

Considerations for Prescribed Burning: WHY, WHEN, AND WHEN NOT TO BURN

Why Burn

Prescribed fire is a tool utilized under very specific and predetermined conditions (weather, fuel load, and season) to manipulate the environment and achieve a desired outcome. Historically, fire was used by Native Americans to clear forested understories of saplings and shrubs and promote open park-like savannas dominated by grasses. This combination of trees and

grass increased both overall game populations and access for hunting. Fires helped to control unwanted pests (mosquitoes, biting flies, etc.), and to increase safety around the living areas by increasing the visibility. Learning from the past, land stewards now use prescribed fire in forests to manage vegetation, improve wildlife habitat, and control pest problems.

Managing Vegetation

Removing undesirable trees and/or invasive plants can be a time consuming and expensive task. In most cases, treatments must be repeated for several years in order to control root sprouting and/or persistent seeds that are dormant in the soil. In conjunction with mechanical removal techniques, herbicide use is often needed to kill unwanted/invasive plants. However, if fire is used properly, it can greatly reduce unwanted vegetation without the need for extensive follow-up treatments. When prescribing fire to control invasive species, it is crucial that the fire be timed to coincide with a specific growth stage of the target species. Plants are usually most susceptible during the early stages of the growing season. Burning during the proper season might also mean burning prior to seed dispersal or when the non desired tree is young and lacking a thick protective bark. The temporary disturbance caused by fire can reduce competition, increase available nutrients and moisture resources, and promote vegetation such as wildflowers, native prairie grasses, forbs, and shade intolerant trees such as oak.

Specific effects of fire

- Controls thin-barked, nonfire-adapted woody vegetation
- Promotes increased light levels at ground level
- Decreases below ground competition and increases rooting space
- Increases water infiltration
- Reduces litter layer allowing for increased seed germination

Improving Wildlife Habitat

Burning the understory of certain forest types (e.g., oaks, hickories) and rangeland/savanna areas can improve forage quality and quantity by returning important nutrients to the soil that were locked in the litter layer.

When combined, increased light and soil nutrient levels can stimulate growth of plants that have higher nutritional values and are easier to digest. Prescribed fire also promotes flower, seed, and fruit production, which can be a vital food source for wildlife throughout both the growing season and fall and winter months. Changes to vegetation composition can promote insect diversity and overall insect populations, and can provide critical food resources in the spring and summer months for many game and nongame bird species and their young. Work continues to show the importance of having diverse healthy prairie type grass systems for young pheasant chicks to feed in.

Controlling Pest Problems

Prescribed burning can be an effective tool for managing several pests, but this is normally viewed as a secondary benefit of fire and not a driving motive to conduct a burn. (Note: The goal is not to eliminate but to manage a dynamic population.) Fire is able to control pests through the elimination of food sources (killing vegetation that pests feed on), outright mortality if insect pests spend portions of their lifestages in the litter layer that burns, and secondary mortality caused by changes in habitat characteristics (e.g., increased light and temperature levels, reductions in moisture levels). The success of controlling pests using fire depends on knowing the lifestages of the target pest and being able to conduct a burn during a time period when the pest is vulnerable (unable to fly, in the litter as eggs or nymphs) and the habitat (e.g., trees, prairie plants) will not be harmed.

Pests that fire can help to control include

- Ticks and chiggers
- Bark beetles in infested trees that are cut and burned
- Spittle bugs in pastures
- Gypsy moth

(See Table 1, page 2-3, for When To Burn)

When To Burn

Managing Vegetation

When using fire to eliminate unwanted vegetation, it is crucial to burn at the right time. Burning prior to seed dispersal and better yet, flowering, can help eliminate plant spread. Some plants, even if they are killed after flowering, will still set viable seed, allowing the problem to return next year. Burning after seed dispersal may in fact promote the unwanted species by giving the newly dispersed seed nutrients and growing space.

To promote wildflowers, an early-spring burn may be the most beneficial. However, a late-spring burn can help promote warm season grasses by adding nutrients to the soil. In general, burns to promote grassy vegetation occur during the spring between late March and early April.

