

THE SALT CEDAR MANAGEMENT WORKSHOP

PROCEEDINGS OF THE
SALT CEDAR MANAGEMENT WORKSHOP
JUNE 12, 1996
MARRIOTT'S RANCHO LAS PALMAS RESORT
RANCHO MIRAGE, CALIFORNIA

SPONSORED BY

UNIVERSITY OF CALIFORNIA &
COOPERATIVE EXTENSION,
IMPERIAL COUNTY AND UC DAVIS



CALIFORNIA
EXOTIC
PEST PLANT
COUNCIL

PROCEEDINGS

THE SALT CEDAR MANAGEMENT WORKSHOP

JUNE 12, 1996

MARRIOTT'S RANCHO LAS PALMAS RESORT

RANCHO MIRAGE, CALIFORNIA

SPONSORED BY:

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION,

IMPERIAL COUNTY AND UC DAVIS

AND THE

CALIFORNIA EXOTIC PEST PLANT COUNCIL (CaIEPPC)

PREFACE

The Saltcedar Management Workshop was a huge success, attracting more than 150 people from 10 western states. Nine federal agencies were represented, along with four Native American tribes, four state agencies from California and Arizona, numerous local government entities, private consultants, pest control advisors, landscape and nursery businesses, three NGO's (nongovernmental organizations), and three Universities. The extent and severity of the saltcedar problem in the western US is apparent by the interest shown in this workshop.

The Saltcedar Management Workshop happened because of the hard work and thoughtful input by the organizing committee. These people came together one day last March, and in two hours, had outlined the whole workshop and suggested most of the speakers. The members of the organizing committee are listed on the following page. Most of these individuals were also speakers at the workshop. The papers included in this Proceedings should serve as an excellent reference both for workshop attendees and to those who could not join us in Rancho Mirage.

Additional copies of the proceedings are available; to order, send a check payable to the Ag Extension Trust Fund for \$10.00 per copy to Carl E. Bell, Cooperative Extension, 1050 E. Holton Rd., Holtville, CA 92250. Proceedings Editors are Joe DiTomaso and Carl E. Bell

SALT CEDAR MANAGEMENT WORKSHOP

ORGANIZING COMMITTEE

Carl E. Bell, Weed Science Farm Advisor, University of California Cooperative Extension, Imperial County, 1050 E. Holton Rd., Holtville, CA 92250. Phone: (619) 352-9474, Fax: (619)352-0846, E-mail: cebell@ucdavis.edu. Co-Chair and Editor for Proceedings.

Roland deGouvenain, Bureau of Land Management, P.O. Box 2000, North Palm Springs. (619) 251-4829, E-mail: rdegouve@ca2013.psscra.ca.blm.gov. Co-Chair.

Nelroy Jackson, Monsanto Company, 400 S. Ramona Ave., Suite 212, Corona, CA 91719. Phone (909) 279-7787, Fax: (909) 279-7803, E-mail: nejack@ccmail.monsanto.com. Local arrangements. Member of CalEPPC Board of Directors

Joe DiTomaso, Extension Weed Specialist, Department of Vegetable Crops, University of California, Davis, Ca 95616. (916) 754-8715, E-mail: ditomaso@vegmail.ucdavis.edu. Editor for Proceedings.

Tom Lanini, Extension Weed Specialist, Department of Vegetable Crops, University of California, Davis, Ca 95616. (916) 752-4476, E-mail: wtlanini@ucdavis.edu.

Tom Nishimura, American Cyanamid Company, 17454 SW Canal Circle, Lake Oswego, OR 97035. Phone: (503) 635-5804, Fax: (503) 635-6815.

Anthony Chavez, Bureau of Land Management, 150 Coolwater Lane, Barstow, CA 92311. (619) 255-8721.

Cameron Barrows, The Nature Conservancy, P.O. Box 188, Thousand Palms, CA 92276. (619) 343-1234.

Curt Deuser, National Park Service, 601 Nevada Highway, Boulder City, NV 89005. (702) 293-8979.

Jeff Lovich, National Biological Service, Palm Springs Field Station, 63500 Garnet Ave. North Palm Springs, CA 92258-2000. Phone: (619) 251-4823, Fax: (619) 251-4899, E-mail: jeffrey_lovich@nbs.gov.

