

Managing Musk Thistle

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Musk or nodding thistle (*Carduus nutans*) is a native of Europe and Western Asia. It has been in the United States since the late 1800's. It was accidentally introduced and has spread rapidly in North America. It is a prolific seed producer and, as an alien species, it lacks natural enemies.

It is important to identify and eradicate musk thistle as soon as it is found. It is a noxious weed in Nevada and many other states because it reduces forage yield and quality, makes recreation areas impassable, and degrades wildlife habitats.

Identification

Musk thistle is a biennial. In its first year, it grows as a basal rosette (a plant with leaves radiating from the crown (center) close to the ground and without flower stalks) (Fig.1). The rosette may grow two feet in diameter. Its waxy leaves appear pale blue-green because they are covered with whitish hairs.



Figure 1. Musk thistle rosette.

During its second growing season, musk thistle can grow to nine feet tall. It has large, coarse stems that are covered with dense, short hairs. The leaves are three to six inches long and

alternate. They are spiny, deeply lobed, long and narrow. Musk thistle has a single, deep taproot that does not spread laterally. The root is hollow at the top and has a corky texture throughout.

During the second year, approximately 45 to 55 days after bolting (producing a flower stalk), musk thistles produce seeds. Fortunately, musk thistle only reproduces by seed; unfortunately, it is very prolific, producing a few thousand to 100,000 seeds per plant. On average, a plant produces 10,000 seeds. Each seed has a bristle or pappus (stiff hairs) that aids in seed dispersal; however, animals, wind, birds, and water do not generally spread the seeds; but they may. The majority falls close to the plant, resulting in thousands of new seedlings in the immediate area. Musk thistle seeds may remain viable for more than 10 years in the soil.

Musk thistle produces terminal flower heads from June through October (Fig.2). It may also



Figure 2. Musk thistle flower.

produce secondary heads that develop lower on the main branches. All the flower heads (terminal and secondary) can emerge over nine

weeks. In as little as seven days after the first bloom, and for a period of up to two months, seeds can be shed. The flowers are one to three inches in diameter and deep rose to violet or purple colored; very rarely a white flower is produced. Each flower has spine-tipped bracts (reduced leaf or leaf-like structure at the base of the flower) surrounding it. The flower heads often droop or nod, giving the musk thistle its common name, nodding thistle (Fig. 3).



Figure 3. Musk thistle on rangeland.

Habitat

Musk thistle is found in temperate climate zones and only occasionally in the tropics. It can occupy saline soils in low valleys, as well as acidic soils at 10,000 feet. Its seeds germinate in various ranges of environmental conditions. It grows in 40 states, including arid Nevada and the moist climates of the East Coast. Moisture and sunlight favor its establishment. Pastures, construction sites, roadsides, ditches, gullies, and rangeland, particularly areas covered by snowdrifts, are ideal sites for musk thistle.

Musk thistle does not become well established in vegetated sites where competition is great. Healthy, dense pasture and rangeland vegetation prevents musk thistle from establishing. However, competitive vegetation does not guarantee a musk thistle-free area, but it

does reduce musk thistle establishment and dominance.

Impact of Musk Thistle

Coming in contact with musk thistle is very unpleasant. A dense stand of musk thistle can act as a natural fence line or barrier on the range because of its spiny leaves. Animals avoid musk thistle. In pastures and rangeland, valuable forage is lost due to the presence of musk thistle. Livestock will not graze musk thistle nor near it. Sheep may graze it in its rosette stage, but only if there is nothing else to eat. Similarly, musk thistle does not provide good forage for wildlife, thus reducing wildlife habitat value. Wildlife may move to a new location if a significant portion of their habitat is infested with musk and other thistles. A dense stand can make waterways inaccessible to wildlife, livestock, and recreationists.

The quality of recreation is diminished when musk thistle invades trails and scenic areas. Trails become inaccessible, native vegetation is displaced (changing the natural landscape), and opportunities for wildlife viewing diminish as wildlife relocates.

Management of Musk Thistle

Because musk thistle is a biennial that reproduces only by seeds, it is more manageable than many invasive species. Prevention is the key to controlling musk thistle. Complete exclusion of the thistle is the most cost effective method of control. If musk thistle does establish, prevention of seed production and dispersal is most important for a successful management program. By combining several management techniques, musk thistle may be eradicated or controlled.

▪ Prevention

Prevention is the most time and cost effective of all the available techniques and must come first.

Buy and plant certified weed-free seed to keep musk thistle out of new plantings. When feeding livestock, make sure the feed, hay or grain, is certified weed free.

