

## Evaluation of Saltcedar Control - Pecos River, New Mexico

K. W. Duncan, S. D. Schemnitz, M. Suzuki, Z. Homesley, and M. Cardenas

Saltcedar (*Tamarix* spp.) is an introduced phreatophyte growing primarily in riparian areas of western North America. Saltcedar is highly salt tolerant and has been shown to not only thrive on ground water containing 8000 ppm dissolved solids (Gatewood et al. 1950), but also exudes salt from its leaves. Gatewood reported 41,000 ppm dissolved solids in the guttation sap of saltcedar. This ability to disperse highly concentrated salt excretions provides saltcedar a competitive advantage over native plants.

Saltcedar has been labeled as an "extreme" phreatophyte because of its ability to tap and exploit deep water tables. This ability enables saltcedar to survive almost indefinitely in the absence of surface saturation or shallow soil moisture which is required by other plants. Saltcedar has been shown in numerous studies to have very high evapotranspiration rates. Robinson (1965) reported that saltcedar in Arizona used between 4 and 5 acre feet of water per acre per year, while Davenport et al. (1982) showed transpiration rates of 4 to 13 acre feet of water per year.

The phenomenal spread of saltcedar along the Pecos River in New Mexico and the continued reports of high water use by saltcedar prompted the Bureau of Reclamation and the New Mexico State Engineer Office (1967) to estimate that the continued spread of saltcedar could dry up the Pecos River by 2000 or 2010. Hughes (1970) reported removal of 40,000 acres of saltcedar from Las Vegas to Carlsbad could probably yield between 60,000 and 70,000 acre feet of additional water each year. More recently, Weeks et al. (1987) working in the Acme to Artesia reach of the Pecos River reported that annual water use by saltcedar probably is about 0.3 meter greater than that by replacement vegetation. Therefore, Weeks predicted a net gain of one acre foot of water for each acre of saltcedar treated.

The monotypic stands characteristics of saltcedar also affect wildlife populations. Saltcedar provides little browse or seed food source for native North American wildlife species. In comparing the number of birds in cottonwood, willow and mesquite, to saltcedar stands, saltcedar consistently had fewer birds (Cohan et al. 1978, Anderson and Ohmart 1977). Engel-Wilson and Ohmart (1978) observed more birds in cottonwood, willow and mesquite communities than in saltcedar even though the native plants covered less than 98 acres of a 49,000 acre study area. The authors further stated that "cottonwood-willow communities not only contain a higher density of birds than saltcedar but also support a higher species diversity and richness."

Cohan et al. (1978) concluded that saltcedar has a low value for a majority of bird species. However, the wildlife value of saltcedar infested areas can be improved. Cohan et al. (1978) stated that "through a combination of adding more plant species favorable to wildlife and manipulating the vegetative structure, it may prove relatively easy and economically feasible to manipulate saltcedar to enhance the vegetative community for wildlife." The encroachment of saltcedar and subsequent replacement of a diverse native

Sanford D. Schemnitz, is a Professor in the Department of Fisheries and Wildlife Sciences at New Mexico State University in Las Cruces. K. W. Duncan, M. Suzuki, Z. Homesley, and M. Cardenas are with the Cooperative Extension Service, Fishery and Wildlife Sciences and the Experimental Statistics Department at, New Mexico State University

vegetation with dense saltcedar is a drastic habitat change which results in a limited wildlife population. The U. S. Fish and Wildlife Service (1987) stated that "...with the possible exceptions of doves and bees, saltcedar communities are clearly less valuable to wildlife than are native riparian plant communities."

Wildlife populations can be drastically influenced both positively and negatively by the impacts of herbicide applications on vegetation. Herbicides are a widely used and accepted management tool to manipulate and improve wildlife habitat by a wide number of state wildlife departments and federal natural resource agencies (Scifres 1980).

