Managing Yaupon With Fire and Herbicides in the Texas Post Oak Savannah

Yaupon invasion into historic grassland savannahs can be effectively reduced with prescribed burning and herbicides.

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The Post Oak Savannah Ecological Region in Texas was once an open grassland savannah maintained by periodic fires.[1] The Post Oak Savannah can support mid- and tall grasses, such as little bluestem, indiangrass, Texas wintergrass, and purpletop. Today, the savannahs have been replaced by oak woodlands with dense yaupon (*Ilex vomitoria*) understories that limit grass and forb production and species diversity (Fig. 1). Restriction of fires in conjunction with poor grazing management and periodic droughts are often credited for the dense thickets that occur in the Post Oak Savannah.[2]

Yaupon is a native component of the Post Oak Savannah and is a slow-growing and erect evergreen shrub found in both open areas and in the forest understory.[2–4] It can form dense thickets from its multistemmed base and reach 26 feet in height.[4] Yaupon growth begins in March and continues through October if soil water is sufficient and grows best on sites with sandy soils and permeable subsoils.[3] Yaupon growing in open areas tends to produce high fruit yields during alternate years. It also reproduces asexually by root or basal crown sprouting.

Yaupon is easily top-killed by burning, but the plant sprouts from the base, resulting in low mortality. Most burning in the region occurs during winter, which provides the safest conditions for burning. However, winter burning favors forbs and reduces grass, which may be desirable for wildlife habitat but detrimental for livestock grazing.[5] A management plan that incorporates only winter burning usually results in fine-fuel loads dominated by forbs, promoting patchy, lower temperature burns in the future. Yaupon thrives under these conditions.

Locations and Treatments

Studies were conducted on the Gus Engeling Wildlife Management Area (WMA) near Palestine, Texas (Fig. 2).

Figure 1. A dense yaupon thicket during winter at the Gus Engling Wildlife Management Area near Palestine, Texas. Some yaupon in this thicket exceeded heights of 15 feet.

Sidebar

The use of individual plant treatments (IPT) to control problem plants is becoming an increasingly viable management alternative.[6] The suggested method for managing yaupon in Texas is to apply an IPT of 25% Remedy (triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester, 61.6%) in diesel fuel to wet completely around the lower 18 inches of the trunk anytime during the year.[7] However, little information is available for treatment options that incorporate prescribed burning. We investigated the impact of low-volume basal IPT of diesel and diesel combined with Garlon 4 (triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester, 61.6%) at rates of 5%, 10%, 20%, and 25% on yaupon plants that had sprouted 6 and 18 months after prescribed burning. We used Garlon 4 because it is labeled for controlling woody plants in forests and wildlife openings.

The climate is moist subhumid, with annual precipitation of about 40 inches and a 225-day growing season.[8]

Management units on Gus Engeling WMA are typically burned every 3 years. We chose 2 study sites that were burned on either February 15, 2000, or February 22, 2001. These areas allowed us to evaluate the use of herbicides 6 and 18 months after burning. Study sites were selected on the basis of accessibility and the presence of an adequate yaupon density for evaluation. The soils on each site were dominated by sandy loams with slopes ranging from 1% to 8%.[8] Woody plants varied by site and included post oak, sand jack oak, cedar elm, yaupon, hawthorn, dewberry, and greenbrier.

At each of the burned sites, 25 yaupon plants were selected and randomly marked for no treatment, treatment with diesel only, or 5%, 10%, 20%, or 25% Garlon 4 in diesel. We maintained 4–6 feet between treated trees to ensure that different trees were treated. The 2000 (18 months postburn) and 2001 (6 months postburn) burned yaupon trees had to meet 2 criteria to be selected for study. First, it must have been top-killed by the fire, and, second, the sprouts had to be in the short-shoot (reproductive) growth stage. A backpack sprayer fitted with a flat-fan nozzle was used to spray the basal portion of the plant, avoiding the foliage (Fig. 3). All herbicide treatments were applied between July 16 and 20, 2001. Mortality was evaluated 24 months after spraying. All trees that had any new or living leaves, new sprouts or stems, or pliable stems were considered living, whereas all trees with brittle stems and brown leaves were considered dead.

