

BRUSH MANAGEMENT DESIGN PROCEDURES 314DP

BACKGROUND

Brush management is the application of management or a method of treatment to remove, reduce, or control perennial woody (non-herbaceous or succulent) plants that are invasive and noxious for the purpose(s) of:

- Create the desired plant community consistent with the ecological site.
- Restore or release desired vegetative cover to protect soils, control erosion, reduce sediment, improve water quality or enhance stream flow.
- Maintain, modify, or enhance fish and wildlife habitat.
- Improve forage accessibility, quality and quantity for livestock and wildlife.
- Manage fuel loads to achieve desired conditions.



Brush Management shall be installed in accordance with the [NRCS Brush Management Standard \(314\)](#), as detailed in the Nebraska Field Office Technical Guide (FOTG). These Design Procedures address brush management techniques along with the positive and negative aspects of each technique. Planners shall recommend the technique(s) best suited to the site that meets the objective of the land manager.

Only chemical, mechanical and biological treatments are included in this particular Design Procedure. Prescribed burning for brush management purposes is covered in the Prescribed Burning (Code 338) standard, and can be used in combination with chemical, mechanical, and biological treatments. The design procedures in this document are divided into four sections as follows:

- **Considerations for determining the need for brush management (p. 1)**
- **Inventory procedures to assess the brush resource (p. 3)**
- **Relationships to consider between brush management, wildlife habitat, and soil erosion (p. 4)**
- **Techniques for managing brush with treatments ranging from mechanical to biological, to chemical or combination thereof (p. 6)**

DETERMINING THE NEED FOR BRUSH MANAGEMENT

Brush control should be considered if the existing or expected brush component interferes with, or has the potential to interfere with, the land resource objectives. For some species, brush control to the point of eradication is appropriate in situations where a noxious woody species, such as salt cedar, has become established but currently has not infested a vast acreage. For other species, brush management might consist only of containment, reducing the plant's ability to move into additional acres while allowing compatible uses, such as grazing.

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Recommendations for prioritizing brush managements needs are presented in Table 1.

Table 1. Recommendations for Categorizing Brush Levels in Canopy Cover OR Plant Density

Density Category	Canopy (percent)	Plant Density (no. of plants/acre)
O&M	<5	0-24
Low	5-20	25-150
Medium	21-50	151-370
High	51-70	371-500
Excessive	>71	501 +

Some species of brush are present in the reference plant communities as listed in Ecological Site Descriptions. Other species such as eastern red cedar, Siberian elm, Russian olive, tamarisk and honey locust are invasive in grassland communities. Brush levels for invasive species at 5% and below or plant densities below 25 plants per acre are considered to be operation and maintenance (O&M). Land users should be encouraged to remove invasive brush species when levels are low because treatment is more effective and less costly.

Treatment methods for brush control are almost always more economically feasible when plants are young and have not expanded to the extent of occupying thick stands or closed canopies. Early and regular treatment combined with on-going, long-term management will be most effective before woody plant densities exceed 150 plants per acre or canopy cover percentages exceed 20 percent.

Plant populations of greater than 70% canopy cover/density of over 500 plants per acre are consider past the threshold of economic return.

Woody plant species may also increase or invade to the point where accelerated control measures may be necessary to meet resource objectives. Where available, the ecological site description for the site(s) involved can provide additional information regarding plant community dynamics and management. Where the objective is to restore natural plant community balance, brush management should be planned in such a way as to not remove more woody species than indicated in the Ecological Site Description for the desired plant community. **Tree or brush species not listed in the Ecological Site Description for the desired plant community are considered invasive for the site and removal of these species is recommended to prevent excessive brush levels.**

Refer to [Biology Technical Note No. 65](#), "Terrestrial Natural Communities of Nebraska," for additional guidance on the appropriate species composition for native plant communities. Several forest and woodland natural communities, including many of the oak associations and cottonwood riparian areas, are noted as imperiled. Brush Management and/or [Forest Stand Improvement \(666\)](#) may be used to improve the condition of these habitats provided that appropriate native species are maintained during implementation. Likewise, shrub components of prairie plant communities, such as Sand Sage Prairie, Silver Sagebrush Shrub Prairie, and Greasewood Shrub Prairie are imperiled in Nebraska and caution should be used when applying brush management in these areas.

Brush management should be planned for the entire acreage containing brush in excess of O&M levels unless an alternative use applies as described in other portions of this standard. The treated area should be managed according to its needs.

