# Brush Management Options for Grazing Lands

Brush is often more difficult to manage than herbaceous broadleaved plants (forbs or weeds) because it occupies more space as it grows each year. Brush refers to shrubs and/or small trees that are considered undesirable for livestock or timber production. However, some of this "brush" may have value for certain livestock and wildlife operations, wildlife habitat, and/or watershed protection. The key element in making a decision on brush management is knowing whether the woody species in question is native to the site, as compared to the historical landscape when fire was a key in shaping vegetation structure and composition. This information may be obtained from Ecological Site Descriptions located in the Natural Resources Conservation Service Field Office Technical Guide.

Some reasons for brush problems in Oklahoma include:

1. Soils and rainfall are such that the native vegetation included woody plants on about one-half of the 20 million acres of the rangelands in Oklahoma. Examples include: Cross Timbers (6,215,000 acres), Ouachita Highlands (4,614,000 acres), and Ozark Highlands (1,600,000 acres).
2. Decreased fires in the State since settlement has resulted in a significant increase in many brush species on all ecological sites. Eastern redcedar is native to Oklahoma, but not native to many of the sites it occupies today.

*Many historical savannah sites have turned into closed canopy, mature woody communities.*

3. In some areas, notably the Cross Timbers region, oak species are native to the soils and have thickened up over time. **It will be difficult to keep oak removed from these sites because the plant naturally occurs there.** Other sites have naturally occurring woody plants such as sand shinnery and sand sage sites. This information is also available from Ecological Site Descriptions located in the Natural Resources Conservation Service Field Office Technical Guide.
4. The introduction of some woody species with no natural enemies. Examples include: Salt Cedar or Russian Olive.

5. Overgrazing and other disturbances in rangelands remove the grass competition allowing for establishment and growth of brush that is not palatable to the livestock. A thick cover of grasses can not only compete for sunlight and moisture and retard brush, but can serve as cover for biological control agents that would also retard unwanted brush. Moreover, some plants like cedar, will invade even under proper grazing management.
6. Brush problems on established introduced pastureland seldom become serious. Most pasturelands were previously cropland that had been in production for many years and typically were from rangeland sites that would not have had very much brush historically. Therefore, native seed sources or remaining root sources for re-growth are not present in large amounts if at all. Due to these reasons, as well as management that includes inputs such as fertilizer and herbicides for weed control, high densities of brush on pasturelands should not be a major problem. Some native (cedar) and non-native (Russian olive) invasive species can become a concern due to invasion.
7. The exception on pasturelands is reclaimed or cleared lands that were converted to pasturelands. This is a typical situation in much of eastern Oklahoma where old growth of trees were dozed or had herbicide applications and then planted to introduced grasses, such as bermudagrass or fescue. These cleared areas were in most cases savannah or forest ecological sites which would have a woody component. These pastures will be similar to rangeland sites in that the native woody species previously removed by reclamation activities will continue to regrow and will be difficult to control.

## Losses Due to Brush

1. The loss of herbaceous plant production is the major loss from brush competition. This results in decreased carrying capacity for livestock producers. If brush covers 35% of a field, the carrying capacity for that field has decreased by 35%.
2. Increased costs of livestock management due to: A) Loss of visual sight of cattle that complicates counting, checking for sick animals, and movement of livestock. B) Keeping fences maintained. C) Injury to livestock by brush (thorny growth), and D) Difficult to drive across pasture for fertility and weed control applications.
3. Decreased livestock gains due to livestock eating poisonous brush. Poisonous brush species in Oklahoma include Black Cherry, Red Maple, Black Locust, Buckeye, Oaks, and Pine. For more information, see Toxic Plants of Oklahoma and The Southern Plains by Burrows et al. Oklahoma State Cooperative Extension: Circular E-868, 1996.

