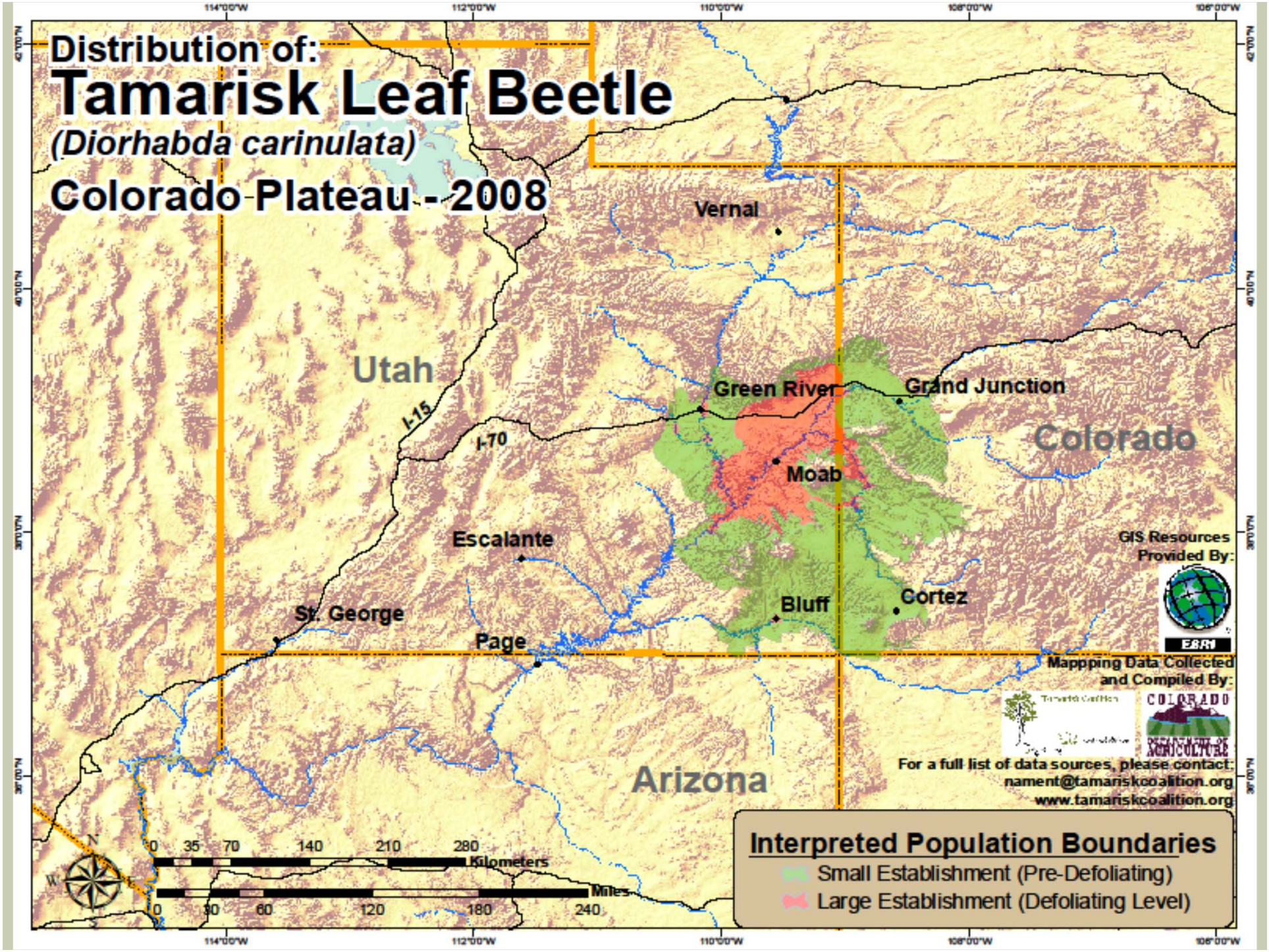
Dolores River near Bedrock, CO 2010

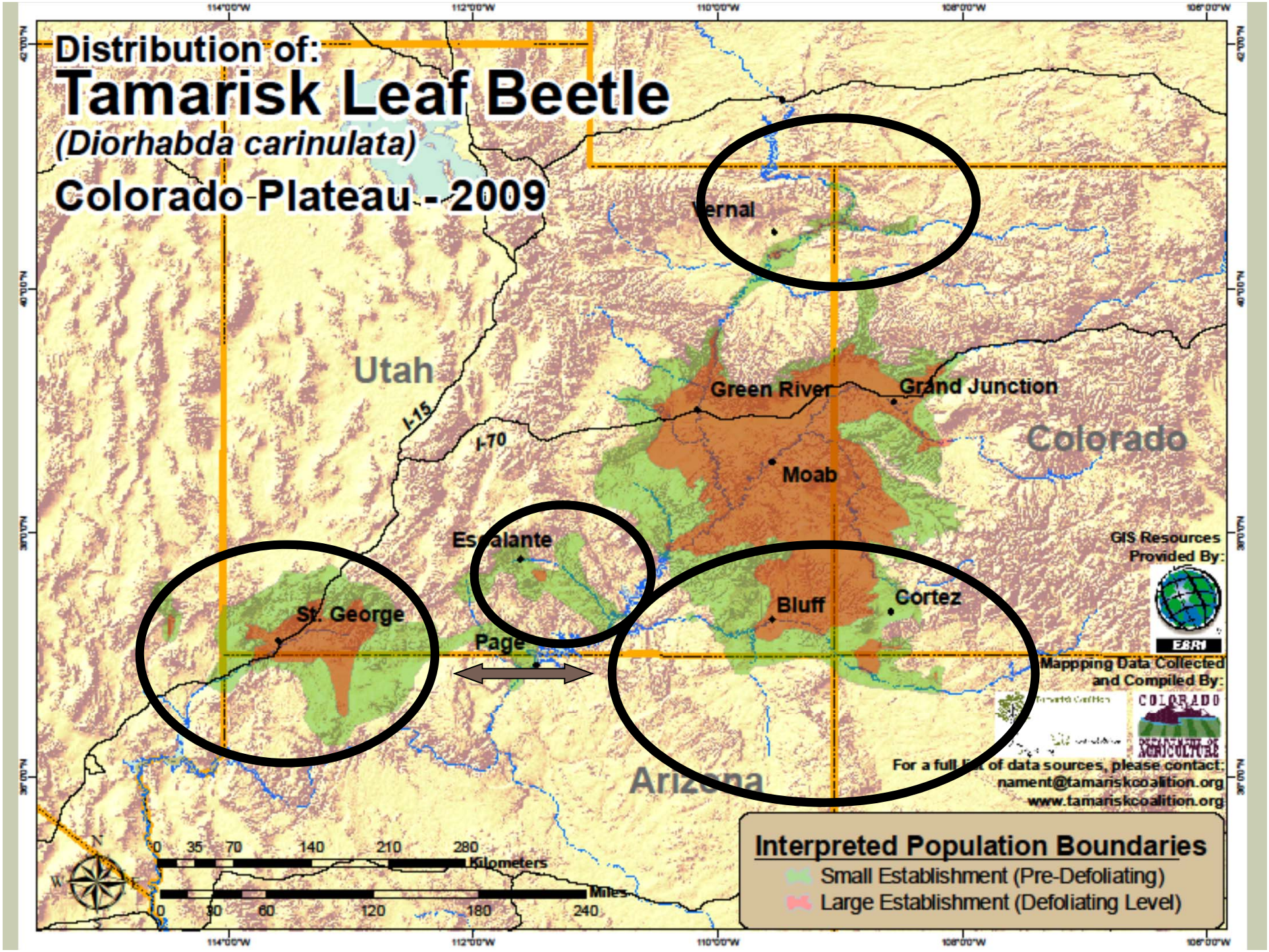
Cataract Canyon along the Colorado River