INVENTORY PROCEDURES FOR BRUSH

A field inventory of the brush species to be controlled is necessary before treatment alternatives can be recommended. Field inventory procedures are described in [Nebraska Range and Pasture Technical Note #17, Nebraska Field Inventory Procedures for Determining Brush Canopy Cover and Density Using Photographic Guides](#) and [Nebraska Range and Pasture Technical Note #21, Determining Canopy Based on Average Tree Canopy Diameter and Trees Per Acre](#). Ocular estimates of woody plant cover and/or density are used in photographic guides to help in quantifying field measurements. Other inventory methods are described in Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Herrick, et al., Chapter 12.

Measurements for woody plant species can be expressed in terms of density as measured by the number of plants per acre, or as the percentage of crown canopy these plants occupy. Canopy is defined as the percent of the ground shaded by a species with the sun in a vertical position over it. Young woody plants, such as eastern red cedar less than six feet in height may be easier to measure in terms of density, while more mature trees or brushy thickets, such as sumac or buckbrush, may be easier to measure in terms of canopy.

Many woody plant species initially removed will resprout from roots or stumps. These species often require a follow-up chemical or grazing treatment to ensure successful control. Table 2 lists a variety of woody plant species and their sprouting potential following removal. Note that several of the species listed may be desirable to maintain in order to provide wildlife habitat and contribute to ecological diversity.

Table 2. Resprouting Potential of Woody Plant Species Following Removal

Dominant Woody Plant Species	Resprouting from Roots or Stumps	Dominant Woody Plant Species	Resprouting from Roots or Stumps
Buckbrush	yes	Russian olive	yes
Cottonwood	yes	Sageworts (fringed and prairie)	yes
Dogwood	yes	Salt cedar	yes
False indigo	yes	Sand sagebrush	yes
ts (black and honey)	yes	Siberian elm	yes
Osage Orange	yes	Soapweed (yucca)	yes
Prickly-pear cactus	yes	Smooth sumac	yes
Eastern red cedar	no	Willows	yes
Rocky Mountain juniper	no		

Where mixed brush exists, control measures will be prescribed for the species that is of the greatest concern. Multiple treatments can be prescribed if they are compatible. Treatments for secondary species may be recommended if compatible. Follow-up treatment will be needed for most brush species. Where chemical methods are used, retreatment should be delayed until adequate top growth has occurred to assure translocation of the herbicide. Do not apply brush treatment to root-sprouting species unless an accompanying follow-up treatment is recommended.

BRUSH MANAGEMENT CONSIDERATIONS IN RELATION TO WILDLIFE HABITAT AND SOIL EROSION

Wildlife Habitat

Where the objective is to improve, maintain, or enhance wildlife habitat, brush management will be planned and applied in a manner to meet the habitat requirements of the wildlife of concern, and either an [Upland Wildlife Habitat Management \(645\)](#) plan or [Wetland Wildlife Habitat \(644\)](#) plan will be developed. Refer to Wildlife Habitat Evaluation Worksheets NE-[CPA-32](#), [CPA-33](#), [CPA-34](#), [CPA-35](#) and [CPA-36](#) and NE- [CPA-43](#) or Species Habitat Evaluation Tools or Habitat Suitability Index Models for the land use or species of concern.

Brush management will be planned in a manner that it will not adversely affect threatened or endangered species (plant, or animal) or their habitats. The Areas of woody cover providing important habitat for threatened and/or endangered species and/or migratory birds will be inventoried and evaluated in order to encourage landowners to implement alternatives that avoid negative habitat impacts.

These alternatives may include: leaving areas undisturbed, adjusting treatment methods or timing, and conducting wildlife surveys prior to initiating treatment activity.

The impact of brush management activities on migratory birds must be assessed. Refer to associated guide sheets on [NE-CPA-52 Environmental Evaluation](#) for Endangered and Threatened Species or Migratory Bird considerations.

When significant changes are planned for an existing woody plant community, consideration should be given to wildlife species dependent on the target woody plants. When planning block treatments, consultation with a wildlife biologist to assess impacts to these species is advised.

When planning the brush management treatment consider the composition of the historic plant community and the habitat needs of associated wildlife species. The type of cover and size of the areas to be retained in woody cover depends on the type of wildlife to be benefited, client objectives, and the need for soil erosion protection. In general, treatments that create a mosaic are desirable.

