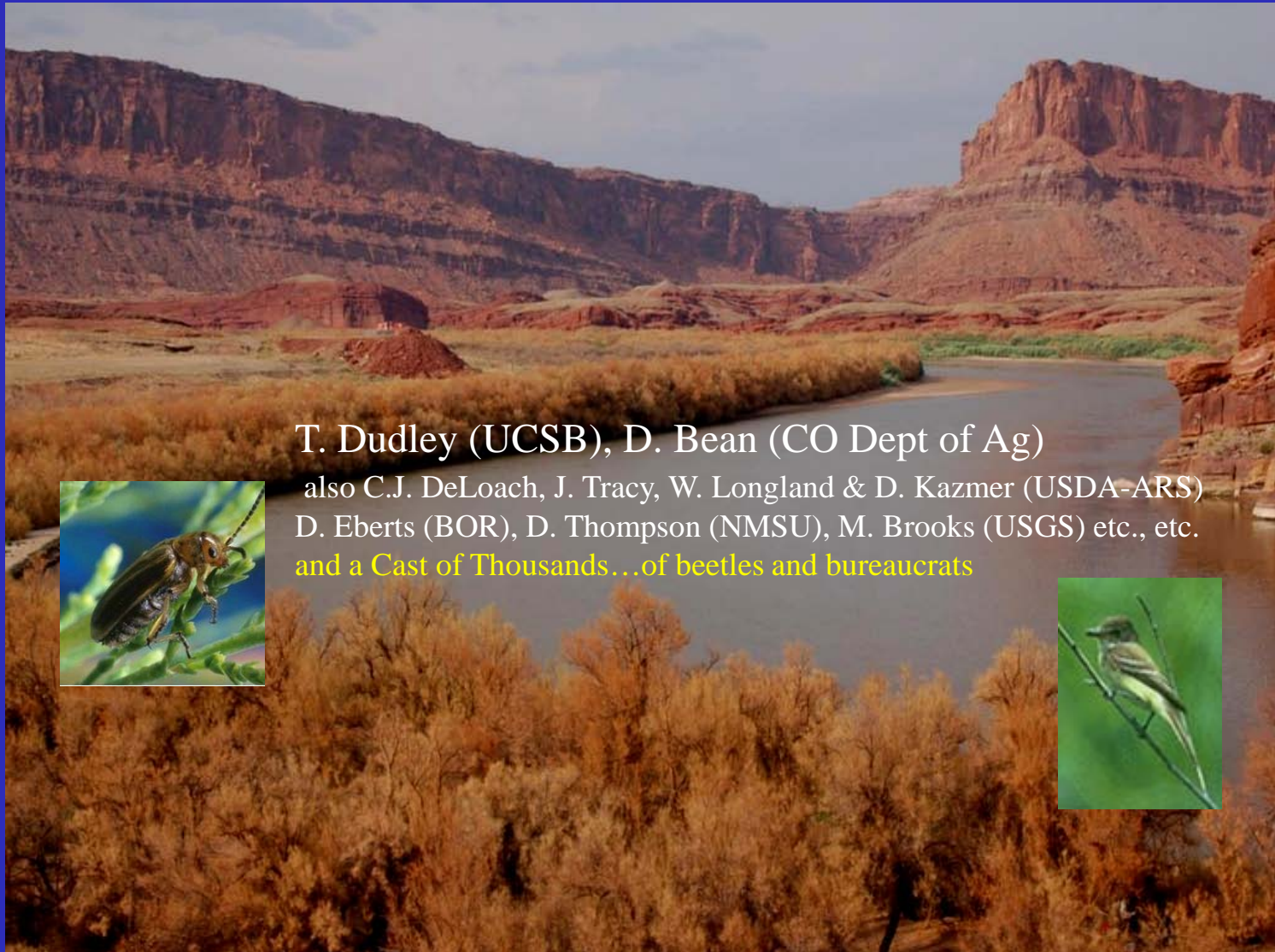
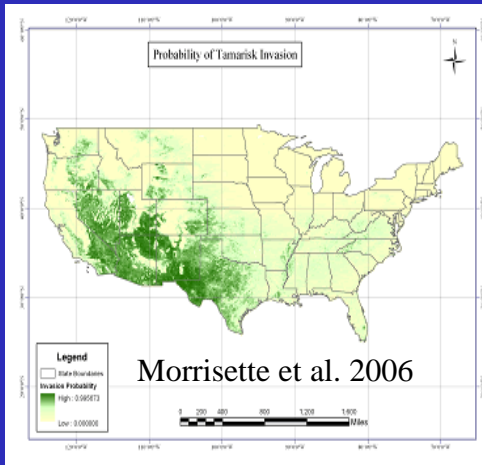


Tamarix Biocontrol, an Endangered Bird and Regulatory Dysfunction: Can Restoration provide Resolution?



T. Dudley (UCSB), D. Bean (CO Dept of Ag)
also C.J. DeLoach, J. Tracy, W. Longland & D. Kazmer (USDA-ARS)
D. Eberts (BOR), D. Thompson (NMSU), M. Brooks (USGS) etc., etc.
and a Cast of Thousands... of beetles and bureaucrats





- *Tamarix* spp. occupy >1 million acres in No. America
- *Tamarix* is the 3rd most common woody plant in Western riparian areas (Friedman et al. 2005)



Humboldt River, NV



Virgin River, NV



Colorado River, CO & UT



Impacts to Ecosystems & Biodiversity



Displaces native riparian plants

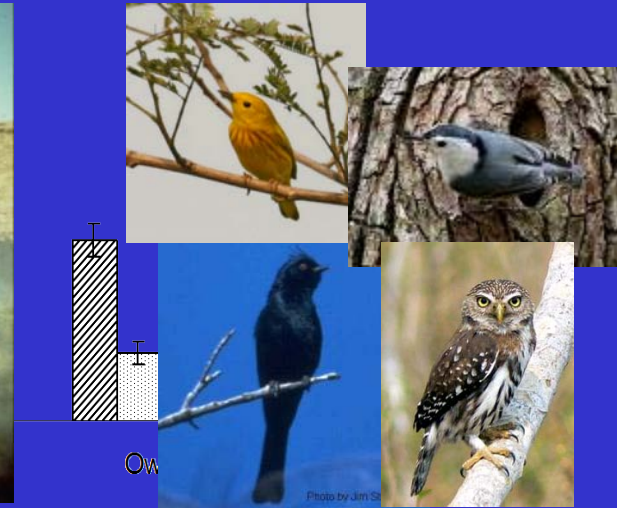
High water transpiration
Desiccates & Salinates soils



Erosion & Sedimentation



Wildfire hazard



Low quality habitat

Conventional control – Expensive/Unsustainable



Collateral damage to resources
Disturbance promotes
other 2^o weeds



Salsola spp.
(Russian thistle)



Biocontrol program:

1st in 1970's (Andres & Pemberton)
1980's by Jack DeLoach, ARS
(here w/ Ivan Mityaev in Kazakhstan)

