

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):	Cakile maritima Scop.
Synonyms:	enter text here
Common names:	Sea rocket
Evaluation date (mm/dd/yy):	05/20/04
Evaluator #1 Name/Title:	John J. Knapp/ Invasive Plant Program Manager
Affiliation:	Catalina Island Conservancy
Phone numbers:	(310) 510-1299
Email address:	jknapp@catalinaconservancy.org
Address:	P.O. 2739 Avalon, CA 90704
Evaluator #2 Name/Title:	Joseph M. DiTomaso
Affiliation:	University of California, Davis
Phone numbers:	530-754-8715
Email address:	jmditomaso@ucdavis.edu
Address:	Dept. Plant Sci., Mail Stop 4, Davis, CA 95616

Section below for list committee use—please leave blank

List committee members:	Jake Sigg, Peter Warner, Bob Case, John Knapp, Elizabeth Brusati
Committee review date:	7/8/05 (Revised 9/13/05 Joe DiTomaso, Jake Sigg, Carla Bossard)
List date:	enter text here
Re-evaluation date(s):	enter text here

General comments on this assessment:

Table 2. Criteria, Section, and Overall Scores

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

“Impact”
 Enter four characters from Q1.1-1.4 below:
CCCD
 Use matrix determine the score; enter below:
C

2.1	Role of anthropogenic and natural disturbance	B 2	Other Pub. Mat'l
2.2	Local rate of spread with no management	B 2	Rev'd, Sci. Pub'n
2.3	Recent trend in total area infested within state	C 1	Rev'd, Sci. Pub'n
2.4	Innate reproductive potential Wksht A	B 2	Rev'd, Sci. Pub'n
2.5	Potential for human-caused dispersal	C 1	Rev'd, Sci. Pub'n
2.6	Potential for natural long-distance dispersal	A 3	Rev'd, Sci. Pub'n
2.7	Other regions invaded	C 1	Rev'd, Sci. Pub'n

“Invasiveness”
 For questions at left, recall that an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Enter the sum total of all points for Q2.1-2.7 below:
12
 Use matrix to determine score and enter below:
B

“Plant Score”
 Using matrix, determine the Overall Score and Alert Status from the three section scores and enter them below:
Low
No Alert

3.1	Ecological amplitude/Range	D	Rev'd, Sci. Pub'n
3.2	Distribution/Peak frequency Wksht C	A	Other Pub. Mat'l

“Distribution”
 Use matrix determine the score; enter below:
B

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes	C Rev'd, Sci. Pub'n back
Identify ecosystem processes impacted: <i>C. maritima</i> demonstrates weak allelopathy.	
Rationale: <i>C. maritima</i> has demonstrated evidence of allelopathic effects in replicated growth chamber experiments; however, the effect was not detected under field experiments.	
Sources of information: Boyd, R.S. 1993. Replacement of <i>Cakile edentula</i> by <i>C. maritima</i> in the strand habitat of California. <i>American Midland Naturalist</i> , 130(2):209-228.	
Question 1.2 Impact on plant community composition, structure, and interactions	C Other Pub. Mat'l back
Identify type of impact or alteration: <i>C. maritima</i> has lead to the reduction, and in some situations the extirpation of <i>Abronia</i> spp. However, in most places its impacts are minor.	
Rationale: <i>C. maritima</i> is invasive, with the ability to produce more seed, tolerate disturbance, and disperse greater distances than native <i>Abronia</i> spp.	
Sources of information: Wood, L. 19???. Dune stabilization. <i>Fremontia</i> , ?(?):27. Pers. Obs. Joe DiTomaso, Carla Bossard, Jake Sigg, Peter Warner 9/15/05	
Question 1.3 Impact on higher trophic levels	C Other Pub. Mat'l back
Identify type of impact or alteration: Competes for pollination visitation with native vegetation but this may not impact native species.	
Rationale: Although self-compatible, insect pollination plays an intergral part in reproduction.	
Sources of information: Barbour, M.G. and Rodman, J.E. 1970. Saga of the west coast sea-rockets: <i>Cakile edentula</i> ssp. <i>californica</i> and <i>C. maritima</i> . <i>Rhodora</i> , 72(791):370-386.	
Question 1.4 Impact on genetic integrity	D Other Pub. Mat'l back
Identify impacts: No hybridization is known to occur with native California taxa.	
Rationale: No related native California taxa in the genus <i>Cakile</i> .	
Sources of information: Hickman, J.C. (ed.). 1993. <i>The Jepson manual of higher plants of California</i> . Pp. 406. University of California Press, Berkeley.	
Question 2.1 Role of anthropogenic and natural disturbance in establishment	B Other Pub. Mat'l back
Describe role of disturbance: Establishes quickly on beaches and dunes that are frequently disturbed and have	

