

Abstracts – Session 7: *Tamarix* Impacts on Native Species

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Effects of Tamarisk Invasion and Biological Control on Birds

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Abstract:

Riparian corridors in the arid western states become conspicuously more homogeneous when they are invaded and dominated by saltcedar (*Tamarix ramosissima*). In contrast to the multi-canopy structure of most native riparian systems, saltcedar generally occurs as a single woody canopy layer with a depauperate herbaceous understory. Bird species diversity is known to be positively associated with foliage height diversity across a wide variety of environments, and riparian corridors tend to be among the most productive habitats for birds in the western states, because they offer more structurally distinct canopy layers than surrounding arid land vegetation. Consequently, bird diversity may be reduced considerably when native riparian vegetation is replaced by saltcedar. Despite this possibility, the implementation of a saltcedar biological control program has been hindered by concerns that a decline in saltcedar populations along invaded riparian corridors could negatively impact local bird populations. To address these issues, we first compared numbers and species richness of passerine birds between paired native and saltcedar-invaded stretches of three western Great Basin river systems during the breeding seasons of 2001 and 2002. With the exception of one river system in one year, all of these comparisons showed significantly greater numbers and species richness of passerines in native riparian vegetation relative to paired saltcedar sites. In 2005, we compared adjacent areas of a saltcedar-invaded stretch along one of these rivers -- one area with an extremely high density of saltcedar leaf beetles (*Diorhabda elongata*) and the other lacking these biological control insects. Numbers and species richness of passerine birds were significantly greater in the presence of *Diorhabda* than in their absence. Finally, we compared frequencies of bird fecal deposits in neighboring saltcedar-invaded areas with versus without *Diorhabda*. Bird droppings occurred significantly more frequently under saltcedar trees in stands with *Diorhabda* present. Taken together, our results indicate that saltcedar invasions reduce local numbers and diversity of passerine birds and that efforts at biological control of saltcedar can incur at least short-term benefits for passerine birds.

Native and exotic riparian leaf litter as food for aquatic macroinvertebrates: Tamarisk, Cottonwood, and Russian olive

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Abstract:

Non-native tamarisk and Russian olive are the third and fourth most frequently occurring tree species in Western riparian zones (Friedman *et al.* 2005). The invertebrate shredders that live in streams derive a large portion of their diet from riparian allochthonous inputs (e.g. autumn leaf fall). These larval invertebrates are consumed by aquatic invertebrate predators and fish. Emerging insects are in turn consumed by terrestrial predators such as bats, birds, and spiders. Despite the link between riparian vegetation and stream food webs, the effect of exotic tamarisk and Russian olive on invertebrate shredders is unknown. Tamarisk differs from native vegetation

in its chemical composition and leaf morphology, and previous research has suggested that tamarisk may be a poor food for stream invertebrates. Bailey *et al.* (2001) studied in-stream tamarisk leaf pack colonization and suggested that tamarisk is less palatable to aquatic invertebrates than native cottonwood because of its high salt content. They also suggested that because fragile tamarisk leaves decompose more quickly than cottonwood, they provide relatively poor habitat. Other researchers, however, have found no difference between invertebrate colonization of tamarisk and native leaf packs (Pomeroy *et al.* 1999, Moline *unpub. data*).

We compared the relative growth rates of aquatic insect shredders on diets of cottonwood (*Populus deltoides*), Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix* spp.). Crane fly larvae (Diptera: *Tipula* sp.) that are found in Western streams were used as a model shredder in the lab. *Tipula* larvae were maintained in the lab in individual aquaria and fed a single species of leaf material *ad libitum*. The leaf material was soaked in stream water for two weeks prior to the experiment to allow for aquatic biofilm colonization. Tipulid larvae were weighed weekly over a 7 week period. The aquatic insects grew significantly faster (average = 2x) and to a larger final size when fed tamarisk compared to either Russian olive or cottonwood, which were statistically indistinguishable from one another.

Contrary to our expectations, tamarisk appears to be a good food for this common aquatic invertebrate shredder. We did not run the experiment to pupation/emergence, so we are uncertain what effect tamarisk has on *Tipula* fitness. The ecosystem scale effect of tamarisk on stream invertebrates is still unclear, as Western streams tend to be flashy and leaf litter is frequently flushed from the system. Tamarisk leaves are small and may be easily transported downstream. In the laboratory, by contrast, tamarisk leaf litter was retained in the foraging arenas and was constantly available for consumption. In addition, aquatic shredders constitute a relatively small portion of the aquatic invertebrate fauna in Western streams, so the positive overall impact of tamarisk on stream food webs may be small.

