

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):	Foeniculum vulgare Miller
Synonyms:	
Common names:	fennel, sweet fennel, sweet anise
Evaluation date (mm/dd/yy):	6/6/05
Evaluator #1 Name/Title:	Elizabeth Brusati, project manager
Affiliation:	California Invasive Plant Council
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Evaluator #2 Name/Title:	Jenn Erskine Ogden
Affiliation:	Section of Evolution and Ecology, UC Davis
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Section below for list committee use—please leave blank

List committee members:	Joe DiTomaso, Alison Stanton, Joanna Clines, Cynthia Roye, Doug Johnson
Committee review date:	7/8/05 (Revised 9/05)
List date:	enter text here
Re-evaluation date(s):	enter text here

General comments on this assessment:

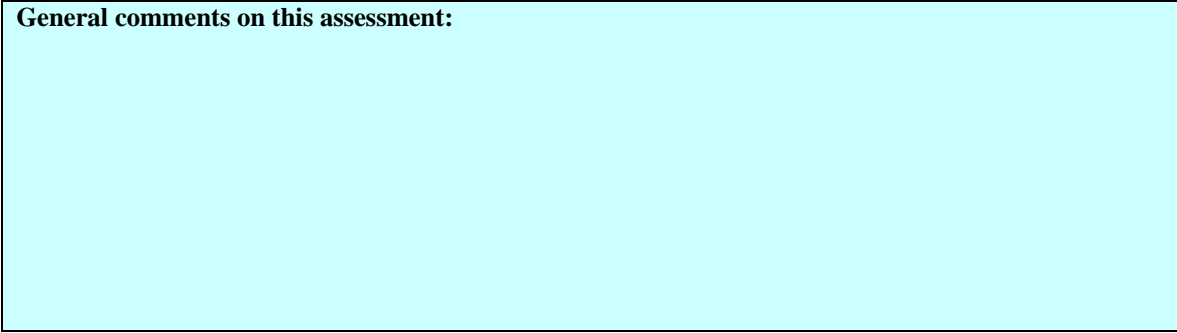


Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	A	Observational
1.2	Impact on plant community	B	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:

ABCD

Using matrix, determine score and enter below:

A

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

Invasiveness

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 Overall Score and Alert Status from the three section scores and enter below:

**High
No Alert**

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

Distribution

Using matrix, determine score and enter below:

A

Table 3. Documentation

<p>Question 1.1 Impact on abiotic ecosystem processes</p>	<p>A Observational back</p>
<p>Identify ecosystem processes impacted: Can alter fire regimes. If fennel is ignited, it creates an intense, fast-moving fire. However, does not burn well in the spring. Primarily affects gaps in coastal scrub stands, rather than intact stands. Fennel’s structure as a fuel includes high live fuel moisture content, shading of the understory herbaceous layer, which increases ignition temperature, and greater volume of 10-hr fuels. This translates into much higher ignition temperatures but greater intensity and duration of fire once it does ignite.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: E-mail from Rob Klinger, UC Davis, rcklinger@ucdavis.edu</p>	
<p>Question 1.2 Impact on plant community composition, structure, and interactions</p>	<p>B Other Pub. Mat'l back</p>
<p>Identify type of impact or alteration: Once firmly established, it excludes almost all other vegetation. Established plants are competitive, and soil disturbance facilitates the development of dense stands, which can exclude native vegetation in some areas (2). The increase in vertical complexity when it invades grassland communities can increase seed input of native fleshy fruited species, but excludes many grassland species. (3,4)</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information:</p> <ol style="list-style-type: none"> 1. Parsons W.T. 1973. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280 2. DiTomaso and Healy. 2006. Weeds of California. UC DANR Publ. #3488. 3. Brenton, R.K. and Klinger, R.C. 2002. Factors influencing the control of fennel (<i>Foeniculum vulgare</i> Miller) using triclopyr on Santa Cruz Island, California, USA. <i>Natural Areas Journal</i> 22: 135-147. 4. Erskine Ogden, J.A. and M. Rejmanek. 2005. Recovery of native plant communities after the control of a dominant invasive plant species, <i>Foeniculum vulgare</i>: Implications for management. <i>Biological Conservation</i> 125: 427-439. 	
<p>Question 1.3 Impact on higher trophic levels</p>	<p>C Other Pub. Mat'l back</p>
<p>Identify type of impact or alteration: Not preferentially grazed by animals because of its strong odor although small plants/seedlings are controlled by grazers (1,3,4). Removal of fennel on Santa Cruz island increased abundance of sideblotched lizards but decreased abundance of southern alligator lizards (2, 5). Frugivorous bird diversity increases in fennel infested grasslands as the birds use the dead fennel stems as perches (6).</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: 1. Parsons W.T. 1973. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280</p> <p>2. Gibson, J. K. 2000. The presence of fennel affects the distribution of lizards on Santa Cruz Island. <i>Cal-EPPC Symposium Proceeding</i>. Vol. 6 (2000-02). pg.37 (you could also use her master's thesis at San Jose State)</p>	