Date	GPS Point ID	UTM Coordinates	River Dist. (mi/km)		Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 5	☑ Eggs	% Defoliation	☑ Refoliation	Photo	Comments
		Latit:		Adults									ID:	
				Early Larvae						☐		☐	Direction	
		Long:		Late Larvae										
		Lat:		Adults									ID:	
				Early Larvae						☐		☐	Direction	
		Long:		Late Larvae										
		Latit:		Adults									ID:	
				Early Larvae						☐		☐	Direction	
		Long:		Late Larvae										
		Lat:		Adults									ID:	
				Early Larvae						☐		☐	Direction	
		Long:		Late Larvae										


N
W
E
S
Defoliation Level
Low
Medium
High
Defoliation
2006
0 10 20 40 60 80
Miles
Kilometers
0 10 20 40 60 80


N
W
E
S
Defoliation Level
Low
Medium
High
Defoliation
2007
0 10 20 40 60 80
Miles
Kilometers
0 10 20 40 60 80


Distribution of:
Tamarisk Leaf Beetle
(Diorhabda carinulata)
Colorado Plateau - 2008
Vernal
Utah
I-15
I-70
Green River
Grand Junction
Colorado
Moab
Escalante
St. George
Page
Bluff
Cortez
Arizona
GIS Resources Provided By:
ESRI
Mappping Data Collected and Compiled By:
For a full list of data sources, please contact:
nament@tamariskcoalition.org
www.tamariskcoalition.org
Interpreted Population Boundaries
Small Establishment (Pre-Defoliating)
Large Establishment (Defoliating Level)
0 35 70 140 210 280
Kilometers
0 30 60 120 180 240
Miles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Tamarisk Leaf Beetle
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Colorado Plateau -- 2009