Overseas Exploration: >300 potential specialists

3 candidates accepted
through TAG with
US-FWS support



Diorhabda 'elongata'
(saltcedar leaf beetle) from
central Asia, now *D. carinulata*
Approved for release in 1996



Coniatus tamarisci
(weevil)

Trabutina mannipara
(mealy bug)



Southwestern Willow Flycatcher (SWFL) (*Empidonax traillii extimus*) listed as

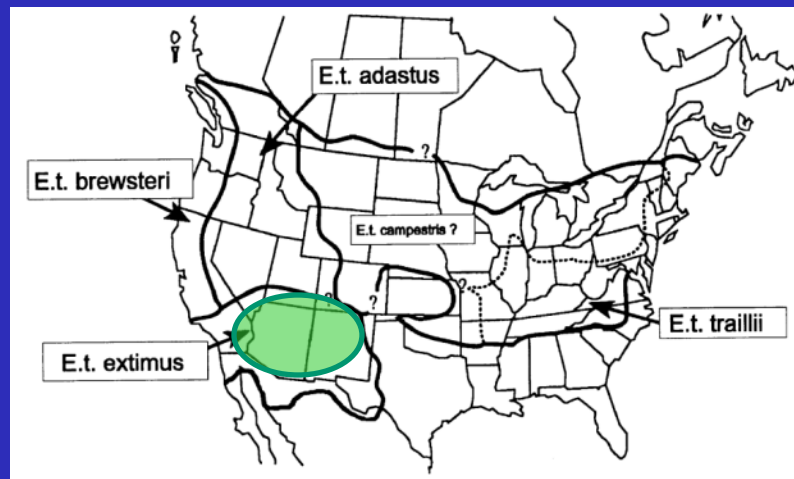
Endangered Species in 1995

Cause for listing: Loss of Cottonwood/Willow
vegetation across Southwest

Tamarix Invasion listed as major factor in decline

Can nest in *Tamarix* – Approx 1% occupied

(parts of Arizona, New Mexico, Nevada, Utah)



Biocontrol Program halted by US-FWS for ESA Section 7 Consultation

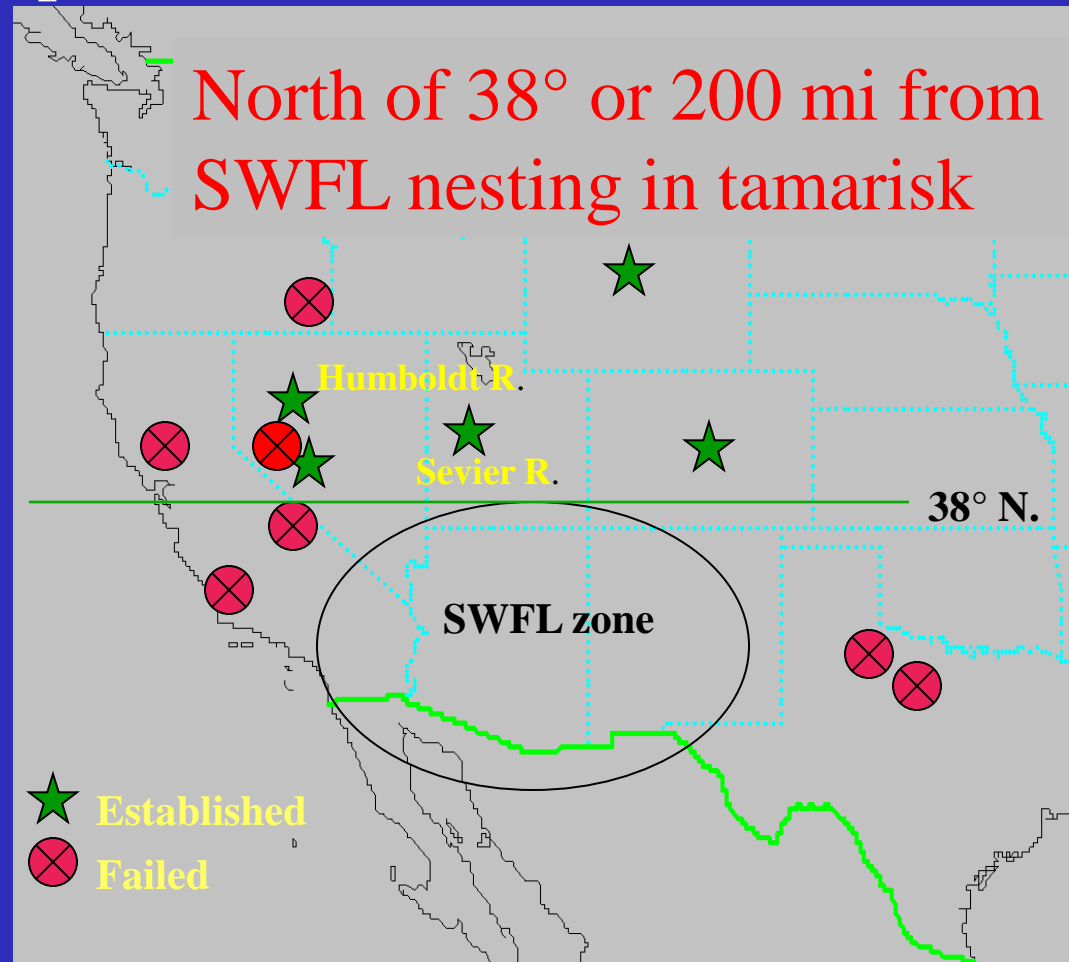
- Defoliation could expose nest to excess heat
- Biocontrol may eradicate target too fast for native regeneration
- Habitat too degraded for natives
- Beetles may be toxic



BioControl Program continues with restrictions

Site-specific PPQ 526 permits, local FWS approval

D. carinulata cage releases - 1999;
Open releases - 2001



Humboldt River (NV) in 2002



Defoliates by 'scraping' tissues, causes desiccation



June 11



June 22



June 26



July 9



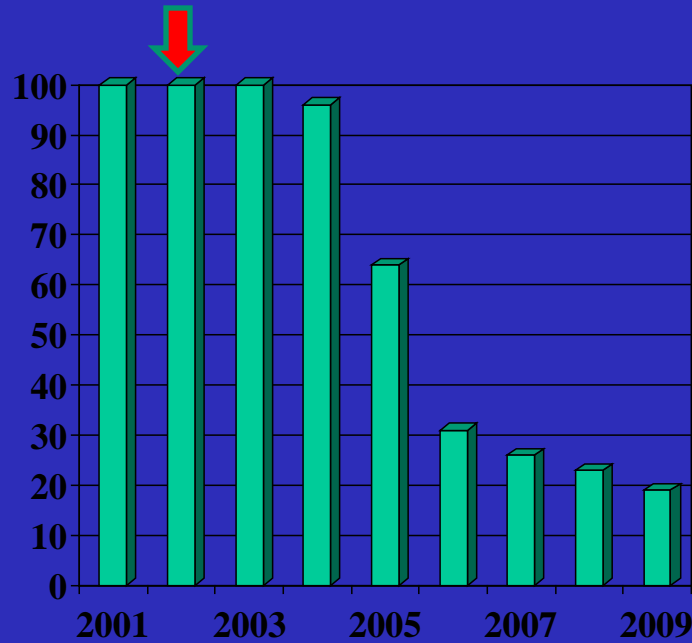
Population Expansion!

