



## FIELD GUIDE

# Wyoming Weed Watchlist



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The *Wyoming Weed Watchlist Field Guide* is designed to enhance prevention and early detection efforts of weeds not yet widely established in Wyoming. It was developed by students enrolled in the University of Wyoming's Invasive Plant Ecology course of fall semester 2010. Each weed profile is written by a different student, so some variability in areas of focus is apparent. However, the information is supported by literature and is considered accurate and current.

The field guide is not intended as a management handbook, but rather an educational tool for outdoor recreationalists, natural resource professionals, tourists, gardeners, agriculturalists, and others to aid in identification of unfamiliar, yet extremely important, weeds in the region. The highest leverage step in reducing potential impact of new invasive weeds in Wyoming is to detect new populations before they can become well-established. Small, new populations are easier to control than larger, older populations.

### **Distribution Data**

Data used to produce the distribution maps for each species represent documented occurrences from the following sources: Rocky Mountain Herbarium online database, INVADERS database, Early Detection and Distribution Mapping System (EDDMaPS), Wyoming Cooperative Agricultural Pest Survey, and additional information from recent weed collections. A documented collection in the past does not mean that a current infestation is present, but these data show that a species has been found at some time in the county, which is colored. Distributions will be updated in subsequent versions of the field guide if new information indicates populations are in currently undocumented counties.

### **Reporting Infestations**

Please report a population of any of these weeds so immediate action can be taken to control the population and to prevent its spread into new areas of the state. Weed populations can be reported in different ways:

- To your local weed and pest control district  
<http://www.wyoweed.org/addresses.html>
- To your local University of Wyoming Extension office  
<http://www.uwyo.edu/ces/areas/index.html>
- Through the Wyoming Cooperative Agricultural Pest Survey Report-A-Pest program  
<https://survey.uwyo.edu/TakeSurvey>.
- To the University of Wyoming Extension weed specialist [bamealor@uwyo.edu](mailto:bamealor@uwyo.edu)

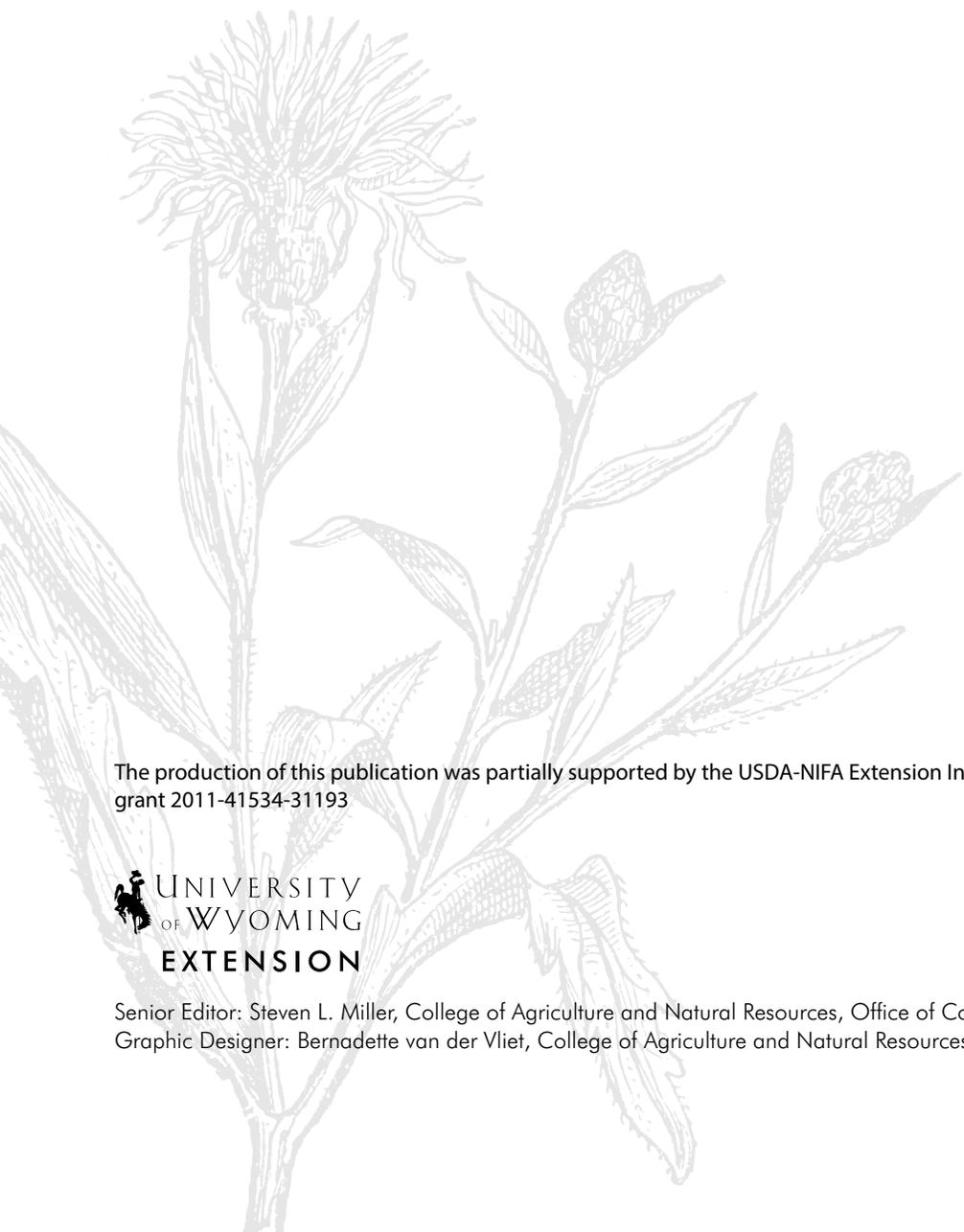
Thank you for contributing to the detection and control of weeds in Wyoming!

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# Purple starthistle

*Centaurea calcitrapa* L.

by: Patrick Miller

Asteraceae

## General information

Purple starthistle, also known as red or common starthistle, was accidentally introduced to North America through California in the early 1900s. It is native to the Mediterranean region. Purple starthistle is listed as noxious in six Western states. The plant is primarily a biennial that sometimes acts as an annual or a short-lived perennial and is a close relative of Iberian and yellow starthistle. The scientific name comes from the word "caltrop." A caltrop was an ancient weapon with four spine-like projections.

## Identification

Purple starthistle grows from 1 to 4 feet tall and has a thick taproot. The plant is heavily branched, and the lower leaves are divided with the leaves toward the apex of the plant being less divided and tapered at the tip. The stems and leaves are covered with fine, cobweb-type hairs. The plant produces many purple flower heads  $\frac{3}{4}$  to 1 inch in length, and they are covered with 1-inch spines.

## Potential look-alikes

Purple starthistle may be mistaken for yellow or Iberian starthistle. Yellow starthistle has yellow flowers and wing-like leaf margins on the stem that are absent in purple starthistle. Iberian starthistle is very similar to purple starthistle but can be distinguished by its white to pink flowers and shorter, bristly hairs on the leaves and stem.



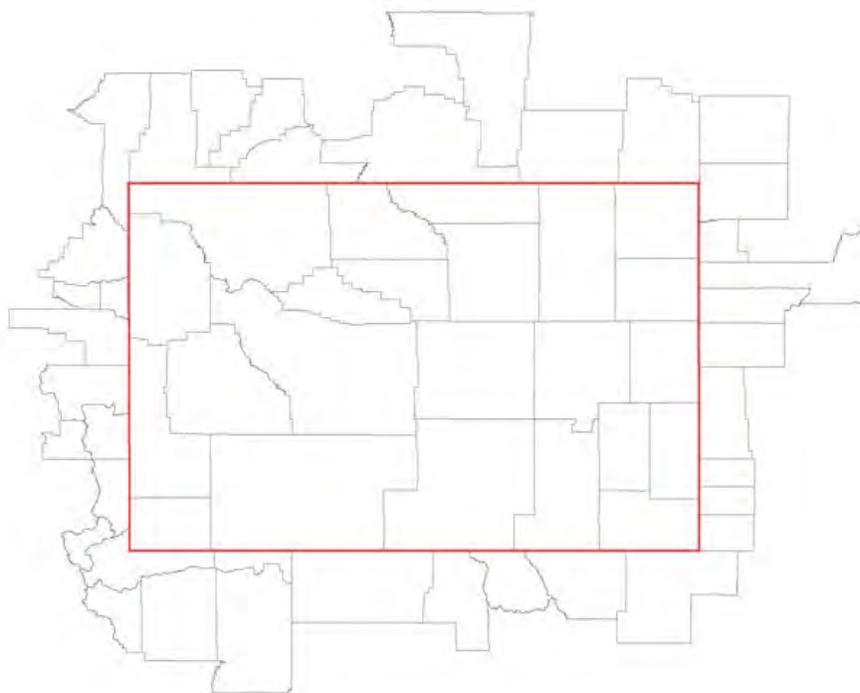
**Fig. 1.** Purple starthistle showing spines on flower. (Barry Rice, [sarracenia.com](http://sarracenia.com), [Bugwood.org](http://Bugwood.org))



**Fig.2.** Purple starthistle plant. (Ricette Almanacco)

# Purple starthistle

*Centaurea calcitrapa* L.



**Fig. 3.** Purple starthistle is currently not documented in Wyoming, but it is a county-declared weed in Big Horn, Converse, and Washakie counties.

## Distribution

Purple starthistle is native to Northern Africa and Asia Minor in a region between the Black and Caspian seas. Its spread in North America began in California; it is now present in eight Western states and five Midwest and Mid-Atlantic states. It is listed as noxious in Arizona, California, Nevada, New Mexico, Oregon, and Washington but is also found in Utah. The closest populations outside Wyoming are in Salt Lake and Utah counties in Utah. In Wyoming, purple starthistle is a county-declared weed in Big Horn, Converse, and Washakie counties.

## Impacts

In California, it has degraded ecosystems from San Diego to Humboldt counties. It thrives in healthy, moist soils of rangelands, pastures, and roadsides where it invades and displaces native vegetation. Purple starthistle is poor tasting and has spine-covered flowers and seed heads so it is unpalatable to both livestock and wildlife. Its presence on a rangeland reduces forage production and decreases the health of the native plant community. Since it is avoided by animals, it reduces the carrying capacity of rangelands. Its spiny nature inhibits proper management and recreational potential on public lands.

# Purple starthistle

*Centaurea calcitrapa* L.

## Monitoring

The seeds of purple starthistle have no long-distance dispersal mechanism so they fall to the ground within several feet of the parent plant. The seed heads are spiny and can stick to animals, vehicle tires, and machinery and can be transported by water. Seeds can remain viable for many years so infested sites, once cleared, need to be monitored for seedling establishment. Infestations are best controlled while still small. Hay, seed, livestock, and equipment should all be checked for potential weed seed introduction. Extra precautions should be taken when receiving products from infested areas of a state.

**Control options:** *Biological:* There is no current biological control program for purple starthistle. There are reports of two insects introduced for other *Centaurea* species that also feed on purple starthistle. Yellow starthistle is controlled with a rust fungus that also attacks purple starthistle, but purple starthistle seems to withstand the attack with no effect on root biomass.

*Mechanical:* For small infestations, purple starthistle can be hand pulled. If plants have formed flowers, they must be disposed of properly by burning as they likely contain viable seeds. Field tests in California have shown a 10 to 15 percent resprout rate from roots even when chopped several inches below the base of the crown. Mowing is not recommended as multiple sprouts will come out of each root causing an explosion in resprouting populations. Mowing can also spread seeds over a larger area.

*Chemical:* Herbicides that have shown effectiveness against the spread of purple starthistle include glyphosate, 2,4-D, dicamba, and picloram. These are best applied in the spring when plants are actively growing and soil moisture is high. If used later in the season, apply only enough herbicide to cover the crown of the plant to prevent the weed's seed bank from sprouting in large bare patches of soil left from too much herbicide use.

## References

California Department of Food and Agriculture. Accessed 7 Dec 2011

<<http://www.cdffa.ca.gov/phpps/ipc/weedinfo/centaurea.htm>>

Early Detection and Distribution Mapping System. Accessed 7 Dec 2011

<<http://www.eddmaps.org/distribution/usstate.cfm?sub=5268>>

Wyoming County Weed and Pest Districts. Accessed 7 Dec 2011

<[http://www.uwyo.edu/capswebsupport/Weeds/2010\\_WEED\\_MAPS/PUST\\_ACRES\\_10.pdf](http://www.uwyo.edu/capswebsupport/Weeds/2010_WEED_MAPS/PUST_ACRES_10.pdf)>

San Francisco Peaks Weed Management Area. Accessed 7 Dec 2011

<[http://sbsc.wr.usgs.gov/research/projects/swepic/factsheets/ceca2sf\\_info.pdf](http://sbsc.wr.usgs.gov/research/projects/swepic/factsheets/ceca2sf_info.pdf)>

Washington State University. Accessed 7 Dec 2011

<<http://cru.cahe.wsu.edu/CEPublications/pnw0350/pnw0350.html>>

## For more information

USDA PLANTS Database

<<http://plants.usda.gov/java/profile?symbol=ceca2>>

Wyoming Pest Detection Program

<<http://uwadmnweb.uwyo.edu/capsweb/info.asp?p=11553>>

USDA NISIC

<<http://www.invasivespeciesinfo.gov/plants/purplestarthistle.shtml>>

# Iberian starthistle

by: Patrick Miller

*Centaurea iberica* Trev. ex Spreng.

Asteraceae

## General information

Iberian starthistle is native to Europe and was first reported in California in the early 1950s. It has since been declared a noxious weed in California, Oregon, Nevada, Washington, and certain counties of Wyoming. Iberian starthistle is a biennial weed but can behave as an annual or short-lived perennial. An invader of pasture, range, and roadsides, Iberian starthistle favors wet areas near streams and drainages.

## Identification

Iberian starthistle is a tap-rooted biennial. Leaves are scabrous with stiff, pointed hairs. Lower leaf surfaces are pitted with minute globules. Lower leaves are deeply lobed; upper leaves have large middle lobes with two small lateral lobes. Leaf margins are edged with small yellow spines. Flower heads are  $\frac{3}{8}$ - to  $\frac{1}{2}$ - inches wide and  $\frac{1}{2}$ - inches tall. These dimensions exclude spines and flowers. Bracts form on flower heads and are pale green in color with a stiff spine at the end. Spines can be up to  $\frac{3}{4}$  of an inch long. Purple flowers form on the seed head, and seeds are  $\frac{1}{8}$ -inch long and have a plume of bristles about half as long as the seed (Fig. 1).

## Potential look-alikes

Purple starthistle looks almost identical and must be differentiated based on flower heads. Purple starthistle has a darker shade of purple flowers and seed heads are smaller ( $\frac{3}{16}$  to  $\frac{1}{4}$  of an inch wide) (Figure 2).



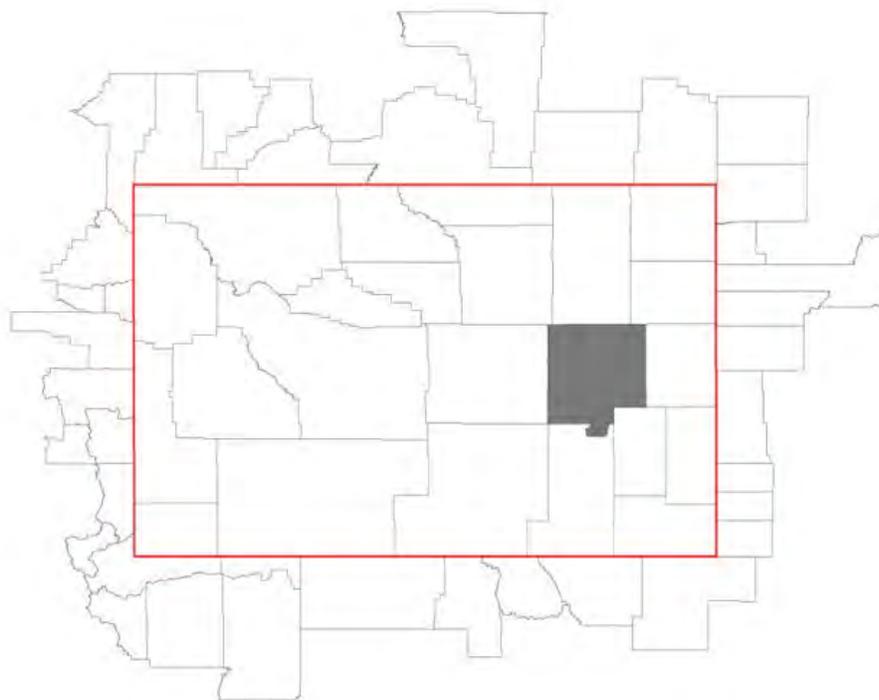
**Fig. 1.** Iberian starthistle. Top: flower, left: basal rosette, right: seeds. (CalPhotos)



**Fig. 2.** Purple starthistle. (CalPhotos)

# Iberian starthistle

*Centaurea iberica* Trev. ex Spreng.



**Fig. 3.** Documented Iberian starthistle distribution in and around Wyoming.

## Distribution

Iberian starthistle is a native of Bulgaria, Greece, Romania, Ukraine, and Yugoslavia. It has been established in the United States since the early 1950s and is present in California, Oregon, Nevada, and Washington. Iberian starthistle has been previously discovered in Converse County (Figure 3) and is a declared weed in Big Horn and Washakie counties although it has not been documented yet. In addition to the United States, Iberian starthistle has established in parts of Canada and India.

## Impacts

Iberian starthistle is capable of invading natural ecosystems and out-competing native plants, lowering biodiversity, degrading habitat, and lowering land values. Iberian starthistle is a well-adapted species for invasion. A prolific seed producer capable of distributing its seeds over long distances, it can thrive in harsh climates and is capable of outcompeting many desirable species. Iberian starthistle's unpalatability to livestock and wildlife can decrease the productivity of rangeland and lower the value of the land. Additionally, the sharp spines can serve as a barrier to human and wildlife traffic.

# Iberian starthistle

*Centaurea iberica* Trev. ex Spreng.

## Monitoring

Monitoring for new invasions of Iberian starthistle is an important strategy that may greatly reduce control costs in the long term. Counties bordering Converse County should take extra steps in monitoring for Iberian starthistle. Inspection of livestock, hay, and machinery in areas where Iberian starthistle has been found may also help prevent invasion.

## Control options

*Mechanical:* Young plants can be controlled by grubbing or digging the root out of the soil while still in the rosette stage; however, as the plant matures, mechanical control options become limited. Mowing is not considered effective as 10-15 percent of plants can re-sprout from the roots even if cut below the base of the crown.

*Biological:* Although several insect species have been studied for possible biologic control of Iberian starthistle, none have currently been approved for release. Grazing is ineffective on Iberian starthistle as the sharp spike on the flower heads can harm grazing animals.

*Chemical:* Herbicide can effectively control Iberian starthistle, but multiple applications may be required throughout the year. Effective herbicides include glyphosate, 2,4-D, picloram, and clorpyralid. Herbicide applications are most effective in the fall and in the spring during the first year of growth. Herbicide applications are often not effective after seed heads have formed.

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# Meadow knapweed

*Centaurea pratensis* Thuill

by: Kelsey Hutchinson

Asteraceae

## General information

Meadow knapweed is a hybrid of black and brown knapweeds and a native of Europe. This plant was originally introduced as a potential forage plant. Unfortunately, it actually has low palatability and reduces the quality of pasturelands. This plant is also known to invade roadsides, sand/gravel bars, river banks, irrigated pastures, moist meadows, forest openings, parks, lawns, industrial sites, tree farms, vacant lands, and railroad rights of way.

