

CHAPTER 15: Grazing and Browsing Guidelines for Invasive Rangeland Weeds

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GRAZING GUIDELINES



INTRODUCTION

When stories of using livestock to manage invasive plants hit the media they take on the aura of a “silver bullet,” with headlines like: “Goats to Restore Battered Landscapes,” “Sheep and Goats Can Help Wage War On Weeds,” “Clearing The Bosque With Goat Power,” “Ranchers Harnessing Hoofed Weed Whackers,” and “Sheep and Goats: Ecological Tools for the 21st Century.” In reality, applying livestock grazing to manage weeds and other vegetation is a meticulously honed and finely skilled practice. Behind the headlines are livestock managers and others who provide grazing services and understand how to apply the right animals at the right time and in the right amount for specific vegetation and landscape problems.

This section provides guidelines for prescription grazing and browsing on specific plant species. The guidelines are intended for resource managers, livestock producers, contract grazing service providers, and anyone interested in targeting grazing to manage vegetation.

The guidelines were developed from phone interviews between October 2005 and February 2006 of about 100 people from California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, Utah, Washington, and Wyoming. Interviewees responded to a list of 27 questions aimed at capturing their knowledge and experience of prescription grazing for vegetation management. Respondents included a broad range of practitioners, contract grazers, researchers, and extension educators. In addition to phone interviews, a survey of the literature was conducted of the Internet and published articles (journals, bulletins, reports, proceedings, etc.).

The results are compiled in a handbook and CD titled “Livestock Grazing Guidelines for Controlling Noxious Weeds in the Western United States.” In addition to most of the plant species addressed in this section, the handbook encompasses 26 noxious weed species – a list of all noxious weeds common to at least two of the nine Western states listed below. The handbook and CD are being distributed to Cooperative Extension and NRCS offices in California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming. (The project was funded by a grant from the Western Sustainable Agriculture Research and Education Program.)

Each guideline suggests the type and class of livestock, the grazing objective, growth stage for treatment, intensity and duration of treatments, palatability of the

plant, plant response to grazing, the potential effectiveness of the grazing treatment, and the potential for integrating targeted grazing with other control methods. Other management considerations are provided case by case. Based on the handbook and other information, guidelines are provided for these plant species:

Forbs (herbaceous, broad-leaved plants):

- Bull Thistle
- Canada Thistle
- Diffuse Knapweed
- Hoary Cress (or Whitetop)
- Kudzu
- Leafy Spurge
- Musk Thistle
- Perennial Pepperweed (or Tall Whitetop)
- Russian Knapweed
- Scotch Thistle
- Sericea
- Spotted Knapweed
- Tansy Ragwort
- Yellow Starthistle

Woody Plants:

- Blackberries
- Juniper Trees
- Multiflora Rose
- Pine
- Saltcedar

Grasses:

- Cheatgrass
- Medusahead

FORBS

Bull Thistle *Cirsium vulgare*

Description:

Bull thistle is a large, coarse, tap-rooted biennial plant that grows up to 7 feet tall. Rosette leaves are pubescent, oblong in shape with small spines at the tips of deep lobes. Flowering plants have a few to many branched stems covered with fine white hair resembling cobwebs. Stem leaves are spiny and alternate, and the leaf blades grow along the leaf stem giving them a “winged” appearance. Each branch produces one or more large flowerheads about 2 inches in diameter and surrounded with stiff spiny bracts. The flowers are rose to purple, maturing into pale brown seeds with dark streaks and a feathery plume of bristles growing from one end.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Prevent seed production, reduce plant size and vigor.

Growth Stage for Treatment – Graze bull thistle heavily during the rosette to bolting stage. Repeated grazing at approximately two-week intervals will be necessary to prevent flowering and seed production. May need to graze only once in a season if grazing occurs in the early flowering stage. A minimum of three successive years of grazing is needed to reduce populations.

Potential Effectiveness – Sheep and goats will readily graze bull thistle. Cattle will not graze bull thistle beyond the late bud stage. Grazing works best when combined with a fall herbicide treatment. Grazing reduces plant size, density, and reproductive efficiency.

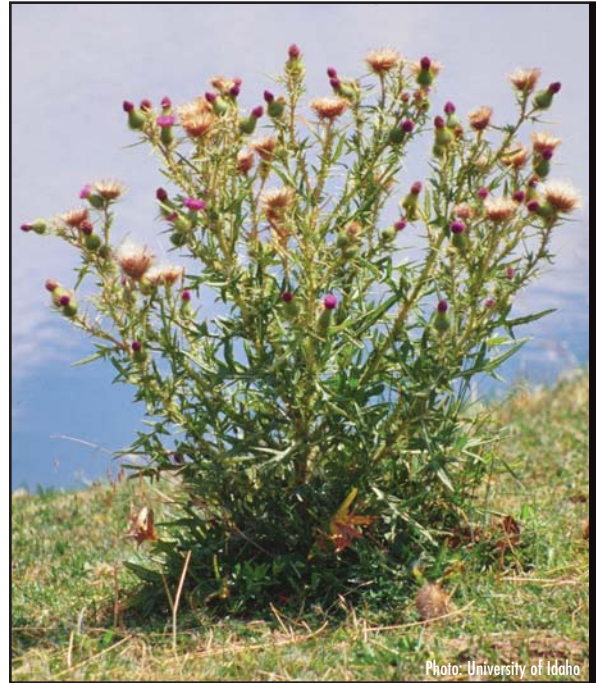
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FORBS

Canada Thistle *Cirsium arvense*



Description:

Canada thistle is a perennial plant that grows from a vigorous, spreading root system. It grows up to 4 feet in height with multiple branches growing from a single, heavily ridged stem. The spiny leaves are deeply lobed, oblong, and up to 6 inches in length. Stem leaves are clasping and alternate. Each stem produces several flowerheads armed with small spines. The flowers are small and lavender to purple in color; male and female flowers grow on separate plants (dioecious). The smooth, light-brown seeds bear a white plume of hairs.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Begin grazing when rosettes are green and begin to sprout. Remove animals when grazing shifts to desirable species and then regraze new sprouts.

