

musk thistle (*Carduus nutans* L.) and related species:

plumeless thistle (*Carduus acanthoides* L.)

Italian thistle (*Carduus pycnocephalus* L.)

slender-flowered thistle (*Carduus tenuiflorus* W. Curtis)

Synonyms for *Carduus nutans*: *Carduus macrocephalus* Desfontaines, *C. macrolepis* Petermann, *C. nutans* ssp. *leiophyllus* (Petrovic) Stojanov & Stefanoff, *C. nutans* var. *leiophyllus* (Petrovic) Arènes, *C. nutans* ssp. *macrocephalus* (Desfontaines) Nyman, *C. nutans* var. *macrocephalus* (Desfontaines) B. Boivin, *C. nutans* ssp. *macrolepis* (Petermann) Kazmi, *C. nutans* ssp. *nutans* L., *C. nutans* var. *vestitus* (Hallier) B. Boivin, *C. thoermeri* Weinmann

Other common names: chardon penche, nodding plumeless thistle, nodding thistle

Synonyms for *Carduus acanthoides*: none

Other common names: spiny plumeless thistle

Synonyms for *Carduus pycnocephalus*: none

Other common names: compact-headed thistle, Italian plumeless thistle

Synonyms for *Carduus tenuiflorus*: *Carduus pycnocephalus* Linnaeus var. *tenuiflorus* (Curtis) Fiori

Other common names: winged thistle

Family: Asteraceae

Introduction

A number of *Carduus* species have been introduced to North America but have not yet been recorded in Alaska. They have established in waste areas, agricultural fields, grazed pastures, and native grasslands. These species have the potential to spread and become weeds in Alaska. They have very similar ecologies, community impacts, and ecological impacts. We treat the descriptions separately but combine the discussion of ecological impacts, biology and invasive potential, distribution and abundance, and control methods.

Invasiveness Rank: 61 The invasiveness rank is calculated based on a species' ecological impacts, biological attributes, distribution, and response to control measures. The ranks are scaled from 0 to 100, with 0 representing a plant that poses no threat to native ecosystems and 100 representing a plant that poses a major threat to native ecosystems.

musk thistle (*Carduus nutans*)

Musk thistle is a biennial or, rarely, annual plant that grows up to 183 cm tall. Large, flat basal rosettes form during the first year of growth and flowers appear during the second year. The entire plant is covered with spines. Leaves are glabrous and can grow up to 41 cm long and 15 cm wide. Stem leaves are alternate, deeply lobed, and dark green with white midribs. Leaf bases extend down stems. Flower heads are usually solitary and nodding at the ends of the branches. They are usually 4 to 7 cm in diameter. Middle and outer involucre bracts are conspicuously broad (up to 9½ mm) with long, flat, spine-pointed tips. Inner involucre bracts are narrower, softer, sparsely spiny, and often purplish. Flowers are red to purple (Cronquist 1955, Royer and Dickinson 1999). Musk thistle grows throughout most of Canada and the U.S. (USDA 2002).

plumeless thistle (*C. acanthoides*)

Plumeless thistle is a winter annual or biennial plant that grows up to 122 cm tall. Stems are freely branched above and covered with spiny wings that extend to the flower heads. Basal leaves are usually 10 to 20 cm long with spiny lobes. Plumeless thistle can be distinguished from musk thistle by the presence of erect flower heads that are less than 25 mm in diameter and narrowly lanceolate, densely hairy involucre bracts (Whitson et al. 2000). Plumeless thistle grows in 33 states of the U.S. and throughout much of Canada (USDA 2010).



Carduus nutans L. Photo by California Department of Food and Agriculture



Carduus acanthoides L. Photo by G. Piper.

Italian thistle (*C. pycnocephalus*)

Italian thistle can be distinguished from other *Carduus* species by the presence of narrow, cylindrical flower

heads that grow in clusters of two to five at the ends of branches. Each flower head measures about 16 mm across (Cronquist 1998). Italian thistle grows in Alabama, Arkansas, California, Hawaii, Idaho, New York, Oregon, South Carolina, Texas, and Washington (USDA 2010).



Carduus pycnocephalus L. Photo by A. Brousseau.

slender-flowered thistle (*C. tenuiflorus*)

Slender-flowered thistle can be distinguished from other *Carduus* species by the presence of five to twenty flower heads per cluster (Keil and Turner 1993). This species grows in California, New Jersey, Oregon, Pennsylvania, Texas, and Washington. Both Italian thistle and slender-flowered thistle are rapidly spreading throughout the U.S. and establishing as weeds (USDA 2010).

Similar species: No *Carduus* species are native to Alaska. *Carduus* species can be distinguished from native and introduced *Cirsium* species by their simple pappus hairs. Unlike *Carduus* species, *Cirsium* species have feathery, plumose pappus hairs (Douglas et al. 1998).