## Identification

Meadow knapweed is a perennial plant that grows from a woody crown up to 3½ feet tall. Stems of the plant are erect, branched near the middle, and slightly pubescent. Leaves are entire or have small lobes or teeth and can grow to 6 inches long, 1¼- inch wide. Flowers are rose-purple (on occasion white) and held in round heads about the size of a nickel. Flowering peaks in July and August but can continue into November and December. Bracts are light to dark brown with a papery fringe on the margin. The bracts appear metallic-gold when the plant is flowering. Seeds are about 1/8-inch long, ivory-white to light brown in color, and sometimes bearing a row of short hairs.

## Potential look-alikes

Unlike spotted and diffuse knapweed, meadow knapweed leaves are not finely divided. Also, meadow knapweed bracts are intermediate between black-fringed and brown papery (center picture), as seen in Fig. 2. The bracts surrounding flower heads of brown knapweed have rounded papery tips (left). The black comb-like fringes characterize the black knapweed bracts (right). The commonly planted bachelor's buttons are also a look-alike to meadow knapweed.



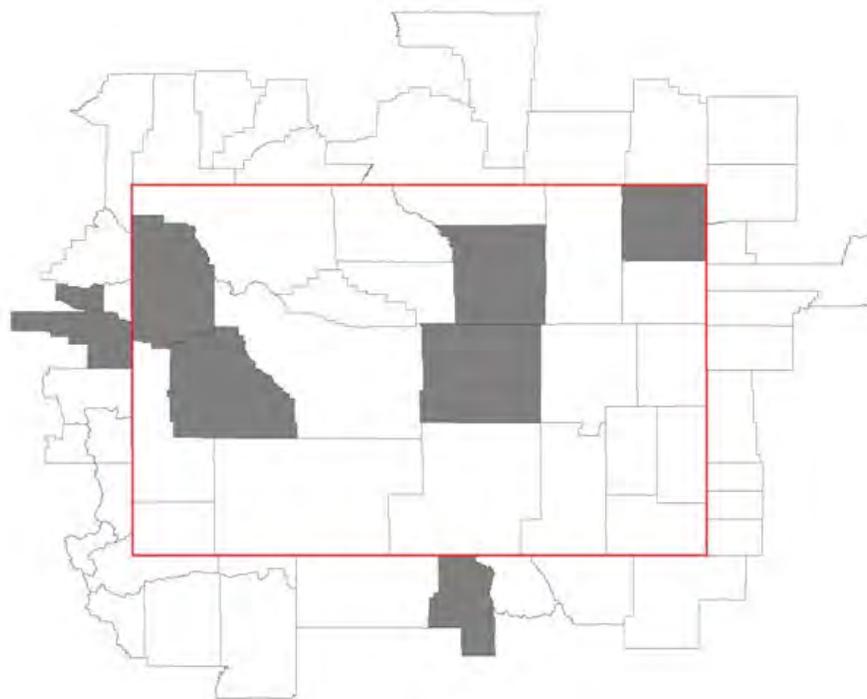
**Fig. 1.** Clockwise from upper left: meadow knapweed rosette, flower and bracts, entire plant, and another angle of the flower (King County [WA] Noxious Weed Control Program, 2010).



**Fig. 2.** The background picture is of an infestation of Meadow knapweed. The three flower photos: (left) brown knapweed, (center) meadow knapweed, (right) black knapweed (Roche and Coombs, 2003).

# Meadow knapweed

*Centaurea pratensis* Thuill



**Fig. 3.** This shows documented distribution of meadow knapweed in and around Wyoming.

## Distribution

The earliest records of meadow knapweed in the Pacific Northwest are in Oregon between 1910 and 1920. This weed has spread from Oregon to Washington and Idaho. In Idaho, the weed is on the statewide control list. In Oregon and Washington, the weed is a designated B weed. The current update on the Cooperative Agricultural Pest Survey (CAPS) shows that five counties (Crook, Johnson, Natrona, Sublette, and Teton) in Wyoming have meadow knapweed. Very few infestations in Colorado have been documented. Each state's designated place on a weeds list was found at the Center for Invasive Plant Management (CIPM).

## Impacts

Meadow knapweed is an aggressive species that decreases biodiversity in native plant communities. This weed can also reduce usable forage production in grass hayfields and pastures. This knapweed exhibits low palatability and has the ability to inhibit the growth of surrounding vegetation by exuding toxins through roots and leaves.

As is common among knapweeds, meadow knapweed produces both pollen and nectar, which can make it a desirable plant to beekeepers (Whatcom County, WA Noxious Weed Control Board, 2010.)

# Meadow knapweed

*Centaurea pratensis* Thuill

## Monitoring

Meadow knapweed invades moist sites, including irrigated pastures and moist meadows, river banks, streams, irrigation ditches, and openings in forested areas. These areas are at high risk for invasion. Prevent meadow knapweed from becoming established. First learn how to identify it and avoid driving through infested areas. Check purchased hay and fields or pastures from which equipment or livestock move onto your property. Use weed screens on irrigation water intakes and work with irrigation districts to prevent meadow knapweed seeds from entering the water. Seed all disturbed sites to a perennial vegetative cover immediately after any soil disturbance. Control should involve prevention and early detection. Control measures should eliminate or reduce seed production and vegetative spread of established populations. Seeds can remain viable in the soil for several years. As a result, infestations should be monitored for multiple growing seasons to prevent germination of new plants. Combining control methods into an integrated management system will provide the greatest long-term control of the invader.

## Control options

**Mechanical:** Hand pulling or digging can be effective in reducing small infestations of meadow knapweed. The entire root crown of the plant should be removed to guarantee a new stem does not reproduce. Mowing or cutting plants may suppress infestations, but, generally, meadow knapweed will continue to flower and produce seeds on shorter plants.

**Chemical:** There are many different herbicide options. For recommendations, visit the *Pacific Northwest Weeds Handbook* (<http://weeds.ippc.orst.edu/pnw/weeds>). Some of the chemicals suggested are clopyralid plus triclopyr, clopyralid alone, and picloram. However, first contact a local county extension educator for recommended use rates, locations, and timing.

**Biological:** A few biocontrol agents have been released on other knapweeds and have been observed feeding on meadow knapweed. A moth, *Metzneria paucipunctella*, a weevil, *Larinus minutus*, and a fly, *Urophora quadrifasciata*, have all established on meadow knapweed.

## References

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<<http://invader.dbs.umt.edu>>

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<<http://uwadmnweb.uwyo.edu/capsweb/info.asp?p=11131>>

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<<http://www.idahoweedawareness.com>>

Idaho Weed Resource. Accessed 7 Dec 2011

<<http://www.cals.uidaho.edu/weeds/>>

Institute for Applied Ecology. Accessed 7 Dec 2011.

<[http://www.bentonswcd.org/invasive\\_species/meadow\\_knapweed\\_brochure.pdf](http://www.bentonswcd.org/invasive_species/meadow_knapweed_brochure.pdf)>

# Yellow starthistle

*Centaurea solstitialis* L.

by: Tyrell Perry

Asteraceae

## General information

Yellow starthistle is a winter annual forb native to Eurasia normally found below 7,000 feet elevation in dry areas where there are high light conditions and annual rainfall is between 10-60 inches. Common habitats include rangelands, pastures, roadsides, and wastelands. Most common invaded land is over-utilized grasslands. Yellow starthistle can yield up to 30,000 seeds per square meter with up to 95 percent viable.

## Identification

Yellow starthistle is characterized by its bright yellow flowers ringed with long, sharp spines. Spines can be up to  $\frac{3}{4}$ -inch long. Height of the plant can vary from 6 inches to 5 feet. Basal leaves are 2 to 3 inches long and deeply lobed where upper leaves are short ( $\frac{1}{2}$ - to 1-inch long) and narrow with few lobes. Stems and leaves are covered with a loose, cottony wool that gives them a whitish appearance.

## Potential look-alikes

Buffalo bur is a plant commonly mistaken for yellow starthistle. To identify buffalo bur, look for tomato-like flowers and extremely prickly leaves, stems, and fruits.



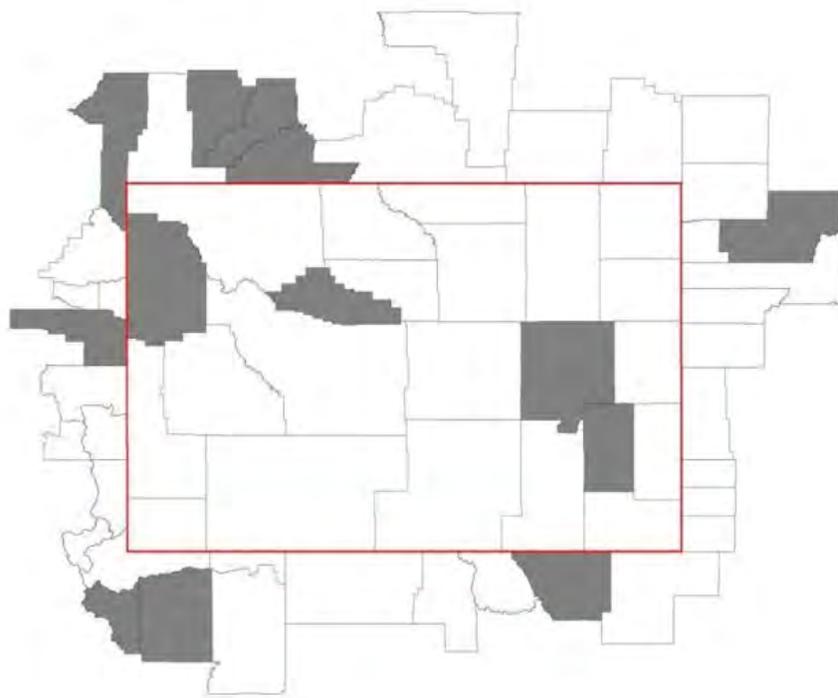
**Fig. 1.** Top: seedling/rosette (Steven County Noxious Weed Control Board); right: flower head of yellow starthistle. (Barry Rice, [sarracenia.com](http://sarracenia.com), [Bugwood.org](http://Bugwood.org))



**Fig. 2.** Buffalo bur has sometimes been mistaken for yellow starthistle. (Beth Kinsey)

# Yellow starthistle

*Centaurea solstitialis* L.



**Fig. 3.** Documented yellow starthistle distribution in and around Wyoming. No known self-sustaining populations exist in Wyoming.

## Distribution

Yellow starthistle originates from Eurasia and was introduced into California in the mid-19th century. It has since taken over about 15,000,000 acres in California alone. As of 2006, yellow starthistle has been reported to be present in 41 of the lower 48 states. Specimens had been documented in Converse, Hot Springs, Platte, and Teton Counties in Wyoming but have been eradicated.

## Impacts

Yellow starthistle is known to be poisonous to horses, but is safe for other livestock to consume. It is capable of lowering yield and forage quality of rangelands. It reduces land value and limits access to recreational areas.

## Common names

Geeldissel, golden starthistle, Sonnwend-Flockenblume, St. Barnaby's thistle, yellow centaury, yellow cockspur, yellow starthistle.

## Synonyms

*Leucantha solstitialis*

# Yellow starthistle

*Centaurea solstitialis* L.

## Control options

**Biological control:** In 2003, four natural enemies of yellow starthistle were brought from Europe and established in California. The four biological control agents include two flies (*Urophora sirunaseva* and *Chaetorellia succinea*) and two weevils (*Bangasternus orientalis* and *Eustenopus villosus*). They act in similar fashion attacking the flower and seed head causing a decrease in seed production. All insects are host-specific to yellow starthistle and will not harm commercially valuable crops or native plants.

**Mechanical control:** Mechanical control methods such as tillage can be effective against yellow starthistle but proceed with caution. Rainfall following tillage allows rapid reinfestation. Repeated cultivation is an effective method of removing yellow starthistle. Burning can also be an effective. It can aid in the survival of native forbs and perennial grasses if burning takes place following native species dispersal of seeds and before yellow starthistle produces viable seed (June-July).

**Chemical control:** Postemergent herbicide treatments work best on seedlings. The long germination period of yellow starthistle makes control with single applications nearly impossible. The best time to apply herbicides is later in the rainy season to achieve a greater number of seedlings treated. There are several different effective herbicides to treat mature yellow starthistle; possible herbicides include picloram, aminopyralid, clopyralid, 2,4-D, dicamba, triclopyr, and glyphosate. Each of these herbicides when used at proper rates and times of the growing season can be effective in control of yellow starthistle.

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Idaho Weed Awareness Campaign. Accessed 7 Dec 2011.

<<http://www.idahoweedawareness.net/vfg/weedlist/ystarthistle/ystarthistle.html>>

# Squarrose knapweed

by: Holden Hergert

*Centaurea virgata* Lam. ssp. *squarrosa* (Willd.) Gugler Asteraceae

## General information

Squarrose knapweed is a long-lived perennial. It has a deep taproot, and typically is 12 to 18 inches in height. Squarrose knapweed is native to the eastern Mediterranean area. It can be highly competitive in disturbed sites and open rangeland areas with dry and shallow soils.

## Identification

Stems are highly branched with deeply dissected lower leaves and bract-like upper leaves. Flower heads are relatively small, containing three to eight pink-colored flowers that will develop no more than three to four seeds. Flower bract tips are recurved with the terminal spine longer than the lateral spines on each bract.

## Potential look-alikes

Distinguishing squarrose knapweed from other knapweeds can be difficult. The easiest way is by the size, shape, and color of the flower bracts. Diffuse knapweed can be hardest to discern, but squarrose knapweed has recurved flower bracts. Its seed heads are also highly deciduous, falling off the stems soon after seeds mature. Russian knapweed is easiest to separate because it is the only knapweed with dark perennial roots with lateral root buds.



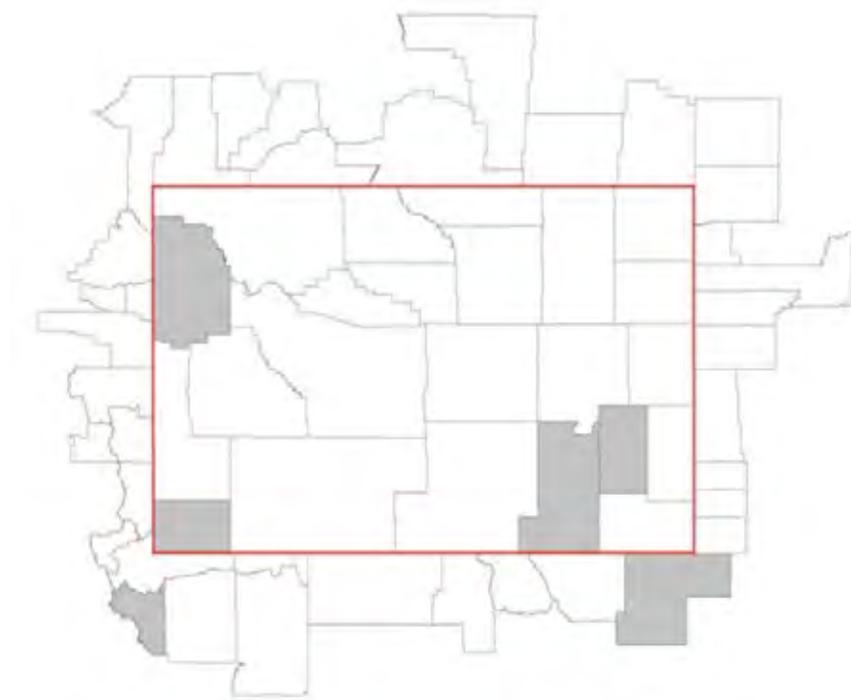
**Fig. 1.** Top: Squarrose knapweed; bottom left: flower (Steve Dewey, Utah State University, Bugwood.org); bottom right: branching structure (Joseph M. DiTomaso, University of California - Davis, Bugwood.org)



**Fig. 2.** Left: spotted; top, diffuse; right, Russian knapweed. Photo by Steve Dewey, Utah State University, Bugwood.org

# Squarrose knapweed

*Centaurea virgata* Lam. ssp. *squarrosa* (Willd.) Gugler



**Fig. 3.** Documented distribution of squarrose knapweed in and around Wyoming.

## Distribution

In Wyoming, squarrose knapweed has been identified in Uinta, Teton, Albany, and Platte counties. It was almost eradicated from Uinta County, but one sighting was made in 2010. Most recently, it has been found in Albany and Platte counties. In Colorado, it has been found in Weld County. It is in six counties in west-central Utah, the closest to Wyoming being Wasatch County. In Montana, it has been found in one mid-central county—Judith Basin.

## Impacts

Squarrose knapweed readily invades rangelands that are disturbed or that have little competitive native species. It is also drought and fire tolerant, making post-fire sites and harsh environments its ideal habitat. Once established, it can become highly competitive with desired vegetation and reduce the forage production and wildlife habitat of the invaded site. The recurved flower bracts make perfect burs that can cling to passing animals that become transporters of seeds to new areas.

# Squarrose knapweed

*Centaurea virgata* Lam. ssp. *squarrosa* (Willd.) Gugler

## Monitoring

Most of Wyoming is at risk for squarrose knapweed invasion. The areas most at risk to invasion or further invasion are southwestern and southeastern Wyoming. If it has invaded, the weed will most likely be found in dry and shallow soils. If found, eradication should be the management goal.

## Control options

**Mechanical control:** Mechanical control is only effective if the entire taproot is removed or if it is severed at a depth of at least 8 inches.

**Biological control:** Several biocontrol insect species exist for control of knapweeds, and several of those will feed on squarrose knapweed. However, since eradication of likely small populations is the goal, biocontrol agents may not be the best method. If it is a large area that is impossible to control otherwise due to terrain or environmental sensitivity, biocontrol may be warranted.

**Chemical control:**

Herbicide	Rate (product/acre)	Application time
Tordon <i>picloram</i>	1-1.5 pt	Rosette to mid-bolting stage
Grazon P&D <i>picloram</i> + 2,4-D	2-3 qt	Rosette to mid-bolting stage
Curtail 2,4-D + <i>clopyralid</i>	2-3 qt	Late bud to early rosette
Milestone <i>aminopyralid</i>	5-7 oz	Rosette to bolting stage

**\*\*Always read and follow herbicide label\*\***

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# Rush skeletonweed

*Chondrilla juncea* L.

by: Sam Kendrick

Asteraceae

## General information

This herbaceous perennial is native to Eurasia and the Mediterranean region, readily invades many ecological sites in the Intermountain West. Long-distance dispersal is accomplished via the dandelion-like seeds, but local spread is often facilitated by an aggressive root system. Seed longevity in the soil is considered to be at least three years. New plants usually overwinter as rosettes and may produce flowering stems the following year.

## Identification

Circular rosettes (basal bunch of leaves) sometimes wither as the plant matures. Basal rosettes may easily be mistaken for common dandelion. The bottom portion of the stem (4-6 inches) is covered in downward-pointing brown hairs. Leaves and stems exude a milky white sap when injured. Overall, plants may range from 1-4 feet in height. Yellow flowers are clustered in groups of 9-12 and are less than 1 inch in diameter. Petals have notched, blunt ends.

## Potential look-alikes

Both common dandelion and chicory may look like rush skeletonweed in the rosette stage.



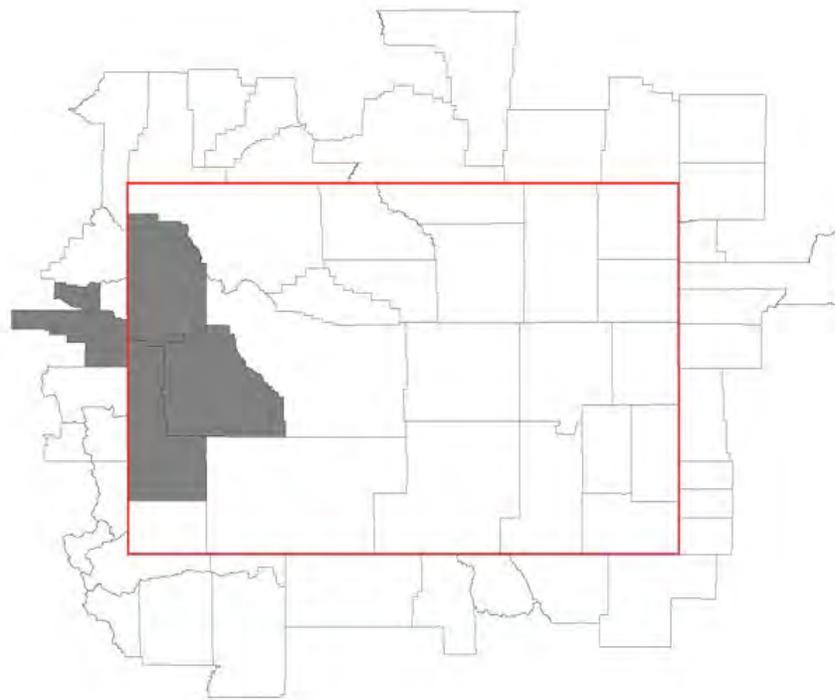
**Fig. 1.** Clockwise from top left: flowers and fruit, rosette with young stems, fully developed plant, young rosettes (*Idaho Weed Awareness Campaign*).



