

Water Quality Enhancement Activity – WQL01 – Biological suppression and other non-chemical techniques to manage brush, herbaceous weeds and invasive species



Enhancement Description

This enhancement is for the reduction of woody brush, herbaceous weeds and invasive plants using non-chemical methods. Physical methods include pulling, hoeing, mowing, mulching or other similar techniques. Biological methods include use of natural enemies either introduced or augmented. Use of chemicals is prohibited with this enhancement.

Land Use Applicability

Pastureland, Rangeland, Forestland

Benefits

Environmental benefits will be site specific. Benefits may include but are not limited to improved water quality achieved through eliminating the use of synthetic pesticides resulting in no chemicals in surface runoff or leaching into the soil profile. Air quality will see similar impacts by eliminating chemical drift and volatilization. Controlling invasive species, brush and weeds will allow native plant communities to return and improve wildlife habitat.

Conditions Where Enhancement Applies

This enhancement applies to all pasture, range or forest land use acres.

Criteria

1. Develop a plan for managing invasive plants, brush and/or weeds that includes:
 - a. Assessment of existing conditions,
 - b. Identify strategies for control,
 - c. Control methods selected,
 - d. Monitoring and evaluation process, and
 - e. Operation and maintenance follow up activities.
2. Implementation of this enhancement requires the use of biological and/or physical pest suppression techniques instead of pesticides. These techniques, used individually or in combination, can include activities such as:
 - a. Grazing animals (primarily through the use of goats) to target undesirable vegetation.
 - b. Introduction of beneficial insects to attack undesirable vegetation.
 - c. Introduction of beneficial micro-organisms to attack undesirable vegetation.



- d. Prescribed burning
- e. Hand removal or cultivation
- f. Mowing or cutting
- g. Use of heavy equipment in areas with well established, dense brush cover
3. Biological suppression techniques should be based on techniques recommended by the local Land Grant University.
4. Biological suppression must be preceded by an analysis to ensure the proposed biological agent is compatible with the agronomic, ecological and social objectives of the operation.
5. Operation and maintenance activities must be followed to ensure regrowth or resprouting is controlled. Additional treatment of individual plants or areas needing retreatment should be completed as required to effectively controlling the targeted species.

Adoption Requirements

This enhancement is considered adopted when invasives are being managed via biological or physical methods described above and no pesticides were used.

Documentation Requirements

Written documentation for each treatment area and year of this enhancement including:

1. A full description of all biological and/or physical suppression techniques utilized include:
 - a. Method (s) of control used
 - b. Area (s) on farm control methods were applied
 - c. Number of animals or insect colonies distributed and the planned time frame of the treatment.
 - d. Photograph (s) of treatment applied
2. A map showing where the activities were applied including treatment acreage

Michigan Supplement

WQL01

Implementation of this enhancement requires the use of biological and /or physical pest suppression techniques instead of pesticides. These techniques can include:

- Grazing animals to target undesirable vegetation
- Introduction of beneficial insects or micro-organisms
- Hand Removal
- Cultivation
- Mowing
- Heavy Equipment in areas with dense brush cover

Biological Brush Control

Biological brush control is the use of animals, insects, plants or pathogens to control brush. Goats and sheep are two examples of livestock that will eat brush including multiflora rose and autumn olive. The key to control is repeated heavy defoliation in spring and early summer without overgrazing the grasses and legumes.

Research suggests that the grazing of sheep or goats for two seasons at a rate of eight to twelve goats/sheep per acre may be required in the early season. This stocking rate may be reduced later when pasture growth slows. A rotation system works best. Multi-species grazing (Table 1.) can be effective at clearing and subsequent killing of brush in pastures. Goats will defoliate and de-bark bushes, saplings, and small trees and by standing on their hind legs, they can defoliate stems to a height of 5 feet.

Brush Reduction

For brush reduction, identify the priority paddock or area. Use high density grazing beginning when the leaf of the target brush is one half to two thirds full size in the spring. Percent defoliation to achieve depends on the species of brush. Follow the grazing schedule for rotation in the grazing plan. Pull animals out of rotation and put them back into the priority area to achieve desired defoliation. Repeat this process.

