

# Guide to exotic thistles of Montana



# and how to differentiate from native thistles



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COVER PHOTOS:

*Left:* Bull thistle, page 5

photo by Starr Environmental, [bugwood.org](http://bugwood.org)

*Right:* Flodman's thistle, page 12

photo by M. Lavin, Montana State University



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Five exotic and ten native thistles grow in Montana. This publication is designed to determine whether an unknown thistle is exotic or native; if exotic, the publication will help you determine the species. Based on the technical nature and difficulty of identifying native thistles, they are not identified to species in the dichotomous key on page 3. This publication also includes instructions on how to use a dichotomous key, descriptive text, and pictures to illustrate the five exotic and ten native thistles that grow in Montana.

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## WHAT IS A THISTLE?

Many plants have “thistle” in their name, but only certain ones fit the definition of a true thistle. True thistles are plants in the sunflower family (Asteraceae). They have spiny leaves and spiny bracts surrounding flowers that are usually white to purple.

### Why is it important to identify exotic thistles and differentiate them from natives?

Exotic thistles can spread quickly (especially with disturbance), have poor forage value, and their sharp spines can limit recreational activities and injure livestock. From a management perspective, differentiating among exotics is important because perennial rhizomatous thistles will require different control measures than taprooted annuals or biennials. Compared to exotics, native thistles do not spread quickly with disturbance, are rarely reported as invasive, and are important for wildlife. For example, birds feed on thistle seed, and some may time their nesting around thistle flowering, using plumes on seeds to line nests. Bees, wasps, flies and beetles feed on thistle pollen and become food sources for wildlife. For some large ungulates like elk, native thistles are a source of forage.

This guide serves to promote the importance of maintaining native thistles in the landscape and should be used to verify whether a thistle is native or exotic before implementing control strategies.



FIGURE 1. Spines extend along entire length of stem.

## WHAT TO LOOK FOR

The features described below are essential for determining whether the thistle is exotic or native. Become familiar with and carefully investigate the features below before starting the dichotomous key on page 3.

- 1) **Observe whether there are spiny wings along the entire stem length.** If prominent, spiny wings (Figure 1) line the entire length of the stem then it is an exotic thistle. If a few spines or spiny wings occur intermittently along the stem then it could be native or exotic.
- 2) **Observe the bracts on the flowering head.** Note the height of the bracts collectively. Note the width of the flowering head. Thistles have bracts, or tiny, leaf-like structures that form a cup around the base of flowers. The white arrow in Figure 2 points to a single bract. The shape of an individual thistle bract, e.g. whether needle-like (e.g. bull thistle), or more broad and triangular (e.g. musk thistle)



FIGURE 2. How to measure bracts collectively, an individual thistle bract and head width.

is important for identification. Measure whether bracts collectively are greater than or less than 0.8 inches high, referring to the white bracket in Figure 2 for the length to measure. Measure the width of the flowering head, referring to the black bract in Figure 2 for the length to measure.

- 3) **Assess whether the plant is rhizomatous or taprooted.** Rhizomatous plants send out shoots below the ground that develop into new plants at some distance from the mother plant. Rhizomatous plants will typically be more dense (spaced closer together) and when mature will lack a prominent basal rosette (clusters of leaves growing at the plant's base). There are two thistles in Montana that are rhizomatous or may appear rhizomatous. Canada thistle is densely rhizomatous. Flodman's thistle can spread by horizontal roots so may at times grow more densely, thereby appearing rhizomatous.
- 4) **Assess whether flowers are densely clustered on short stalks or more solitary on long stalks.** This characteristic is somewhat variable among the exotic thistles and should be used in conjunction with other characteristics. See Canada thistle, page 6, for an example of densely clustered flowers on short stalks and musk thistle, page 7, for an example of solitary flowers on long stalks.

#### TUTORIAL ON USING A DICHOTOMOUS KEY

Dichotomous keys consist of a series of two mutually exclusive statements, known as couplets. Starting with the first couplet, choose the statement that best fits the unknown plant; the corresponding number will lead to another couplet, and ultimately to the plant's name. Below is an example.