## Value of Brush for Livestock and Wildlife

Brush refers to woody shrubs and/or small trees and may have value for certain kinds of livestock and recreational leasing operations, wildlife habitat, and/or watershed protection. Some woody plants provide thermal protection (winter and summer) and food (browse) for livestock. Some wildlife species require woody plants (brush) for protective cover, food (browse, fruits, or seeds), or nesting platforms/cavities. Typically, woody plant structure is the most important habitat attribute for wildlife. It should be noted, however, that many species of wildlife do not require woody plants and even in small amounts have a negative impact on their habitat. The key element in making a decision on the value of brush for your management objectives is understanding the ecological

role of the woody species in question. Questions that should be asked are: Is it native to the site? Is it invasive? What is its status in terms of cover and structure compared to its historical context when fire was a key in shaping vegetation structure and composition? This information can be obtained from the Natural Resource Conservation Service in the form of Ecological Site Guides.

## Brush Management Alternatives

Brush management is the removal, reduction, or manipulation of non-herbaceous plants. There is sometimes confusion with the terms brush management (control) and eradication. Any level of brush response that reduces competition for space, moisture, and sunlight between desired and unwanted plants is brush management, whereas, eradication refers to total control of a species, which means all trees killed, as well as seeds. Total brush eradication is essentially never obtained, as brush species tend to be very resilient. That means that follow-up brush management will be necessary to control resistant species, resprouting brush, and new seedling brush.

Brush management alternatives should be cost effective and applied in a timely manner in order to eliminate the need for expensive reclamation practices. **Reclamation (or land clearing)** refers to the initial brush removal on a site or removal of brush that has established to the point where understory herbaceous vegetation is missing, due to suppression. Basically, these areas look like forests with very little herbaceous species. Reclamation / clearing was a common practice years ago when livestock producers reclaimed rangelands that had been allowed to revert to thick stands of naturally occurring woody species, typically due to removal of fire and grazing management. Under rangeland conditions, grasses usually come back following brush removal, unless major soil disturbance occurs. **For this reason, brush management alternatives should minimize these disturbances.** Some areas were planted to introduced forages to increase livestock production. Reclamation is very expensive and destructive to existing plants, the soil and some wildlife species and typically requires follow-up treatments.

Brush management alternatives can include several methods. In many cases, an integrated approach using more than one method is best.

**Herbicides:** Herbicides continue to play a major role in brush control. When used correctly, herbicides represent a very selective and cost effective way to control many of the brush species occurring in Oklahoma. The response of the brush to the various herbicides can vary from no effect to total plant kill. Herbicide rates and application techniques can also be adjusted in some cases in order to create a desired level of brush (i.e. leaving areas or certain percentage of cover for wildlife).

***Anytime herbicides are used, labels must be followed for proper rates, volumes, mixing instructions and safety / environmental precautions*.** Oklahoma also has some county restrictions on some herbicide types. These can be found in the Oklahoma Pesticide Regulations. Due to potential for these rules to change, they should always be reviewed prior to any herbicide applications.

There are a number of ways to express brush control. Usually the first visible response after treatment is leaf-brownout and this is often expressed as "Percent Brownout". Data taken one year after spraying is a more accurate estimate of control. For brush control from herbicides to last more than a couple of years, it is necessary to get about 100% canopy control and 80 to 90% tree kill of the major brush problems. There are several application methods that can be considered:

1. **Broadcast Foliar Application** – Foliar applied herbicides have to be applied when brush is actively growing. This means that conditions at spraying, such as soil moisture, soil temperature, and air temperature, are very important and can mean the difference between no control and good control. An example is not applying herbicides during a drought. Foliar-applied herbicides are usually applied some time between May and July. (See recommendations for individual plants). Application of herbicides are by aerial application (plane, helicopter) or by ground broadcast application. Where brush makes it difficult to get over the areas with ground rigs, aerial application is the best method. Smaller, shrubby types of brush such as blackberry can be easily controlled with ground rigs as growth usually does not inhibit application. Total spray volume is different for each method and essential for good coverage of plants. Aerial applications typically use total spray volumes of 4 gal. per acre while Broadcast applications typically use a minimum of 10 gal. per acre. Broadcast applications are typically the best alternatives when treating larges areas with infestations of more than 150 plants per acre.