Vernal
Utah
Green River
Grand Junction
Colorado
I-15
I-70
Moab
Escalante
St. George
Page
Bluff
Cortez
Arizona
GIS Resources Provided By:
ESRI
Mappping Data Collected and Compiled By:
COLORADO
DEPARTMENT OF AGRICULTURE
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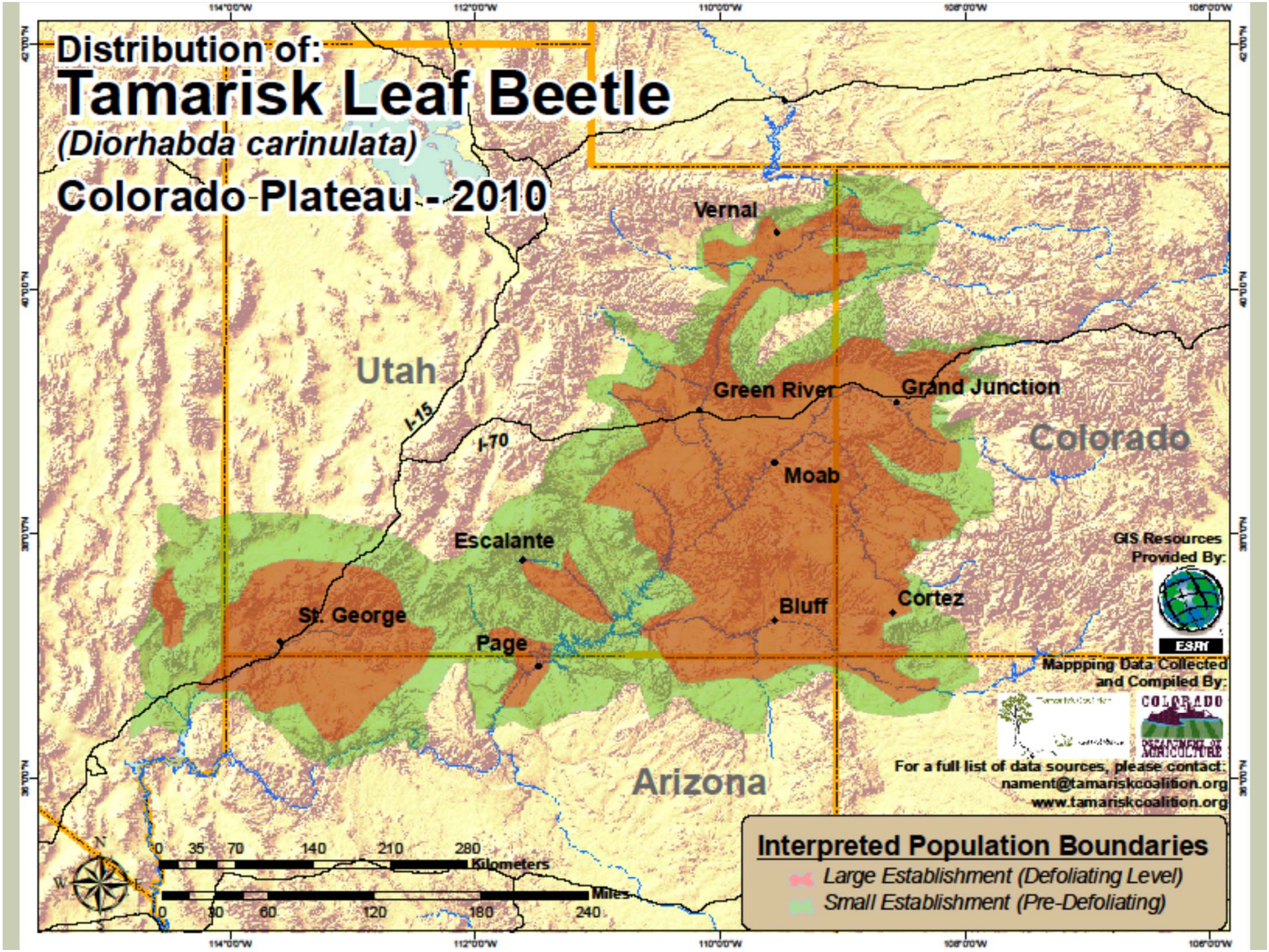
N
W
E
S
0 35 70 140 210 280
Kilometers
0 30 60 120 180 240
Miles
Interpreted Population Boundaries
Small Establishment (Pre-Defoliating)
Large Establishment (Defoliating Level)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Vernal
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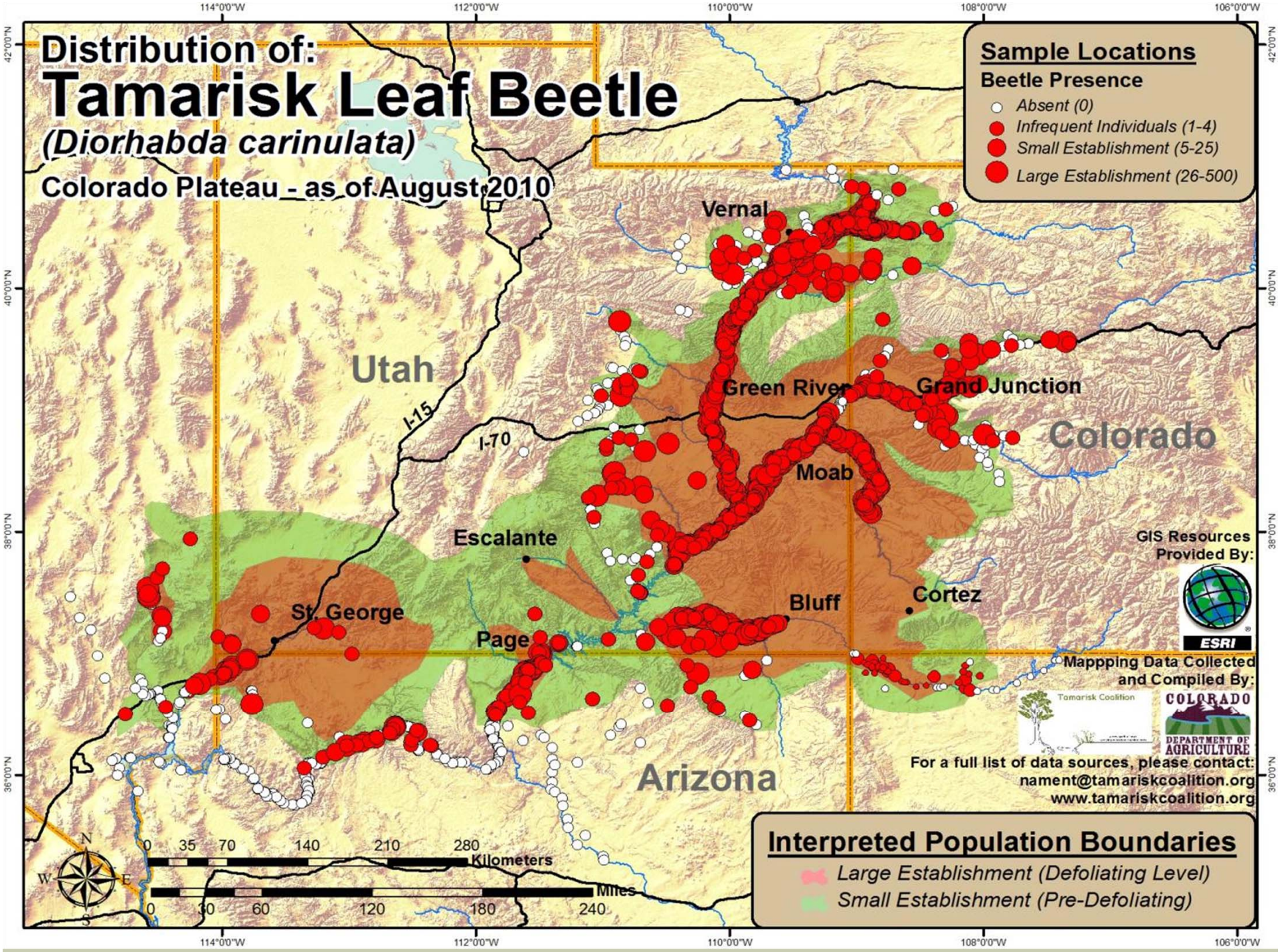
0 35 70 140 210 280
Kilometers
0 30 60 120 180 240
Miles
Interpreted Population Boundaries
Large Establishment (Defoliating Level)
Small Establishment (Pre-Defoliating)


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)
Vernal
Utah
I-15
I-70
Green River
Grand Junction
Colorado
Moab
Escalante
St. George
Page
Bluff
Cortez
Arizona
GIS Resources Provided By:
ESRI
Mappping Data Collected and Compiled By:
Tamarisk Coalition
COLORADO DEPARTMENT OF AGRICULTURE
For a full list of data sources, please contact:
nament@tamariskcoalition.org
www.tamariskcoalition.org
Interpreted Population Boundaries
Large Establishment (Defoliating Level)
Small Establishment (Pre-Defoliating)
0 35 70 140 210 280 Kilometers
0 30 60 120 180 240 Miles
114°0'0"W
112°0'0"W
110°0'0"W
108°0'0"W
106°0'0"W
42°0'0"N
40°0'0"N
38°0'0"N
36°0'0"N

