

# 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</b> (Latin binomial):	Centaurea virgata Lam. var. squarrosa (Boiss.) Gugler
<b>Synonyms:</b>	Centaurea squarrosa Willd. is an illegally applied name according to the rules of the International Code of Botanical Nomenclature (Saint Louis Code) since the name Centaurea squarrosa Roth was previously applied to a different species. Centaurea virgata Lam. var. squarrosa (Willd.) Boiss. is a synonym of Centaurea squarrosa Willd. Some taxonomists are using the name C. triumfetti All. for diffuse knapweed. Some flora use C. virgata Lam. ssp. squarrosa (Willd.) Gugler, but the taxon was given variety ranking first.
<b>Common names:</b>	squarrose knapweed
<b>Evaluation date</b> (mm/dd/yy):	September 15, 2004
<b>Evaluator #1 Name/Title:</b>	Carri Pirosko
<b>Affiliation:</b>	California Department of Food and Agriculture, Noxious Weed Program
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<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:**

enter text here

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

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

<p><b>Impact</b></p> <p><i>Enter four characters from Q1.1-1.4 below:</i></p> <p><b>BBBD</b></p> <p><i>Using matrix, determine score and enter below:</i></p> <p><b>B</b></p>
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<a href="#">2.1</a>	Role of anthropogenic and natural disturbance	<b>B (2 pts)</b>	Rev'd, Sci. Pub'n
<a href="#">2.2</a>	Local rate of spread with no management	<b>B (2 pts)</b>	Observational
<a href="#">2.3</a>	Recent trend in total area infested within state	<b>B (2 pts)</b>	Other Pub. Mat'l
<a href="#">2.4</a>	Innate reproductive potential <a href="#">Wksht A</a>	<b>A (3 pts)</b>	Rev'd, Sci. Pub'n
<a href="#">2.5</a>	Potential for human-caused dispersal	<b>B (2 pts)</b>	Rev'd, Sci. Pub'n
<a href="#">2.6</a>	Potential for natural long-distance dispersal	<b>B (2 pts)</b>	Rev'd, Sci. Pub'n
<a href="#">2.7</a>	Other regions invaded	<b>C (1 pt)</b>	Rev'd, Sci. Pub'n

<p><b>Invasiveness</b></p> <p><i>Enter the sum total of all points for Q2.1-2.7 below:</i></p> <p><b>14</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>Medium</b></p> <p><b>No Alert</b></p>
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<a href="#">3.1</a>	Ecological amplitude/Range	<b>A</b>	Rev'd, Sci. Pub'n
<a href="#">3.2</a>	Distribution/Peak frequency <a href="#">Wksht C</a>	<b>C</b>	Rev'd, Sci. Pub'n

<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**

<p><b>Question 1.1</b> Impact on abiotic ecosystem processes</p>	<p>B Rev'd, Sci. Pub'n <a href="#">back</a></p>
<p>Identify ecosystem processes impacted: light availability is impacted in dense stands of squarrose knapweed- this is the only plant in stands that reach monotypic levels</p> <p>It is suspected that available water in the rangeland profile is severely reduced by dense stands of squarrose knapweed, based on findings with yellow starthistle in similar rangeland settings. The success of Centaurea species in dominating grasslands is explained by their ability to compete successfully for the new limiting resource or resources (K.D. LeJeune et al.)</p> <p>Wildfires create the ideal conditions for rapid expansion. Squarrose knapweed's fire and drought tolerance, excellent seed dispersal, and rapid response to soil resources released by fire nearly guarantee spread into burned closed-canopy juniper sites with little understory.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: C. Pirosko, personal observation.</p> <p>LeJeune, Katherine D., Seastedt, Timothy R. 2001. Centaurea species: The forb that won the west. Conservation Biology. 15(6). December: 1568-1574.</p> <p>Sheley and Petroff. Biology and Management of Noxious Rangeland Weeds.</p>	
<p><b>Question 1.2</b> Impact on plant community composition, structure, and interactions</p>	<p>B Other Pub. Mat'l <a href="#">back</a></p>
<p>Identify type of impact or alteration: Formation of dense stands dominate &gt;75% cover by squarrose knapweed, with remaining cover being bare ground.</p> <p>Dense stands build up over time and alter plant community structure and composition.</p> <p>May have allelopathic properties, as other knapweeds (spotted and Russian) do allowing other vegetation to be excluded.</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: J. DiTomaso and E. Healy, Weeds of California and Other Western States, as yet unpublished.</p> <p>C. Pirosko personal observation.</p>	
<p><b>Question 1.3</b> Impact on higher trophic levels</p>	<p>B Other Pub. Mat'l <a href="#">back</a></p>
<p>Identify type of impact or alteration: Dense stands impact bird and wildlife, as well as range animal use of the system.</p> <p>Highly competitive, dense stands can exclude desirable vegetation and wildlife in natural areas</p>	
<p>Rationale: enter text here</p>	
<p>Sources of information: J. DiTomaso and E. Healy, Weeds of California, as yet unpublished.</p>	