low diversity.	
Rationale: Able to colonize beach and dune habitats along coast that are frequently disturbed by surf and wind, and have low biodiversity.	
Sources of information: Haubensak, K. 1999. <i>Cakile maritima</i> . Channel Islands National Park Service Species Literature Review. Unpublished.	
Question 2.2 Local rate of spread with no management	B Rev'd, Sci. Pub'n back
Describe rate of spread: No populations were recorded in the first Catalina Island flora in 1923, but by 1966, <i>C. maritima</i> was widespread throughout the beaches and dunes of the Island, and has a similar distribution and abundance in 2003.	
Rationale: If <i>C. maritima</i> can survive into a second or even a third year of reproduction, it can produce an 18-fold difference in seed output. Seed production is increased during colonization, and has a high fecundity.	
Sources of information: Thorne, R.F. 1967. A Flora of Santa Catalina Island, California. <i>Aliso</i> , 6(3):1-77. Knapp, J.J. 2004. Catalina Invasive Plant Ranking Plan for the Catalina Island Conservancy. Unpublished. Barbour, M.G. and Rodman, J.E. 1970. Saga of the west coast sea-rockets: <i>Cakile edentula</i> ssp. <i>californica</i> and <i>C. maritima</i> . <i>Rhodora</i> , 72(791):370-386. Boyd, R.S. 1988. Herbivory and species replacement in the west coast searockets (<i>Cakile</i> , Brassicaceae). <i>American Midland Naturalist</i> , 119(2):304-317. Boyd, R.S. 1993. Replacement of <i>Cakile edentula</i> by <i>C. maritima</i> in the strand habitat of California. <i>American Midland Naturalist</i> , 130(2):209-228. Barbour, M.G. 1970. Seedling ecology of <i>Calike maritima</i> along the California coast. <i>Bulletin of the Torrey Botatnical Club</i> , 97(5):280-289.	
Question 2.3 Recent trend in total area infested within state	C Rev'd, Sci. Pub'n back
Describe trend: Occupies all available habitats along the California and Baja coast. Santa Cruz Island. On Catalina Island, 101,225 square feet are infested.	
Rationale: <i>C. maritima</i> has similar xeric region of origin similar to California, with the average temperature at Santa Cruz Island being the optimal for germination.	
Sources of information: Wood, L. 19XX. Dune stabilization. <i>Fremontia</i> , X(X):27. Knapp, J.J. 2004. Catalina Invasive Plant Ranking Plan for the Catalina Island Conservancy. Unpublished. Boyd, R.S. 1988. Herbivory and species replacement in the west coast searockets (<i>Cakile</i> , Brassicaceae). <i>American Midland naturalist</i> , 119(2):304-317. Barbour, M.G. 1970. Seedling ecology of <i>Calike maritima</i> along the California coast. <i>Bulletin of the Torrey Botatnical Club</i> , 97(5):280-289.	

