

# Part IV. Plant Assessment Form

For use with “Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands”  
by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association

Electronic version, February 28, 2003

**Table 1. Species and Evaluator Information**

<b>Species name (Latin binomial):</b>	Tamarix aphylla (L.) Karsten
<b>Synonyms:</b>	T. articulata Vahl., T. orientalis Forssk., Thuja aphylla L.
<b>Common names:</b>	athel, athel pine, tamarisk, evergreen saltcedar
<b>Evaluation date (mm/dd/yy):</b>	08/12/04
<b>Evaluator #1 Name/Title:</b>	T. Dudley, Assoc. Research Prof.
<b>Affiliation:</b>	Univ. of Nevada
<b>Phone numbers:</b>	775-784-1716
<b>Email address:</b>	tdudley@cabnr.unr.edu
<b>Address:</b>	Dept. of Natural Resource & Environmental Science, MS 186; 1000 Valley Rd.; University of Nevada Reno, NV, 89512-0013
<b>Evaluator #2 Name/Title:</b>	enter text here
<b>Affiliation:</b>	enter text here
<b>Phone numbers:</b>	enter text here
<b>Email address:</b>	enter text here
<b>Address:</b>	enter text here
Section below for list committee use—please leave blank	
<b>List committee members:</b>	Joe DiTomaso, John Randall, Carla Bossard
<b>Committee review date:</b>	3/11/05
<b>List date:</b>	enter text here
<b>Re-evaluation date(s):</b>	enter text here

**General comments on this assessment:**

There is a basic problem with assessing individual species within the Tamarix complex - there exist many species and hybrid forms of these that are invasive across the west, and in fact hybrids are more common than any true species. Thus, this assessment may miss an important aspect of the situation in the field, esp. if hybrids constitute greater threats than the identified species. In addition, the impacts of *T. aphylla* are minor in California and Arizona so far, so responses rely in large part on a real problem situation with this species in other continents so impacts would be listed as more severe than we are likely to experience here (but potential may exist).

**Table 2. Criteria, Section, and Overall Scores**

<a href="#"><u>1.1</u></a>	Impact on abiotic ecosystem processes	<b>C</b>	<b>Other Pub. Mat'l</b>
<a href="#"><u>1.2</u></a>	Impact on plant community	<b>C</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>1.3</u></a>	Impact on higher trophic levels	<b>B</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>1.4</u></a>	Impact on genetic integrity	<b>D</b>	<b>Rev'd, Sci. Pub'n</b>

<p><b>Impact</b></p> <p><i>Enter four characters from Q1.1-1.4 below:</i></p> <p><b>CCBD</b></p> <p><i>Using matrix, determine score and enter below:</i></p> <p><b>C</b></p>
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<a href="#"><u>2.1</u></a>	Role of anthropogenic and natural disturbance	<b>B (2 pts)</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>2.2</u></a>	Local rate of spread with no management	<b>C (1 pt)</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>2.3</u></a>	Recent trend in total area infested within state	<b>D (0 pts)</b>	<b>Observational</b>
<a href="#"><u>2.4</u></a>	Innate reproductive potential <a href="#"><u>Wksht A</u></a>	<b>B (2 pts)</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>2.5</u></a>	Potential for human-caused dispersal	<b>B (2 pts)</b>	<b>Other Pub. Mat'l</b>
<a href="#"><u>2.6</u></a>	Potential for natural long-distance dispersal	<b>B (2 pts)</b>	<b>Other Pub. Mat'l</b>
<a href="#"><u>2.7</u></a>	Other regions invaded	<b>B (2 pts)</b>	<b>Rev'd, Sci. Pub'n</b>

<p><b>Invasiveness</b></p> <p><i>Enter the sum total of all points for Q2.1-2.7 below:</i></p> <p><b>11</b></p> <p><i>Use matrix to determine score and enter below:</i></p> <p><b>B</b></p>
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<p><b>Plant Score</b></p> <p><i>Using matrix, determine Overall Score and Alert Status from the three section scores and enter below:</i></p> <p><b>Low</b></p> <p><b>No Alert</b></p>
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<a href="#"><u>3.1</u></a>	Ecological amplitude/Range	<b>A</b>	<b>Rev'd, Sci. Pub'n</b>
<a href="#"><u>3.2</u></a>	Distribution/Peak frequency <a href="#"><u>Wksht C</u></a>	<b>D</b>	<b>Other Pub. Mat'l</b>