- 1a. Plant has spiny winged stems entire length . . . . . 2  
 1b. Plant does not have spiny winged stems entire length . . . . . 5

The two choices, 1a and 1b, form a couplet. Imagine your unknown plant does have spiny winged stems the entire length, meaning you should proceed to couplet 2.

- 2a. Flowers less than 1 inch in diameter and typically densely clustered on short stalks . . . . . Plumeless thistle  
 2b. Flowers more than 1 inch in diameter and tending to be solitary on longer stalks . . . . . 4

If the plant has small flowers densely clustered on short stalks, then choose 2a which leads to 'plumeless thistle'. If flowers are larger and mostly solitary on longer stalks, then choose 2b and proceed to couplet 4. Read each couplet carefully before proceeding to the next step. It may take many steps and some backtracking to arrive at the correct plant.

## SIMPLIFIED DICHOTOMOUS KEY FOR THISTLES OF MONTANA: IS IT EXOTIC OR NATIVE? IF EXOTIC, WHICH SPECIES?

- 1a. Spiny wings (Figure 1) consistently line entire stem length . . . . . 2
- 1b. Stems without spiny wings lining entire length; may be intermittent spines and/or spiny wings, but not a consistent line from below flower heads to plant base . . . . . 5
- 2a. Flower heads not more than 1 inch in diameter, bracts collectively less than 0.8 inches high and flowers tending to be on shorter stalks and in denser clusters, plant not silvery gray . . . . . Plumelless thistle, *Carduus acanthoides*, pg. 8
- 2b. Flower heads more than 1 inch in diameter, bracts collectively more than 0.8 inches high and flowers typically solitary on longer stalks; foliage green or silvery gray . . . . . 3
- 3a. Foliage silver gray in appearance, plants may grow up to 6 feet tall . . . . . Scotch thistle, *Onopordum acanthium*, pg. 9
- 3b. Foliage green, not silver gray, plants rarely over 5 feet tall . . . . . 4
- 4a. Floral bracts broad and triangular, and margins entire, bract midrib prominent, heads often nodding . . . . . Musk thistle, *Carduus nutans*, pg. 7
- 4b. Floral bracts narrow, needle-like . . . . . Bull thistle, *Cirsium vulgare*, pg. 5
- 5a. Plants strongly rhizomatous, bracts collectively less than 0.8 inches high; (see the native Wyoming thistle with bracts collectively less than 0.8 inches high, but lacking rhizomes, and leaves white beneath) . . . . . Canada thistle, *Cirsium arvense*, pg. 6
- 5b. Plants not rhizomatous (or weakly showing signs of being rhizomatous), and/or bracts collectively more than 0.8 inches high . . . . . 6
- 6a. Plants with broad triangular bracts, often bent outwards from base, bract margins entire; spiny wings on stem may be absent below flower head, but begin some distance below and continue to plant base . . . . .Musk thistle, *Carduus nutans*, pg. 7
- 6b. Plants without broad triangular bracts . . . . . 7
- 7a. Upper leaf surface with many short, sharp spines covering all parts of this plant making it difficult to find any place to touch it without being injured, and outer bracts tend to point outward rather than upward . . . . . Bull thistle, *Cirsium vulgare*, pg. 5
- 7b. Upper leaf surface lacking spines and may be hairless or hairy; bracts tend to point upward, adhering to the flower head for most of their length (excluding some with a spine at the tip that may point outwards) . . . . . a native thistle\*

\* If you'd like to identify native thistle to species, refer to *Manual of Montana Vascular Plants* (Lesica 2012) or *Vascular Plants of Montana* (Dorn 1984), or contact your local MSU Extension office (<https://msuextension.org/localoffices.html>).

# exotic thistles

The following pages give detailed information and photos on the five exotic thistles that occur in Montana including life cycle, habitat, and key diagnostic features to identify them.

Exotic thistles can form dense infestations, often in disturbed areas.