Bill Wiesenborn, Bureau of Reclamation, P.O.Box 61470, Boulder City, NV 89006. (702) 293-8146.

TABLE OF CONTENTS

PAPERS PRESENTED AT THE

SALT CEDAR MANAGEMENT WORKSHOP

Marriott's Rancho Las Palmas Resort, Rancho Mirage, CA

June 12, 1996

Origin, history and current range of saltcedar in the U.S. Roland deGouvenain, Bureau of Land Management, North Palm Springs, CA	1
Identification, biology and ecology of saltcedar. Joseph M. DiTomaso, University of California, Davis, CA	4
Saltcedar impacts on salinity, water, fire frequency, and flooding. William D. Weisenborn, Bureau of Reclamation, Boulder City, NV	9
A brief overview of the impact of tamarisk infestation on native plants and animals. Jeffrey E. Lovich, National Biological Service, North Palm Springs, CA	13
Partnerships and volunteers for control of saltcedar. Roland deGouvenain, Bureau of Land Management, North Palm Springs, CA and Bruce West, Bureau of Land Management, Barstow, CA	16
Guidelines for recruiting volunteers. Bill Neill, Desert Protective Council, Anaheim, CA	20
Chemical control of saltcedar (<i>Tamarix ramosissima</i>). Nelroy E. Jackson, Monsanto Company, Corona, CA	21
The use of prescribed fire and mechanical removal as means of control of tamarisk trees. Mark C. Jorgensen, California State Parks, Borrego Springs, CA	28
Biological control of saltcedar in southern California. C.J.DeLoach, USDA Agricultural Research Service, Temple TX, Michael J. Pitcairn and Dale Woods, CDFA Biological Control Program, Sacramento, CA	30
Integrated weed management: concept and practice. R. Anthony Chavez, Bureau of Land Management, Barstow, CA	32
Decision criteria for developing saltcedar management programs. Curtis E. Deuser, National Park Service, Boulder City, NV	37

Obtaining the right permits.
Nelroy E. Jackson, Monsanto Company, Corona, CA and Carl E. Bell,
University of California Cooperative Extension, Holtville, CA 39

Invasive weed control and the need for section 404 Clean Water Act permits:
the dual role of the Army Corps of Engineers.
Eric D. Stein, US Army Corps of Engineers, Los Angeles, CA 40

An approach to site restoration and maintenance for saltcedar control.
Thomas B. Egan, Bureau of Land Management, Barstow, CA 46

Saltcedar management: a success story.
Curtis E. Deuser, National Park Service, Boulder City, NV 50

Saltcedar management workshop, 1996 participant list 53

ORIGIN, HISTORY AND CURRENT RANGE OF SALT CEDAR IN THE U.S.

Roland C. de Gouvenain

USDI Bureau of Land Management
P.O. Box 2000
North Palm Springs, CA 92258-2000
email rdegouve@ca2013.psscra.ca.blm.gov

I. ORIGIN/TAXONOMY

The genus *Tamarix* (common name "tamarisk") contains many species (as many as 54 are formally recognized) originating from widely dispersed areas located in arid and semi-arid regions of the Old World (Baum, 1967; DeLoach, 1989). Examples are *Tamarix pentandra* from the Middle East, *T. articulata* and *T. tetragyna* from Israel, *T. articulata-africana* from the Libyan Sahara, *T. aphylla*, *T. ericoides* and *T. dioica* from India and Pakistan, *T. chinensis*, *T. parviflora* and *T. ramosissima* from southwestern Asia, *T. taklamakanensis* from the Sinkiang, *T. gallica* from Sicily and Morocco and *T. gallica canariensis* from the Canary Islands (DeLoach, 1989). There are no species of tamarisk native to the New World (DeLoach, 1989).

II. HISTORY/IMPORT INTO THE U.S.

Eight tamarisk species were introduced in the U.S. in the early 1800's, mostly from Asia (DeLoach, 1989). Some were introduced for their ornamental values (e.g., *T. chinensis* and *T. ramosissima*), others for planting in wind breaks (e.g., *T. aphylla*) or to stabilize eroding stream banks (Neill, 1985).

