The Effect of Fire on Woody Plant Selection by Nesting Nongame Birds

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Highlight: Selection of woody plants by nesting nongame birds was investigated in burns of several different ages in a honey mesquite-tobosagrass community in central Texas. Lotebush and honey mesquite were the most important plants used with nesting activity recorded in 30.3% of all lotebushes inspected. The average volume of 97 occupied lotebushes was $1.6m^3$. Above-ground age of the smallest plants used averaged 6.1 years. The majority (68.6%) of the lotebushes counted in density plots were resprouts following fires and only 3.0 plants/ha were actually available as nest sites.

Brush control, or type conversion practices, are directed at the removal of woody plant species to increase forage production for livestock. In Texas, prescribed burning is a proven tool in the control of honey mesquite (*Prosopis glandulosa* var. *glandulosa*) associated with clay soils in the Rolling Plains. The subsequent loss of mesquite and other woody species in its range may adversely affect nongame bird populations breeding in these habitats.

The purpose of this study was to determine the importance of woody plants to nesting nongame birds in a honey mesquite-tobosagrass (*Hilaria mutica*) community following a 7-year burning program.

Study Area and Methods

The study area was located on the Renderbrook-Spade Ranch, 32.2 km south of Colorado City, Texas. Average precipitation is 48.2 cm per year. Slopes range from 0 to 3% on a Stamford Clay soil. Vegetation is dominated by tobosagrass, buffalograss (*Buchloe dactyloides*), and annual broomweed (*Xanthocephalum dracunculoides*), with an overstory of honey mesquite and scattered lotebush (*Zisiphus obtusifolia*).

Eight burned areas were used to evaluate nongame bird nest sites during the spring of 1975. They included areas burned in 1969 (109.7 ha), 1970 (57.1 ha), 1971 (60.3 ha), 1972 (123.1 ha), 1973 (71.2 ha), 1974 (73.2 ha), 1975 (91.1 ha), and an unburned control (140.8 ha).

Nest searches were conducted during two periods in 1975: May 1 through May 4 and June 17 through June 20 to cover early and late nesting activity. Only active nests with eggs or young were counted. Forty lotebushes and 40 honey mesquite trees in each treatment were searched for nests along random transects, with different transects used for each census period. Transects were restricted to tobosa "flats" or large areas of unbroken topography where fire had uninterrupted effect. Forty algerita (*Berberis trifoliata*), four-winged saltbush (*Atriplex canescens*), and catclaw acacia (*Acacia greggii*) plants were not a major part of the honey mesquite-tobosa grass community.

The physical characteristics of each plant that served as a nest site were recorded to identify those plants most preferred by nesting birds. Measurements included: height, width, and length; basal growth form, i.e., single or multiple-stemmed; an physical condition, i.e., green (>50% living material) and degenerate (<50% living material). Density of woody plants was determined using two 50 \times 50-m plots randomly located in each treatment.

Table 1. Woody plant selection by nesting nongame birds following a 7-year burning program in Mitchell County, Texas. 1969-1975.

Year of burn	Plants selected as nest sites				
	Lotebush	Honey mesquite	Algerita	Four-winged satlbush	Catclaw acacia
1969	16	5	0	0	0
1970	14	2	0	0	0
1971	18	8	0	0	1
1972	12	6	0	0	3
1973	14	3	0	0	0
1974	0	0	0	0	0
1975	7	0	0	0	0
Control	16	4	0	0	0

Preliminary observations indicated that lotebush was a preferred nest site, therefore additional measuremens were taken on these plants. Above-ground age was estimated by counting rings from cross-sections of the three largest stems from each plant. A minimum size lotebush useful to nesting birds was calculated by taking the average dimensions (height \times width \times length) of the two smallest bushes used in each treatment, excluding the control.

The nonparametric Mann-Whitney Test (Conover 1971:224-229) was used to test for differences between the number of nests used in lotebushes vs. mesquite.

Table 2. Bird species use of woody plants following a 7-year burning program in Mitchell County, Texas. 1969-1975.

Bird Species	Lotebush	Mesquite
Cardinal	14	4
Cactus wren	17	10
Mocking bird	15	3
Lark sparrow	10	0
Brown towhee	41	0
Road runner	2	0
Northern oriole	0	5
Ash-throated flycatcher	0	2
Scissor-tailed flycatcher	0	4
Percent Plants Utilized	30.3%	8.8%



Fig. 1. Nesting lark sparrow (Chondestes grammacus) utilizing a lotebush in central Texas.

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This research was supported in part by the Forest Service, U.S. Department of Agriculture, through Eisenhower Consortium for Western Environmental Forestry Research. Manuscript received July 27, 1977.

Results and Discussion

Nest Site Preferences and Characteristics

A search of 1,600 woody plants revealed that nesting nongame birds preferred lotebush and honey mesquite over all other woody plants (Table 1). Nest searches also indicated a significant difference (P < 0.01) between the number of nests found in lotebushes (97) and the number found in honey mesquite (28). This preference for lotebush is of particular significance when related to woody plant densities following fire. Lotebush density for burned plots averaged 33.6 plants/ha while mesquite averaged 212.1 trees/ha. More than six times as many mesquite trees were available for nest sites yet lotebushes received three times as much use. More important, based on the minimum size lotebush acceptable to nesting birds only 3.0 plants/ha were available as nest sites. The majority (68.6%) of the lotebushes counted in density plots were basal resprouts of a prostrate, rosette growth form which appeared useless to nesting birds.