Sheley, R. L, and J. K. Petroff. 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, OR	
<b>Question 1.4</b> Impact on genetic integrity	D Observational <a href="#">back</a>
Identify impacts: No information found as to impacts within populations of native species.	
Rationale: Suspected that crossing does occur with other non-native knapweeds- as specimens are found with characteristics of squarrose, spotted, and diffuse knapweeds.	
Sources of information: C. Pirosko, personal observation.	
<b>Question 2.1</b> Role of anthropogenic and natural disturbance in establishment	B Other Pub. Mat'l <a href="#">back</a>
Describe role of disturbance: Largely invades disturbed sites.	
Largely dependant on human disturbances such as: over grazing, logging/replanting activities, roadside maintenance/scraping, roads and trails.	
Dispersal by vehicles and trains appears increasingly important, judging by the expansion of squarrose knapweed along roads, railroads, and off-road vehicles.	
Often grows on degraded rangeland soils and is more adaptable to drought and cold temperatures than other knapweeds.	
Rationale: enter text here	
Sources of information: J. DiTomaso and E. Healy, Weeds of California, as yet unpublished. Sheley and Petroff. Biology and Management of Noxious Rangeland Weeds.	
<b>Question 2.2</b> Local rate of spread with no management	B Observational <a href="#">back</a>
Describe rate of spread: Rate of spread is slow and steady within sites- gradually expands at the edges of the populations over time.	
Spread in the Big Valley area of Lassen County is the best documentation of spread. Since 1950 when the plant was first officially documented (infestation likely had been there since 1930-40's), the infestation has slowly crept along roadways, from ranch to ranch on equipment and sheep. So that today extensions of the original infestation spread up into the forest behind the Kramer Ranch in Big Valley, up into Lookout, Modoc County, and down all the way into Pittville area to the southeast of Big Valley.	
Rationale: enter text here	
Sources of information: personal observation, C. Pirosko California Department of Food and Agriculture. Internal Document (typed document from 1973, author unknown), California Department of Food and Agriculture, Integrated Pest Control Branch, Noxious Weed Program, Redding Field Office.	

<b>Question 2.3</b> Recent trend in total area infested within state	B Observational <a href="#">back</a>
Describe trend:	
Not widely distributed throughout the State. Primarily has been isolated to the Great Basin area in northeastern California.	
Rate of spread is slow and steady. Spread in the Big Valley area of Lassen County is the best documentation of spread. Since 1950 when the plant was first officially documented (infestation likely had been there since 1930-40's), the infestation has slowly crept along roadways, from ranch to ranch on equipment and sheep. So that today extensions of the original infestation spread up into the forest behind the Kramer Ranch in Big Valley, up into Lookout, Modoc County, and down all the way into Pittville area to the southeast of Big Valley.	
Rationale: enter text here	
Sources of information: personal observation, C. Pirosko California Department of Food and Agriculture.	
Internal Document (typed document from 1973, author unknown), California Department of Food and Agriculture, Integrated Pest Control Branch, Noxious Weed Program, Redding Field Office.	
<b>Question 2.4</b> Innate reproductive potential	A Other Pub. Mat'l <a href="#">back</a>
Describe key reproductive characteristics: Can reach reproductive maturity in less than one year (goes from rosette to seeding plant with one little wimpy flowering stalk). Number of seeds are 2-8 per seed head, certainly less than other knapweeds, however the number of squarrose knaped seed heads per plant is large.	
Long-lived perennial with deep roots and stout crown; squarrose knapweed can endure drought at either temperature extreme, and does not depend on annual seed production nor frequent seedling success to maintain it populations.	
Forms multiple rosettes from a single taproot	
Resprouts very easily after mowed, chopped, cut at ground surface or even with some underground root material removed- must get all of the root to avoid resprouting.	
Rationale: enter text here	
Sources of information: Sheley and Petroff. Biology and Management of Noxious Rangeland Weeds.	
C. Pirosko personal observation.	
<b>Question 2.5</b> Potential for human-caused dispersal	B Other Pub. Mat'l <a href="#">back</a>
Identify dispersal mechanisms: Primarily Human caused. Long distance dispersal is primarily through sheep. The recurved spines of squarrose knapweed are ideally suited to transport by sheep's wool. Historically, most of the movement of squarrose knapweed has been associated with sheep. No reference has been found regarding the initial introduction of squarrose knapweed into the western U.S., but it is possible that seed was carried in wool, either of sheep or wool products, yarn, blankets, or clothing.	
Often grows on degraded rangeland soils and is more adaptable to drought and cold temperatures than other knapweeds.	
Roadside equipment, scraping of road shoulders by CalTrans and County Road departments is also a mode of long distance dispersal along roadways.	

