GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Tamarix ramosissima***

Tamarix ramosissima 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Violales	Tamaricaceae

Common name salt cedar (English), Sommertamariske (German), tamarisk (English), tamarix (English)

Synonym *Tamarix pallasii* , var. *brachystachys* Bunge
Tamarix pentandra

Similar species *Tamarix aphylla, Tamarix canariensis, Tamarix chinensis, Tamarix gallica, Tamarix parviflora*

Summary *Tamarix ramosissima* is a rampantly invasive shrub that has dominated riparian zones of arid climates. A massive invasion of *T. ramosissmia* in the western United States has dominated over a million acres. Typically found in conjunction with other *Tamarix* species and resultant hybrids, *T. ramosissima* displaces native plants, drastically alters habitat and food webs for animals, depletes water sources, increases erosion, flood damage, soil salinity, and fire potential.

view this species on IUCN Red List

Species Description
Tamarix ramosissima is a semi-deciduous, loosely branched shrub or small to medium-sized tree. The branchlets are slender with minute, appressed scaly leaves. The leaves are rhombic to ovate, sharply pointed to gradually tapering, and 0.5 - 3.0mm long. The margins of the leaves are thin, dry and membranaceous. Flowers are whitish or pinkish and borne on slender racemes 2-5cm long on the current year's branches and are grouped together in terminal panicles. The pedicels are short. The flowers are most abundant between April and August, but may be found any time of the year. Petals are usually retained on the fruit. The seeds are borne in a lance-ovoid capsule 3-4mm long; the seeds are about 0.45mm long and 0.17mm wide and have unicellular hairs about 2mm long at the apical end. The seeds have no endosperm and weigh about 0.00001 gram. (Carpenter, 2003; Dudley, pers. comm.).
T. ramosissima, *Tamarix aralensis*, and *T. chinensis* can be distinguished from other members of *Tamarix* by their sessile leaves, pentamerous flowers, and hololophic androecial discs. *T. chinensis* and *T. ramosissima* can be distinguished from *T. aralensis* by its caducous petals at the time of seed maturation.*T. ramosissima* and *T. chinensis* may be distinguished by a few microscopic floral characters especially where the filament is inserted into the nectary disk and edaphic affinities. *T. ramosissima* has an eroded denticulate, obovate petals, and is halophilous, while *T. chinensis* has entire sepals, elliptic-ovate petals, and prefers non-halophilous soils (Gaskin & Scheel, 2003)

Notes
There are few plants that are true genetic species of *Tamarix ramosissima* in infested areas, at least in North America. Most of what is called *T. ramosissima* represents a variety of hybrids, including haplotypes of *T. ramosissima*, *T. chinensis*, *T. gallica* and others (Gaskin and Schaal 2002); it even hybridizes with athel (T. aphylla), an evergreen species, in some southwest U.S. locations (Gaskin and Shafroth, in press). The most common genotype in the U.S. is a morphologically cryptic hybrid of *T. ramosissima* and *T. chinensis* not detected in Eurasia (Gaskin & Schaal, 2002).

Lifecycle Stages
Tamarix ramosissima will produce roots from buried or submerged stems or stem fragments. This allows the species to produce new plants vegetatively following floods from stems torn from the parent plants and buried by sediment. Ideal conditions for first-year survival are saturated soil during the first few weeks of life, a high water table, and open sunny ground with little competition from other plants. The seedlings of this species grow more slowly than many native riparian plant species and it is highly susceptible to shading (Carpenter, 2003).

Uses
Often planted as an ornamental and to prevent erosion in arid areas. *Tamarix ramosissima* provides a nectar source for honeybees in some areas, and is widely used in the old world for furniture making and for firewood, for tannin extraction, and for cover for livestock (Dudley, pers. comm.). *T. ramossisima* may also be useful for bioremediation, for instance it takes up perchlorate from groundwater, perchlorate being a pollutant derived from jet fuel (Urbansky *et al.* 2000).
Many species of native birds, including the endangered and federally protected south-western willow flycatcher (*Empidonax traillii extimus*), are able to exploit *T. ramosissima* for shelter and nesting, especially when some native trees remain (Fleishman *et al.* 2003). However, it is mostly foliage gleaners and fairly opportunistic species that use it to a substantial extent - cavity nesters like owls and wrens, drillers like woodpeckers and sapsuckers, frugivores, granivores and other specialists rarely occupy tamarisk (Ellis 1995, Shafroth *et al.* 2005, Hunter 1984, Hunter *et al.* 1985, Cohan *et al.* 1979, Lovich and DeGouvenain 1998, Dudley and DeLoach 2005) and usage by insectivores declines greatly as vegetation dominance by tamarisk increases (Yard *et al.* 2004).