2. Herbicides may also be applied as **Spot or Individual Plant Treatment (IPT)** with ground rigs as foliage wetting sprays (high-volume foliar application). This involves taking the herbicide rate recommended broadcast for an acre and putting it into a 100 gallon mix with water (other mixes may be needed depending on individual species). This mixture is then sprayed onto the foliage, stems and trunks of the tree until completely wet. Equipment can include backpack sprayers, spray guns attached to tanks on ATV's or tractors. Labels should be consulted for restrictions on total amount of product per acre that can be applied with this method. To help with control using this method, consider returning to the sprayed area as soon as brown-out results (usually 2 to 3 weeks) and respray the green leaves. With most of the foliage-applied herbicides, it is often necessary to retreat for several years to obtain total brush kill. This foliage wetting type of spraying is very useful for spraying small clumps of scattered brush but is time consuming. IPT is typically most cost effective when infestations are below 150 plants per acre.

3. **Soil Applied Herbicides** - Soil-applied herbicides are taken up by the roots and quite often result in better tree kill than is possible with foliage-applied herbicides. These are usually applied by hand as pellets or some liquid herbicides require an exact delivery handgun applicator. Since the herbicide must be moved into the soil with rainfall and then taken up by actively growing trees, the best time to apply soil herbicides to get maximum tree kill is March and April. Another good time to get good tree kill is early in the fall before trees go dormant, providing soil moisture conditions are satisfactory. With the more persistent urea type herbicides like Spike, it is possible to get satisfactory tree kill with applications made any time of the year. To minimize damage to the grasses with soil-applied herbicides, it is recommended that they not be applied while the grass is actively growing. Soil applied herbicides are often used for control of individual trees (IPT) and rate is based on tree size. Some herbicides may be applied directly to the soil beneath the target vegetation. Since this method relies on soil activity, desirable plants growing near the target may be damaged if their roots absorb some of the herbicide. Do not use this method if damage to nearby vegetation cannot be tolerated.

In addition to the individual foliage wetting technique described above, there are several other methods used for individual plant treatments.

**Basal Bark Applications** - This method allows selective control of individual plants. Herbicides are applied alone or mixed with diesel fuel oil or penetrant, and are best done when plants have leaves and are actively growing (April - October), although some may also be applied outside the regular growing season. Refer to specific herbicides and species recommendations for exact mixtures. Some types of basal treatment include:

- **Low Volume Basal:** Application of high percentage of herbicide mixed with diesel fuel to the entire circumference of the lower 15 to 20 inches of the treated stem. Application should continue until the bark is thoroughly wet, but not until the point of runoff. Best for control woody plants with stems less than 6 inches in diameter.
- **Streamline Basal Bark Treatment:** Application of herbicide mixed with oil and penetrant and applied, as directed, with a straight stream (using nozzle which can deliver a straight stream of herbicide mixture). The application should form a 3 to 4 inch wide band around the entire circumference of the target stem, 12-24 inches above the ground. This technique can be used with stems less than 4 inches.

**Cut Stump** - These treatments are done by spraying a herbicide / diesel fuel mixture on the freshly cut surfaces of tree stumps to prevent resprouting. It is important to spray entire exposed stump, particularly the cambium layer next to the bark of the cut surface. Herbicides must be applied immediately following cutting (within 30 minutes). Stump treatments may be made at any time of the year, but effectiveness may be decreased if applied in the spring before trees are leafed. Good method to control trees taller than 15 feet.