**Fig. 2.** Top: Dandelion (*Next Barn Over Farm*); Bottom: Chicory (*Susan Boyer*) are often confused with rush skeletonweed.

# Rush skeletonweed

*Chondrilla juncea* L.



**Fig. 3.** No sustaining populations have been found in Wyoming, but specimens have been collected in Lincoln, Teton, and Sublette counties.

## Distribution

Rush skeletonweed is designated as a noxious weed in eight states and in British Columbia, Canada. It is prevalent throughout the Pacific Northwest and Idaho, where it invades many different types of habitats. It has been recorded in both Sublette and Lincoln counties in Wyoming but has not been documented as long-term, self-sustaining populations. In these areas, sites with frequent interstate traffic and soil disturbance should be intensively monitored.

## Impacts

Rush skeletonweed reduces forage quantity and quality for both domestic livestock and wildlife. It can be very problematic in wheat farming operations as it will readily spread from field to field and into adjacent areas. Rush skeletonweed populations can recover quickly following fire, which allows it to form dense stands within areas of altered fire regime due to annual grass invasion.

# Rush skeletonweed

*Chondrilla juncea* L.

## Control options

**Mechanical and cultural:** Hand pulling several times per year for up to 10 years will deplete seed bank and root stores but is only practical for small infestations. Burning of pulled biomass will effectively eliminate potential for reestablishment. Pulling should be done prior to seed set. Mowing, tilling, or cultivation will have little effect and may encourage new growth and spread.

**Chemical:** Rush skeletonweed may be difficult to control because it is a deep-rooted perennial. 2,4-D, picloram, clopyralid, aminopyralid, and metsulfuron have shown to provide some control of rush skeletonweed. Picloram and aminopyralid may be more effective when using fall applications.

**Biocontrol:** Several biological control agents offer control of rush skeletonweed in North America: *Cystiphora schmidtii*, a gall midge, *Eriophyes chondrillae*, a gall mite, and *Puccinia chondrilla*, a rust fungus.

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# Common crupina

*Crupina vulgaris* Cass.

by: Sage Askin

Asteraceae

## General information

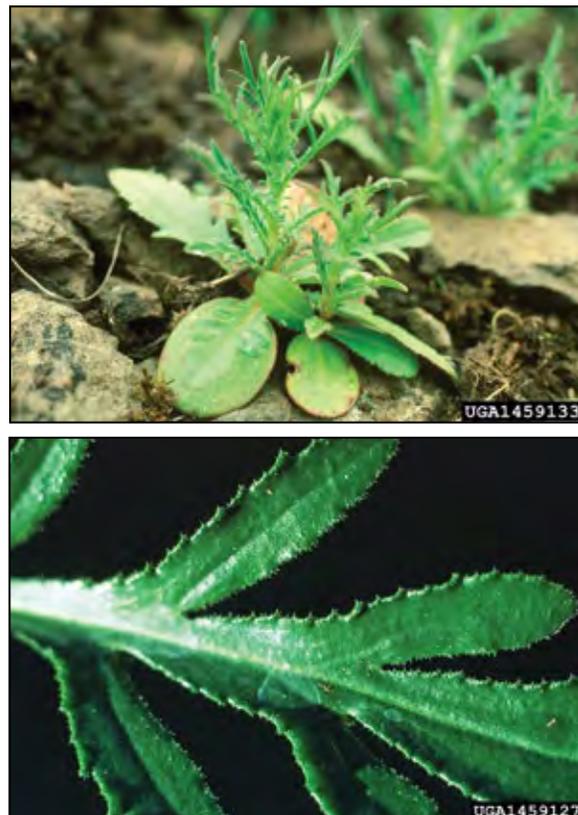
Originally native to the Mediterranean region of Europe, common crupina has invaded the Rocky Mountain west, especially the Pacific Northwest, and is currently on the federal noxious weed list. It typically grows on rangelands and disturbed non-agronomic lands and, in the Pacific Northwest, prefers southern slopes of steep canyon grasslands.

## Identification

Common crupina is a fall/winter germinating annual that ranges from 1-4 feet tall when mature. Leaves have entire margins in the rosette stage with development of slight teeth in older leaves, pinnate to bi pinnate lobes. Lobe margins have stiff spines that create rough-textured leaves. Leaves alternate up the stem and get more deeply lobed and smaller in size toward the plant apex. Upper leaf axils may branch and flower. The main stem buds and flowers in one to several locations at the apex. Each branch can produce between one and five heads on average, and these flowers are pink, lavender, or purple. They are narrow and round, three to four times longer than wide, with a distinct ring of dark stiff bristles surrounding the lower end of the seed.



**Fig. 1.** Left: Representative sample of common crupina. (Utah State University Archive, Utah State University, Bugwood.org) Right: Common crupina invasion in Utah. (USDA APHIS PPQ Archive, USDA APHIS PPQ, Bugwood.org)



**Fig. 2.** Top: Common crupina seedling. Bottom: spiny leaf margins. (Utah State University Archive, Utah State University, Bugwood.org)

# Common crupina

*Crupina vulgaris* Cass.



**Fig. 3.** Documented distribution of common crupina around Wyoming.

## Distribution

Many individuals have been found in Idaho, Washington, and Oregon. The trends in Wyoming show an unknown status in Albany, Platte, Goshen, Laramie, Hot Springs, Crook, Johnson, Sheridan, Big Horn, Lincoln, and Uinta counties, with never-found status in the rest of the state. It is a county-declared weed in Converse, Big Horn, and Washakie counties, meaning that it poses a threat. There are no known populations in Wyoming.

## Impacts

This plant can invade not only preferred sites, such as those on south-facing steep slopes in canyon grasslands, it can invade lands disturbed in any way: rangelands, forested, riparian areas, roadsides, landfills, and other waste areas. Once cut or grazed on top portions of this plant, lateral branching may be instigated below, resulting in more branching and further reproduction. Common crupina can overtake entire areas creating an unhealthy, nonaesthetically pleasing monoculture.

# Common crupina

*Crupina vulgaris* Cass.

## Monitoring

Monitor areas near northwestern Wyoming especially, as well as in Platte, Albany, Big Horn and Laramie county regions where individuals have been recently discovered. Monitoring lands by eye, in-depth annual field studies using simple cover class, and macroplot indexing can bring such invasives to the public attention. This is very important to help managers know about common crupina while it can still be exterminated. Help managers keep this weed outside Wyoming by staying informed, educated, and cooperative with local weed and pest control agencies.

## Control options

*Biological:* Common crupina has no known insect herbivores that can act as biological control agents. Several are being studied for use in the United States, but none have been approved. It also has no real forage value for livestock use, and is generally regarded as unpalatable. Grazing may be detrimental and can increase lateral branching, resulting in greater reproduction via flowering. Overgrazing areas can increase densities of common crupina.

*Mechanical:* Hand pulling is recommended for small-scale infestations. This must be completed repeatedly before flowering to halt seedbank establishment. Mowing is not an option after flowering because mature seeds will be spread.

*Cultural:* Grasses such as natives to the site, preferably hardy vigorous species, may be interseeded and have high potential for competing with common crupina.

*Chemical:* 2,4-D is the most frequently recommended herbicide for use on common crupina. Any mode of action for control of broadleaf herbicides is an option. The deeply lobed leaves of common crupina have little leaf area for such an herbicide to act.

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# Common teasel

*Dipsacus fullonum* L.

by: Kyrre Stroh

Dipsacaceae

## General information

Common teasel is a monocarpic perennial native to Europe, temperate Asia, and northern Africa. It was first introduced into North America during the early 1700s and throughout most of the United States, except the northern Great Plains, and several Southeastern states. Common teasel occupies similar habitats in its native and non-native ranges, which include riparian areas, meadows, grasslands, savannas, forest openings, and disturbed sites. Habitats most commonly occupied are open and sunny with limited tree or shrub cover.

## Identification

Common teasel grows as a basal rosette for a minimum of one year, sending up a 6- to-7 foot tall flowering stalk, and then dying. During the rosette phase, teasel develops a long taproot that may be more than 2 feet in length and 1 inch in diameter at the crown. It blooms from June-October. This flowering plant has large oblong, opposite, sessile leaves that form cups that are prickly especially on the lower mid-rib. Flowers are small and packed within dense, oval-shaped heads. Flowers are subtended by stiff, spiny bracts located terminally on the flower.

## Potential look-alikes

Common teasel may be mistaken for cut-leaved teasel. A distinct difference between common and cut-leaved teasel is flower color. Common teasel produces purple flowers while cut-leaved teasel produces white flowers.



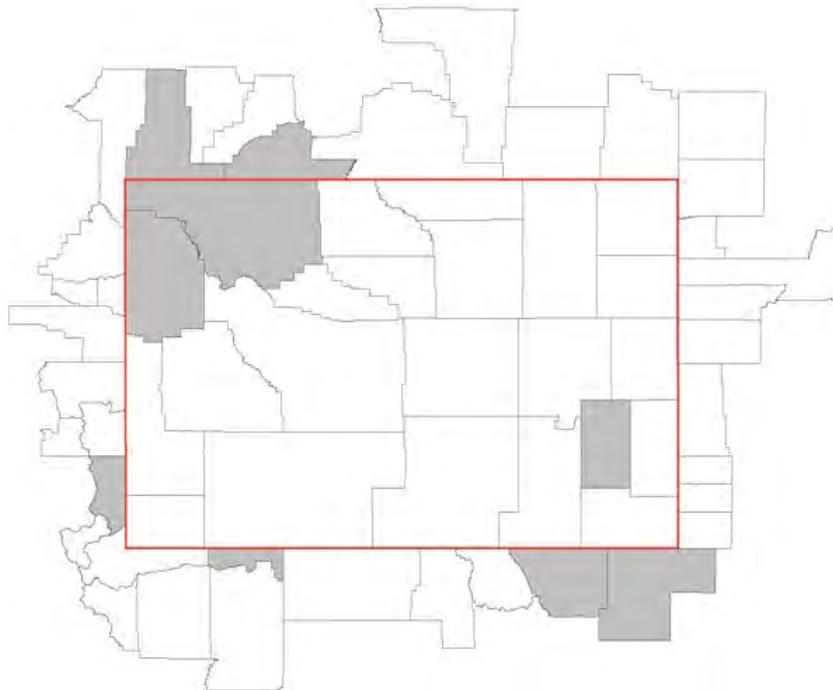
**Fig. 1.** Developmental stages of common teasel. Top left: fully grown flowered common teasel (*Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org*); top right: a dried seed head of a common teasel plant (*Steve Dewey, Utah State University, Bugwood.org*); right: a developing common teasel seed head protruding (*luirig.altervista.org*)



**Fig. 2.** Common teasel (left) produces a purple flower while cut-leaved teasel (right) produces white flowers.

# Common teasel

*Dipsacus fullonum* L.



**Fig. 3.** Common teasel has been documented in Teton, Park and Platte counties, Wyoming, and in neighboring counties.

## Distribution

In the last 20 to 30 years, common teasel has rapidly spread from Quebec and Maine to Ontario and Michigan, and south to North Carolina, Tennessee, and Missouri. The rapid invasion has been aided by interstate highway construction. Use of common teasel in horticultural plantings, as well as flower arrangements, has also contributed to rapid expansion into the North American range. Currently, common teasel is not listed as a Wyoming state noxious weed. To date, it has only been found in Platte and Teton counties. No counties bordering Wyoming bordering states except Montana's Carbon and Park counties have a record of common teasel.

## Impacts

Common teasel is an aggressive, exotic species, which has the capacity to take over prairies if allowed to establish. If left unmanaged, teasel can quickly form large monocultures, eradicating all native vegetation. Seed movement has been documented along highway systems where dispersal is aided by mowing equipment. Other pathways of movement for common teasel seeds are through water dispersal and through dispersal via bird feeding.

# Common teasel

*Dipsacus fullonum* L.

## Monitoring

If treated in the early stages of infestation, common teasel can be controlled cheaply and quickly. As with all exotics, starting control prior to the weed becoming a serious problem is critical.

## Control options

*Mechanical control:* Cutting, digging, and burning are recommended solutions for control in natural areas. In small areas, rosettes can be dug using a dandelion digger, digging up as much of the root as possible to prevent resprouting. Stalks of the flowering plants may also be cut just before flowering.

*Chemical control:* For heavily infested sites, the most cost-effective method is the use of foliar applied herbicides. Glyphosate, 2,4-D amine, and triclopyr have been used successfully. Triclopyr and 2,4-D amine are dicot-specific and should not harm monocots. Both herbicides should be applied during the growing season, preferably before the plant has bolted. Application can be made after bolting, but there is a risk of the seeds still developing depending on the application date. Glyphosate is a non-selective herbicide. Glyphosate should be applied before the plant bolts. These herbicides can be used as a spot treatment method with a backpack sprayer. A 1.5-2% solution of glyphosate is effective. A 2% solution of triclopyr has proven successful. Triclopyr needs the addition of an agricultural non-ionic surfactant. Herbicide coverage should be thorough to wet all the leaves and stems.

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# Viper's bugloss

## *Echium vulgare* L.

by: Kathleen Meyers

Boraginaceae

### General information

Viper's bugloss is also known as blueweed, blue echium, blue devil, blue thistle, snake weed, and common bugloss. *Echium* comes from the Greek word *echis* meaning viper. *Vulgare* is from the Latin word *vulgaris* meaning common or usual. This plant will grow in fields, on roadsides, and waste ditches. Viper's bugloss is competitive in rangelands and non-cropland areas. This plant has toxic alkaloids and is harmful to livestock and humans.

### Identification

Viper's bugloss can be an annual, biennial, or perennial, depending on environmental conditions. This plant usually grows to about 3 feet tall but can be several feet taller. Leaves are alternate and narrow to lance-shaped. The entire plant is covered with bristly hairs, which have swollen bases. These swellings can have a reddish or blackish tint, giving the plant a speckled appearance. Spike-like cymes are coiled at the tips. Seeds are produced in nutlets of four parts, which are hard and long-lived. Flowers are approximately  $\frac{3}{4}$ -inch across, purplish-blue to blue with pink stamens arranged on the upper side of scorpion tail-like stems. Flowers can also be found in pink and white phases. Flowers open a few at a time starting nearest the stalk. Viper's bugloss blooms from June to early fall (usually September). This plant can have a large tap root and regrow from the crown.



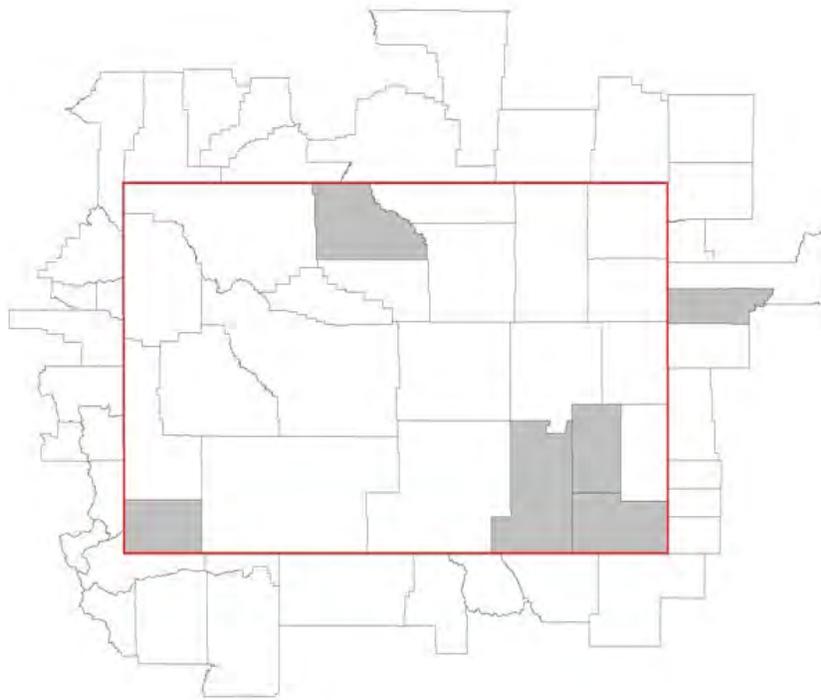
**Fig. 1.** Upper left: vegetation crown of viper's bugloss; lower left: the nutlet and seeds with an individual flower; right, identification characteristics. (Audra Rouge Photos)



**Fig. 2.** Left: threadleaf phacelia, a look-alike to Viper's bugloss; Right: houndstongue. Other plants in the Boraginaceae family can also look similar to Viper's bugloss. Flower arrangement on the plant and the specks are unique to viper's bugloss and can distinguish it from look-alikes. (Graves, Mangold, and Jacobs)

# Viper's bugloss

*Echium vulgare* L.



**Fig. 3.** Viper's bugloss has been documented in Big Horn, Uinta, Albany, Laramie, and Platte counties in Wyoming through work from the Wyoming Weed and Pest Council and the Rocky Mountain Herbarium.

## Distribution

It is often found in alkaline soils with a dolomite or limestone base but can also be found in acidic soils. It has been commonly found that viper's bugloss prefers sandy, well-drained soils and does not do well in very arid regions. Research from Canada and Europe demonstrated that viper's bugloss does not grow well under dense vegetation, but it has been found in well-maintained pastures in Ravalli County, Montana. Viper's bugloss is a native to the Canary Islands and was introduced from Europe in the colonial period. It is now considered invasive in Australia, New Zealand, parts of Asia, Africa, South America, and throughout Canada and the United States. This plant is a Class B noxious weed in Washington.

## Impacts

Viper's bugloss is adapted to temperate areas with cool winters and warm summers making its potential to invade these regions greater. Viper's bugloss contains pyrrolizidine alkaloids, which can be toxic to horses, cattle, and pigs when ingested. Sheep and goats have shown resistance to alkaloid toxicity. The presence of alkaloids leads to reduced pasture productivity where viper's bugloss is present and increases the risk of livestock poisoning. Viper's bugloss is a known host for several plant diseases that are spread by aphids. Alfalfa mosaic virus and tobacco mosaic virus are the two biggest concerns. Research in Europe showed that viper's bugloss may sometimes act as a secondary host for three types of wheat rust.

# Viper's bugloss

## *Echium vulgare* L.

### Monitoring

Watching fields and pastures for overgrazing is key in prevention of viper's bugloss. Where overgrazing occurs, viper's bugloss is likely to move in due to its preference of lower competition for resources. It also prefers soils with poor nutrients so keeping pasture and fields at optimum quality will aid in prevention of infestation. Viper's bugloss should be treated immediately to prevent spread and further establishment. Railroad rights-of-way should also be closely monitored.

### Control options

*Prevention:* Prevention is the best control. Learning plant identification and being cautious with fill dirt, hay, and seed from outside the area can save resources in the long run. Know your property and watch borders for incoming species.

*Biological:* There are no known biological control agents for viper's bugloss.

*Mechanical and Cultural:* Planting competitive vegetation and keeping lawns and pastures healthy is good practice for cultural control. Mechanical control is useful in the short term. Mowing can stop seed production, but the plants can regrow from the crown and bloom shorter than the blade height. Digging or pulling prior to bloom can be effective control in small areas. The seed bank will be present for many years.