The following provisions may be used as a guide to wildlife enhancement:

- Manage brush to provide travel lanes, thermal and escape cover, loafing areas, and browse plants.
- Where slope of the land provides opportunity, leave brush areas on steep escarpments, ravines, rocky hillsides, and other rough formations. On areas of uniform slopes, leave strips or clumps of brush to provide food and cover.
- Tree-lined drainage ways can provide thermal cover and other habitat components. Maintain fruit and mast trees to produce food for wildlife.
- When important to fisheries and aquatic species, sufficient woody cover should be retained in riparian areas to provide for shading, bank stability, and detritus.

When brush is being managed to improve rangeland, consideration should be given to leaving selected areas of desirable food and cover plants for wildlife. In mixed brush, less desirable species may be controlled to promote the development of the more important species that contribute to wildlife food and cover.

Table 3 lists some native woody plants especially valuable for food and cover for wildlife. The relative importance of plant species may change from one location to another, due to the targeted wildlife species and the influence of plant associations, soils, climate, and stage of maturity. Refer to Section II of the FOTG Windbreak Interpretations, [Conservation Tree and Shrub Groups](#), for more information on additional native shrubs/trees, and tree and shrub attributes.

Table 3. Native Woody Species Valuable for Wildlife Food or Cover

TREE SPECIES		SHRUB SPECIES	
American elm	Hackberry	Antelope	Nannyberry
Basswood	Hickory – all species	Chokecherry	Plum
Black cherry	Honey locust	Coralberry	Rose (Arkansas or Woods)
Black walnut	Oak – all species	Currant – all species	Sandcherry
Boxelder	Ponderosa pine	Dogwood – all species	Sage – all native species
Cottonwood	Quaking aspen	Elderberry	Serviceberry
Eastern red cedar	Red mulberry	Hazelnut	Silver buffaloberry
Eastern redbud	Rocky Mt. juniper	Leadplant	Snowberry – all species
Green Ash	Willow – (Black or Peach-leaf)	Mountain mahogany	Willow – all native species
American Plum			

1/ Under site-specific circumstances, it may be desirable or necessary to reduce or eliminate tree/shrub species that provide wildlife habitat in order to restore or maintain the overall ecological health of the plant community.

Soil Erosion

Soil erosion can be a short term impact associated with some brush treatment practices, depending on site conditions and recovery potential. Consider soil erosion potential and the difficulty of vegetation establishment when choosing a method of control that causes soil disturbance. Mechanical brush management operations should be planned at times that minimize the exposure of bare soil to erosion by wind and/or water. If soil erosion is anticipated, recommend a mitigating treatment, such as range seeding, mulching, constructing water-bars, or choosing an alternative timing of treatment. Both the short and long-term effects of the brush management recommendation should be documented on NE-ECS-52.

BRUSH CONTROL TECHNIQUES

General Comments Applicable to All Brush Control Techniques

The use of a single control method in a single application is often not sufficient to achieve brush management goals because woody plant species respond differently to any given control method, depending upon: time of year, plant growth stage, plant growth characteristics, climatic conditions, and other factors.

Follow-up treatments or application of a combination of treatment methods are often necessary to achieve desired results. Some brush management activities may require multiple years of treatment to achieve desired objectives.

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Select a combination of methods to control woody plants to a level compatible with landowner objectives and ecological values. Refer to [Nebraska Range and Pasture Technical Note #18, Procedures Using Targeted Grazing – Invasive Plant Management](#), [Nebraska Range and Pasture Technical Note #19, Salt Cedar – Weed Management Strategies](#), or [Nebraska Range and Pasture Technical Note #20, Quick Guide to Invasive Plant Treatment](#) for additional guidance on control methods that may be applicable.

The goals and objectives for all brush management plans should be clearly stated. Describe the area to be treated using maps, drawings, and/or narratives. Include areas to be left undisturbed, as well as the pattern of treatment (if applicable).

Develop a monitoring plan that details the documentation of changes in the plant community in relation to the brush management plan objective and includes information on the timing of measurements and the frequency of observations. The monitoring plan will reference changes to the pre-treatment cover or density of the target plants and the planned post-treatment cover or density.

The requirements for determining successful application of the brush management practice are described in the treatment narratives presented for mechanical, biological, chemical, and prescribed fire methods of control (Table 4).

