Complexity and Constraints of Tamarisk Treatment in the Mojave River Watershed

Ken Lair, Lair Restoration Consulting
Apple Valley, CA

Chuck Bell and Jackie Lindgren,
Mojave Desert Resource Conservation District
Victorville, CA

Cal-IPC 2017 Symposium
Palm Springs, CA
October 24-27, 2017

Tamarisk species effects – two (possibly three) species – *Tamarix parviflora, T. ramosissima, T. chinensis*

– with possible hybrids between the latter two species.
– different phenological maturation rates.

Tamarix ramosissima

Tamarix parviflora

- Mojave River watershed dynamics
  - Significant fall in elevation, from Mojave Forks (south) to Barstow (north), yielding significant differences in riverine micro-climate.
  - Significant changes in geology affecting both aerial micro-climate (e.g., Mojave Narrows), and particularly groundwater depth.
    - ✓ Geologic "sills" at Mojave Narrows and Camp Cady, providing shallow water tables for typical (*Populus / Salix*) riparian habitat.
    - ✓ Other areas without sills, keeping groundwater at deeper depths, yielding open, wind-scoured washes.
- Different optimum herbicidal treatment timing
  - *T. parviflora* – earlier
  - *T. ramosissima / chinensis* – later
- Requirement to treat after September 15 to avoid bird nesting period necessitates late treatment, which is not optimum for *T. parviflora*.
- Probable differential herbivory by *Diorhabda* species (if and when introduced), with demonstrated *Diorhabda* preference for *T. ramosissima / chinensis*.

Diurnal timing effects on foliar spraying

- Southwest desert environment (heat and aridity) affects optimum timing during the day for foliar spraying
  - Chemical volatilization – increases herbicide "lift and drift"
  - Tamarisk stomatal opening reduction or restriction above 90°F – reduces atmospheric exchange – reduces herbicide uptake.
- Applicator constraints – work limited hours (early, partial days) during hotter air temperatures.

Plant morphological effects

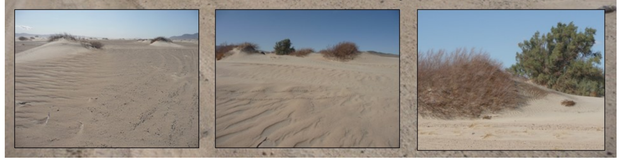
- Scattered, patchy stand distribution = increased time and labor for coverage.

Plant morphological effects

- Individually large, clonal ("clumpy") plants, with layered canopies and very high canopy volume (laterally and vertically).
  - Increased time, labor, materials, and need for higher pressure sprayer technology for full canopy coverage with foliar techniques.
- Nearly impossible to conduct basal bark treatment due to limited access to interior of plant canopies.
- Increased time, labor, and materials for full coverage with cut-stump techniques because of numerous basal stems per plant.

Soil effects

- Very sandy streambed and riparian soils, resulting from stream flow dynamics and localized high wind erosion impacts.
  - Limits equipment access.
  - Increases water infiltration and deep percolation, while lowering water holding capacity in the root zone.
  - Reduces plant vigor and atmospheric exchange, reducing herbicide uptake.
  - Reduces vigor and competiveness of associated desirable vegetation.
  - Soil and climate interaction makes tamarisk distribution and morphology even more patchy and clumpy.
  - Creates constraints relative to preservation of:
    - ✓ Aesthetics for adjacent landowners.
    - ✓ Streambank and flood control berm stabilization and maintenance.
- Difficult to maintain sufficient cover of desirable species to reduce erosion.



Habitat effects

- Designated southwestern willow flycatcher (*Empidonax traillii extimus*; SWFL) habitat at Mojave Narrows, and potentially at Camp Cady. As such, this presents technical and political issues that might limit options for controlling tamarisk, particularly by biological control agents.
- Dunes formed below tamarisk are habitat for potentially sensitive species such as desert panicgrass (*Panicum urvilleanum*) and desert twinbugs (*Dicoria canescens*).

Water conservation, salvage, and recharge effects / issues

- Waste treatment effluent and aquifer recharge discharge sites into the Mojave River increase islands of tamarisk establishment, propagule dissemination, and stand expansion.
  - CDFW Fishery discharge site [up to 8,000,000 gallons (~25 ac-ft) per day],
  - MWA aquifer recharge sites (2),
  - Victor Valley Wastewater Reclamation Authority and Barstow water treatment ponds and discharge sites.
- Mojave Water Agency – large $$$ and priority consideration – tamarisk control for groundwater salvage.
- Mitigation properties (COE, CDFW, SBCO, and private developers) – $$$ and priority consideration – tamarisk control for habitat improvement.

Field Trial Sites at Victor Valley College and the Lewis Center

Multiple land ownership types

- Must be coordinated for effective, cross-boundary treatment
- Over 600 private landowners
- County land ownership by SBCO Flood Control District (mandate no phreatophytes)
- Federal land ownership by BLM
- State land ownership by CDFW
- Mitigation properties under the management of SBCO, CDFW, USFWS, and COE
- Coordination of funding mechanisms between CDFW, MWA, and MDRCD

Occasional saltcedar genetic mutations after fire injury –

- Stem and leaf coalescence into fans;
- Plants develop resistance to certain types of herbicide treatment.

No scientific studies to date, but field observations indicate it occurs occasionally following plant injury by fire.

Given all these constraints,

- The MDRCD has accomplished approximately 90% control of saltcedar in the Upper and Middle Mojave River system (approximately 60 river miles) – outside of established protection zones related to erosion control and/or landowner non-consents.
- A total of 2,310 actual infestation acres have been treated across multiple land ownerships, over an 8-year program, costing approximately $3,000,000. Treatments included foliar (70%), cut-stump (20%), and mechanical extraction (10%). Imazapyr (Habitat™ or Polaris™) was applied in all foliar herbicide treatments, and triclopyr (Garlon 4™) in all cut-stump treatments.
- Water salvage is estimated at approximately 0.8 acre-feet per acre of saltcedar actual canopy area treated per year (Neale et al. 2011) [1].
- Significant portions of the treated river channel and riparian zones are naturally recovering to predominantly native species through relief from competition with saltcedar, in combination with reduced agricultural irrigation withdrawal from the river system.

[1] Neale, C.M., S. Taghvaeian, H. Geli, S. Sivarajan, A. Masih, R. Pack, A. Witheral, S. O'Meara, and R. Simms. 2011. Evapotranspiration water use analysis of saltcedar and other vegetation in the Mojave River floodplain, 2007 and 2010. Mojave Water Agency Water Supply Management Study, Phase I Report. Department of Civil and Environmental Engineering, Utah State University, Logan, UT; and Bureau of Reclamation, Temecula, CA.

Contacts for More Information:

Ken Lair
Lair Restoration Consulting
559-476-9335
klair1968@gmail.com

Jackie Lindgren
Mojave Desert Resource Conservation District
760-843-6882
Jackie_lindgren@yahoo.com