

Oregon Department of Agriculture  
Plant Pest Risk Assessment for  
Squarrose knapweed, *Centaurea virgata* ssp. *squarrosa*  
2010

Name: Squarrose knapweed, *Centaurea virgata*  
Family: Sunflower, *Asteraceae*

**Findings of This Review and Assessment:** Squarrose knapweed, *Centaurea virgata*, was evaluated and determined to be a category “**A**” rated noxious weed, as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination was based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v.3.6, squarrose knapweed scored **62** indicating a Risk Category of **A**; and a score of **17** with the Noxious Weed Rating System v.3.2, indicating an **A** rating.



*Squarrose knapweed flowers, photo by Dan Sharratt, ODA*

**Introduction:** Squarrose knapweed, *Centaurea virgata*, is an “A” classified noxious weed in Colorado, Nevada and California, a prohibited noxious weed in Arizona, and a Class B Noxious weed in Utah. Squarrose knapweed appears to be a slow disperser if left to its own devices. Seed fall is generally within a meter of the plant unless assisted. A member of the sunflower family, it is native to parts of Iran, Iraq, Afghanistan, Turkey and Lebanon. These areas are dry with unpredictable precipitation and temperature extremes, and have experienced a long history of sheep and goat grazing. Squarrose knapweed is considered to be a component of quality range forage for goats in its native Iran (Arzani.et.al). It appears to have been introduced into the West in the 1800's as a contaminant of wheat and wool. Squarrose knapweed is one of the least widespread of the invasive *Centaureas*, but has the greatest potential of impacting eastern Oregon's desert rangelands because it can form very dense stands. The largest infestation, near Long Creek, Oregon, is in high quality native bunchgrass in the 16-inch precipitation zone.

The Long Creek site originated at an old shepherders homestead with the original field heavily infested, and the adjacent unplowed rangeland moderately to heavily infested.

**Growth Habits, Reproduction, and Spread:** Squarrose knapweed is a long-lived perennial with deep roots and a large crown. Rosettes will grow slowly for a number of years before blooming. Flower heads are smaller than the other knapweeds, showing rose-colored flowers beginning in early to mid June and having up to eight seeds per head. The terminal bracts around the flower heads are enlarged and recurved. Squarrose knapweed is not a showy plant and may escape detection if found in the presence of other knapweeds. The heads readily detach from the plants when mature, acting as a very effective dispersal mechanism by catching in animal hair and on clothing. Whole plants can also detach and tumble with the wind dropping seed heads as they go. The seed heads do not open at maturity, ensuring that they are dispersed far from the parent plant and slowly shaken out over time. Sheep are heavily implicated in the spread of squarrose knapweed. Agricultural activities are responsible for long distance dispersal through hay and livestock movements, equipment transport and possibly, in contaminated seed. Wind, wildlife and livestock are important factors in localized movement.



*Squarrose knapweed buds, photo by Dan Sharratt, ODA*

**Factors Effecting Establishment and Spread:** Ground disturbance and the wide availability of susceptible habitats are the key factors in the establishment of squarrose knapweed in the west. Hoof marks create excellent microclimates for germinating seedlings and overgrazed pastures offer little competition to developing plants. Squarrose does invade healthy bunchgrass communities by establishing between bunchgrass clumps very early in the spring. Droughts and cold tolerance also play a key factor in this plant's success. Human right-of-way maintenance activities also provide annual disturbance often leaving bare soil open to colonization.

**Native Range:** Squarrose knapweed is native to parts of Southern Asia; Bulgaria, Lebanon, Iraq, Iran, Afghanistan, and Turkey and parts of China. These are harsh climates with hot summers, cold winters, high diurnal fluctuations, erratic precipitation and long historic exposure to grazing animals. This plant forms a relatively small part of the native desert flora and is considered to be an important grazing component particularly for goats (Arzani.et.al. 2006).