Reproduction
Tamarix ramosissima is highly fecund. It produces massive quantities of minute seeds that are readily dispersed by wind (Carpenter 2003) but are usually only viable for a few days (Dudley pers. comm.). *T. ramosissima* seeds have no dormancy or after-ripening requirements. Germination can occur almost immediately upon reaching a moist site, and germination conditions are broad, good germination being found from 10 to 35°C, but mid-summer seed collections indicated poorer germination rates than those collected in late spring (Young *et al.* 2004). *T. ramosissima* flowered in two flushes, one in April-May and another in late July in northern Arizona, presumably reflecting availability of spring snowmelt and summer monsoon moisture. This species flowered continuously under favourable environmental conditions but the flowers require insect pollination to set seed (Carpenter 2003).

Nutrition
Tamarix ramosissima is a facultative phreatophyte, meaning that its roots are able to reach deep water tables but it is capable of tolerating periods without access to water (Carpenter 2003).

General Impacts
Tamarix ramosissima has displaced or replaced native plant communities and may be a major contributor to the decline of many native plants and animals, including endangered species (Dudley & Deloach, 2004). Alteration of natural flooding regimes through dam construction has resulted in *T. ramossisima* replacing many native tree species, such as cottonwood (*Populus deltoides* subsp. *wislizenii*) and willows (*Salix* spp.), in riparian forests (Everitt 1980; Horton 1977; Robinson 1965; Graf 1978). The invasion of *Tamarix ramosissima* along streams is likely to have altered the food webs in these aquatic ecosystems (Kennedy & Hobbie 2004). The roots of *T. ramosissima* bind together gravel and cobble riverbeds, resulting in enlarged bars and narrowed channels increasing the likelihood of flood (Cooper *et. al* 2003).
The leaf litter and foliage produced by *T. ramosissima* is flammable and encourages the spread of wildfires (Busch 1995; Brotherson & Field 1987; Dudley *et al* 2000). Native vegetation and wildlife is destroyed in these fires, while *T. ramosissima* seedlings are able to increase their spread. This is due to their ability to re-sprout more successfully than native plants following fire (Huntert *et al* 1988; Busch 1995; Ellis 2001; Dudley *et al* 2000).
T. ramosissima is capable of utilizing saline groundwater by excreting excess salts through glands in the leaves causing an increase in surface soil salinity. This increase, combined with dense canopy of saltcedar plants and higher likelihood of fires within stands of saltcedar, results in the elimination of native riparian plants (APHIS, 2000).
T. ramosissima is also known to transpire large amounts of groundwater, which dessicates soils and reduces the water table. Its transpiration rate is similar to native plants on a per-leaf basis but it maintains a larger leaf area per ground area, and therefore uses more water in total (Sala *et al* 1996; Dahm *et al* 2002; Shafroth *et al* 2005; Cleverly *et al* 2002). Because *T. ramosissima* can take up water from non-saturated soils, it has an added advantage in outcompeting native vegetaion (Dudley, pers. comm.).
T. ramosissima posseses many physiological adaptations that allow it to replace the native tree species, especially along human-altered river stretches. These include: high seed production, rapid germination and seedling establishment, high growth rates, high ET rates, drought tolerance, extreme salt tolerance, flood tolerance, the ability to resprout after fire, and high leaf area index (LAI) allowing it to establish quickly and deplete water-tables at the expense of native species These advantages appear to be so overwhelming that, once it becomes established, eradication of it by human intervention is difficult but necessary to restore riparian corridors (Glen & Nagler, 2005).