2003: 2 ha. \uparrow to 200 ha.

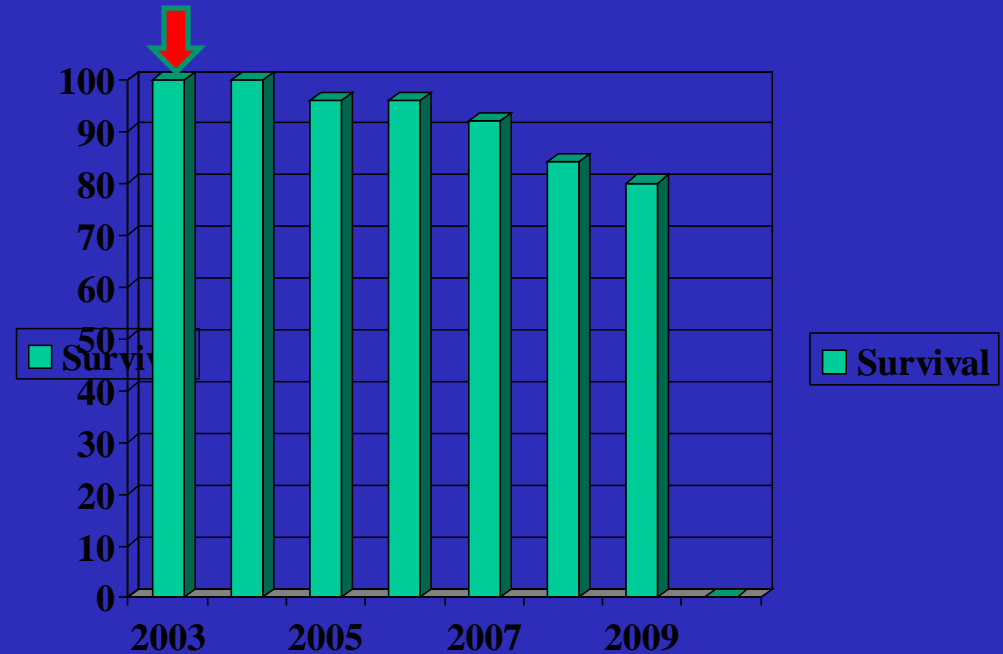
2004: >10,000 ha. expansion



But, Re-growth is Rapid
Dieback gradual &
Mortality low



Survival at Release Site

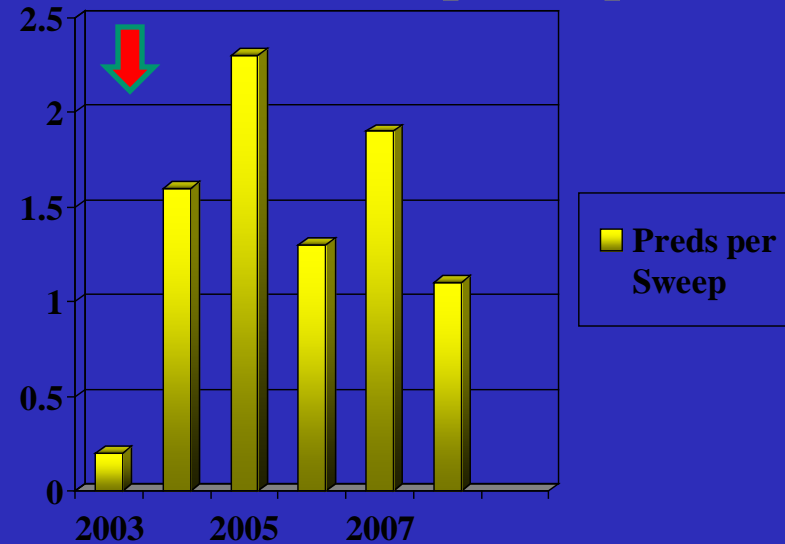


Survival 4 km from Release Site

Higher Trophic Levels Promoted



Standard Sweep Samples



Introducing a new trophic level (Primary Consumer) promotes higher trophic levels (Predators)

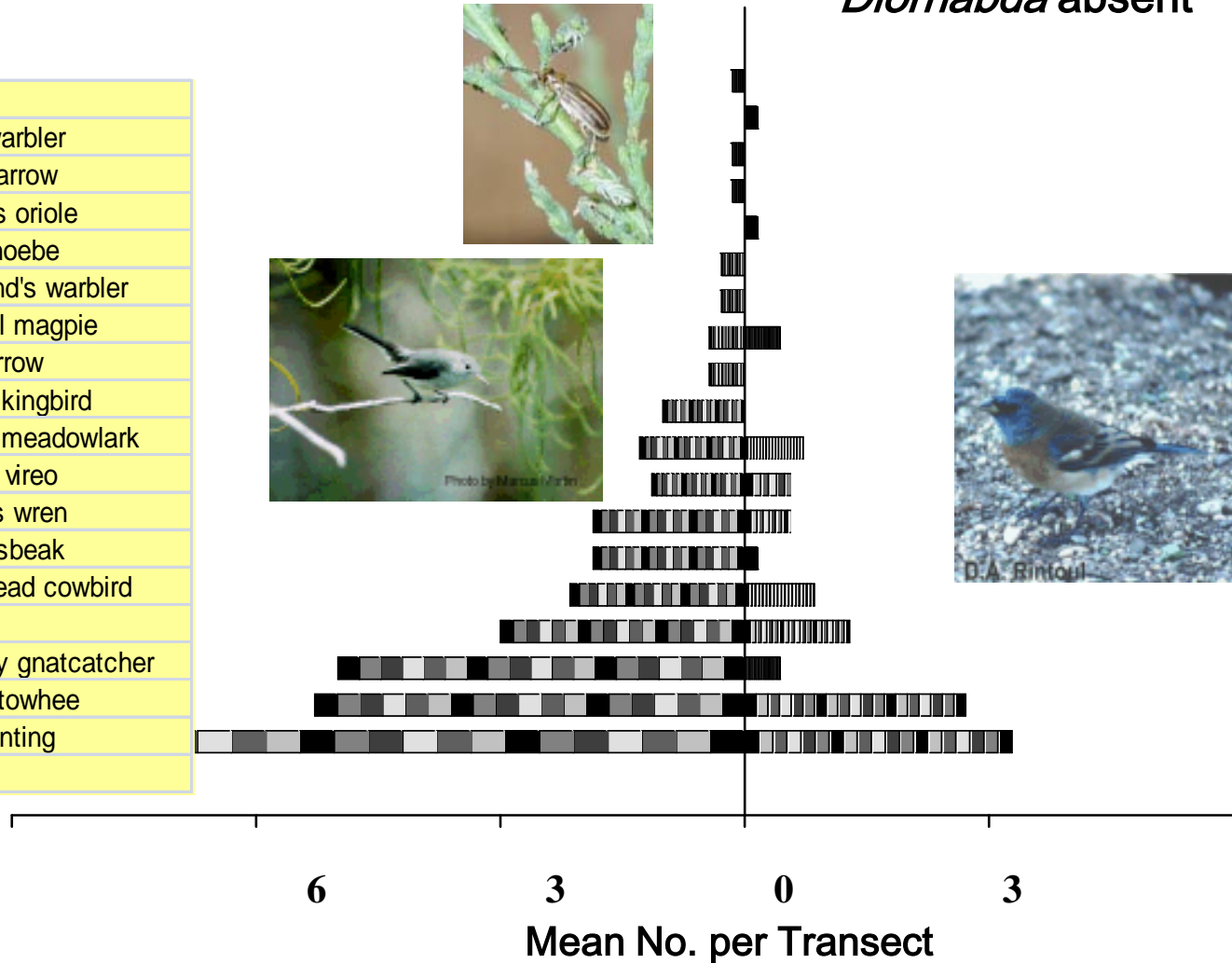
Birds and *Diorhabda* in Tamarisk (Longland et al.)

