FOX SQUIRREL
MANAGEMENT IN EAST TEXAS

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Foreward

Referred to by scientists as ***Sciurus niger***, the fox squirrel is one of three tree-dwelling species of squirrels that occur in Texas. The fox squirrel is by far the most widely distributed of the three, being present over the majority of approximately 22 million acres of forested habitat. Fox squirrels are not found in deep South Texas and extreme western portions of the state.

The fox squirrel and its cousin the gray squirrel are important game resources of Texas. The small, nocturnal flying squirrel is also a tree dweller, but is not sought after by the hunter. Squirrel hunting ranks third in popularity among hunters in East Texas and ranks fourth in popularity among hunters on a statewide basis. While their importance to the economy has not been calculated it probably is significant. Presently, almost one million squirrels are harvested in Texas each year. The percentage of fox squirrels in the harvest is not known.

Deer hunting is now the most popular pursuit of Texas hunters with the overall increase of deer populations over the state in recent years.

East Texas has historically been the stronghold of squirrels and squirrel hunting in Texas. Early settlers of East Texas generally emigrated from the southeastern states where squirrels had always been hunted as a food source. Many descendants of these early settlers continue the traditions of their ancestors by hunting squirrels.

Of primary concern to squirrel managers today is the alarming rate of habitat loss resulting from a variety of land-use changes. At present, 63 percent of bottomland hardwoods have been lost and upland hardwoods are also disappearing at a fast rate.

The future of squirrels in East Texas is not bright. Demands for forest products by our modern society are increasing to the point that forest management practices said to be necessary economically to meet this current and projected demand are extremely detrimental to many wildlife resources, especially squirrels. Lignite mining, urban sprawl, reservoir construction and land development projects all pose significant threats to many woodland wildlife species including squirrels.

It appears certain that squirrel habitat will continue to decline in both quantity and quality with the passing of time. The only alternative which appears feasible to offset this loss is more intensive management on those habitats which remain.

The purpose of this publication is to provide information useful to land managers in enhancing squirrel habitat in the primary forested squirrel habitats in East Texas. It is hoped those who care enough to seek knowledge essential to sound squirrel management will find ways to apply this knowledge to the land and encourage others to do likewise.

The basic information contained in this brochure was derived from Pittman-Robertson project W-108-R, Upland Game Program.

Some Basic Facts about Fox Squirrels

VARIETIES IN TEXAS

According to Phil Goodrum, a noted squirrel biologist, there are three varieties of fox squirrels which occur in Texas.

The Pineywoods Fox Squirrel, ***Sciurus niger ludovicianus***, of eastern Texas is the largest variety in Texas, weighing an average of 1.7 pounds and measuring 20 inches from the nose to the tip of the tailbone. The Western Fox Squirrel, ***Sciurus niger rufiventer***, found in the Panhandle area of the state and the Texas Fox Squirrel, ***Sciurus niger limitis***, of central Texas are approximately the same size with an average adult weight of 1.3 pounds and a length of $18^{1}/_{2}$ inches.

Color patterns are generally grayish or brownish on the upperparts of the body with rusty or buff colored underparts. The feet are cinnamon in color while the tail is black with cinnamon. Considerable variation is found in fox squirrels, with some almost totally black and others pure white.

RANGE IN TEXAS

Fox squirrels inhabit almost all timbered areas in Texas with some exceptions. Fox squirrels are not found in the Trans-Pecos, extreme South Texas and the extreme middle-western portion of the Panhandle areas. However, historical records indicate that the range of the fox squirrel is extending farther west than previously recorded and its range to the south has been shrinking.

