United States
Department of
Agriculture

Forest
Service

**Southwestern
Region**

TP-R3-16-1

January 2010

Field Guide for Managing Malta Starthistle

Printed on recycled paper • January 2010

Malta starthistle (*Centaurea melitensis* L.)

Sunflower family (Asteraceae)

Malta starthistle is an invasive plant that has been listed as a noxious weed in both Arizona and New Mexico. This field guide is intended to serve as the U.S. Forest Service's recommendations for management of Malta starthistle in forests, woodlands, and rangelands associated with the Forest Service's Southwestern Region. The region consists of 11 national forests in Arizona and New Mexico together with 3 national grasslands in New Mexico, Oklahoma and Texas.

Description

Malta starthistle (synonyms: Napa starthistle, tocalote) is an annual invasive weed with foliage and winged stems that are grayish to green in color. Its thistle-like appearance is similar to yellow starthistle *(C. solstitialis)* but is distinguished by smaller yellow flowers and longer seedpods armed with relatively short (less than 1/2 inch) spines. Strategies for managing both species are similar.

Growth Characteristics

- Winter annual and occasional biennial.
- Grows erect to 1 to 2 feet tall.
- Deep, simple taproot.
- Thick leaves are held in a basal rosette through winter and early spring until flower stems bolt. Leaves are narrow and smooth edged near the tip and lobed at the base and are covered with thick, stiff "prickly" hairs and dot-like resinous glands that may be overlaid by fine white "cottony" hairs.
- Insect-pollinated and reproduces by seed. Produces 1 to over 100 solitary, spiny, yellow flower heads (with 1 to over 60 seeds per head) from April through September. Flowers are about one-third to one-half inch long and have a purple to brown-tinged base with a central spine and fine hairs. Seeds are about one-tenth of an inch long with gray to tan stripes.

Ecology

- **Impacts/Threats** – Malta starthistle is highly competitive and often develops dense, impenetrable stands that displace desirable vegetation. Malta starthistle can be poisonous to horses due to its ability to produce a nervous disorder called "chewing disease." However, animals typically avoid the weed because of its sharp spines and hairs. The threat of injury from spines on the seed heads diminishes recreational opportunities, livestock grazing, and other values.
- **Location** – Occurs on open, disturbed sites such as grasslands, rangelands, open woodlands, fields, pastures, roadsides, waste places, and cultivated fields. Found throughout most of the Western States, some Central States, Eastern States, as well as Southern States. Ranges up to 7,200 feet. Uncommon in desert regions.
- **Spread** – Seeds adhere to surfaces and thus can be carried for long distances on undercarriages of vehicles and road maintenance equipment and for shorter distances on animals and humans. Birds can also transport seeds after eating them.
- **Contributing Factors** – Excessive grazing favors growth of Malta starthistle over grass species, and infested land may need to rest for a year and a half after treatment before re-introducing grazing. Areas with soil disturbance (particularly disturbances along roadsides) are highly susceptible to Malta starthistle infestations.

Management

Malta starthistle grows rapidly as an invasive plant, and seeds may remain dormant in the soil for up to 10 years. Therefore, starthistle cannot be controlled within a single year or by using only one control method. Strategies to contain and reduce Malta starthistle populations require long-term planning and integrated management:

- Healthy plant communities should be maintained to prevent or limit infestations of starthistle.
- New populations of starthistle should be detected and eradicated as early as possible.

- Mechanical, cultural, biological, and chemical methods to control starthistle populations should be combined whenever possible.

Choice of control method(s) for Malta starthistle depends on the land use and site conditions such as accessibility, terrain, climate, density and degree of infestation, nontarget flora and fauna present, etc. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. Table 1 summarizes approaches for the most common situations involving Malta starthistle. More than one control method may be needed for each site.

Physical Control

Physical methods to control Malta starthistle should focus on removal of seed heads and the root system. These methods usually have to be repeated and must be timed properly to be most effective.

Manual Methods

Hand pulling and hoeing are effective for small infestations of Malta starthistle, but this must be done repeatedly. Plants should be removed in early bolt before flowers have opened and gone to seed. The taproot should be removed as much as possible.