Table 4. Requirements for Determining Successful Application of the Brush Management Practice

TREATMENT METHOD		% MORTALITY OF TARGET SPECIES
MECHANICAL	Dozing	>95% of above ground stems <6 inch stumps
	Shearing	
	Sawing	
	Pulling/Grubbing	>95% of above ground stems
	Brush Mower	100% of above ground stems, <3 inch stump
	Girdling	>95% of top growth above girdle
BIOLOGICAL	Grazing	Reductions as planned in Prescribed Grazing Plan (528) within 3 years. Water and soil resources show minimal adverse effects.
CHEMICAL 2/	Foliar	>80% of target species
	Cut and Frill	>80% of target species
	Basal	
	Stump	>95% of above ground stems are removed
	Soil Applied	80% of target species
PRESCRIBED FIRE	All Junipers <5 ft. tall	90% or > Control
	All Junipers >5 ft. tall	+/- 50% Control
	With Mechanical Treatments	+/- 70% Control

1/ Includes in combination with chemical treatment for sprouting woody plants.

2/ Includes control on sprouting woody plants.

Mechanical Treatments

Mechanical treatment methods may involve the removal of top growth alone or the removal of stumps and roots as well as top growth. Once completed, the site should be smoothed enough so that subsequent management activities can be completed without hazard to equipment or livestock. Stumps and roots should be removed or left undisturbed below the soil surface. Debris should be stacked, burned, and/or buried to meet landowner ecological restoration objectives and state or local ordinances. For details on building a debris pile of green material for subsequent burning, refer to the NRCS video, "Windbreak Renovation", 2001.

Dozing

Removal of brush using standard construction equipment is a common practice. A single dozing operation can be effective on brush species that do not resprout from roots or stumps. Refer to Table 2 for a list of common woody plant species in Nebraska that tend to resprout from roots or stumps. To effectively control resprouting species by dozing alone will require extensive soil disturbance that removes the stump and roots. After the initial removal, additional control methods, such as chemical, mowing, or prescribed grazing, may be needed to provide adequate control of resprouts.

Risks of erosion may increase with dozing. Substantial smoothing and leveling of the site may be necessary to establish herbaceous vegetation or to facilitate future management of the area. Root and limb cleanup by hand may be required prior to seeding where soil becomes mixed in the debris pile.

The U.S. Army Corps of Engineers should be contacted for permit requirements when conducting dozing in riparian zones that may impact stream channels and wetlands.

Requirements of a Successful Dozing Operation:

- Greater than 95% of the above ground stems should be removed from the root systems leaving no more than a 6 inch high stump. If the site is to be negotiated with machinery and/or livestock, the stumps should have minimal ragged edges and be as low to the ground as possible.
- If roots and stumps are to be removed, the site should be leveled and cleaned enough so that normal farm machinery can negotiate the site.
- Depending upon site needs or landowner objectives, debris may be left in a uniform layer spread about the site or stacked in windrows or piles.
- Root and basal resprouts must be addressed as needed to meet plan objectives.

Shearing, Rotobeating and Rolling Choppers

Shearing is the removal of the above ground portion of the plant by specialized machines, such as feller-bunchers, shear blades, hydraulic saws, etc. It is very effective on conifers, but in many cases it will encourage sprouting on young shrubs and deciduous trees. Roto-beaters and rolling choppers can effectively remove the top growth of woody plants less than 4 inches in diameter and reduce the size of the debris to a mulch-like product. The depth and extent of the mulch should be managed to avoid excessive build-up of debris in a concentrated area where subsequent re-seeding or desired herbaceous plant regrowth is planned.



Seppi Rotobeater or Mower

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This method works well when combined with chemical stump treatments or foliar herbicide applications. Shearing, rotobeating or chopping removes the top growth and exposes the cambium layer in the stump for herbicide application. To prevent resprouting, an appropriate chemical must be applied to the cambium layer within minutes of the top being removed (see page13 for a reference to chemical treatments for stumps).

Time the treatment to allow for vigorous brush regrowth that can subsequently be sprayed, burned or grazed. For example, shearing in July would allow a vigorous regrowth that could be grazed or sprayed in August or September, and thus kill or stress the plants as they try to build up root reserves prior to winter dormancy.

Surface soil disturbance is usually minimal; however, compliance with buried utility and cultural resource protection policies must be followed.

With properly sized machines, shearing can quickly remove larger diameter brush. Many shears or hydraulic saws are ineffective at removing smaller diameter (less than 3 inch) stock. The rotobeater or rolling chopper will be a more effective machine at removing these smaller diameter species. The particular machine used and skill of the operator will determine how rough the site is left and how effectively debris can be cut, sheared, and stacked.