Growth Stage for Treatment – Graze during the seedling through late vegetative stage, with regular removal of top growth throughout the season. Graze often enough to prevent flowering. Grazing treatment will need to be repeated at least three years. Goats will graze older plants.

Potential Effectiveness – Goats, sheep, and cattle can damage Canada thistle with repeated grazing to prevent flowering. Goats are the preferred grazing animal, followed by sheep and cattle. Sheep and cattle prefer to graze this plant when it is young before spines develop. Grazing is most effective when repeated during the season and for multiple seasons to prevent seed production and to deplete root reserves. Plants are smaller and weaker in successive years after repeated grazing. Most information suggests best results are achieved when grazing is combined with herbicide treatments.

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FORBS

Diffuse Knapweed *Centaurea diffusa*

Description:

Diffuse knapweed is a biennial, short-lived perennial or sometimes annual plant. It grows about 2 feet tall from a single branched stem. Rosette leaves are about 6 inches long and thinly divided, whereas upper stem leaves are smaller and smooth-edged. The stem is rough to the touch. Each branch produces a single flowerhead at the tips. The flowers vary from white to pinkish. Bracts on the flowerheads bear small, yellowish spines with small teeth-like projections along the sides. The seeds are brown to grey and tipped with a light-colored plume that drops off as the seed ripens.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Graze heavily at least twice each year to prevent flowering and for three or more years to reduce populations.

Growth Stage for Treatment – For sheep, it is best to graze diffuse knapweed in the rosette or bolted stages. Goats will graze all growth stages. Palatability for cattle quickly declines beyond the bolting stage. A minimum of two grazing treatments per year is necessary to prevent seed formation, and a minimum of three years is required to reduce populations.

Potential Effectiveness – Diffuse knapweed is readily grazed by sheep, goats, and cattle up through the early vegetative stages. Palatability is reduced as the plant ages especially for sheep and cattle. Diffuse knapweed is not as palatable as spotted knapweed. Targeted grazing can reduce plant vigor, size, and flower production. Long-term control depends on the prevention of flower and seed production. Grazing must be applied at least twice per year over several years to be effective. Remove livestock for approximately two weeks and regraze to prevent seed head formation. Grazing is most effective when combined with herbicide treatments.

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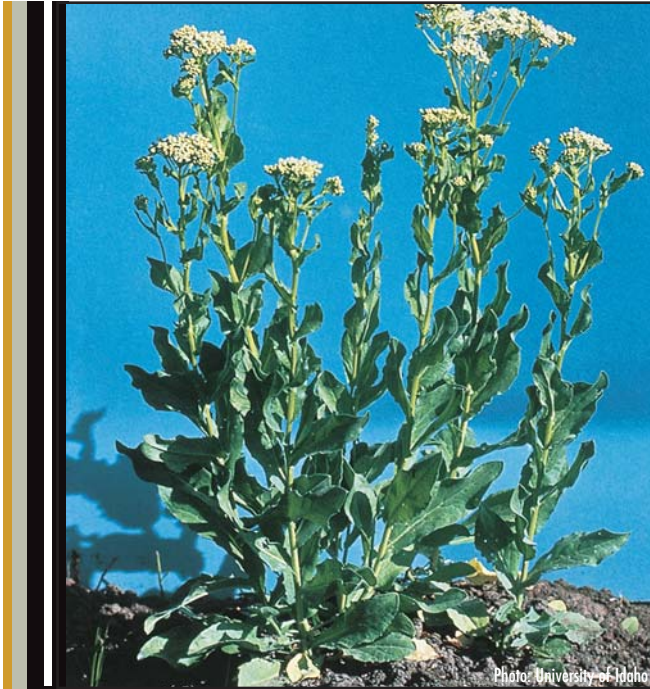
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Photo: University of Idaho

FORBS

Hoary Cress (or Whitetop) *Lepidium draba* (or *Cardaria draba*)



Description:

Hoary cress is a perennial plant that grows up to 2 feet tall. It reproduces by seeds and from a deep, spreading root system. Plants begin growth early in the spring with leaves that are grey-green in color with short stems. The leaves are longer than wide, with rounded tips and smooth to slightly toothed edges. Stem leaves are alternate and clasping. Plants bloom in the spring. The flowers are small, and white with four petals, arranged in dense, flat-topped clusters. Seeds are produced in heart-shaped pods, with each pod producing two reddish brown seeds.

Management Guidelines:

Type and Class of Livestock – Sheep and goats; considered mildly toxic to cattle.

Grazing Objective – The objective is to prevent flowering and maintain removal of 85% of top growth during the growing season.

Growth Stage for Treatment – The best time to graze is before flowering. Palatability is considered to be low for all classes of livestock, and decreases rapidly as plants bloom and mature. As with all deep-rooted perennial plants, the treatments would have to be repeated at least two times per year. Literature indicates at least three years of grazing is necessary to reduce populations of hoary cress. Grazing hoary cress is considered impractical because of low acceptance by livestock and the potential for poisoning.

Potential Effectiveness – Sheep and goats will consume hoary cress more readily than cattle. Cattle will consume hoary cress but, glucosinolates in large quantities may be toxic. Little information is currently available on the effectiveness of targeted grazing of hoary cress. Surveys and literature disagree on the potential of controlling hoary cress with grazing because of palatability and toxicity issues. However, repeated grazing may reduce plant vigor and flower production.

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FORBS

Kudzu *Pueraria montana*

Description:

Kudzu is a fast-growing, climbing, semi-woody perennial vine in the pea family. The leaves are alternate and compound, with three broad, hairy leaflets up to 4 inches across. Leaflets may be entire or deeply lobed. Individual flowers, about ½ inch long, are purple, highly fragrant, and borne in long hanging clusters. Flowering occurs in late summer. Three to 10 hard seeds are produced in flat, hairy, brown seed pods.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Continuous grazing to remove 80% of biomass each season.