III. PRESENT DISTRIBUTION IN THE U.S.

While *T. aphylla* (a large evergreen tree often planted along railroad tracks and referred to as "athel") has invaded some riverain ecosystems in Australia (Griffin et. al., 1989), it has not acquired weedy habits in North America. This is not the case for *T. chinensis*, *T. parviflora* and *T. ramosissima* (small deciduous trees or shrubs often called "salt cedar") which are invasive weeds throughout the southwestern United States (Kerpez and Smith, 1987; Kunzmann et al., 1989). They have successfully invaded nearly every drainage system in arid and semi-arid areas, occupying over 607,050 hectares (Brotherson and Field, 1987), including approximately 6,475 hectares in California (Johnson, 1987). Today, salt cedar occupies suitable habitat west of the Great Plains, north into Montana and south into northwestern Mexico (DeLoach, 1989).

A4

A3
A3
A first phase of the spread of salt cedar in the southwestern U.S. affected the floodplains of major drainages. By the 1940s, saltcedar had spread through extensive areas along the Gila, Salt, Pecos and Colorado River, as well as the Rio Grande (Horton, 1977). Less severe and seasonally altered flooding regimes brought about by the dams and flood control structures constructed along these rivers provided ideal conditions for the establishment, reproduction and spread of salt cedar (DeLoach, 1989; Kerpez and Smith, 1987). It is estimated that 1400 square miles of floodplain land in the western U.S. was occupied by salt cedar by 1961 (Neill, 1985). Large intermittent desert streams, such as the Mojave River near Barstow, California, have seen their original riparian vegetation of willows and cottonwoods replaced by salt cedar, but disturbances other than flood control may have favored that process. In Afton Canyon, 70% of the original native vegetation has been replaced by salt cedar, mostly since the 1960s. Reduced river flows, off-road vehicle disturbance, year-round grazing and native tree cutting are hypothesized to have contributed to that vegetation type conversion (Lovich et al., 1994).

More recently, salt cedar has expended its range into interior desert riparian habitats that are otherwise unaffected by human activities. This invasion of desert riparian areas by salt cedar has occurred fairly recently, during the last couple of decades (Lovich et al., 1994). In the Colorado Desert of southern California, *Tamarix ramosissima* can now be found in many of the springs (e.g., Buzzard Spring in the Eagle Mountains), streams (e.g., Palm Canyon in the Santa Rosa Mountains), and in some of the more mesic desert washes (e.g., Thousand Palm Canyon in the Coachella Valley, prior to eradication).

LITERATURE CITED

- Baume, B.R., 1967. Introduced and naturalized tamarisks in the United States and Canada [Tamaricaceae]. *Baileya* 15:19-25.
- Brotherson, J.D. and D. Field, 1987. *Tamarix*: impacts of a successful weed. *Rangelands* 9(3):110-112.
- DeLoach, C.J. 1989. Prospects for biological control of saltcedar (*Tamarix* spp.) in riparian habitats of the southwestern United States. *In*: Proc. VII Int. Symp. Biol. Contr. Weeds, 1988, Rome, Italy. Delfosse, E.S. (ed.). 1st. Sper. Patol. Veg. (MAF), pp. 307-14 (1989).
- Griffin, G.F., Stafford, D.M., Morton, S.R., Allan, G.E. and K.A. Masters, 1989. Status and implications of the invasion of tamarisk (*Tamarix aphylla*) on the Finke River, Northern Territory, Australia. *J. Environ. Manag.* 29:297-315.
- Horton, J.S., 1977. The development and perpetuation of the permanent tamarisk type in the phreatophyte zone of the southwest. USDA For. Serv. Gen. Tech. Rep., U.S. Rocky Mountain For. Range Exp. Sta. 43:124-127.

Johnson, S. 1987. Can tamarisk be controlled? *Fremontia* 15:19-20.

Kerpez, T.A. and N.S. Smith, 1987. Saltcedar control for wildlife habitat improvement in the southwestern United States. USDI Fish and Wildlife Service. Res. Pub. 169, Washington, D.C.

Kunzmann, M.R., Johnson, R.R. and P.S. Bennett (eds.) 1989. Tamarisk control in the southwestern United States. USDI, National Park Service, Special Rep. No.9 (Revised 1990) 144 pp.

Lovich, J.E., Egan, T.B. and R.C. de Gouvenain, 1994. Tamarisk control on public lands in the desert of southern California: Two case studies. *In*: Proceedings, 46th Annual California Weed Science Society Meeting. San Jose, California.

Neill, W.M., 1985. Tamarisk. *Fremontia* 12(4):22-23.