Shearing can be accomplished with a wide assortment of specialized tools that require machinery ranging in size from medium-sized skid steer loaders to large bulldozers. Sheer blades on dozers can clear a large acreage in a fairly short time, but leave a rough site that is difficult to access with traditional farm equipment without further cleanup. Shears and similar tools on skid steer loaders can leave a clean site but require that each tree or shrub be sheared individually.

Requirements of a Successful Shearing, Rotobeating, or Rolling Chopper Operation:

- Greater than 95% of the above ground stems shall be removed from the root systems leaving no more than a 6 inch high stump. If site is to be used with livestock or machinery, the stumps should have minimal ragged edges and be cut as low to the ground as possible.
- Smaller stems that are unable to be sheared must be cut with hand equipment or by some other method if necessary to meet plan objectives.
- Debris may be left in a uniform layer spread about the site or stacked in windrows or piles, depending upon site needs or landowner objectives.
- Root and basal resprouts must be addressed as needed to meet plan objectives. They may be left to grow or killed using chemicals, grazing or fire.



Effective control of deciduous woody plants will depend upon immediate treatment of the stumps with an approved herbicide. Herbicide requirements may dictate when brush should be cut. Stump heights shall be low enough to meet landowner objectives and not prevent subsequent management of the area.

Sawing

Chain saws, larger capacity brush trimmers, and specialized saws on tractors and skid steer loaders can be effectively used to remove top growth. As with shearing; effective control of deciduous plants will depend upon immediate treatment of the stump with an approved herbicide. Herbicide requirements may dictate when brush should be cut. Stump heights shall be low enough to meet landowner objectives and not hinder subsequent management of the area.

Requirements of a Successful Sawing Operation:

- Greater than 95% of the above ground stems shall be removed from the root systems leaving no more than a 4 inch high stump. Remaining smaller stems should be hand cut, if necessary, in order to meet plan objectives.
- If the site is to be negotiated with machinery and/or livestock the stumps should have minimal ragged edges and be cut as low to the ground as possible.
- Cuts should be nearly horizontal. Avoid angled cuts as they increase the danger to the saw operator and increase the likelihood of vehicular damage or livestock injury.
- Debris should be left in a uniform layer spread about the site, or stacked in windrows or piles depending upon site needs or landowner objectives.
- Root and basal resprouts must be addressed as needed to meet plan objectives. They may be left to grow or killed using chemicals, grazing or fire.

Pulling/Grubbing

Specialized machines on a front-end loader may be used to pull out woody plants. Ordinary loaders may be used to grub out plants by digging out the root balls. When soils are moist, a chain and tractor can effectively remove moderate to small-sized trees or shrubs. Plants with prominent and deep taproots are harder to pull. Equipment requirements increase geometrically as the size of the plant increases. There is some risk that roots remaining in the soil could initiate resprouts. Root balls with soil loads will increase disposal difficulties.

Requirements of a Successful Grubbing and Pulling Operation:

- Greater than 95% of the above ground stems shall be removed. Remaining smaller stems should be hand cut, if necessary, in order to meet plan objectives.
- The site must be leveled enough that normal farm machinery can negotiate the site.
- Debris may be left in a uniform layer spread about the site, or stacked in windrows or piles, depending upon site needs or landowner objectives.
- Resprouts must be addressed as needed to meet plan objectives. They may be left to grow or controlled using chemicals, grazing or prescribed fire.

Brush Mowers

Smaller brush can be managed by timely mowing with conventional rear mount rotary mowers. The size of the brush should usually be smaller than one-inch diameter at the soil surface. Heavy-duty brush mowers specifically designed for tree and brush cutting, work well on material up to 8 inches in diameter.

Mowing can treat a large area in less time than sawing, shearing, or pulling. Mowing as an efficient control method rapidly loses efficiency as brush diameters exceed 4 inches at ground level. Depending upon the severity of the brush encroachment, mowing can leave a fairly dense layer of limbs, twigs, and leaves on the ground. This debris layer may be thick enough to hinder subsequent management options.

Generally, brush should be mowed as close to the ground as possible without damaging equipment. Mowing height may need to be adjusted to minimize stress to desirable herbaceous plants. Timing and frequency of mowing will depend upon the follow-up treatments planned. If herbicides are used as a follow-up treatment, mowing shall be timed to allow woody regrowth to

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reach the desired height, at the proper time, for best chemical control. If grazing is to follow, mowing should be timed so that brush regrowth occurs when it would be most palatable to livestock. Usually sheep or goats are most effective for brush control.