Growth Stage for Treatment – Kudzu can be grazed throughout the growing season. Frost will damage the aerial parts without killing the plant. Livestock will readily consume kudzu leaves and terminal stems. Three to four years of continuous or controlled, repeated grazing is necessary to suppress this plant.

Potential Effectiveness – All types of livestock consume kudzu, but cattle have shown the greatest success in eradication. High grazing intensity and repeated defoliation throughout the growing season will deplete starch reserves in tubers and weaken the plant. Grazing intensity should be high from the start of the grazing season to repeatedly defoliate and weaken the kudzu vines. Grazing must be repeated for at least three seasons to suppress kudzu to negligible levels. Spot spraying herbicides after the grazing treatment will kill any residual plants. All information indicates that grazing is the most practical method for controlling kudzu.

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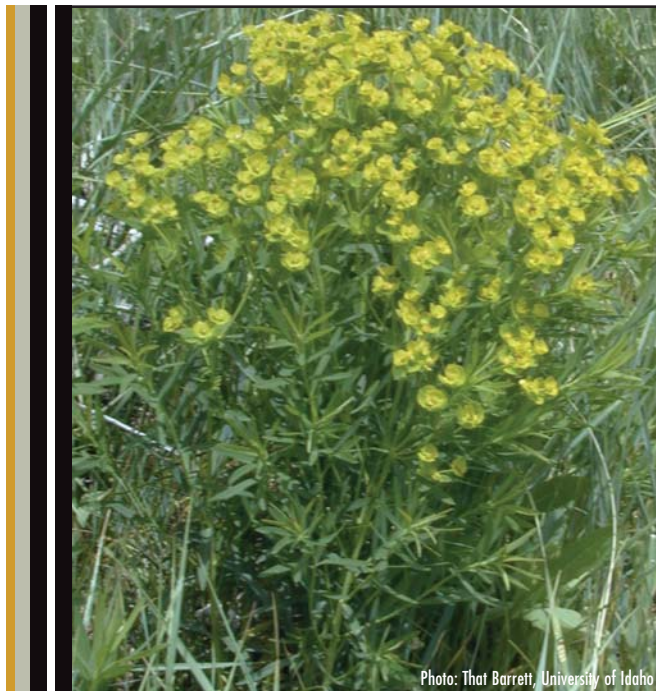
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Photo: Chris Parker, Purdue University Extension

FORBS

Leafy Spurge *Euphorbia esula*



Description:

Leafy spurge is a long-lived perennial plant that can grow up to 3 feet tall. The leaves are long, narrow, and about 4 inches long. Leaf edges are smooth, hairless, and wider toward the tip. They grow in an alternate pattern along numerous smooth stems that produce multiple branches near the top. The stems and leaves are filled with white sap that oozes when the plant is broken. The flowers are a bright yellow-green color, tiny and grow above two to three heart-shaped leaf-like structures of the same color. The fruit is a capsule divided into three compartments, each containing numerous small, smooth, gray- to brown-colored seeds. The root system spreads horizontally and vertically to depths up to 30 feet. New plants can emerge from buds along the horizontal roots. The entire plant turns a bright red color in the fall.

Management Guidelines:

Type and Class of Livestock – All classes of sheep and goats; not recommended for cattle.

Grazing Objective – Remove 95% of top growth; graze regrowth after first treatment; prevent flowering and seed production.

Growth Stage for Treatment – Grazing should occur in the vegetative to flowering stage. Sheep may need to learn to eat leafy spurge and prefer younger plants whereas goats readily eat leafy spurge at all growth stages.

Potential Effectiveness – Sheep and goats readily eat leafy spurge after it has been introduced into their diets. It is considered to be somewhat toxic to cattle and horses. Sheep and goats are very effective at reducing biomass on an annual basis when leafy spurge is grazed to a moderate to severe level of utilization during the vegetative to flowering stage of growth. Grazing effectiveness can be low the first year as plants can produce a flush of new growth the second year. Suppression of high density infestations will likely occur after four or more consecutive years of grazing treatments. Grazing multiple times per year may be needed in moist or riparian areas. Integrating grazing with herbicides and biological control may provide the most effective strategy for long-term management of leafy spurge.

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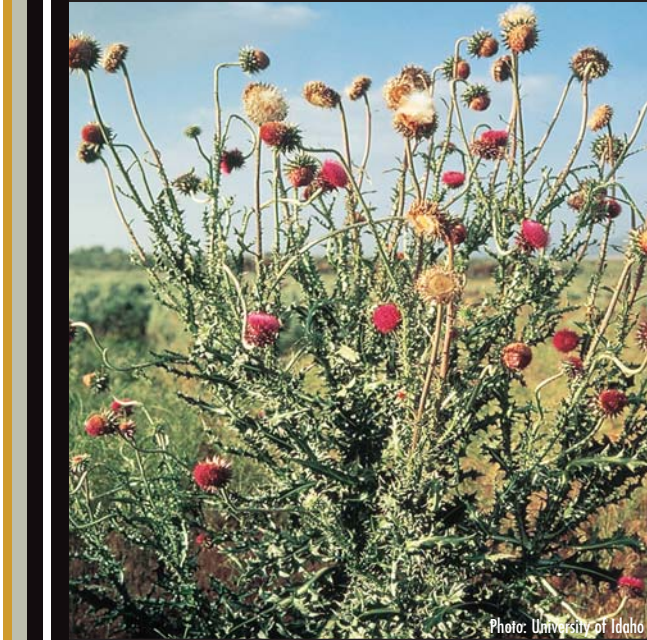
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FORBS

Musk Thistle *Carduus nutans*



Description:

Musk thistle, a biennial or occasionally a winter annual plant, can reach a height of 6 feet or more and reproduces by seed. Plants have a large, fleshy taproot. Young plants develop into large rosettes of dark green, deeply lobed, spiny leaves that can be over 14 inches long. Leaves have a light yellow vein. Flowering plants produce single or multiple winged stems, each with smaller leaves and a single terminal flowerhead. Each flowerhead is 2 to 3 inches in diameter and droops at first (giving the plant another common name of nodding thistle). The bracts surrounding each flowerhead are armed with stiff spines. The flowers are pink to rose-purple, maturing into straw-colored seeds with a white plume of soft bristles.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Prevent seed production, reduce plant size and vigor.

