

SAN FRANCISCO PEAKS WEED MANAGEMENT AREA

SPECIES ACTION PLAN #3: BIENNIAL THISTLES

Life History/Identification:



MUSK THISTLE (*Carduus nutans* L.) Musk thistle is an aggressive biennial member of the sunflower family, which occasionally acts as a winter annual. The plant forms a rosette during the first year of growth. During the second year the plant bolts and flowers. Plants can reach a height of six feet or more. The leaves of the plant are dark green with lighter green mid ribs. The leaf margins are deeply lobed and have spines at the tips of the lobes. There are spiny vertical ribs on the lower stems of individual plants. Individual plants can each form up to one hundred flowers with **large drooping magenta flowerheads**. The flower heads have brown bracts that give the inflorescence a distinct, spiny appearance. Regeneration of biennial thistles occurs only from seed, therefore to successfully control them seed production must be restricted. The habitat of musk thistle includes disturbed areas such as roadsides, waste areas, and pastures.

BULL THISTLE (*Cirsium vulgare*) Bull thistle is another aggressive, biennial weed. The characteristics of bull thistle include dark green foliage, **double dentate spiny leaves** which are hairy and prickly above and spiny below. There are vertical, spiny ribs on the stems. The flower heads of bull thistle have been described as urn shaped and are solitary at the ends of each stem. The flower color varies from white to bright pink or purple. The seed of bull thistle will only remain viable for one to two years, although populations can exist for more than 25 years. Bull thistle can be found in many disturbed areas within the Weed Management Area; these include roadsides, burned areas and old slash pile sites. They were likely brought in on vehicles and equipment.



SCOTCH THISTLE (*Onopordum acanthium*) Scotch thistle is a highly invasive biennial weed. One of the distinguishing characteristics of Scotch thistle is the "hairiness" of the leaves and stems. The leaves and stems of the plant are covered with many **fine whitish hairs** giving the plant a gray-green appearance. The plants can be very large. Some Scotch thistle plants found in Northern Arizona have been six to eight feet tall. Other characteristics of Scotch thistle include dentate, spiny leaves and vertical spines on the heavily winged stems. The flower heads are generally bright pink and are solitary at the ends of each stem. This thistle seems to be exceptionally aggressive; it forms large single species colonies and the seeds remain viable for 12 to 18 years.

Northern Arizona Localities:

Musk thistle is a native of southern Europe and western Asia that was introduced into North America by 1853 and has naturalized from Nova Scotia and British Columbia to California and Georgia. The first collection of this species in N. Arizona was made in 1952, near Ganado Dam, Apache Co. In Flagstaff there are several isolated populations on the southwest side of the peaks: in Baderville, Aspen meadows, and Lake Mary Road.

Bull thistle originates from Eurasia and arrived in North America in the 1800's through the shipping ports of Oregon. It now exists in all of the lower 48 states, primarily in disturbed or degraded lands.

Bull thistle is widespread throughout Northern Arizona. Populations can be found throughout the Coconino National Forest along roads, in burned areas and on old slash piles.

Scotch thistle is native to Europe and Asia. It is credited as saving the Scots from invading Norsemen. The invaders attempted to wade through a population of Scotch thistle to invade Staines Castle. The cries of the invaders alerted the castle guards allowing the Scots to defeat the invaders. Scotch thistle is now an aggressive exotic in many Western States. There are many areas infested with Scotch thistle in Northern Arizona. These include populations along Highway 180, Highway 89N, Interstate 40, Forest Roads in the Cosnino and Winona areas and along Townsend-Winona and Leupp Highways. Large infestations also exist within the City of Flagstaff: including the Rio De Flag, Flagstaff urban trail system and several large groups near Goodwill and Walgreen's Warehouse in east Flagstaff.

Status: MUSK THISTLE (*Carduus nutans* L.), BULL THISTLE (*Cirsium vulgare*) and SCOTCH THISTLE (*Onopordum acanthium*) are recognized as noxious weeds on the Coconino, Kaibab and Prescott National Forests. Scotch thistle and plumeless thistle are listed as restricted and prohibited noxious weeds in Arizona. Arizona Administrative Code R3-4-244 & R3-4-245 revised July 1999 established three categories of noxious weeds in our state: regulated, restricted, and prohibited.