BREEDING HABITS

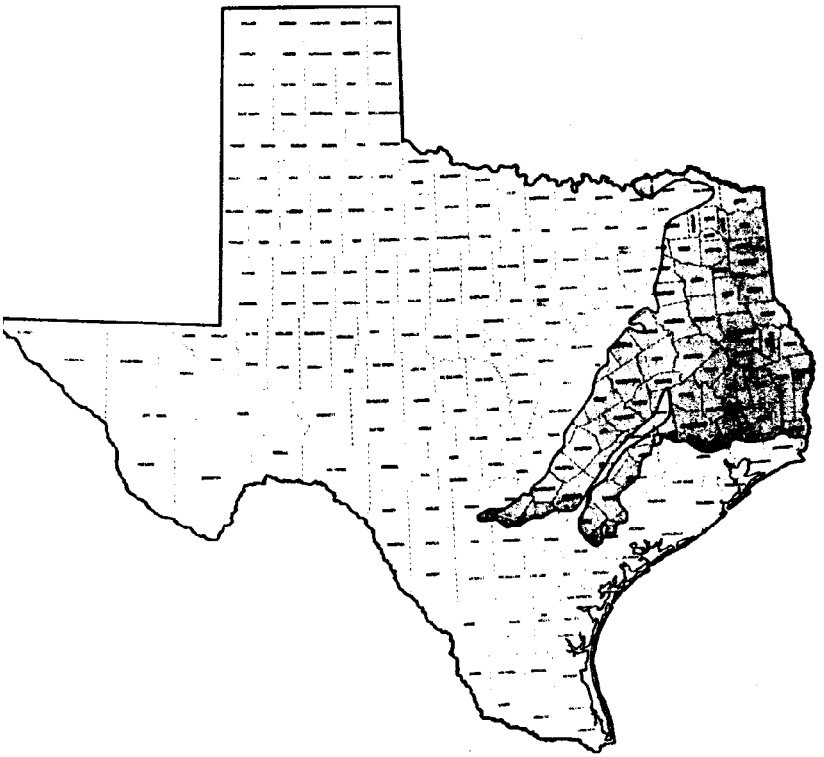
Two peaks of breeding activity occur annually in the fox squirrel populations in Texas. A winter breeding period usually begins in December and continues into February and a summer period begins in May and continues into July. The gestation period is approximately 44 days with peak birth rates occurring during February and July.

At birth the young weigh approximately one-half ounce, and are naked and the eyes and ears are closed. Weaning begins during the eighth week of age and normally is complete by the 12th week. Fox squirrels reach sexual maturity at approximately 11 months of age. Old females will rear two litters annually while yearling females normally will rear only one litter their first year. The average litter size is two or three.