Mowing alone rarely provides complete brush control. It can suppress brush vigor or encourage a rapid flush of new growth. Subsequent treatments will usually be needed for control of resprouts. For example, effective control of western snowberry/buckbrush may require up to three consecutive years of mowing. Mowed brush will exhibit a profusion of stubs with ragged ends. These stubs may prove hazardous to tires, people, and livestock.

Requirements of a Successful Brush Mowing Operation:

- All of the above ground stems shall be removed from the root systems leaving no more than a 3 inch high stump. If site is to be negotiated with machinery and/or livestock, the stumps should be cut even closer to the ground, if possible.
- Larger stems that are unable to be mowed must be cut with hand equipment, or by some other method, if necessary to meet plan objectives.
- Debris should be left in a uniform layer spread about the site, or stacked in windrows or piles, depending upon site needs or landowner objectives.
- Root and basal resprouts must be addressed as needed to meet plan objectives. They may be left to grow or be killed using chemicals, grazing, or fire.

Girdling

Girdling is usually performed on trees larger than four inches in diameter at 4.5 feet height (dbh or diameter-at-breast-height) above the ground. It can effectively kill the plant parts above the girdle but does not kill the plant below the girdle for resprouting trees. If there are no live limbs below the girdle, this method alone, will kill conifers.

Girdling is similar to the first step of a cut-and-frill herbicide control method. Girdling removes the bark, inner bark, and cambium in a 1 to 2 inch band that is contiguous around the tree trunk. It is usually performed 3 to 5 feet off the ground at a height that is comfortable for the operator. Axes, machetes, hatchets, chainsaws, or other sharp tools may be used. It is best performed in the spring before leaves emerge, and when the bark peels off readily.

The dead tree is still standing after the application of this method. This dead standing material may provide roosting sites and cavities for wildlife. It may prove a hazard to livestock and persons using the site several years later. Several years after girdling that completely kills the tree, brush may be easier to knock down, stack, and burn. For most deciduous species in Nebraska, girdling without herbicide treatment will often initiate a profusion of root or basal sprouts or sprouts just below the girdling mark. Follow-up treatment with fire, grazing, or herbicide is usually needed to completely control brush.

Requirements of a Successful Girdling Operation:

- Greater than 95% of the top growth, above the girdle, shall be killed.
- Management plans should address the subsequent management of dead snags and the resprout potential below the girdle line.
- Where elm control is the targeted species, use brush control treatments in combination with other methods that will make the debris an unsuitable habitat for the elm bark beetle, i.e., burning, burying, or chipping before the following spring.

BIOLOGICAL TREATMENTS**Grazing**

One of the most commonly used biological brush control measures is grazing. The effectiveness is dependent upon the species of brush, herbaceous vegetation present, age of the brush, species of animal, and management objectives of the landowner. Generally, sheep and goats are most effective at stressing or reducing the presence of woody brush. Care must be taken to ensure that the grazing animals do not increase the erosion risk from the site or negatively impact water resources.

This method is most effective on smaller brush that is within reach of the grazing animal, such as the regrowth that might occur from other brush treatment methods. At times this method may need to be combined with herbicide or mechanical.

A prescribed grazing plan will accompany the brush management plan on all lands grazed by livestock before and after planned brush treatment to ensure desired results are achieved.

Refer to [Nebraska Range and Pasture Technical Note #18, Procedures Using Targeted Grazing – Invasive Plant Management](#).

Requirements for Successful Brush Control through Grazing Management:

- Brush management plans, will indicate the brush species to be controlled, the existing brush canopy or density and extent, and the number, kind and size of the grazing/browsing animal to be used in the treatment. The timing, sequence, and duration of brush management in a pasture and/or entire operating unit shall be described in the prescribed grazing plan.
- Changes in grazing management should show a measureable reduction in the targeted brush and an increase in desirable species within 3 years of the grazing management treatments.
- Associated water resources should not show adverse effects from grazing.
- Erosion levels should either not increase or show minimal increases.

CHEMICAL TREATMENTS

Chemical brush control methods can vary considerably based upon time of year, growth stage of the brush, moisture conditions, desirable material to be left alive, proximity to water (ground and surface), and available application equipment. Many brush control herbicides are species and time-of-year specific. Several of the herbicides used in chemical control exhibit residual effects that may affect reseeding opportunities or the health and vigor of residual woody and herbaceous plants. Follow product label directions closely and comply with all State and Federal laws. Additional guidance on chemical control of brush may be found in the “Guide for Weed Management in Nebraska”. NOTE: Take proper precautions to avoid damaging non-target species.