Rationale: enter text here	
Sources of information: Bellue, M. K. 1952. Virgate Star Thistle, <i>Centaurea virgata</i> var. <i>squarrosa</i> (Willd.) Boiss. in California. Bulletin, California Dept. of Agriculture. Vol. 41(2): 61-63. J. DiTomaso and E. Healy, Weeds of California, as yet unpublished. C. Pirosko, personal observation.	
<b>Question 2.6</b> Potential for natural long-distance dispersal	B Other Pub. Mat'l <a href="#">back</a>
Identify dispersal mechanisms: Primarily Human caused. The highly deciduous nature of the seed heads could lend itself to distribution through wind and water and/or through the fur of wildlife and birds.	
Rationale: enter text here	
Sources of information: Bellue, M. K. 1952. Virgate Star Thistle, <i>Centaurea virgata</i> var. <i>squarrosa</i> (Willd.) Boiss. in California. Bulletin, California Dept. of Agriculture. Vol. 41(2): 61-63. C. Pirosko, personal observation.	
<b>Question 2.7</b> Other regions invaded	C Other Pub. Mat'l <a href="#">back</a>
Identify other regions: Utah, Oregon, Washington, Nevada, Michigan Primarily invades range and pasture lands, as well as along roadsides. Often grows on degraded rangeland soils and is more adaptable to drought and cold temperatures than other knapweeds. Native to Eastern Europe, Southern Russia, and Western Asia--- The climate of these native ranges are very similar to that of the Great Basin found in northeastern California, Eastern Oregon, and parts of Utah. Squarrose knapweed is native to Bulgaria, Lebanon, Anti-Lebanon, Transcaucasia, northern Iraq, Iran, Afghanistan, and Turkestan. In the Flora of Turkey, the U.S. specimens key to subspecies <i>squarrosa</i> of <i>Centaurea virgata</i> , which is found mainly in Inner Anatolia; much of the plateau of Inner Anatolia lies between 2,500 and 3,300 feet elevation, falling to a large salt lake in the center. The climate in that region is harsh, characterized by erratic precipitation, temperature extremes, wind and devastating hail storms. Precipitation primarily falls as snow in the winter and spring; summers are dry with very low humidity; Winter temperatures are lower than Mediterranean climates and in summer temperatures soar during the day and drop drastically at night. (NOTE: A PERFECT DESCRIPTION OF BIG VALLY, LASSEN COUNTY, CA, USA as well!)	
Rationale: Squarrose knapweed is a threat to similar ecological types already invaded; similar great basin-like habitat found in eastern portions of the state; Could still invade range and pasture lands south of Lassen County, into regions along the California/Nevada Border. STILL VAST OPPORTUNITY to keep spreading in areas already invaded, expansion of current distribution. PLUS lots of range/pasture in the GREAT BASIN is still susceptible to invasion which would have significant impacts on productivity of these lands. Squarrose knapweed simply hasn't been introduced in these susceptible	