Diorhabda present

Diorhabda absent

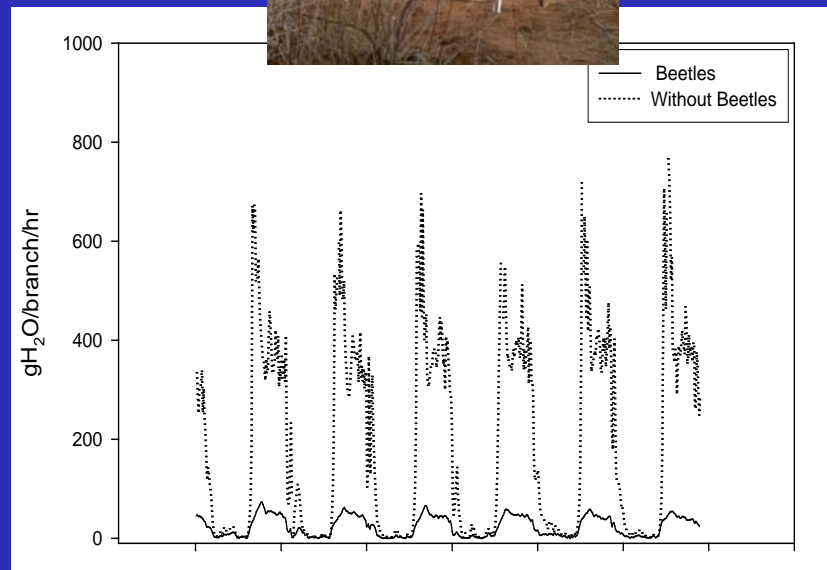
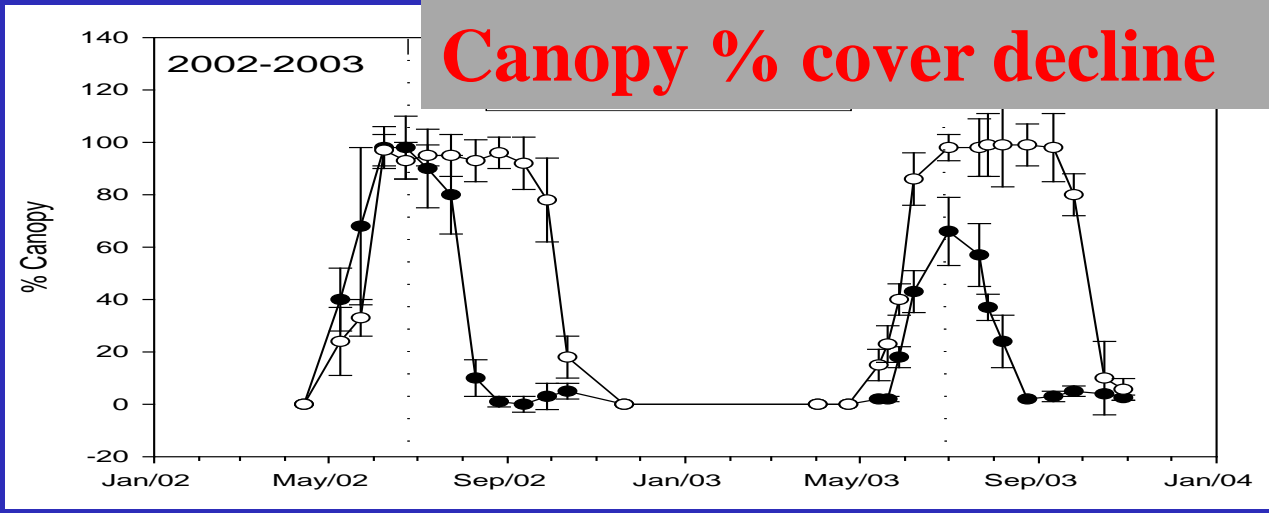


- bushtit
- yellow warbler
- sage sparrow
- Bullock's oriole
- Say's phoebe
- Townsend's warbler
- black-bill magpie
- lark sparrow
- western kingbird
- western meadowlark
- warbling vireo
- Bewick's wren
- blue grosbeak
- brown-head cowbird
- raven
- blue-grey gnatcatcher
- spotted towhee
- lazuli bunting



Ecosystem Benefits

Canopy % cover decline



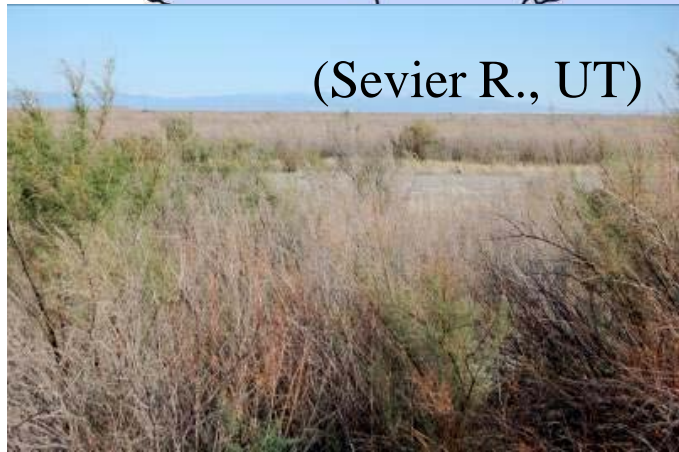
Seasonal Evapotranspiration

↓ 65% Yr 1, ↓ >90% Yr 2
(Pattison et al.)