*Chemical:* Herbicide trials conducted on rangeland in Ravalli County, Montana, showed that metsulfuron (Escort) at 1 ounce product/acre, chlorsulfuron (Telar) at 1 ounce product/acre, or their combination (1/2 ounce of each product/acre) applied to rosette in the spring or fall provided almost 100-percent control one year after treatment. Formulations containing 2,4-D LVE at 1 to 2 quarts/acre have been shown to successfully control viper's bugloss in the rosette stage during active growth.

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# Cypress spurge

*Euphorbia cyparissias* L.

by: Anna Dailey

Euphorbiaceae

## General information

Cypress spurge is native to Europe and western Asia and was introduced to the United States in the 1860s for use as an ornamental in cemeteries. It is a problem in disturbed sites throughout the United States, especially in fields, pastures, agricultural lands, roadsides, cemeteries, and yards. Cypress spurge is avoided by grazers, displaces native vegetation, and is a hay contaminant. It has an extensive root system and reproduces vegetatively from the roots. Cypress spurge is also known as graveyard spurge or graveyard weed.

## Identification

Cypress spurge is a short, herbaceous, perennial plant that grows up to 12 inches tall. Bright green, short (up to 1-inch), linear leaves are alternate or whorled along the stem. Bright yellow-green flowers are clustered at the top of a plant. Flowers redden at maturity. Fruits are three-lobed and contain one to three egg-shaped, smooth gray seeds. A white, milky latex exudes from all parts of the plant when broken. Cypress spurge forms extensive clonal populations.

## Potential look-alikes

Leafy spurge (*Euphorbia esula*) is a close relative of cypress spurge. Cypress spurge is distinguishable from leafy spurge because it is shorter, its leaves are shorter, and it has more branching at the upper part of the plant.



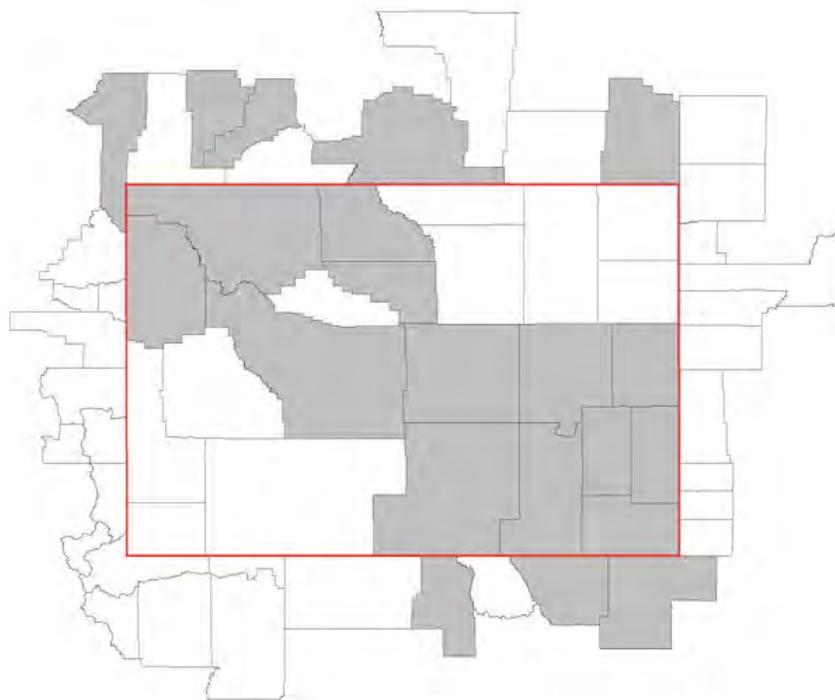
**Fig. 1.** Cypress spurge in bloom. (Todd Pfeiffer, Klamath County Weed Control, Bugwood.org)



**Fig. 2.** Cypress spurge infestation. (Todd Pfeiffer, Klamath County Weed Control, Bugwood.org)

# Cypress spurge

*Euphorbia cyparissias* L.



**Fig. 3:** Documented distribution of cypress spurge in and around Wyoming.

## Distribution

Cypress spurge is native to Europe and western Asia. It is found throughout the United States and Canada and is listed as a noxious weed in Colorado, Connecticut, and Massachusetts. In Wyoming, cypress spurge has been found in the counties of Albany, Park, Laramie, Goshen, Niobrara, Converse, Natrona, Fremont, Teton, Park, Big Horn, and Washakie, and in numerous counties in Montana, Idaho, and Colorado. In Wyoming, cypress spurge is reported to be increasing in Teton County.

## Impacts

Cypress spurge invades recently disturbed sites such as fields, pastures, agricultural lands, roadsides, and yards. Because grazers typically avoid it, it can take over pastures and rangeland and decrease forage values. It can also contaminate hayfields and take over native habitats. Cypress spurge can potentially be toxic to horses and cattle, and the latex that exudes from the plant can be an irritant to human skin. Because of its ability to reproduce vegetatively from the roots, cypress spurge can be more difficult to control than other problem weeds.

# Cypress spurge

*Euphorbia cyparissias* L.

## Monitoring

Property should be regularly monitored so landowners can be aware of new and occurring infestations and can decide upon the best control option for the degree of infestation. All Wyoming counties should be monitored for cypress spurge because of the relatively widespread distribution of the plant.

## Control options

**Cultural:** Cypress spurge should be prevented from establishing by encouraging the vigorous growth of desirable species in pastures and rangeland, and minimizing disturbances. Control of cypress spurge can be difficult because of its ability to reproduce vegetatively from the roots.

**Mechanical:** Mechanical control, such as mowing or chopping, will not be effective because this will cause the plant to produce new clonal plants. Hand pulling and digging is an option; when infestations are small, such as when one or two plants are discovered, moistening the soil prior to hand removal will make removing the root system easier. Hand and eye protection should be worn to protect the skin from the irritating latex.

**Chemical:** Chemical control is a better option and can be effective using the following herbicides labeled for use in pastures and rangeland. Quinclorac (Paramount) can be applied at 16 oz/A with 2 pt/A of a methylated seed oil or crop oil concentrate. It should be applied at the flowering stage in the spring. 2,4-D + dicamba (Rangestar) can be applied at 2 quart 2,4-D and 1 quart dicamba/A at the flowering stage in the spring. And picloram (Tordon-22K- restricted use) can be applied at 2-4 pt/A with 0.25% v/v non-ionic surfactant during spring at full bloom or in the fall during regrowth. Always read and follow pesticide label directions.

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Weed of the Week - USDA Forest Service. [http://www.na.fs.fed.us/fhp/invasive\\_plants/weeds/cypress-spurge.pdf](http://www.na.fs.fed.us/fhp/invasive_plants/weeds/cypress-spurge.pdf)

# Baby's-breath

*Gypsophila paniculata* L.

by: Brian Sebade

Caryophyllaceae

## General information

Baby's-breath is a perennial forb often found growing along roadsides, wastelands, rangelands, and pastures. Alternative names include perennial baby's-breath, perennial gypsophila, tall gypsophill, and maiden's-breath. The plant has attractive white flowers that mature from June through August. Its preferred habitats include moist, sandy soils at elevations between 3,900 and 6,600 feet.

## Identification

Baby's-breath is a branching perennial with a maximum height of 3 feet. Leaves are hairless, paired (3/4 to 4 inches) and have sharp points. Flowers are 1/16 to 1/8 inches wide. The calyxes are five-lobed and purple with white petals. Fruits contain two to five black, kidney-shaped seeds. A single plant is capable of producing 14,000 seeds.

## Potential look-alikes

Potential look-alikes include annual baby's-breath and glandular baby's breath. Annual baby's breath has shorter stems. Glandular baby's-breath possesses hairs on the leaves.



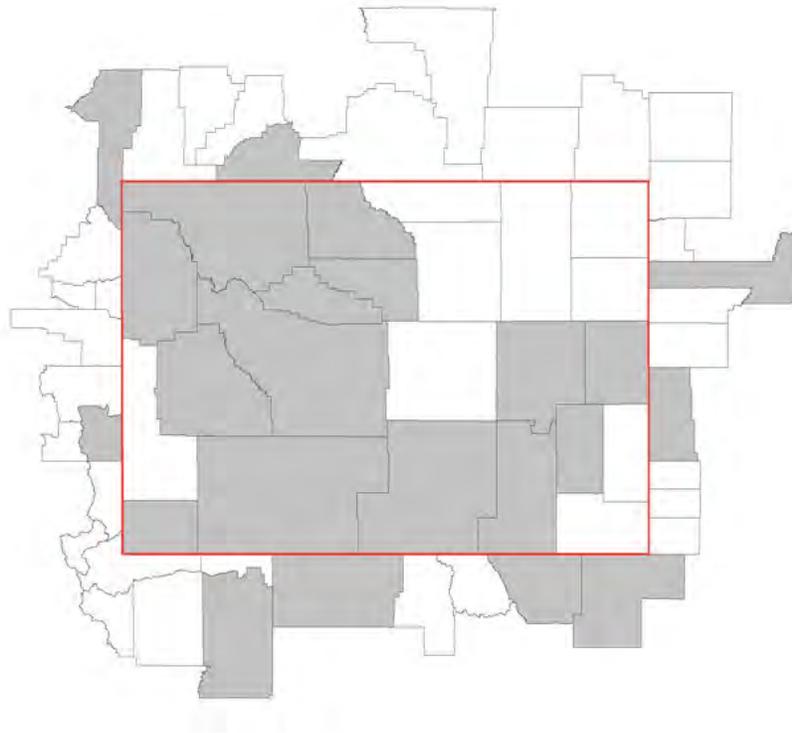
**Fig. 1.** Baby's-breath plant with white flowers (Steve Dewey, Utah State University, Bugwood.org.)



**Fig. 2.** Left: leaves of annual baby's-breath ([plantcare.com](http://plantcare.com)). Right: leaves of glandular baby's breath ([NRCS Plants database](http://NRCS Plants database))

# Baby's-breath

*Gypsophila paniculata* L.



**Fig. 3.** Documented baby's-breath distribution in and around Wyoming.

## Distribution

Baby's-breath is native to Eurasia and was introduced to North America in the 1800s. It was first reported in Canada in 1887 and is now found extensively throughout the northern United States and southern Canada. It is found in 14 counties within Wyoming and nine bordering counties. Distribution is sporadic and may need increased detection protocols. It has been declared a noxious weed in Big Horn and Converse counties, Wyoming.

## Impacts

Baby's-breath forms dense stands and is suggested to host viruses such as aster yellows and beet curly top. Its deep root systems aid in the formation of dense stands. Impacts rarely occur in cropland situations and more often in rangeland and pasture areas. It is capable of displacing native vegetation.

# Baby's-breath

## *Gypsophila paniculata* L.

### Monitoring

Baby's-breath is a Class B noxious weed in California and a Class C noxious weed in Washington. Well-drained, moist soils similar to those found in Washington and California may be at highest risk of invasion. Monitoring can be completed by ground crews. Spatial monitoring is suggested to be effective for detecting new populations. Monitoring of possible habitats may be most effective for invasion prevention. It is found in many wildflower mixes, which is a potential means of spread.

### Control options

*Biological:* Biological controls are not known.

*Mechanical:* Hand pulling is ineffective, and digging of plant is only effective when the entire root crown is removed to prevent re-sprouting.

*Chemical:* Chemical control may be achieved with four herbicides: picloram 1 lbs. acid equivalent per acre (ae/A), dicamba 2 lbs ae/A, MCPP 7 lbs ae/A, and 2,4-D 2 lbs ae/A.

Integrated control using repeated tillage and herbicide applications may produce best control.

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# Orange hawkweed

*Hieracium aurantiacum* L.

by: Michael Curran

Asteraceae

## General information

Orange hawkweed is a perennial forb of the *Asteraceae* family. Other common names are devil's paintbrush, fox and cubs, missionary weed, and king devil. It is native to central and northern Europe and was introduced to the New England area of the United States as a garden ornamental. Orange hawkweed has been documented in 32 states, including Wyoming, Idaho, Montana, South Dakota, and Colorado. It spreads via seeds, but most spreading is vegetative through rhizomes and stolons. It is found to invade meadows, grasslands, rangelands, roadsides, forest openings, and pastures.

## Identification

Orange hawkweed has bright orange or yellow-orange, dandelion-like flowers in summer and fall, ½- to 1-inch in diameter, and clustered atop a stem 10-24 inches above leaves. Leaves are 4-6 inches at the base of the plant, minutely toothed, and basally shaped. It excretes milky sap if broken.

## Potential look-alikes

Orange hawkweed, if displaying enough yellow in the flower, can be confused with dandelion or other hawkweed species. Flowers can also bear close resemblance to Orange agoseris.



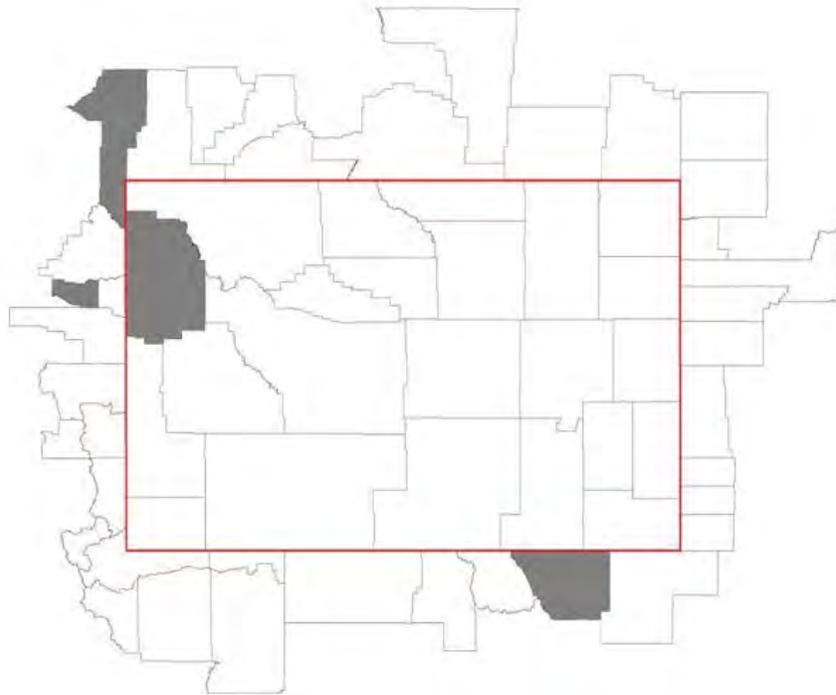
**Fig. 1.** Roots, leaves, stem, and flower of an orange hawkweed. (USDA Forest Service, Alaska Region.)



**Fig. 2.** Orange hawkweed has the potential to dominate open fields. (USDA Forest Service, Alaska Region.)

# Orange hawkweed

*Hieracium aurantiacum* L.



**Fig. 3.** Counties in grey have records of orange hawkweed infestations. Please note South Dakota has multiple sightings but does not have county data available. Infestations may exist just to the east of Wyoming.

## Distribution

Orange hawkweed is native to central and northern Europe and is considered an invasive weed in the United States. Several states have the weed listed as noxious. New England and the northeastern states have the largest infestations of orange hawkweed. The species was also introduced in the northwest and central parts of the United States. Infestations in Idaho, Montana, South Dakota, Colorado, and in the Yellowstone area of Wyoming should be carefully monitored to prevent further spread.

## Impacts

Orange hawkweed's vegetative growth habits make it a threat to form monocultures in meadows, rangelands, grasslands, and pastures. This can result in serious loss of biodiversity and can entirely change ecosystems. Orange hawkweed tends to be less desirable to grazing animals than many native plants and can reduce livestock productivity.

# Orange hawkweed

*Hieracium aurantiacum* L.

## Monitoring

Orange hawkweed has already been introduced to the Yellowstone area of Wyoming. The weed's presence there should be carefully monitored to prevent further spread. Infestations in Idaho and Montana, also near the Yellowstone area, should also be carefully monitored to prevent encroachment into Wyoming.

There have been reports of orange hawkweed infestations in northern Colorado and in South Dakota. The southern and eastern parts of Wyoming may also be at risk.

Seeds of orange hawkweed can remain viable for seven years. Take caution if transporting soil.

## Control options

*Prevention:* The most effective method of control is to prevent orange hawkweed from establishing in new areas.

*Mechanical:* Once established, early detection and rapid response may eradicate the species – in small enough populations, hand pulling or digging are the best methods. Make sure all roots are removed as there is potential for regrowth with roots being present. All plant material should be burned in an isolated location.

*Biological and chemical:* No biological control agents are being used, but clopyralid and 2,4-D seem to be the most effective herbicides and should be applied in the rosette stage to help control large populations.

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# Meadow hawkweed

by: Michael Curran

*Hieracium caespitosum* Dumort, or *Hieracium pratense* Asteraceae

## General information

Meadow hawkweed is a perennial forb of the *Asteraceae* family. Other common names are indian paintbrush, yellow king devil, field hawkweed, yellow hawkweed. It is native to Europe. Arrival to the United States was as an ornamental in New York in 1879. Meadow hawkweed spreads via seeds, but most spreading is vegetative through rhizomes and stolons. It is mostly found to invade meadows, grasslands, rangelands, roadsides, and pastures.

## Identification

Meadow hawkweed has yellow flowers in summer and fall that are 1/2-1- inch in diameter and clustered on top of a stem 10-20 inches above the leaves. Elongated leaves are 4-6 inches at the base of the plant, minutely toothed, and basally shaped. It excretes milky sap if broken.

## Potential look-alikes

Yellow hawkweed flowers bear close resemblance to dandelions but can be distinguished by flower clusters atop their stems. The 14 native hawkweeds can also be similar, although the natives regularly have a less extensive root and rhizome system and primarily grow via seed.



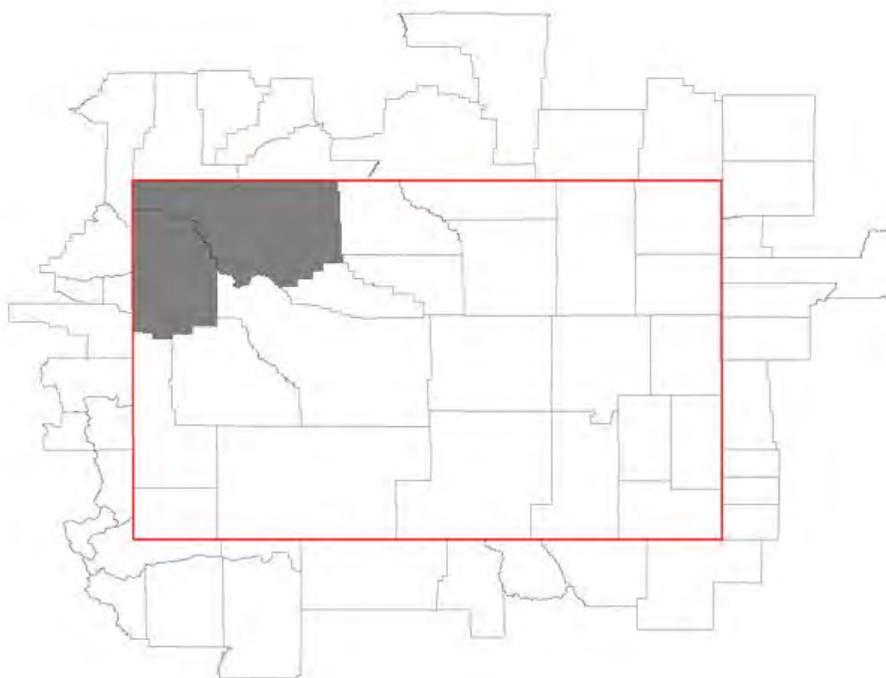
**Fig. 1.** Flowers of meadow hawkweed form in clusters atop of the stem. (Tom Heutte, USDA Forest Service, Bugwood.org)



**Fig. 2.** Meadow hawkweed flowers develop atop a leafless stem between 10-20 inches above the base of the plant. (Michael Shephard, USDA Forest Service, Bugwood.org)

# Meadow hawkweed

*Hieracium caespitosum* Dumort, or *Hieracium pratense*



**Fig. 3.** Counties in grey have records of meadow hawkweed infestations. Areas in Idaho and Montana not directly bordering Wyoming have meadow hawkweed documented.

