



Saltcedar: Blight or Benefit?

A 10-year study
on the Lower
Colorado River

By Susan McGinley

There is nothing neutral about saltcedar. Imported to the East Coast from Eurasia as a nursery plant in the early 1800s, the hardy shrub's popularity grew beyond ornamental purposes in the early 1900s, when thousands were planted out West to stabilize irrigation canals and control erosion along elevated Southern Pacific rail lines. Satisfaction turned to alarm when the eight imported species of saltcedar—also called tamarisk—escaped cultivation and spread too fast.

Dense thickets of the drought- and salt-tolerant species *Tamarix ramosissima* now cover vast tracts of the West and Southwest, especially in watercourse (riparian) areas once filled with native willows and cottonwoods. Blamed for guzzling too much water, out-competing native plants and destroying wildlife habitats, saltcedar has been the focus of 25 years of aggressive abatement efforts. To many, the only way to control it is to kill and remove it.

"The longstanding idea is that getting rid of saltcedar would improve the ecology and save water," says Ed Glenn, a senior research scientist in the Environmental Research Laboratory, part of the UA Department of Soil, Water and Environmental Science (SWES). Yet eradication measures are costly, time-consuming and labor intensive—and may not, as new research shows, be entirely necessary.

Glenn and a team of scientists from the UA, the U.S. Geological Survey and other institutions have spent 10 years comparing saltcedar and native plant water use, and assessing riparian zone ecology along the Lower Colorado River, from the Grand Canyon to the delta in Mexico. Funding sources have included NASA, the U.S. Fish and Wildlife Service (USFWS), the U.S. Bureau of Reclamation and many others. The studies have yielded surprising results.

"What we've found using remote sensors calibrated with ground measurements is that saltcedar only uses three feet of water per year, which is less than your backyard lawn, and even less than the native trees," Glenn says. "In comparison, farmers apply seven to nine feet to their alfalfa fields, of which the plants use about six feet, and the rest is lost to runoff or deep infiltration."

To put this in context, the flow in the Lower Colorado is about 15 million acre-feet of water annually. Along this 200-mile stretch, there are nearly 100,000 acres of riparian vegetation; about half

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of that is dense stands of saltcedar and the rest is saltcedar mixed with native plants, according to Glenn.

Studies show that—contrary to popular perception—the heaviest tracts of saltcedar, around 50,000 acres, use only about one percent of the river water from the Grand Canyon to the Mexican border, and all riparian stands together use only about two percent. The same figures apply for the stretch of the Colorado in Mexico that runs from the border to the delta. Thus tearing out saltcedar to save water for native plants and also for cities—another reason given for its eradication—may not save as much as commonly believed.

“For every acre of saltcedar eradicated, it was estimated that as much as 10 acres of water would be salvaged,” Glenn says. “The actual number is nearly zero, because saltcedar uses three feet of water, not 10 feet. With the soil bare, something else will come in and take over, or erosion will set in.”

Glenn worked on a series of saltcedar studies with Pamela Nagler, who initially participated in the NASA-funded study as a UA graduate student and is now an adjunct assistant research scientist in SWES and a research scientist with USGS. The most recent study measured the water use of saltcedar and native plants at sampling sites in the Cibola National Wildlife Refuge on the Lower Colorado River and compared those figures with alfalfa water use in a field adjacent to the refuge.

Measuring plant water use in riparian areas only became possible in the early to mid-1990s, when moisture flux towers were introduced and installed at intervals along various Southwest rivers, including the San Pedro, the Lower Colorado and the Rio Grande. Flux towers precisely measure the moisture passing from the leaves of the plant canopy into the atmosphere.

“We’ve combined the data from the flux towers with the new satellite images that can measure the actual area of the river,” Glenn explains. “It’s like somebody pulled a window shade open and you can see the whole thing. Before, people would use cement catchments or pots, but those aren’t actual measurements of real stands of saltcedar. For the first time, we’re getting an accurate look at what the real vegetation use of water is along the river.”

Along with the water use measurements, researchers also examined saltcedar as a bird habitat in response to the perception that the plant displaces native vegetation used by native and migrating birds. Scientists involved in the bird work include Charles



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A view of the Colorado River in Mexico. The river is free to meander and overflow its banks at times, producing stands of native trees among the dominant saltcedar plants.