If any other population of biennial thistles is found in the Flagstaff area or all of N. Arizona, please contact us for help creating a management plan:

Laura P. Moser, coordinator San Francisco Peaks Weed Mngt. Area
Tel: 520-527-3423 2323 Greenlaw Lane
Fax: 520-527-3620 Flagstaff, AZ 86004
Email: lmoser@fs.fed.us

Control:

An **integrated combination of methods** will be needed to successively control such aggressive and adaptable noxious weeds. **Prevention** and detection of new populations, as well as eradication and containment of existing populations all need to be addressed to achieve control over biennial thistles. **Mapping** of distribution and extent as well as consistent monitoring are also necessary to determine which combinations of control methods will be most effective in each circumstance. Most local land management agencies have adopted policies to map and monitor noxious weed populations through the collaboration of South West Exotic Mapping Project (USGS).

1. Cultural Control:

Prevention is the most effective and least expensive method of control. Maintenance of a vigorous, competitive plant community will control or reduce the rate of biennial thistle spread. Plan activities to avoid areas infested with biennial thistles if possible. If not possible, cleaning all equipment, tires, boots and hooves when leaving infested areas will prevent the creation of new infestations. Purchase only certified weed-free hay, and don't allow livestock to graze infested areas in late summer or fall. Reseeding any disturbed sites with vigorous, hardy, early successional natives will also deter establishment of new biennial thistle seedlings. Prevention is important and must be continued at all times to prevent new infestations but something also has to be done as quickly as possible about the existing populations.

Re-vegetation, no control plan will be effective unless re-establishment of preferred vegetation is considered. In most cases in open spaces, adjacent roads and neighborhoods, native plants are the best choice. It is important to use vigorous, early-successional species that will be able to compete with any exotics left in the seedbank.

2. Mechanical Control:

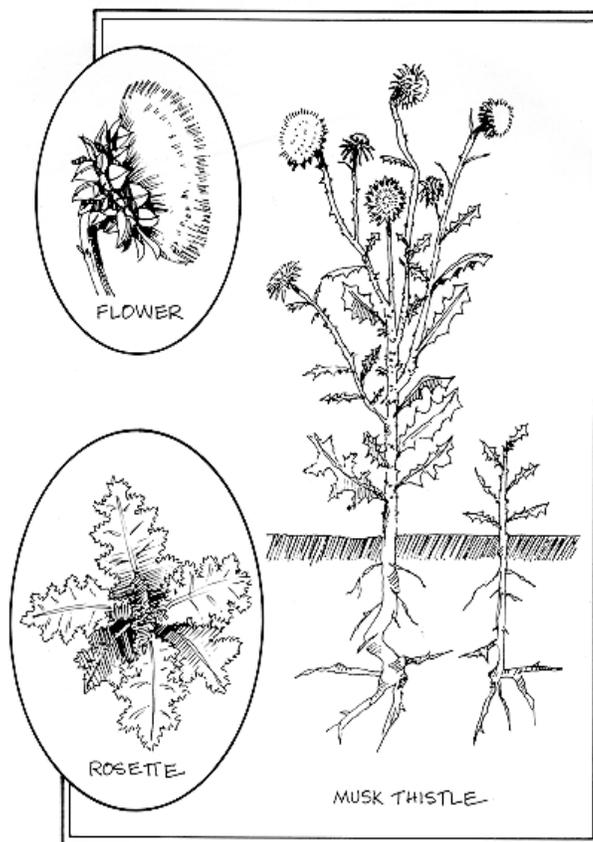
The first step most often taken in an attempt to control weeds is a physical or mechanical one: dig 'em, pull 'em, mow 'em, plow 'em, burn 'em, and destroy those weeds somehow. These tools can be very effective if timed carefully and used in combination; if not they will simply prepare a perfect seedbed for more weeds to come.

Hand pulling or grubbing biennial thistle is most effective for small infestations, perimeter populations, along riparian zones, or following an herbicide treatment. Dig up at least 4 inches of rosette taproot or pull up taproot after plants have bolted and before flowers have bloomed. Repeat at least three times during the growing season (rosette stage, bolting stage, and late flowering stage), removing as much of the root as possible. If flower buds have already formed, bag all plants until they can be burned in a hot fire at a controlled site.

Cultivation, where feasible, may control (reduce) biennial thistle if an annual grain or cover crop is planted before reseeding to perennial grasses. Tilling must be done two or three times a year, starting in May or alternate control treatments should be planned. Remember that seeds stay dormant in the soil for at least **twelve** years.