## Distribution

Yellow hawkweed is native to Europe and is considered an invasive weed in the United States. Several states have the weed listed as noxious.

Most of the eastern states and Wyoming, Washington, Montana, Idaho, Oregon, and several Canadian provinces have documented presence of meadow hawkweed.

Meadow hawkweed has been found in Montana, Idaho, and the Yellowstone area of Wyoming and should be monitored carefully to prevent further spread in Wyoming.

## Impacts

Meadow hawkweed's vegetative growth habits make it a threat to form monocultures in meadows, rangelands, grasslands, and pastures. This can result in serious loss of biodiversity and can entirely change ecosystems.

Meadow hawkweed tends to be less desirable to grazing animals than many native plants and can reduce livestock productivity

# Meadow hawkweed

*Hieracium caespitosum* Dumort, or *Hieracium pratense*

## Monitoring

Meadow hawkweed is present in the Yellowstone area of Wyoming. The weed's presence there should be carefully monitored to prevent further spread. Infestations in Idaho and Montana, also near the Yellowstone area, should also be carefully monitored to prevent encroachment into Wyoming.

## Control options

*Biocontrol:* Researchers at the University of Idaho are investigating biocontrol agents for meadow hawkweed, but none have been released.

*Prevention:* The most effective method of control is to prevent meadow hawkweed from establishing in new areas.

*Mechanical:* Once established, early detection and rapid response may eradicate the species – in small enough populations, hand pulling or digging are the best methods. It is important to make sure all roots are removed as there is potential for regrowth with roots being present. All plant material should be burned in an isolated location.

*Chemical:* Areas with high populations of meadow hawkweed should be treated with herbicide. 2,4-D does not seem to be effective by itself, but if combined with picloram or dicamba, it tends to be effective in reducing meadow hawkweed.

## References

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# Eurasian watermilfoil

*Myriophyllum spicatum* L.

by: Eric T. Watson

Haloragaceae

## General information

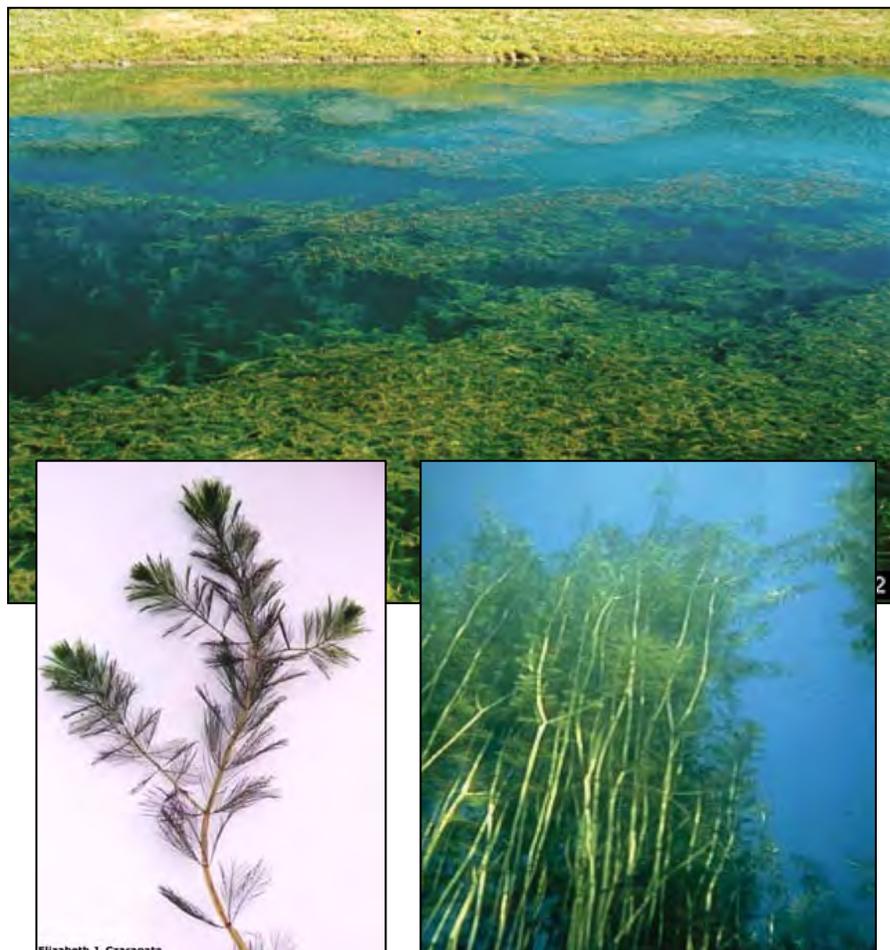
Eurasian watermilfoil originates from Europe and Asia. This plant was introduced to the eastern United States in the 1940s, but it may have arrived as early as the late 1800s. Eurasian watermilfoil is a submersed, rooted, perennial. Its stems can “top out” in 20 feet of water. It frequently forms large infestations and often is the most abundant submersed species in a locale. It spreads and reproduces mainly by re-growth of plant fragments. Eurasian watermilfoil competes aggressively to displace and reduce the diversity of native aquatic plants. It is tolerant of low water temperature. It quickly grows to the surface, forming dense canopies that overtop and shade the surrounding vegetation that can result in the decline of native plant abundance. Lower diversity is observed when Eurasian watermilfoil invades healthy plant communities.

## Identification

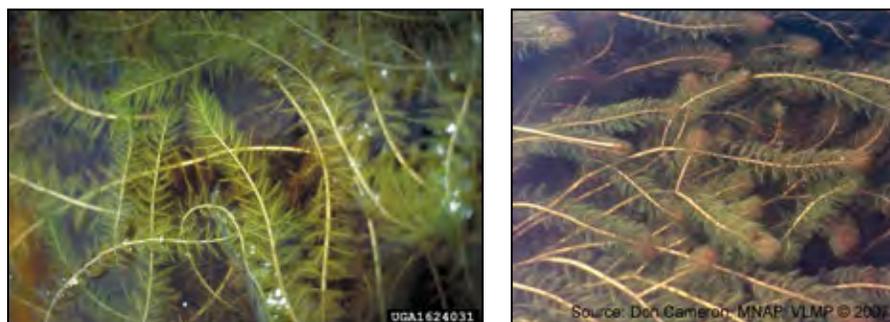
All milfoils have feather-like leaves arranged in whorls around the stem (see photos right). The threadlike segments are very widely separated, and there are few pairs per leaflet.

Some tips to identify Eurasian watermilfoil from other watermilfoils such as a native watermilfoil like Northern:

- Count the pairs of leaflets. Eurasian watermilfoil usually has 12 or more pairs on each leaf.
- Eurasian watermilfoil leaves tend to collapse around the stem when removed from the water. Other milfoil species have thicker stems and are usually more robust.
- The mature leaves are typically arranged in whorls of four around the stem.



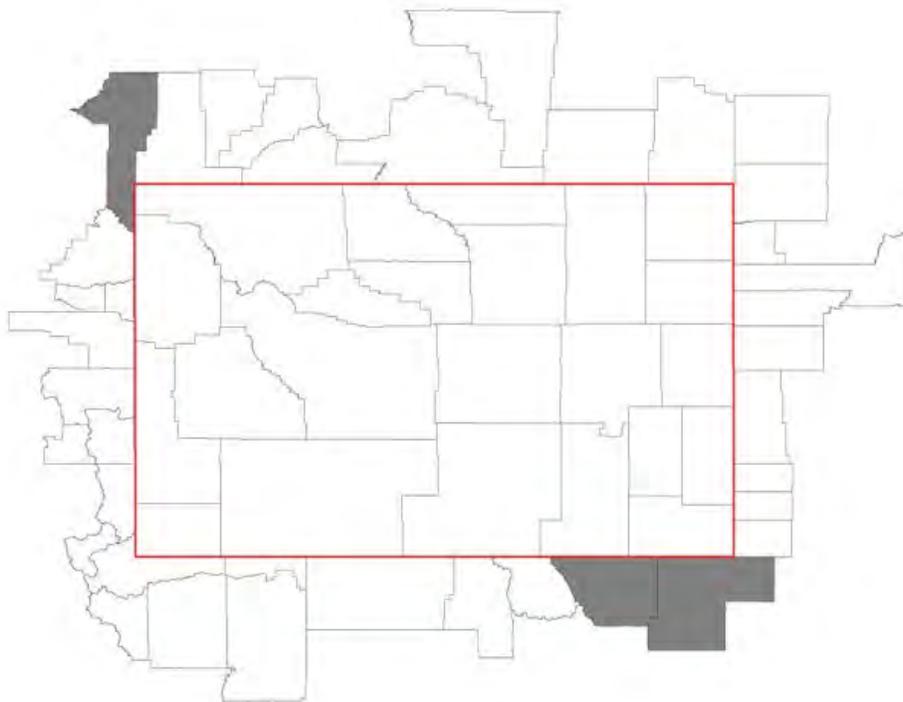
**Fig. 1.** Top: a high infestation. (Robert L. Johnson, Cornell University, Bugwood.org). Bottom left: feathery structure. (Elisabeth J. Czarapeta). Bottom right: underwater view of Eurasian watermilfoil canopy. (GeoResources Institute).



**Fig. 2.** Left: Eurasian watermilfoil. (Alison Fox, University of Florida, Bugwood.org) Right: Northern watermilfoil. (Dan Cameron)

# Eurasian watermilfoil

*Myriophyllum spicatum* L.



**Fig. 3.** Documented Eurasian watermilfoil distribution around Wyoming.

## Distribution

Eurasian watermilfoil is found scattered throughout the United States, but in particular has been a long-time problem in Tennessee Valley Authority waters, tributaries of Mobile Bay, freshwater and brackish estuaries of the Gulf, and backwaters of the Mississippi River. Eurasian watermilfoil is gaining a foothold in Idaho's western lakes, ponds, rivers, and other waterways. Populations are found in Colorado in the Denver-Boulder metro area in South Platte River drainages, the Rio Grande River in Alamosa County, and in Huerfano County. In western Washington, Eurasian watermilfoil was found in Lake Washington in 1974, and from there Eurasian watermilfoil has spread along the Interstate 5 corridor into many western Washington lakes. No documented cases have been found in Wyoming.

## Impacts

Now considered a major nuisance species throughout the Northeast, northern Midwest and Pacific Northwest. Its establishment in Lake George, New York, reduced native plants from 5.5 to 2.2 species per square meter in just two years. Eurasian watermilfoil has less value as a food source for waterfowl than the native plants it replaces. At high densities, its foliage supports a lower abundance and diversity of invertebrates - organisms that serve as fish food. Dense cover allows high survival rates of young fish, however, larger predator fish lose foraging space and are less efficient at obtaining prey. Madsen et al. (1995) found that the growth and vigor of a warm-water fishery was reduced by dense Eurasian watermilfoil cover. Millions of dollars have been spent nationwide for control efforts. In New York State, annual costs are estimated at \$500,000.

# Eurasian watermilfoil

## *Myriophyllum spicatum* L.

### Monitoring

Monitoring and prevention are the most important steps for controlling Eurasian watermilfoil. A sound precautionary measure is to check all equipment used in infested waters and remove all aquatic vegetation upon leaving a lake or river. All equipment, including boats, motors, trailers, and fishing/diving equipment, should be free of aquatic plants. Lake managers and lakeshore owners should check for new colonies and control them before they spread.

### Control options

**Mechanical:** The plants can be hand pulled or raked. It is imperative that all fragments be removed from the water and the shore. Mechanical cutters and harvesters are the most common method for controlling Eurasian watermilfoil. While harvesting, keep in mind the method is not selective and removes beneficial aquatic vegetation as well. These machines also create shoot fragments, which contributes to milfoil dispersal. Hand cutters work best inshore, where they complement hand pulling and bottom screening. Bottom screening can be used for severe infestations but will kill native vegetation. A diver-operated suction dredge can vacuum up weeds, but the technique can destroy nearby native plants and temporarily raise water turbidity. Hand pulling is the preferred control method for colonies under 0.75 acres or fewer than 100 plants. The process is both thorough and selective (not to mention time-consuming); special care must be taken to collect all roots and plant fragments during removal.

**Chemical:** Herbicide treatment is not recommended because it is typically disruptive to aquatic ecosystems and not selective in the vegetation it affects, thus threatening native plants.

**Biological:** *Eurhychiopsis lecontei*, an herbivorous weevil native to North America, has been found to feed on Eurasian watermilfoil. Adult weevils feed on the stems and leaves, and females lay their eggs on the apical meristem (top-growing tip); larvae bore into stems and cause extensive damage to plant tissue before pupating and emerging from the stem.

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# African rue

*Peganum harmala* L.

by: Jared Unverzagt

Zygophyllaceae

## General information

African rue is native to northern Africa and southern Asia. It was introduced into the United States between the 1920s and 1930s near Deming, New Mexico. African rue establishes in disturbed and arid areas that include roadsides, parking lots, corrals, rangeland, and pastures. African rue is very drought tolerant due to its deep and robust perennial root system. It is also toxic to livestock as it contains four deadly alkaloids. Livestock symptoms include loss of appetite and loss of coordination.

## Identification

African rue is a bright-green shrub that rarely grows over a foot tall. It has a bushy growth habit with succulent, narrow leaves arranged alternately on the stem (Fig. 1). Flowers are white and consist of five petals that produce a fruiting body that develops soon after flowering. Each fruiting body contains two to four chambers containing many small seeds (Fig. 2). Roots can grow to more than 20 feet deep in dryer soils. African rue is able to grow in alkaline, salty soils making it very drought tolerant. It reproduces primarily by seed but has the potential to re-sprout by injured roots.



**Fig. 1.** African rue readily invades areas with little rainfall and can tolerate saline and alkaline soils. (Bonnie Rasmussen, Oregon Department of Agriculture)



5 mm

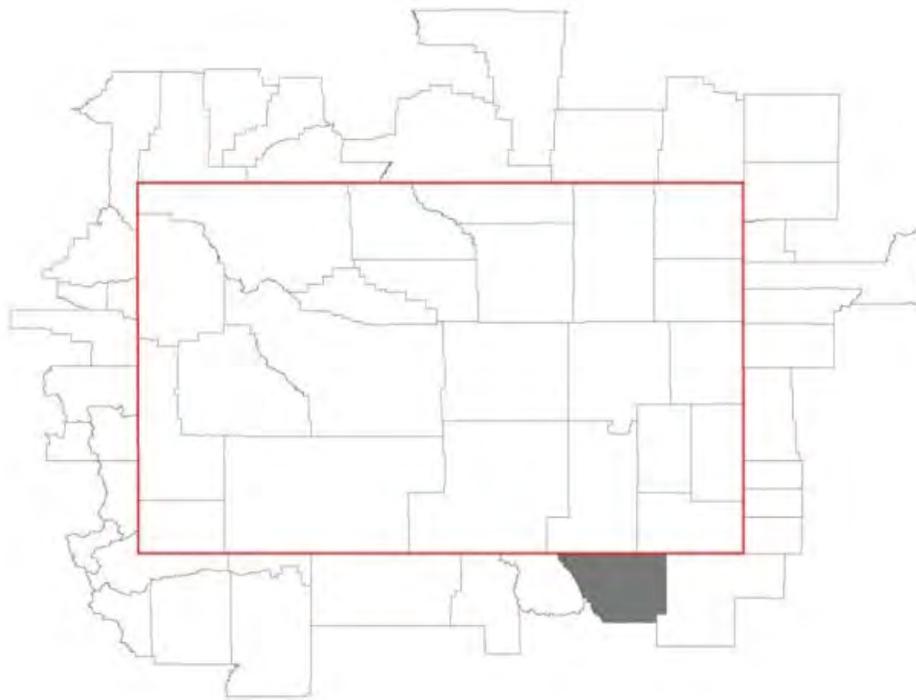


5 mm

**Fig. 2.** Fruiting bodies containing two to four small chambers holding many small seeds (Bonnie Rasmussen, Oregon Department of Agriculture)

# African rue

*Peganum harmala L.*



**Fig. 3.** The only documented case of African rue near Wyoming is in Larimer County, Colorado. There are no documented cases in Wyoming. Montana has documented African rue near the Canadian border.

## Distribution

Distribution primarily consists of the western coastal and southwestern United States, with the exception being small infestations in Colorado (Fig. 3) and Montana. The densest infestations are found in west Texas and New Mexico, where it was originally introduced by a farmer cultivating the plant to produce red dye for wool and yarn. The native range of African rue is northern Africa through the Mediterranean region.

## Impacts

African rue's root system can grow more than 20 feet deep making it very drought tolerant, in turn enabling it to outcompete native vegetation. Along with the drought tolerance, African rue can also tolerate alkaline and saline soils. It primarily spreads by seed but can also re-sprout from injured roots giving it yet another competitive edge. African rue easily invades disturbed areas and outcompetes native vegetation. Economically, African rue displaces desirable forage and is toxic to livestock.

# African rue

*Peganum harmala L.*

## Monitoring

African rue should be carefully monitored in arid, disturbed areas, especially in areas with little rainfall, higher than average salinity concentrations in the soils, and alkaline soils. States and counties near New Mexico should be more alert as that is the region where African rue was introduced. The southwestern United States and coastal western states should also be moderately alert.

## Control options

*Biological:* There are no biological control agents available in the United States.

*Prevention:* Prevention is the best method of control by maintaining healthy native vegetation and early detection.

*Mechanical:* Mechanical control, including mowing and tillage, are usually unsuccessful because the plant can readily re-sprout from injured roots and the crown of the plant.

*Chemical:* Herbicides usually provide the best control of African rue. Aresenal or Habitat (imazapyr) sprayed at 3 pints/A and Roundup (glyphosate) at the recommended use rate are the most effective for non-cropland areas. Escort or Ally (metsulfuron) applied at 3.2 to 6.4 oz/A and Spike 20P (tebuthiuron) applied at 1.5 lbs ai/A can be used in rangeland situations. Triclopyr has also shown to be effective in rangeland. Most of the aforementioned herbicides will cause damage to the native grass; precaution should be taken when applying. Spot spraying should be the first means of application to sufficiently coat African rue with product and to ensure minimal desired species loss. Applicators should always read and follow the label before applying any products.

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# Japanese knotweed

by: Lisa Cox

*Polygonum cuspidatum* Sieb. And Zucc.