Question 2.4 Innate reproductive potential	A Rev'd, Sci. Pub'n back
Describe key reproductive characteristics: Seed bank persists for at least 2 years in foredunes. <i>C. maritima</i> can survive disturbance into a second or even a third year of reproduction, producing an 18-fold difference in seed output. Seed production is increased during colonization, and has a high fecundity. Self-pollination is possible. 90% seed set. Classified as an annual species; however, has shown to be biennial.	
Rationale: Seeds are readily buried in foredunes, allowing them to escape predation by deer mice (<i>Peromyscus maniculatus</i>), which can remove 95% of seed, causing only 20% seed survivorship. During colonization of disturbed sites of native <i>Abronia maritima</i> , <i>C. maritima</i> will allocate energy to seed production rather than to biomass to survive until the next year leading to a greater level of invasiveness. <i>C. maritima</i> is a facultative annual, germinating in the winter and fruiting in the summer. One seed per fruit segment.	
Sources of information: Haubensak, K. 1999. <i>Cakile maritima</i> . Channel Islands National Park Service Species Literature Review. Unpublished. Wood, L. 19XX. Dune stabilization. <i>Fremontia</i> , X(X):27. Barbour, M.G. and Rodman, J.E. 1970. Saga of the west coast sea-rockets: <i>Cakile edentula</i> ssp. <i>californica</i> and <i>C. maritima</i> . <i>Rhodora</i> , 72(791):370-386. Boyd, R.S. 1988. Herbivory and species replacement in the west coast searockets (<i>Cakile</i> , Brassicaceae). <i>American Midland Naturalist</i> , 119(2):304-317. Boyd, R.S. 1993. Replacement of <i>Cakile edentula</i> by <i>C. maritima</i> in the strand habitat of California. <i>American Midland Naturalist</i> , 130(2):209-228. Barbour, M.G. 1970. Seedling ecology of <i>Cakile maritima</i> along the California coast. <i>Bulletin of the Torrey Botanical Club</i> , 97(5):280-289. Brown, K. and Brooks, K. 2002. Bushland weeds: a practical guide to their management with case studies from Swan Coastal Plain and beyond. Environmental Weeds Action Network. Greenwood, Australia.	
Question 2.5 Potential for human-caused dispersal	C Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: Sand transport, ship ballast, and trampling account for human-caused dispersal.	
Rationale: The relocation of sand from areas infested with <i>C. maritima</i> to new locales, and trampling by hikers and campers in dunes may allow for plant material to roll (tumble weed effect), thus dispersing seed.	
Sources of information: Rodman, J.E. 1986. Introduction, establishment and replacement of sea-rockets (<i>Cakile</i> , Cruciferae) in Australia. <i>Journal of Biogeography</i> , 13(2):159-171. Wood, L. 19XX. Dune stabilization. <i>Fremontia</i> , X(X):27. Knapp J.J. 2004. Personal observations from 2000-2004 of people walking through infestations on beaches of California and Catalina Island. (310) 510-2821, jknapp@catalinaconservancy.org.	
Question 2.6 Potential for natural long-distance dispersal	A Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: Fruits are adapted for both short and long distance dispersal by wind and water respectively. In California, <i>C. maritima</i> dispersed at a rate of 53 km per year. Deer mice act as microdispersal vectors; however, their herbivory has also impacted <i>C. maritima</i> .	