Foliar Herbicides

Appropriate herbicides are directly applied to foliage with air, ground, and hand application equipment. Care must be taken to avoid damaging non-target species. Depending upon the brush species, timing (growth stage) is critical. Apply control treatments to vigorously growing foliage when the brush is small. Foliar treatment products may not be selective and can affect desirable forbs and woody plants. Depending upon the species of brush and prior preparations (shearing, burning, mowing, etc.), herbicide control will usually require multiple applications. Select herbicides that are compatible with the herbaceous vegetation to remain. Foliar applications without some other method will result in dead brush standing on the site.

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Requirements of a Successful Foliar Herbicide Operation:

- Greater than 80% of the brush plants are dead or dying following the second herbicide application (many brush species will require at least 2 applications).
- Resprouts must be addressed as needed to meet plan objectives. They may be left to grow or killed using chemicals, grazing or fire.

Cut and Frill with Herbicide

Cut and frill treatments involve applying an approved herbicide to cuts made on the trunk, usually 3 to 5 feet from the ground. Cuts can be made with a hatchet, machete, or small chain saw with a short bar. An appropriate chemical is then applied into the cut as directed by the herbicide label. Both the cut and the area treated with chemical should be contiguous around the trunk. Effectiveness is dependent upon time of year, herbicide used, and species to be controlled.

When properly timed and applied, this method can be effective with minimal resprouting. This method leaves dead standing brush. This method is suitable for elm brush control only when combined with other methods that will make the debris unsuitable habitat for the elm bark beetle (burning, burying, or chipping before the following spring).

Requirements of a Successful Cut and Frill Herbicide Operation:

- Greater than 80% of the brush species are dead or dying following the first application.
- Resprouts must be addressed as needed to meet plan objectives.

Basal Herbicide Treatments

Basal treatments are applied close to the root system. Basal treatments may be applied in two ways. Both methods leave dead trees and brush standing.

The first method is performed with a specialized tool (tree injector) available from most forestry supply companies. Tree injectors inject a small amount of concentrated herbicide in a capsule directly into the base of the tree. Best results occur when this treatment is applied in late summer or early fall.

The second method involves saturating the lower one foot of the trunk and any exposed roots with herbicide to the point of runoff. Equipment, such as backpack and hand sprayers, is required. It is most effective when applied in the fall. Young plants or plants with thinner bark are most easily controlled with this method.

Requirements of a Successful Basal Herbicide Operation:

- Greater than 80% of the brush species are dead or dying following the first application.

Stump Herbicide Treatments

Stump treatment is applied in combination with any of the mechanical methods that remove the tops of brush. An appropriate herbicide is applied to the cambium layer of the stump immediately after the top has been removed. Immediate treatment is especially important for species, such as Russian olive and Salt cedar, where the exposed cambium is quickly covered over by sap. It is most effective when treatment is applied in late summer or early fall.

On larger stumps herbicide can be applied with squirt bottles, weed wipers, hand sprayers, or brushes. Usually only the cambium and phloem need to be treated. Depending upon the species of brush, some herbicides need to saturate the bark of the exposed stump and root collar. Specially formulated colored dyes may be added to the spray mixture to identify which stumps have been treated.

Requirements of a Successful Cut Stump Treatment Operation:

- Greater than 95% of the above ground stems needing treatment have been removed from the stump. If site is to be negotiated with machinery and or livestock, the stumps should have minimal ragged edges and be as low to the ground as possible. Elm stumps must be cut flush to the surface of the ground to minimize bark beetle habitat.
- Stump treatment with an approved herbicide occurs within a few minutes of the top growth removal and results in an 80% kill after the first application.
- Debris may be left in a uniform layer spread about the site, or stacked in windrows or piles depending upon site needs or landowner objectives.
- Root and basal resprouts must be addressed as needed to meet plan objectives.

Soil Applied Residual Herbicides

Soil applied residual herbicides have a long residual life and are nonselective. They tend to kill or stress all of the woody plants in the application area, making it difficult to selectively remove unwanted woody brush versus desirable trees and shrubs.

The top growth of woody brush is still standing after application of this method. These dead plants can be attractive to wildlife as bird roosts and provide a site for fresh infestation from seeds deposited by birds. After several years of drying, this standing debris can be knocked down and burned. Prescribed burning alone may not effectively consume dead standing material without some mechanical manipulation that places it closer to fine fuels.

Requirements for a Successfully Applied Soil Herbicide Operation:

- Greater than 80% of the target brush plants are controlled.
- Desired species of residual plants show no negative effects of herbicide application.
- Surface and ground water sources and associated habitats are not adversely affected by the application.
- Disposal of killed brush is consistent with landowner's brush management plan.

