United States Department of Agriculture

NRCS
Natural Resources Conservation Service
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Lexington, KY 40503-5479

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TECHNICAL GUIDE NOTICE NO. 291

This notice transmits the Prescribed Burning (338) practice standard and the Prescribed Burning Conservation Practice Information Sheet. This standard and information sheet go into effect upon receipt of this notice.

These documents haves been posted on eFOTG in Section IV under the applicable conservation practice.

Document Titles:

Conservation Practice Standard – Prescribed Burning (338)
Prescribed Burning Conservation Practice Information Sheet (338)

Filing Instructions:

- Download these documents from eFOTG as needed.
- File this notice in the front of Section I of the FOTG.

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NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

PRESCRIBED BURNING

(Ac.)

CODE 338

DEFINITION

Controlled fire applied to a predetermined area.

PURPOSE

- Control undesirable vegetation.
- Prepare sites for harvesting, planting or seeding.
- Control plant disease.
- Reduce wildfire hazards.
- Improve wildlife habitat.
- Improve plant production quantity and/or quality.
- Remove slash and debris.
- Enhance seed and seedling production.
- Facilitate distribution of grazing and browsing animals.
- Restore and maintain ecological sites.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

All prescribed burns shall address the following items:

- Location and description of the burn area.
- Pre-burn vegetation cover.
- Resource management objectives.
- Required weather conditions for prescribed burn.
- Notification check list.
- Pre-burn preparation.
- Equipment checklist/personnel assignments and needs/safety requirements.
- Post burn evaluation criteria.
- Firing sequence.
- Ignition method.
- Approval signatures

Cooperators will be informed that they must burn in accordance with federal, state, and local laws and regulations, and following an approved prescribed burn plan. They must understand that they may be liable for damages caused by fire

escaping from their land or for damage caused to others from inadequate smoke management. They may also be responsible for fire suppression cost, should the fire escape the designated area.

The procedure, equipment, and the number of trained personnel shall be adequate to accomplish the intended purposes.

The expected weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability (e.g., utility lines) and safety and health precautions shall be integrated into the timing, location and expected intensity of the burn.

Timing of burning will be commensurate with soil and site conditions to maintain site productivity and minimize effects on soil erosion and soil properties (structure, soil moisture).

Weather parameters and other data that affect fire behavior will be monitored during the burn.

Identify, locate, and address in the plan any potential hazard areas; (roads, headquarters, residences, windbreaks, woodlands, electrical power poles and transmission lines, fences, flammable conduits, etc.).

Potential smoke impacts must be identified and addressed.

Burn when there is sufficient steady surface winds (1-15mph) to carry the fire. Do not burn when surface wind velocities are greater than 15 mph or when winds are gusty or shifting more than 45 degrees in direction.

Burn only when sufficient transport wind will carry smoke away from roads and residences unless adequate safeguards have been taken (traffic control, removal of residents, notification, etc.). People who have known respiratory problems should be removed from the area where smoke intrusion could occur.

Burns should be accomplished when the mulch layer and soil surface are slightly moist but dry enough to carry a fire. Generally 1-3 days after a rain on grassland.

The relative humidity should be no less than 25%. High relative humidity and low temperatures will often reduce fire intensity and effectiveness. Topography effects shall be addressed when needed.

Burn when air temperatures are between 20-70 degrees F. Extra caution, for fire control, will be necessary when the humidity is low and temperatures high.

Never burn within 1 mile of an airport, unless written permission is obtained from airport authorities.

On the day of the burn, the cooperator will notify all appropriate units of government and adjoining landowners of intent to burn. These will be specified on the burn plan.

The timing of the burn will be based on, as a minimum: relative humidity, wind conditions, air temperature, fuel conditions, and burn objectives. Acceptable levels will be detailed in the burn plan.

Firebreaks will be established that separate the area to be burned from those needing protection. A firebreak will be constructed according to specifications as stated in the burn plan and as indicated on a detailed burn plan map.

Firebreaks will be inspected on the day of the burn prior to ignition and any obstructions or hazards removed. Snags and brush piles near the firebreak will be addressed to prevent fires from escaping or spotting over.

Public roads and public rights of way will not be used as primary firebreaks.

All necessary permits must be obtained before implementation of the practice.