Management Info
Mechanical: Hand pulling can be used where plants are small, access is difficult, or herbicides cannot be used (Carpenter 2003). Uprooting methods are effective in the short-term because uprooted trees do not resprout. For sawing and mowing, chemical treatment may be necessary to prevent resprouting. Immature plants may often be physically removed by hand with care given to complete removal of the root structure and disposal of the plant by burning or deep burial. Bulldozing, followed by root-plowing is successful, consistent and effective when used on large thickets of established *Tamarix ramosissima*.
Managed flooding can effectively kill *T. ramosissima* on a long-term basis. Repeated flooding is necessary to kill saltcedar seedlings that are rapidly established from windborne seeds. Established saltcedar plants can tolerate flooding for up to 3 months. Conditions suitable for controlled flooding exist in relatively small areas such as highly managed wildlife refuges (APHIS, 2003).
Chemical: Aerial application of the herbicide imazapyr, alone or in combination with glyphosate, is effective and practical for controlling *T. ramosissima* over thousands of hectares, particularly in dense stands where little or no native vegetation is present. Several field trials have produced control rates of > 90% after one or two years (Carpenter 2003).
On smaller sites the cut stump method is successful when triclopyr herbicides are also used. Basal bark applications of Garlon4 were very effective on plants with a basal diameter of less than 4 inches. Burning, followed by herbicide application to the resprouts, also produced excellent results, although this method is not appropriate when *T. ramosissima* exists as a component of native plant communities (Carpenter 2003). The use of triclopyr (Garlon4 or Remedy) mixed with oil and applied as a basal bark or cut stump treatment has been used with great success on scattered infestations, with no resprouting occurring. The basal bark treatment involves applying the herbicide mixture to the lower 18 inches of the plant clear to the ground.
Herbicides used at aquatic sites include Arsenal and Habitat. These are very effective as foliar treatments, but are not selective and must be used with care. Around 30% of tamarisk may resprout after three years when using these herbicides (Baker, 2005. pers. comm.).
Biological: Cattle (and probably goats) will eat *T. ramosissima*.
A biocontrol agent, the saltcedar leaf beetle (*Diorhabda elongate*), has been released in nine states (California, Oregon, Nevada, Utah, Wyoming, Colorado, Montana, New Mexico and Texas), excluding those areas where the endangered southwestern willow flycatcher (*Empidonax traillii extimus* is nesting in tamarisk (Dudley *et al*. 2001, DeLoach *et al*. 2004).
The Athel Pine National Best Practice Management Manual brings together the best management practices available to date on control options for athel pine (*T. aphylla*), tamarisk (*T. ramosissima*) and smallflower tamarisk (*T. parviflora*). It also illustrates successful control programs with case studies that demonstrate how these weeds are managed effectively in Australia. Included are pointers to identify the Tamarix species you are dealing with as each of them are managed using different strategies. The manual includes a 'Decision Support Tree for Tamarix control' to develop a control program for athel pine, tamarisk or smallflower tamarisk based on the type of infestation you have to treat and the options available to you.

Pathway
Introduced as ornamentals and for windbreaks (Sobhian *et. al* 1998).

Principal source: Carpenter, 2003 Element Stewardship Abstract for *Tamarix ramosissima* Ledebour

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Tom Dudley Marine Science Institute University of California Santa Barbara & Natural Resource & Environmental Sciences University of Nevada, Reno. United States

Pubblication date: 2010-10-04

ALIEN RANGE

[1] ARGENTINA
[2] CANADA
[1] SOUTH AFRICA
[1] AUSTRALIA
[1] MEXICO
[30] UNITED STATES

BIBLIOGRAPHY

102 references found for **Tamarix ramosissima**

Managment information

Aber, James S; Eberts, Debra; Aber, Susan., 2005. Applications of kite aerial photography: Biocontrol of salt cedar (*Tamarix*) in the western United States. Transactions of the Kansas Academy of Science. 108(1-2). SPR 05. 63-66

Anderson, G. L., Carruthers, R. I., Ge, Shaokui and Gong, Peng., 2005. Cover: Monitoring of invasive *Tamarix* distribution and effects of biological control with airborne hyperspectral remote sensing , International Journal of Remote Sensing, 26:12, 2487 – 2489

Animal and Plant Health Inspection Service (APHIS)., 2003. Proposed Program for Control of Saltcedar (*Tamarix* spp.) in Fourteen States Draft Environmental Assessment November 2003. Animal and Plant Health Inspection Service U.S. Department of Agriculture, Western Region

Beauchamp, Vanessa B; Stromberg, Juliet C. [Author]., 2007. Flow regulation of the Verde River, Arizona encourages *Tamarix* recruitment but has minimal effect on *Populus* and *Salix* stand density. Wetlands. 27(2). JUN 2007. 381-389

Carpenter, Alan T. 1998. Element Stewardship Abstract for *Tamarix ramosissima* Ledebour; *Tamarix pentandra* Pallas; *Tamarix chinensis* Loureiro; *Tamarix parviflora* De Candolle. The Nature Conservancy.

Summary: Available from: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/tamaram.pdf [Accessed 15 June 2009]

Centre for Invasive Species Research (CISR)., University of California Riverside. Text provided by Jeffrey Lovich, updated by Mark S. Hoddle.

Summary: Available from: http://cisr.ucr.edu/saltcedar.html [Accessed 15 March 2009]

Cleverly, J. R.; Dahm, C. N.; Thibault, J. R.; *et al.* 2002. Seasonal estimates of actual evapo-transpiration from *Tamarix ramosissima* stands using three-dimensional eddy covariance. Journal of Arid Environments 52:181-197.

Cleverly, J. R., S. D. Smith, A. Sala, and D. A. Devitt. 1997. Invasive capacity of *Tamarix ramosissima* in a Mojave Desert floodplain: the role of drought. Oecologia 111:12-18

Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Collins, J.N, May M, Grosso C. 2003. Salt cedar *Tamarix* spp. Practical Guidebook to the Control of Invasive Aquatic and Wetland Plants of the San Francisco Bay - Delta Region.

Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: http://legacy.sfei.org/nis/cedar.html [Accessed 22 May 2010].