**musk thistle** S. Dewey, bugwood.org



M. Lavin, MSU



**bull thistle** J. DiTomaso, bugwood.org



M. Lavin, MSU



**Scotch thistle** J. Randall, bugwood.org



M. Lavin, MSU

## **Bull thistle** *Cirsium vulgare*

Biennial. Common to disturbed meadows, thickets and roadsides.

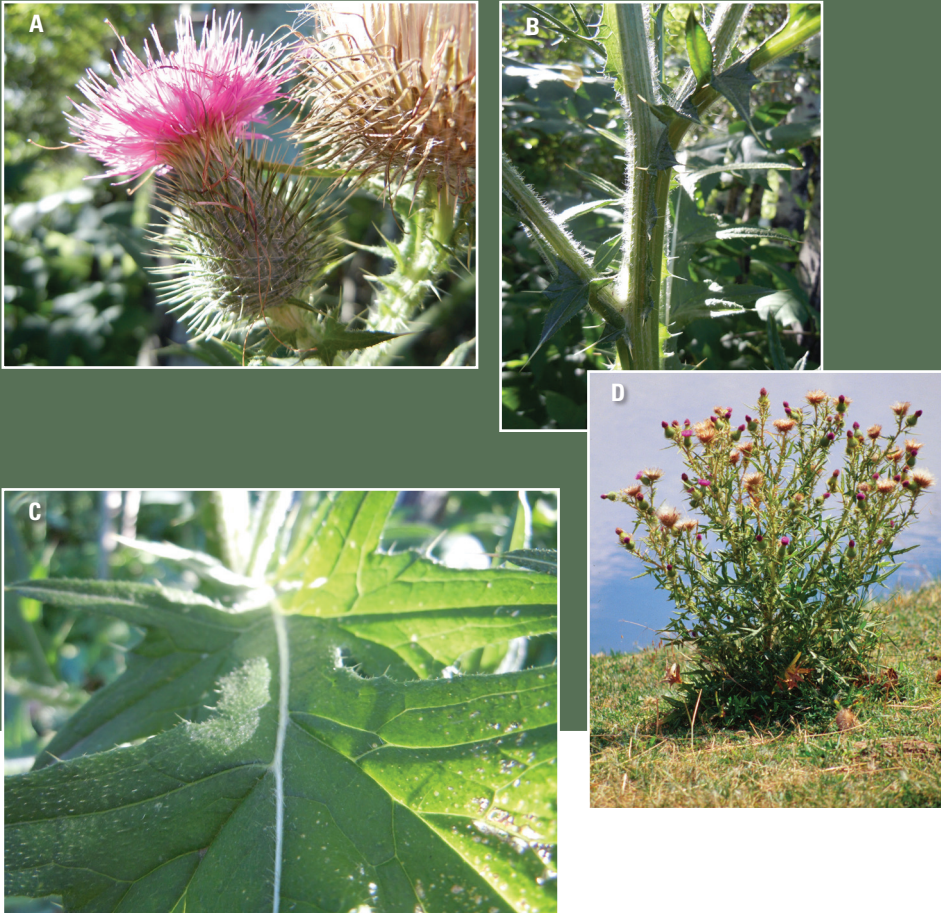


FIGURE 3. A) Bracts needlelike and tend to point more outward than upward; collectively bracts are 1-1.6 inches high and 1.5-2 inches wide; B) Plant has spiny wings. Also, a portion of the spiny leaves may continue down the stem beyond the point of attachment, appearing like a spiny wing; C) Upper leaf surface bears small spines, distinct from other native or exotic thistles; D) Flowers tend to be solitary.

**DISTINGUISHING CHARACTERISTIC(S):** Spines on the surface of the leaves, not just the margins making it one of the spiniest thistles – it is difficult to find any surface on leaves or stems to touch and not be injured.



## Canada thistle *Cirsium arvense*

Perennial. Common to moist, usually disturbed fields, meadows, thickets, roadsides, woodlands, or open forests. Often growing along streams and wetlands that are drying or wet and highly disturbed.