IDENTIFICATION, BIOLOGY AND ECOLOGY OF SALT CEDAR

Joseph M. DiTomaso

Cooperative Extension Non-Crop Weed Ecologist, University of California, Davis CA

Taxonomy

Tamarix (salt cedar) is one of four genera of Tamaricaceae and is represented by 90 species worldwide. The genus was named after the Tamaris River in Spain and consists of halophytic shrubs and small trees native to Western Europe, the Mediterranean, North Africa, and northeast China and India (Baum 1967). Eight species of *Tamarix* have been introduced into the United States, primarily as ornamentals or for wind breaks and shade. Of these species, five are present in California. Most species are weedy, particularly *T. parviflora*, previously known as *T. tetrandra*, and *T. ramosissima*, previously known as *T. pentandra*. One species which is less weedy is the large evergreen tree, athel (*T. aphylla*). Table 1 compares the morphology, distribution and abundance of the salt cedar species found in California.

Table 1. Comparison of the naturalized five California *Tamarix* species.

Species	Height	Leaves	Flowers	Range	Abundance
<i>T. aphylla</i>	tree <12 m	not overlapping, strongly clasping	5-parted, nectar disk lobes wider than long, stamens alternate disk lobes	San Joaquin valley to desert	escaped populations uncommon, often cultivated
<i>T. chinensis</i>	tree <10 m	overlapping, oblong to narrowly lanceolate	5-parted, nectar disk lobes wider than long, stamens alternate disk lobes	Southern California, primarily desert	uncommon
<i>T. gallica</i>	shrub or tree <8 m	overlapping, linear to narrowly lanceolate	5-parted, nectar disk lobes longer than wide, stamens together with disk lobes	primarily in Southern California, as far north as San Francisco Bay	uncommon
<i>T. parviflora</i>	shrub or tree 1.5-5 m	overlapping, linear	4-parted, nectar disk lobes longer than wide, stamens together with disk lobes	throughout Northern and Southern California	common, serious weed problem
<i>T. ramosissima</i>	shrub or tree <8 m	overlapping, ovate	5-parted, nectar disk lobes wider than long, stamens alternate disk lobes	San Joaquin valley to desert, uncommon in Northern California	common, serious weed problem

Biology

Salt cedar species are phreatophytes (deep-rooted to reach water table) that depend on groundwater for their water supply. However, under some conditions salt cedar can grow where no groundwater is accessible. Thus, it is classified as a facultative rather than obligate phreatophyte (Kerpez and Smith 1987).

Shoot Growth. Weedy salt cedars can grow to heights of 3 to 4 m in a single growing season under favorable conditions (Sisneros 1991). Furthermore, mature salt cedar is remarkably tolerant to a variety of stress conditions, including heat, cold, drought, flood, and high concentrations of dissolved solids. By dropping its leaves and halting growth, salt cedar can withstand lengthy periods of drought. In contrast, mature plants can also survive complete submergence for as long as 70 days (Kerpez and Smith 1987).

Root Growth. The root system of salt cedar is extensive, and is largely responsible for its competitiveness and survival under stress. Initially, the primary root grows steadily downward with little branching until it reaches the water table, which can be at depths of 3 m or deeper (Brotherson and Winkel 1986). Once the water table is reached, secondary root branching becomes profuse.

Adventitious roots easily develop from submerged or buried salt cedar stems. Thus, expansion in salt cedar infested areas can also be through vegetative growth (Kerpez and Smith 1987).

Reproduction. Seedlings mature rapidly and produce small, white or pinkish flowers often by the end of the first year of growth (Neill 1985). Flowers have four or five sepals and petals, three to five styles, and stamens borne on a fleshy, lobed, hypogynous disk. The flowers produce many 3 to 5-valved capsule fruit usually having a tuft of hair on the end to aid in wind dispersal (Kerpez and Smith 1987). Seeds can also be carried and deposited along sandbars and riverbanks by water (Brotherson and Field 1987). A single large salt cedar plant can produce a half million seeds per year, primarily from late May to October.

Germination. Seeds which develop from mature plants are quite small and light (0.1 mg) (Sisneros 1991), and will germinate on saturated soils or while afloat. Once wetted, fresh seeds usually germinate within 24 h (Kerpez and Smith 1987). Due to their short-lived viability, salt cedar seeds must come in contact with suitable moisture within a few weeks of dispersal. Seedling mortality is high when soils are scoured, dry up too quickly, or submergence for four to six weeks following germination (Shrader 1977).

