

Integrated Pest Management (IPM) Resources

USDA-Natural Resources Conservation Service
Boise, Idaho

May 2008

Integrated Weed Management of Yellow Starthistle



Yellow starthistle is a troublesome noxious weed on large acreages in northern Idaho. University of Idaho field surveys show that yellow starthistle has invaded Idaho lands at the rate of about 6,000 acres per year since 1981, and now infests over 200,000 acres. Yellow starthistle is adapted to the semiarid climatic conditions of the intermountain west, and is a winter annual with a tap root that takes advantage of deep soil moisture throughout the growing season. Its competitive ability allows it to develop large monospecific stands which suppress desirable species and significantly reduce grazing capacity.

The importance of integrated pest/weed management to control noxious weeds like starthistle cannot be understated. Problems with weed resistance to herbicides continue to increase in Idaho, making the use of multiple strategies of control critical. Spraying adult thistle with herbicides will kill the adult plants but will do nothing to stop new ones from growing from seeds already in the soil. Conventional methods, such as chemical application, for yellow starthistle control have often failed because of lack of competitive vegetation, developed seed banks, size of infestations, and lack of long-term commitment

Prevention

For large infestations of yellow starthistle, containment may be the most desirable and least-cost strategy. Keeping an established population of thistles from spreading to non-infested areas is the primary objective. For example, a “barrier strip” between infested and non-infested areas can be maintained and monitored so that adjacent lands remain weed free. In addition, measures that stop seed production can help prevent further spread of the weed. Below are some recommendations gathered from various sources:

- Monitor vigilantly and eradicate small, new infestations.
- Always insist on certified weed-free seeds and forage.
- Communicate with neighbors about weed areas, infestation levels, and control practices.
- Prevent vehicles from moving freely between infested and uninfested areas, and thoroughly clean the undercarriage of any vehicles or machinery that have come into contact with infested areas.
- Permit animals to graze weeds only before they flower and set seed. If this is impossible, contain animals for 7 to 14 days in a holding area before moving them to non-infested areas.
- Minimize soil disturbance caused by water, livestock, vehicles, or machinery.
- Observe good land management practices such as deferred or rotational grazing, water conservation, erosion control, etc.

Chemical Control

Chemical control is only one strategy to help suppress thistles. Picloram, chlorosulfuron, triclopyr and clopyralid have been used to control starthistle on pasture and rangeland, with application timing from the rosette to bolting stage. When chemical control is used as part of an IWM approach, it is desirable to select the least toxic alternative(s) that provide adequate efficacy. Contact local Extension or the County Weed Superintendent for chemical recommendations.

Mechanical/Cultural Control

Numerous studies indicate that well-timed, heavy grazing by goats, sheep, and cattle can reduce yellow starthistle seed production as well as biomass. The grazing period should be timed to the bolting stage in late May or June, before spines are on the plant. Grazing earlier, at the rosette stage, seems to favor yellow starthistle development by elimination of competitive plants which do not regrow as quickly. Since most defoliated yellow starthistle will recover from one grazing, it is necessary to bring the animals back one to four times at about two week intervals under rotational grazing.

Trials in California investigated mowing in combination with targeted sheep grazing and seeding of competitive, desirable forage species. Researchers found that Yellow starthistle seed production was 130 times higher where only one mowing was done, and 1,720 times higher where nothing was done, as compared to the area that had been grazed and mowed twice. Thistle flower-head density was least where mowing and grazing were combined. The study suggests that excellent yellow starthistle control can be achieved when competition from desirable plants is combined with mowing and rotational grazing. Avoid mowing after starthistle seeds have matured, as this may aid seed dispersal.

Cultivation with appropriate tools effectively controls yellow starthistle seedlings in some situations. The equipment used should vary with soil condition and plant stage. For loose soil and small plants, spike-tooth or spring-harrows are usually sufficient to destroy the weed. For larger plants, a rotary hoe or disc can be used. The best time to begin cultivation is when emergence begins in the fall after the rains begin. Repeated cultivations are generally needed to control each new flush of seedlings. Cultivation will also bring deeply buried seeds to the surface where conditions are favorable for germination.

Burning can also be an effective yellow starthistle management tool in some situations. Repeated burns not only kills yellow starthistle, but also significantly reduces the seed bank. A prescribed burning plan would need to be developed to address all concerns. Do not burn where biological control insects have been released.

Burning should be done at the end of the rainy season, but prior to the formation of viable seeds. According to Thomsen et al. (1996), the best time to burn is probably when plants are in the early flowering stage, prior to seed formation. Yellow starthistle may still be green at this time, so there must be enough dry biomass from other annual plants to carry the fire. If there is insufficient grass to carry the fire, fuel for the burns can be provided by sowing grass seed the winter before a planned burn. Full consumption of the plants by fire is not crucial, as only

enough heat to produce foliar scorch and stem girdle is necessary. A flame thrower can be used to scorch patches of accessible plants that do not burn.