Polygonaceae

## General information

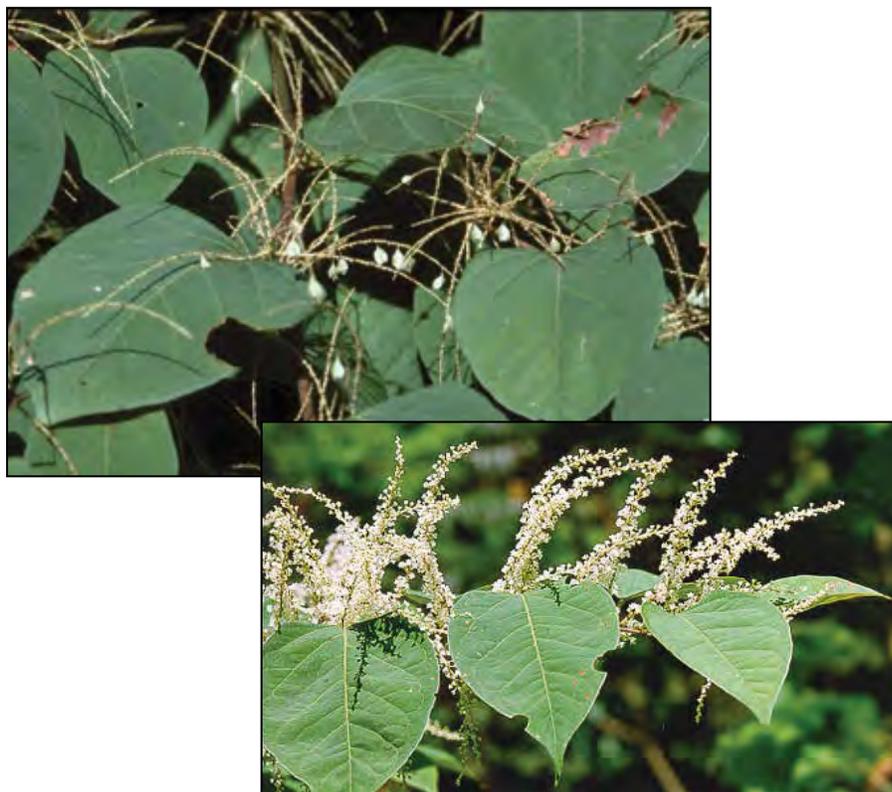
Japanese knotweed is native to southeast Asia. It was introduced to the United States in the late 1800s as an ornamental and for erosion control. It is also known as fleecflower, Japanese bamboo, and Mexican bamboo. It spreads primarily vegetatively with the help of long, stout rhizomes. It is often transported as contaminant in fill/dirt seeds. Sometimes, it is distributed by water or wind. Escapees from neglected gardens and discarded cuttings are common routes of dispersal from urban areas. Japanese knotweed can tolerate a variety of adverse conditions: full shade, high temperatures, salinity, drought. It is found near water, waste sites, and low-lying areas.

## Identification

Japanese knotweed is an upright, shrublike, herbaceous perennial. It can grow more than 10 feet tall. The base of the stem above each joint is surrounded by membranous sheath. The stem is smooth, stout, and swollen at joints where leaf meets stem. The leaves are normally about 6 inches long by 3 to 4 inches wide, broadly oval to somewhat triangular, and pointed at the tip. It has minute greenish-white flowers in branched sprays in summer, followed soon by small winged fruits. The seeds are triangular, shiny, and small (about 1/10 inch long).

## Potential look-alikes

Giant knotweed (*Polygonum sachalinense*), Virginia knotweed (*Tovara virginica*).



**Fig. 1.** Top: Japanese knotweed showing jointed stems (Jil Swearingen, USDI National Park Service, Bugwood.org); Bottom: showing small sprays of flowers (USDA National Invasive Species Information Center and Chocorua Lake Association)



**Fig. 2.** A Japanese knotweed infestation in Alaska (Tom Heutte, USDA Forest Service, Bugwood.org)

# Japanese knotweed

*Polygonum cuspidatum* Sieb. And Zucc.

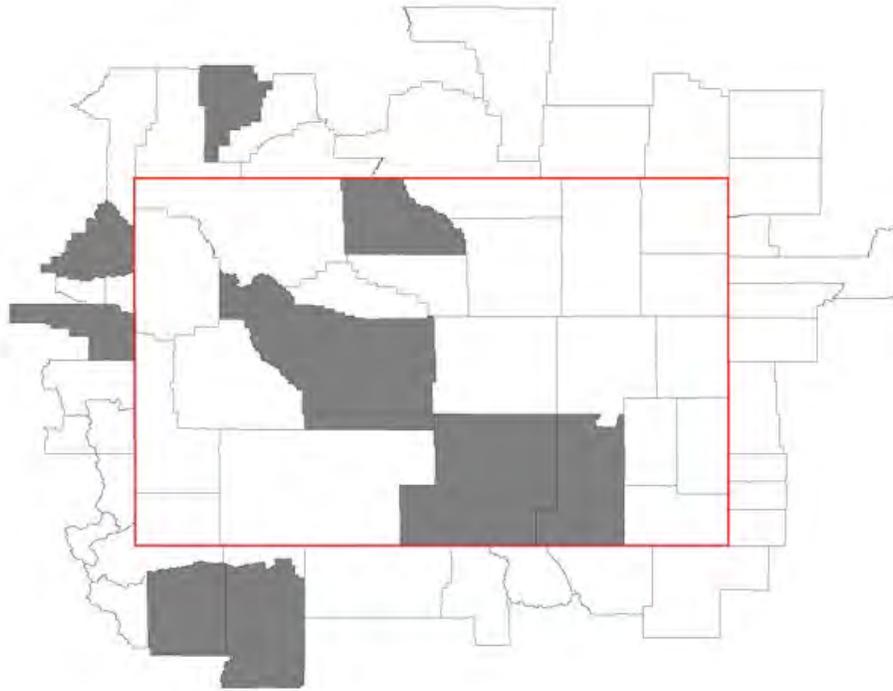


Fig. 3. Japanese knotweed has been reported in several states bordering or near the western border of Wyoming (Wyoming bordered in red), and has been reported, though not necessarily documented with voucher specimens, in Wyoming.

## Distribution

Japanese knotweed is native to southeast Asia. It is reported in all U.S. states except Florida, Texas, New Mexico, Arizona, Nevada, and North Dakota. In Wyoming it is present in Laramie (Albany County); Lander (Fremont County); Big Horn County, 2009; Carbon County, 2010. It is considered a noxious weed in U.S.: Class C in Alabama; B list in California; banned, invasive in Connecticut; prohibited in Massachusetts; prohibited, invasive in New Hampshire; B-designated, quarantined in Oregon; Class B in Vermont; Class B quarantined in Washington. It has noxious weed status in Idaho, and reported in counties bordering Wyoming near Yellowstone and Teton National Park. It is listed by World Conservation Union as one of world's 100 worst invasive species.

## Impacts

Early emergence and dense growth prevents establishment, crowds other species, and degrades wildlife habitat. It spreads quickly, forms dense thickets, excludes native vegetation, greatly alters natural ecosystems, and poses significant threat to riparian areas, where it can survive severe floods and rapidly colonize scoured shores and islands. During winter dormancy, the species standing biomass can be a fire hazard. Once established, populations are extremely persistent.

# Japanese knotweed

*Polygonum cuspidatum* Sieb. And Zucc.

## Monitoring

Inspect topsoil before use. Act quickly when discovered. Albany County and Fremont County reports note incidence in flower beds in Laramie and Lander. Communicate with neighboring landowners and agencies when Japanese knotweed is found to discuss control options. Monitor for reestablishment after physical and chemical control methods are used. Yellowstone and Teton National Parks could be affected if weed spreads across border between Idaho or Montana and Wyoming, or from Fremont County, Wyoming.

## Control options

**Mechanical:** Grubbing is effective for small initial populations and environmentally sensitive areas where herbicides cannot be used. Use a pulaski or a similar digging tool to remove the entire plant including all roots and runners. Juvenile plants can be hand pulled depending on soil conditions and root development. Any portions of the root system not removed will potentially re-sprout. All plant parts (including mature fruit) should be bagged and disposed of in trash dumpster to prevent reestablishment.

## Chemical

Best approach: combination cutting and herbicide (2,4-D earlier in season, glyphosate concentrate later) application, in late spring/early summer followed by early fall re-treatment. Several years' treatment may be needed for well-established populations. Plants will not re-sprout from cut cane, but removing canes may aid in finding and treating re-sprouts in infested patches. Areas are also more conducive to revegetation if cut canes are removed. Stem injection with glyphosate is very effective for smaller infestations.

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# Sulphur cinquefoil

*Potentilla recta* L.

by: Al Emmons

Rosaceae

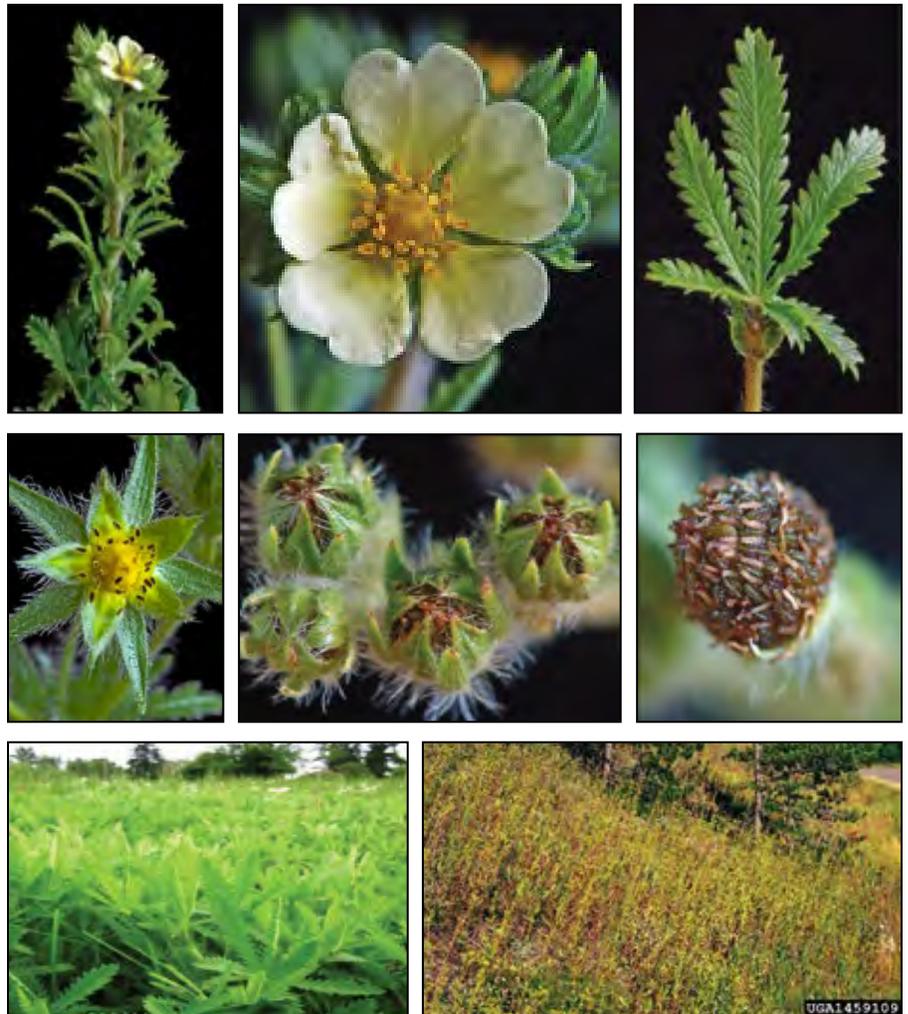
## General information

Sulphur cinquefoil is an herbaceous forb native to Eurasia. Introduced into Canada before 1900, it is now well-established throughout the United States and Canada. Adapted to a wide range of environmental conditions, it can be found along roadsides, rights-of-way, disturbed areas, and old fields. In western North America, it has also invaded forest, shrub, and grassland communities. It is not limited by soil textures but does best on coarse-textured soils on drier sites at low- to mid-elevations.

## Identification

Sulphur cinquefoil is an erect-growing perennial with one to three hairy stems growing up to 2 feet in height. Leaves alternate on the stems and are palmately divided, usually with five leaflets. The leaflets are oblanceolate in shape with toothed margins. The flowers are pale yellow with five heart-shaped petals around a bright yellow center and ½ to 1-inch across. The petals fall off soon after blooming. It flowers in late spring through early summer (May through July) and will produce up to 1,600 seeds.

It is often confused with the native cinquefoil, *Potentilla gracilis*, which is shorter and has white woolly hairs on the undersides of its leaves.



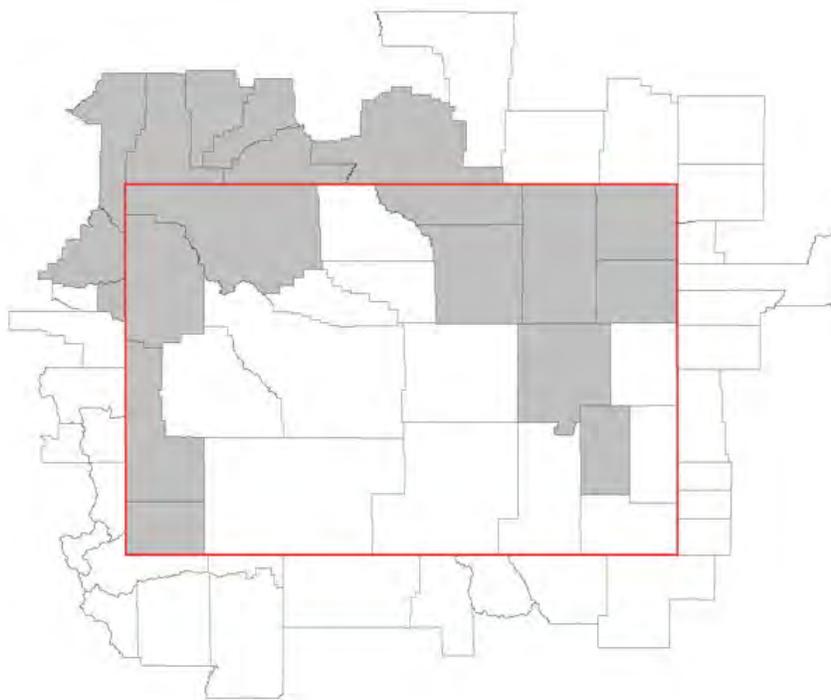
**Fig. 1:** Top from left: mature plant; the flower; the leaf. Middle row: Flower after petals drop off; flower head about a month after blooming; the developing fruit. (Brian Johnston) Bottom row: Infested areas. (Steve Dewey, Utah State University, Bugwood.org)



**Fig. 2:** *Potentilla gracilis* (left: Dave Powell, USDA Forest Service, Bugwood.org; right: Mary Ellen (Mel) Harte, Bugwood.org)

# Sulphur cinquefoil

*Potentilla recta* L.



**Fig. 3.** Documented distribution of sulphur cinquefoil in and around Wyoming.

## Distribution

Native to Eurasia, it is found in central and southern Europe, mountainous areas in North Africa, and central Asia where it is found in grass and shrub-dominated communities, forest clearings, and borders. Introduced in Canada before 1900, by the 1950s it was well-established in Canada and the northeastern and upper Midwest of the United States. The plant is now established throughout the continent and is found in the 10 southernmost provinces of Canada and in every state except Arizona, Utah, and New Mexico. It is listed as a noxious weed in Washington, Oregon, Idaho, Montana, and Wyoming. The weed is found mostly in the northern counties in Wyoming.

## Impacts

Sulphur cinquefoil can pose a serious management problem in natural areas due to its high seed production. It is not very palatable to grazing by animals and will reduce native grass production in grasslands and reduce carrying capacity for domestic livestock and wildlife. It will also reduce the quality of hay in infested hay meadows.

It will decrease native plant diversity and alter the natural successional processes in native plant communities in which it becomes established.

# Sulphur cinquefoil

*Potentilla recta* L.

## Monitoring

Monitoring should occur before and after control is implemented and continue for several years following to ensure management is lasting and having the desired results. Landowners should assess changes in density or cover of sulphur cinquefoil compared to native species in the affected areas. Control methods should be repeated at least once a year and continue for a minimum of three to five years. Also, it is helpful to monitor the changes in controlled areas compared to areas where no controls were used to evaluate treatment success.

## Control options

*Manual and mechanical control:* Hand digging may eradicate small infestations. Mowing, if done before blooming, may reduce flowering and seed production but will not reduce populations. Mowing after flowering may spread the infestation.

*Biological control:* There are no biological controls available. Sulphur cinquefoil is related to the strawberry and other native cinquefoil species, so effects on non-target species are a concern of any possible bio-control.

*Cultural options:* Plant competition reduces the invasiveness of sulphur cinquefoil so practices such as crop rotation, conservation cover, and replanting will help reduce the invasiveness of the weed.

*Chemical control:* Chemicals such as metsulfuron, picloram, and triclopyr will work temporarily, but repeated applications are necessary for long-term control.

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# Austrian fieldcress

*Rorippa austriaca* (Crantz) Besser

by: Brenna Hansen

Brassicaceae

## General information

Austrian fieldcress is a perennial forb in the mustard family native to Eastern Europe and Russia. It is typically found in moist soils and thrives in disturbed habitats. This fondness of moist habitats can make Austrian fieldcress particularly problematic in riparian habitats and irrigated fields. While it produces seeds, they are often non-viable. Persistent stems produce roots when in water, which may also be a potential method of spread, but the most common method of reproduction is through creeping rhizomes. Additionally, it is capable of hybridizing with the closely related, invasive *Rorippa sylvestris* (Fig. 2). This hybrid has been found to be more invasive in Europe than either parent species.

## Identification

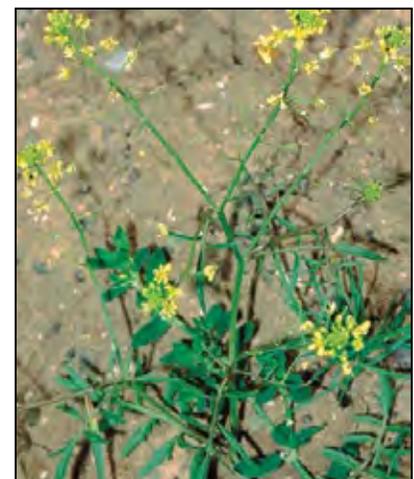
The root system is extensive, with a thick, fleshy taproot. Stems emerge from a basal rosette and are 1-3 feet tall with sparse hairs. Leaves are oblong and lobed, possessing serrate edges and lacking hairs. Four-petal flowers are small and yellow, blooming in mid- to late summer.

## Potential look-alikes

Austrian fieldcress looks similar to other members of the mustard family and is most similar in growth and habitat to *R. sylvestris*. As with all mustards, it can be properly identified by analyzing the combination of traits present, particularly the seed shape (*R. austriaca* possesses round fruits, while *R. sylvestris* produces long, slender fruits).



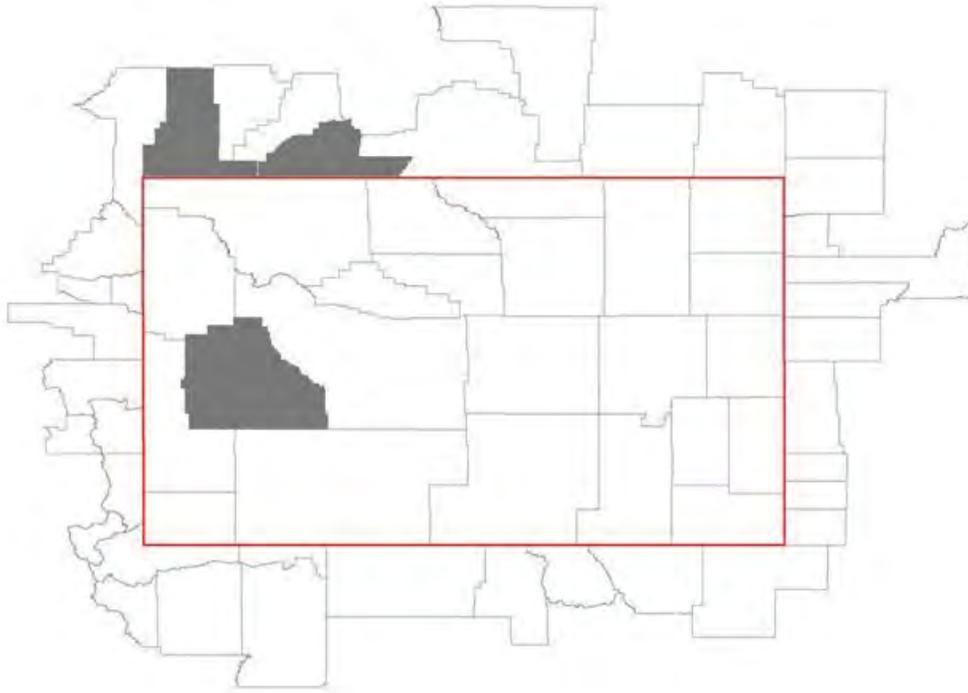
**Fig. 1. Clockwise from top left:** mature flowers, plant, young leaves of rosette; root system; infestation. (CDFA/IPC-J.P. Clark)



**Fig. 2. *Rorippa austriaca*** (left) is capable of hybridizing with the related *R. sylvestris* (right). The resulting offspring are stronger invaders than either parent plant. (Elizabeth Bella, USDA Forest Service, Bugwood.org)

# Austrian fieldcress

*Rorippa austriaca* (Crantz) Besser



**Fig. 3.** Documented distribution of Austrian fieldcress in and around Wyoming.

## Distribution

Austrian fieldcress is native to Eastern Europe and Russia and has spread through Europe and North America, including Canada. It has been identified in the northern and western United States, including Wyoming and all bordering states except Colorado. In Wyoming, the only known Austrian fieldcress is in Sublette County. Park and Carbon counties in Montana are the only documented areas bordering Wyoming that have populations.