<p>Rationale: Fruits are composed of two segments and have superb dispersability- the upper segment detaches and is carried by the sea, allowing for 50% of detached fruits to stay afloat for over 100 days. The lower segment remains attached to the plant until wind events cause the plant to roll along the surface, thus breaking off the fruits break. Deer mice cachet seeds.</p>	
<p>Sources of information: Haubensak, K. 1999. <i>Cakile maritima</i>. Channel Islands National Park Service Species Literature Review. Unpublished.</p> <p>Rodman, J.E. 1986. Introduction, establishment and replacement of sea-rockets (<i>Cakile</i>, Cruciferae) in Australia. <i>Journal of Biogeography</i>, 13(2):159-171.</p> <p>Boyd, R.S. 1988. Microdistribution of the beach plant <i>Cakile maritima</i> (Brassicaceae) as influenced by a rodent herbivore. <i>American Journal of Botany</i>, 75(10):1540-1548.</p> <p>Boyd, R.S. 1993. Replacement of <i>Cakile edentula</i> by <i>C. maritima</i> in the strand habitat of California. <i>American Midland Naturalist</i>, 130(2):209-228.</p>	
<p>Question 2.7 Other regions invaded</p>	<p>C Rev'd, Sci. Pub'n back</p>
<p>Identify other regions: Eastern North America, western and southern Australia, Tasmania, and New Zealand are invaded.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: Haubensak, K. 1999. <i>Cakile maritima</i>. Channel Islands National Park Service Species Literature Review. Unpublished.</p> <p>Rodman, J.E. 1986. Introduction, establishment and replacement of sea-rockets (<i>Cakile</i>, Cruciferae) in Australia. <i>Journal of Biogeography</i>, 13(2):159-171.</p> <p>Barbour, M.G. 1970. Seedling ecology of <i>Calike maritima</i> along the California coast. <i>Bulletin of the Torrey Botatnical Club</i>, 97(5):280-289.</p>	
<p>Question 3.1 Ecological amplitude/Range</p>	<p>D Rev'd, Sci. Pub'n back</p>
<p>Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Introduced to California, north of San Francisco in the 1930's. In 1967, Thorne found <i>C. maritima</i> to be well-established, while other botanists found it abundant on Santa Cruz, San Clemente and San Nicolas islands. First recorded on Catalina Island 1966 as well-established on beaches around the Island. Coastal beaches, dunes and sandy stream mouths. Occupies coast line with sandy substrate. On Catalina Island in 2003, 21 populations were recorded and the following are the percentages of habitat infested: beach and dune- 1.4%, and riparian creek mouth-<0.00%.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: Barbour, M.G. 1970. Seedling ecology of <i>Calike maritima</i> along the California coast. <i>Bulletin of the Torrey Botatnical Club</i>, 97(5):280-289.</p> <p>Barbour, M.G. and Rodman, J.E. 1970. Saga of the west coast sea-rockets: <i>Cakile edentula</i> ssp. <i>californica</i> and <i>C. maritima</i>. <i>Rhodora</i>, 72(791):370-386.</p> <p>Thorne, R.F. 1967. A flora of Santa Catalina Island, California. <i>Aliso</i>, 6(3):1-77.</p>	

<p>Knapp, J.J. 2004. Catalina Invasive Plant Ranking Plan for the Catalina Island Conservancy. Unpublished.</p> <p>Haubensak, K. 1999. <i>Cakile maritima</i>. Channel Islands National Park Service Species Literature Review. Unpublished.</p>	
<p>Question 3.2 Distribution/Peak frequency</p>	<p>A Other Pub. Mat'l back</p>
<p>Describe distribution: Very common, but not typically in dense patches.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: Barbour, M.G. 1970. Seedling ecology of <i>Calike maritima</i> along the California coast. Bulletin of the Torrey Botatnical Club, 97(5):280-289.</p> <p>Barbour, M.G. and Rodman, J.E. 1970. Saga of the west coast sea-rockets: <i>Cakile edentula</i> ssp. <i>californica</i> and <i>C. maritima</i>. <i>Rhodora</i>, 72(791):370-386.</p> <p>Thorne, R.F. 1967. A flora of Santa Catalina Island, California. <i>Aliso</i>, 6(3):1-77.</p> <p>Knapp, J.J. 2004. Catalina Invasive Plant Ranking Plan for the Catalina Island Conservancy. Unpublished.</p> <p>Haubensak, K. 1999. <i>Cakile maritima</i>. Channel Islands National Park Service Species Literature Review. Unpublished.</p> <p>Rodman, J.E. 1986. Introduction, establishment and replacement of sea-rockets (<i>Cakile</i>, Cruciferae) in Australia. <i>Journal of Biogeography</i>, 13(2):159-171.</p>	

Worksheet A[back](#)

Reaches reproductive maturity in 2 years or less	Yes: 1 pt
Dense infestations produce >1,000 viable seed per square meter	No: 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	Unknown: 0 pts
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	No: 0 pt
	5 pts 1 unknown
	B (4-5 pts)
Note any related traits: enter text here	

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	A. >50%
	desert	score
	interior	score
Scrub and Chaparral	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
Grasslands, Vernal Pools, Meadows, and other Herb Communities	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
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).