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: None
Family: Asteraceae

A number of *Carduus* species have been introduced in North America but have not yet been recorded in Alaska. They have established in waste ground, agricultural fields, grazed pastures, and native grasslands. These species have the potential of spreading and becoming weeds in Alaska. They have very similar ecologies and community and ecological impacts. Here we treat the description, distribution and abundance separately, but combine the discussion of ecological impacts and control methods.

DESCRIPTION

Musk thistle (*Carduus nutans*) is a biennial or rarely annual herb up to 6 feet tall. Large, flat basal rosettes are formed in the first year and flowers appear in the second year of growth. The plant is spiny. Leaves are glabrous and up to 16 inches long, and 6 inches wide. Stem leaves are alternate, deeply lobed, dark green with a white midrib. The bases of the leaves extend down the stem. Heads are mostly solitary and nodding at the ends of the branches; they are usually large, 1½ to 3 inches across. Middle and outer involucral bracts are conspicuously broad (to 3/8 inch), with long, flat, spine-pointed tip. Inner bracts are narrower and softer, sparsely spiny, often purplish. Flowers red to purple (Cronquist 1955, Royer and Dickinson 1999). Musk thistle is the most widespread species of the genus in both the United States and Canada. Four subspecies of *Carduus nutans* are described in North America (USDA 2002).

Musk thistle (*Carduus nutans*) © 2001 California Department of Food and Agriculture

Plumeless thistle (*C. acanthoides*) is a winter annual or biennial herb up to 4 feet tall. Stems are freely branched above and covered with spiny wings extending to the flowering heads. Basal leaves are usually 4 to 8 inches long with spinose lobes. Plumless thistle is distinguished from musk thistle by its erect flower heads that are less than 1 inch across, and narrowly lanceolate, densely hairy involucral bracts (Whitson et al. 2000). Plumeless thistle is more abundant in northern states of the United States (USDA 2002).

Plumeless thistle (*Carduus acanthoides*). Gary L. Piper, Washington State University

Italian thistle (*C. pycnocephalus*) is distinguished by its narrow, cylindrical heads about 5/8 inch across in clusters of 2 to 5 at the ends of the branches (Cronquist 1998).

Slender-flowered thistle (*C. tenuiflorus*) has 5 to 20 heads per cluster (Keil and Turner 1993). Italian and slender-flowered thistles are found in only a few states but are rapidly spreading and establishing as weeds (USDA 2002).

There are no native species of *Carduus* thistle present in Alaska. Members of the genus *Carduus* are distinguished by their simple pappus hairs from native and introduced members of the genus *Cirsium*, which have feathery, plumose pappus hairs (Douglas et al. 1998).

Italian thistle (*Carduus pycnocephalus*). Brother Alfred Brousseau © 1995 Saint Mary's College of California

Slender-flowered thistle (*Carduus tenuiflorus*). Virginia Moore © 1999 California Academy of Sciences

Ecological Impact

Impact on community composition, structure, and interactions: Once established, these species of thistles form large, dense colonies and crowd out native plants. They can compete for light, nutrients, and moisture with native vegetation. Wildlife and livestock often avoid grazing near these spiny plants, and 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 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 material from musk thistle inhibit germination and 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 process: 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 colonize anthropogenically disturbed areas, but can also colonize areas subject to natural disturbances such as landslides or frequent flooding (Remaley 2004). Fire or heavy grazing are favorable to their establishment and development (Zouhar 2002).

Potential for long-distance dispersal: The majority of the seeds fall near the parent plant. Some seeds are dispersed by wind, small mammals, birds, and water (Beck 2004, Butterfield et al. 1996, Rutledge and McLendon 1996). In contact with moisture, the seedcoat of Italian thistle releases sticky mucilage, allowing adhesion to moving objects.

Potential to be spread by human activity: Seeds may attach to animals, farm machinery, and vehicles. They

may contaminate crops and hay (Rutledge and McLendon 1996, Zouhar 2002).
Germination requirements: Germination occurs usually in the fall in moist soils at 59° to 86° F. Adequate soil moisture and light initiate seed germination and seedling establishment (Hamrick and Lee 1987, Rutledge and McLendon 1996).
Growth requirements: Thistles may grow and thrive under a wide range of environmental conditions. They grow in well-drained soil of all texture types with pH ranges of 6.0 to 8.9. They are most abundant in fertile soils but may also be found in poorer soils. Musk thistle usually requires a vernalization period of a minimum of 40 days below 50° F to produce flowers (Butterfield et al. 1996, Desrochers et al. 1988).
Congeneric weeds: The *Carduus* genus is comprised of a number of noxious weeds of pastures and ranges (Royer and Dickinson 1999, USDA 2002, Whitson et al. 2000).
Listing: Species of genus *Carduus* are classified as noxious, restricted, or prohibited weeds in 22 American states and 5 Canadian provinces (Royer and Dickinson 1999).

Distribution and abundance
Native and current distribution: Members of the genus *Carduus* are native to Europe, western Siberia, Asia Minor, and North Africa (Desrochers et al. 1988). They have been introduced to North and South America, Australia and New Zealand. They occur in 45 American states and all Canadian provinces. *Carduus* species can be found in waste ground, old fields, pastures, and along roads and railroads. They can invade open natural areas such as meadows, prairies, and grasslands (Beck 2004, Butterfield et al. 1996).

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 (Beck 2004, Heidel 1987, Remaley 2004).

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