Imazapyr has been found to be extremely nontoxic to wildlife (BLM 1991). Risk use of imazapyr is at a low level ("no risk") according to EPA standards for terrestrial animals when typical application rates are used (US Department of Agriculture 1988). An acute lethal oral dosage for bobwhite quail, mallard ducks and rats is  $> 5000$  mg/kg. Of 22 commonly used herbicides tested, imazapyr had the lowest toxicity (low number = high toxicity) of 500 (mg/kg/day). The next closest nontoxic herbicide had a dosage of 31. Some other widely used herbicides and their toxicity dosage were 2,4-D (1.0), picloram (7.0), simazine (5.0) and tebuthiuron (12.5). Acute toxicity of pesticides are ranked in four categories from severe (parathion  $LD_{50}=3$  mg/kg) to very slight. Imazapyr ranked in the very slight category ( $LD_{50}$  to rats  $> 5000$  mg/kg). Imazapyr was also found to be non-mutagenic and noncancer causing in five assays.

Imazapyr does not leach or move laterally in soils, therefore it does not contaminate groundwater. "Even using the worst case assumptions, the use of ...imazapyr... is not expected to pose unacceptable risks to terrestrial wildlife" (BLM 1991). Imazapyr has been used in such environmentally sensitive areas as the Attwater Prairie Chicken National Wildlife Refuge, Everglades National Park and the Bosque del Apache Wildlife Refuge.

Studies conducted by New Mexico State University scientists have shown imazapyr

(Arsenal) to provide 90-99% control of saltcedar (Duncan and McDaniel 1992). In one study, saltcedar growing in two 13 acre dry lake beds near Artesia, New Mexico, were aerially sprayed with a fixed-wing aircraft in August, 1989. Imazapyr was applied at 1.0 lb ai/acre. In June, 1992, water returned to the surface of one of the two lakes for the first time since 1970. Data from the project indicate the water table on the area rose from a depth of greater than 20 feet below the soil surface to the surface within 34 months after application (Duncan 1993). Saltcedar canopy reduction and mortality was estimated on September 28, 1992 to be 99% and 95.1% respectively. Cost of the application was \$85/acre.

Duncan and McDaniel (1992) also reported that tank mix applications of imazapyr + glyphosate (Rodeo) provided 90-99 control of saltcedar. The advantage of imazapyr + glyphosate applications is cost. Whereas, the cost of aerial application of imazapyr at the recommended rate is approximately \$85/acre, the equivalent application of imazapyr + glyphosate may cost as little as \$60/acre. These costs for herbicide application are in contrast to that of mechanical saltcedar removal of \$600-700/acre as reported by the U. S. Fish and Wildlife Service at the Bosque del Apache (Personal communication 1992). The U. S. Fish and Wildlife Service is attempting to restore the native riparian habitat by a combination mechanical/herbicide/fire operation. The restoration effort involves root plowing, racking and stacking, burning of the piles and individual plant treatment of resprouts with imazapyr.

Every stream and river system in New Mexico is infested or has the potential to be infested with saltcedar. The opportunity to protect existing native riparian habitat and restore riparian habitat is tremendous. However in the past, saltcedar manipulation has been cost prohibitive for large scale studies. Now, with the development of imazapyr and imazapyr + glyphosate tank mixes as management tools, the economics for a large scale study are much more favorable. In this light, the Pecos River Native Riparian Restoration Project (PRNRRP) has been proposed.

The area included in the project extends from the Pecos River bridge on U. S. Highway 82, south approximately six miles on the west side of the river to the southern edge of the former Brainard Lake. The project involves approximately 5,000 acres of saltcedar infested private, deeded land in the McMillian Delta.

The project is sponsored by the Pecos River Native Riparian Restoration Organization (PRNRRO) which is a nonprofit corporation (501C-3). PRNRRO is composed of various community and business leaders in southeast New Mexico. The objectives of the PRNRRO are to:

- 1) Demonstrate native wetlands and wildlife habitat improvement through saltcedar management.
- 2) Demonstrate effective, economical and environmentally sound saltcedar control.
- 3) Monitor possible hydrologic effects from saltcedar control and management.