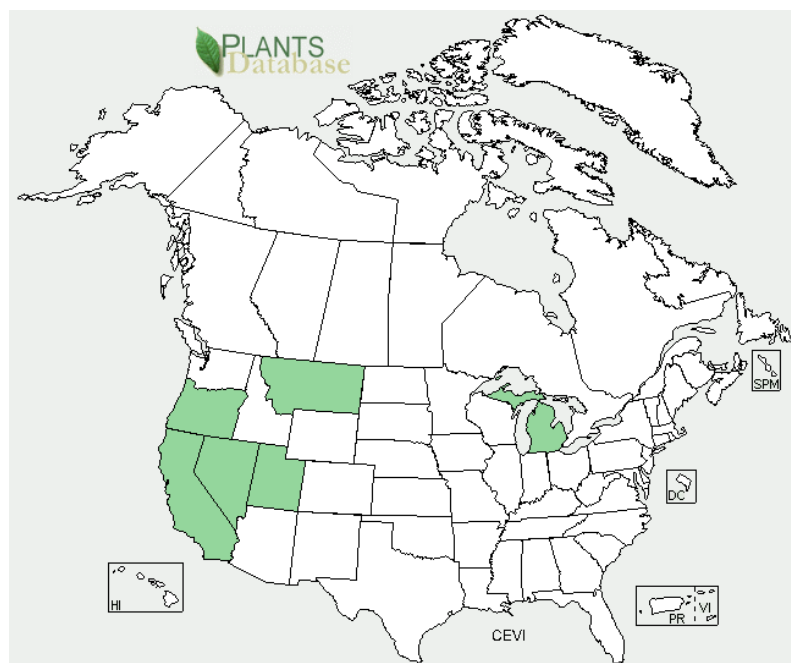
**Distribution and Habitat Availability in North America:** Squarrose knapweed is highly adaptable to a wide range of habitats throughout the west. It can thrive in arid rangeland, pine forests, prime Great Basin and Rocky mountain grasslands and in wastelands, non-crop and right-of-ways.

It is one of the more drought-tolerant of the knapweeds. Nationally, it can be found in two southeast counties in Wyoming and is considered eradicated in the western half of the state.

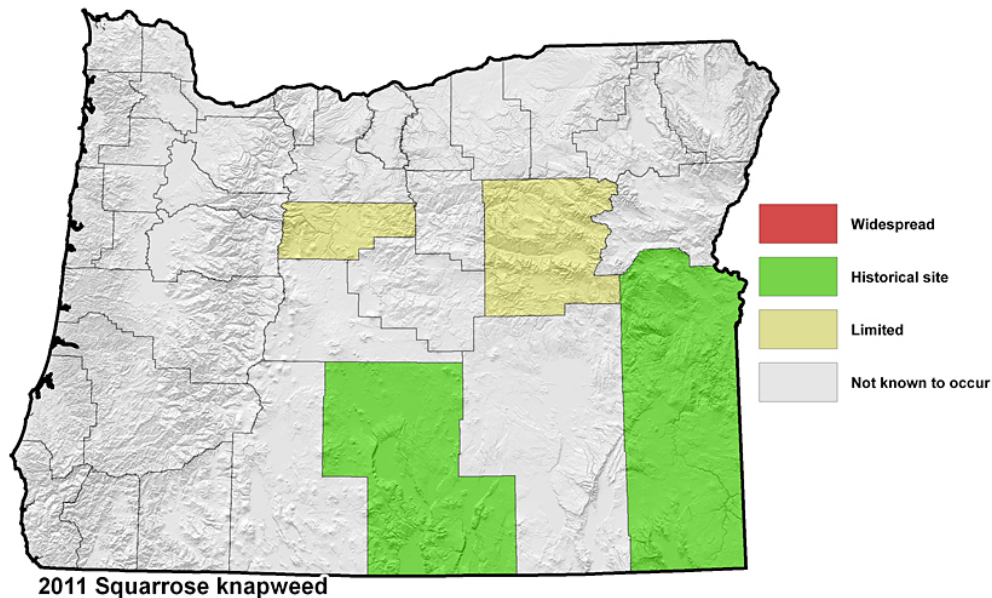
There are seven infested counties in Northern California (second largest infestations compared to Utah), with most infestations under intensive chemical control, though some of the larger sites in Shasta and Lassen Counties are being evaluated for biocontrol with some promising results (CDFA Noxious Times Vol 7 No. 2). Nevada hosts infestations in three counties with Utah containing 200,000 acres in its West-Central region. The plant is reported to be eradicated in Montana.



*Squarrose knapweed infestation in California, photo by Jerry Asher, BLM*



*US distribution of squarrose knapweed on Plants Database*



*Oregon's distribution of squarrose knapweed on WeedMapper.org*

**Hardiness Zones:** Squarrose knapweed thrives in 3 - 4 hardiness zones. See attachment A.

**Positive Economic Impact:** Squarrose knapweed has no known positive benefits in North America. It is considered a valuable part of the native forage base for goats in its native range. Introduction was accidental, thought to be as contaminants of cereal grain seed and/or wool. There are no reported historical ornamental or herbal uses.