Additional Criteria to Improve Wildlife Habitat

Burning will be managed with consideration for wildlife needs so as to maintain or improve; nesting, brooding, winter and escape cover.

Refer to the KDFWR publication "Prescribed Burning Habitat How-To" for additional information on prescribed burning to improve wildlife habitat.

Additional Criteria to Restore and Maintain Rare and Declining Ecosystems

These criteria apply to remnant glades, barrens, oak woodlands and other rare woodland ecosystems for the purpose of improving forest health, oak regeneration, native grass and forb communities and invasive species control.

Burn prescription including timing, intensity, and frequency shall be developed according to the needs of the target plant community requirements.

CONSIDERATIONS

Existing barriers such as lakes, streams, wetlands, roads and constructed firebreaks are important to the design and layout of this practice.

Generally, it is not necessary to burn more often than once every 3-5 years. When burning to control undesirable sprouting woody vegetation or persistent and pernicious weeds, it may be necessary to burn two or more consecutive years.

Burning should be managed with consideration for wildlife needs such as nesting, feeding and cover.

Weather conditions are generally most stable and favorable for burning following the passage of a weather front. Good burning conditions are frequently present 1-3 days following a rain.

Fire weather forecasts will be obtain prior to and on the day of the burn. Additional current weather information can be accessed on the Internet.
http://www.weather.com

http://www.intellicast.com

http://www.spc.noaa.gov/products/fire_wx/

http://www.crh.noaa.gov/fire_weather.php

Reducing the fuel height to about 1 foot next to the firebreak greatly reduces the intensity of the fire at the fire line.

Existing barriers such as lakes, streams, wetlands, private roads, and constructed firebreaks can be used as primary or secondary firebreaks and are important to the design and layout of any prescribed burn.

When trying to avoid fire scarring of susceptible timber species, burn prescriptions should specify fires with very low heat intensities.

Consider cultural resources and threatened and endangered species when planning this practice.

PLANS AND SPECIFICATIONS

All prescribed burns must be completed according to a detailed written prescribed burn plan.

This burn plan will be prepared for each burn by individuals with proper training, experience and certification and authorization from their organization. **While NRCS employees in Kentucky with appropriate Job Approval Authority can plan Prescribed Burning (338) in a conservation plan, NRCS in Kentucky completely relies on the Kentucky Department of Fish and Wildlife Resources (KDFWR), The Nature Conservancy (TNC), and qualified TSPs to complete detailed site specific prescribed burn plans and implement prescribed burning for customers. See the Kentucky Supplement To GM-190, Part 413 – Prescribed Burning, Subpart B – Policy for additional information on planning prescribed burning for NRCS conservation plans.**

Prescribed burn plan will be filed with and referred to in the conservation plan. All conservation plans that include Prescribed Burning (338) as a conservation practice will include a narrative that states that prescribed burning shall be completed according to a detailed site-specific burn plan developed by qualified KDFWR or TNC personnel or qualified TSPs. This narrative shall also reference the Kentucky Prescribed Burning Information Sheet which will be attached to conservation plans which contain Prescribed Burning (338).

As a minimum, the detailed burn plan will include and address the following:

- Location and description of the burn area.
- Pre-burn vegetation cover.
- Resource management objectives.
- Required weather conditions for prescribed burn.
- Notification check list.
- Pre-burn preparation.
- Equipment checklist/personnel assignments and needs/safety requirements.
- Post burn evaluation criteria.
- Firing sequence.
- Ignition method.
- Approval signatures

OPERATION AND MAINTENANCE

The kinds and expected variability of site factors (e.g., fuel condition and moisture content, weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability, and safety and health precautions) shall be monitored during the operation of this practice. Sufficient fire suppression equipment and personnel shall be available commensurate with the expected behavior of these factors during the time of burning to prevent a wildfire or other safety, health or liability incident.

Maintenance shall include monitoring of the burned site and adjacent areas until ash, debris and other consumed material is at pre-burn temperatures.

Prescribed Burning

Conservation Practice Information Sheet (338)
Kentucky

Natural Resources Conservation Service (NRCS) **January 2008**

This is an NRCS Prescribed Burning Information Sheet, it is not a detailed site specific burn plan. All Prescribed Burning (338) planned on NRCS Conservation Plans must be completed according to a detailed site specific plan developed by qualified personnel from the Kentucky Department of Fish and Wildlife Resources, The Nature Conservancy, or qualified Technical Service Provider.