The Guidebook is available from: http://legacy.sfei.org/nis/index.html

Cooper, D. J., D. C. Andersen, and R. A. Chimner. 2003. Multiple pathways for woody plant establishment on floodplains at local to regional scales. Journal of Ecology 91:182-196

Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

CRC Weed Management, 2004. Weed Management Guide, Athel Pine or Tamarisk- *Tamarix aphylla*

Summary: Available from: http://www.wyong.nsw.gov.au/environment/Category_five_weeds_Athel_pine.pdf [Accessed 26 May 2009]

D Antonio, C. M.; Mack, M. M.; and Dudley, T. L. 1999. Disturbance and biological invasions: direct effects and feedbacks. Pp. 413-452, In Walker, L. R. (ed.) *Ecosystems of the World No. 16: Ecosystems of Disturbed Ground*. Elsevier Press, Amsterdam.

DeLoach, C. Jack., Phil A. Lewis, John C. Herr, Raymond I. Carruthers, James L. Tracy, Joye Johnson., 2003. Host specificity of the leaf beetle, *Diorhabda elongata deserticola* (Coleoptera: Chrysomelidae) from Asia, a biological control agent for saltcedars (*Tamarix*: Tamaricaceae) in the Western United States. Biological Control Volume 27, Issue 2, June 2003, Pages 117-147

DeLoach, C. J.; Carruthers, R.; Dudley, T.; Eberts, D.; Kazmer, D.; Knutson, A.; Bean, D.; Knight, J.; Lewis, P.; Tracy, J.; Herr, J.; Abbot, G.; Prestwich, S.; Adams, G.; Mityaev, I.; Jashenko, R. ; Li, B.; Sobhian, R.; Kirk, A.; Robbins, T.; and Delfosse, E. 2004. First results for control of saltcedar (*Tamarix* spp.) in the open field in the western United States. R. Cullen, ed. *XI Internat. Symp. on Biol. Control of Weeds, Canberra, Australia*, pp. 505-513.

Department of the Environment and Heritage and the CRC for Australian Weed Management, 2003. Athel pine or tamarisk (*Tamarix aphylla*) weed management guide

Summary: Available from: http://www.weeds.gov.au/publications/guidelines/wons/t-aphylla.html [Accessed 15 March 2009]

Dewine, J. M; Cooper, D. J., 2008. Canopy shade and the successional replacement of tamarisk by native box elder. Journal of Applied Ecology. 45(2). APR 2008. 505-514

Di Tomaso, Joseph M. [Reprint author]., 1998. Impact, biology, and ecology of saltcedar (*Tamarix* spp.) in the southwestern United States. Weed Technology. 12(2). April-June, 1998. 326-336

Dudley, T. L. and Deloach, C. J. 2005. Saltcedar (*Tamarix* spp.), endangered species and biological weed control – can they mix? Weed Technology (in press).

Dudley, T. L.; DeLoach, C. J.; Lewis, P. A.; and Carruthers, R. I. 2001. Cage tests and field studies indicate leaf-eating beetle may control saltcedar. Ecol. Restoration 19: 260-261.

Dudley, T. L.; DeLoach, C. J.; Lovich, J.; and Carruthers, R. I. 2000. Saltcedar invasion of western riparian areas: impacts and new prospects for control. Trans. 65th No. Amer. Wildlife and Nat. Res. Conf., March 2000, Chicago, pp. 345-381.

Dudley, Tom. L., 2005. Progress and Pitfalls in the Biological Control of Saltcedar (*Tamarix* spp.) in North America. 2005. Proceedings, 16th U.S. Department of Agriculture interagency research forum on gypsy moth and other invasive species 2005 GTR-NE-337

Dudley, Tom L; DeLoach, C. Jack., 2004. Saltcedar (*Tamarix* spp.), endangered species, and biological weed control - Can they Mix? Weed Technology. 18(Suppl. S). 2004. 1542-1551