FIGURE 4. A) Bracts small and leaf-like, purple tipped, and collectively less than 0.8 inches high, unlike all other thistles except spiny plumeless (exotic, p. 8) and Wyoming thistle (native, p. 15); heads are 0.3-0.5 inches in diameter and grow in dense clusters on short stalks; flowers typically pink to purple, rarely white; B) Plants are rhizomatous (the only truly rhizomatous thistle in Montana), typically occurring in dense patches; C) Stems without spiny wings, leaves green above and below.

**DISTINGUISHING CHARACTERISTIC(S):** Rhizomatous with small flower heads.

## Musk thistle *Carduus nutans*

Annual to biennial. Common to disturbed or overgrazed fields, roadsides, grasslands, or riparian meadows.



FIGURE 5. A) Broad triangular bracts, notably wide at the base and bent backwards unlike any other native or exotic thistle in Montana; B) Flowers solitary and often nod once mature; C) Stems spiny winged, but upper stems below flower heads often without spiny wings (photo A).

**DISTINGUISHING CHARACTERISTIC(S):** Bracts are wide at the base and narrow to a tip to form a broad-based triangle, and flowers often nod.

## Plumeless thistle *Carduus acanthoides*

Annual to biennial. Common to disturbed fields, roadsides, and grasslands.



**FIGURE 6.** A) Bracts collectively less than 0.8 inches high; B) Heads typically grow in clusters on short stalks; C) but stalks can be longer, making heads appear more solitary.

**DISTINGUISHING CHARACTERISTIC(S):** Small heads like Canada thistle, but there are no rhizomes and spiny wings line the entire stem length.

## Scotch thistle *Onopordum acanthium*

Biennial to monocarpic perennial. Common to pastures, fields, and roadsides.

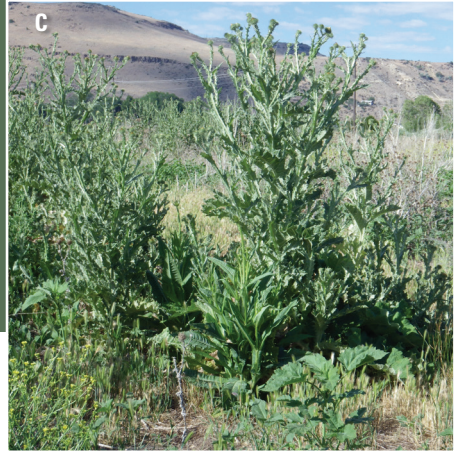
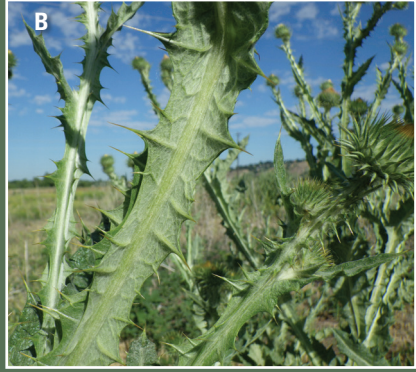


FIGURE 7. A) Bracts broadly needle like, collectively 0.8-1.4 inches high, outer bracts spine tipped, heads 1-3 at branch tips; B) Conspicuously prominent spiny wings run entire stem length; C) Foliage silvery gray in color, from cotton-like hair; plants may be up to 6 feet tall.

**DISTINGUISHING CHARACTERISTIC(S):** Silver gray foliage; exemplifies spiny winged stem; and can be well over five feet tall.

# native thistles

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- ◆ Native thistles do not have spiny wings that line the entire length of the stem. Some native thistles may appear to have spiny wings because they have 'decurrent' leaf bases. A decurrent leaf base occurs when a portion of leaf extends a short distance onto the stem beyond where it attaches to the stem; decurrent leaf bases are typically less than one inch long. For a picture, see graygreen thistle Fig 11b.
- ◆ No native thistle is rhizomatous or able to spread by underground shoots like Canada thistle. Native Flodman's thistle can spread by underground horizontal roots. In contrast to Canada thistle, Flodman thistle's bracts collectively are greater than 0.8 inches, and the leaves are whitish on the underside.
- ◆ Native thistles tend to occur in less disturbed areas compared to exotics. However, natives can also occur in more disturbed areas like roadsides, pastures, and grasslands, therefore habitat alone is not an adequate feature to determine whether the thistle is native or exotic.



meadow thistle Matt Lavin, MSU



## Clustered thistle *Cirsium brevistylum*

Biennial. Often found in meadows and sagebrush steppe in areas with high native plant cover and adjacent to seldomly used roads.