Alternatively, a 30 day in and 30 day out switchback method may be used to defoliate target species at least 65% and up to 95%. Multiple years of grazing animal control will be needed to obtain desired control. Alternate the starting paddock or area each year.

Table 1 - Stocking Rate Guide for Brush Control

Pasture Type	Brush Canopy	Cows	Goats or Sheep Alone	Cows + Goats/Sheep
Brushy Pasture	10-40%	1	9-11	1 + (2 to 4)
Brush Eradication	>40%	Not recommended alone	8-12	0.5 + (6 to 8 per acre)

Herbaceous Weed Control

Understanding the biology of the target weed species is essential for selection of the biological suppression technique and the management needed to apply the technique. Herbaceous pasture weeds can be annuals, biennial, or perennial species. Weeds that move and invade new habitats are among the most dangerous and destructive of the herbaceous pasture weeds. Other herbaceous weeds produce huge numbers of seeds per plant and have excellent dispersal systems that facilitate seeds finding bare ground for establishment. Correct weed identification is essential to choosing a suppression technique. Confirm the weed species' toxicity to protect livestock from consuming toxic weed species.

Maintain High Quality Pastures

One of the key factors to weed infestation is the pasture condition of the infested site. The first step in pasture weed control is to maintain a healthy and vigorous forage plant base through appropriate and timely amendments to the soil as indicated by a soil nutrient analysis. Healthy soils support healthy, vigorous plants.

Apply Grazing Management

Good grazing and/or haying management can enhance weed control and prevent the buildup of perennial pasture weeds. Livestock can either reduce or aggravate weed problems in pastures, depending on how they are managed. Correct stocking rates and suitable recovery periods generally improves pasture quality and minimizes weed growth. Evaluate the pasture for weed distribution, and then adapt the grazing management to target the priority areas. Plan livestock grazing to occur before the weeds set seed for the most effective control. To reduce the risk of weed seeds being transported to new paddocks, livestock that are being used to graze noxious weeds when the plants are flowering must be quarantined for a period of time and fed weed-free forage before moving them to any location that is weed free. The amount of time mentioned in the literature ranges from 5 to upwards of 14 days.

Grazing in the early spring will remove new growth, requiring the plant to utilize root and crown reserves while significantly reducing photosynthesis and subsequent food production. If continued for long enough, the plant is weakened and may die. Grazing later in the spring can prevent flowering and seed formation, reducing the opportunity for seed production. Grazing the target weed during the growing season can stress the weed while allowing desirable plants to grow with reduced competition. Fall grazing can disrupt the flow of plant nutrients to the roots and crowns of the plant and, as a result, reduce carbohydrate reserves necessary for subsequent spring growth.

Grazing plans will describe the implementation of one of these grazing strategies:

- Priority area rotational grazing- the key area infested by the target weed is identified in each pasture or paddock. Livestock graze in the priority area long enough to achieve 50% defoliation of the desirable forage plants. It may be necessary to confine livestock with temporary fencing, forcing them to consume the weeds. Grazing weed control works best on weeds that are high quality forage such as johnsongrass, quackgrass, crabgrass, lambsquarters and pigweed. Move livestock to different paddocks allowing the priority area desirable vegetation to recover. Repeat the process in the priority area during the grazing season.

- High density short duration grazing- Stock paddocks infested by the target weeds with high livestock numbers to remove greater than 50% defoliation of weeds in a short period of time, followed by a long rest period. Grazed stubble height of desirable forage plants should not be allowed to reach below 2 inches. The number of paddocks, grazing capacity and stocking density will determine the number of times a treated area will be grazed.
- Multi-species grazing (Table 2) - Cattle, horses, and bison are true grazers preferring grasses, clovers and palatable legumes. Goats are true browsers, eating a high percentage of shrubs and forbs. Sheep are intermediate grazers, eating grasses and legumes along with palatable forbs and shrubs. Swine not only graze, but will dig into the soil to root out and consume fleshy roots of some perennial weeds. Weeder Geese are certain African and Chinese varieties of geese used for removal of young grasses and other weeds. Weeder geese are introduced to pastures at six to eight weeks of age, and usually utilized for weed control for one year only. Combining species can reduce the weeds rejected by the livestock. Multi-species grazing management should follow the priority area rotational grazing model.