Conducting a Successful Prescribed Burn

What is Prescribed Burning?

Naturally occurring fires have historically been an important factor in determining plant and animal distribution and composition in Kentucky. While natural fires are random and uncontrolled, prescribed burning is the process of applying a controlled fire to a predetermined area to meet certain goals and objectives. Prescribed fire is used as a tool to manage natural communities and planted grass stands. It can set back succession by controlling woody invasion, improve wildlife habitat by stimulating desirable plant species and suppressing undesirable species, improve poor grazing distribution, restore declining habitats like oak/hickory forests and barrens and reduce wildfire risk. Other uses of prescribed burning include preparing sites for planting or seeding, removing slash or debris, and enhancing seed production of target plant species.

Prescribed burning, when implemented according to a written plan, is a relatively safe and economical tool to set back succession, control plant species, and improve habitat on grasslands and woodlands.

Detailed Burn Plan Contacts:

Name/Organization: _____

Phone Number: _____

Name/Organization: _____

Phone Number: _____

Preparing for a Prescribed Burn

Pre-Burn

A prescribed burn must be prepared ahead of the burning time. This detailed plan prepared by a qualified person must address the following:

- Landowner and location of the burn area
- Description of burn area, including land use, pre-burn vegetative cover, and topography
- Objectives of the burn and planned timing to accomplish them

- Notification check list
- Required weather conditions to safely complete the burn
- Pre-burn preparation including primary and secondary firebreaks installation and placement
- Hazards within and adjacent to the burn unit
- Equipment checklist and personnel needs/safety requirements
- Precautions to prevent escapes and actions needed to suppress an escape
- Maps showing adjacent land uses and hazards and the firing sequence
- Ignition method

The prescribed burn plan should be reviewed and signed by the landowner or his/her representative that has legal power of attorney in advance of the burn day. This allows time to arrange for equipment, personnel, and the installation of the firebreaks. It is important to emphasize that the prepared plan is specific to the area and the planned burning season. If the plan is to be used for a subsequent burn season, it might be necessary to revise the plan to address new conditions.

Firebreaks are used to contain the fire within the burn area. They should be of sufficient width to control the back and flank fires (2-10 times the height of adjacent vegetation). There are several types of firebreaks, but by far the safest and most effective is a bare, mineral soil break created with a disk, plow, or roto-tiller in open lands or with leaf blowers and council rakes in wooded areas. Where erosion is not a concern, these firebreaks can be installed months ahead of the planned date of burn, especially if moist soil will limit equipment access immediately prior to the burn.

Other types of firebreaks:

Close Mowed Breaks are constructed by mowing to keep the fuel load to a minimum and allowing short, green growth that will slow fire spread, but not necessarily stop it. Raking residue from the mowed area, away from the burn unit, reduces available fuel within the break and makes it much easier to control and extinguish the fire.

Burned or Black Lines are established in conjunction with mowed breaks or wet lines (see below). They are prepared by lighting short sections, allowing them to burn a certain width, then extinguishing the fire. A new length of line is ignited and the process is repeated. Burned breaks should be installed during evening or early morning hours when the temperature is low and the humidity is high, resulting in an easy to control fire. These breaks are time consuming to install and have limited application, however, they may be useful in situations where equipment access is limited.

Wetlines require high volume sprayers to moisten vegetation off of which the back fire will be lit. They can be enhanced with chemical fire retardants mixed in the spray water. Once the fire backs off the wetline, the vegetation is sprayed again to extinguish any burning material on the downwind side of the fire.

High Mowed Intensity Reduction Lines are installed adjacent to the primary firebreak by mowing a strip around the perimeter of the burn unit to a height of 8-12 inches. This will reduce the flame length and heat along the firebreak. This is extremely important in tall fuels and is very helpful to the holding crew, especially when using close mowed firebreaks.

***CAUTION**: On wooded sites, hollow trees and snags can catch on fire and fall across the firebreak. If possible, cut down all snags that could fall across the firebreak prior to burning.*

Bare soil firebreaks are by far the safest and easiest on the burn crew of all the types of firebreaks. Once the fire burns to the break it will go out because there is no available fuel to sustain combustion.