<p>3. Weeds of Australia (I believe the reference for this but don't have it at my house.</p> <p>4. Erskine Ogden, J.A. personal observation</p> <p>5. Gibson, J., G. Yost and S. Bros. 2005. Factors Influencing the Distribution and Abundance of Lizards Following the Removal of an Invasive Non-Native Weed on Santa Cruz Island. In Rejmanek, M., R. Thorp, S. Bros, W. Fox, S. Gleissman and J. Randall. Factors influencing diversity, composition, and assembly patterns of plant and animal communities following the removal of an invasive exotic weed on Santa Cruz Island. Final Report to The Nature Conservancy.</p> <p>6. Erskine Ogden, J.A. and M. Rejmanek. 2005. Recovery of native plant communities after the control of a dominant invasive plant species, <i>Foeniculum vulgare</i>: Implications for management. <i>Biological Conservation</i> 125: 427-439.</p>	
Question 1.4 Impact on genetic integrity	D Other Pub. Mat'l back
Identify impacts: none	
Rationale: No native <i>Foeniculum</i> species.	
Sources of information: Hickman, J. C. (ed.) 1993. <i>The Jepson Manual, Higher Plants of California</i> . University of California Press. Berkeley, CA enter text here	
Question 2.1 Role of anthropogenic and natural disturbance in establishment	B Other Pub. Mat'l back
Describe role of disturbance: Typically inhabits waste places, roadsides, and other disturbed areas. Usually found in areas that are so disturbed as to be of low ecological quality. Feral animal disturbance also promotes germination and spread (2,3). Also found in undisturbed sites.	
Rationale: enter text here	
Sources of information:	
<p>1. Bean C., Russo M.J. "The Nature Conservancy Element Stewardship Abstract for <i>Foeniculum vulgare</i>." http://tncweeds.ucdavis.edu/esadocs/documnts/foenvul.html. 1988.</p> <p>2. Beatty, S.W. 1991. The interaction of grazing, soil disturbance and invasion success of fennel on Santa Cruz Island. Report to The Nature Conservancy, Santa Barbara.</p> <p>3. Brenton, R. and R.C. Klinger. 1994. Modeling the expansion and control of fennel (<i>Foeniculum vulgare</i>) on the Channel Islands. In: Halvorson, W.L. and G.J. Maender (eds). <i>The fourth California Islands Symposium: Update on the status of resources</i>. Santa Barbara Museum of Natural History, Santa Barbara, pp. 497-504.</p>	
Question 2.2 Local rate of spread with no management	B Other Pub. Mat'l back
Describe rate of spread: In last 5 years has spread north east up Hwy 80 from Fairfield, CA, area to Vacaville, Davis, and northeastward (2).	
Rationale: enter text here	