Duncan, Keith W; McDaniel, Kirk C., 1998. Saltcedar (*Tamarix* spp.) management with imazapyr. Weed Technology. 12(2). April-June, 1998. 337-344.
Early Detection and Distribution Mapping System (EDDMapS)., 2009. saltcedar *Tamarix ramosissima* Ledeb.
Summary: Available from: http://www.eddmaps.org/distribution/state.cfm?sub=6515&id=us_tx [Accessed 15 March 2009]
Ellingson, A. R., and D. C. Andersen. 2002. Spatial correlations of *Diceroprocta apache* and its host plants: evidence for a negative impact from Tamarix invasion. Ecological Entomology 27:16-24.
Ellis, L. M. 2001. Short-term response of woody plants to fire in a Rio Grande riparian forest, central New Mexico. Biol. Conserv. 97:159-170.
Everitt, B. L. 1980. Ecology of saltcedar - a plea for research. Environmental Geology 3: 77-84.
Friedman, Jonathan M.; Auble, Gregor T.; Shafroth, Patrick B.; Scott, Michael L.; Merigliano, Michael F.; Preehling, Michael D.; Griffin, Eleanor R., 2005. Dominance of non-native riparian trees in western USA. Biological Invasions. 7(4). JUL 2005. 747-751
Gaskin, John F., 2003. Molecular systematics and the control of invasive plants: A case study of *Tamarix* (Tamaricaceae). Annals of the Missouri Botanical Garden. 90(1). Winter 2003. 109-118.
Gaskin, John F.; Kazmer, David J, 2006. Comparison of ornamental and wild saltcedar (*Tamarix* spp.) along Eastern Montana, USA riverways using chloroplast and nuclear DNA sequence markers. Wetlands. 26(4). DEC 2006. 939-950.
Glenn, Edward P.; Nagler, Pamela L., 2005. Comparative ecophysiology of *Tamarix ramosissima* and native trees in western US riparian zones. Journal of Arid Environments. 61(3). MAY 2005. 419-446
Gouldthorpe, Jonah, 2008. Athel Pine National Best Practice Management Manual: Managing athel pine and other Tamarix weeds in Australia. This manual is sponsored by the Australian Government and supported by the Northern Territory Government's Department of Natural Resources, Environment and The Arts (NRETA).
Summary: Available from: http://www.weeds.org.au/WoNS/athelpine/docs/Athel%20Pine%20Manual%20Web.pdf [Accessed 26 July 2010]
Government Of Alberta, Agriculture and Rural Development., 2008. Weed Alert *Tamarix ramosissima*
Summary: Available from:http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/prm12239 [Accessed 15 March 2009]
IUCN/SSC Invasive Species Specialist Group (ISSG)., 2010. A Compilation of Information Sources for Conservation Managers.
Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.
Kennedy, T. A., and S. E. Hobbie. 2004. Saltcedar (*Tamarix ramosissima*) invasion alters organic matter dynamics in a desert stream. Freshwater Biology 49:65-76
Summary: Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.
Kennedy, Theodore A.; Finlay, Jacques C; Hobbie, Sarah E., 2005. Eradication of invasive *Tamarix ramosissima* along a desert stream increases native fish density. Ecological Applications. 15(6). DEC 2005. 2072-2083
Kimball, Bruce A; Perry, Kelly R., 2008. Manipulating beaver (*Castor canadensis*) feeding responses to invasive tamarisk (*Tamarix* spp.) Journal of Chemical Ecology. 34(8). AUG 2008. 1050-1056
Knutson, Allen; Mark Muegge and C. Jack DeLoach., 2003. Biological Control of SaltCedar. AgriLife Extension Texas A&M syatem
Summary: Available from: http://agrilifebookstore.org/publications_getfile.cfm?getfile=pdf&whichpublication=1854 [Accessed 15 March 2009]
Lesica, Peter; Miles, Scott., 2004. Ecological strategies for managing tamarisk on the C.M. Russell National Wildlife Refuge, Montana, USA. Biological Conservation. 119(4). October 2004. 535-543.
Lewis, Phil A., C. Jack DeLoach, Allen E. Knutson, James L. Tracy, Thomas O. Robbins., 2003. Biology of *Diorhabda elongata deserticola* (Coleoptera: Chrysomelidae), an Asian leaf beetle for biological control of saltcedars (*Tamarix* spp.) in the United States. Biological Control Volume 27, Issue 2, June 2003, Pages 101-116
Lewis, Phil A., C. Jack DeLoach, John C. Herr, Tom L. Dudley and Raymond I. Carruthers., 2003. Assessment of risk to native *Frankenia* shrubs from an Asian leaf beetle, *Diorhabda elongata deserticola* (Coleoptera: Chrysomelidae), introduced for biological control of saltcedars (*Tamarix* spp.) in the western United States. Biological Control Volume 27, Issue 2, June 2003, Pages 148-166
Morisette, Jeffrey T., Catherine S. Jarnevich, Asad Ullah, Weijie Cai, Jeffrey A. Pedelty, James E. Gentle, Thomas J. Stohlgren, John L. Schnase., 2006. A tamarisk habitat suitability map for the continental United States. Frontiers in Ecology and the Environment: Vol. 4, No. 1, pp. 11-17.
Muzika, R. M., and J. M. Swearingen. 1999. *Tamarix ramosissima*. Plant Conservation Alliance, Alien Plant Working Group.
NatureServe. 2009. *Tamarix ramosissima* - Ledeb. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia.
Summary: Available from: http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Tamarix%20ramosissima [Accessed 15 March 2009]
Plant Conservation Alliance (PCA)., 2006. Alien Plant Working Group Salt Cedar
Summary: Available from: http://www.nps.gov/plants/alien/fact/tama1.htm [Accessed 15 March 2009]
Richard, R. 2003. Proposed program for control of saltcedar (*Tamarix* spp.) in 14 states. USDA-APHIS Draft Environmental Assessment, Nov. 2003. Washington, D.C.
Robinson, T. W. 1965. Introduction, spread and areal extent of saltcedar (*Tamarix*) in the western states. US Geological Survey Professional Paper 491-A.
Sala, Anna; Smith, Stanley D; Devitt, Dale A., 1996. Water use by *Tamarix ramosissima* and associated phreatophytes in a Mojave Desert floodplain. Ecological Applications. 6(3). 1996. 888-898.
Saltcedar Biological Control Consortium: 2005. Texas, New Mexico, Mexico Section First (Organizational) Meeting. Saltcedar Biological Control Consortium: Texas, New Mexico, Mexico Section First (Organizational) Meeting. 29-30 March 2005 El Paso Texas
Summary: Available from: http://bc4weeds.tamu.edu/weeds/rangeland/saltcedar-bcc-2005.pdf [Accessed 15 March 2009]

