

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

Species name (Latin binomial):	Lupinus arboreus Sims.
Synonyms:	L. eximius, L. macrocarpus, L. propinquus, L. rivular
Common names:	yellow bush lupine, coastal bush lupine
Evaluation date (mm/dd/yy):	12/22/04
Evaluator #1 Name/Title:	Elizabeth Brusati, project manager
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Evaluator #2 Name/Title:	Peter J. Warner; ecologist
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Section below for list committee use—please leave blank

List committee members:	Peter Warner, Jake Sigg, Cynthia Roye, Joe DiTomaso
Committee review date:	8/15/05
List date:	enter text here
Re-evaluation date(s):	enter text here

<p>General comments on this assessment: Native from the San Francisco Bay Area south. Considered invasive further north.</p>

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	B	Rev'd, Sci. Pub'n
1.2	Impact on plant community	B	Rev'd, Sci. Pub'n
1.3	Impact on higher trophic levels	B	Rev'd, Sci. Pub'n
1.4	Impact on genetic integrity	B	Rev'd, Sci. Pub'n

Impact

Enter four characters from Q1.1-1.4 below:

BBBB

Using matrix, determine score and enter below:

B

2.1	Role of anthropogenic and natural disturbance	↘ (3 pts)	Rev'd, Sci. Pub'n
2.2	Local rate of spread with no management	↘ (3 pts)	Observational
2.3	Recent trend in total area infested within state	↘ (1 pt)	Observational
2.4	Innate reproductive potential Wksht A	↘ (3 pts)	Rev'd, Sci. Pub'n
2.5	Potential for human-caused dispersal	↘ (3 pts)	Rev'd, Sci. Pub'n
2.6	Potential for natural long-distance dispersal	↘ (0 pts)	Rev'd, Sci. Pub'n
2.7	Other regions invaded	↘ (1 pt)	Rev'd, Sci. Pub'n

Invasiveness

Enter the sum total of all points for Q2.1-2.7 below:

14

Use matrix to determine score and enter below:

B

Plant Score

Using matrix, determine Overall Score and Alert Status from the three section scores and enter below:

Medium

No Alert

3.1	Ecological amplitude/Range	A	Rev'd, Sci. Pub'n
3.2	Distribution/Peak frequency Wksht C	B	Observational

Distribution

Using matrix, determine score and enter below:

B

Table 3. Documentation

<p>Question 1.1 Impact on abiotic ecosystem processes</p>	<p>B Rev'd, Sci. Pub'n back</p>
<p>Identify ecosystem processes impacted: nitrogen availability</p>	
<p>Rationale: N-fixing shrub enriches N content of soil, N-rich litter fertilizes soil</p>	
<p>Sources of information: 1. Maron, J. L. and R. L. Jefferies 1999. "Bush lupine mortality, altered resource availability, and alternative vegetation states." <i>Ecology</i> 80(2): 443-454. 2. Pickart A.J., Miller L.M., Duebendorfer T.E. 1998. "Yellow Bush Lupine Invasion in Northern California Coastal Dunes I. Ecological Impacts and Manual Restoration Techniques." <i>Restoration Ecology</i> 6(1): 59-68. 3. Maron J.L., Connors P.G. "A Native Nitrogen-fixing Shrub Facilitates Weed Invasion." 1996. <i>Oecologia</i> 105:302-312.</p>	
<p>Question 1.2 Impact on plant community composition, structure, and interactions</p>	<p>B Rev'd, Sci. Pub'n back</p>
<p>Identify type of impact or alteration: Restricts other vegetation under its canopy (1), patches containing dead lupines had lower species richness and plant biomass than surrounding grasslands without lupines (1), non-native grasses are decreased after lupine duff is removed (2). Restricts light under the canopy.(3).</p>	
<p>Rationale: Dense shrubs block light; repeated bouts of lupine germination, establishment, and death convert a rich native plant community into a less diverse community of non-natives (1)</p>	
<p>Sources of information: 1. Maron and Connors 1996 2. Pickart et al. 1998 3. Maron, J. L. and R. L. Jefferies. 1999. Bush lupine mortality, altered resource availability, and alternative vegetative states. <i>Ecology</i>. 80(2): 443-454</p>	
<p>Question 1.3 Impact on higher trophic levels</p>	<p>B Rev'd, Sci. Pub'n back</p>
<p>Identify type of impact or alteration: Seeds eaten by mice (1), poisonous (2). Pocket gophers, rabbits, and deer eat seedlings (3). No information available on species that rely on lupine for food, nesting, etc. Scored as B based on alteration of habitat.</p>	
<p>Rationale: Seeds eaten by mice, especially in dunes (1), poisonous alkaloids are toxic to goats, swine, and deer (2), has several insect herbivores</p>	
<p>Sources of information: 1. Maron, J. L. and E. L. Simms 1997. "Effect of seed predation on seed bank size and seedling recruitment of bush lupine (<i>Lupinus arboreus</i>)." <i>Oecologia</i> 111: 76-83. 2. Kingsbury, J. M. 1964. <i>Poisonous plants of the United States and Canada</i> 3. Strong, D.R.; Maron, J.L.; Connors, P.G.; Whipple, A.; Harrison, S.; Jefferies, R.L. 1995. "High mortality, fluctuation in numbers, and heavy subterranean insect herbivory in bush lupine, <i>Lupinus arboreus</i>." <i>Oecologia</i>. 104: 85-92.</p>	