If the burn unit contains live, volatile woody species over 4 feet tall close to the firebreak it is imperative to remove them from within 50 feet of the primary firebreak. They should be cut and dragged to the middle of the burn unit or removed entirely. This will reduce the possibility of embers being carried up and blown across the firebreak causing spotfires or escapes.

Burn Day

On the morning of the burn, a qualified "Burn Boss", with suitable training, should supervise all phases of the application of a prescribed burn and review the Pre-Burn Checklist. This review serves as a reminder to take all the necessary precautions to ensure that burn will be completed as safe as possible. Besides the items outlined on the checklist, it is the responsibility of the Burn Boss to do the following:

- Make sure all participants are properly dressed, in good physical condition and properly trained.
- Check all firebreaks to ensure that there is no fuel continuity across the fire break.
- Provide protection to potential hazard areas as identified in the plan.

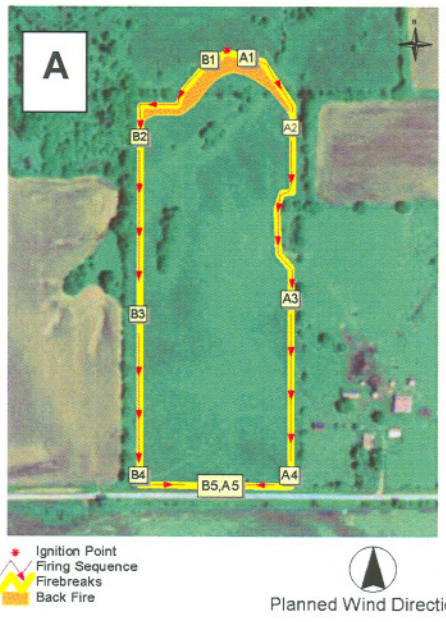
If everything is favorable, the Burn Boss should conduct a test burn in the downwind corner of the burn area and within the protection of an established firebreak. It will be used to confirm that the fire will burn as predicted, the burn will achieve the planned objective, and that smoke can be managed as planned. The burn should be deferred if the test burn is not satisfactory or if prolonged drought has caused high fire danger levels. Good soil moisture helps keep the soil temperature low during the burn. Burn when the vegetation is dry enough to carry a fire well, but while the soil surface is still damp to the touch.

Burn only within the prescription set forth in the Prescribed Burn Plan!

Conducting the Burn

Most prescribed burns in Kentucky are conducted with the Ring-Head Fire Technique. To begin the firing process, a backfire is carefully completed on the down wind side of the area to be burned and within the protection of an established firebreak. The backfire should be allowed to create a burned firebreak a minimum of 50 feet wide on the down wind side of the planned burn area, before extending it into a flanking fire. **(Diagram A)**

Extend the ends of the backfire up each flank, burning from an established firebreak, creating a flanking fire and establishing a burned firebreak along the sides of the burn area. The ignition crew should lay the backfire and flanking fire to control the pace of the burn. The ignition crew must be careful not to lay fire faster than the holding crew can comfortably keep it controlled. **(Diagram B)**



***CAUTION**: On steep slopes > 20% and when wind speed is light (< 5 mph), fire movement may be directed up slope regardless of wind direction.*

Once the backfire and flank fires have burned out a sufficient black area to control the headfire, the headfire can then be set. Burning with the wind the headfire will move rapidly to complete the burn. Headfires burn with much more intensity, greater flame length and move much more rapidly. Be sure all personnel are safely out of the headfire's path before ignition. Make certain that firebreaks have been extended sufficiently with backing and flanking fires to insure that the intensity of the headfire will be safely contained. **(Diagram C)**

Patrolling the firebreaks throughout the course of a prescribed burn permits the burn crew to find and extinguish any fire escapes or spot over fires.

After the headfire and backfire meet, make sure the fire is completely out before leaving the area. Permitting large fuels to smolder after the initial fire has passed, greatly contributes to the problem of residual smoke. These larger fuels may re-ignite and lead to spot fires outside the burn unit.

Smoke Management Planning

Avoidance, dilution, and emissions reduction are ways to manage smoke from prescribed fires.