**Negative Economic Impact:** Squarrose knapweed has shown the ability to form very dense stands under a wide variety of rangeland conditions. Invasion is most rapid in disturbed ground, particularly when sheep grazing is involved. Most of Oregon's driest desert range would be susceptible to invasion. These are ranges that support much of the livestock industry in Oregon, as well as threatened sage grouse and numerous rare plants. Squarrose knapweed responds quickly to re-establishes after a fire, and is said to carry a fire as handily as cheatgrass when in dense infestations (Whittaker and Jensen 2008).

**Ecological Impacts:** Heavy knapweed stands are effective sinks of moisture and nutrients, robbing grasses and forbs of those resources. Invaded rangeland does not convert back to productive communities even over a long time span. In some locations, such as in Siskiyou County, California treatments are being made to prevent invasion in habitats hosting two listed rare plants.

**Control:** Initial evaluations of Transline/Milestone treatments showed poor results though weed density greatly decreased one-year post (Sharratt per com 2010). Tordon demonstrates good results though there are concerns over the loss of non-target forbs. Fire as a management tool probably increases populations under most conditions and should be followed by an herbicide treatment and grass seeding. Manual control is very labor intensive due to the stout deep-rooted nature of the knapweed plants. Though it is difficult to control, there are apparent eradication success stories in Western Colorado, Montana, and some counties in Northern California.

# Noxious Weed Qualitative Risk Assessment

## Oregon Department of Agriculture

Common name: Squarrose knapweed  
Scientific name: *Centaurea virgata*  
Family: Sunflower, *Asteraceae*

For use with plant species that occur or may occur in Oregon and to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

**Total Score: 62**                      **Risk Category: A**

### GEOGRAPHICAL INFORMATION

**1) 6**            **Invasive in Other Areas**

- 0 Low- not known to be invasive elsewhere.
- 2 Known to be invasive in climates dissimilar to Oregon's current climates.
- 6 Known to be invasive in geographically similar areas.

Comments: Known to be invasive in climates similar to Oregon

**2) 6**            **Habitat Availability:** Are there susceptible habitats for this species and how common or widespread are they in Oregon?

- 1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
- 3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
- 6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Capable of successfully invading most of eastern and southwestern Oregon regions.

**3) 0**            **Proximity to Oregon:** What is the current distribution of the species?

- 0 *Present* – Occurs within Oregon.
- 1 *Distant* – Occurs only in distant US regions or foreign countries.
- 3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
- 6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Occurs within Oregon.

**4) 10**           **Current Distribution:** What is the current distribution of escaped populations in Oregon?

- 0 *Not present* – Not known to occur in Oregon.
- 1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
- 5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
- 10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Limited to one established infestation in the state.

## BIOLOGICAL INFORMATION

- 5) 2 **Environmental Factors:** Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).
- 1 *Low* – Severely confined by abiotic factors.
  - 2 *Medium* – Moderately confined by environmental factors
  - 4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Moderately confined by environmental factors. Prefers dryer conditions and well-drained soils.

- 6) 5 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.
- 0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
  - 1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
  - 3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
  - 3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).
  - 5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
  - 6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Produces many seeds of moderate longevity.

- 7) 3 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)
- 0 *Negligible* – Host plant not present for parasitic species.
  - 1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
  - 2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
  - 4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Moderately limited by biological factors. Grass competition can restrict density.

- 8) 3 **Reproductive Potential and Spread After Establishment - Non-human Factors:** How well can the species spread by natural means?
- 0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
  - 1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
  - 3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed).
  - 5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Comments: Wind and water dispersed and by animals locally.

- 9) 5 **Potential of Species to be Spread by Humans.** What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.
- 1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).
  - 3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).
  - 5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: High potential to be moved by human activities.

#### IMPACT INFORMATION

- 10) 7 **Economic Impact:** What impact does/can the species have on Oregon's agriculture and economy?
- 0 *Negligible* – Causes few, if any, economic impacts.
  - 1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
  - 5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
  - 10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Has impacts on rangeland productivity and hay quality and yields. Also seed contaminant.

- 11) 4 **Environmental Impact:** What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.
- 0 *Negligible* – None of the above impacts probable.
  - 1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.
  - 4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).
  - 6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Can compete successfully in dryer climates for water and nutrients.