Mechanical Methods

When feasible, frequent tillage with a plow or disc will control Malta starthistle. Tilling should be done when the surface soil is dry since fragmented plant segments can regrow in moist soil. Shallow cultivation (five or six times a year, 2 weeks apart) should be repeated while leaves are present but before plants have flowered. Regular cultivation for 2 or more years must be maintained for long-term effectiveness.

Mowing is a commonly used technique that can reduce seed production; however, mowing during early plant growth can cause greater production of flowers and seed. Some

Table 1. Control Decisions

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides	Use machinery such as mowers or graders for mechanical clearing.	Implement requirements for operation of vehicles and for reporting infestations along roads.	Little researched	Use truck spraying equipment. Wash underneath to prevent spread.
Rangeland	Use tillage or prescribed fire when possible. May need to use hand tools in difficult terrain.	Use certified seed. When moving livestock or vehicles through infested areas, inspect and remove any seeds from animals, clothing, and vehicles before entering uninfested areas. Do not graze for 1½ years after treatment.	Little researched	Use ground or aerial broadcast spraying; however, backpack spraying may be more practical in areas difficult to access.
Wilderness or Natural Areas	Hand methods may be needed to protect other resources.	Post signs warning visitors to remove seeds. When moving livestock or vehicles through infested areas, inspect and remove any seeds from animals, clothing, and vehicles before entering uninfested areas. Do not graze for 1½ years after treatment.	Little researched	Use backpack sprayers. Broadcast spraying by aerial or ground methods may be used on thicker stands if allowed.

vegetation management experts do not recommend mowing at all since mown plants often produce side branches that have more flowers, even with repeated mowing and proper timing. When appropriate, mowing should take place only when plants are in late bud or early bloom stage. Mowing should occur regularly (e.g., weekly or biweekly) at a level that will remove the lowest branches. Leaves should not be left below the level of the cut.

Prescribed Fire

Burning conducted from January to April can eliminate Malta starthistle during the rosette stage provided there is a source of fine fuels sufficient to carry an intense, uniform fire. Malta starthistle may also be burned in early to mid-summer (late June to early July) during the early flower stage. However, prescribed fire operations during this period may not be feasible in some areas due to the hazard of causing an uncontrolled fire. Burning at other times may increase seed production and enhance survival of established plants. Research currently underway is investigating the combination of fire with followup herbicide treatments for improved control, but results are not known at this time.

Cultural Control

Early detection and plant removal are critical for preventing establishment of Malta starthistle. The local public should be educated to help prevent Malta starthistle from becoming established. Vehicles, humans, and livestock should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles and livestock after going through infested areas should be implemented to help stop dispersal. Hay, straw mulch, planting seeds, and other related products should be certified to be weed-free before use in areas undergoing treatment.

Biological Control

Grazing

Sheep, goats, and cattle may graze Malta starthistle in early spring when plants have developed flowering stems but before they have spiny heads. Grazing can reduce the presence of starthistle, but owners of horse and other livestock should look for signs of toxicity or so-called "chewing disease" in starthistle stands that have flowering heads.

Classical Biological Agents

Biological control agents for Malta starthistle have not been researched as well as yellow starthistle, although some biological control agents may affect both species. A beetle, *Lasioderma haemmorrhoidale*, that feeds on starthistle seed heads was transplanted from the Mediterranean region but has little effect in controlling the invasive plant. The limited number of agents known to affect Malta starthistle is shown in table 2.

Chemical Control

The most effective period to spray Malta starthistle is from December through April during the seedling to early rosette stage since lower rates of herbicide can be applied. When in the late rosette or bolting stage, higher rates should be used. Herbicides should be applied before flowering when there are 4 to 6 inches of growth and good growing conditions. Since Malta starthistle is typically an annual, herbicide application during or after flowering is ineffective. Label instructions and guidelines for mixing and application should always be followed.

