more productive the site, the more frequently fire needs to be applied. If a site has only had a few prescribed fires, or if it has been more than three years since the last fire, care should be given to assess the fuel loads prior to implementation. Heavy fuel loads can produce more intense, radiant heat than expected and could result in unintended damage or mortality to overstory trees. Thinnings can also create coarse fuels on the ground that can be problematic on the first burn.

Care should be taken to leave nesting cover each year by alternating burn units so that approximately half the area is left unburned. Burn units should be less than 60 acres in size and scattered across the property, if possible. If larger burns are needed to accomplish management goals and maintain woodland structure, consider burning under conditions when patchy fuel combustion is likely so that patches of vegetation structure exist within the burn unit. Managers should apply fire throughout the year instead of all at once, as different seasons favor various flora and fauna. Spreading out the burn season is also a hedge against lack of cover and drought.

Herbicides

Herbicides can greatly enhance the effectiveness of prescribed fire and thinning in controlling hardwood sprouts and promoting desirable vegetation. If possible, a pre-harvest treatment of herbicides should be applied, focusing on non-commercial stems not likely to be removed during a thinning operation. If a pre-harvest treatment is not possible, a post-thinning treatment is recommended. Care must be used to avoid herbicides that could harm residual overstory hardwoods. For example, products containing Imazapic or Imazapyr are active in the soil for as long as 120 days after application and should not be used in broadcast treatments for oak woodlands. They can, however, be used to control single stems and resprouts using the

Hack-and-squirt herbicide application. Photo by Dwayne Elmore.

hack-and-squirt method. Triclopyr is an effective herbicide for hack-and-squirt application and would be preferred if legumes or hackberry are to be controlled. Hack-and-spray should not be used during periods of heavy sap flow (spring), as effectiveness is greatly reduced.

Herbicides can also be applied using a tractor- or skidder-mounted rig designed to spray in a low arc, covering undesirable understory species without contacting residual overstory trees. Foliar spraying is generally done in late summer the year of thinning. However, if thinning is completed late in summer, spraying can be used the following spring or summer. Once sprouts are under control, a prescribed fire regimen can be incorporated to develop and maintain desirable bobwhite cover. By using herbicides initially, the frequency with which fire must be used can be reduced. This is particularly helpful for landowners who are wary of fire, live in areas where fire is problematic, or can't conduct prescribed burns every two years.

Landowners should seek the advice of a professional for specific herbicide recommendations, and always follow the label instructions and any state and federal regulations.

Cover photo provided by Tennessee Wildlife Resources Agency.

Photo by Dwayne Elmore.

Historically, woodlands were extensive in the eastern United States. The combination of herbaceous and woody vegetation, along with the regular disturbances that maintained these conditions, provided ideal habitat for quail.

On appropriate sites, they can be restored and provide high quality habitat once again.

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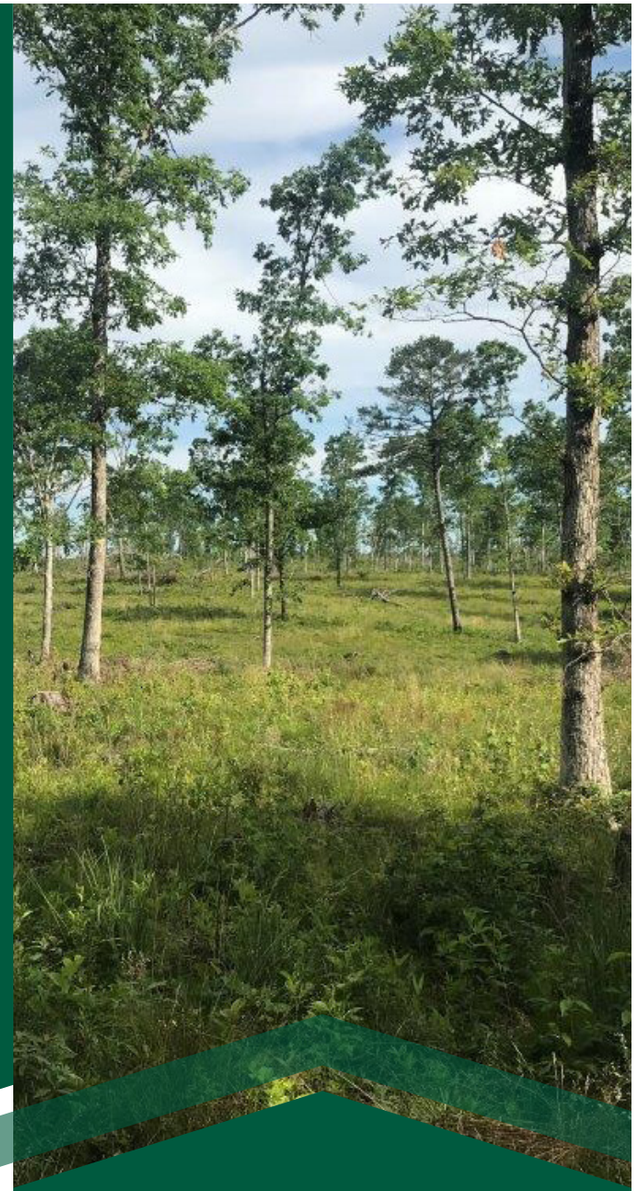

Restoring Woodlands for Bobwhite

What is a woodland?