Desired Vegetation Recovery



Suppression does
lead to recovery of
vegetation and
ecosystem function



Diorhabda introduced to Virgin River from Sevier River/Delta site by county agency in 2006

Tamarisk defoliation in St. George, UT in 2008

Diorhabda now in contact w/ SWFL



Spread and Defoliation can be Rapid & Dramatic

June 1



July 1



Virgin River 2010:
Before and After
Biocontrol

Beetle # / Sample

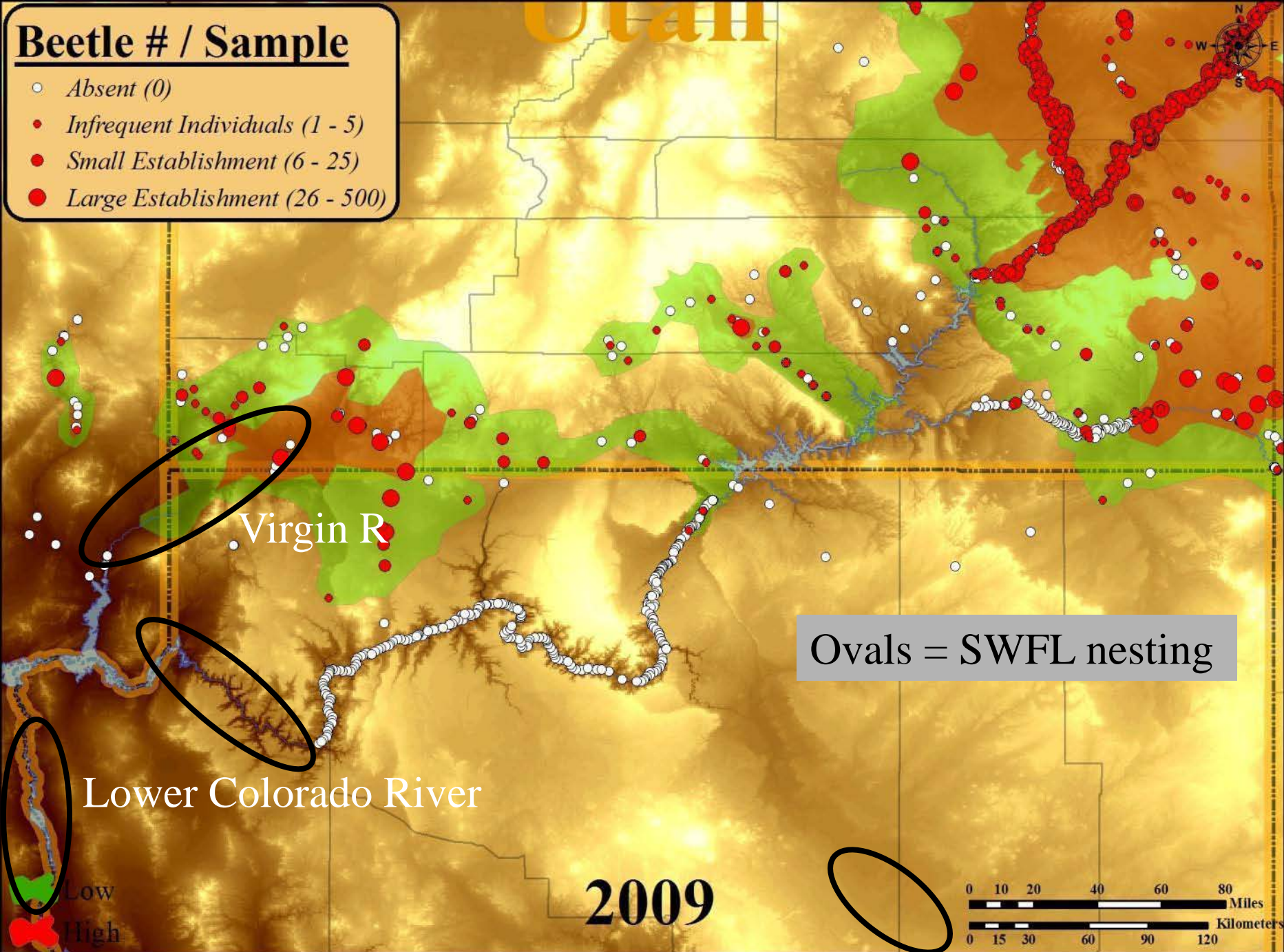
- Absent (0)
- Infrequent Individuals (1 - 5)
- Small Establishment (6 - 25)
- Large Establishment (26 - 500)