Malta starthistle is best controlled with post-emergent broadleaf herbicides since these chemicals generally have

Table 2. Classical Biological Agents

Species	Type of Agent	Site of Attack	Impact/Use	Considerations for Release
Bangasternus orientalis	weevil	Eats or uses flowers for cocoons	Limited	Little researched
Puccinia juncea var. *solstitialis*	rust fungus	Undetermined	Unknown/ California	Little researched

little or no effect on grass species. The main herbicide entry into the plant is through the leaves with only minor entry through the roots. All herbicides listed in table 3 will effectively control Malta starthistle when properly applied. However, they will also impact other emerged, broad-leaved species so caution should be taken if non-target species need to be protected. This includes woody species which may also be impacted. Herbicides may be applied by backpack sprayers, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. Populations of Malta starthistle are rarely extensive enough to warrant aerial application of herbicide; however, spraying targeted areas by helicopter may be an option when large areas are infested by the starthistle.

Table 3. Herbicide Recommendations

Common Chemical Name (active ingredient)	Product Example[1]	Product Example Rate per Acre[1] (broadcast)	Backpack Sprayer Treatment Using Product Example	Time of Application	Remarks
Clopyralid	Reclaim	2/3 to 1 pt	1 to 3%[2]	Early rosette stage; use higher rate at bolting to bud stage.	Wet foliage thoroughly. Do not spray when plants are defoliated by late freeze, hail, insects or other unfavorable conditions. Effects are shown within 2 to 4 weeks.
Aminopyralid: 2,4-D[3]	GrazonNext	1.5 to 2 pt	1 to 3%	Same	Same
Picloram[4]	Tordon 22K	1 to 3 pt	1 to 3%	Same	Same
Picloram: 2,4-D[3, 4]	Grazon P+D	1 to 2 qt	1 to 3%	Same	Same
Dicamba: Diflufenzopyr	Overdrive	4 to 8 oz	1 to 3%	Same	Same
Dicamba: 2,4-D[3]	Weedmaster	1 pt to 1 qt	3 to 5%	Same	Same
2,4-D[3]	Several Manufacturers	1 to 2 qt	5 to 10%	Same	Same
Metsulfuron	Escort	1 oz	NA	Same	May take 2 to 3 months to show effects.
Metsulfuron: 2,4-D: Dicamba[3]	Cimarron Max	Rate III: 1 oz (Part A) 4 pt (Part B)	NA	Same	May take 1 to 3 months to show effects.
Imazapyr	Arsenal	1 qt.	1%	All stages	Spray to have total plant control (e.g., along roadsides). May take 2 to 3 months to show effects.

[1] Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with Malta starthistle.

[2] Herbicide/water ratio, e.g., a gallon of spray water with a 3 percent mixture is made by adding a sufficient volume of water to 4 ounces of herbicide until a volume of 1 gallon is reached (4 oz ÷ 128 oz/gal = 0.03 or 3 percent).

[3] 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

[4] Restricted use pesticide. A certified applicator's license is required for purchase and use.

Control Strategies

In nearly all cases, a long-term commitment (greater than 3 years) to manage Malta starthistle is necessary to deplete the seed bank. Each treatment situation is unique and implementing an adaptive management approach using different control methods is usually necessary for long-term success. Initial treatment should attempt to eliminate as much of the weed population as possible. Secondary treatment should include monitoring and additional control measures such as spot spraying with backpack sprayers or prescribed fire. An option for treatment in the first year is to apply herbicide with clopyralid as an active ingredient. The herbicide will substantially reduce the starthistle population and allow grasses to become established. The herbicide treatment can then be followed by prescribed burning in the next year (or possibly 2 years). This sequence greatly reduces starthistle infestations to insignificant or very low levels. The greatest benefit from a treatment sequence such as herbicide-prescribed fire is a healthier range plant community as indicated by increased species diversity and enhancements in forage quality and quantity.

Similar strategies may be adapted for other treatment situations according to local circumstances. For example, roadways infested with Malta starthistle may be treated first by intensive spraying to control the starthistle. In the second step, deep-rooted native perennial grasses can be seeded to establish erosion control. In the final state, native broadleaf forbs such as lupines may be seeded to restore a more balanced mix of plants into the system.

Further Information

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