- 12) 1**      **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms).
- 0 *Negligible* – Has no impact on human or animal health.
  - 2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge).
  - 4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).
  - 6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock).

Comments: Seedheads may cause physical injury to sheep and other livestock.

#### CONTROL INFORMATION

- 13) 8**      **Probability of Detection at Point of Introduction:** How likely is detection of species after introduction and naturalization in Oregon?
- 1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).
  - 5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).
  - 10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Not a showy plant, similar in appearance to diffuse knapweed. May not be identified for years in remote locations.

- 14) 2**      **Control Efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?
- 1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).
  - 2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).
  - 4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents ineffective.
  - 6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Herbicides primarily used for control.



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Category Scores:

**22** Geographic score (Add scores 1-4)

**18** Biological Score (Add lines 5-9)

**12** Impact Score (Add lines 10-12)

**10** Control Score (Add Lines 13-14)

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**62 Total Score** (Add scores 1-14 and list on front of form)

**Risk Category:**      55-89+ = **A**      24-54 = **B**      < 24 = unlisted.

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This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species.

1/15/2013 v.3.8

Oregon Department of Agriculture  
Noxious Weed Rating System

Common Name: Squarrose knapweed  
Scientific Name: *Centaurea virgata*

**Points: 17**                      **Rating: A**

- 1) **3**                      **Detrimental Effects:** Circle all that apply, enter number of circles.  
1. *Health:* causes poisoning or injury to humans or animals  
2. *Competition:* strongly competitive with crops, forage, or native flora  
3. *Host:* host of pathogens and/or pests of crops or forage  
4. *Contamination:* causes economic loss as a contaminate in seeds and/or feeds  
5. *Interference:* interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement
- 2) **3**                      **Reproduction & Capacity for Spread:** Circle the number that best describes, enter that number.  
1. Few seeds, not wind blown, spreads slowly  
2. Many seeds, slow spread  
3. Many seeds, spreads quickly by vehicles or animals  
4. Windblown seed, or spreading rhizomes, or water borne  
5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials
- 3) **3**                      **Difficulty to Control:** Circle the number that best describes, enter that number.  
1. Easily controlled with tillage or by competitive plants  
2. Requires moderate control, tillage, competition or herbicides  
3. Herbicides generally required, or intensive management practices  
4. Intensive management generally gives marginal control  
5. No management works well, spreading out of control
- 4) **5**                      **Distribution:** Circle the number that best describes, enter that number.  
1. Widely distributed throughout the state in susceptible habitat  
2. Regionally abundant, 5 or more counties, more than 1/2 of a county  
3. Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds  
4. Contained in only 1 watershed, or less than 5 square miles gross infestation  
5. Isolated infestation less than 640 acres, more than 10 acres  
6. Occurs in less than 10 acres, or not present, but imminent from adjacent state
- 5) **3**                      **Ecological Impact:** Circle the number that best describes, enter that number.  
1. Occurs in most disturbed habitats with little competition  
2. Occurs in disturbed habitats with competition  
3. Invades undisturbed habitats and crowds out native species  
4. Invades restricted habitats (i.e. riparian) and crowds out native species

**17 TOTAL POINTS**

*Note:* Noxious weeds are non-native plants with scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as “A” rated weeds. *Ratings:* 16 + = A, 15 – 11 = B  
ODA Weed Rating System 8/30/2012 v.3.2

RA produced by Daniel B Sharratt, ODA  
Edited: Glenn Miller, ODA, 2011

References:

Whittaker, Alison and Scott L. Jensen. 2008. Effects of Fire and Restoration Seeding on Establishment of Squarrose Knapweed (*Centaurea virgata* var. *squarrosa*). USDA Forest Service Proceedings RMRS-P-52 2008

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Arzani, H. M. Basiri, F. Khatibi, G. Ghorbani. 2006. Nutritive value of some Zagros Mountain rangeland species. Small Ruminant Research 65(2006) 128-135.

Rocke, Cindy Talbott. 1999. Squarrose Knapweed. pp362-371. Biology and Management of Noxious Rangeland Weeds. Eds. Roger L. Sheley, Janet K. Petroff. Oregon State University Press 1999

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PLANTS Database. 2010. "Plants Profile *Centaurea virgata* Lam. Squarrose knapweed.  
<http://plants.usda.gov/java/profile?symbol=CEVI>

Attachment A