Encourage Weed And Weed-Seed Consumers

Herbivorous or seed-eating insects, specific microbial pathogens of weeds, and soil micro-organisms have the potential to suppress weed germination, emergence or growth. Insects can control weeds by feeding on seeds, flowers, leaves, stems, roots, or combinations of these, or by transmitting plant pathogens, which will infect plants. Farmscaping to provide habitat for weed and weed-seed consumers will conserve the biological controls already present in the pasture.

The more ground cover maintained and diverse the ecosystem the more likely weed consumers will be present. Maintaining season-long diverse habitat, including leaving un-grazed field borders and adding forbs, legumes, and wildflowers as well as avoiding the use of insecticides on pastures and hayfields can encourage weed seed consumers.

Table 2 - Animal Species for Multi-Species Grazing By Weed

Herbaceous Weed Common name	Animal Type			
	Sheep	Goats	Cattle	Horses
Canada thistle	X	X	X	NR
Musk thistle	X	X	X	NR
Spotted knapweed, young	X	X	X	X
Leafy Spurge	X	X	X	Toxic
Field Pepperweed	X	X	NR	NR
Quackgrass	X	X	X	X
Hoary Allysum	X	X	X	Toxic
Smartweed	X	X	X	NR
Crabgrass	X	X	X	X
Pigweed	X	X	X	NR
Lambsquarter	X	X	X	NR
Foxtails	X	X	X	X
Common ragweed	X	X	X	X
Chickweed	X	X	X	X
Henbit	X	X	X	X
Shepherds Purse	X	X	X	X

NR= not recommended

References

Davison, J, E. Smith and L. Wilson. Livestock grazing guidelines for controlling noxious weeds in the western United States. University of Nevada, Reno Publication EB06-05. Available online <http://www.unce.unr.edu/publications/files/ag/2006/eb0605.pdf> accessed 7/28/2009.

Dufour, Rex. Farmscaping to enhance biological control (online). National Sustainable Agriculture Information Service ATTRA Publications CT065 . <http://www.attra.org/attra-pub/farmscape.html> accessed 7/28/2009.

Olson, B and K. Launchbaugh. 2006. Chapter 7 Managing herbaceous weeds and targeted grazing. *In Targeted Grazing: a natural approach to vegetation management and landscape enhancement.* American Sheep Industry. Available online. http://www.cnr.uidaho.edu/rx-grazing/Handbook/Chapter_7_Targeted_Grazing.pdf

Schonbeck, Mark. Utilize biological processes to further reduce weed pressure (Online). eXtension Cooperative Extension System and Michigan State University Extension. <http://www.extension.org/article/18548> accessed 7/27/2009.

Weeden, C.R., A. M. Shelton, and M. P. Hoffman. Biological Control: A Guide to Natural Enemies in North America (Online). <http://www.nysaes.cornell.edu/ent/biocontrol/> accessed 7/27/2009.

Campbell, E. and C.A. Taylor Jr. 2006. Chapter 9 Targeted grazing to manage weedy brush and trees. *In Targeted Grazing: a natural approach to vegetation management and landscape enhancement.* American Sheep Industry. Available online. http://www.cnr.uidaho.edu/rx-grazing/Handbook/Chapter_9_Targeted_Grazing.pdf

Dalington, Jamey and Bruce M. Loyd. 194. Control of Autumn Olive, Multiflora Rose, and Tartartian Honeysuckle. West Virginia University Extension Service. www.wvu.edu/~agexten/pubnwsltr/TRIM/5412.htm

Luginbuhl, J-M, J T Green, M H Poore and J P Mueller. 1996 Use of goats as biological agents for the control of unwanted vegetation. Proceedings of the Internation Workshop "Los Arboles enlos Sistemas de Produccion Ganadera", Indio Hatuey Pasture and Forage Experimental Station, Matanzas.

USDA NRCS Missouri. Prescribed Grazing 528 Appendix 3 Plant Control with Goats.

Wood, G. M. 1987. Animals for biological brush control. *Agronomy Journal* 79: 319-321.