Growth Stage for Treatment – Graze musk thistle heavily during the rosette to bolting stage. Repeated grazing at approximately two-week intervals will be necessary to prevent flowering and seed production. May need to graze only once in a season if grazing occurs in the early flowering stage and site conditions limit regrowth. At least three successive years of grazing are needed to reduce populations.

Potential Effectiveness – Grazing musk thistle reduces plant size, density, and reproductive efficiency. Sheep and goats will readily graze musk thistle; cattle will not graze musk thistle beyond the early bud stage. Grazing works best when combined with a fall herbicide treatment to control new seedlings and escaped plants.

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FORBS

Perennial Pepperweed (or Tall Whitetop) *Lepidium latifolium*

Description:

Perennial pepperweed is a hardy perennial plant that can reach 6 feet in height under ideal conditions. It reproduces by seeds and from a deep, creeping root system. Basal leaves are waxy and lance-shaped on a long petiole. Stem leaves are smaller with short stalks. Leaves have a prominent white mid-vein. The tiny flowers have four white petals and are arranged in numerous rounded clusters on the ends of the branches. Each flat, elongated capsule produces two seeds.

Management Guidelines:

Type and Class of Livestock – All classes of sheep and goats.

Grazing Objective – Remove 85% of top growth with repeated grazing treatments (every three to four weeks) to remove regrowth.

Growth Stage for Treatment – Sheep and goats will readily consume the plants until the early flowering stage, with preference for early vegetative stages. Repeated grazing for several years will be necessary to suppress perennial pepperweed long term.

Potential Effectiveness – Repeated, intensive grazing can significantly reduce perennial pepperweed biomass, density, and height in a single season, but the massive root system rapidly replenishes the infestation. Thus, grazing must be continued for several years to deplete root reserves. Results vary as to the long-term impacts of targeted grazing for plant suppression. Grazing can be combined with herbicide spraying for long-term perennial pepperweed management.

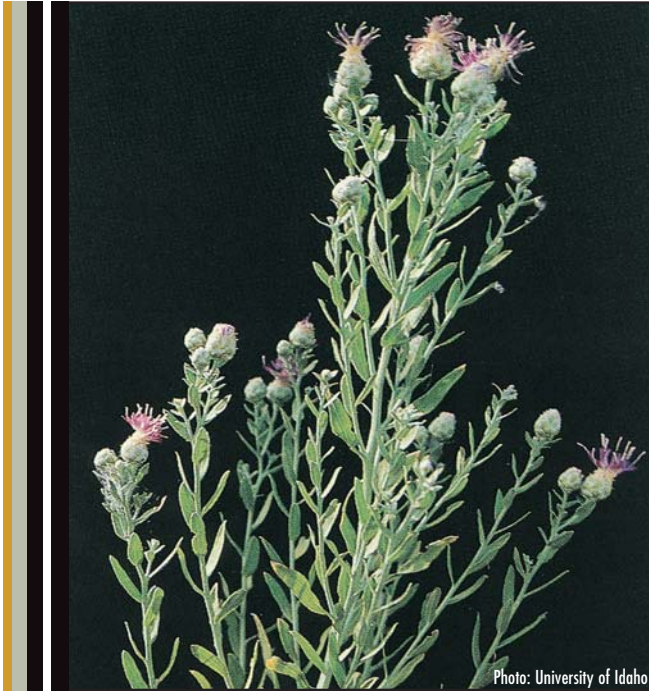
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FORBS

Russian Knapweed *Acrotilon repens*



Description:

Russian knapweed is a deep-rooted perennial plant that can grow up to 3 feet tall. It reproduces by seeds and from aggressive underground stems and roots. Rosette leaves are lobed and have wavy margins; they are blue-green in color and covered with fine hairs that give the appearance of a fine white powder. Most plants produce a single branched stem that is covered with fine gray hairs. The leaves are about 1 inch long, relatively narrow, linear, and arranged alternately along the stem. Each branch produces one to three flowerheads that are about ¼ inch in diameter and have papery bracts. The flowers are pink to purple. Ten to 15 seeds are produced in each flowerhead.

Management Guidelines:

Type and Class of Livestock – Sheep (particularly dry ewes) and all classes of goats.

Grazing Objective – Removal of 80% of biomass.

Growth Stage for Treatment – Early vegetative to flowering. Livestock will consume Russian knapweed reluctantly. It is unpalatable to cattle though it may be occasionally eaten. Patches should be grazed at least three times per season, allowing 8 to 10 inches of regrowth between treatments. Three or more years of successive grazing treatments will be necessary to suppress populations.

Potential Effectiveness – Most of the literature indicates that livestock will not eat Russian knapweed because of its bitter taste. However, survey respondents indicated that under certain conditions sheep and goats will graze Russian knapweed, especially when the plants are young and after the animals have grazing experience. To be effective, grazing must be repeated multiple times each season and for several years. Grazing Russian knapweed may result in reduced biomass and density of plants, but populations may return to pre-grazing density when grazing ceases. Long-term management of Russian knapweed will require an integrated program including herbicides and competitive plantings.

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FORBS

Sericea *Sericea lespedeza*

Description:

Sericea is an erect, perennial shrub up to 5 feet tall. Stems are hairy only along the ridges on the stem. Leaves have three leaflets, each less than 1 inch long and less than ¼ inch wide, wedge-shaped (cuneate). Plants flower from mid or late July to October. Flowers have yellowish petals sometimes tinged with purple and are about ¼ inch long. Seeds are borne in pods about 1/8 inch long, broad, and flattened.

Management Guidelines:

Type and Class of Livestock – All classes of sheep and goats; Sericea can be toxic to cattle.

Grazing Objective – Reduce plant biomass and prevent flowering and seed production.

