Tamarisk Biocontrol and Habitat Recovery

Tom Dudley, Meghan Taylor, Gail Drus – UCSB
Ken Lair - Harvey Assoc. (& Bur. of Reclam.)
Dan Bean - Colorado Dept of Agriculture
Curt Deuser - National Park Service, NV
Matt Brooks, Steve Ostoja, - US Geol. Survey, CA/NV
Nora Caplette - BLM, NV
Biocontrol Isn’t New: Routine in agricultural/dispersed production systems

e.g. Leafy spurge in Montana – Before/after *Aphthona* release
Biocontrol in Ecosystem Conservation

New Goals

- Suppress abundance/impact of invasive species in natural ecosystems
- Promote conservation and recovery of native vegetation and wildlife
- Restore ecosystem functioning

New clients & critics

- Wildlife/natural resource agencies
- Environmental organizations, etc.
Tamarisk biocontrol program hindered by many controversies

- Appearance of being TOO successful
- Speculative fears of consequences
- Possible non-target effects
- Demand for information before implementation

Controversy driven by Zero-Risk mentality rather than Risk-Benefit assessment
Concerns of Successful *Tamarix* Biocontrol: Single Species - SW Willow Flycatcher

- Biocontrol removes target too fast for native regeneration?
- Habitat too degraded for natives?
- Beetles may be toxic?

Approx. 1% of No. American *Tamarix* distribution is occupied by SWWWF
Questions with *Tamarix* Biocontrol

• Does biocontrol with *Diorhabda* cause major mortality & removal of *Tamarix*?

• Can, or should, recovery of native vegetation be accelerated to replace it (restoration)?

• Will biocontrol simulation and response provide useful information for restoration?

Humboldt Basin NV
Is Tamarisk Biocontrol Too Successful?

Good establishment at sites in Nevada, Colorado, Utah, Wyoming & Texas

Dramatic results announced by popular and USDA media
Humboldt River (NV) in 2002

**Humboldt Basin**

Open release 2001

*D. elongata carinulata* from China

June 11  June 22  June 26  July 9
Humboldt Defoliation

2003: 2 ha. expands to 200 ha.
2004: >10,000 ha. expansion
Dieback and Mortality at Release Site

Approximately 75% *Tamarix* mortality at Ground Zero
**Tamarix Mortality – 1.5 km distant**

Apparent mortality mostly related to fire during winter.
Diorhabda population declines by 2006

Mortality: Floods inhibit pupation
Higher Trophic Level Response

Early Success may primarily be related to low predation impact
Tamarix Mortality – 4 km distant

Mortality low - lesser re-defoliation from surrounding area
Delta, UT Research Site

- Released 2001
- Established 2003
- Sampled 2007

(Sevier R.)
Most releases fail – several causes:
1. Developmental mismatching - latitude/daylength response
2. Predation (ants, arachnids, hemipterans, birds, etc.)
3. Insufficient host plant abundance
4. Unsuitable host species

>50% of Implementation releases also fail
Establishment isn’t Easy
& Establishment ≠ Eradication
Seasonal Evapotranspiration
Water loss reduced ca. 65% in Yr 1, >90% Yr 2 (Pattison et al.)
Birds and *Diorhabda* in *Tamarix* (Hitchcock et al.)

- 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 present**

**Diorhabda absent**

*Mean No. per Transect*
Status of *Tamarix* BioControl

- *D. elongata* can suppress *T. ramosissima* growth and population size
- Initial **Epidemic** impacts dramatic -- **Endemic** impacts moderate as ecological factors regulate *Diorhabda* populations
- ‘Economic’ control may not be common and massive mortality unlikely -- may require other agents (Research phase NOT done)

But, Restoration may still be useful in some locations with inadequate native vegetation
Simulated Defoliation – Test Responses
Prior to *Diorhabda* Establishment
Study site: Virgin River (Utah/Ariz/Nev)
Simulated Defoliation: Clark Co. MS-HCP

Low-dose herbicide to cause defoliation w/out foliage loss or mortality

Proposed for Summer 2006 – Prior to Release

Delayed to Fall 2008 (by FWS project approval, & Concurrence to spray 0.1 acre patches)
Experimental Design – Fall 2008

- Treatment
  - Herbicide (DefSim)
    - 10% Glyphosate foliar spray
  - Control (No herbicide)

- Plot set-up
  - 30 x 30 m/plot
  - 3 plots/treatment
  - 9 trees/plot TC
  - 12 trees/plot litter

Results: Too early to tell.
Simulated Defoliation and Flammability

Defoliated or Not, tamarisk-fueled wildfire remains major threat to biodiversity
Diorhabda established in Virgin River watershed

First overlap of Biocontrol with SWWF

SW Willow Flycatcher nest failure in St. George, UT – Defoliated, but cause unknown
Modified 2008-2011 Program to Study Impacts and Recovery
(UCSB, USGS, NPS, Colo. DOA, NAU, ASU, Clark Co.)

• Monitor *Diorhabda* dispersal, abundance & life cycle

• Assess target impacts & associated assemblage responses (Plants, Inverts, Birds, Herptiles)

• Test ecosystem restoration approaches and assess native propagule status
Tamarix spp. dominate but natives present, may be recruitment-limited

Experimental planting to jump-start restoration Cottonwood/willow & Mesquite (honey, screwbean)

Goal: Promote propagule sources to sustain recovery
Restoration Experimental Methods

UCSB - M. Taylor, G. Drus, USGS - M. Brooks, S. Ostoja, BLM - N. Caplette, NPS - C. Deuser, Harvey Assoc/BOR - K. Lair

Populus, Salix, Prosopis, Acacia & understory spp.
Goal: Create habitat islands and propagule sources for short-term habitat and long-term riparian restoration

Methods include:
- Pole cuttings
- Container – shallow & deep
- Horiz. Willow wattles
- Nurse plant protection
- Zeolite water columns
For landscape-level invasive species, biocontrol may be the ONLY feasible weed management approach...

Does undocumented risk in small area outweigh benefits across the West?

(Humboldt R., NV)
Colorado River, USA

Xinjiang, China

Colorado Basin Riparian Restoration Project – Tamarisk Coalition

Biocontrol monitoring and experimental restoration in 6 demonstration watersheds