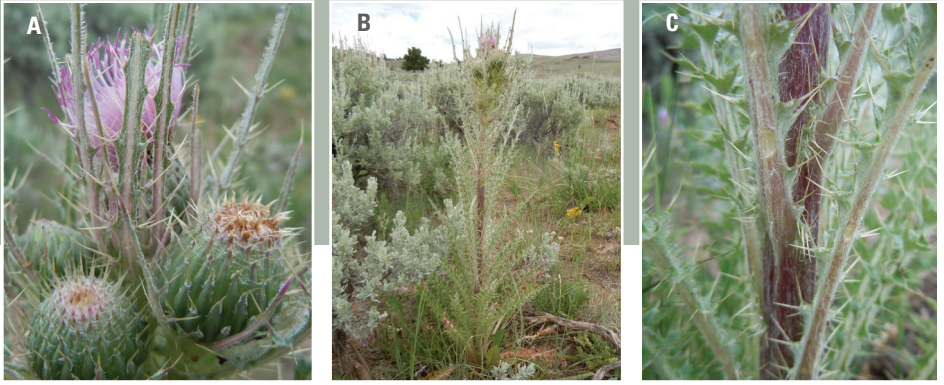


FIGURE 8. A) Bracts collectively 1-1.4 inches high; bracts with long tapering tip and cobwebby hairs; B) Stems erect, often unbranched; heads in dense clusters at stem tips; one to several upwardly pointing leaves extend above flowers; C) Stems without spiny wings.

A-C M. Lavin, MSU

## Eaton's thistle *Cirsium eatonii*

Perennial. Common to meadows, talus, or mountain slopes at high elevations (subalpine to alpine).

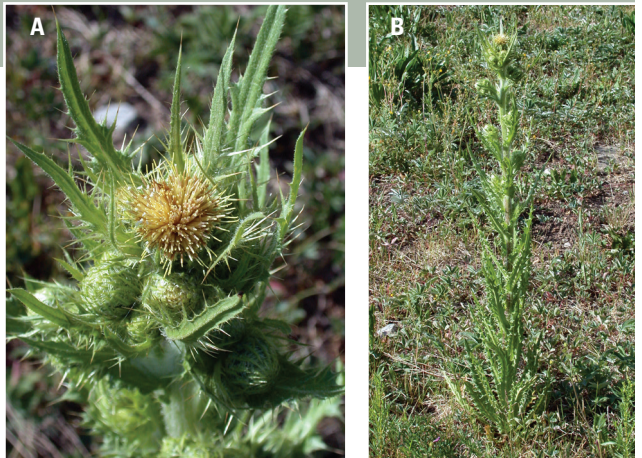


FIGURE 9. A) Bracts collectively 0.8-1.2 inches high; flowers clustered or spike-like with white flowers; one to several upwardly pointing leaves extend above flowers; leaves without hairs, or nearly so; B) Stems erect, unbranched; leaves decurrent.

AB Mel Harte, bugwood.org

## Flodman's thistle *Cirsium flodmanii*

Perennial. Common to grasslands and meadows, and often along streams and wetlands.