Mowing is not recommended for control, as plants produce side branches with more flowers. Mowing can be used to extend the period of maximum herbicide effectiveness by stimulating new growth.

Burning, currently an under-utilized tool in the Flagstaff area, could be used to control thistle infestations and deplete seed banks if a burn plan considered plant phenology and the biannual rainfall and combined with another control method as a follow-up treatment. Because of the vigorous new growth after a fire this is an effective way to prepare a site for herbicide treatment, but fire alone has shown mixed results. Observations by local Biologist, Heather Green indicates that one-time burning does not effectively eradicate bull thistle. The fleshy tissue of bull thistle remains after the fire has occurred.



3. Chemical Control: (Noted here are chemical control techniques in use in other areas. Always check with weed specialists or chemical suppliers to ensure correct dosage and application. Mention of these products does not imply endorsement by the Northern Arizona Weed Council, San Francisco Peaks Weed Management Area, the USDA Forest Service, nor the Nature Conservancy).

Chemical control is a **costly but effective** tool for controlling biennial thistles in reseeding programs, highly productive soils, high-risk areas, or around the perimeter of large infestations to contain spread. As mentioned above it can be effectively combined with mechanical treatments to reduce cost. If manpower is the limiting factor, chemical treatment can be used first to reduce the population; after revegetation has begun, hand-pulling could be used to prevent remaining plants from going to seed. Selective soil residual, foliar, or pre-emergent herbicides applied at the correct time and rate may control biennial thistles long enough to establish competitive grasses. Picloram (Tordon™ or Amdon™) at a rate of .25 lb to .50 lb active ingredient per acre to seedlings, rosettes, or plants beginning to bolt will reduce all broadleaf vegetation with a residual activity controlling later germinants up to three years. Well-established grasses are unaffected at this rate, but grass plants with less than four leaves may be killed. Clopyralid, another broadleaf selective herbicide, can be used to effectively control musk thistle in areas with a high water table when the thistle is in the rosette stage of growth if applied at a rate of .25 lb to .50 lb active ingredient per acre. The amounts and timing of herbicides needed to control the biennial thistles mentioned in this document are dependent on several factors including the time of year, habitat condition and growth stage of the plants. A table showing the application rates and timing of herbicide treatment can be found in *Biology and Management of Noxious Rangeland Weeds* page 155.

4. Biological Control: : No exotic species should be introduced into an ecosystem

without extensive research into the long-term effects. Mention of the below species does not imply appropriateness for use in N. Arizona.

Several insects have been used effectively for control of biennial thistles, but when not handled and researched properly they have also caused disaster. Larvae of the thistle head weevil (*Rhinocyllus conicus*) feed on the seed heads of several genera of thistles including *Carduus*, *Cirsium*, *Silybum* and *Onopordium*, reducing all seed production dramatically. A rosette-feeding weevil (*Trichosiromalus horridus*) was introduced to control musk thistle but will also control bull thistle. This insect causes some plants to die; others show a decrease in vigor and smaller flower heads. *Cheilisia corydon* is a control agent for musk thistle; the larvae of this dipteran bore into the shoots and roots of the plants, causing a weakening of the plant. Secondary invasion from soil microbes can be introduced into the plant from lesions in the roots caused by the larvae. *Urophora solstitialis* and *Psylliodes chalconera* were mentioned as possible controls for musk thistle, but no data on the mechanism of control was found. *Urophora stylata*, a seed head fly, is approved for use on bull thistle. The larvae feed on developing seeds and decrease seed production. Most of these biological control agents attack the flower head with the goal of reducing seed production and plant spread, while root feeders reduce rosette survivorship. Insects alone will not eliminate an infestation, however they will enhance control and reduce the rate of expansion of large existing infestations. Biological control is only appropriate in populations large enough to be beyond control by any other means, and only if that species has been proven not to threaten local species. Contact the Flagstaff agricultural extension agent (774-1868) & APHIS/NBCI (www.aphis.usda.gov/nbc) for availability, status, and information.

Extreme Caution should be used before initiating a biological control program on thistles. There was at least one account of biological control agents attacking native thistles. Native thistles are important components of native flora and provide forage for many small animals, including songbirds. Some native species of thistle are considered threatened, endangered or sensitive in many regions.