Virgin R

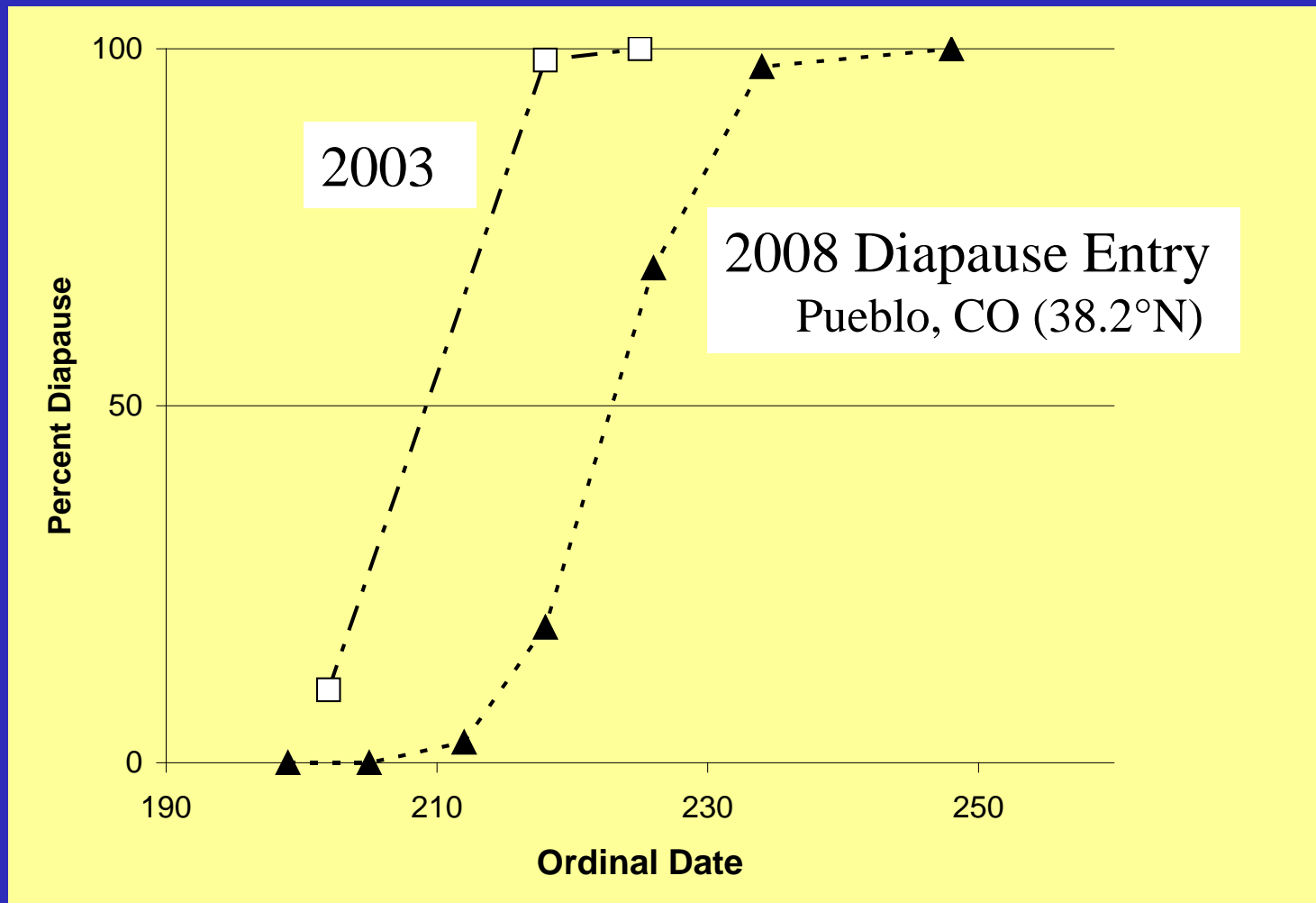
Lower Colorado River

Ovals = SWFL nesting

2009



Natural Selection for Delayed Diapause = Beetles Survive Further South



NOT WANTED IN ARIZONA: TAMARISK LEAF BEETLES



Tamarisk beetles at St. George, Utah
Credit: Mary Ann McLeod, SWCA Assoc



Tamarisk beetle defoliation below St. George, Utah
Credit: Christiana Manville, U.S. Fish & Wildlife Service



Southwestern willow flycatcher nest in defoliated tamarisk on Virgin River, St. George, Utah
Credit: Pam Wheeler, Utah Division of Wildlife Resources



“Imported leaf-eating bug is chewing up scenery from Moab to Salt Lake City”
Salt Lake City Weekly

“Biological war wreaks havoc on endangered bird's habitat”
Associated Press



CENTER *for* BIOLOGICAL DIVERSITY

FOR IMMEDIATE RELEASE
TUCSON, Arizona Mar 27, 2009

Lawsuit Filed to Save Endangered Songbird; Southwestern Willow Flycatcher Threatened by Release of Imported Beetle

The Center for Biological Diversity and Maricopa Audubon Society filed a lawsuit ...against the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) and the U.S. Fish and Wildlife Service. The suit seeks review by the U.S. Fish and Wildlife Service of **APHIS's program of granting permits for the indiscriminate introduction** of the tamarisk leaf-eating beetle into critical habitat of the endangered southwestern willow flycatcher.

“We face loss of the flycatcher in the Southwest because APHIS has broken its promises and refuses to take responsibility for its actions. We now must appeal to the courts to help us save this adorable little migratory songbird,” said Dr. Robin Silver of the Center for Biological Diversity.

USDA ‘Loses’ - “Washes Hands” of *Tamarix* Biocontrol

15 June 2010 USDA APHIS PPQ Moratorium for Biological Control of Saltcedar

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

The saltcedar leaf beetle, *Diorhabda* species...was previously permitted ... 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.
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 and environmental release of *Diorhabda* spp.
4. The PPQ Permit Unit has cancelled all issued (i.e., active) permits for interstate movement and environmental release of *Diorhabda* spp.

In the event that endangered species issues are resolved, consultation between USDA APHIS and the U.S. Fish and Wildlife Service may be initiated...human-assisted movement of *Diorhabda* spp... is not authorized by APHIS, and may constitute a violation of the Endangered Species Act which could result in criminal punishment and/or fines.... up to \$250,000 per violation.

News Reports and Commentary tend to de-legitimize the biocontrol program

washingtonexaminer.com

The Examiner

The Seattle Times

“USDA stops using beetles vs. invasive saltcedar”

DiscoveryNews.

planet green

“Fed halts use of beetles vs. saltcedar”

 Wildlife Management Institute

“Saltcedar, Flycatcher and Saltcedar Leaf Beetle—Three Part Disharmony”

Meanwhile, will 'Willow' Flycatcher survive without 'Willows'?



90% of nests in
Native or Mixed
Native/Exotic Veg

Sogge et al. 2005

Absent from *Tamarix*
Monocultures

Trend toward *Tamarix*
dominance over time

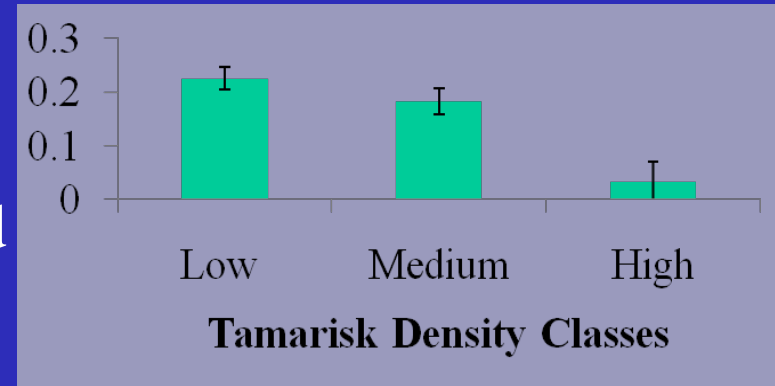
Mortensen et al. 2009, Whiteman 2009

Riparian Ecosystems are not static



Tamarix Dominance increases fire threat to native riparian veg

21 of 25 saltcedar stands on the lower
Colorado River burned in a 15-year period
(Anderson et al. 1977)



...and to wildlife, e.g. SWFL –
2 nests destroyed



Does Willow recovery benefit SWFL?



“Hubbard (1987) found 55% of 20 nests in New Mexico to be in tamarisk...all from Elephant Butte Reservoir...and the sub-species no longer even occurs at Elephant Butte.”