Basin-scale hydrology, vegetation, and patch selection by the southwestern willow flycatcher along the Lower San Pedro and Gila Rivers, Arizona

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Abstract:

The southwestern willow flycatcher (*Empidonax traillii extimus*, SWFL) is an endangered riparian obligate songbird whose habitat has been greatly altered by large-scale damming, flow diversion, and groundwater pumping that substantially changed hydrology, riparian vegetation, and nesting habitat quality. To develop long-term conservation strategies for the bird, managers need data that links river processes to breeding habitat suitability. We assessed the relationships between hydrogeomorphic conditions (surface and groundwater hydrology) and riparian vegetation, and assessed SWFL patch selection patterns, along the free-flowing lower San Pedro River and the regulated Gila River in southeastern Arizona. Riparian forest near the confluence of these rivers supports one of the largest concentrations of SWFL in the subspecies range. Results indicated that the Gila River has low patch and structural diversity, and an abundance of tamarisk (*Tamarix ramosissima*) forest, compared to the free-flowing San Pedro River, which had high patch and structural diversity with co-dominant cottonwood-willow (*Populus* spp. – *Salix* spp.) and tamarisk forest. On the San Pedro River, SWFL selection patterns suggested that willow forest was used more than expected, tamarisk less often than expected, and cottonwood in equal

proportion based on availability. On the Gila River, most of the limited cottonwood-willow patches were utilized but were too sparse to allow for determination of selection preference. Willow forest patches were located at lower floodplain elevations, inundated more frequently, and had shallower groundwater compared to tamarisk forest patches. Substantial alteration to the hydrograph and interruption of characteristic fluvial processes by regulation probably are the causes of the low structural diversity of vegetation patches on the Gila River, and could limit temporal availability of SWFL nesting habitat. Preference for willow forest on the San Pedro River highlights the need to further examine the impact to SWFL of plant community shifts from cottonwood-willow to tamarisk forest. For land and water managers, conservation and restoration of SWFL breeding habitat should consider hydrogeomorphic conditions across multiple scales including the influence of basin-scale hydrology on riparian floodplain forests and its constraint on local patch vegetation structure and floristic characteristics.

The suitability of tamarisk as habitat for riparian breeding birds; data and perspectives from the Southwest

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Abstract:

Saltcedar eradication and control projects often have the stated goal of improving habitat values for wildlife, especially birds. An underlying assumption for this goal is that saltcedar is unsuitable as bird habitat, or that it is less suitable than the habitat that will replace saltcedar. While not all bird species use saltcedar to the degree that they use native habitats, many species do breed in saltcedar, and few studies have been conducted to determine if saltcedar control efforts actually benefit the local bird community.

To evaluate the assumption that saltcedar is unsuitable or poor-quality habitat for birds in the Southwest, we synthesized data from avian inventory work, research projects, and bird species accounts. It has long been known that Southwestern Willow Flycatchers breed in some saltcedar habitats; recent research demonstrates extensive use of saltcedar, with no discernible negative effects to flycatcher productivity, survivorship, or physiological condition. Flycatcher use of saltcedar has sometimes been portrayed as a “single species issue”, and an aberration among birds. However, Yellow-billed Cuckoos are widespread and abundant breeders in saltcedar habitat on the Pecos River. Interestingly, cuckoo use of saltcedar is less common along the Rio Grande, and they are not known to breed in saltcedar along the Lower Colorado River. This pattern illustrates that the habitat value of saltcedar can vary across the landscape, even for a single bird species. From a bird community standpoint, use of saltcedar is well documented. Studies from the Colorado River in the Grand Canyon show that populations of many bird species using the saltcedar habitats that now dominate the riparian zone have increased. In addition, the area and volume of saltcedar in a habitat patch was one of the best predictors in models of breeding bird community abundance, diversity, and richness. At a state-wide level, data from the recently completed Arizona Breeding Bird Atlas show that 22 of 29 lowland and mid-elevation riparian breeding species are recorded as nesting in saltcedar. Similarly, data gleaned from the Birds of North America project also show that many species of birds will breed in saltcedar, including important game birds such as White-winged Dove and Mourning Dove. Overall, these data demonstrate that a universal benefit of saltcedar control can not be assumed, as a wide range of birds species use tamarisk for breeding with no universal negative effect.

Given the likelihood that not all saltcedar control sites will support high-quality native vegetation as replacement habitat, a key question will be whether the replacement habitat will provide greater wildlife value (in both quantity and quality) than the saltcedar that was removed. In order to learn from saltcedar control efforts, and provide managers with information for Adaptive Management practices, projects need to (a) articulate local and specific objectives, (b) include measurable response criteria, and (c) assure adequate post-control data collection. Ultimately, effective monitoring will be required to determine if the project's goals have been met, if local and regional bird populations have benefited, and to provide useful information for future saltcedar control efforts.