Growth Stage for Treatment – It is important to graze young plants early in the season. Sericea becomes much less palatable after bloom as levels of lignin and tannins increase with maturity. Two or more treatments are necessary each season, and three to several years are needed to weaken plants.

Potential Effectiveness – Grazed plants are often smaller next year, but plant density has not been shown to decrease with grazing. Early intensive grazing followed by chemical control seems to provide the most effective control of Sericea.

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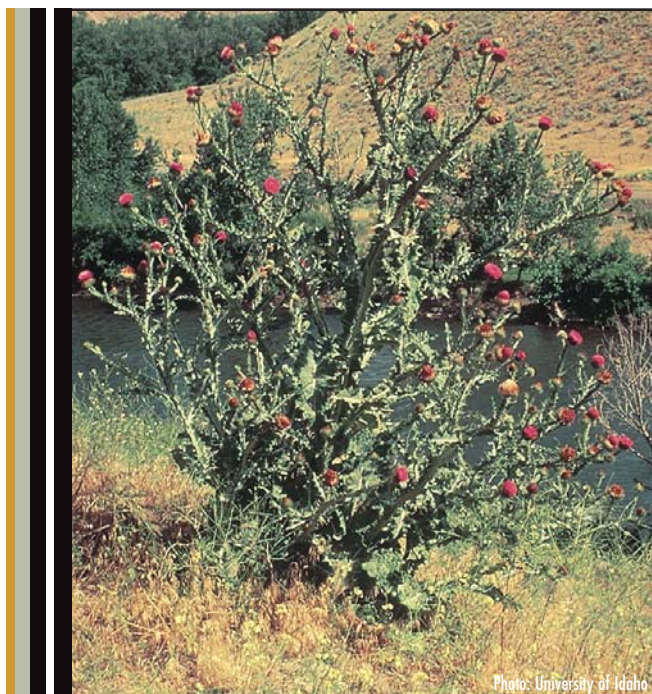
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Photo: Jean-Marie Luginbuhl, North Carolina State University

FORBS

Scotch Thistle *Onopordum acanthium*



Description:

Scotch thistle is a tap-rooted, biennial plant that can grow to 12 feet tall. It reproduces by seeds. During the first year rosette leaves can grow to 2 feet long and 1 foot wide. They are densely covered with fine white hair giving them a blue-grey color. The edges of the leaves are very wavy, lobed, and tipped with sharp spines. A thick, upright stem is produced the second year. Stem leaves are deeply lobed, spiny, and alternate. The leaf blades extend along the stem as wing-like projections. The entire plant is covered with fine, dense hairs giving it a wooly appearance. Each branch of the stem produces two to three large flowerheads about 2 inches in diameter. Flowers are bright reddish-purple in color. The seeds are smooth, spatula-shaped, and tipped with a plume of soft bristles.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Prevention of flowering and reduction of stem density.

Growth Stage for Treatment – Graze Scotch thistle at the rosette to bolting stage. Livestock will graze Scotch thistle with some reluctance, and better results can be achieved after they have some experience with the plant. Heavy to severe utilization, using short-duration, high-intensity grazing practices, provides the best results when repeated for several years to deplete the seedbank.

Potential Effectiveness – Prescribed grazing of Scotch thistle is considered an effective means of control, suppressing flowering and reducing stem density 30 to 50%. Sheep, goat, and cattle grazing is considered effective, although several years of grazing may be needed to reduce populations of Scotch thistle. Maintaining vigorous perennial grass competition is essential to long-term management. Grazing Scotch thistle is very effective when combined with a follow-up herbicide treatment.

References:

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FORBS

Spotted Knapweed *Centaurea stobe* (or *Centaurea maculosa*)

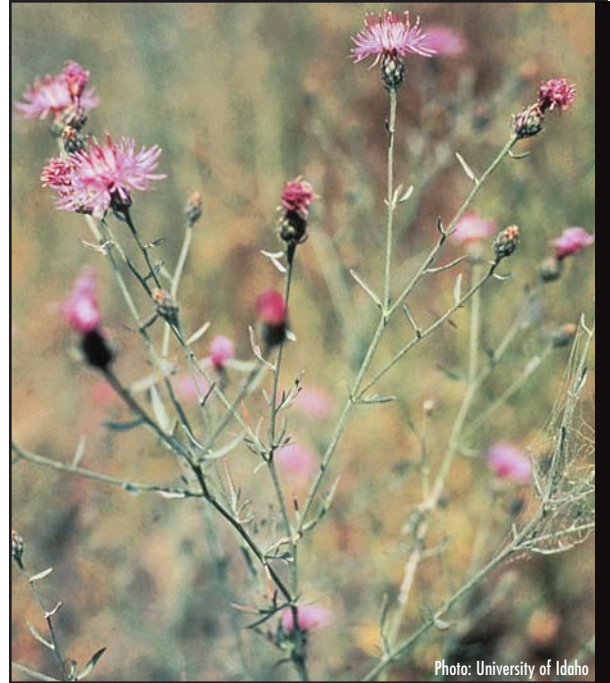
Description:

Spotted knapweed is a biennial or short-lived perennial plant that grows from 1 to 4 feet tall. It reproduces by seed and has a thick taproot. Seedlings develop the first year into rosettes of narrow, deeply lobed leaves that are up to 6 inches long. The upper leaf surface is rough. Flowering plants produce one to many stems with numerous branches. Stem leaves are smaller and linear, arranged alternately along the stem. A single flowerhead is produced at the end of each branch. Bracts at the base of the flowerhead are black-tipped, which gives them a spotted appearance when viewed from a distance. The flowers are pink to light purple in color and mature into brown seeds tipped with a plume of soft tawny bristles.

Management Guidelines:

Type and Class of Livestock – Sheep and goats.

Grazing Objective – Graze to prevent seed production and reduce biomass.



Growth Stage for Treatment – Graze spotted knapweed heavily during the rosette or bolting stage. Livestock prefer young, smaller plants, but will usually readily consume it at all growth stages. Two grazing periods per year, once during rosette to bolting stage and again in the bud stage, provide the best control. Stem reductions, smaller plants, and lower seed production can occur after three to six consecutive years of grazing.

