Quality Vegetation Management

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QDMA Articles

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Have you ever wondered what it must have been like to hunt whitetails during the 1700s? An old painting shows a Native American stalking a deer in an open, almost park-like, pine forest. This painted warrior was peering around a very large pine tree, standing in knee-high vegetation, patiently waiting for a doe to walk within bow range. Several more deer were visible about 200 yards through the woods. The scene was quite different from what many pine forests and hunting situations look like today.

Southern pine forests historically provided quality habitat for whitetails and were characterized by early explorers and settlers as being open, park-like stands with diverse understory communities of grasses and herbaceous plants. These habitats were the result of periodic fire started by lightning or as part of land management by Native Americans — and wildlife flourished.

Some say that “change is the only constant” and that saying certainly fits management practices applied to southern pine habitats in the last century. Practices today, such as fire suppression, have left many southeastern pine systems a tangled mess. Thick, low-quality hardwood brush and trees flourish in the forest midstory, making high-quality whitetail habitat anything but bountiful.

Today, non-industrial, private forest landowners own two-thirds of the forestland in the southeastern U.S. Ownership objectives range from recreational use such as hunting, fishing, and bird watching to timber production to simply having the “old woods” behind the house. Unfortunately, many landowners do not realize that active management is needed if their properties are to meet their ownership objectives. The resulting “hands-off” forest management approach has added to the acreage of low-quality wildlife habitat. Without active management, low-quality hardwood species such as sweetgum invade pine forests and, over time, dramatically degrade wildlife habitat quality.

Although these stands may look healthy to the untrained eye, they are practically worthless to many important wildlife species. Hardwood invaders form a dense midstory canopy and prevent sunlight from reaching the forest floor, impeding the growth of herbaceous species that need sunlight to thrive and grow. In addition, a thick litter layer — in the form of leaves and pine straw — builds up over time and chokes out plant communities that are beneficial to wildlife. When large acreages reach this stage, local deer will have to work hard to find the high-quality diet items that are so important to body growth and antler quality.

The traditional landowner’s or hunter’s management response to this condition is to supplement the habitat by planting food plots. Although valuable, there are certain limitations associated with food plots. First, pine-production acreage must be sacrificed to create food plots, which typically results in only one to two percent of forested property available for food plots. Secondly, food-plot production is sensitive to rainfall patterns, so success varies over time. Lastly, food plots are expensive to establish and maintain. These limitations do not preclude use of food plots as part of the habitat management plan for producing quality deer, but they certainly indicate the need to consider additional options.

If planting a food plot is not always the best option, then what about managing native vegetation? Certain habitat management alternatives can be used to reestablish high-quality habitat, but limitations apply here as well. Prescribed fire can be an effective tool but should not be used in stands with dense midstories, otherwise you might experience what we call a catastrophic, stand-replacement fire. Similarly, a mechanical treatment such as bushhogging undesirable tree species that have the ability to sprout from a stump will simply add to the problem.

The key to reestablishing high-quality upland pine habitat is to essentially “re-capture” the forest from the controlling influence of the undesirable hardwood midstory. The existing hardwood component, with its established root system must be killed, which will open up the forest floor to sunlight. Secondly, the litter layer should be removed to promote the natural establishment of high-quality, shade-intolerant plants, such as legumes and other forbs.

Recapturing High-Quality Habitat

More than 12 years ago, Bobby Watkins, a BASF forestry technical specialist, established a study area in north-central Mississippi to observe the effects of a herbicide and fire treatment to a mature, naturally regenerated pine stand with no history of active management other than thinning. He sprayed the area with 16 ounces per acre of Arsenal® Applicators Concentrate herbicide in mid-fall and followed with a prescribed burn in early spring. He removed the hardwood midstory and produced an understory herbaceous plant community the following growing season that was comprised of desirable deer forages such as American beautyberry, beggar’s lice, honeysuckle, blackberry, and muscadine. Not only did these high-quality deer forages flourish, but their biomass production increased over time with a four-fold increase in forb production and an eleven-fold increase in grass production compared to an adjacent, untreated area. The results were encouraging.

Quality Vegetation Management in Action

Mississippi State University began working with Watkins in 1998 to further quantify the effects of a combined vegetation management approach involving Arsenal herbicide, prescribed fire, and fertilizer. The combination of these techniques is known as Quality Vegetation Management (QVM). Our goal was to compare the cost of producing quality forages using food plots to the cost of encouraging growth of natural vegetation under the existing pine canopy using QVM.

Watkins applied QVM within mature (45 to 50 years old), naturally-regenerated, loblolly pine stands in central Mississippi. Four treatment areas and adjacent untreated areas were selected for direct comparison of the vegetative response. Arsenal® Applicators Concentrate herbicide was applied at 16 ounces per acre in October 1998 with a skidder using a water solution of 20 gallons per acre. A controlled burn was conducted in April 1999 to reduce the accumulated fuel load, and 200 pounds per acre of 0-26-26 fertilizer was applied in August 1999.

During the growing seasons of 2000 and 2001 (years two and three post-treatment), a team of Mississippi State University students collected plant samples to determine the quality and quantity of deer forages produced. Vegetation quality was determined by conducting crude protein and in vitro digestibility analysis on 13 preferred deer forages.

Vegetation quantity was determined by clipping forages from within exclosures that restricted deer foraging. Biomass samples were clipped by species to determine total biomass production and then separated into leaf biomass, the portions of plants that are potentially consumable by deer. Digestible protein production was then calculated by multiplying a species leaf biomass production by its crude protein and digestibility estimates.