Question 1.4 Impact on genetic integrity	B Rev'd, Sci. Pub'n back
Identify impacts: Hybridizes with <i>L. littoralis</i> , 70 related California natives, gene flow within the genus has resulted in confusion over taxonomy and range of the different species	
Rationale: Scored as B because I'm not sure what proportion of individuals hybridize	
Sources of information: Pickart, A. 2000. <i>Lupinus arboreus</i> . pp. 231-235 in Bossard, C. M., J. M. Randall, and M. C. Hoshovsky (ed.) <i>Invasive plants of California's wildlands</i> . University of California Press. Berkeley, CA.	
Question 2.1 Role of anthropogenic and natural disturbance in establishment	A Rev'd, Sci. Pub'n back
Describe role of disturbance: Able to establish in undisturbed, N-poor grasslands (1) and dunes (2)	
Rationale:	
Sources of information: 1. Maron and Connors 1996 2. Pickart, A. 2000. <i>Lupinus arboreus</i> . pp. 231-235 in Bossard, C. M., J. M. Randall, and M. C. Hoshovsky (ed.) <i>Invasive plants of California's wildlands</i> . University of California Press. Berkeley, CA.	
Question 2.2 Local rate of spread with no management	A Other Pub. Mat'l back
Describe rate of spread: Very rapidly increases cover in dunes and coastal prairie once established (1, 2).	
Rationale: Based on my recollection from Pickart and Sawyer, and personal observations.	
Sources of information: 1. Pickart, A, and J. Sawyer. 1996? <i>Restoration of Northern California Dunes</i> (?). 2. Warner, PJ. 1996-2005. Personal observations from Marin, Sonoma, and Mendocino Counties. 707-937-2278/corylus@earthlink.net	
Question 2.3 Recent trend in total area infested within state	C Observational back
Describe trend: Probably stable, due to ongoing maintenance efforts on north coast (Humboldt County), with some sporadic establishment in other dune systems and prairies (1).	
Rationale: enter text here	
Sources of information: 1. Warner, PJ. 1996-2005. Personal observations from Marin, Sonoma, and Mendocino Counties. 707-937-2278/corylus@earthlink.net	