San Francisco Estuary Institute (SFEI), undated. Salt Cedar *Tamarisk* spp. Practical Guidebook to the Control of Invasive Aquatic and Wetland Plants of the San Francisco Bay Delta Region
Summary: Available from: http://www.sfei.org/nis/cedar.html [Accessed 15 March 2009]
Sexton, Jason P., John K. McKay, Anna Sala., 2002. Plasticity and genetic diversity may allow saltcedar to invade cold climates in North America. Ecological Applications: Vol. 12, No. 6, pp. 1652-1660.
Shafroth, Patrick B., James R. Cleverly, Tom L. Dudley, John P. Taylor, Charles VAN Riper, Edwin P. Weeks and James N. Stuart., 2005. Control of *Tamarix* in the Western United States: Implications for Water Salvage, Wildlife Use, and Riparian Restoration. Environmental Management Volume 35, Number 3 / March, 2005
Shafroth, P. B.; Cleverly, J. ; Dudley, T. L.; Stuart, J.; Van Riper, C.; and Weeks, E. P. 2004. Saltcedar removal, water salvage and wildlife habitat restoration along rivers in the southwestern U.S. Envir. Mgt. (in press).
Sher, A. A.; Marshall, D. L.; and Gilbert, S. A. 2000. Competition between native *Populus deltoides* and invasive *Tamarix ramosissima* and the implications for reestablishing flooding disturbance. Conservation Biology 14(6):1744-1754
Sher, Anna A. and Diane L. Marshall., 2003. Seedling competition between native *Populus deltoides* (Salicaceae) and exotic *Tamarix ramosissima* (Tamaricaceae) across water regimes and substrate types. American Journal of Botany. 2003;90:413-422.
Smith, Stanley D; Devitt, Dale A.; Sala, Anna; Cleverly, James R; Busch, David E., 1998. Water relations of riparian plants from warm desert regions. Wetlands. 18(4). Dec., 1998. 687-696.
Sobhian, R., L. Fornasari, J. S. Rodier, and S. Agret. 1998. Field Evaluation of Natural Enemies of *Tamarix* spp. in Southern France. Biological Control 12: 164-170.
South African National Biodiversity Institute (SANBI), 2001. Declared Weeds & Alien Invader Plants
Summary: Available from: http://www.plantzafrica.com/miscell/aliens5.htm [Accessed 2 August 2007]
Sprenger, Matthew D; Smith, Loren M; Taylor, John P., 2001. Testing control of saltcedar seedlings using fall flooding. Wetlands. 21(3). September, 2001. 437-441.
Sprenger, Matthew D; Smith, Loren M; Taylor, John P., 2002. Restoration of riparian habitat using experimental flooding. Wetlands. 22(1). March 2002. 49-57
Tallent-Halsell, Nita G; Walker, Lawrence R., 2002. Responses of *Salix gooddingii* and *Tamarix ramosissima* to flooding. Wetlands. 22(4). December 2002. 776-785.
Tamarisk Coalition, 2009. A non-profit alliance working to restore riparian lands
Summary: Available from: http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Tamarix%20ramosissima [Accessed 15 March 2009]
Taylor, John P; Smith, Loren M; Haukos, David A., 2006. Evaluation of woody plant restoration in the Middle Rio Grande: Ten years after. Wetlands. 26(4). DEC 2006. 1151-1160
Taylor, John P; Wester, David B; Smith, Loren M., 1999. Soil disturbance, flood management, and riparian woody plant establishment in the Rio Grande floodplain. Wetlands. 19(2). June, 1999. 372-382.
USDA, NRCS. 2009. *Tamarix ramosissima* Ledeb. Saltcedar The PLANTS Database. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
Summary: Available from: http://plants.usda.gov/java/profile?symbol=TARA [Accessed 15 June 2009]
Vandersande, Matthew W; Glenn, Edward P; Walworth, James L., 2001. Tolerance of five riparian plants from the lower Colorado River to salinity drought and inundation. Journal of Arid Environments. 49(1). September, 2001. 147-159
Whitcraft, Christine R.; Talley, Drew M; Crooks, Jeffrey A; Boland, John; Gaskin, John., 2007. Invasion of tamarisk (*Tamarix* spp.) in a southern California salt marsh. Biological Invasions. 9(7). OCT 2007. 875-879

