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

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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)
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° weeds

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

Salsola spp.
(Russian thistle)
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

North of 38° or 200 mi from SWFL nesting in tamarisk
Humboldt River (NV) in 2002

Defoliates by ‘scraping’ tissues, causes desiccation.
Population Expansion!

2003: 2 ha. ↑ 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
Introducing a new trophic level (Primary Consumer) promotes higher trophic levels (Predators)
Birds and *Diorhabda* in Tamarisk (Longland et al.)

**Diorhabda present**

- 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

**Diorhabda absent**

![Bar graph showing mean number of individuals per transect with bird species listed.](image)
Canopy % cover decline

Ecosystem Benefits

Seasonal Evapotranspiration
↓ 65% Yr 1, ↓ >90% Yr 2
(Pattison et al.)
Desired Vegetation Recovery

Before Biocontrol

After Biocontrol

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
Virgin River 2010: Before and After Biocontrol

Spread and Defoliation can be Rapid & Dramatic

June 1

July 1
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

2003 Diapause Entry
Pueblo, CO (38.2°N)

2008 Diapause Entry
Pueblo, CO (38.2°N)
NOT WANTED IN ARIZONA:
TAMARISK LEAF BEETLES

“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

US Fish & Wildlife Service campaign poster
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

“USDA stops using beetles vs. invasive saltcedar”

“Fed halts use of beetles vs. saltcedar”

“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

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

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

(Ahlers & Moore 2009)
Tamarisk is not a preferred veg type, but can be an acceptable element. Biocontrol can promote Native Diversity. 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?

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

- Mixed Tamarisk Early Succ. Edge

- Mean # of Species Detected (Per Station)

- N=30

- Species
  - Long-tailed Pocket Mouse
  - Merriam’s Kangaroo Rat
  - Desert Woodrat
  - Deer Mouse
  - W. Harvest Mouse

- Unique Captures
  - Monotypic
  - Mixed

- Small Mammal Captures by Species in each Habitat Type
Propagule Islands Restoration Strategy

30 Control Plots (>60% Tamarisk cover)
35 Treatment Plots (<5% Tamarisk cover)

• Each plot 6.25 ha

City of Mesquite Restoration Site
Riparian Restoration - Willow Flycatcher Action Plan

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