Avoidance: Smoke related problems can often be prevented by planning burns when conditions make intrusions of smoke into sensitive areas unlikely. Stagnant high pressure systems usually cause problems with smoke dispersion and burning under those conditions should be avoided when smoke management is critical. Most fires have an active burning period and a residual period. Wind directions during both periods must be carefully considered.

Dilution: Smoke concentrations can be reduced by diluting smoke through a greater volume of air, either by scheduling burns during good dispersion conditions or burning at slower rates (burning smaller or narrower strips or smaller areas). Burning at slower rates may mean burning later into the evening. Usually, a morning burn has improving rates of ventilation. An evening burn generally faces deteriorating ventilation conditions.

Emission Reduction: Backing fires more completely consume the fuel load during the active burning period which allows more smoke to be entrained in the convection column. This minimizes the inefficient smolder phase of a prescribed fire. Scheduling fires when duff and larger fuels are too wet to burn also reduces emissions.

Atmospheric stability is the degree to which vertical motion in the atmosphere is enhanced or suppressed. An unstable atmosphere enhances vertical motion, hence increases mixing and the dispersion of smoke. A stable atmosphere suppresses vertical motion, thereby limiting the dispersion of smoke.

When smoke management is critical, burn when conditions are good for rapid dispersion of smoke. The atmosphere should be somewhat unstable so that the smoke will rise and dissipate; but not so unstable as to be problematic in controlling the burn.

If not carefully planned, residual smoke associated with smoldering larger slash or brush fuels can cause serious visibility problems, especially at night.

Heavy, carbon laden smoke can cause dangerous discharges from overhead, electrical transmission lines. Extreme caution should be used when burning around these lines. Divide the burn unit so the powerline right of way is not included in the burn unit or use alternative firing methods (backing fire) and/or mowing under powerlines to reduce the smoke emissions into the lines and reduce risk of damage to lines.

Prescribed Burning Benefits

While prescribed fire in Kentucky is typically used to manipulate or manage vegetation for the benefit of wildlife species prescribed fire has many uses for the land manager including improving forages, controlling woody vegetation, and restoring oak/hickory forests and declining habitats. The timing of the burn depends on the management objectives. Tables 1 and 2 compare timing of burns and the expected results on the vegetation being managed. Some things to consider when using prescribed fire for improving wildlife habitat are:

- Burns should be managed with consideration for wildlife needs, such as nesting and feeding cover.
- Late summer and fall burns generally favor the forb component in mixed stands, and help improve plant structure and habitat diversity.
- Burning in spring and fall of the same year greatly reduces stands of cool season grasses, including tall fescue.
- For the greatest wildlife benefits, native warm season grasses should be burned between

August 15th and December 15th. Cool season grasses should be burned between March 15th and May 1st.

- When possible, fields should be burned on a three to five year rotation, limiting the burned acreage to approximately a third of the cover on a given field.
- Spring burning of serecia lespedeza removes dead growth but has no detrimental effect on established plants and can actually enhance the germination of dormant seed. However, spring burning can improve the effectiveness of herbicides if applied to re-growth the same year.
- Late growing season burns have shown an improved impact on serecia lespedeza, but it is probably not feasible to eliminate a stand with fire alone.

Prescribed burning stands of native warm-season grass in the late summer or fall greatly improves habitat for small game species. It will set back the stand of grass, while allowing space for forbs and annual weeds to become established. This also creates the needed bare ground for these wildlife species and helps control unwanted wooded species.

DEFINITION OF TERMS

Backfire: A fire set to spread against the wind to remove flammable material and thus help to stop or control the headfire. Backfires consume a greater portion of the fuel load and may be prescribed for the entire burn in some instances.

Burn Boss: A person, with appropriate job approval authority, who supervises all phases of the application of a prescribed burn.

Convection Column: That portion of a smoke plume sharply defined by the buoyant forces of heated air and effluents.

Crew Boss/Squad Boss: A person, selected by the Burn Boss, who directs the activity of firing and holding crews during the application of a prescribed burn.

Firebreak: A space which is clear of flammable materials to stop or check fires. It also serves as a line from which to work and to facilitate the movement of personnel and equipment. Plowed areas, previously burned areas, wetted areas, roads, lakes, cool season grass, winter wheat, etc. serve as firebreaks.

Fire Intensity Reduction Line: A line constructed by reducing the height of the fuel next to the firebreak which greatly reduces the intensity of the burn at the firebreak.