Ensure equipment and vehicles are cleaned before leaving contaminated areas.

On rangeland and in pastures, have a grazing management plan that allows desirable

vegetation to recover from grazing. To prevent musk thistle incursion, do not over graze a healthy pasture or rangeland. A site with forage under stress and with open, disturbed patches allows musk thistle to establish.

Monitor your property and adjacent lands for musk thistle and eradicate new plants whenever they appear. Preventing seed production and dispersal is paramount. Kill existing rosettes wherever they are found by tilling, cultivating or herbicide application. Mow second year plants after the flower stalk is in the bud stage. Earlier mowing may cause the plant architecture to change to a prostrate (laying flat on the ground) plant capable of producing flowers and seeds. Eradicating a small infestation of any weed is more cost effective and consumes less time than trying to control and eradicate a large stand.

▪ **Cultural Control**

Cultural control of musk thistle is limited. Good forage management practices that establish competitive desirable forage, maintain soil fertility, and prevent erosion will help combat musk thistle. Perennial grasses are most competitive with broadleaf weeds in the western United States (Sheley and Petroff 1999). Research shows that musk thistle has declined over the years when perennial grasses are present.

▪ **Mechanical Control**

Mechanical control is effective on musk thistle. Tilling, hoeing, and hand pulling must be completed either in the rosette stage or early after the flower stalk grows (bolts), but before the plant flowers and produces seed. Hand pulling and hoeing are only an option for small stands. To be effective, a successful revegetation program must follow tilling. If this is not done, reinfestation of musk thistle is inevitable.

Mowing is an option, but it can allow some musk thistle plants to recover and possibly sow seeds. Mowing does reduce seed production, but should not be the single means of control in a management program. It is most effective at the flower bud stage. Mowing combined with an herbicide is more effective.

Mechanical control is very effective in ditches, yards, construction sites and pastures. However, it may be difficult or uneconomical to use this method on rangelands.

▪ **Biological Control**

Grazing just to control musk thistle is not recommended. However, using good grazing techniques will stimulate growth of native grasses and keep pastures healthy. Since cattle will not graze musk thistle and sheep will only eat it in its rosette stage, it is difficult to maintain healthy pasturelands once they have been infested with musk thistle.



Photos courtesy of Oregon Department of Agriculture.

Figure 4. *Rhinocyllus conicus* adult laying eggs (left). *Rhinocyllus conicus* larval-damaged seed (right).

There are four insects in the United States that attack musk thistle. *Rhinocyllus conicus* (Fig. 4) is a seed weevil that reduces seed production. *Trichosirocalus horridus*, a beetle, eats the crown of the thistle, kills the apical (top or terminal bud of a stem) meristem (actively dividing tissues at the growing tips of shoots and roots), and reduces flowering. The leaf feeding tortoise beetle, *Cassida rubiginosa*, feeds on the leaves, skeletonizing them. This complements the damage of *Rhinocyllus conicus* and *Trichosirocalus horridus*. *Cheilosia corydon*, a leaf and shoot miner, deposits its eggs in young leaves and shoots. The larvae feed on the inner part of the leaves and shoots. Hollowed out, they dry and break. However, *Rhinocyllus conicus* is not host specific. It has been released in Nevada near Verdi and is well established in the areas of Austin, Big Creek, and Grove's Lake. It will eat other thistles including native species, some of which may be endangered.

▪ **Chemical Control**

Numerous chemicals kill musk thistle. clopyralid, dicamba, MCPA, picloram, metsulfuron, chlorsulfuron, and 2,4-D have proven to be effective. Which chemical to use and at what application rate depend on the

location, environmental conditions, growth stage of the musk thistle, weather, associated species, soil-type, stand density, county or state regulations, and what is to be grown in the area in the future.

In the rosette stage, clopyralid, dicamba, MCPA, picloram, and 2,4-D provide good control. Application of these chemicals is usually suggested for the fall of the first year (rosette stage). After the musk thistle bolts, metsulfuron and chlorsulfuron are effective. These two products reduce the amount of seed produced after application. Clopyralid, dicamba, MCPA, picloram, and 2,4-D do not appear to reduce seed production after application if the plant has bolted. Apply metsulfuron and chlorsulfuron in the spring, during bolting. If the season is long and the musk thistles bolt the first year, apply metsulfuron and chlorsulfuron in the fall. This same treatment can be used on bull and scotch thistle as well. Always follow labeled directions; it's the law!

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Editing by Sue Strom

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