General information

Bailey, J.K., Schweitzer, J.A., and Whitham, T.G. 2001. Salt cedar negatively affects biodiversity of aquatic macroinvertebrates. Wetlands. 21 (3): 442-447.
Bailey, Joseph K., Jennifer A. Schweitzer, Thomas G. Whitham., 2001. Salt Cedar Negatively Affects Biodiversity of Aquatic Macroinvertebrates. Wetlands Sep 2001 : Vol. 21, Issue 3, pg(s) 442-447 doi: 10.1672/0277-5212
Bean, D.; Chew, T.; Li, B.; and Carruthers, R. I. 2001. Diapause in relation to the life history of *Diorhabda elongata* (Chrysomelidae), a Eurasian leaf beetle introduced as a biocontrol agent of saltcedar (*Tamarix* spp.) (abstract). Entomol. Soc. America, San Diego.
Brotherson, J.D. and Field, D. 1987. Tamarix: impacts of a successful weed. Rangelands 9(3): 110-112.
Busch, D. E. and Smith, S. D. 1995. Mechanisms associated with decline of woody species in riparian ecosystems of the southwestern U.S. Ecol. Monogr. 65: 347-370.

CONABIO. 2008. Sistema de informaci&#65533;n sobre especies invasoras en M&#65533;xico. Especies invasoras - Plantas. Comisi&#65533;n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.
Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.
Invasive species - Plants is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]
Spanish:
La lista de especies del Sistema de informaci&#65533;n sobre especies invasoras de m&#65533;xico cuenta actualmente con informaci&#65533;n aceca de nombre cient&#65533;fico, familia, grupo y nombre com&#65533;n, as&#65533; como h&#65533;bitat, estado de la invasi&#65533;n en M&#65533;xico, rutas de introducci&#65533;n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p&#65533;gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci&#65533;n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci&#65533;n novedades, para conocer los cambios.
Especies invasoras - Plantas is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]
Conway, Courtney J; Sulzman, Christina., 2007. Status and habitat use of the California black rail in the southwestern USA Wetlands. 27(4). DEC 2007. 987-998.
Dahm, C. N.; Cleverly, J. R.; Coonrod, J. E. A.; *et al.* 2002. Evapotranspiration at the land/water interface in a semi-arid drainage basin. Freshwater Biology 47: 831-843.
Evangelista, Paul; Kumar, Sunil; Stohlgren, Thomas J.; Crall, Alycia W.; Newman, Gregory J., 2007. Modeling aboveground biomass of *Tamarix ramosissima* in the Arkansas River basin of southeastern Colorado, USA. Western North American Naturalist. 67(4). DEC 2007. 503-509.
Everitt, B. L. 1998. Chronology of the spread of saltcedar in the central Rio Grande. Wetlands 18:658-668.
Fleishman, E., N. McDonal, R. M. Nally, D. D. Murphy, J. Walters, and T. Floyd. 2003. Effects of floristics, physiognomy and non-native vegetation on riparian bird communities in a Mojave Desert watershed. Journal of Animal Ecology 72:484-490.
Friedman, Jonathan M.; Roelle, James E; Gaskin, John F.; Pepper, Alan E.; Manhart, James R., 2008. Latitudinal variation in cold hardiness in introduced *Tamarix* and native *Populus*. Evolutionary Applications. 1(4). NOV 2008. 598-607
Gaskin, J. F. and Schaal, B. A. 2002. Hybrid *Tamarix* widespread in U.S. invasion and undetected in native Asian range. Proc. Natl. Acad. Sci. 99:11256&#65533;11259.
Gaskin, J.F. and Shafroth, P.B. in press. Hybridization of invasive saltcedars (*Tamarix ramosissima*, *T. chinensis*) and athel (*T. aphylla*) in the southwestern USA, determined from morphology and DNA sequence data. Madro&#65533;o (in review).
Gaskin, John F. and Barbara A. Schaal., 2002. Hybrid *Tamarix* widespread in U.S. invasion and undetected in native Asian range. PNAS August 20, 2002 vol. 99 no. 17 11256-11259
Gaskin, John F.; Schaal, Barbara A., 2003. Molecular phylogenetic investigation of U.S. invasive *Tamarix*. Systematic Botany. 28(1). January-March 2003. 86-95.
Gaskin, John F; Shafroth, Patrick B., 2005. Hybridization of *Tamarix ramosissima* and *T. chinensis* (saltcedars) with *T. aphylla* (athel) (Tamaricaceae) in the southwestern USA determined from DNA sequence data. Madrono. 52(1). JAN-MAR05. 1-10
Going, Barbara M; Dudley, Tom L., 2008. Invasive riparian plant litter alters aquatic insect growth. Biological Invasions. 10(7). OCT 2008. 1041-1051.
Graf, W. F. 1978. Fluvial adjustment to the spread of tamarisk in the Colorado Plateau region. Geological Society of America Bulletin 89: 1491-1501.
Hart, C.R. 2003. Pecos River, Texas Restoration and Water Recovery. 2003 Tamarisk Symposium, Grand Junction, Colorado.
Summary: Presentation on the impacts and control of tamarisk along the Pecos River, Texas.
Available from: http://www.coopext.colostate.edu/TRA/abstracts/2203Tamarisk/Hart.html [Accessed January 24 2005]
Horton, J. S. 1977. The development and perpetuation of the permanent tamarisk type in the phreatophyte zone of the southwest. Pp. 124-127 In: *Importance, preservation, and management of riparian habitat: a symposium.* General Technical Report RM-43. U.S. Forest Service, Washington, D.C.
Hunter, W. C.; Anderson, B. W.; and Ohmart, R. D. 1988. Use of exotic saltcedar (*Tamarix chinensis*) by birds in arid riparian systems. Condor 90:113-123.
ITIS (Integrated Taxonomic Information System), 2005. Online Database *Tamarix ramosissima*
Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from:
http://www.cbif.gc.ca/pls/itisca/taxastep?king=every&p_action=containing&taxa=Tamarix+ramosissima&p_format=&p_ifx=plglt&p_lang= [Accessed March 2005]
Kennedy, Theodore A; Hobbie, Sarah E., 2004. Saltcedar (*Tamarix ramosissima*) invasion alters organic matter dynamics in a desert stream. Freshwater Biology. 49(1). January 2004. 65-76
Lovich, Jeff; Meyer, Kathie., 2002. The western pond turtle (*Clemmys marmorata*) in the Mojave River, California, USA: Highly adapted survivor or tenuous relict? Journal of Zoology (London). 256(4). April, 2002. 537-545.
Mortenson, Susan G; Weisberg, Peter J; Ralston, Barbara E., 2008. Do beavers promote the invasion of non-native *Tamarix* in the Grand Canyon riparian zone? Wetlands. 28(3). SEP 2008. 666-675
Natale, E. S; Gaskin, J; Zalba, S. M; Ceballos, M; Reinoso, H. E., 2008. *Tamarix* species (Tamaricaceae) invading natural and seminatural habitats in Argentina. Boletin de la Sociedad Argentina de Botanica. 43(1-2). JUL 2008. 137-145.