Flankfire: The sides of a fire between the headfire and the backfire. Flankfires spread perpendicular to the wind direction.

Headfire: A fire which is set to spread rapidly with the wind and usually used in conjunction with backing and flanking fires. Headfires though intense move rapidly and don't as fully consume the available fuel during the initial fire as does backing or flanking fires. This causes more fuel to be left unburned or smoldering.

Inversion: A layer of atmosphere where temperature increases with height. May be caused by warming aloft, like that associated with subsidence (subsidence inversion), or by cooling from below, as occurs at night at the surface (radiation inversion).

Mixed or Mixing Layer: That portion of the atmosphere from the surface up to the mixing height. This is the layer of air, usually a sub-inversion layer, within which pollutants are mixed by turbulence and diffusion.

Mixing Height: The height above ground through which relatively vigorous vertical mixing occurs. Mixing height varies throughout the day and is normally lowest late at night or early morning and highest during mid- to late afternoon.

Particulate Matter: Any liquid or solid particles. "Total suspended particulates" as used in air quality are those particles suspended in or falling through the atmosphere, ranging in size from 0.1 to 100 microns.

Residual Smoke: Smoke produced after the initial fire has passed through the fuel and not entrained in the convection column. In complex terrain residual smoke can flow down drainages at night, causing poor visibility and other problems. In addition, the particulate matter can serve as nuclei for fog formation further reducing visibility.

Smoke Intrusion: Smoke from prescribed fire entering a designated area at unacceptable levels.

Smoke Management: Conducting a prescribed fire under fuel moisture and meteorological conditions, and with firing techniques that keep the smoke's impact within acceptable limits.

Subsidence: Downward or sinking motion of air in the atmosphere. Subsiding air warms due to compression. Increased temperature and decreasing humidity are present in subsiding air. Subsidence results in a stable atmosphere inhibiting dispersion.

Transport Wind Speed: A measure of the average rate of the horizontal transport of air within the mixing layer or the wind speed at the final height of plume rise. Generally refers to the rate at which emissions will be transported from one area to another.

Table 1: Prescribed burning timing guidelines for selected objectives.

Grass types / Growth Stages /Burning Periods	Objectives /Results
Cool-season Grasses: Less than 2" new growth February - March	To stimulate or enhance cool-season grass To prepare seedbed for interseeding Legumes To stimulate germination of legumes in a heavy grass stand To control woody invasion
Cool-season Grasses: 4 – 6 " new growth April - May	To set back cool-season grass dominance and stimulate weedy growth and bare ground Note: Burning during this period will seriously injure and probably kill newly germinated annual lespedeza plants.
Warm-season Grasses: Winter December - March	May encourage native grasses to thicken but also removes thatch which can hinder wildlife movement. To create bare ground and prepare for winter overseeding of legumes and native forbs Note: Burning during this period tends not to favor CSG or forbs.

Warm-season Grasses: 1 – 3" new growth Spring April – May	To thicken or enhance poor stands of native grasses Note: Rank stands of warm-season grasses may not be utilized by certain wildlife species. Burning during this period will seriously injure and probably kill newly germinated annual lespedeza plants.
Warm-season Grasses: Summer July - September	To control woody invasion Note: Summer burns are encouraged mainly for the control of woody plants. Summer burns can be very stressful on burn crews and native grass plants.
Warm-season Grasses: Fall August - December	To stimulate native forb regeneration and growth To set back warm-season grass dominance Note: Burning during this period on erosive slopes may cause erosion problems.

Table 2. Quick reference chart for selected prescribed burning activities. See Table 1 for detailed guidelines. **Green shading** indicates cool-season grass activity. **Tan shading** indicates warm-season grass activity. **Blue shading** indicates woody vegetation activity.

Management Objective	Jan	Feb - Mar	April	May	June	July	Aug	Sept	Oct	Nov - Dec
Stimulate cool-season grass										
Seedbed preparation for legumes										
Stimulate germination of legumes										
Set back cool-season grasses										
Seedbed preparation for interseeding legumes or forbs into WSG stands										
Thicken poor stands of native grass										
Stimulate native forb growth in WSG										
Set-back WSG dominance										
Control woody invasion in open lands or thin mesic invaders in oak woodlands or barrens										