## Impacts

Due to the fondness for moist habitats, Austrian fieldcress may be particularly problematic to sensitive riparian and wetland habitats. Irrigated and tilled agricultural areas may also be at risk. Special caution should be taken to prevent spread to these areas. Austrian fieldcress is listed as a noxious weed in Alaska, California, Washington, Oregon, and Nevada, and is a declared weed in Sublette County, Wyoming.

# Austrian fieldcress

## *Rorippa austriaca* (Crantz) Besser

### Monitoring

As the most likely spread is through contaminated soils and vegetation, special consideration should be taken to clean equipment and screen all materials leaving contaminated areas. Any suspected sightings should be reported to the proper authorities.

### Control options

*Mechanical:* Mechanical control is not an option because the whole root system must be removed.

*Chemical:* Chemical control with herbicides such as 2,4-D and glyphosate may be the most successful option, although multiple applications may be required.

*Cultural:* Tillage may increase an infestation by spreading root fragments.

*Biological:* There are no approved biological control agents.

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# Mediterranean sage

*Salvia aethiopsis* L.

by: Brandon Schaneman

Lamiaceae

## General information

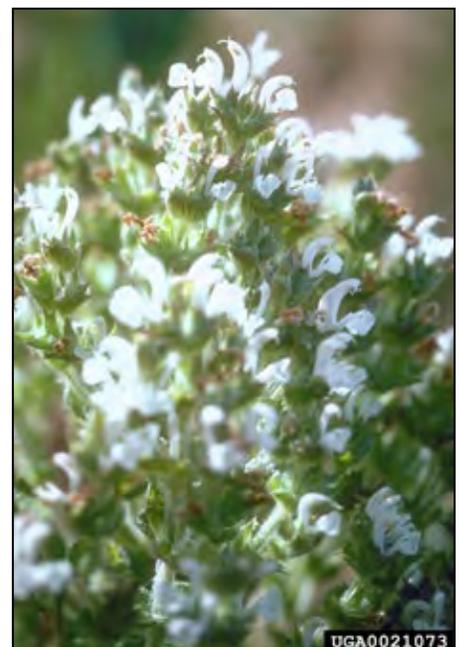
Mediterranean sage, or Med sage, prefers dry, disturbed soils in its native range. Outside of its native range, it will invade a well-drained soil in riparian areas, forests, roadsides, and dry pastures. Mediterranean sage is often found on south facing slopes in loose gravel or poorly developed soils on rangeland.

## Identification

It is a biennial plant that has square stems like many other members of the mint family. It can reach up to 3 feet in height. The lower surface of the leaves have white, wooly hairs. The rosette leaves can be 4-12 inches in length are lobed and appear grayish-green. The leaves on the stem are smaller than the rosette leaves. The flowering stems are highly branched, and it begins to flower in June to August. The flowers are yellowish to white in color. When Mediterranean sage is crushed, it has a sage-like smell.

## Potential look-alikes

The rosettes of common mullein may be confused with the rosettes of Mediterranean sage, but common mullein leaves are usually entire along the margins (not-lobed).



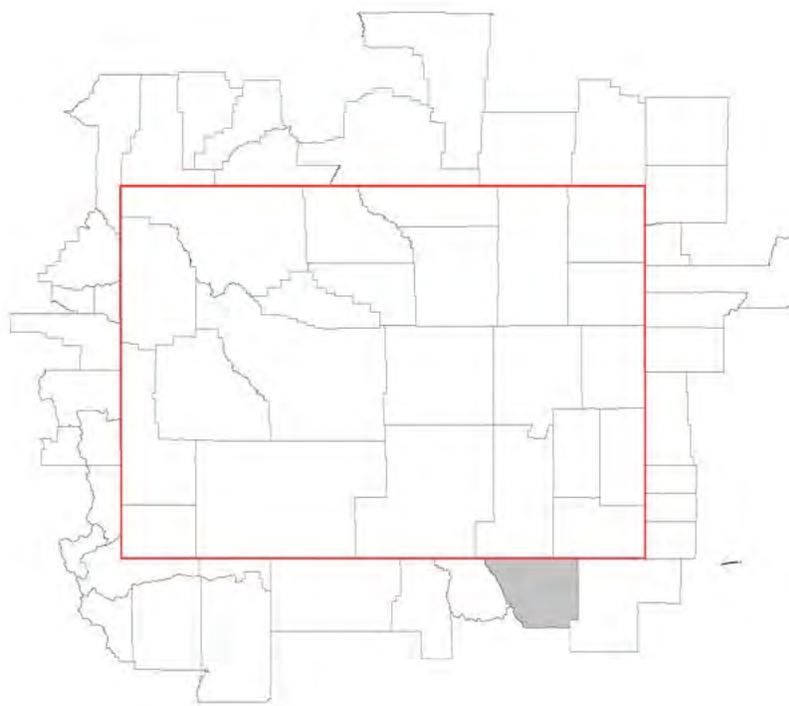
**Fig. 1.** Different growth stages of Mediterranean sage (Top: Lloyd Andres, USDA Agricultural Research Service, Bugwood.org; Left: L.L. Berry, Bugwood.org Right: Eric Coombs, Oregon Department of Agriculture, Bugwood.org)



**Fig. 2.** Left: Common mullein. (Chris Evans, Illinois Wildlife Action Plan, Bugwood.org) Right: Mediterranean sage (right; Eric Coombs, Oregon Department of Agriculture, Bugwood.org)

# Mediterranean sage

*Salvia aethiopsis* L.



**Fig. 3.** Documented distribution of Mediterranean sage around Wyoming.

## Distribution

It can be found in Utah, Oregon, Washington, Nevada, California, Idaho, and Colorado. It has been found in Larimer and Boulder counties in Colorado where it is listed as a Class A noxious weed. Southeast and south-central Wyoming may be at highest risk because of proximity of the populations directly south in Colorado.

## Impacts

Mediterranean sage is a detrimental species due to its ability to disperse seeds by tumbling. If established in pastures or rangelands, it may be able to continue to spread because it is unpalatable to grazing animals. It has the ability to form dense stands that reduce the quantity and quality of forage for domestic livestock and wildlife. Foliage from Mediterranean sage has been used as an herbal wound dressing.

# Mediterranean sage

*Salvia aethiopsis* L.

## Monitoring

Since Mediterranean sage readily inhabits disturbed areas, such areas should be the initial focus for search efforts. Diligent monitoring of rangelands and uplands with poorly developed soils is crucial, along with grazing management practices that encourage long-term health of desirable species for prevention of invasion.

## Control options

*Biological:* The Mediterranean sage weevil (*Phrydiuchus tau*) has been released in California, Oregon and Washington.

*Mechanical:* Hand pulling or digging individual plants to at least 3 inches deep provides control for small infestations. Since Mediterranean sage does not spread via roots, hand pulling should not contribute to increased densities as long as accomplished prior to seed production.

*Cultural:* Prevent overgrazing and promote desirable species to prevent invasion.

*Chemical:* Picloram, chlorsulfuron, metsulfuron, and 2,4-D all have activity on Mediterranean sage. Herbicides should be applied at labeled rates from rosette to bolting (early flowering) to achieve satisfactory control. Because of the woolly leaves, adequate surfactants are very important. The primary objective should be to prevent seed set for this biennial weed.

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# Tansy ragwort

*Senecio jacobaea* L.

by: Jennifer Faulkner

Asteraceae

## General information

Tansy ragwort (also stinking willie) is a taprooted biennial or short-lived perennial that can reach 1-6 feet in height. Flowering occurs from July to September. The plant is highly toxic and responsible for the death of thousands of livestock. It remains toxic when dry. Livestock do not avoid consumption in hay or silage, and toxins can be passed through the milk of nursing mothers. Plants can also be toxic to deer, goats, and pigs. Plants invade pastures, open forests, swamps, riverbeds, and rangeland sites. It is usually found in full-sun to partially shaded disturbed or vacant areas.

## Identification

Stems are solitary or several and simple up to the inflorescence. Stems are stout and erect. Pubescence consists of cobwebby hairs in early growth stages. Cauline (stem) leaves are sessile and deeply lobed and are 2-8 inches long. Leaves are alternate and are equally distributed, mostly two to three times pinnately lobed, terminal lobe typically larger than lateral lobes. Leaves are the most toxic part of the plant. Flowering occurs in summer to early fall when yellow, daisy-like flowers develop in a flat-topped inflorescence at the apex of the stems. Flowering heads are numerous and form at the end of erect branches. Both ray and disk flowers are yellow. Ray flowers are 10-13 in number and  $\frac{1}{4}$  to  $\frac{1}{2}$  inches long. Flower heads are  $\frac{4}{5}$  inches in diameter. Fruits of disk flowers are minutely pubescent, while those of ray flowers are glabrous. Crushed leaves emit a rank odor.



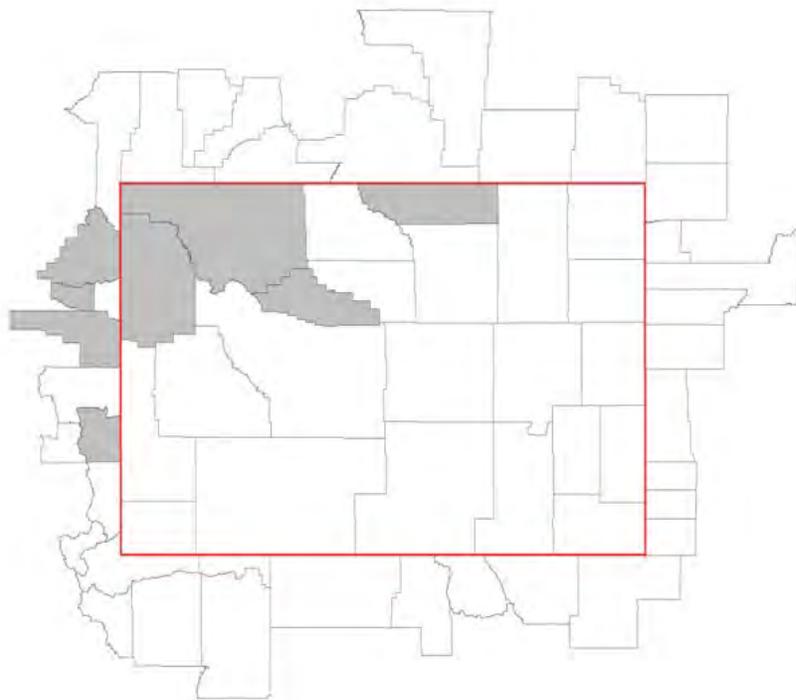
**Fig. 1.** Left: tansy ragwort in flower (Richard Old, XID Services, Inc., Bugwood.org); Right: tansy ragwort during early growth (Michael Shepard)



**Fig. 2.** Upper left: seedlings; upper right: early growth; lower left: flowers; lower right: senescing plant. (Michael Shepard, USDA Forest Service, Bugwood.org, Leslie J. Mehrhoff, University of Connecticut, Bugwood.org and (Faith Duncan, USDA Forest Service, Bugwood.org)

# Tansy ragwort

*Senecio jacobaea* L.



**Fig. 3.** Tansy ragwort has been found in Teton and Park counties in Wyoming, but is currently considered eradicated in those areas. The plant has been found in northwest Montana and in Idaho. It was recently found in Hot Springs and Sheridan counties in Wyoming.

## Distribution

Tansy ragwort is a non-indigenous, poisonous weed native to Europe and Asia Minor. It arrived in the United States through seaports in the early 1900s. It is widespread in Washington, Oregon, California, and British Columbia. It has been found in Idaho, Montana, and Wyoming. It is listed as noxious by Colorado, Montana, Idaho, Washington, Oregon, Massachusetts, Connecticut, Arizona, and California.

Seeds are pappus and are carried short distances by the wind. Longer distance transport is by vehicles and livestock. Each plant can produce up to 150,000 seeds. Pollination is by a wide range of bees, flies, moths, and butterflies.

## Impacts

Tansy ragwort has infested millions of acres in the Pacific Northwest. Direct economic loss estimates for livestock producers during highest infestation periods due to this weed are \$6 to \$8 million annually. Tansy ragwort is toxic to cattle and horses. It contains several alkaloids that produce irreversible liver damage. These toxic alkaloids have cumulative and fatal effects. Tansy ragwort outcompetes native plants, forms monocultures, and reduces available forage for livestock and wildlife; the plant is not palatable nor nutritionally sufficient as forage.

# Tansy ragwort

*Senecio jacobaea* L.

## Monitoring

Tansy ragwort has been classified as a county declared weed in Converse, Washakie, and Big Horn counties in Wyoming. It has also been found in Hot Springs and Sheridan counties in Wyoming. Although considered eradicated in Park and Teton counties, it requires continual monitoring because of the long-term viability of its seeds (up to 16 years). The crown and root system of the plant can reproduce vegetatively and produce rosettes. This occurs when plants are disturbed by mechanical and pulling control methods.

## Control options

**Cultural:** In rangeland and pasture situations where soil nitrogen levels may be depleted and native forbs and grasses are already present, applying fertilizer may be useful in assisting native plant competitiveness.

**Mechanical:** Hand pulling or digging is effective for small populations. Hand pulling should be done on moist soils and include the entire root. Pulled plants should be carefully bagged to prevent seed dispersal during flowering. Mowing is not recommended.

**Biological:** The most effective biological control method is to release the ragwort flea beetle and the cinnabar moth together, but this may take six years to prove effective.

**Chemical:** The following recommendations are for pasture and rangeland sites and are based on equipment with 30 gal/acre outputs.

Herbicide	Rate	Timing of Application
2,4-D (various - general use)	2 lb ai/A + 0.25% v/v non-ionic surfactant	Apply at rosette stage (during first year of growth or spring)
Metsulfuron (Escort XP- general use)	1 oz product/A + 0.25% v/v non-ionic surfactant	Apply at bud growth or spring
Picloram (Tordon 22K – restricted use)	2-4 oz pt/A + 0.25% v/v non-ionic surfactant	Apply at rosette stage (during first year of growth or spring)
Aminopyralid (Milestone- general use)	4-5 oz/A	Apply at rosette stage (during first year of growth or spring)

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# Medusahead wildrye

by: Craig Rothwell

*Taeniatherum caput-medusae* L. Nevski

Poaceae

## General information

Medusahead wildrye is a winter annual in the *Poaceae* (grass) family. Growth starts in the fall months and the flowering typically begins in early to mid-summer. Medusahead wildrye contains large amounts of silica, which contribute to slow decomposition of dead plants, thereby leading to significant buildup of litter and debris.

## Identification

Medusahead wildrye grows from 6 to 18 inches in height. Multiple stems grow from the base at the ground and have slender, slightly rolled leaves with two to four leaves per stem. The head produces thin awns that are 1 to 4 inches in length. The root system is fibrous. The plant overwinters as seedling and matures in the spring and summer months.

## Potential look-alikes

Various *Hordeum* and *Elymus* species may be confused with medusahead. Some species of rye are similar in appearance to medusahead.



**Fig. 1.** Medusahead wildrye during active growth. Heads contain large awns that point upward. (left: John M. Randall, *The Nature Conservancy, Bugwood.org* CDFA; right: Steve Dewey – Utah State University, 2001)



**Fig. 2.** Head of Medusahead wildrye. (left: Barry Rice, *sarracenia.com, Bugwood.org*; right: Steve Dewey, Utah State University, *Bugwood.org*)

# Medusahead wildrye

*Taeniatherum caput-medusae* L. Nevski



**Fig. 3.** Distribution of Medusahead wildrye in and around Wyoming.

## Distribution

Medusahead wildrye is a native to Eurasia. It is found in the western states of California, Oregon, Washington, Idaho, Montana, Nevada, and Utah and in the eastern states of New York, Pennsylvania, and Connecticut. In Oregon, the infestation occurs in most of the state. The infestation is in the northern part of the state, in California, in the eastern portion of Washington, in the western part of Idaho, and scattered throughout Nevada, Utah, and Montana. There are no infested areas recorded in Wyoming.

## Impacts

Medusahead wild rye reduces availability of quality forage for grazing. Awns can injure livestock and wildlife by physical damage to the face, eyes, and mouth. Slow decomposition rates allow for a thick thatch to build that affects moisture regime and seed germination. The thick thatch also creates fuel for fire and changes the fire regime of the area it infests.

# Medusahead wildrye

*Taeniatherum caput-medusae* L. Nevski

## Monitoring

Monitor to help prevent the spread of medusahead wildrye. Special attention should be paid to disturbed rangeland and other disturbed sites. States that have limited infestations (Utah, Idaho, Nevada, and Washington) should pay close attention to areas that are near existing infestations.

**Control options:** *Prevention:* Well managed grazing can help prevent establishment, however, overgrazing may favor establishment. Maintain a diverse community with plants that can compete with medusahead wildrye (plant species that establish quickly and are tolerant of fire and drought). Avoid soil disturbance.

*Mechanical:* Till infested area before plants flower. Tilling infested areas reduces thatch layer as well as seed production; however, it does disturb the land, which can favor future infestations. Mowing may also work if the grass can be cut below the seed head before flower production to reduce seed production.

*Cultural:* Clean machinery between fields, quarantine livestock that has previously grazed on infested acreage, clean equipment and clothes after being in infested area.

*Chemical:* Several herbicides provide good control of medusahead wildrye. Foliar applied herbicides such as glyphosate may be used. If thatch is thick, it may be difficult to get the desired coverage of the herbicide. Soil-active herbicides typically provide better control. Aminopyralid and imazapic have achieved good control. Applying the proper herbicide is important; the wrong herbicide may injure non-targeted plants in the area.

*Integrated weed management:* Although these individual methods all achieve control, a program of various control methods should be implemented to achieve the best control.

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# Scentless chamomile

by: Cara E. Noseworthy

*Tripleurospermum perforatum* (Mérat) M. Lainz

Asteraceae

## General information

Scentless chamomile is an exotic annual, biennial, or short-lived perennial forb introduced to North America from Europe in the 19th century. It has become a large problem in crops in the Canadian prairie provinces and has invaded the United States. It is often found in perennial forage crops, lawns, gardens, waste areas, and along roadsides, irrigation ditches, and other waterways. It is found in clay, loam, and sand soils with pH ranging from 5.5 to 7.9, and it prefers moist, organic soils. Buried seed can remain viable for 15 years.

## Identification

Scentless chamomile has a fibrous root system and highly branched stems, and grows more than 3 feet tall. The leaves are 1-3 inches long, alternate along the stem, and they are divided into narrow, thread-like branched segments. From June to September, scentless chamomile produces flowers that are yellow with white petals, similar to a daisy. Mature seeds of the forb have three distinct ridges.

## Potential look-alikes

Scentless chamomile could be confused with stinking mayweed (*Anthemis cotula*) or wild chamomile (*Matricaria recutita*). Each of these plants is present in Wyoming. Although they look very similar, scentless chamomile can be recognized for its distinct lack of smell. Oxeye daisy is also similar but with broader leaves.