<p><b>Distribution</b></p> <p><i>Using matrix, determine score and enter below:</i></p> <p><b>B</b></p>
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**Table 3. Documentation**

<b>Question 1.1</b> Impact on abiotic ecosystem processes	C Rev'd, Sci. Pub'n <a href="#">back</a>
Identify ecosystem processes impacted: groundwater/soil water availability, soil chemistry, hydrological resistance (flow regimes and flooding). Populations do not grow dense in western US and have only been found to escape in a couple of area so it is unlikely that abiotic processes are affected to the extent of other Tamarix species.	
Rationale: takes up salts through roots and salinates surface soils by both salty litterfall and salt drip, probably depletes water table based on congeners, interferes with waterflow and therefore can exacerbate over-bank flooding; unlike other saltcedar species; light transmission is very low through athel canopy; T. aphylla is not known to increase fire risks and presumably is substantially less flammable than the deciduous species	
Sources of information: Griffin, G. F., D. M. Stafford Smith, S. R. Morton, G. E. Allan, K. A. Masters, and N. Preece. 1989. Status and implications of the invasions of tamarisk ( <i>Tamaris aphylla</i> ) on the Finke River, Northern Territory, Australia. <i>Journal of Environmental Management</i> . 29:297-315	
Berry, W. L. 1970. Characteristics of salts secreted by <i>Tamarix aphylla</i> . <i>American Journal of Botany</i> . 57:1226-1230 (salt uptake)	
Waisel, Y. 1960. Ecological studies on <i>Tamarix aphylla</i> (L.) Karst. Distribution and reproduction. <i>Phyton</i> 15:7-17.	
Waisel, Y. 1960. Ecological studies on <i>Tamarix aphylla</i> (L.) Karst. The water economy. <i>Phyton</i> 15: 19-29.	
Litwak, M. 1957. The influence of <i>T. aphylla</i> on soil composition in the northern Negev of Israel. <i>Bulletin of Resources Council of Israel</i> 6D:38-45	
Hagemeyer, J. and Y. Waisel 1988. Excretion of ions (Cd <sup>2+</sup> , Li <sup>+</sup> , Na <sup>+</sup> , and Cl <sup>-</sup> ) by <i>Tamarix aphylla</i> . <i>Physiologia Plantarum</i> . 73:541-546.	
<b>Question 1.2</b> Impact on plant community composition, structure, and interactions	C Rev'd, Sci. Pub'n <a href="#">back</a>
Identify type of impact or alteration: reduction in native plant diversity and inhibition of native trees, promotion of non-native plants where it is common, but not found in high densities anywhere in western US.	
Rationale: lower species diversity and greater proportion of non-native plants are found in association with <i>T. aphylla</i> in Australia, although it is not clear whether it displaces natives or just occupies sites that have been opened by natural disturbance and possibly made saltier by salt inputs from nearby sites; in U.S. it may be associated with higher diversity than adjoining habitats because seeding of all plants may be higher in more favorable sites	
Sources of information: Griffin, G., D. Smith, S. Morton, G. Allan and K. Masters. 1989. Status and implications of the invasion of tamarisk ( <i>T. aphylla</i> ) on the Finke River, Northern Territory, Australia. <i>Journal of Environmental Management</i> 29:297-315.	
Barnes, P.L., L.R. Walker and E.A. Power. <i>Tamarix aphylla</i> : A newly invasive tree in southern Nevada. <i>Wetlands</i> (in review).	
<b>Question 1.3</b> Impact on higher trophic levels	A Rev'd, Sci. Pub'n <a href="#">back</a>
Identify type of impact or alteration: reduction in native wildlife abundance, and reduced herbivore abundance	