Potential Effectiveness – Sheep and goats readily graze spotted knapweed, considered to be moderately good forage for livestock. Sheep tend to strip leaves and avoid the fibrous stems of mature plants. Grazing can reduce plant vigor, density, size, flower stems, and seed production. It may be necessary to manage grazing based on degree of utilization of desirable species. Palatability may be reduced as the plant ages because of reduced forage value and the presence of a bitter-tasting compound called cnicin. Sheep digestive systems may suffer if diets are composed of more than 70% spotted knapweed. Grazing is most effective when combined with herbicide treatments.

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FORBS

Tansy Ragwort *Senecio jacobaea*

Description:

Tansy ragwort is a biennial or short-lived perennial plant that can grow up to 6 feet tall. It reproduces by seeds and from lateral roots. Seeds germinate in the fall or spring and develop into rosettes the first year. Leaves are serrated, deeply lobed, and grow up to 9 inches long. In the second and subsequent years, plants produce multiple branched stems, with smaller lobed leaves arranged alternately along the stem. Numerous small flowerheads are produced in dense clusters at the ends of the upper branches. The individual flowers are bright yellow with 10 to 15 petal-like flowers surrounding a button-like center of tiny disc flowers. Tansy ragwort has a short taproot that produces many spreading side roots.



Management Guidelines:

Type and Class of Livestock – All classes of sheep and cattle. Little information about the use of goats.

Grazing Objective – Prevent seed production and destroy seedlings and rosettes.

Growth Stage for Treatment – Best results are achieved when tansy ragwort is grazed in the rosette and bolting stages. Multiple defoliations during the season may promote a multiple-stemmed, perennial habit. Continuous or rotational grazing is better than a single treatment of short-duration, highly intense grazing. More than two years of successive grazing are needed to achieve adequate control.

Potential Effectiveness – Grazing at the rosette stage is considered to be the most effective time to control tansy ragwort, resulting in reduced plant density and height, defoliation of stems, and reduced seed production. Most sheep readily graze tansy ragwort, which is considered good sheep forage when comprising up to 50% of sheep diets. Multi-species grazing of sheep and cattle is effective in grass pastures infested with tansy ragwort. Grazing combined with vigorous perennial grasses competition provides the best management of tansy ragwort.

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FORBS

Yellow Starthistle *Centaurea solstitialis*



Description:

Yellow starthistle is a winter annual plant that can range from 10 inches to over 6 feet in height depending on growing conditions. Fall-germinated seeds quickly develop in deep-rooted rosettes of bright green, deeply lobed leaves shaped like an arrowhead. They grow from 6 to 8 inches long and 1 to 2 inches wide. Plants produce single or multiple branches that have matted hairs giving the plant a gray-green color. The stem leaves are small and linear with smooth edges and sharply pointed tips. The leaf blades extend down the stem giving it a “winged” appearance. A single, bright yellow flowerhead armed with 1-inch stiff thorns is produced on the end of each branch. Both plumed and unplumed brown seeds are produced in each flowerhead.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Graze heavily at least twice each year to prevent flowering and for several years to deplete seed-bank and reduce plant density.

Growth Stage for Treatment – Sheep and goats will graze yellow starthistle in all growth stages. Cattle will graze in the rosette to bolting stage but will avoid the weed beyond the late bud stage. Two or three treatments are needed if grazed in the rosette or bolting stage; grazing during or after flowering with goats may require only one treatment per year.

Potential Effectiveness – Targeted grazing to control yellow starthistle is strongly recommended for sheep and goats, less so for cattle. Goats are probably the most effective livestock to use for grazing of yellow starthistle because they will readily eat the plant in all growth stages. Grazing reduces plant vigor and plant size and suppresses flower production. Effective control depends on the prevention of flower and seed production, which can be achieved by grazing at least twice a year over several years. Yellow starthistle is highly toxic to horses.

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WOODY PLANTS

Blackberries *Rubus* spp.

Description:

Perennial; blooms June to August. Root buds produce trailing reddish stems with sharp spines that can grow more than 20 feet per season. Leaves alternate, palmate, and compound with serrate margins. Flowers five-petaled, white to light pink. Himalayan blackberry is the most widespread and economically disruptive of all the noxious weeds in western Oregon. It aggressively displaces native plant species, dominates most riparian habitats, and has a significant economic impact on right-of-way maintenance, agriculture, park maintenance, and forest production. It is a significant cost in riparian restoration projects and physically inhibits access to recreational activities. It reproduces at cane apices (tips) and by seeds, which are carried by birds and animals. This strategy allows it to expand quickly across a landscape or to jump great distances and create new infestations.

Management Guidelines:

Type and Class of Livestock – Goats and sheep.



Photo: Karen Launchbaugh, University of Idaho

Grazing Objective – Browse blackberries season long to achieve and maintain 95% stem defoliation or complete removal of young stems.

Growth Stage for Treatment – Livestock, especially goats, will readily consume blackberry seedlings and early-season growth. However, sheep or goats can browse blackberries year round, with average stocking rates of three to four animals per acre.

Potential Effectiveness – Goats are ideal for browsing blackberries, because they will consume the entire plant year round. Sheep will eat blackberries but not to the same extent as goats. Goats have the potential to destroy all top growth in a single year of grazing. Shrubs will regrow if grazing stops before the entire plant is destroyed, which may take a few to several years. Season-long browsing may require supplemental feeding of hay during the winter to maintain animal body weight. Grazing by goats or sheep is less costly than chemical or mechanical control of blackberries, especially in rough terrain. However, grazing can be integrated with herbicides or mechanical control. Any control strategy can be considered short-lived unless projects are planned and funded for the long term.

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WOODY PLANTS

Juniper *Juniperus* spp.