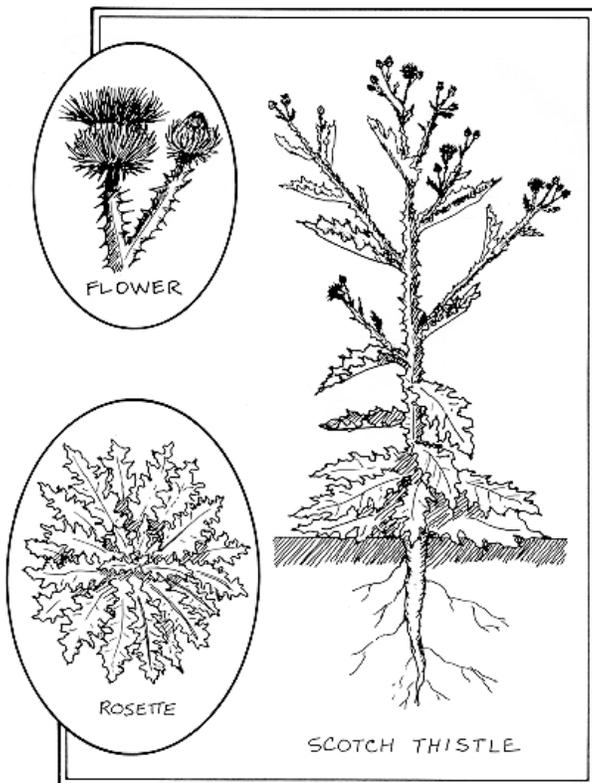
5. Integrated Control:

Mechanical control combined with herbicide treatment can be more effective than mechanical treatment alone. Herbicide treatment followed by seeding with competitive grasses has been successful in many parts of the western U.S. The use of herbicides in combination with insect control is successful on large populations. One example of this technique would be to release the insects near the center of the infestation, and then spray the edges to reduce or prevent the spread of the infestation.

No single control method, nor any one-year treatment program will ever achieve effective control of an area infested with biennial thistles. The fast growth, high seed viability and long seed dormancy of these plants require long-term cooperative integrated management programs and planning to contain and reduce biennial thistle infestations.

References:

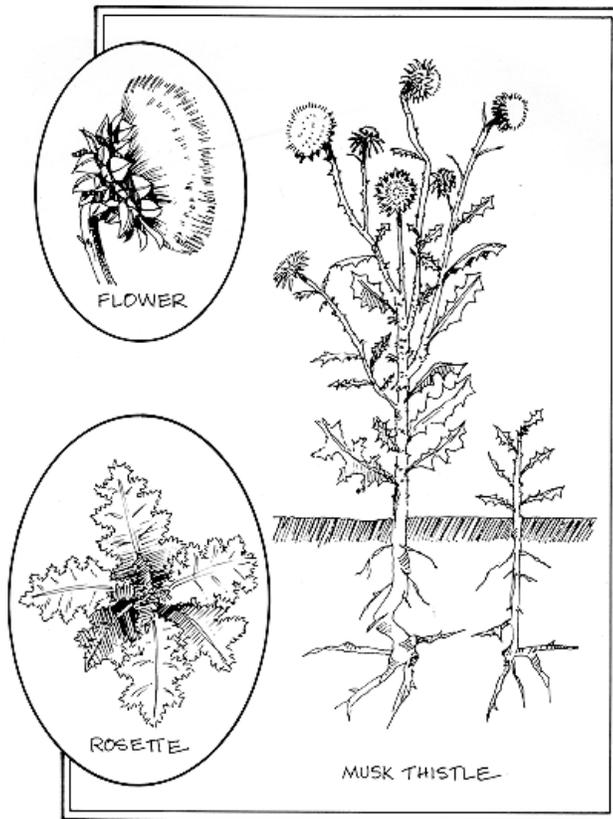
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USDA Animal and Plant Health Inspection Service Plant Protection and Quarantine. Insects, Mites and Nematodes Introduced for Bio Control
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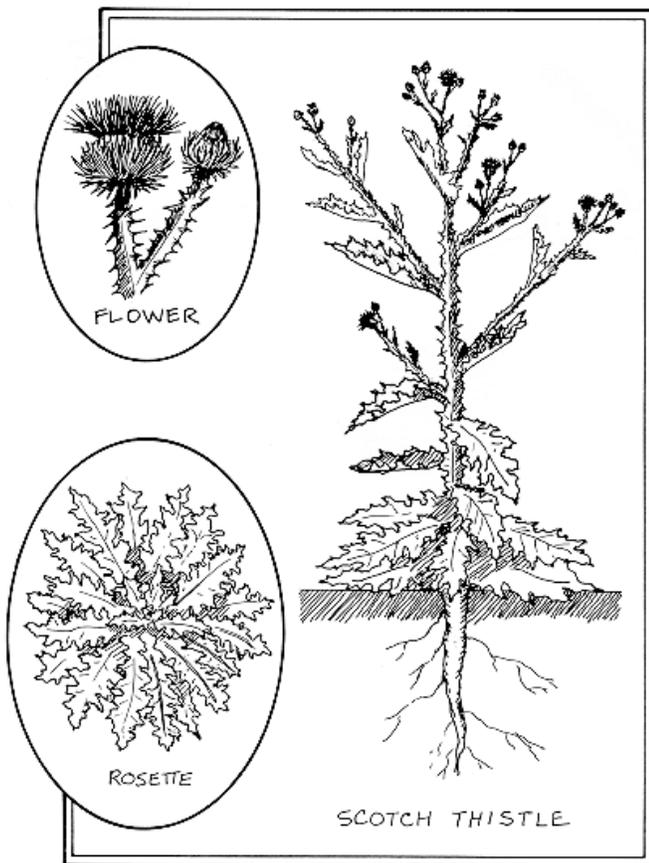
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BULL THISTLE (*Cirsium vulgare*). Bull thistle is another aggressive, biennial weed. It is found in many areas within the Weed Management Area. The unique characteristics of bull thistle include dagger-like dark green foliage; the **double dentate spiny leaves** are hairy and prickly above and spiny below. There are vertical, spiny ribs on the stems. The flower heads of bull thistle have been described as **urn shaped** and are solitary at the ends of each stem. The flower color varies from white to bright pink or purple. The seed of bull thistle will only remain viable for one to two years, although populations can exist for more than 25 years. Bull thistle can be found in many disturbed areas within the Weed Management Area; these include roadsides, burned areas and old slash pile sites where they were commonly brought in on vehicles and equipment.