Rationale: in Australia there are fewer birds associated with <i>T. aphylla</i> vs. native riparian eucalypt forest, presumably related to lower insect numbers; does contain high phenol levels which can inhibit herbivores, and also salts and other chemicals (e.g. cadmium) that are taken up through roots can further reduce suitability for herbivores; reptiles are also reduced in numbers, as litter is denser under tamarix which reduces invertebrate numbers and habitat diversity	
Sources of information: Griffin et al. 1989, Hagemeyer and Waisel 1988	
<b>Question 1.4</b> Impact on genetic integrity	D Rev'd, Sci. Pub'n <a href="#">back</a>
Identify impacts: none, but does hybridize with other <i>Tamarix</i>	
Rationale: hybrids between <i>T. aphylla</i> and <i>T. ramosissima</i> are present on lower Colorado River systems (esp. Lake Mead), and these are less suitable for herbivores (including biocontrol agents) than normal <i>T. ramosissima</i> type so may cause control problems in future	
Sources of information: Barnes et al. in review Gaskin, J.F. and P.B. Shafroth. Hybridization of invasive saltcedars ( <i>Tamarix ramosissima</i> , <i>T. chinensis</i> ) and athel ( <i>T. aphylla</i> ) in the southwestern USA, determined from morphology and DNA sequence data. Madroño (in review). Caires and Dudley, unpublished data	
<b>Question 2.1</b> Role of anthropogenic and natural disturbance in establishment	B Rev'd, Sci. Pub'n <a href="#">back</a>
Describe role of disturbance: natural high flows and anthropogenic reduced flows can both facilitate invasion	
Rationale: in Australia, natural flooding (removes native competitors and opens substrate for colonization) promoted seed dispersal and widespread establishment, but reduced natural flooding (Salt and Colorado Rivers) or river regulation and then water level declines (Lake Mead shoreline) provide substrate and conditions for colonization without removal that would occur during natural floods (this is the case for all <i>Tamarix</i> spp.)	
Sources of information: Barnes et al. in review, Griffin et al. 1989, D'Antonio et al. 1999	
<b>Question 2.2</b> Local rate of spread with no management	C Rev'd, Sci. Pub'n <a href="#">back</a>
Describe rate of spread: potentially explosive, but typically incremental in U.S. Does not appear to be expanding much, probably stable.	
Rationale: flood conditions promoted infestation of hundreds of kilometers of a river in Australia; In lower Colorado watershed relatively few new recruits occur but regularly along the Lake Mead shoreline, leading to a more gradual infestation rate - this is increasing as densities increase	
Sources of information: Griffin et al. 1989, Barnes et al. in review	

<b>Question 2.3</b> Recent trend in total area infested within state	D Observational <a href="#">back</a>
Describe trend: increasing at Lake Mead, being controlled near Coalinga, not known elsewhere,	
Rationale: as densities along shoreline increase there are more seeds produced leading to exponential increase in potential recruits	
Sources of information: Barnes et al. in review	
<b>Question 2.4</b> Innate reproductive potential	B Rev'd, Sci. Pub'n <a href="#">back</a>
Describe key reproductive characteristics: relatively low because seed viability is moderate (ca. 22% under best conditions) and seed production period fairly restricted (ca. 50 days, as opposed to many months for some other Tamarix species), but because millions of seeds CAN be produced, under the right conditions the potential for invasion is theoretically very high	
Rationale: see above	
Sources of information: Barnes et al. in review, Griffin et al., Waisel 1960a, b, Usher 1986,	
<b>Question 2.5</b> Potential for human-caused dispersal	B Other Pub. Mat'l <a href="#">back</a>
Identify dispersal mechanisms: water- and wind-dispersed seeds from planted populations, cuttings are planted or can be dispersed by water. Still sold commercially in some areas.	
Rationale: humans are important factors because T. aphylla is widely used as a horticultural plant, often near natural resource areas, where seeds are then available for recruitment; flood management creates better conditions for seed dispersal to suitable sites and subsequent establishment	
Sources of information: same as above	
<b>Question 2.6</b> Potential for natural long-distance dispersal	B Other Pub. Mat'l <a href="#">back</a>
Identify dispersal mechanisms: wind- and water-dispersed seed, water-dispersed vegetative propagules. Generally does not produce viable seed.	
Rationale: seeds can be carried long distances by rivers, as was observed in Australia	
Sources of information: Healy and DiTomaso	
<b>Question 2.7</b> Other regions invaded	C Rev'd, Sci. Pub'n <a href="#">back</a>
Identify other regions: Australia, Hawaii, Texas and New Mexico, probably northern Mexico, global distribution not clear. Found in dry and riparian areas in other regions.	