Elephant Butte, Rio Grande NM

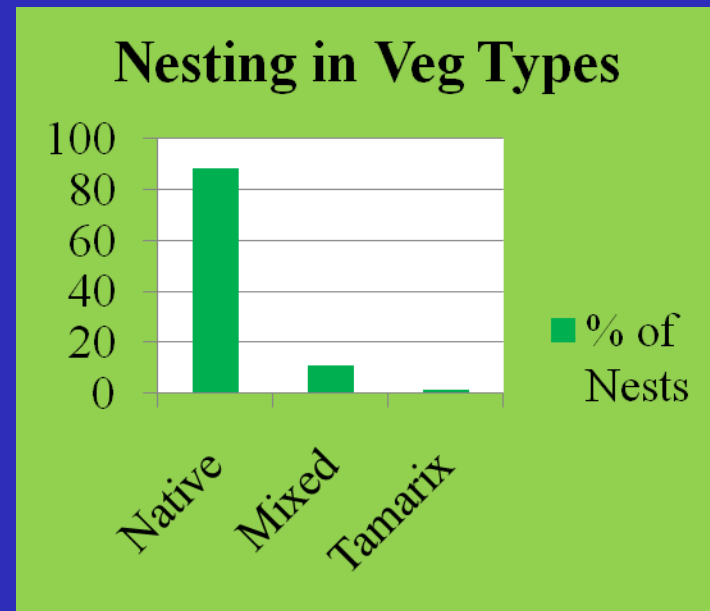
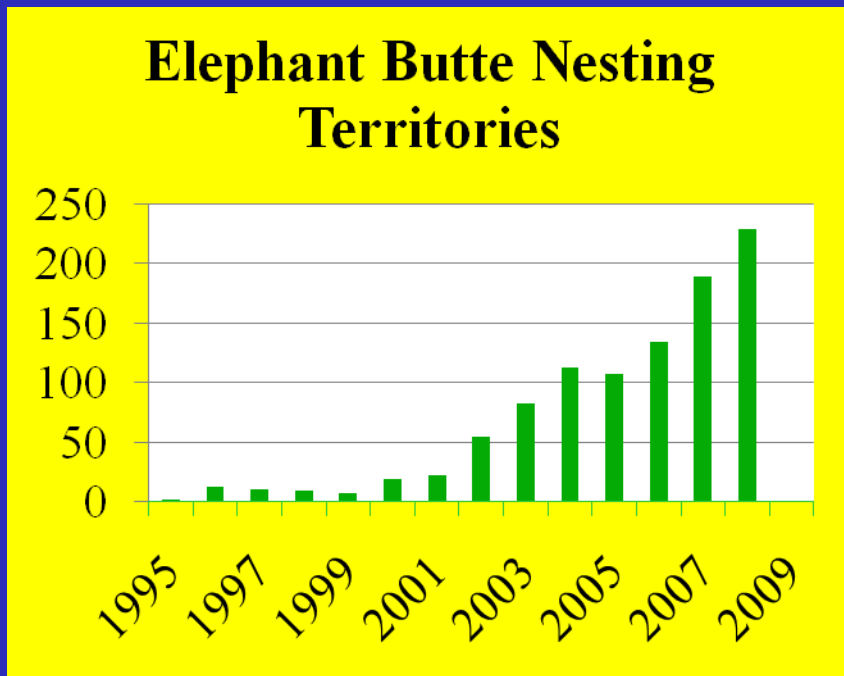


Site Tenacity of SWFL during initial inundation



Willow & Cottonwood recovery at reservoir

More Willows => More Flycatchers



(Ahlers & Moore 2009)

Similar response at Roosevelt Lake (Salt River) with SWFL recruitment to newly established willows after flooding

Tamarisk is not a preferred veg type, but can be an acceptable element



Need strategies to inhibit dominance and encourage natives – with disturbance [flood, fire, livestock]



Biocontrol can promote Native Diversity

Will active Re-vegetation lead to SWFL colonization?



Restoration projects in Virgin River Watershed:
2008 – 2010 (*Diorhabda* present)



Virgin River: St. George, UT With Willow Re-vegetation

(Utah Dept of Wildlife, M. McLoed)

2009 - 10 females (one in Native, 9 in tamarisk-dominated sites)

13% of nests fledged; 40% failed to hatch

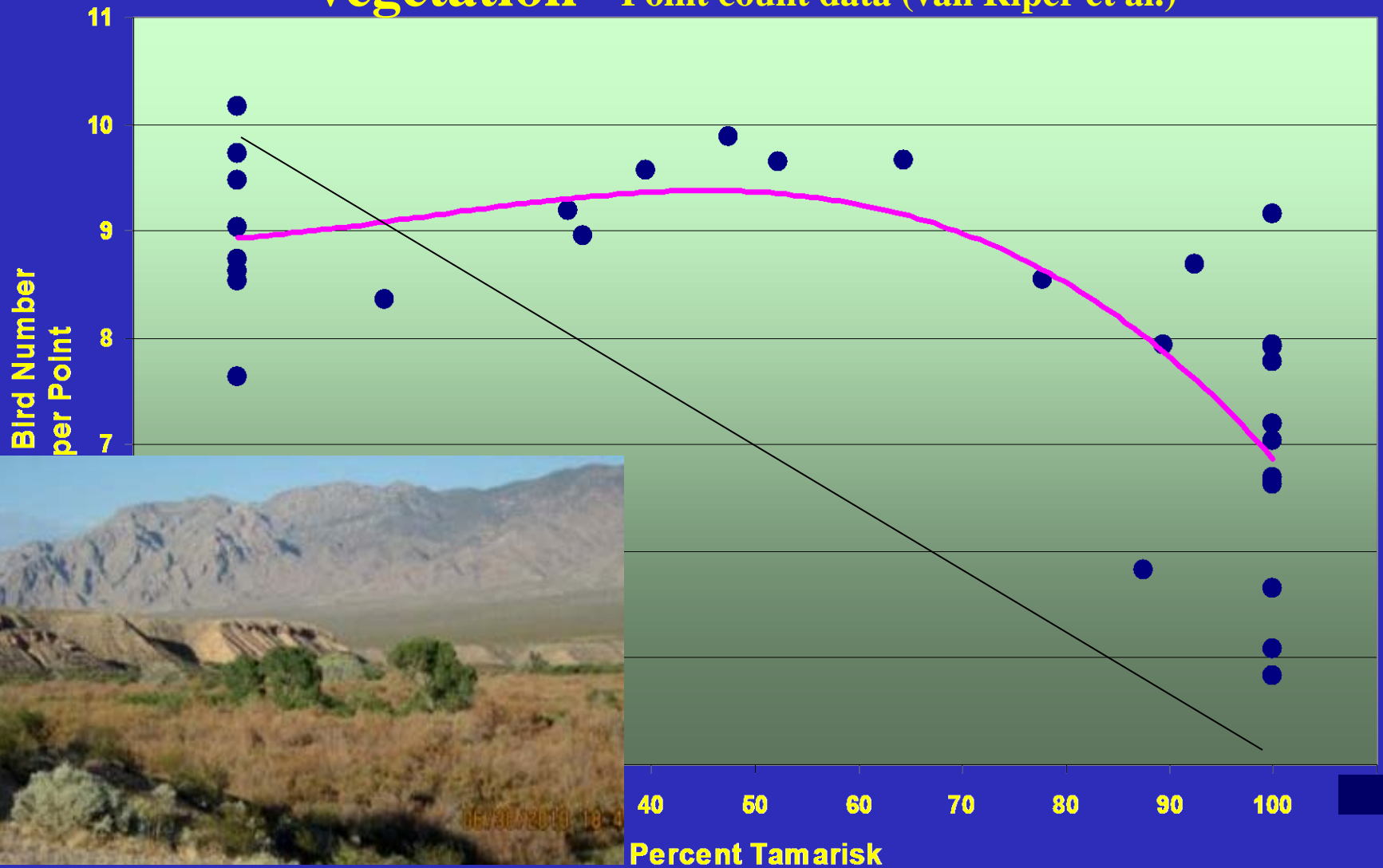
2010 - 9 females (major shift to native-dominated sites)