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

Dewey Bridge, UT 8-31-10

photos: Dr. Dan Bean-Palisade Insectary

Increased invasive plant communities

Russian knapweed / kochia

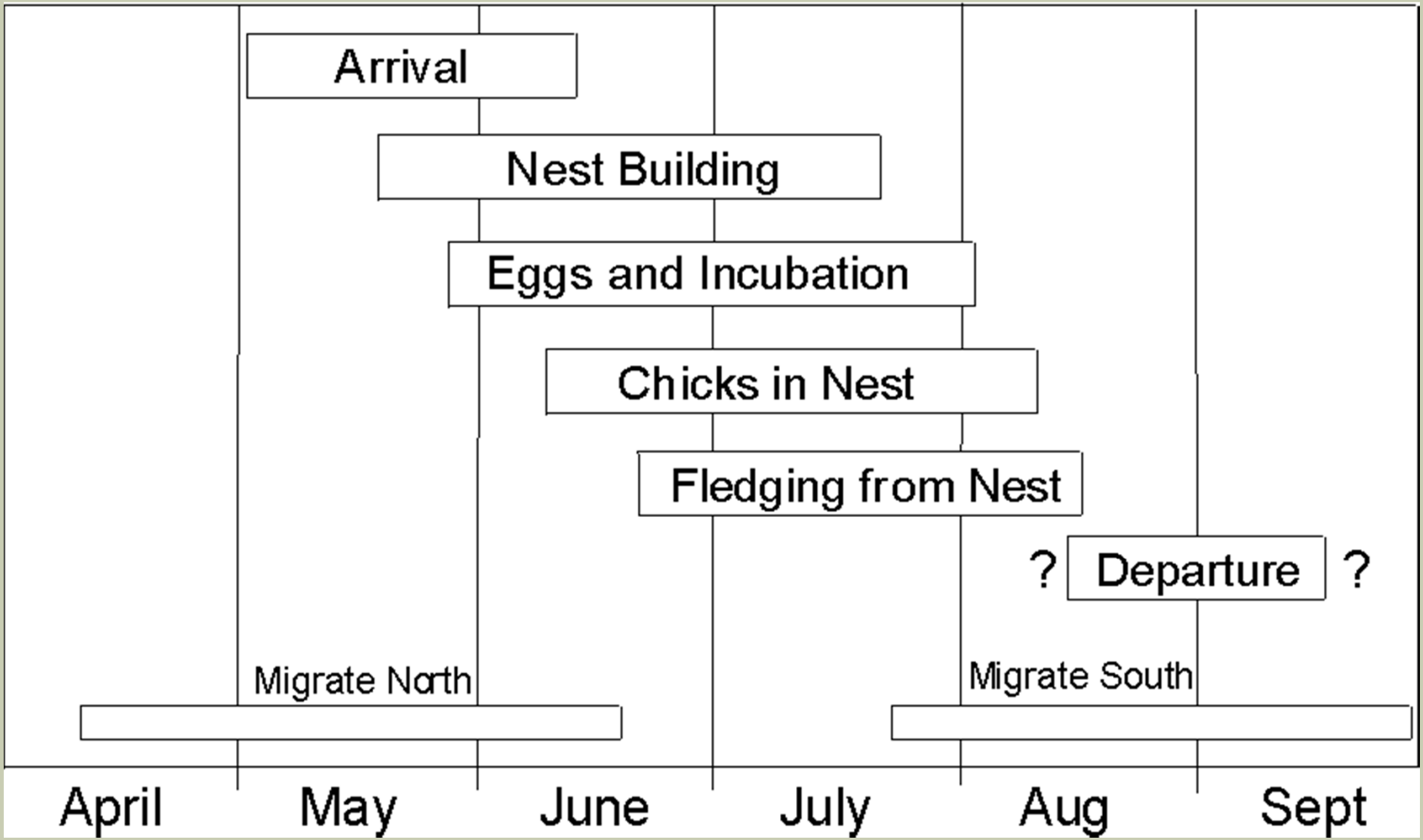
Need to plan for restoration & monitoring

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

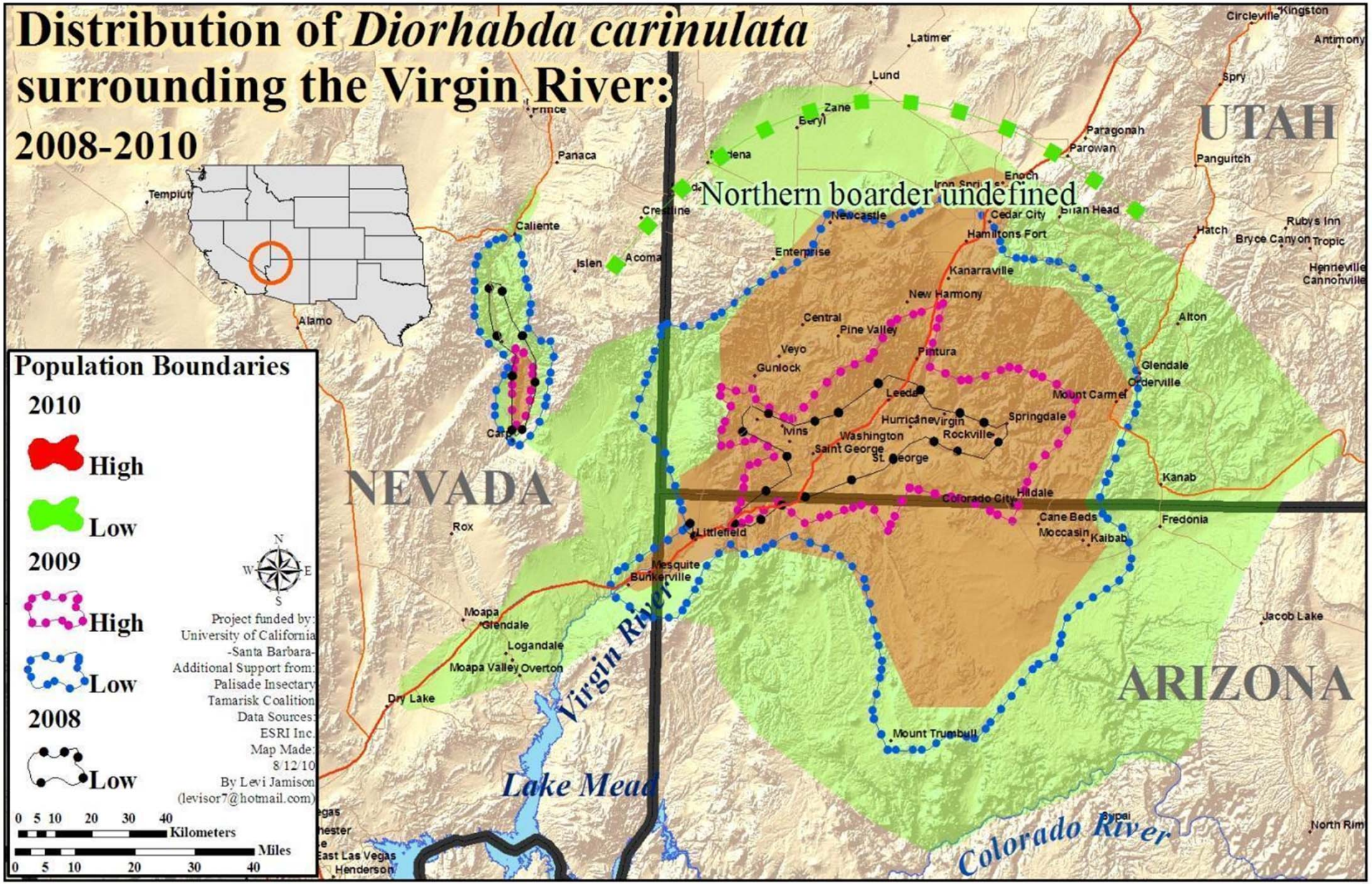
Nest chronology and timing of defoliation