**Frill Application** - A notch is cut into the tree completely around the tree base (usually with an ax), and herbicide solution (concentrated from container) is applied directly into the cut area. A modification of the frill is Tree Injection. Ax injections are uniformly made every 3 inches around the tree and concentrated herbicide is placed into the injections. Tree injectors can be purchased which can be used to cut into the tree, and the chemical is applied either manually or automatically through the injector bit.

**Mechanical Control:** Mechanical treatment is the control or manipulation of brush using heavy equipment. Mechanical treatment is usually costly and therefore many times is used as a last resort or for reclamation (land clearing), unless used as selective, individual plant treatments (i.e. low density brush where other methods are not effective). Mechanical treatment can be very selective by treating the individual unwanted plants, while leaving a desirable one. The results of mechanical treatment are immediately noticeable. Mechanical treatment is used when brush is too thick or mature for a fire (lack of fuel) or herbicide to be effective, where site conditions preclude herbicides or for species that have no other effective control options.

Mechanical treatments can be hard on the land and aesthetically unpleasing. Practices such as chaining or bulldozing can leave large root balls exposed and holes in the ground where the roots once were. Severe ground disturbance may require reseeding of desirable plants. Large amounts of debris can be left on the landscape. This debris can either be piled and burned, or left for wildlife cover for rabbits, quail, and others.

Sometimes mechanical treatment is used in combination with other treatments. Some examples include chaining and burning of cedar, and clipping and spraying the stumps of mesquite.

**Chaining:** (*Usually for land clearing / reclamation*) Chaining is non-selective and drags down all plants. It should only be used as a component of integrated treatment with fire, especially on juniper. Chaining is not recommended for resprouting species unless some other type of integrated treatment is planned. It can result in heavy re-growth of root sprouting species, especially where plants are snapped off instead of up-rooted, and many cactus species are spread by chaining. Chaining is usually done with two dozers that pull a ship anchor chain in a half-circle or "J" pattern between them. The chain should not be stretched tight between the dozers. In order to pull out the target species of brush, each link should weigh more than 50 lbs. per link. The most uprooting occurs with good soil moisture and tree diameters of greater than 4 inches. Smaller trees tend to be limber and either bend over or break off. Chains attached to a 4 foot diameter ball to elevate the chain reduces power requirements and is effective on large juniper (>9feet). Chaining can be done as a one-way or two-way treatment. Two-way treatments are basically chaining in two, opposite directions and are best for larger trees.

**Bulldozing:** (*Usually for land clearing / reclamation*). Best used for selective removal or small areas; for larger trees; to remove volatile species from burn areas; or in areas where no other option may exist. Should only be considered for non-sprouting species (i.e. eastern redcedar). Can cause severe ground disturbance and may require follow-up seeding if existing vegetation does not return.

**Clipping:** Clippers work like heavy duty scissors that sever the plant at the base. This is only effective on non-sprouting species, unless appropriate herbicide is applied immediately following cutting. If brush species have been well established, there may be some carryover of seed so follow-up treatment may be needed.

**Mowing, Shredding, Brush Hogging:** Mowers with heavy duty blades are capable of cutting some brush species. This is generally limited to the size of brush that the tractor can handle. Mowing only has annual benefits and is usually only effective as a part of an integrated approach. Stobs from severed plants can damage tires. Equipment maintenance is usually high on most brush species. Follow-up treatments will be needed. This method should not be used prior to any herbicide treatments, usually one growing season, nor used within 90 days following herbicide treatments.

**Rollerchop:** (*Usually for land clearing / reclamation*) Rollerchopping kills very few plants and is therefore used as an integrated treatment with other practices to achieve control. Rollerchoppers are also used to prepare a seedbed following rootplowing or other severe ground disturbance by firming and smoothing the seedbed. Rollerchoppers are heavy duty steel drums about 3 - 5 feet in diameter, with heavy duty steel blades attached to the drum. They are pulled by crawler tractors and use their weight to crush and cut the brush.