Photo: Bob Drinkwater, B.C. Ministry of Forests and Range

Description:

Juniper is a slow-growing, long-lived evergreen shrub or a small columnar tree. It generally has multiple stems that are spreading or upright. Juniper has a thin brown fibrous bark that peels in thin strips. Twigs are yellowish or green when young, turn brown and harden with age. The leaves are simple, stiff, and arranged in whorls of three with pungent odor. Young leaves tend to be more needle-like, whereas mature leaves are scale-like. The fruits are rounded, berry-like seed cones on short stems that are red at first, ripening to a bluish black. Juniper berries take two or three years to ripen, so that blue and green berries occur on the same plant. Each cone has two or three seeds.

Management Guidelines:

Type and Class of Livestock – Goats.

Grazing Objective – Remove biomass, young plants, and young stems.

Growth Stage for Treatment – Goats prefer seedlings or juvenile juniper plants or young regrowth from cut stems.

Potential Effectiveness – Goats will eat younger parts of the plant before consuming older juniper. Goats can graze year round and can be very effective in controlling juniper. Essential oils, or monoterpenes, that give the plant its distinct odor can deter animals from browsing. Studies have shown that goat breeds differ in their ability to tolerate the chemicals in juniper; Boer-Spanish goats are better than Angora goats. Offering a high energy/protein supplement may enhance goats' acceptance of juniper.

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WOODY PLANTS

Multiflora Rose *Rosa multiflora*

Description:

Multiflora rose is a vigorous, thorny shrub with clumps of long, arching stems 5 to 10 feet in height. The leaves are divided into five to 11 sharply toothed leaflets, each 1½ to 2 inches long. The base of each leaf stalk bears a pair of fringed bracts. Beginning in May or June, clusters of showy, fragrant white to pink flowers appear, each about an inch across. Small bright red fruits, or rose hips, are ¼ inch in diameter, develop during the summer, becoming leathery, and remain on the plant until spring. Multiflora rose spreads primarily by seeds.

Management Guidelines:

Type and Class of Livestock – Sheep and goats; not recommended for cattle.

Grazing Objective – Graze multiflora rose season long to achieve and maintain 95% stem defoliation.

Growth Stage for Treatment – Sheep and goats readily consume multiflora rose. Effective control requires intensive grazing early in the grazing season, followed by less intensive grazing later in the summer as pasture growth slows.

Potential Effectiveness – Livestock are highly recommended for long-term, sustainable management of multiflora rose. Goats will defoliate multiflora rose up to 5 feet tall. Goats are most effective; they are able to defoliate three times the amount as sheep in a single season. Even though goats or sheep can reduce multiflora rose in one season, it will take several seasons of grazing treatment to kill the plant. Goats or sheep will consume multiflora rose and other brush and open the area for grazing by cattle.

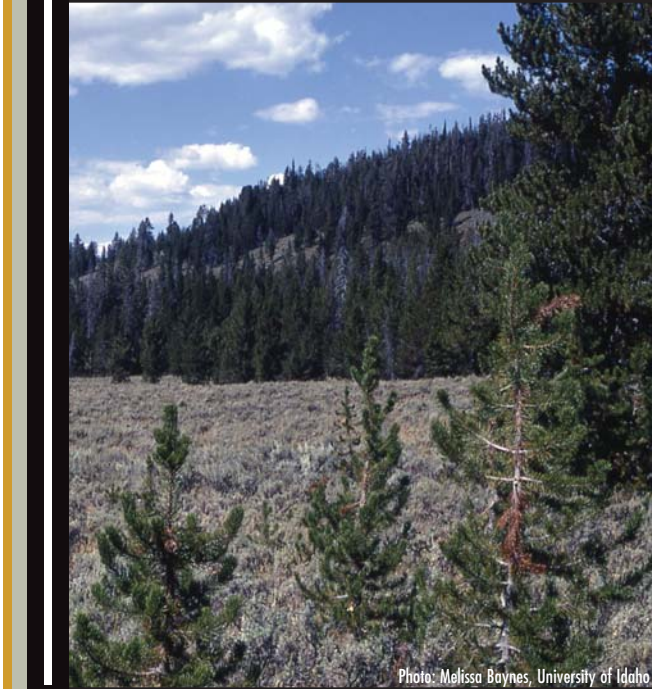
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WOODY PLANTS

Pine *Pinus* spp.



Description:

Encroachment of native pine trees into Western rangelands reduces area available for grazing livestock and wildlife.

Management Guidelines:

Type and Class of Livestock – Goats and sheep.

Grazing Objective – Stocking rate should achieve removal of more than half of the terminal leaders and lateral branches of young pine trees.

Growth Stage for Treatment – Browse saplings and juvenile trees during the winter months. Browse pine trees until desirable grasses and forbs have 2 to 3 inches of residual stubble and desirable shrubs have 60% utilization.

Potential Effectiveness – A single season of browsing pine can reduce plant height and diameter growth. Browsing more than half the branches for two consecu-

tive years can kill trees. Higher stocking rates (three to four sheep or goats per acre) will be needed in areas where pine density exceeds 300 trees per acre. Feeding with a high energy/protein supplement can increase the rate of pine browsing. Livestock should not be forced to browse continuously during the winter; a rest period of two to three weeks periodically during the season will provide the greatest overall control of pine encroachment.

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WOODY PLANTS

Saltcedar *Tamarix ramosissima*

Description:

Saltcedar, or tamarisk, is a deciduous shrub or small tree growing 12 to 15 feet in height and forming dense thickets. Saltcedar is characterized by slender branches and gray-green foliage. The bark of young branches is smooth and reddish-brown. As the plants age, the bark becomes brownish-purple, ridged and furrowed. Leaves are scale-like, less than an inch long, and overlap each other along the stem. Leaves are usually encrusted with salt secretions. From March to September, large numbers of pink to white flowers appear in dense masses on 2-inch-long spikes at the tips of branches.

Management Guidelines:

Type and Class of Livestock – Goats (especially wethers). Not recommended for sheep and cattle.