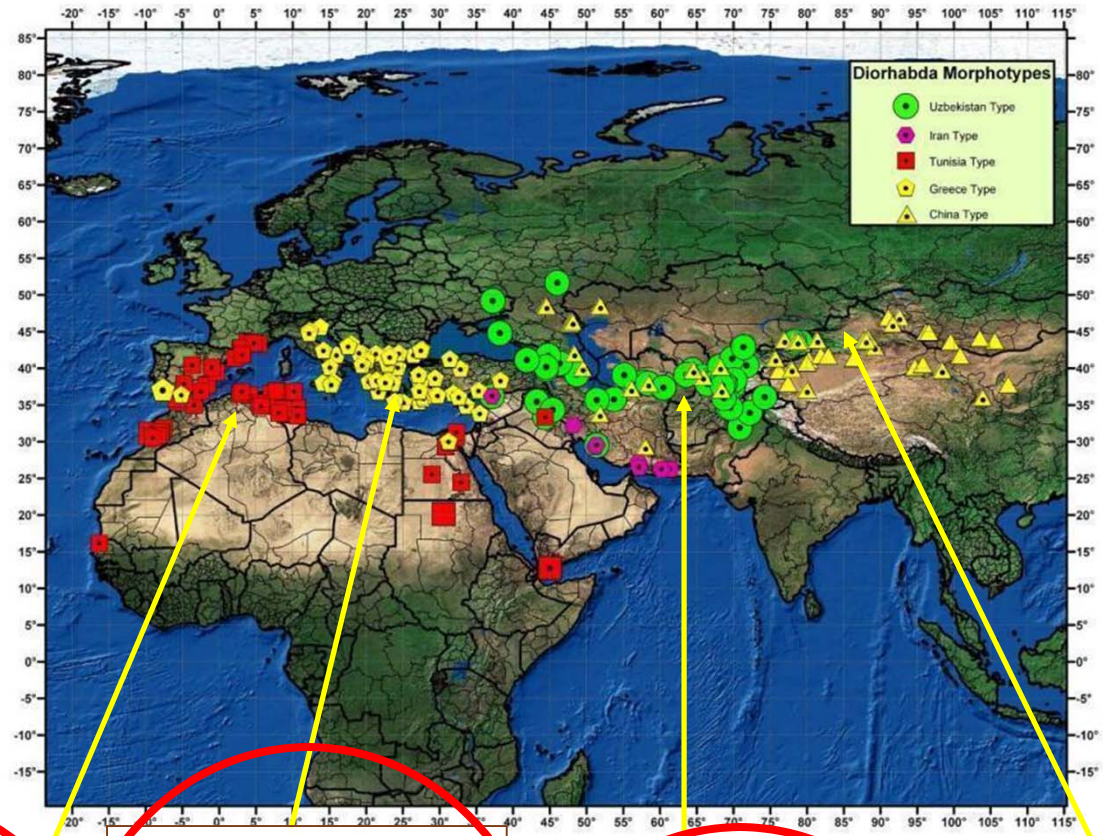


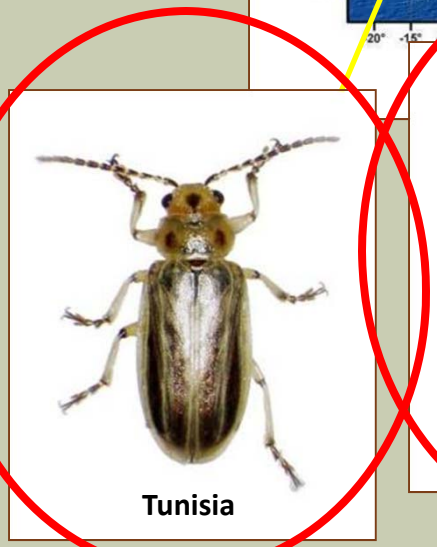
Slide – Mary Anne McLeod - SWCA

Virgin River Valley 2010 – Before Biocontrol (June 1) and After (June 20)