Pearce, Cheryl M; Smith, Derald G., 2003. Saltcedar: Distribution, abundance, and dispersal mechanisms, northern Montana, USA. Wetlands. 23(2). June 2003. 215-228.
Sala, A.; Smith, S. D.; and Devitt, D. A.. 1996. Water use by *Tamarix ramosissima* and associated phreatophytes in a Mojave Desert floodplain. Ecol. Applic. 6: 888-898.
Sexton, Jason P., Anna Sala, Kevin Murray., 2006. Occurrence, Persistance and Expansion of Saltcedar (*Tamarix* spp.) Populations in the Great Plains of Montana. Western North American Naturalist 66(1):1-11. 2006
Sher, A. A,; Marshall, D. L.; and Taylor, J. P. 2002. Establishment patterns of native *Populus* and *Salix* in the presence of invasive nonnative Tamarix. Ecological Applications 12:760-772.
Sher, Anna A., Diane L. Marshall and Steven A. Gilbert., 2000. Competition between Native *Populus deltoides* and Invasive *Tamarix ramosissima* and the Implications for Reestablishing Flooding Disturbance. Conservation Biology, Vol. 14, No. 6 (Dec., 2000), pp. 1744-1754
Stromberg, Juliet C., Sharon J. Lite, Roy Marler, Charles Paradzick, Patrick B. Shafroth, Donna Shorrock, Jacqueline M. White, Margaret S. White., 2007. Altered stream-flow regimes and invasive plant species: the *Tamarix* case. Global Ecology and Biogeography Volume 16 Issue 3 , (May 2007) (p 381-393)
USDA, ARS, 2009. Taxon: *Tamarix ramosissima* Ledeb. National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland.
Summary: Available from: http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl?Tamarix+ramosissima [Accessed 15 June 2009]
Young J.A.; Clements, C.D.; and Harmon, D. 2004. Germination of seeds of *Tamarix ramosissima*. J. Range Mgt. 57: 475-481.