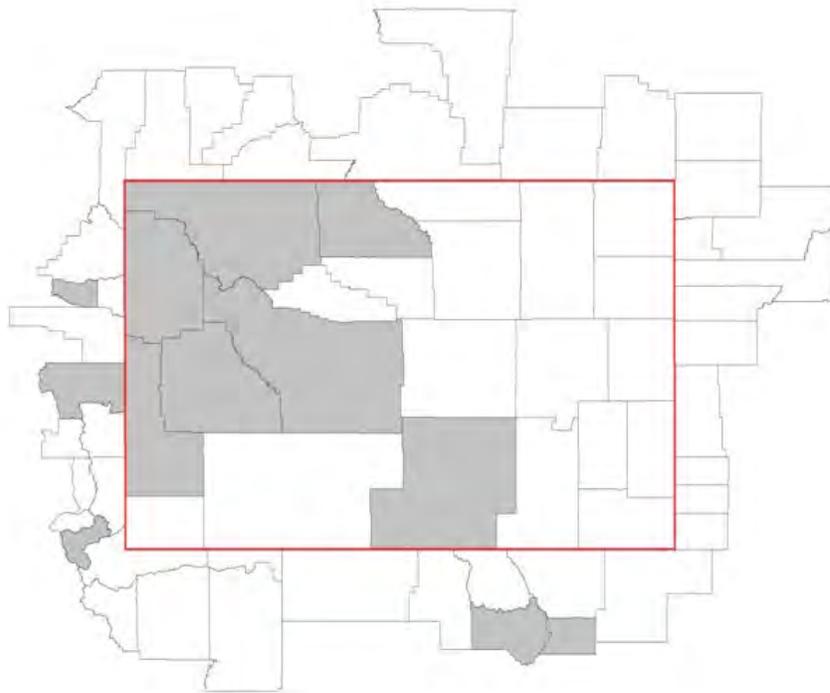
**Fig. 1.** The leaves of scentless chamomile are narrow and branched (bottom left), and the flowers are yellow with white petals (Top right and bottom : Richard Old, XID Services, Inc., Bugwood.org; top left: [luirig.altervista.org](http://luirig.altervista.org); bottom left: Richard Old)



**Fig. 2.** Left: Stinking mayweed ([ncwillflower.org](http://ncwillflower.org)); Right: wild chamomile ([freeherbpictures.com](http://freeherbpictures.com))

# Scentless chamomile

*Tripleurospermum perforatum* (Mérat) M. Lainz



**Fig. 3.** Documented distribution of scentless chamomile in and around Wyoming.

## Distribution

Scentless chamomile originated in northern and central Europe and has spread to North America and Asia. It has invaded about 26 states in the northern half of America and all of the Canadian provinces. In Wyoming, scentless chamomile has been documented in Niobrara, Carbon, Sweetwater, Uinta, Lincoln, Sublette, and Teton counties. It has also been documented in Powder River County and Gallatin County in Montana as well as Caribou, Bonneville, Madison, and Fremont counties in Idaho, all of which border Wyoming.

## Impacts

Scentless chamomile tends to form dense stands that have negative ecological impacts. The dense stands reduce the growth of other seedlings. It is also likely to alter the soil moisture and nutrient availability for other plants. The dense stands of scentless chamomile can also have an economic impact by reducing forage value. Scentless chamomile is unpalatable to animals. Therefore, dense stands of this forb in a pasture could result in decreased weight gain in livestock. In addition, scentless chamomile can also reduce crop yield.

# Scentless chamomile

*Tripleurospermum perforatum* (Mérat) M. Lainz

## Monitoring

Focusing on disturbed areas with little competition is important. Any area subject to cultivation, livestock trampling, or flooding is at risk. Seeds can be transported by vehicles, contaminated forage, grain, and grass seed. Caution should be taken by farmers and ranchers. Those living in or around the counties highlighted in gray on the map have reason to monitor.

## Control options

Scentless chamomile is known to inhabit recently disturbed sites. Therefore, control may not be necessary if there is no chance for re-disturbance. However, on farms and ranches, that is unlikely.

*Chemical and Mechanical:* Chemical and mechanical controls for scentless chamomile have been stated to be ineffective or uneconomic. It is relatively susceptible to many herbicides, but some tolerance has been reported. Although they are not the most effective and timing can be critical, mowing, tillage, and hand-weeding are options.

*Cultural:* Cultural control is probably the best method and can usually be applied to prevent more than one infestation. Using a rotational grazing system to decrease disturbance or being sure to plant and promote natives to increase competition are two ways to prevent or reduce scentless chamomile. Establishing a dense crop stand early in the season has been shown to reduce the weed.

*Biological:* Studies have been done on potential biological control agents, and three insects have been released in Canada. *Diplapion confluens* and *Coryssomerus capucinus* have been shown to further reduce scentless chamomile populations that are already stressed by competition. However, these two insects are not available in the United States because they were too much of a risk for cultivated and native plants.

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# North Africa grass

by: Benjamin Wolff

*Ventenata dubia* (Leers) Coss.

Poaceae

## General information

North Africa grass is a relatively new, invasive tufted winter annual grass that germinates best with moderate to high temperatures in early fall with a germination period between six and 13 days. It can grow to 28 inches but generally falls within the range of 7 to 20 inches. The stems can be slightly pubescent while the leaf blades exhibit a rolled-in appearance. The inflorescence displays a yellow to yellow-brown color with an open panicle while the branches of the panicle can be drooping. The awns are on the upper florets and are abruptly twisted and bent (Fig. 1). North Africa grass is native to southern Europe, North Africa, east Asia, and the Middle East. It was first identified in Spokane County, Washington, in 1952 and in Kootenai County, Idaho, in 1957.

## Identification

North Africa grass can produce a ligule of up 1/3 inches along with reddish black-colored nodes in the months of May and June. In mid- to late-summer season, it can be mistaken with grass species belonging to the Aveneae tribe due to its tendency to produce twisted, bent awns after senescence as seen in Fig. 2. North Africa grass can be mistaken for downy brome (*Bromus tectorum*) in appearance; however, downy brome flowers in May and June, and North Africa grass flowers in July and August.

## Potential look-alikes

Downy brome (*Bromus tectorum*)



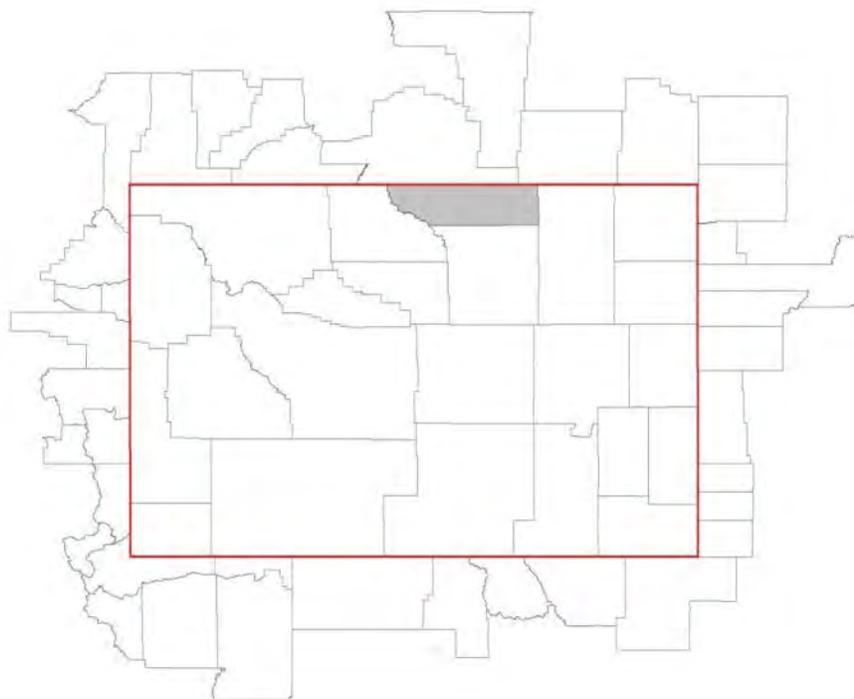
**Fig. 1.** North Africa grass inflorescence stage as indicated by the spikelet and awn production. Note the bent and twisted awns (*Franck Le Driant/FloreAlpes.com*)



**Fig. 2.** North Africa grass root structure and inflorescence. Note the yellow-brown and reddish appearance making it easily mistaken for downy brome. (*Invasive.org*)

# North Africa grass

*Ventenata dubia* (Leers) Coss.



**Fig. 3.** Documented distribution of North Africa grass in and around Wyoming. Sheridan County record was a single collection from the 1980s.

## Distribution

North Africa grass, being a relatively new invasive species, has few documented collections in and around Wyoming. There has been one documented collection in Wyoming in Sheridan County as illustrated by Fig. 3. It has not been documented in Nebraska, Utah, or Colorado. There have been numerous documented collections in Idaho counties Kootenai, Benewah, and Latah, and in Washington counties Spokane, Klickitat, and Cowlitz. North Africa grass has moved aggressively into the Pacific Northwest along with mild invasion into the New England region; however, it is not classified as a noxious weed in any U.S. state nor is it listed as a federal noxious weed. It has also spread across Canada's eastern and western provinces but is also not listed as a noxious weed.

## Impacts

North Africa grass is highly invasive and very competitive in grazing and pasture lands and certain cropping environments. It has the ability to invade transportation corridors and disturbed sites along with stands of bluegrass, alfalfa, winter wheat, and CRP production lands. In grazing lands, it replaces perennial grasses and forbs, ultimately reducing forage production. A major vector for invasion is by motorized vehicle, contaminated hay, and annual crops. North Africa grass has the ability to impede and potentially damage mechanical harvesting equipment along with significant reduction in crop yield through rapid establishment in agricultural environments. Early stages of growth produce mild forage value, however, as the panicle emerges, the plant becomes unpalatable.

# North Africa grass

## *Ventenata dubia* (Leers) Coss.

### Monitoring

Populations of North Africa grass should be assessed to identify the current status and trends in population sizes and distributions over time. Also, it is important to assess the surrounding ecosystem and the processes this invasive species has the potential to affect. New populations should be spatially analyzed for proximity to agricultural production lands and irrigation/riparian zones as seed can be transported via water movement. Areas of concern include winter wheat and alfalfa stands along with CRP, grazing, and pasture lands. A good monitoring program includes systematic sampling of both invaded and non-invaded areas. Sampling events should be either predetermined or based on known occurrences of potential introduction via vector transport. This can include machinery/vehicle movement or crop transport.

### Control options

North Africa grass is an annual species, and the major focus of control should be to reduce and/or eliminate seed production.

*Mechanical:* Multiple mowing events throughout the growing season have shown to be somewhat successful. Mowing should be implemented before the plant is allowed to head out. Standard grazing practices are not recommended due to the low palatability of North Africa grass. However, this can be addressed through targeted grazing practices. Prescribed burning is not recommended due to the high potential of rapid reestablishment of downy brome and North Africa grass.

*Chemical:* Resistance to both sethoxydim and glyphosate has been seen and application of either is not recommended. Application of imazapic in the fall when perennial grasses are dormant may be effective.

*Biological:* There are no biological control agents identified for North Africa grass. Establishing and maintaining high perennial grass cover and density has shown positive control for limiting the introduction and spread of North Africa grass.

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# Syrian bean-caper

## *Zygophyllum fabago* L.

by: Daniel Blaney

Zygophyllaceae

### General information

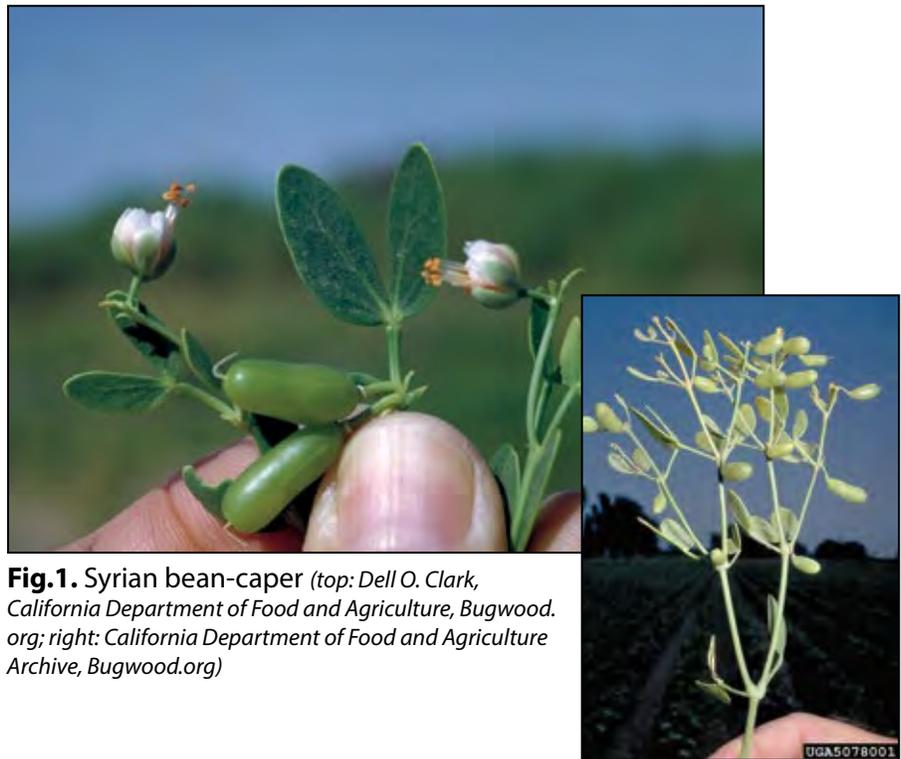
Syrian bean-caper is native to the Middle East. It is thought to have been introduced to North America in the state of Washington in 1916. Its preferred environment is deserts and has the ability to grow well in alkaline soils. The succulent plants generally behave as perennials, though in very cold areas they may behave as annuals. This plant is a vigorous invader in some Western states and has been eradicated from other Western states. This history of invasion should make it a relatively high priority for detection.

### Identification

Leaves are opposite, fleshy, smooth, and hairless. The flowers are perfect, white with orange stamens, and have five petals, and appear between May and early July. The perennial taproot can be very thick with multiple branches leading to what appear to be separate individuals much like Canada thistle. Plants are generally upright, and when mature, can occupy about 1 square meter.

### Potential look-alikes

African (or Syrian) rue (*Peganum harmala*), and puncturevine (*Tribulus terrestris*) are both members of the same family as Syrian bean-caper. Puncturevine is fairly easy to distinguish by its prostrate growth habit, while African rue must be distinguished from Syrian bean-caper by the narrow leaves and woody stems of the former.



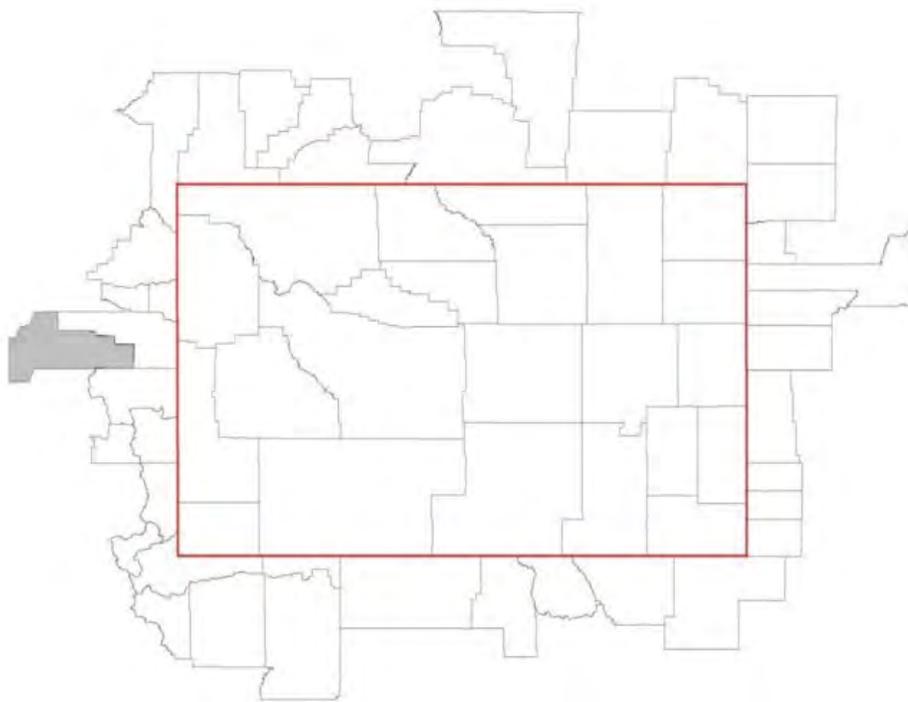
**Fig. 1.** Syrian bean-caper (top: Dell O. Clark, California Department of Food and Agriculture, Bugwood.org; right: California Department of Food and Agriculture Archive, Bugwood.org)



**Fig. 2.** African (Syrian) Rue has very similar flowers to Syrian bean-caper. One can distinguish the two by differences in leaves and roots. ([herbal-ayurveda-remedy.com](http://herbal-ayurveda-remedy.com))

# Syrian bean-caper

## *Zygophyllum fabago* L.



**Fig. 3.** Bingham County, Idaho, is the only county near Wyoming reporting a population. Converse and Big Horn counties have declared sightings of the weed in Wyoming along with eradication. Beaverhead County, Montana, has also reported an eradicated population.

### Distribution

Native to Syria, Iran, Afghanistan, and the Caucuses, it is easy to understand how *Zygophyllum* has invaded areas throughout the arid West. According to their 2010 state departments of agriculture listings, both Colorado and Montana have no *Zygophyllum* populations at present and it is not a priority for detection, though it has been present before. Fremont County, Idaho (eastern most highlighted county in Fig. 3), confirmed the continued existence of Syrian bean-caper populations in 2010, meaning the northwest corner of Wyoming requires intensive monitoring. Continued monitoring throughout the state will ensure populations can continue to be eradicated as they were in Big Horn and Converse counties.

### Impacts

Like many invasive weeds, Syrian bean-caper can form dense stands to the exclusion of other species. In addition to these general negative impacts, Syrian bean-caper's pollen is known to be allergenic to humans, and it has also been documented to remove heavy metals such as cadmium from soils and deposit some (not all) of the minerals in stem tissues. In part, Syrian bean-caper's common name is derived from the fact that, in its native ranges, its fruit is sometimes used as a substitute caper in cooking. It has also been shown to be a highly effective ethno-botanical treatment for yeast infections.

# Syrian bean-caper

## *Zygophyllum fabago* L.

### Monitoring

Recently disturbed, alkaline sites are at highest risk for developing a population. The population present in Fremont County, Idaho, means that Lincoln and Teton County Weed and Pest control districts should monitor vulnerable sites. In addition, Yellowstone National Park is at-risk for being invaded from the Fremont County, Idaho, population as evidenced by the prior invasion of Beaverhead County, Montana, which directly borders the park.

### Control options

*Biological:* Research has not yet begun on potential bio-control agents.

*Mechanical:* Since Syrian bean-caper is a root sprouting plant, mechanical control must be approached accordingly. Hand pulling, burning, and mowing, may all be effective if timed correctly and the infestation size/site features permit. Tillage, or any soil disturbance, is likely to spread infestations and increase the number of individuals within the population.

*Chemical:* Roundup (glyphosate) has been used to control Syrian bean-caper. It should be applied at the maximum labeled rate during the bud stage of growth. Repeated treatments, and the use of surfactants, will probably be necessary to effectively translocate through the plant's waxy exterior and achieve satisfactory control. Soil sterilizers such as imazapyr also work if there is no regard for the condition of other plants. Picloram has been proposed to be effective as well, although no testing of any these herbicides has been conducted in laboratory or field trials.

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Be aware that due to the dynamic nature of the World Wide Web, Internet sources may be difficult to find. Addresses change and pages can disappear over time. If you find problems with any of the listed websites in this publication, please contact Brian A. Mealor, Assistant Professor and Extension Weed Specialist, UW.

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# Notes

# Notes