The following chart highlights a few of the invasive plants dealt with on a regular basis in Iowa and across the Midwest. Proper plant identification is critical to begin planning the control measures.

Species	When to Burn	How Many Times to Burn	Optimal Fire Conditions	Remarks
Buckbrush	Mid to late spring.	Repeated burns (>3) may be needed to eliminate the species.	Very flammable when dormant during dry season.	
Buckthorn	Fall after leaf litter is cured or early spring before green-up, if adult trees were previously controlled.	Repeated burns every year or every other year for 5-6 years to eliminate viable seeds in the soil.	Spot fires in dry fire adapted habitats; good in oaks and prairies.	Carefully uprooting seedlings ½ to 1½ inches can help reduce resprouting; be careful not to disturb the soil.
Bush Honeysuckle	Early spring or fall burns prior to seed dispersal.	Burn every year for 5 years to control viable seed in the soil.	Allow for top-till of mature honeysuckle.	
Eastern Red Cedar	Late fall to early winter after deciduous leaf fall.	Smaller trees can be killed with a single fire whereas larger trees will most likely need to be burned several times. A single hot fire may kill larger trees but often leads to dangerous fire conditions.	Burns are most affective when there is plenty of dry grass for fuel underneath the tree. Individual torching can be very effective if grass is not present.	Burning when trees are below 6 ft. tall seems to be the most effective.
Shade-tolerant hardwoods (Ironwood, Maple, Elm, etc)	Fall and early spring	Repeat once the following year	Dry conditions	Most fires will kill seedlings and saplings and can severely damage mature trees.
Garlic Mustard	Early spring after garlic mustard emerges through the litter layer and while seeds are germinating (before desired species emerge).	Repeated burns every spring for at least 4-6 years.	Moderate to high-fire severity fires are most productive; low intensity fires may increase density.	Timing is critical; burning at the wrong time (during the growing season) can increase density of sprouts.
Greenbrier	Fire adapted and will increase in abundance with fire. Fire is not recommended as a control method.			
Multiflora Rose	Early spring	Periodic burns – each burn creates more fuel for the next burn.	Mow strips into the multiflora rose to create fuel to burn.	Not much research has been conducted on the species.
Wild Parsnip	Rapidly resprouts after fire, growing larger, and out-competing native vegetation. Fire is not recommended as a control method.			
Poison Ivy	When burned, it releases noxious chemicals/oils into the air that can cause severe allergic reaction. Fire is not recommended as a control method.			
Poison Oak	When burned, it releases noxious chemicals/oils into the air that can cause severe allergic reaction. Has been known to readily resprout after fire. Fire is not recommended as a control method.			
Stinging Nettle	Spring during the early part of the growing season or fall.	Spring burns may require subsequent frequent burns to reduce abundance.	High severity, frequent spring fires and winter exposure after fall fires can kill the rhizome.	Burning may increase their abundance if done in the spring without subsequent burns.

When To Burn

Improving Wildlife Habitat

As mentioned before, prescribed burning can be an effective tool for improving wildlife habitat. When burning to improve wildlife habitat, keep in mind the animal's life cycle. Burning during the late spring when birds are nesting can cause complete nest failure and direct young mortality. Late fall burns will not harm the subadults directly but will reduce the amount of overwinter habitat available. Creating a mosaic of burned and unburned areas that are rotated through

a spring and fall will create optimal areas for winter, spring, and summer habitat.

This section provides a set of guidelines to promote certain species. The focus is primarily on game species with the objective being to provide habitat that is healthy and in the proper landscape orientation. By creating or improving habitat for these species, the benefits to nongame species are likely to be high.