**Rootplow:** Rootplowing destroys nearly all the forage plants, and is therefore only used for reclamation of high density brush where reseeding is needed. Additional preparation is needed from rollerchopping, chaining, raking, or disking to smooth

the seedbed for the planting operation. Rootplowing can be done in strips or patterns to create edge habitat for wildlife species. Rootplowed sites soak up large amounts of rainfall and can be a factor in preventing ponds from catching water. A rootplow is a large, V-shaped blade mounted on the rear of a large crawler tractor. Some rootplows are mounted on wheels however. The blade varies from 8 - 16 feet wide and is lifted in and out of the ground either by cables and pulleys or hydraulically. The blade is set to plow at a 14 - 18 inch depth and is usually equipped with three to five fins welded to the top of the cutting blade to push brush roots to the soil surface. These fins are 20 - 30 inches long and mounted at a 22 - 28 degree angle to help loosen the soil surface and kill shallow rooted species. Prickly pear can be spread by rootplowing.

**Rootrakes:** Rootrakes use heavy duty tines that either slide on the soil surface or comb brush roots out of the soil. Rakes can be mounted on the front of a dozer to facilitate stacking of the brush or on the back of the dozer to facilitate seedbed preparation following rootplowing.

**Saw:** Sawing can be done with chainsaws or with specialized machinery that has a front mounted saw blade. In order to be effective, the selected brush species must be cut at ground level. This is only effective on non-sprouting species, unless appropriate herbicide is applied immediately following cutting.

**Powergrubbing:** Powergrubbing, treedozing, and low-energy grubbing are terms that apply to several types of equipment that can individually uproot brush plants. They are designed to cut underneath a brush plant and lift or push it out of the ground. Although ground disturbance is limited to the area occupied by the plant, many times desirable plants grow right around the base of the trees and will be destroyed with this operation. If it is determined that reseeding is necessary, the hole left from this operation is a very good seedbed if seeding is done immediately and at the proper time of the year. The equipment can be mounted on the front of dozers and tractors, or the back of farm type equipment.

Each features a heavy duty blade that is driven hydraulically or with pulleys to control the depth of cut. Dozer blades are not as desirable for this as they can disturb more soil and destroy more desirable plants.

Tilted blades that tilt to use the corner of the blade instead of the entire blade can minimize disturbance but getting to the proper depth and uprooting the plant is typically not accomplished.

**Biological:** Goats are commonly used for controlling brush species and are typically used as a follow-up treatment following mechanical treatments, prescribed burning, or shredding or where management of understory brush species is desired. Goats can be used to initially control oaks, sumac, cottonwood, plum, berry vines, greenbrier, or similar species as long as the brush is within browsing reach. Some success has been observed during the winter on small juniper, such as eastern redcedar. Fields that are being grazed by goats for brush management should not be grazed by other livestock until the desired forages have established. Goats that are familiar to grazing grass will eat the recovering grasses, desirable forbs, as well as the brush. A grazing management system is recommended over continuous grazing to preserve plant diversity and to maintain high quality forage. The key to success is stock densities that result in frequent defoliation. It should be noted that goats can alter wildlife habitat and may negatively impact some wildlife species. For example, goats compete directly with white-tailed deer. Thus, a comprehensive plan should be developed to make sure that land management objectives will be met.

**Prescribed Burning**: Prescribed burning can be effective in controlling brush with the right prescription and works well along with other methods in an integrated approach. Different brush species respond to fire in different ways. In addition to proper weather conditions, the most important factors in using fire for brush control are fuel loads and frequency of burns. Prescribed burning should be applied according to a written burn plan.

*Proper fire return intervals can be used to effectively control brush and manage for desired plant communities.*

***Without Fire*** ***With Fire every 2-3years***

**REFERENCES:**

Brush Management in the Cross Timbers – Proceedings, Jan. 19, 1987, CES Circular E862

NRCS Brush Management Standard and Specification (314)

Plants pest website and information from articles and publications from the following authors:

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