Rationale: enter text here	
Sources of information: Lyon 1924, Weber 2003	
<b>Question 3.1</b> Ecological amplitude/Range	A Rev'd, Sci. Pub'n <a href="#">back</a>
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: although athel is widespread as a horticultural plant under many growth conditions in California and adjacent regions (ARizona, Mexico), it is only functioning as an invader in a small subset of systems, primarily along the lower Colorado River and associated reservoirs and possibly in the Salton Sea Basin; it has presumably been used ornamentally/culturally since the the 1800's - documentation of its invasive potential was only determined in the last 5 years or so based on studies at Lake Mead (in Nevada)	
Rationale: see above	
Sources of information: Barnes et al., Shafroth and Gaskin	
<b>Question 3.2</b> Distribution/Peak frequency	D Other Pub. Mat'l <a href="#">back</a>
Describe distribution: Not common in western US.	
Rationale: same as for 3.2	
Sources of information: Healy and DiTomaso. 2003	

**Worksheet A**[back](#)

Reaches reproductive maturity in 2 years or less	<b>No: 0 pt</b>
Dense infestations produce >1,000 viable seed per square meter	<b>Yes: 2 pts</b>
Populations of this species produce seeds every year.	<b>Yes: 1 pt</b>
Seed production sustained over 3 or more months within a population annually	<b>Yes: 1 pt</b>
Seeds remain viable in soil for three or more years	<b>No: 0 pts</b>
Viable seed produced with <i>both</i> self-pollination and cross-pollination	<b>No: 0 pt</b>
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	<b>No: 0 pt</b>
Fragments easily and fragments can become established elsewhere	<b>No: 0 pts</b>
Resprouts readily when cut, grazed, or burned	<b>Yes: 1 pt</b>
	<b>5 pts      1 unknown</b>
	<b>B (4-5 pts)</b>
<b>Note any related traits:</b> documented to form hybrids with a more invasive congener, tolerates physiologically stressful conditions such as extreme drought and high salinity soils	

## Worksheet C - California Ecological Types

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(*sensu* Holland 1986)

Major Ecological Types	Minor Ecological Types	Code*
<b>Marine Systems</b>	marine systems	score
<b>Freshwater and Estuarine Aquatic Systems</b>	lakes, ponds, reservoirs	D. present
	rivers, streams, canals	D. present
	estuaries	score
<b>Dunes</b>	coastal	score
	desert	D. present
	interior	score
<b>Scrub and Chaparral</b>	coastal bluff scrub	score
	coastal scrub	score
	Sonoran desert scrub	score
	Mojavean desert scrub (incl. Joshua tree woodland)	score
	Great Basin scrub	score
	chenopod scrub	score
	montane dwarf scrub	score
	Upper Sonoran subshrub scrub	score
	chaparral	score
<b>Grasslands, Vernal Pools, Meadows, and other Herb Communities</b>	coastal prairie	score
	valley and foothill grassland	score
	Great Basin grassland	score
	vernal pool	score
	meadow and seep	score
	alkali playa	score
	pebble plain	score
<b>Bog and Marsh</b>	bog and fen	score
	marsh and swamp	score
<b>Riparian and Bottomland</b>	riparian forest	score
	riparian woodland	score
	riparian scrub (incl. desert washes)	D. present
<b>Woodland</b>	cismontane woodland	score
	piñon and juniper woodland	score
	Sonoran thorn woodland	score
<b>Forest</b>	broadleaved upland forest	score
	North Coast coniferous forest	score
	closed cone coniferous forest	score
	lower montane coniferous forest	score
	upper montane coniferous forest	score
	subalpine coniferous forest	score
<b>Alpine Habitats</b>	alpine boulder and rock field	score
	alpine dwarf scrub	score

\* A. means >50% of type occurrences are invaded; B means >20% to 50%; C. means >5% to 20%; D. means present but ≤5%; U. means unknown (unable to estimate percentage of occurrences invaded).