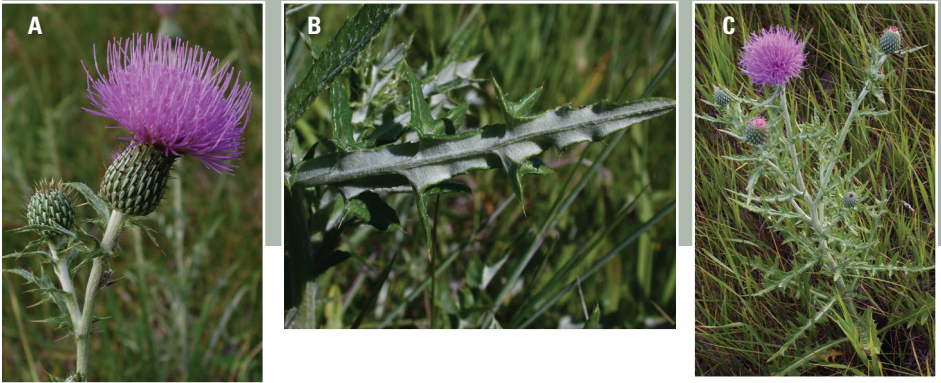


FIGURE 10. A) Bracts collectively 0.8-1.2 inches high; B) Leaves silvery gray beneath, but topside green with a few hairs; distinct from wavyleaf thistle, with gray upper leaf surface; C) Flowers solitary, typically 1-2 at stem tips. This plant is taprooted, but can spread by horizontal roots, meaning it may appear in clusters, but typically less densely than Canada thistle.

A-C M. Lavin, MSU

## Graygreen thistle *Cirsium canovirens*

Biennial. Common to sagebrush steppe, grasslands, and open forests; typically found in mid to higher elevations (montane to subalpine).



FIGURE 11. A) Bracts collectively are 0.6-1.2 inches high; flowers white to purple; B) Leaves typically are decurrent on the stem; upper and lower leaves are covered with sparse woolly hairs, typically more so below; C) Stems erect, branched or unbranched above.

A-C M. Lavin, MSU

## Longstyle thistle *Cirsium longistylum*

Biennial. Common to meadows, moist forest openings, and roadsides at high elevations (upper montane, lower supalpine). This plant is endemic to west-central Montana and is a species of concern. Refer to Montana Natural Heritage Program at <http://mtnhp.org/> for more information.

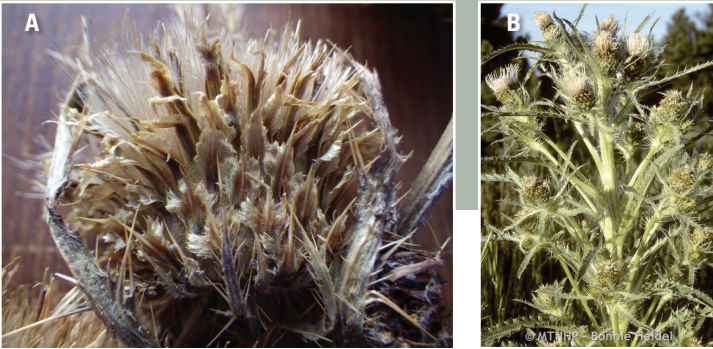


FIGURE 12. A) Dried specimen shows the thin, membranous bracts with irregularly toothed and/or lobed margins; B) Stems may be branched (as shown) or unbranched.

**A** M. Lavin, MSU; **B** Bonnie Heidel, MTNHP

## Meadow or elk thistle *Cirsium scariosum*

Biennial. Common to moist to wet, grasslands (sometimes calcareous) and mountain meadows from low to high elevations.

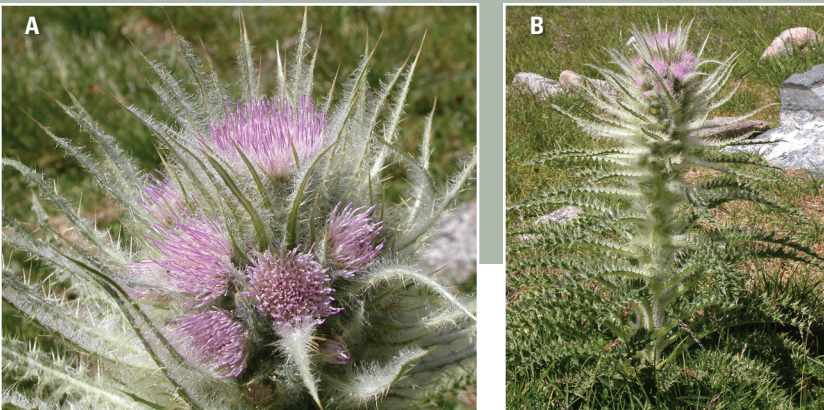


FIGURE 13. A) Flowers in a dense, globe-like cluster at stem tip; one to several upwardly pointing leaves extend above flowers; B) Stems typically unbranched and covered with dense white, cobweb-like hairs.