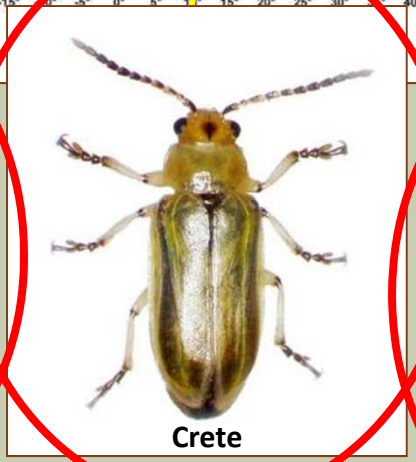
Photos: Dr. Tom Dudley- UCSB


Distribution of *Diorhabda carinulata* surrounding the Virgin River: 2008-2010
Northern boarder undefined
UTAH
NEVADA
ARIZONA
Lake Mead
Virgin River
Colorado River
Population Boundaries
2010
High
Low
2009
High
Low
2008
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)
0 5 10 20 30 40
Kilometers
Miles
0 5 10 20 30 40
Circleville
Kingston
Antimony
Latimer
Lund
Spry
Zane
Beryl
Paragonah
Parowan
Panguitch
Enoch
Cedar City
Brian Head
Hatch
Ruby's Inn
Bryce Canyon
Tropic
Henrieville
Cannonville
Panaca
Caliente
Crestline
Acoma
Islen
Enterprise
Newcastle
Hamiltons Fort
Kanarraville
New Harmony
Central
Pine Valley
Veyo
Pintura
Gunlock
Alton
Glendale
Orderville
Leeds
Mount Carmel
Hurricane
Virgin
Springdale
Ivins
Washington
Rockville
Saint George
St. George
Kanab
Colorado City
Hildale
Cane Beds
Moccasin
Kaibab
Fredonia
Littlefield
Rox
Mesquite
Bunkerville
Moapa
Glendale
Logandale
Moapa Valley
Overton
Dry Lake
Jacob Lake
Mount Trumbull
Tempiute
Alamo
Henderson
East Las Vegas
North Rim





Tunisia



Crete

Uzbekistan

Chilik, Fukang, Turpan

Texas beetle establishment as of July 2010

- **Tunisia beetle:**

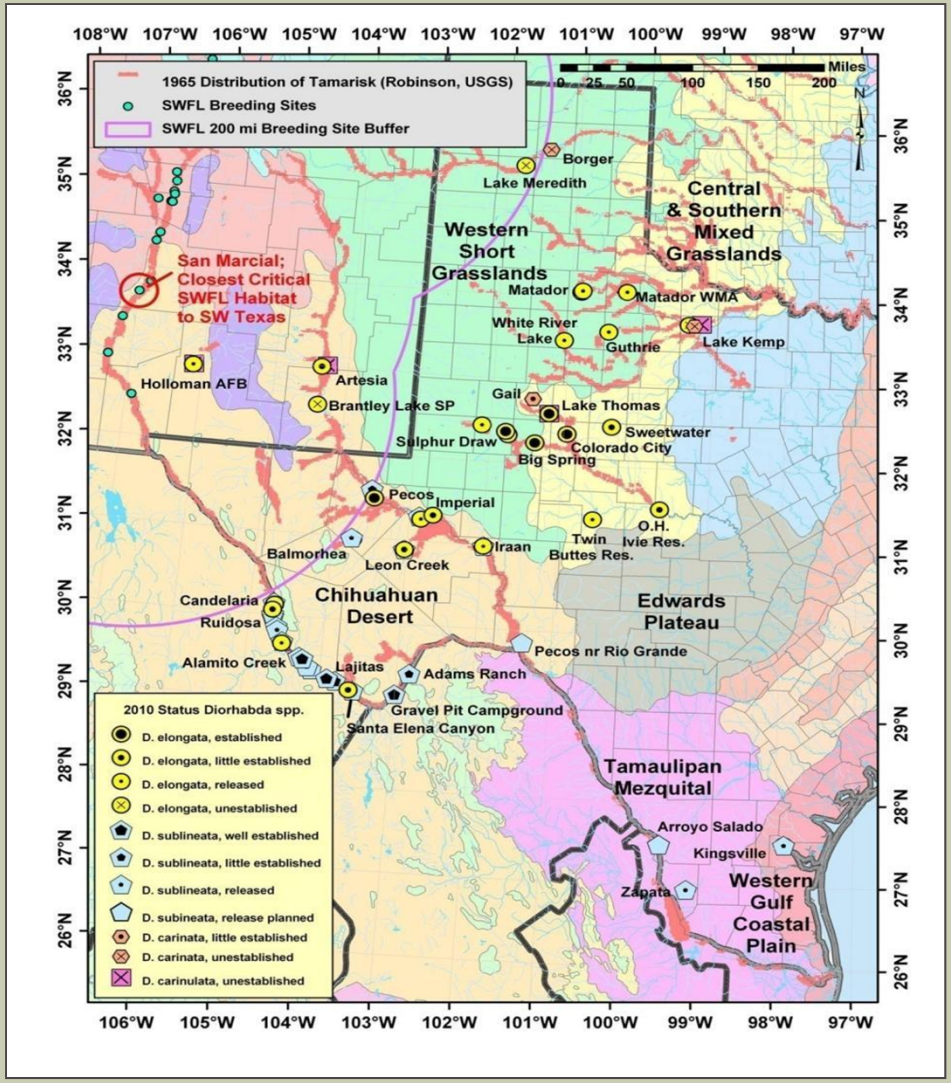
  Rapid expansion and well established along Rio Grande in both Texas and Mexico; also defoliating athel tamarisk