After summer rains, salt cedar seedlings can rapidly colonize new moist areas because flowering and fruiting cycles provide a continual supply of available seeds (Engel-Wilson and Ohmart 1978). This strategy is of considerable advantage over native riparian species since salt cedar can exploit suitable germinating conditions over a longer time interval (Howe and Knopf 1991).

Seedling Establishment. Establishment of salt cedar seedlings occurs in high seasonally saturated soils (Brotherson and Winkel 1986, Brotherson and Field 1987). This requirement is most often met along river or reservoir banks where slowly receding water levels create optimum seed beds. In the initial stages of establishment, roots grow slowly the first two to four weeks, and will not survive more than one day if the soil dries. Although the seedlings can survive submerged for several weeks, they are easily uprooted by even a weak current and do not tolerate flooding within a period of several months subsequent to germination (Kerpez and Smith 1987).

On some occasions salt cedar can become established in typically dry locations if these areas experience an unusually wet spring and early summer, or if rivers or lakes temporarily flood their boundaries (Carman and Brotherson 1982). Once established, salt cedar can survive almost indefinitely in the absence of surface saturation of the soil (Brotherson and Field 1987).

Ecology

Salt cedar grows to about 1,650 m (5,400 ft) in elevation (Brotherson and Winkel 1986) and prefers very saline soils. Typically, salt cedar occupy sites with intermediate moisture, high water tables, and little erosion. However, mature plants can withstand long periods of water inundation (70-90 days). They can resprout vegetatively after fire, severe flood, or treatment with herbicides and are able to accommodate wide variations in soil and mineral gradients (Brotherson and Field 1987).

Soil. Successful stands of salt cedar are generally found in non-rocky soils composed of silt loams and silt clay loams high in organic matter (Brotherson and Field 1987).

Salinity. Salt cedar is not an obligate halophyte but can survive in areas where groundwater concentration of dissolved solids approaches 15,000 ppm (Carman and Brotherson 1982), but typically occur in areas averaging about 6,000 ppm salt (Brotherson and Winkel 1986).

Following fire, higher alluvium salinity and elevated concentrations of phytotoxic boron can delay the reestablishment of native trees and shrubs, particularly *Populus* and *Salix*. These areas are very susceptible to invasion by salt tolerance species of *Tamarix* (Busch and Smith 1993).

Acidity. Salt cedar has a slight preference for alkaline conditions (pH = 7.5) compared to other native shrubs (Brotherson and Winkel 1986).

Allelopathy

Salt cedar exudes excess salt crystals from openings in its scale-like leaves (Neill 1985). It has been reported to contain 41,000 ppm dissolved solids in the guttation sap (Duncan et al. 1993). Not only can these glands concentrate salt, but they also secrete various other ions, including boron (Busch and Smith 1993). These salts are eventually deposited on the soil surface under the plant, sometimes forming a hard crust (Kerpez and Smith 1987). Such deposits of salt-encrusted needles can inhibit the germination of other species (Egan et al. 1993). A combination of this allelopathic effect and the extensive lateral root system contribute to the ability of salt cedar to out compete other vegetation for space and water (Brotherson and Field 1987). In some communities, salt cedar is the dominant overstory species, whereas salt tolerant grasses, such as saltgrass (*Distichlis spicata*), are dominant in the understory (Brotherson and Winkel 1986).

Water Acquisition. The longer the community has been invaded by salt cedar the greater will be the capacity to lower the water table in the soil (Brotherson et al. 1984). With this overall drying out of the habitat, more xeric plant species which occupy the understory in established salt cedar stands.

A dense stand of salt cedar will grow where the water table is between 1.5 and 6 m from the surface (Table 1). Water use of salt cedar is generally considered high, but evapotranspiration rates can vary with water table depth and soil salinity. Under dry or extremely hot conditions, salt cedar does not always transpire at potential rates (Davenport et al. 1982). Water conservation under these situations is of ecological significance as it enables *Tamarix* species which grow in hot desert environments to open their stomata just at daybreak during the coolest and most humid hours of the day. This allows the plants to acquire adequate CO₂ without losing much water. The stomata close during the hotter afternoon hours, further reducing water loss (Hagemeyer and Waisel 1990). Summer evapotranspiration rates can also vary considerably with stand density and other stress conditions (Davenport et al. 1982).