Question 2.4 Innate reproductive potential	A Rev'd, Sci. Pub'n back
Describe key reproductive characteristics: Cycles of colonization, growth, and dieback, followed by regeneration from the seed bank (1). Most plants flower and fruit after two years; density of lupine seedlings was 0.14/m ² . (2). Fast-growing, but lives only approx. 7 years (2). Mixture of outcrossing and selfing. Flowers are self-compatible but self-fertilization rarely occurs and selfed progeny have significantly reduced fitness (3). Capable of recovery by adventitious budding after being stripped of foliage and lower branches (2).	
Rationale: 1. Strong et al. 1995 2. Davidson and Barbour 1977 3. Kittelson, P.M.; Maron, J.L. 2000. "Outcrossing rate and inbreeding depression in the perennial yellow bush lupine, <i>Lupinus arboreus</i> (Fabaceae)." American Journal of Botany. 87:652-660.	
Sources of information: enter text here	
Question 2.5 Potential for human-caused dispersal	A Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: Planted for dune stabilization (1) and used in landscaping	
Rationale: Found in Cal-IPC nursery survey 2004	
Sources of information: 1. Davidson E.D., Barbour M.G. 1977. "Germination, establishment, and demography of Coastal Bush Lupine (<i>Lupinus arboreus</i>) at Bodega Head, California." Ecology 8(3):592-600.	
Question 2.6 Potential for natural long-distance dispersal	D Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: No obvious means of natural long-distance dispersal. Most seeds are taken by mice (1) or roll down dunes (2).	
Rationale:	
Sources of information: 1. Davidson and Barbour 1977 2. Pickart 2000	
Question 2.7 Other regions invaded	C Rev'd, Sci. Pub'n back
Identify other regions: New Zealand (semi-arid area)(1) , Oregon (2)	
Rationale: Since this species is considered (however, no references other than Hickman, et al. come to mind) native south of the SF Bay Area, then only coastal areas northward should be considered as potential habitat, and most dune systems and prairie habitat in Sonoma, Mendocino, Humboldt, and Del Norte Counties are already invaded.	

Sources of information: 1. Kissel, R.M., J.B. Wilson, P. Bannister, A. F. Mark. 1987. "Water relations of some ative and exotic shrubs of New Zealand." New Phytology.107: 29-37.	
2. Davidson and Barbour 1977	
Question 3.1 Ecological amplitude/Range	A Rev'd, Sci. Pub'n back
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Introduced to Humboldt Bay in 1908 for dune stabilization (1), native or invasive on dunes, coastal scrub (2), and coastal grasslands (3).	
Rationale: enter text here	
Sources of information: Miller L. 1988 "How Yellow Bush Lupine Came to Humboldt Bay." Fremontia 16(3):6-7.	
2. Davidson and Barbour	
3. Maron and Connors 1996	
Question 3.2 Distribution/Peak frequency	U Doc'n level back
Describe distribution: This is difficult to answer because bush lupine is native to central and southern California, [Assessed for non-native California habitats only (1).	
Rationale: enter text here	
Sources of information: 1. Warner, PJ. 1996-2005. Personal observations from Marin, Sonoma, and Mendocino Counties. 707-937-2278/corylus@earthlink.net	

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Reaches reproductive maturity in 2 years or less	No: 0 pt
Dense infestations produce >1,000 viable seed per square meter	Unknown: 0 pts
Populations of this species produce seeds every year.	Yes: 1 pt
Seed production sustained over 3 or more months within a population annually	Yes: 1 pt
Seeds remain viable in soil for three or more years	Yes: 2 pts
Viable seed produced with <i>both</i> self-pollination and cross-pollination	Yes: 1 pt
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	No: 0 pt
Fragments easily and fragments can become established elsewhere	No: 0 pts
Resprouts readily when cut, grazed, or burned	Yes: 1 pt
	6 pts 1 unknown
	A (6+ pts)
Note any related traits: Pickart 2000 states that soil must be scraped for four years after eradication to remove seedbank. I'm inferring seed production every year (except when a stand dies back).	

Worksheet C - California Ecological Types

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(*sensu* Holland 1986)

Major Ecological Types	Minor Ecological Types	Code*
Marine Systems	marine systems	score
Freshwater and Estuarine Aquatic Systems	lakes, ponds, reservoirs	score
	rivers, streams, canals	score
	estuaries	score
Dunes	coastal	B. 21-50
	desert	score
	interior	score
Scrub and Chaparral	coastal bluff scrub	score
	coastal scrub	C. 5-20%
	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
Grasslands, Vernal Pools, Meadows, and other Herb Communities	coastal prairie	D. present
	valley and foothill grassland	score
	Great Basin grassland	score
	vernal pool	score
	meadow and seep	score
	alkali playa	score
	pebble plain	score
Bog and Marsh	bog and fen	score
	marsh and swamp	score
Riparian and Bottomland	riparian forest	score
	riparian woodland	score
	riparian scrub (incl. desert washes)	score
Woodland	cismontane woodland	score
	piñon and juniper woodland	score
	Sonoran thorn woodland	score
Forest	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
Alpine Habitats	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).