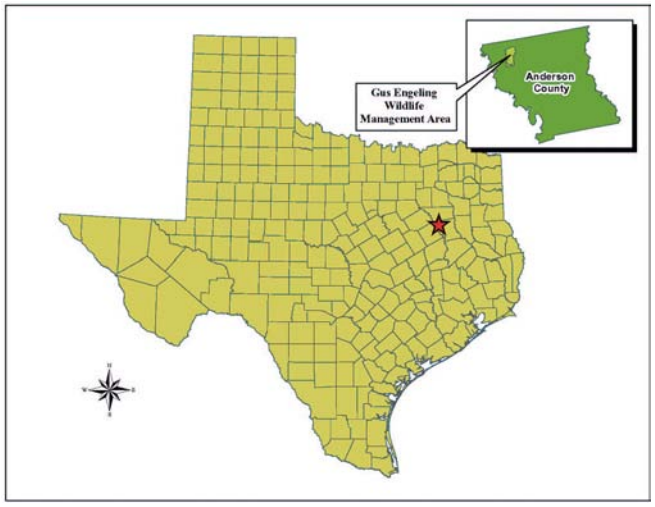

Figure 2. The study was conducted on the Gus Engeling Wildlife Management Area located in Anderson County near Palestine, Texas.

Response to Treatments

Previous observations on Gus Engeling WMA indicated that prescribed burning reduced the canopy of yaupon but did not cause mortality. However, when diesel or diesel mixed with Garlon 4 was applied 6 and 18 months after burning, mortality did occur at high rates (Table 1). All treatments containing Garlon 4 resulted in at least 92% mortality.

Yaupon sprouted vigorously after burning. Mortality due to burning was not evaluated since individual trees were not marked prior to burning. However, yaupon has proven to be a persistent competitor for resources even after prescribed burning. Its strong sprouting ability has limited the long-term control of mature plants by burning alone.

Management Implications

Yaupon is controlled with low concentrations of herbicide after prescribed burning. We suggest selecting the treatment on the basis of management objectives and cost. For example, to develop yaupon-free clearings within a forested management unit, spraying the postfire sprouts with 10% Garlon 4 six months after burning resulted in 100% mortality and would cost $0.40/killed tree. If about 85% mortality is acceptable, a basal application of diesel 6 months after burning would reduce treatment costs to $0.20/killed tree and eliminate the need to purchase herbicides. Although applying 25% Garlon 4 resulted in 100% mortality 6 and 18 months after burning, treatment cost increases to $0.73/killed tree, more than 4 times more expensive than diesel alone. It appears that applying herbicides with IPT 6 months after burning is slightly more effective than applying herbicides 18 months after burning. Plants treated 6 months after burning were smaller, and some of the herbicide was likely applied to the foliage in addition to the plant bases, likely flooding the plant system with herbicide. Prescribed fire alone will not reduce yaupon density and restore the flora and fauna of the Post Oak Savannah.

Yaupon can be readily controlled in most situations. We have provided several alternatives for managing yaupon after burning. Prescribed fire application at 5- to 7-year intervals and monitoring habitat to respond to yaupon invasions early will reduce the negative effects of yaupon. If yaupon is permitted to become too dense before burning, grass production

Table 1. Yaupon mortality (%) 24 months after treatment with diesel or diesel and four concentrations (5, 10, 20, and 25%) of Garlon 4. Study sites at the Gus Engeling Wildlife Management Area near Palestine, Texas, were burned during winter in 2000 and 2001, and herbicide treatments were applied in summer 2001, 6 or 18 months after burning. Costs per treated plant are based on the following assumptions: diesel cost = $2.05/gallon; Garlon 4 cost = $113/gallon; labor cost = $13/hour; 100 trees were treated/hour; each tree received 2.6 oz. of mixture for each treatment.

	6 Months post-burn	18 Months post-burn	Cost/plant
Garlon 4 concentration (%)	Mortality (%)		$/treated ($/killed)
Diesel only - 0	84	60	0.17 (0.20-0.28)
5	96	92	0.28 (0.29-0.30)
10	100	92	0.40 (0.40-0.43)
20	100	96	0.62 (0.62-0.65)
25	100	100	0.73 (0.73)

will be limited, reducing the ability to safely apply prescribed fire and reducing the grazing value and wildlife habitat quality of the site.

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Figure 3. Yaupon being treated with basal herbicide applications 18 months after burning. The plant was top-killed by burning and sprouted from the base, resulting in numerous stems per plant.

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