Four traditional food plots were planted with iron and clay cowpeas during April 2000 and April 2001. The plots were limed and fertilized according to recommended levels and sampled in the same manner as the QVM-treated areas.

What were the results? The QVM treatment removed the hardwood midstory and allowed sunlight to reach the forest floor. The prescribed fire removed the residual hardwood standing debris and the understory litter layer, releasing the desirable herbaceous vegetation present in the seed bed. The summer fertilizer application promoted additional desirable plant growth. The resulting forest was an open, park-like stand providing a smorgasbord of quality food for deer to eat.

The effects of QVM on deer habitat quality were quite dramatic. Total biomass production essentially doubled in QVM areas (Figure 1) with significant increases in the forbs and grass classes. Although the amount of browse produced did not differ between QVM and untreated areas, the composition of the browse was changed from primarily sweetgum in the untreated areas to more desirable deer forages such as American beautyberry, winged elm, tree sparkleberry, blackberry, and muscadine.

The QVM-treated areas showed a remarkable 350 percent increase in leaf biomass (Figure 2, opposite page) of the preferred species. Of even more importance to a buck growing antlers and a doe feeding fawns, there was a 500-percent increase in the amount of digestible protein.

In a concurrent study, Mississippi State University wildlife professors Drs. Jeanne Jones and Wes Burger identified 99 plant species in QVM-treated areas accounting for an average understory canopy cover of 105 percent. Untreated areas produced only 38 species, with an average canopy cover of 44 percent. The more species of plants available to deer, the more capable they are of consuming a high-quality diet that supports proper antler growth and fawn production.

The areas treated with QVM essentially became natural, high-quality food plots. Nothing was planted in these areas — it's all natural vegetation that had been in the seed bed waiting for favorable conditions for germination. All we did was create the right growing conditions and the seed bed and sunlight did the rest.

Deer nutritional carrying capacity in the QVM-treated areas increased dramatically due to the increase in biomass of high-quality forages. These estimates of nutritional carrying capacity are not meant to be used as absolute values, but can be used to compare relative effects of habitat treatments. S pecific results may vary with the age of the stand and soil type. We assumed a deer needed three pounds of forage per day (dry weight) and an average diet quality of 12 percent, which is the protein requirement for adult body maintenance. The average nutritional carrying capacity for the QVM-treated areas was 109 deer days per acre and only three deer days per acre for the untreated areas. We used a 12-percent protein diet for the purposes of comparing the treatment effects. If we had calculated carrying capacity using a more ideal 16 percent protein level, there would have been zero days of foraging potential in the untreated areas.

Cowpea food plots also produced well over the two years of the study, averaging 485 pounds per acre of leaf biomass and 98 pounds per acre of digestible protein. Although the cowpea production results are greater than the QVM areas, does that mean that food plots are the best management alternative in poor-quality habitats? Not necessarily.

The real value of QVM becomes clearer when considering cost efficiency. A licensed applicator applying Arsenal via skidder will charge about $70 per acre, a prescribed fire will cost around $10 per acre, and fertilization costs around $25 per acre. The exact costs may vary somewhat, for instance, if you conduct the burn yourself or contract it through your local forestry commission. We recommend conducting a prescribed fire again in five years to control any additional woody invaders and to stimulate fresh forage production. Thus, the total 10-year cost of the QVM treatment was $115 per acre. A cowpea food plot costs about $106 per acre, per year.

Although initially expensive, one important aspect of QVM is that it is a one-time cost with effects that can last for 10 or more years. The cost of establishing a cowpea food plot is incurred every year the food plot is planted. Based on our productivity estimates, the average annual cost of producing digestible protein over a 10-year economic planning horizon was $0.38 per pound for QVM and $1.09 per pound for cowpea food plots. The bottom line is that the cost of maintaining food plots is nearly three times more expensive than the cost of the QVM approach.

Beyond Deer Food

The benefits of QVM range far beyond simple economics and the increased production of quality deer forages. QVM also can be considered a timber stand improvement practice because it releases the overstory pine trees. Mississippi State University forestry research has shown that mature pine trees can increase their radial growth rate by as much as six percent after receiving treatments similar to QVM. If this trend continues, and assuming quality sawtimber, the volume increase and associated economic return at harvest could easily allow the landowner to recover the QVM investment cost. Because QVM eliminates hardwood stems that normally remain after a timber harvest, it can also assist site preparation for a future timber rotation. In addition, QVM users may receive more accurate timber pricing bids because foresters can more easily navigate within a QVM-treated stand.

Deer are not the only wildlife that can benefit from QVM practices. Burger and Jones reported that QVM-treated areas experienced an increase in total bird species, including early successional birds such as the Bachman’s sparrow — a species of concern in the Southeast due to their population decline from loss of open pine habitats. Game birds such as bobwhite quail and turkey can also flourish in QVM-treated pine stands because such areas create the annual grasses and forbs required for good nesting and brood-rearing habitats.

The benefit of QVM to hunters can be dramatic as well. Deer in these native vegetation food plots can often be seen foraging earlier in the afternoon and QVM areas can serve as travel lanes to funnel deer into planted food plots. These areas provide aesthetically pleasing hunting grounds with increased visibility, often leading to improved hunting success.

Properly managed pine stands can provide quality habitat for deer, turkey, quail, and a host of songbirds. Deer managers should consider using a QVM approach in conjunction with traditional food plots to cost-effectively improve the nutritional forage base for whitetails. And, by removing unwanted midstory vegetation from forestland, the area becomes more aesthetically pleasing. Active forest management can ensure that trees produce a significant financial return to nonindustrialized landowners while simultaneously fulfilling their other wildlife-based management goals.

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