Carduus tenuiflorus W. Curtis. Photo by V. Moore.

Ecological Impact

Impact on community composition, structure, and interactions: Once established, these thistles form large, dense colonies that displace native plant species. They can compete with native vegetation for light, nutrients, and moisture. Wildlife and livestock often avoid grazing near these spiny plants. Selective grazing leads to severe degradation of native meadows and grasslands (Hull and Evans 1973, Royer and Dickinson 1999, Whitson et al. 2000). Thistle seeds are important food sources for a number of songbirds. All thistle flowers are usually very attractive to insect pollinators (Desrochers et al. 1988, Gubanov et al. 2004). Aqueous extracts and dead plant materials from musk thistle inhibit the germination and slow the growth rate of several pasture grasses (Wardle et al. 1993). Hybridization between musk thistle and plumeless thistle has been reported (Warwick et al. 1989).

Impact on ecosystem processes: Overwintering rosettes can severely reduce the establishment of other plants. This may retard processes of natural secondary succession (Pitcher and Russo 1988, Rutledge and McLendon 1996). Dead flowering stalks can trap snow in winter and thus increase soil moisture (Desrochers et al. 1988).

Biology and Invasive Potential

Reproductive potential: *Carduus* species reproduce by

seed only. Seed production can be as great as 11,000 seeds per plant (Desrochers et al. 1988).

Role of disturbance in establishment: Thistles readily colonize anthropogenically disturbed areas but can also colonize naturally disturbed areas (Remaley 2004). Fire and heavy grazing favor the establishment and development of *Carduus* species (Zouhar 2002).

Potential for long-distance dispersal: Most seeds land near the parent plant. Some seeds are dispersed by wind, small mammals, birds, and water (Butterfield et al. 1996, Rutledge and McLendon 1996, Beck 2004). When wet, the seed coats of Italian thistle seeds release sticky mucilage that allows them to adhere to moving objects.

Potential to be spread by human activity: Seeds can attach to animals, farm machinery, and vehicles. They may contaminate crops and hay (Rutledge and McLendon 1996, Zouhar 2002).

Germination requirements: Seeds usually germinate in fall when adequate moisture is present and temperatures are between 15°C and 30°C. Adequate soil moisture and light initiate seed germination and seedling establishment (Hamrick and Lee 1987, Rutledge and McLendon 1996).

Growth requirements: Thistles grow and thrive under a wide range of environmental conditions. They grow in well-drained soil of all texture types with pH between 6.0 and 8.9. They are most abundant in fertile soils but can also be found in nutrient-poor soils. Musk thistle usually requires a vernalization period of a minimum of 40 days below 10°F to produce flowers (Desrochers et al. 1988, Butterfield et al. 1996).

Congeneric weeds: Curly plumeless thistle (*Carduus crispus*) is considered a noxious weed in West Virginia. All *Carduus* species are considered noxious weeds in Arkansas, Iowa, Ontario, and Virginia (Invaders 2010, USDA 2010).

Legal Listings for musk thistle

- Has not been declared noxious
- Listed noxious in Alaska
- Listed noxious by other states (AR, CA, CO, IA, ID, IL, KS, KY, MD, MI, MN, MO, NC, ND, NE, NM, NV, OH, OK, OR, PA, UT, VA, WA, WV, WY)
- Federal noxious weed
- Listed noxious in Canada or other countries (AB, MB, ON, QC, SK)

Legal Listings for plumeless thistle

- Has not been declared noxious
- Listed noxious in Alaska
- Listed noxious by other states (AR, AZ, CA, CO, IA, MD, MI, MN, NC, NE, OR, VA, WA, WV, WY)

- Federal noxious weed
 Listed noxious in Canada or other countries (BC, ON)

Legal Listings for Italian thistle

- Has not been declared noxious
 Listed noxious in Alaska
 Listed noxious by other states (AR, CA, IA, OR, WA)
 Federal noxious weed
 Listed noxious in Canada or other countries (ON)

Legal Listings for musk thistle

- Has not been declared noxious
 Listed noxious in Alaska
 Listed noxious by other states (AR, CA, IA, OR, WA)
 Federal noxious weed
 Listed noxious in Canada or other countries (ON)

Distribution and abundance

Carduus species grow in waste areas, old fields, pastures, roadsides, and railroad embankments. They can invade open natural areas such as meadows, prairies, and grasslands (Butterfield et al. 1996, Beck 2004).

Native and current distribution: *Carduus* species are native to Europe, western Siberia, Asia Minor, and North Africa (Desrochers et al. 1988). They have been introduced to North America, South America, Australia, and New Zealand. None of these *Carduus* species have been documented in Alaska.

Management

Cultural, mechanical, biological, and chemical control methods have all been used on thistles with varying degrees of success. Hand-cutting or mowing can provide control if repeated over a period of years (Heidel 1987, Beck 2004, Remaley 2004).

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