<p>areas- if given the opportunity, squarrose knapweed could do more damage to northeastern rangelands.</p>	
<p>Sources of information: Internal Document (typed document from 1973, author unknown), California Department of Food and Agriculture, Integrated Pest Control Branch, Noxious Weed Program, Redding Field Office.  J. DiTomaso and E. Healy, Weeds of California, as yet unpublished.  Sheley and Petroff. Biology and Management of Noxious Rangeland Weeds.</p>	
<p><b>Question 3.1</b> Ecological amplitude/Range</p>	<p>A Other Pub. Mat'l <a href="#">back</a></p>
<p>Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known:</p> <p>In northern California, squarrose knapweed grows on dry rocky sites of degraded juniper-shrub savanna with scattered western juniper and poderosa pine and chaparral-type understory (Sheley and Petroff)</p> <p>In the Great Basin and intermountain foothills, the sagebrush and juniper range types appear to be the most susceptible to invasion by squarrose knapweed.</p> <p>Often grows on degraded rangeland soils and is more adaptable to drought and cold temperatures than other knapweeds.</p> <p>First official record was in 1950; this species was collected at the Kramer Ranch in Big Valley, Lassen County by Loring White and identified by J.T. Howell of the Academy of Sciences, and subsequently identified by Dr. S.F. Blake of the USDA. Prior to 1910 there is no information about this ranch on which the sample was collected. After 1910 records indicate that the ranch was rented out as sheep pasture and under lease to neighboring rancher, James Summers. This site was then used as an overnight campground by sheepmen when they trailed their bands of sheep from the Sacramento Valley to higher ranges in the summer and returned them in the fall. In 1935 Mr. Summers reported to have commented on a weed taking over his leased pasture. About 1944 Mr. Rupert Lyons purchased the property and found a heavy infestation of the weed. Mr Lyons sold the land to Mr. O.E. Brown, whose son collected the specimen identified in 1950.</p>	
<p>Rationale: Squarrose knapweed has largely Squarrose knapweed is a threat to similar ecological types already invaded; similar great basin-like habitat found in eastern portions of the state; Could still invade range and pasture lands south of Lassen County, into regions along the California/Nevada Border.</p> <p>STILL VAST OPPORTUNITY to keep spreading in areas already invaded, expansion of current distribution.</p> <p>PLUS lots of range/pasture in the GREAT BASIN is still susceptible to invasion which would have significant impacts on productivity of these lands. Squarrose knapweed simply hasn't been introduced in these suceptible areas- if given the opportunity, squarrose knapweed could do more damage to northeastern rangelands.</p>	
<p>Sources of information: Internal Document (typed document from 1973, author unknown), California Department of Food and Agriculture, Integrated Pest Control Branch, Noxious Weed Program, Redding Field Office; C. Pirosko personal observation.  J. DiTomaso and E. Healy, Weeds of California, as yet unpublished.  Sheley and Petroff. Biology and Management of Noxious Rangeland Weeds.</p>	
<p><b>Question 3.2</b> Distribution/Peak frequency</p>	<p>C Other Pub. Mat'l <a href="#">back</a></p>
<p>Describe distribution:</p> <p>Klamath Ranges (n Humboldt, c Siskiyou, ce Trinity cos.), Cascade Range (Shasta Co.), Modoc Plateau (Modoc,</p>	

ne Lassen cos.), northern Sierra Nevada (nc Plumas Co., to 1400 m.

Present distribution in California:

Lassen, Modoc, Siskiyou, and Shasta Counties. The major infestation is in Big Valley, Lassen County. The Modoc infestation is in the area of Lookout and Lookout Junction- are really extensions of the Big Valley infestation. Also found in the Pittville Area, also an extension of the Big Valley infestation. In Shasta County squarrose knapweed has been found on several ranches. The largest infestations are at the Bidwell Ranch (between Fall River Mills and Cassel), Kane Ranch (Off highway 89, north of the town of Hat Creek), on USFS lands on Brush Mountain, on Pit River Tribe lands called "Charlie Bone" off Highway 89, again north of town of Hat Creek, in and around Burney High School, and the PGE Right of Way off Mountain View Road, past Burney High School. Squarrose knapweed is a common find along the roadways- 299, 89, and 44 in Shasta County. A large site known as "Hawkensville" in Siskiyou county was under containment for over 30 years, until the late 1990s with Weed Management Area funding the site was aggressively treated. This Siskiyou site has been significantly reduced, follow-up spot treatments are ongoing until it is eradicated.

The above mentioned sites are the primary active sites in the state, isolated, single plant finds have been found in other counties throughout the state- these have been eradicated by California Department of Food and Agriculture, Noxious Weed Program.

Rationale: Areas similar to Great Basin are vulnerable to invasion (HOT summers, Snow in Winters); certainly there is room for lots more invasion in the northeastern counties, as well as Nevada/California boarder counties.

Sources of information: Internal Document (typed document from 1973, author unknown), California Department of Food and Agriculture, Integrated Pest Control Branch, Noxious Weed Program, Redding Field Office.

J. DiTomaso and E. Healy, Weeds of California, as yet unpublished.

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

Reaches reproductive maturity in 2 years or less	<b>Yes: 1 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>Yes: 2 pts</b>
Viable seed produced with <i>both</i> self-pollination and cross-pollination	<b>Unknown: 0 pts</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>8 pts      1 unknown</b>
	<b>A (6+ pts)</b>
<b>Note any related traits:</b> enter text here	

## 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	score
	rivers, streams, canals	score
	estuaries	score
<b>Dunes</b>	coastal	score
	desert	score
	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	C. 5-20%
	chenopod scrub	score
	montane dwarf scrub	score
	Upper Sonoran subshrub scrub	score
	chaparral	D. presen
<b>Grasslands, Vernal Pools, Meadows, and other Herb Communities</b>	coastal prairie	score
	valley and foothill grassland	score
	Great Basin grassland	C. 5-20%
	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)	score
<b>Woodland</b>	cismontane woodland	score
	piñon and juniper woodland	D. presen
	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).