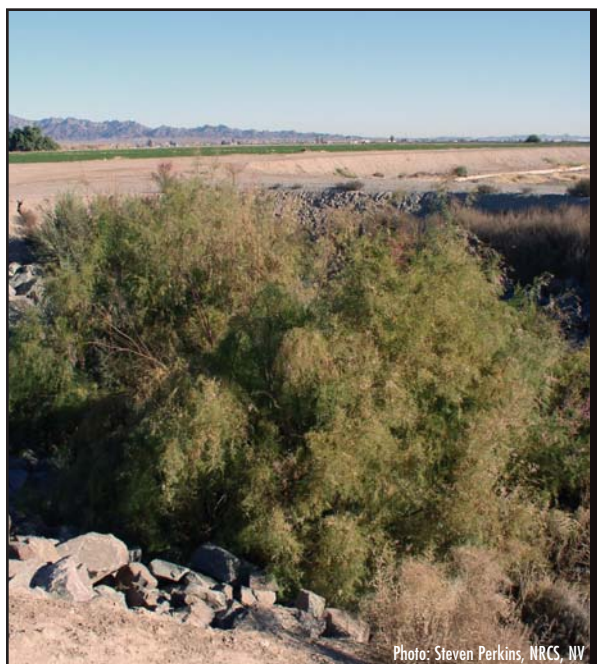
Grazing Objective – Severe defoliation to deplete root reserves and prevent establishment of new plants.

Growth Stage for Treatment – Goats have a preference for young shoots, but will readily browse shoots that are up to four years old. Repeated browsing during the season is needed to limit resprouting and to remove new seedlings.

Potential Effectiveness – Browsing of saltcedar is effective to reduce size and density of trees and potentially eliminate saltcedar from specific sites. Goats must consume most or all resprouts and seedlings for at least three to five years. Goats can effectively control and ultimately eliminate saltcedar. They will browse sprouts after mature plants are cut and/or burned. Maintaining a healthy perennial grass understory to prevent seedling establishment is key to long-term management of saltcedar infestations.

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GRASSES

Cheatgrass (or Downy Brome) *Bromus tectorum*

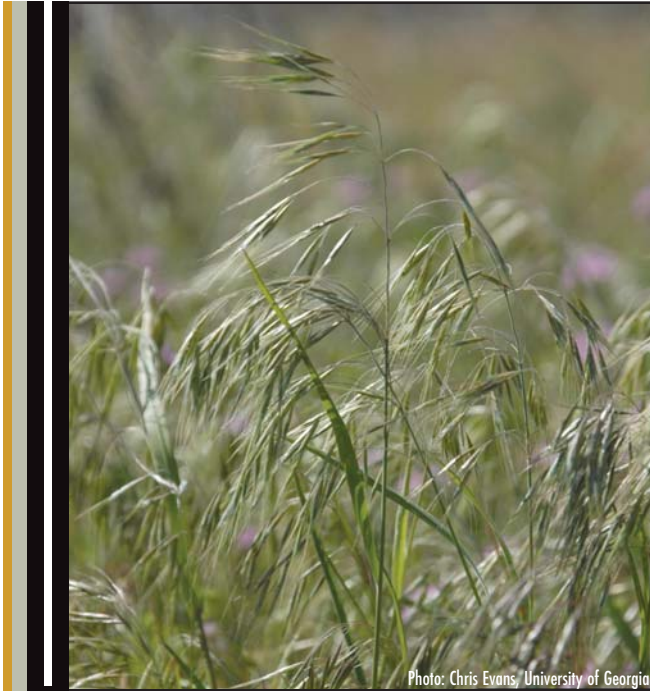


Photo: Chris Evans, University of Georgia

Description:

Cheatgrass is an aggressive winter annual grass that can grow up to 2 feet tall. Seeds germinate in the late winter or early spring. The leaves are flat, wide, and bristly at the base, giving the plant a downy appearance. Each plant can have multiple upright stems. Cheatgrass flowers as an open panicle, each with five to eight florets tipped with a short awn. Plants mature to a wheat color by early summer.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.

Grazing Objective – Intense flash grazing (i.e., grazing for short period) is recommended to remove biomass, decrease plant density, and suppress flowering.

Growth Stage for Treatment – Graze cheatgrass plants as early as possible without harming desirable perennial plants, and repeat grazing to prevent seed production.

Livestock readily consume cheatgrass when it is green and before it turns purple. A minimum of two treatments per year is recommended. Two or more years of grazing is required to significantly suppress cheatgrass populations.

Potential Effectiveness – Surveys and literature agree that targeted grazing is an effective tool to control cheatgrass. Heavy repeated grazing for two or more years will reduce plant density, size, and seed production. Grazing must be closely monitored to avoid damage to desirable perennial plant species. Control of cheatgrass can be very effective when livestock are intensively managed and grazing occurs before plants turn purple. Grazing can also be used in conjunction with mechanical methods, herbicides, and controlled burning.

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GRASSES

Medusahead Rye *Taeniatherum caput-medusae*

Description:

Medusahead is a winter annual grass that normally grows 6 to 10 inches tall. It begins growing in the fall and produces narrow, rolled leaves giving plants a slender appearance. One to several stems grow upright from the base of the plant and produce a dense spike of individual florets each with thin awns 1 to 4 inches long. Flowering occurs in late May to June after other annual grasses. The florets do not easily break apart when mature, as the individual seeds fall out, leaving the long thin bristles attached to the seed head. The plants turn from a wheat color to a very light cream color after the seeds disperse. The plant normally contains large amounts of silica, allowing the dead plants to remain in place longer than other annual grasses.

Management Guidelines:

Type and Class of Livestock – All classes of sheep, goats, and cattle.



Photo: Lovina Roselle, University of Idaho

Grazing Objective – Graze early in season to prevent seed production and reduce medusahead mulch.

Growth Stage for Treatment – Graze winter rosettes in the spring. Palatability drops rapidly as plants flower and mature.

Potential Effectiveness – Grazing causes a decline in plant vigor and density after two years of intensive grazing. Very effective if grazed repeatedly and seed production is prevented. Grazing can be combined with a burning, mechanical methods, and herbicides.

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