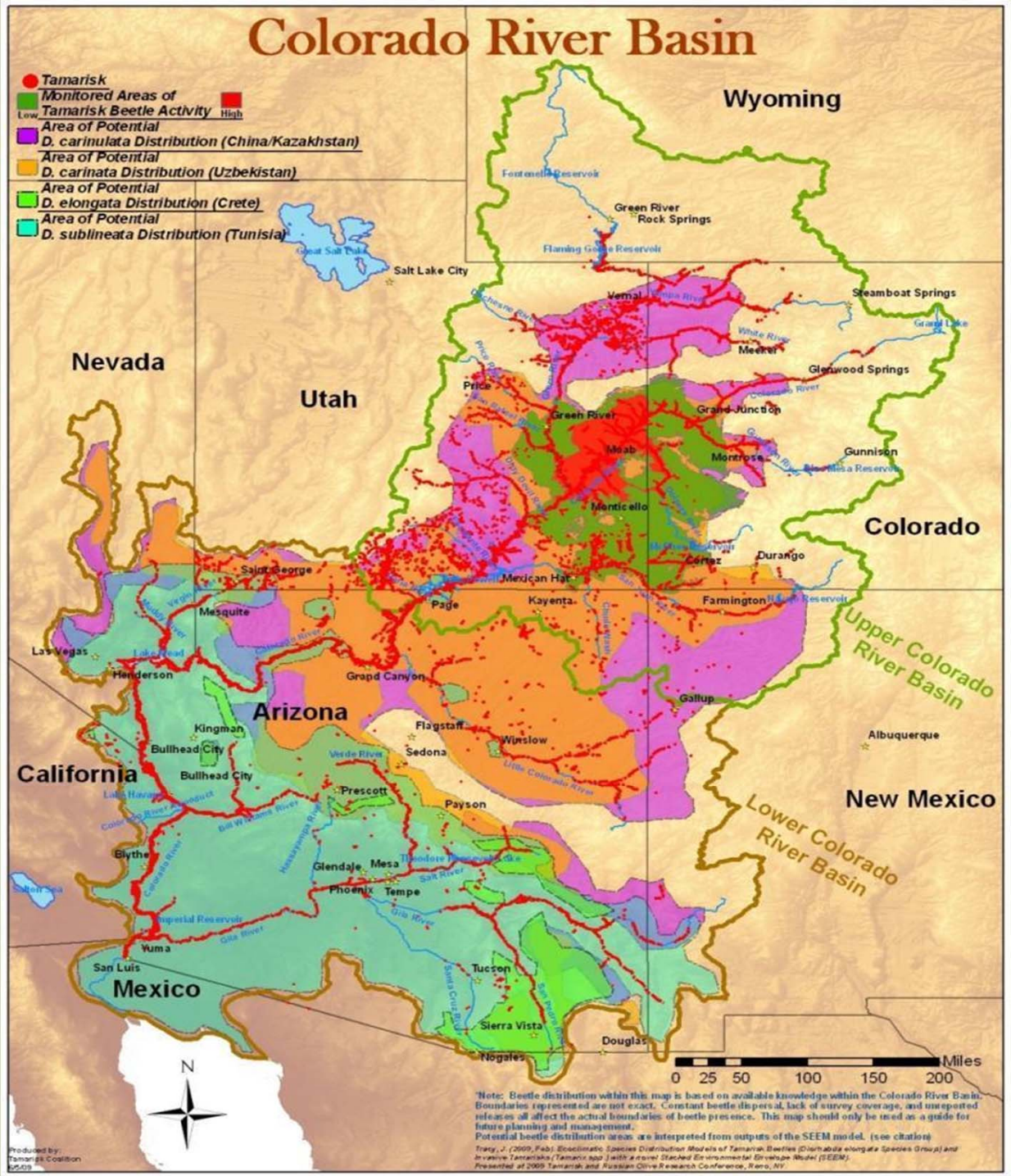
- **Crete beetle:**

  Rapid expansion and well established in central west Texas near Big Springs

- **Uzbek beetle:**

  Not well established




Colorado River Basin
Tamarisk
Monitored Areas of Tamarisk Beetle Activity
Low
High
Area of Potential D. carinulata Distribution (China/Kazakhstan)
Area of Potential D. carinata Distribution (Uzbekistan)
Area of Potential D. elongata Distribution (Crete)
Area of Potential D. sublineata Distribution (Tunisia)
Wyoming
Nevada
Utah
Colorado
Arizona
California
New Mexico
Mexico
Upper Colorado River Basin
Lower Colorado River Basin
Great Salt Lake
Salt Lake City
Fontenelle Reservoir
Green River
Rock Springs
Flaming Gorge Reservoir
Vernal
Steamboat Springs
Grand Lake
White River
Meeker
Glenwood Springs
Price
Green River
Grand Junction
Moab
Montrose
Gunnison
Blue Mesa Reservoir
Monticello
Cortez
Durango
Mexican Hat
Farmington
Navajo Reservoir
Page
Kayenta
Saint George
Mesquite
Las Vegas
Lake Mead
Henderson
Grand Canyon
Gallup
Albuquerque
Kingman
Bullhead City
Flagstaff
Winslow
Sedona
Verde River
Prescott
Payson
Lake Havasu
Colorado River Aqueduct
Bill Williams River
Blythe
Glendale
Mesa
Phoenix
Tempe
Salt River
Theodore Roosevelt Lake
Salton Sea
Imperial Reservoir
Gila River
Yuma
San Luis
Tucson
Sierra Vista
Douglas
Nogales
N
Miles
0 25 50 100 150 200
*Note: Beetle distribution within this map is based on available knowledge within the Colorado River Basin. Boundaries represented are not exact. Constant beetle dispersal, lack of survey coverage, and unreported releases all affect the actual boundaries of beetle presence. This map should only be used as a guide for future planning and management.
Potential beetle distribution areas are interpreted from outputs of the SEEM model. (see citation)
Tracy, J. (2009, Feb). Ecoclimatic Species Distribution Models of Tamarisk Beetles (Diorhabda elongata Species Group) and Invasive Tamarisks (Tamarix spp.) with a novel Stacked Environmental Envelope Model (SEEM). Presented at 2009 Tamarisk and Russian Olive Research Conference, Reno, NV.
Produced by: Tamarisk Coalition


Colorado River Basin
Wyoming
Nevada
Utah
Colorado
Arizona
California
New Mexico
Mexico
Fontenelle Reservoir
Green River
Rock Springs
Flaming Gorge Reservoir
Great Salt Lake
Salt Lake City
Vernal
Yampa River
Steamboat Springs
Grand Lake
Duchesne River
White River
Meeker
Price River
Price
Green River
Glenwood Springs
San Rafael River
Colorado River
Grand Junction
Green River
Moab
Gunnison River
Montrose
Gunnison
Blue Mesa Reservoir
Dirty Devil River
Colorado River
Monticello
Dolores River
Escalante River
McPhee Reservoir
Cortez
Durango
Glen Canyon
Lake Powell
Mexican Hat
San Juan River
Farmington
Navajo Reservoir
Saint George
Virgin River
Muddy River
Mesquite
Page
Kayenta
Chinle Wash
Upper Colorado River Basin
Las Vegas
Lake Mead
Colorado River
Henderson
Grand Canyon
Gallup
Kingman
Flagstaff
Winslow
Albuquerque
Bullhead City
Verde River
Sedona
Little Colorado River
Bullhead City
Lake Havasu
Prescott
Payson
Colorado River Aqueduct
Bill Williams River
Hassayampa River
Lower Colorado River Basin
Blythe
Glendale
Mesa
Theodore Roosevelt Lake
Salt River
Salton Sea
Colorado River
Phoenix
Tempe
Gila River
Imperial Reservoir
Gila River
Yuma
San Luis
Tucson
Santa Cruz River
San Pedro River
Sierra Vista
Douglas
Nogales
N
Miles
0 25 50 100 150 200
Critical Habitat for the Southwestern Willow Flycatcher (Empidonax traillii extimus).
Data Source: http://crithab.fws.gov/
The GIS files and their associated coordinates are not the legal source for determining the proposed critical habitat boundaries of Southwestern willowflycatcher. Inherent in any data set used to develop graphical representations, are limitations of accuracy as determined by, among others, the source, scale and resolution of the data. While the Service makes every effort to represent the proposed critical habitat shown with this data as completely and accurately as possible (given existing time and resource constraints), the USFWS gives no warranty, expressed or implied, as to the accuracy, reliability, or completeness of these data. In addition, the USFWS shall not be held liable for improper or incorrect use of the data described and/or contained herein. Graphical representations provided by the use of this data are do not represent a legal description of the proposed critical habitat boundary. The user is referred to the proposed critical habitat textual description in the appropriate final rule for this species as published in the Federal Register.
Produced by:
Tamarisk Coalition
5/26/09