In one of California's state parks, a successful burning program for yellow starthistle was conducted for three consecutive summers, producing a 90 percent reduction in relative starthistle cover, increasing perennial grass cover by 300 percent, and reducing the soil seed bank over 99 percent. In addition, the vegetative cover of native species increased two-fold.

The University of Idaho recommends the following species for plantings to remediate starthistle areas. Canyon grasslands should be seeded in late winter, and areas with long winters should be seeded in the fall:

- Oahe intermediate wheatgrass - seed at 10 to 15 pounds of PLS per acre
- Luna pubescent wheatgrass - seed at 10 to 15 pounds of PLS per acre
- Secar bluebunch wheatgrass - seed at 10 to 12 pounds of PLS per acre
- Tall wheatgrass - seed at 12 to 16 pounds of PLS per acre
- Covar sheep fescue - seed at 2 to 3 pounds of PLS per acre
- Durar hard fescue - seed at 2 to 3 pounds of PLS per acre

The NRCS Plant Materials Center may also have specific recommendations for this application.

Oregon researchers found that early-growing perennial grasses can help suppress yellow starthistle. Borman et al. (1991) in southwest Oregon rangeland found that perennial grasses such as Idaho fescue (*Festuca idahoensis*), which begins growth early, suppressed thistle and other annual weeds more effectively than later growing perennial grasses such as intermediate (*Apropyron intermedium*) and tall (*A. elongatum*) wheatgrasses.

Biological Control

The use of biological controls is a long-term approach to help suppress undesirable weeds. Table 1, below, was compiled by the University of Idaho, and note that several on the list are currently approved agents in Idaho. Many of the state's Cooperative Weed Management Areas (CWMAs) are actively participating in the release and monitoring of biological control agents.

Researchers with the University of Idaho examined the use of targeted grazing and biological control on yellow starthistle. The timing of grazing had greater impact on starthistle growth and bud production than type of animal. While grazing at all growth stages reduced plant height, grazing at the bolting stage and the rosette stage increased the number of buds, and also the seed production per plant as compared to grazing in the late bud stage. Therefore, grazing during the early growth stages should be avoided. Grazing did not impact the efficacy of biocontrol agents present.

Table 1. Biological control agents for yellow starthistle (UI Weed Resources).

Insect	Description	Redistribution
Starthistle bud weevil (<i>Bangasternus orientalis</i>)**	Larvae tunnel through the flowering stalk and into the flower head where they feed on receptacle tissue and developing seeds. Larval feeding reduces seed production. Collect weevils as adults.	May 31 - July 1
Peacock fly (<i>Chaetorellia australis</i>)	Larvae feed in the flower head and reduce seed production. Collect infested seedheads in early spring.	March 1 - April 15
Starthistle hairy weevil (<i>Eustenopus villosus</i>)**	Adult weevils feed externally on the flowers and larvae feed within, destroying seed production. A good disperser, this agent can become widespread and have a significant impact on seed production. Collect weevils as adults.	June 15 - August 15
Starthistle flower weevil (<i>Larinus curtus</i>)**	Larvae feed on the developing seeds, with single larvae destroying more than 90% of the seeds in infested heads. Collect weevils as adults.	July 15 - August 30
Starthistle gallfly (<i>Urophora sirunaseva</i>)	Larvae feed in the flower head and reduce seed production. Collect infested seedheads early spring.	March 1 - March 15

** Currently approved for use in Idaho by ISDA

References

Bormann, MM, WC Krueger, and DE Johnson. 1991. Effects of established perennial grasses on yields of associated annual weeds. *Journal of Range Management* 44:318-322.

Idaho Weed Resources, University of Idaho,

<http://www.uidaho.edu/weeds/FRA/Yellow%20Starthistle/Yellow%20Starthistle.htm>

Sullivan, PG. 2004. Thistle control alternatives. ATTRA, USDA-NCAT, National Sustainable Agriculture Information Service.

<http://www.attra.ncat.org/attra-pub/PDF/thistlecontrol.pdf>

Thomsen, CD, WA Williams, MP Vayssières, CE Turner, and WT Lanini. 1996. Yellow starthistle biology and control. Univ. of Calif. Div. of Ag. and Natural Resources Publication 21541

Wallace, JM, LM Wilson, and KL Launchbaug. 2008. The Effect of Targeted Grazing and Biological Control on Yellow *Starthistle* (*Centaurea solstitialis*) in Canyon Grassland of Idaho. *Rangeland Ecol. Manage.* 61:314-320.