Sources of information: Bean C., Russo M.J. "The Nature Conservancy Element Stewardship Abstract for <i>Foeniculum vulgare</i> ." http://tncweeds.ucdavis.edu/esadocs/documnts/foenvul.html . 1988.	
2. Erskine Ogden, personal observation.	
Question 2.3 Recent trend in total area infested within state	C Other Pub. Mat'l back
Describe trend: Abundant, so probably not spreading much- following highway corridors and spreading both north and east.	
Rationale: enter text here	
Sources of information: Bean C., Russo M.J. "The Nature Conservancy Element Stewardship Abstract for <i>Foeniculum vulgare</i> ." http://tncweeds.ucdavis.edu/esadocs/documnts/foenvul.html . 1988.	
Erskine Ogden, personal observation.	
Question 2.4 Innate reproductive potential	A Other Pub. Mat'l back
Describe key reproductive characteristics: Can reproduce from both crown and seeds. Seeds germinate at almost any time of year, but plants generally do not flower until they are 18 mo. to two years old. Seeds are produced during the summer and autumn and the flowering stems die back during winter to be replaced by new growth in late winter. Some stems stay alive towards the base and produce new leaves from nodes along the stems during the winter. Seed production is usually prolific. Seed production per plant is in the tens of thousands in its first year of growth (when reproduces) and hundreds of thousands in its second year of growth (3).	
Rationale: enter text here	
Sources of information: 1. DiTomaso and Healy. 2006. Weeds of California. UC DANR Publ. #3488.	
2. Parsons W.T. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280. 1973.	
3. Erskine Ogden, J.A. 2004. Integrating ecology and conservation in an invasive species context: a case study using <i>Foeniculum vulgare</i> . Dissertation, University of California, Davis.	
Question 2.5 Potential for human-caused dispersal	B Other Pub. Mat'l back
Identify dispersal mechanisms: Can be spread by cultivation equipment or earth-moving machinery. Seeds can contaminate machinery, agricultural produce, livestock, and clothing (1).	
Rationale: enter text here	
Sources of information:	
1. Parsons W.T. 1973. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280.	
Question 2.6 Potential for natural long-distance dispersal	C Other Pub. Mat'l back
Identify dispersal mechanisms: Seeds disperse with water and animals but this is probably rare for long distance	

movement.	
Rationale: enter text here	
Sources of information: Parsons W.T. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280. 1973.	
Question 2.7 Other regions invaded	C Other Pub. Mat'l back
Identify other regions: Widely distributed throughout temperate regions of the world, including New Zealand, Australia, the British Isles, and North America, usually as a weed of waste places and roadsides. Also considered a weedy species in non-native areas of Europe and the Mediterranean region.	
Rationale: Scoring as C because already abundant in California.	
Sources of information: Parsons W.T. Noxious Weeds of Victoria. Inkata Press, Melbourne. Pgs. 279-280. 1973.	
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: On Santa Cruz Island, invades grasslands, coastal sage, and chaparral. Generally not successful invading chaparral but can extend at least 10m into coastal sage from invaded grasslands (1). Fennel invades grasslands, riparian areas, and other natural communities, particularly in coastal regions of Central and Southern California. Quite common along roadsides (2). Naturalized in 1880's on mainland and by 1997 on Santa Cruz Island (3).	
Rationale: enter text here	
Sources of information: 1. Beatty S.W., Licari D.L. 1992. Invasion of Fennel (<i>Foeniculum vulgare</i>) Into Shrub Communities on Santa Cruz Island, California. <i>Madrono</i> 39(1): 54-66. 2. DiTomaso and Healy. 2006. Weeds of California. UC DANR Publ. #3488. 3. Greene, E. 1887. Studies of the botany of California and parts adjacent, VI. Notes on the botany of Santa Cruz Island. <i>Bulletin of the California Academy of Sciences</i> 2: 377-418.	
Question 3.2 Distribution/Peak frequency	B Other Pub. Mat'l back
Describe distribution: Most common throughout low elevation areas of California, except Great Basin and desert regions (1). Much more common along the coast in Southern and Central California as well as the Bay Area (2). Beginning to proliferate in more central regions following the Hwy 80 and 5 corridors (3).	
Rationale: enter text here	
Sources of information: 1. DiTomaso and Healy. 2006. Weeds of California. UC DANR Publ. #3488.	

2. Joe DiTomaso, Weed Science Program, UC Davis, observational.
3. Erskine Ogden, J., personal observation

Worksheet A[back](#)

Reaches reproductive maturity in 2 years or less	Yes: 1 pt
Dense infestations produce >1,000 viable seed per square meter	Yes: 2 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	Unknown: 0 pts
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
	8 pts 1 unknown
	A (6+ 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	score
	desert	score
	interior	score
Scrub and Chaparral	coastal bluff scrub	B. 21-50%
	coastal scrub	B. 21-50%
	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	D. presen
Grasslands, Vernal Pools, Meadows, and other Herb Communities	coastal prairie	B. 21-50%
	valley and foothill grassland	C. 5-20%
	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	D. presen
	riparian scrub (incl. desert washes)	D. presen
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).