Differences in the number of nests found may be the result of the various cover requirements of nesting birds. Five of the six birds species that nested in lotebushes built cup or bowl nests, which require sturdy support (Fig. 1). This aspect of nest site selection may be especially important to grassland birds living in areas subject to climatic extremes. Years characterized by dry conditions in southwest grasslands are typified by higher than average winds and temperatures (Wiens 1974). Lotebush provides a very stable substrate during high winds that buffet other woody plants. More important, out of 97 lotebushes used by nesting birds 58 (59.7%) were single-stemmed growth forms able to withstand high winds more effectively.

Nesting bird's preferences for lotebushes, particularly the singlestem type, may also be due to the uniform, dense canopy which offers shade during high temperatures and concealment from predators. A study by Austin (1970) showed that high foliage volume was a favorable factor in shrub selection in desert riparian habitats because of the increased protection from weather and predators. Algerita grows in a form similar to single-stemmed lotebushes yet none of these plants were used by nesting birds. Although its growth from appeared suitable for nesting, undetermined factors were apparently working against its selection.

Honey mesquite trees were used by birds with more specialized nesting requirements. Northern orioles (*Icterus bullockii*) needed a high, open canopy for suspended, pouch nests; and ash-throated flycatchers (*Myiarchus cinerascens*) nested in dead limbs of mesquite trees. Birds common to both plants exhibited more flexibility in nest site choice; as a result total numbers for cardinals (*Richmondena cardinalis*), cactus wrens, and mockingbirds (*Mimus polyglottos*) were higher when both nest sites were combined (Table 2).

Although the number of bird species found in lotebushes and mesquite were the same, there was a difference in the number of plants utilized for nesting. Active nests were found in 30.3% of all lotebushes inspected compared to 8.8% found in honey mesquite. The high utilization figure for lotebush is due primarily to the large number of brown towhee (*Pipilo fuscus*) nests found (41). In deciduous woods MacArthur and MacArthur (1961) contend that one bird species cannot rely soley on one type of tree since it would have to encounter many unsuitable trees before one satisfactory type was found. In this study, brown towhees appeared to use lotebush exclusively in preference to other plants.

The height of honey mesquite trees used by nesting birds averaged 3.2 m. A volume figure for mesquite trees was not calculated since most trees had incomplete or broken canopies due to past spraying programs. All birds nesting in honey mesquite used the leafy part of the canopy as nest sites. All mesquite trees used were green, with 18 out of 28 (64.0%) originating out of the ground as single-stemmed trees with multiple stems branching from 18 to 78 cm from ground level. Lotebush volume ranged from 0.2m^3 to 5.9m^3 . The average volume of 97 occupied plants was 1.6 m^3 . All these plants were green with every nest located in the leafy part of the canopy. The above-ground age of the 14 smallest lotebushes used as nest sites averaged 6.1 years with a volume total averaging 0.8 m^3 .

Effect of Fire on Woody Plants

No differences were found between burned areas in the number of plants used as nest sites except for the most recent burns. The 1974 fire was a "hot" burn conducted during a dry year under ideal burning conditions. Ample fine fuel existed in excess of 3,000 lb/acre, and the entire treatment area burned completely with all lotebushes consumed and a differential mesquite mortality depending on age and whether or not trees had been previously top-killed (Wright 1972). No lotebushes were available as nest sites a year after the burn when the census was taken and no large mesquite trees of a type used by nesting birds were present in the 1974 treatment before the burn so fire may not have had much influence on mesquite selection for nest sites.

The 1975 burn occurred under less favorable weather conditions during a wet year. Many green forbs were present to interfere with combustion of low-volatile grass fuels. This resulted in a "patchy" burn, which left many areas untouched by the fire. All seven nests found in this burn were located in large, single-stemmed lotebushes subjected to the fire but not damaged due to their higher canopies. Lower growing forms either burned down or were partially defoliated, discouraging their use by nesting birds.

A mortality figure for honey mesquite and lotebushes was not calculated since preburn densities were not known for every year of prescribed burning. However, information published by Wright et al. (1976) on this study area showed that mesquite mortality for the years 1968 through 1971 can be expected to be as high as 50% from burns during drought years or repeated burns during wet years. Fire may not have had much effect on many larger mesquite trees that were selected as nest sites on the study area. Most larger trees had been used heavily by livestock as shade and little grass cover was present under the trees to carry the fire to the stems or canopies. Fire is more effective in reducing the canopy cover of lotebush for at least a year following fire. However, lotebush is difficult to kill with fire and observations plus stem cross-sections showed that lotebushes resprout vigorously from 2 to 3 years after a fire and it may take 6 to 7 years before plants reach a closed-canopy stage useful to nesting birds.

Summary and Conclusions

Nest searches indicated nesting nongame birds preferred lotebush to honey mesquite even though lotebush occurred in far fewer numbers. Mesquite remained important since it provided nest sites for bird species not found in lotebushes. Fire may not harm older mesquite trees unless they are burned during a dry year or are subject to frequent reburns. Lotebushes are very susceptible to fire and it may take 6 to 7 years before they become suitable to nesting birds. If songbirds are to be considered in managing rangeland where mesquite and lotebush are obvious components, care must be taken to preserve adequate numbers of lotebushes and older mesquite trees. Widely scattered, individual lotebushes are preferable to several large clumps or clones since only one plant can serve as a nest site. Before burning, 5-m firelines should be dozed 10 m around at least six lotebushes/ha to insure that enough sites exist for nesting pairs. Large mesquite trees not only provide nest sites for some different species of birds, but they also function as roosts for migrating songbirds and resident owls and provide hunting perches for raptors. Based on these findings, it is suggested to the landowner that unless small numbers of lotebushes and large mesquite trees pose a serious problem to livestock operations, these plants should be spared to offer cover to nesting nongame birds.

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