Species	Goal	Type of Burn	Season	Area of Burn	Frequency	Special Considerations
White-tailed Deer	Provide a patchy habitat and promote vegetation regeneration	Back fire or Spot fire	Winter	Small patches with areas left unburned	2-4 years	
Turkey	Provide adequate cover and forage, patchy habitat	Back fire or Spot fire	Winter or July-August	Small patches with areas left unburned around the perimeter	2-4 years	Avoid burning during the nesting season (April-June) to promote nesting success
Quail	Promote forage and insect abundance while maintaining cover	Most types are acceptable	Late winter	At least 25 acres with unburned patches and thickets	1-2 years	Avoid burning during the nesting season (April-June), and avoid ring fires (ring fire may trap birds in the interior of the fire)
Waterfowl	Provide cover and forage for migration	Head fire	Late fall or early winter	Not crucial, only burn the marshland	No less than every 2 years	Only burn in marshlands
Ring-necked Pheasant	Provide grass-forb cover and stimulate warm-season plants and wildflowers	Most types are acceptable	Spring	Rotational burning to create a habitat mosaic	Every 3 years followed by a season of mowing and then no disturbance	Avoid burning during the nesting or brooding season, June-August
Sharp-tailed Grouse	Provide shortgrass prairie	Most types are acceptable	Fall	At least 25 acres with unburned patches and thickets	1-2 years	Avoid burning during the nesting or brooding season
Roughed Grouse	Maintain successional stages of grasses, forbs, and shrubs for cover and forage	Low severity burns	Spring	10 acre plots in a staggered pattern leaving unburned areas adjacent	Every 2 years in oak / hickory types	Avoid burning during the nesting season and fall. Spring burns should be before April 15
Woodcock	Eliminate woody species for nesting cover	Low severity burns	Early spring	1-3 acres per 100 acres	Every 3-5 years	Avoid burning during nesting season (May-June)

Controlling Pest Problems

When burning to control pest and disease problems, it is important to remember the pest/disease life cycle. In order for the burn to be effective for pests, the burn must occur when the pest is the most vulnerable. Some diseases are most susceptible when they first immerge in the beginning of the year, like the brownspot needle blight. Other species are most susceptible during dormancy.

Burning for pests such as root fungus and rust should be done through low intensity surface burns. These burns reduce the number of infestations by killing the spores in the litter layer. Also, burning areas with extensive infestation may help prevent spreading infestation to surrounding areas.



When Not To Burn

The following six guidelines list times when it is not advisable to burn. Also be aware that counties, municipalities, and other areas have restrictions on when burning can occur. For more information on local fire bans, visit <http://www.dps.state.ia.us/fm/burnbans/index.shtml>.

1. Do not burn when smoke will blow toward populated areas, major roads/highways, or linger.

- a. Winds should be between 5 to 15 mph for prairies and 20 to 25 mph for woodlots and savanna.
- b. Wind direction should be checked.

2. Never burn without first checking the National Fire Weather Forecast. No burning should occur:

- a. If the area is under a “fire weather watch” or “red flag warning.”
- b. Within 24 hours before or after a major frontal change (shifts in wind direction and speed, unstable atmosphere).

3. Avoid burning during periods of drought.

- a. Relative humidity should be from 35 to 55 percent for prairies and 20 to 50 percent for forested areas.

4. Do not initiate burning early in the morning.

- a. Burns should begin after 9 a.m.
 - Relative humidity is the lowest in the morning and has the quickest rate of change.
 - Mixing height (height at which the smoke will mix with the atmosphere) peaks during mid to late afternoon.

5. Do not burn in young or overly mature stands.

- a. Young trees may not survive a fire.
- b. Bark must be thick enough to resist the heat from a fire.
 - Red oaks should be greater than 8” in diameter.
 - White oaks should be 6” or greater in diameter.
- c. Many old trees may have areas of decay that the fire can burn into, causing further damage.
- d. Older trees in decline may not be able to produce acorns sufficient to regenerate the site.

6. Avoid burning prior to harvest as this may result in decreased timber value.

- a. Burns that create large amounts of heat may kill or injure mature trees. Unless harvested immediately:
 - Trees that were killed will begin to decay.
 - Wounded trees will begin to compartmentalize burned areas, which may discolor wood.

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