30% successfully fledged

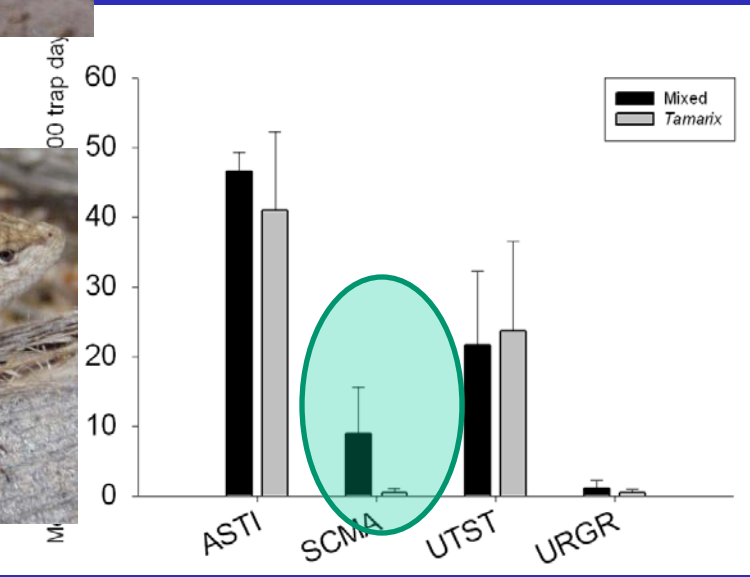
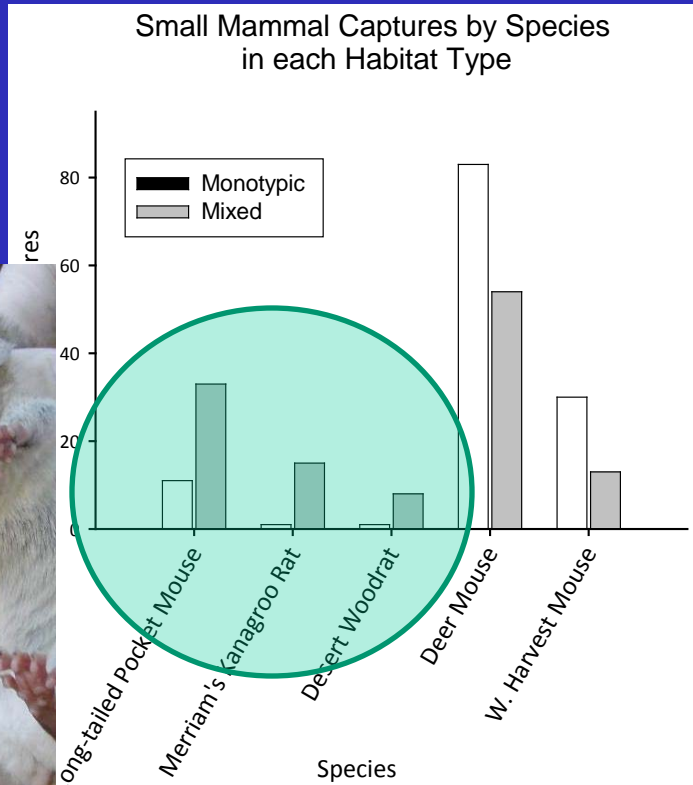
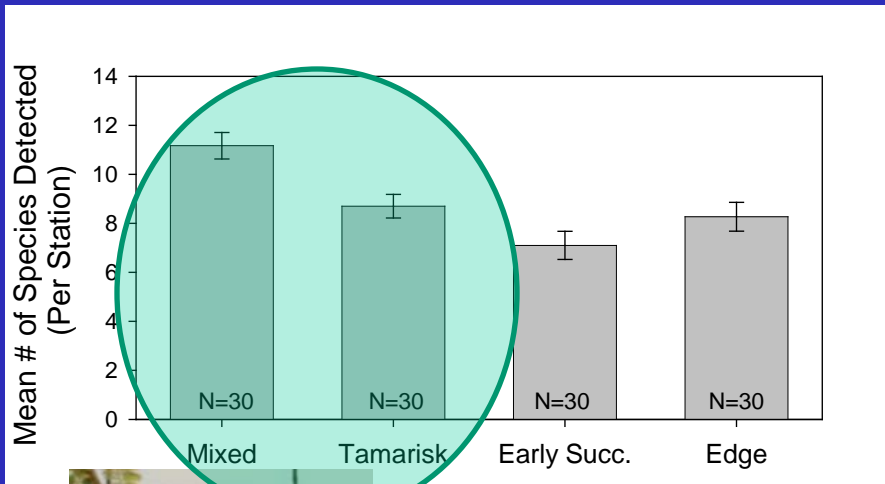


Threshold response by warblers to introduced vegetation

Point count data (van Riper et al.)



Key to retain or restore native vegetation component

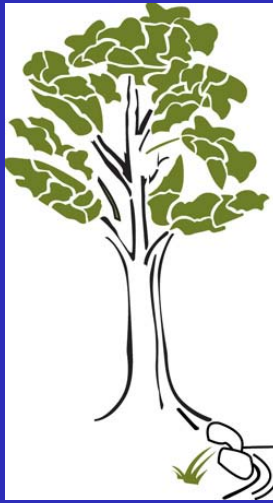


Propagule Islands Restoration Strategy



City of Mesquite
Restoration Site

Tamarisk Coalition

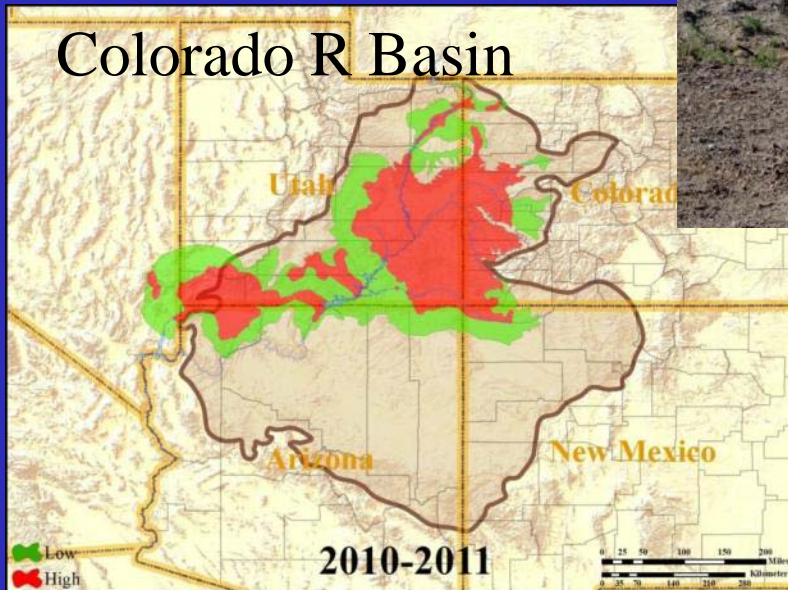


a non-profit alliance
working to restore riparian lands

Riparian Restoration - Willow Flycatcher Action Plan



Colorado R Basin



A Private Foundation proposes to fund major restoration of bird habitat in context of *Tamarix* biocontrol – Partners include Tamarisk Coalition, Universities, US-FWS, USGS, NRCS, BuRec, et al.

Enhancing relative abundance of native riparian plants, by BioControl and Restoration will:

1. Improve wildlife abundance & diversity
2. Reduce wildfire risk & ecological impacts
3. Improve ecosystem function & services
4. Allow APHIS and FWS to resolve ESA Conflict



In Changed Climate...Golf Courses will save Biodiversity