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Email:

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Flagstaff, AZ 86004

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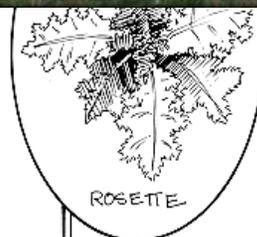
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Re-vegetation, no control plan will be effective unless re-establishment of preferred vegetation is considered. In most cases in open spaces, adjacent roads and neighborhoods, native plants are the best choice. It is important to use vigorous, early-successional species that will be able to compete with any exotics left in the seedbank.

2. Mechanical Control:



The first step most often taken in an attempt to control weeds is a physical or mechanical one: dig 'em, pull 'em, mow 'em, plow 'em, burn 'em, and destroy those weeds somehow. These tools can be very effective if timed carefully and **used in combination**; if not they will simply prepare a perfect seedbed for more weeds to come.

Hand pulling or grubbing biennial thistle is most effective for small infestations, perimeter populations, along riparian zones, or following an herbicide treatment. Dig up at least 4 inches of rosette taproot or pull up taproot after plants have bolted and before flowers have bloomed. Repeat at least three times during the growing season (rosette stage, bolting stage, and late flowering stage), removing as much of the root as possible. If flower buds have already formed, bag all plants until they can be burned in a hot fire at a controlled site.

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Mowing is not recommended for control, as plants produce side branches with more flowers. Mowing can be used to extend the period of maximum herbicide effectiveness by stimulating new growth.

Burning, currently an under-utilized tool in the Flagstaff area, could be used to control thistle infestations and deplete seed banks if a burn plan considered plant phenology and the biannual rainfall and combined with another control method as a follow-up treatment. In the past most areas would burn early or very late in the season when humidity was high and fire danger was lowest. With this type of treatment, plant size and seed production would be increased because of the plants ability to re-sprout from the taproot and quickly capture the newly released nutrients that were tied up in dead plant material. Because of the vigorous new growth after a fire this is an effective way to prepare a site for herbicide treatment, but fire alone has shown mixed results. Observations by local Biologist, Heather Green indicates that one-time burning does not effectively eradicate bull thistle. The fleshy tissue of bull thistle remains after the fire has occurred.

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References:

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