OTHER CONSIDERATIONS

BRUSH MANAGEMENT DESIGN

Brush management designs shall include:

- the method(s) chosen,
- the species to be controlled,
- percent canopy cover or tree density for the species being controlled (either estimated or measured),
- the specie(s) to be favored, if any,
- the time(s) the treatments should be applied and,
- any subsequent management necessary to increase the effectiveness of the practice.

Appropriate Nebraska Conservation Planning form [NE-CPA-314 \(Plan for Mechanical and/or Chemical Brush Control\)](#), [NE-CPA-19 \(Brush Management Plan\)](#) will be used to document this practice.

For mechanical brush control: include instructions on equipment to be used and any needed modifications.

For chemical control: cite herbicide name, rate of application, planned application date, and any other necessary details as required by State regulations.

For biological control: cite the biological agent to be used, time(s) of introduction and extent (delineate treatment area).

BRUSH MANAGEMENT DESIGN PROCEDURES (314DP)-14

For control with grazing: a prescribed grazing plan will accompany the brush management plan on all lands grazed by livestock that involve a brush treatment method. Refer to [Prescribed Grazing Standard 528](#) and [Prescribed Grazing Design Procedures 528DP](#).

Specifications for site-specific management may be needed to increase the likelihood of success. To reduce the likelihood of a recurring brush problem, land management techniques should be modified to encourage the establishment and spread of desirable plant communities while discouraging brush encroachment.

INSTALLATION CONSIDERATIONS

Chemical control shall be planned and applied in accordance with herbicide label directions and the current recommendations in the Guide for Weed Management in Nebraska. Herbicide and pesticide handlers should be certified.

Safety is a concern with any of the brush management treatments mentioned. Only properly trained operators with proper safety equipment and tools should apply the mechanical treatment methods.

Follow-up to determine the effectiveness of the treatment method(s) is recommended. It may not be possible to confirm the effectiveness of a brush control method until 2 to 3 years after the initiation of the practice.

State law requires control of State-listed noxious weeds. Currently, salt cedar or tamarisk, (*Tamarix ramosissima*) is listed as a woody noxious plant in Nebraska.

OPERATION AND MAINTENANCE

Recommended follow-up and maintenance schedules for various brush treatment methods should be based on actual field site inventories and evaluations of resprouting, regrowth, or regeneration of brush species. Scheduling retreatment or continuing treatment may be influenced by climatic variables and availability of operator resources.

Generally, every 3 to 5 years the landscape should be reassessed and treated for brush encroachment that has the potential to interfere with the resource objective(s). On especially aggressive woody plant species, such as Russian olive and salt cedar, annual reassessment and treatment may be needed.

SUPPORT REFERENCES

For specific how-to information on pushing, piling, and burning brush (both green and dead) contact your Nebraska Natural Resources Conservation Service or Cooperative Extension Service field office and borrow a copy of the video "Windbreak Renovation," distributed in 2001. This video shows some of the machines used to remove windbreaks that can also be used for brush management.

Design and Installation Guide, Brush Management- 314, USDA-NRCS, North Dakota, FOTG-Section IV, Conservation Practices.

Herrick, Jeffrey E., et al., 2005, Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, University of Arizona Press, Tucson, AZ, Chapter 12.

Nebraska Range and Pasture Technical Note #17, Nebraska Field Inventory Procedures for Determining Brush Canopy Cover and Density Using Photographic Guides
http://efotg.sc.egov.usda.gov/references/public/NE/NEBRASKA_TECHNICAL_NOTE_17.pdf

Nebraska Range and Pasture Technical Note #18, Procedures Using Targeted Grazing – Invasive Plant Management.
http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_18.pdf

Nebraska Range and Pasture Technical Note #19, Salt Cedar – Weed Management Strategies.
http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_19.pdf

Nebraska Range and Pasture Technical Note #20, Quick Guide to Invasive Plant Treatment.
[http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_20\(Invasive_Plant_Treatment\).pdf](http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_20(Invasive_Plant_Treatment).pdf)

Nebraska Range and Pasture Technical Note #21, Determining Canopy Based on Average Tree Canopy Diameter and Trees Per Acre.
[http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_21\(Determining_Canopy\).pdf](http://efotg.sc.egov.usda.gov/references/public/NE/Range_and_Pasture_Technical_Note_21(Determining_Canopy).pdf)