United States Department of Agriculture

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Emergency and Domestic Programs

4700 River Road
Riverdale, MD
20737

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 AKD
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

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Planning Riparian Restoration in the Context of *Tamarix* Control in Western North America

Patrick B. Shafroth,[1,2] Vanessa B. Beauchamp,[3] Mark K. Briggs,[4] Kenneth Lair,[5] Michael L. Scott,[1] and Anna A. Sher[6,7]

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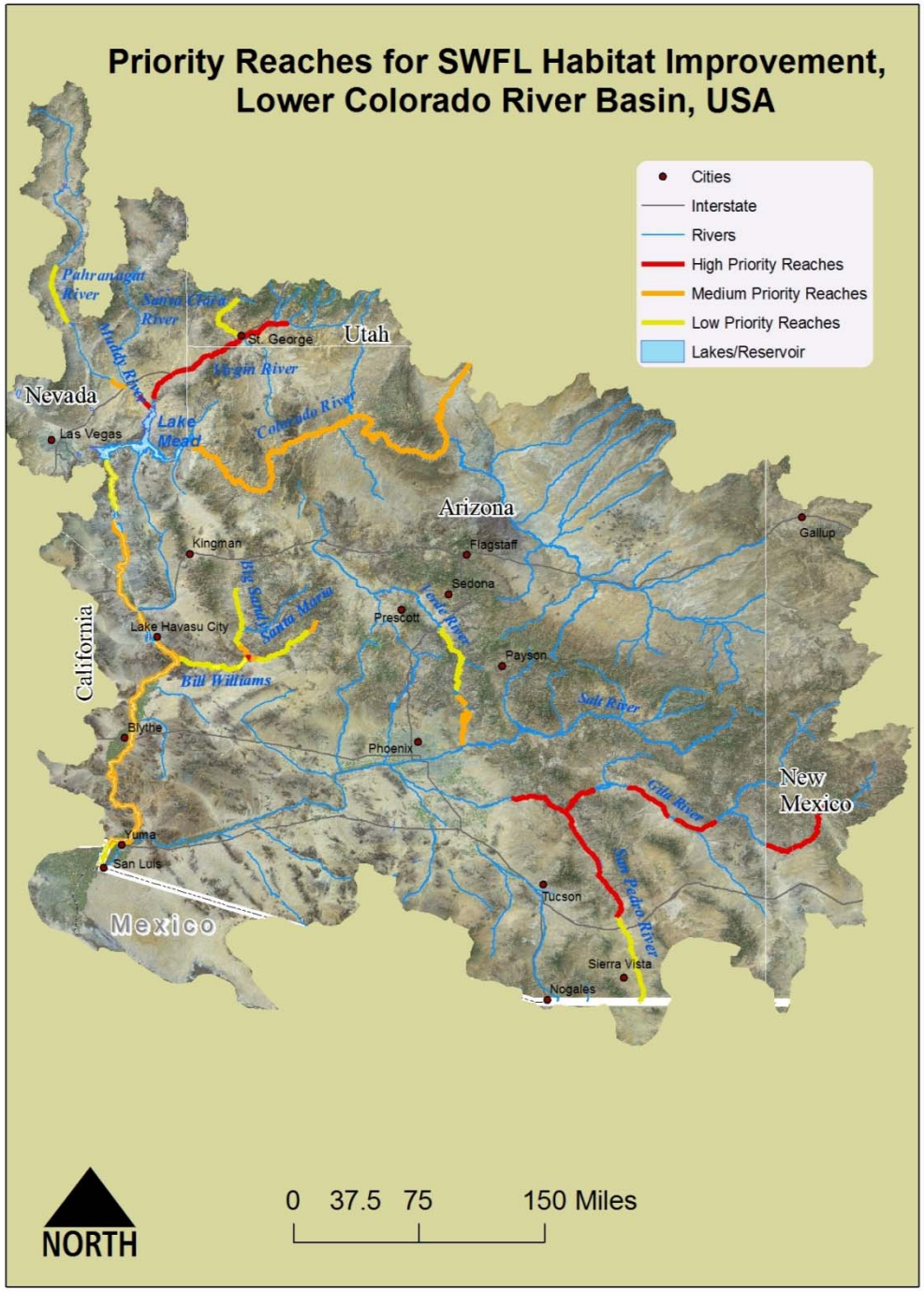
Site Qualifiers*	Hydrology (1-4)	Open water or moist soil (1-3)	Existing Vegetation (1-5)	Soil Salinity (1-3)	Landowner	Site Access (1-3)	Presence or probability of SWFL colonization (1-3)	Restoration Technique (1-3)	Tamarisk leaf beetle presence (1-4)	Stressors	Past, existing, or planned restoration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

Prioritization Ranking Scheme

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

High Priority Reaches

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


Priority Reaches for SWFL Habitat Improvement,
Lower Colorado River Basin, USA
Cities
Interstate
Rivers
High Priority Reaches
Medium Priority Reaches
Low Priority Reaches
Lakes/Reservoir
Pahranagat River
Santa Clara River
Muddy River
St. George
Utah
Virgin River
Nevada
Las Vegas
Lake Mead
Colorado River
Arizona
Kingman
Flagstaff
Gallup
Sedona
Big Sandy
Santa Maria
Prescott
Verde River
Lake Havasu City
California
Payson
Bill Williams
Salt River
Blythe
Phoenix
Gila River
New Mexico
Yuma
San Luis
San Pedro River
Tucson
Mexico
Sierra Vista
Nogales
NORTH
0 37.5 75 150 Miles

To Learn More…www.tamariskcoalition.org

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