These objectives will be accomplished through a series of goals. These goals are to:

- 1) Field test and implement integrated control procedures for maximum saltcedar suppression at minimum cost.
- 2) Re-establish native trees, shrubs and grasses for wildlife habitat improvement by increasing plant species diversity and establishment of motts and clumps.
- 3) Monitor ground water levels and surface flow through drainage channels.

The vegetation in the project area will be intensively surveyed to determine the plant composition, density and distribution. This information is to be compared to studies conducted from 1920-1940 by the Bureau of Reclamation prior to saltcedar invasion. The Bureau of Reclamation studies will be used to determine the native plant composition, density and distribution once the saltcedar has been removed.

Current wildlife population data will be collected from treated and control (untreated) areas. Birds will be sampled along transects and mammals sampled on live-trapping grids. Reptile abundance will be determined with drift fences and pitfall traps. This baseline data on the abundance and diversity of birds, mammals and reptiles will be used to measure the response of native wildlife populations to the saltcedar removal and the reestablishment of the native plant community.

## Literature Cited

Anderson, B. W. and R. D. Ohmart. 1977. Vegetative Structure and Bird Use in the Lower Colorado River Valley. In: Importance, Preservation and Management of Riparian Habitat: A symposium. USDA Forest Service General Technical Report RM-43.

Bureau of Land Management. 1991. Final Environmental Statement. Vegetation Treatment on BLM Lands in Thirteen Western States.

Cohan, D. R., W. Anderson and R. D. Ohmart. 1978. Avian Population Responses to Saltcedar along the Lower Colorado River. USDA Forest Service General Technical Report WO-12.

Davenport, D. C., P. E. Martin and R. M. Hagan. 1982. Evapotranspiration from Riparian Vegetation: Water Relations and Irrecoverable loss for Saltcedar. *Soil and Water Conservation* 37:233-236.

Duncan, K. W. 1993. Saltcedar Control with Imazapyr. WSWS 1993 Research Progress Report. Tucson, Arizona. In Press.

Duncan, K. W. and K. C. McDaniel. 1992. 1991 Summary of Range Brush Control Research-Demonstration Trials in New Mexico. Range Improvement Task Force, NMSU Ag. Exp. Station, NMSU Coop. Ext. Service. Report 30.

Engel-Wilson, R. W. and R. D. Ohmart. 1978. Floral and Attendant Faunal Changes on the Lower Rio Grande between Fort Quitman and Presidio, Texas. USDA Forest Service General Technical Report WO-12.

Gatewood, J. S., T. W. Robinson, R. B. Colby, J. D. Hem and L. C. Halpenny. 1950. Use of Water by Bottomland Vegetation in Lower Safford Valley, Arizona. U. S. Geological Survey Water Supply Paper 1103.

Hughes, W. C. 1970. Economic Feasibility of Increasing Pecos Basin Water Supplies Through Reduction of Evaporation and Evapotranspiration, Water Resources Research Institute Report No. 9.

New Mexico State Engineer Office. 1967. Water Resources of New Mexico, New Mexico Planning Office, Santa Fe.

Robinson, T. W. 1965. Introduction, Spread and Aerial Extent of Saltcedar (*Tamarix*) in the Western States. U. S. Geological Survey Professional Paper 491-A.

Scifres, C. J. 1980. Brush Management. Texas A&M Univ. Press. 360 p.

United States Department of Agriculture. 1988. Risk Assessment for the Use of Herbicides in the Southern Region, USDA Forest Service. Southern Region.

U. S. Fish and Wildlife Service. 1987. Saltcedar Control for Wildlife Habitat Improvement in the Southwestern United States. Resource Publication 169.

Weeks, E. P., H. L. Weaver, G. S. Campbell, and B. D. Tanner. 1987. Water Use by Saltcedar and by Replacement Vegetation in the Pecos River Floodplain Between Acme and Artesia, New Mexico. U. S. Geological Survey Professional Paper 491-G.