Van Riper, a professor in the UA School of Natural Resources (SNR) who has counted birds on the Lower Colorado River for many years, Mark Sogge of the USGS Flagstaff office, and Osvel Hinojosa-Huerta who counted birds in the Colorado River Delta in Mexico, and earned a Ph.D. for this work from the SNR Wildlife and Fisheries unit under professor Bill Shaw.

“It’s actually been shown that birds like saltcedar,” Glenn says. “Insect-eating birds feed off the insects that incubate in the soil underneath the plants when it is moist, while other birds use saltcedar thickets for nesting and protection against predators.”

Along the Lower Colorado, bird surveys have shown that saltcedar supports various bird species, including two endangered native species. The Southwestern willow flycatcher and the yellow-billed cuckoo have moved into saltcedar as a replacement habitat for the willows and cottonwoods,

forcing resource managers to take a second look at whether a zero-tolerance policy for saltcedar is the best course to take.

As an example of the zero-tolerance policy, Glenn notes that herbicide was sprayed on 21,000 acres to control saltcedar along the Pecos River in New Mexico.

“They measured the savings in water and found they could not document any savings at all, and the USFWS has declared that saltcedar clearing is now the single biggest threat to several endangered birds in New Mexico,” he says. “In Nevada, a biocontrol beetle has been released to feed on saltcedar. Unfortunately, if it really caught on, it would cause a problem with taking out a low water-use plant. We wouldn’t know what to replace it with.”

It turns out that saltcedar isn’t inherently invasive—it runs rampant only when human activity diverts river flows. Studies reveal that saltcedar moves into riparian areas and



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An example of a healthy riparian ecosystem in the delta of the Colorado River in Mexico. Saltcedar plants grow in a mixed association with native trees and shrubs, plus aquatic plants and open water, providing an excellent habitat for birds and other wildlife.

displaces native species at the same time that dams and levees have reduced the water coming out of rivers. The reduced stream flow alters the ecosystem, making the area drier and saltier than it was historically, according to Glenn. Native trees no longer thrive under those conditions.

“The trees disappear and the saltcedar moves in,” he says. “It’s easy to look at it as an invasion problem, but scientists go in and just get the facts, and it’s not necessarily what you think.” The UA scientists conducted surveys in pristine streams in Mexico and the natural riparian areas around them, and they found that saltcedar doesn’t enter into natural river systems where there’s a natural ebb and flow over seasons. Rather, it spreads in the areas where the river has been diverted into channels from dams, and as a result, the soil turns salty.

Willows and cottonwoods remain firmly established where free-flowing desert rivers overflow periodically and flood the banks, leaching the salt from the plants. Saltcedar doesn’t compete much with them under those conditions.

“The best kind of ecosystem you could create on disturbed river systems like the Lower Colorado River would be about 10-15 percent native trees and some standing water or wet soil nearby. Saltcedar is great in combination with those trees: the birds like the multilayered canopies,” Glenn says. Saltcedar also benefits agriculture by surviving in the saline brines created by return flows when farmers irrigate crops. “It’s much more feasible to live with the saltcedar and recognize that it doesn’t use much water and does provide habitat for native species, rather than trying to eradicate it and replace

it with plants that are no longer suitable for the environment we’ve created.”

The UA studies support using a pulsed flow along the Lower Colorado, where water is released intermittently in greater amounts from Hoover Dam. This practice would encourage willows and cottonwoods to regenerate—even with saltcedar present—although the area would need to be closely monitored to prevent fires. River terraces accumulate fire-prone litter in a reduced flow situation caused by dams, because there is no flooding to carry it away. Heavy stands of saltcedar can burn in swathes 30 to 40 feet high.

“What we and scientists at other universities have done is a total rethink on the specific ways plants use water, and how you manage it,” Glenn says. “We did have resistance at first, and the restoration community has been slow to change their minds about this, but eventually the story gets out. That’s why science still does drive these processes. Eventually the practices catch up to the science.”

Momentum continues to build in the scientific community regarding the role of saltcedar in the environment. Professor Julie Stromberg at Arizona State University was an early leader in showing that saltcedar could play a valuable role in riparian ecosystems. Researchers at other universities have also clearly demonstrated that saltcedar isn’t a heavy water user, that it grows in the type of salty soils that make up our rivers, and that it supports wildlife, according to Glenn.

“We’ve sort of gone full circle from the saltcedar being added to the landscape, then being regarded as a nuisance, and now being recognized for its value.” ★

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