**AB** M. Lavin, MSU



## Prairie thistle *Cirsium canescens*

Biennial. Common to grasslands and woodlands at lower elevations. Photos not available. It has only been reported in Garfield, Sheridan and Wibaux counties.

FIGURE 14. A) Leaves decurrent; leaves hairy beneath; inner bracts, but not outer bracts have uneven, jagged margins (see longstyle thistle for example of uneven jagged margins on bracts); flowers may be white to pinkish.

USDA-NRCS PLANTS Database <http://plants.usda.gov/>



## Wavyleaf thistle *Cirsium undulatum*

Biennial. Common to grasslands, sagebrush steppe, and roadsides.

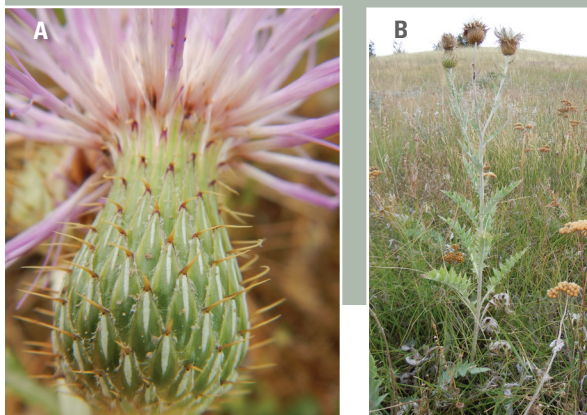


Figure 15. A) Collectively, bracts 1-1.4 inches high; outer bracts with sparse hairs on margins, inner bracts with entire margins; bract tips narrowing to a distinct spine; B) Flowers typically solitary at stem tips, and plants typically solitary or a few together; upper and lower sides of leaves white to gray from dense hairs.

## White or elk thistle *Cirsium hookerianum*

Biennial. Common to meadows, grasslands, and woodlands.



FIGURE 16. A) Heads in dense clusters, outer bracts with cobwebby hairs; B) Upper leaf surface thinly to moderately covered with cobweb-like hairs, under side white from dense hairs; uppermost leaves on stem rarely extend above flowers to obscure them (like elk thistle, *Cirsium scariosum*); plants succulent.

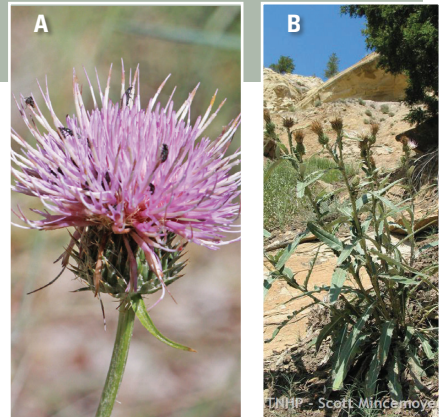
AB Wynn Anderson, The University of Texas at El Paso

## Wyoming thistle *Cirsium pulcherrimum*

Biennial. Common to sagebrush steppe, grasslands, and juniper woodlands, also found in sparsely-vegetated soils of washes and steep eroded gullies like that seen below. This is a species of concern. Refer to Montana Natural Heritage Program at <http://mtnhp.org/> for more information.

FIGURE 17. A) The bracts collectively are short; upper leaf surface is dark green and nearly hairless. B) Stems and underside of leaves are white from dense hairs, and the plant is not rhizomatous. Bracts, especially the inner, have minute glands that are clear, almost resinous bumps that require a hand lens to see.

A Andrey Zharkikh, flickr; B S. Mincemoyer MTNHP





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