As a facultative phreatophyte, *Tamarix* species are capable of extracting soil moisture from less saturated soils in areas with deeper water tables. This appears to be an adaptation that obligate native

phreatophytes such as *Populus* and *Salix* do not possess (Busch et al. 1992), and may partially explain the competitive exclusion of these native shrubs by salt cedar in southwestern riparian areas.

Table 2. Characteristics of floodplain zones at varying groundwater depths (from Shrader 1977).

Zone	Depth to groundwater (m)	Salt cedar growth	Other vegetation	Water salvage prospects	Other uses
1	1	dwarfed & multi-stemmed	vigorous saltgrass & bermudagrass	little	good grazing, flood passage, minimal wildlife use
2	1.5-2.5	major stands	excellent saltgrass	large savings	wildlife utilization (doves), some grazing, bees
3	2.5-6	major stands	xeric types	great water savings	wildlife utilization (doves), bees
4	>6	scattered individuals	xeric types	none expected	limited use

Literature Cited

- Baum, B.R. 1967. Introduced and naturalized tamarisks in the United States and Canada [Tamaricaceae]. *Baileya* 15:19-25
- Brotherson, J.D. and D. Field. 1987. *Tamarix*: impacts of a successful weed. *Rangelands* 9:110-112
- Brotherson, J.D. and V. Winkel. 1986. Habitat relationships of salt cedar (*Tamarix ramosissima*) in central Utah. *Great Basin Naturalist* 46: 535-541
- Brotherson, J.D., J.G. Carman, and L.A. Szyska. 1984. Stem-diameter age relationships of *Tamarix ramosissima* in central Utah. *J. Range Manage.* 37:362-364
- Busch, D.E. and S.D. Smith. 1993. Effects of fire on water and salinity relations of riparian woody taxa. *Oecologia* 94:186-194
- Busch, D.E., N.L. Ingraham, and S.D. Smith. 1992. Water uptake in woody riparian phreatophytes of the southwestern United States: A stable isotope study. *Ecological Applications* 2:450-459
- Carman, J.G. and J.D. Brotherson. 1982. Comparisons of sites infested and not infested with salt cedar (*Tamarix pentandra*) and Russian olive (*Elaeagnus angustifolia*). *Weed Sci.* 30:360-364
- Davenport, D.C., P.E. Martin, and R.M. Hagan. 1982a. Evapotranspiration from riparian vegetation: Water relations and irrecoverable losses for salt cedar. *J. Soil Water Conserv.* 37:233-236
- Duncan, K.W., S.D. Schemnitz, M. Suzuki, Z. Homesley, and M. Cardenas. 1993. Evaluation of salt cedar control - Pecos River, New Mexico. Gen. Tech. Rep. Rocky Mount. Forest Range Exp. Stn., For. Serv. USDA. 226:207-210

- Egan, T.B., R.A. Chavez, and B.R. West. 1993. Afton Canyon salt cedar removal first year status report. In, L. Smith and J. Stephenson, eds., Proc. Sym. Veg. Manag. Hot Desert Rangeland Ecosystems.
- 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. Proceedings of the National Symposium on Strategies for Protection and management of Floodplain Wetlands. pp. 139-147
- Hagemeyer, J. And Y. Waisel. 1990. Phase-shift and memorization of the circadian rhythm of transpiration of *Tamarix aphylla*. *Experientia* 46:876-877
- Howe, W.H. and F.L. Knopf. 1991. On the imminent decline of Rio Grande cottonwoods in central New Mexico. *The Southwestern Naturalist* 36:218-224
- Kerpez, T.A. and N.S. Smith. 1987. Salt cedar control for wildlife habitat improvement in the southwestern United States. USDI Fish and Wildlife Service. Publ. #169. 16 p.
- Neill, W.M. 1985. Tamarisk. *Fremontia* 12:22-23
- Shrader, T.H. 1977. Selective management of phreatophytes for improved utilization of natural food-plain resources. In, *Water Management for Irrigation and Drainage*, Proc. Soc. Civil Engineers 2:16-44
- Sisneros, D. 1991. Herbicide analysis: Lower Colorado River salt cedar vegetation management study. U.S. Dept. Int. R-91-06. 167 p.