The word “woodland” is not just another name for a forest. True open woodlands are characterized as having:

- a canopy cover of 30-60%,
- an under-developed midstory, and
- a well-developed understory with 50-100% ground cover.

This composition allows for sunlight to reach the ground, creates a rich diversity of herbaceous vegetation, and provides ideal habitat for bobwhite and other wildlife species. However, management of woodlands has often neglected the use of prescribed fire. In the absence of fire, woodlands succeed to a closed-canopy community with little understory diversity.

With canopy cover of 60-70%, this stand provides marginal habitat for bobwhite. Photo by Dwayne Elmore.

Choosing a Site

When creating or restoring a woodland, it is important to choose the right site. Woodlands are often found on less productive, south- and west-facing slopes with drier conditions where there has been a history of frequent fire. On more productive, higher-moisture sites, most of the overstory will be composed of fire-intolerant species, and burning may produce unacceptable tree injury. These sites are best reserved for other uses, not managing for open woodlands.

Restoring the Site

A variety of silvicultural practices can be used to restore degraded oak and pine-oak woodlands. To benefit bobwhite and other species with similar habitat requirements, an initial thinning and/or harvesting of over- and midstory trees must be implemented to create an open canopy. Prescribed fire is also essential to restore and maintain woodland. Prescribed burning promotes the herbaceous plants required for nesting and brood-rearing cover and simultaneously controls woody growth, thus keeping woodlands from advancing back to closed-canopy forest. Herbicides may be required to adequately control hardwood stump and root sprouts and maximize the effectiveness of subsequent prescribed burning. Grazing can also be used to manage woodlands, but must be done on an appropriate scale to be beneficial for bobwhite. Bobwhites prefer some shrub cover, so it is unnecessary and impractical to eliminate all shrubs, sprouts, or vines.

Woodland management can benefit other species of wildlife including white-tailed deer, wild turkey, and Eastern bluebird. However, species that require a forest mid-story, thick leaf litter, or high levels of shade should be expected to decline.

Thinning

As a general rule, woodland sites should have no more than 60% canopy cover, and even this level is very marginal for bobwhites. To provide optimum conditions, canopy cover should be less than 40%. Woodland canopies should be evaluated at mid-day and measured when leaves are on the trees. An open overstory and a sparse mid-story are critical to promote native grasses, forbs, and legumes for cover and food resources.

Prior to thinning the overstory, evaluate the presence of invasive species. Depending on location and geography, non-native invasive species (i.e., sericea lespedeza, mimosa, bush honeysuckle, kudzu, tree-of-heaven) and some native species (i.e., yaupon holly, eastern red cedar) may be present along roads, power lines and other openings adjacent to or within the understory. These aggressive species should be controlled prior to the overstory thinning to minimize their spread once thinning and burning occur, as disturbance often favors their distribution.

This stand of hardwoods was heavily thinned to improve quail habitat. Photo provided by Virginia Dept. of Wildlife Resources.

Trees that are to be retained should be marked before beginning the overstory removal. Thinnings should leave a variety of overstory species including red and white oak, hickory, and fire-tolerant pines. Due to the potential for damage from prescribed fire, debris piles should not be left next to residual trees. Additional thinning can be completed with mechanical thinning methods (forestry mulcher) or other treatments (chainsaw or hack-and-squirt). Using herbicides in a hack-and-squirt method is cheap, easy, safe, and is recommended on sites where commercial harvests are not viable. Retaining snags will allow many species of cavity nesters to use the site until the snags fall out, which takes about 10 years.

For those who wish to speed up the process of creating open woodland or are in a location where prescribed fire is not feasible, a forestry mulcher can be used in the understory to reduce residual hardwood brush. However, the mulch created can inhibit herbaceous response for several years. If fire is not an option on the site, it is unlikely that it will be able to be maintained as a woodland.

Prescribed Burning

Frequent prescribed fire is essential to maintaining bobwhite habitat in oak and pine-oak woodlands. Many hardwood species will sprout prolifically at the stump or when top killed. If left unchecked, hardwood sprouts can quickly shade out desirable herbaceous plants and often require mechanical or herbicide treatments to control. If used often enough and during the appropriate season (once leaf flush on hardwoods exceeds 40%, or in the fall prior to leaf abscission), prescribed fire will suppress hardwood sprouts and maintain desirable native grasses, legumes, forbs, and shrubs used by bobwhites. However, bobwhites do require some woody cover in the understory. Scattered patches of plum, sumac, Rubus, and even oak sprouts are beneficial for bobwhites. A balance is needed to maintain enough shrub cover (around 20-30%) and herbaceous cover to meet bobwhite habitat requirements.

Depending on the desired plant community, climate, and site productivity, apply fire on a two- to three-year rotation to maintain good habitat structure for bobwhites. Generally speaking, the

A prescribed fire moves through an open woodland. Photo provided by Missouri Dept. of Conservation.