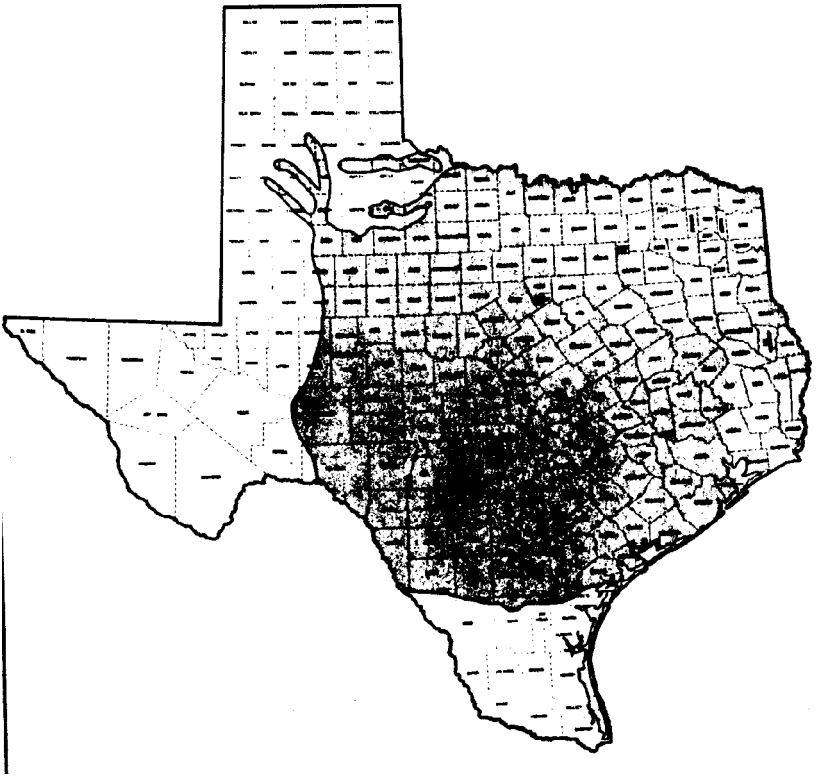
HOME RANGE AND MOVEMENTS

Recent radio telemetry investigations of home ranges of fox squirrels in East Texas forests indicate squirrels normally live within a five-acre area.

Movements of fox squirrels within these home ranges were found to be seasonal and many factors affected movement patterns. The most important of those factors appear to be climatic conditions, food supplies, and breeding activity.



PRIMARY FORESTED SQUIRREL HABITAT IN TEXAS



APPROXIMATE RANGE OF FOX SQUIRRELS IN TEXAS

Rainfall appears to be the most significant climatic factor that affects fox squirrel movement or activity. During periods of light to moderate rainfall, activity increases significantly. No other climatic condition appears to significantly affect squirrel movement.

Food shortages cause increased activity as squirrels are forced to forage greater distances and for longer periods of time in order to find adequate food.

Mating seasons result in increased activity in and between home ranges of fox squirrels.

SQUIRREL DENS AND NESTS

Hollows in tree trunks and limbs provide permanent dens for shelter from the elements and for rearing young. Tree dens require many years to develop and in some hardwoods, such as oaks, may require as long as 30 years. It is normal, then, that the older class of trees in the forest supply the greatest number of dens. Squirrels must compete with other forest-dwelling wildlife for tree dens and for this reason they usually prefer dens with openings no larger than necessary to allow entrance. The opening preferred is usually about three inches in diameter. Larger openings invite larger animals to enter the den and evict or devour resident squirrels.

Hollows in tree trunks and limbs are preferred as den sites by fox squirrels but take many years to develop. Most den trees are in the older age class and every effort should be made to protect them. Den entrances should not be more than 3 1/2 inches in diameter.

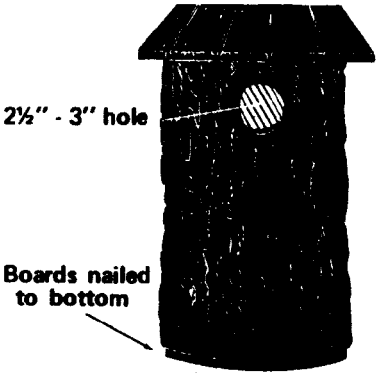
When adequate numbers of tree dens are not available to accommodate the populations present, fox squirrels will readily construct temporary leaf nests in tree limb forks. Leaf nests provide adequate protection in warm climates but may not provide the protection necessary from extreme temperatures during winter.

In areas where den trees appear to be inadequate in number, due to the number of leaf nests observed, artificial den boxes may be erected. Some investigations have indicated that squirrel populations on small woodlands were doubled as a result of establishing artificial nesting structures. However, such results should not be expected in all cases since many different factors are involved. Squirrel den boxes are more likely to be used if placed near the edge of the woods with the entrance hole facing south or southwest.

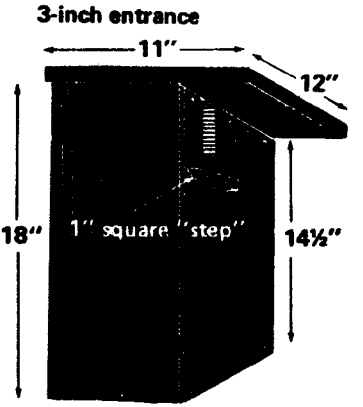
Nesting structures can be provided where natural den cavities are not available.

SQUIRREL FOODS

Hickory nuts are perhaps the favorite food item of fox squirrels along with pecans when they are available. Also, in agricultural areas squirrels will feed extensively on corn while it is in its "milk" stage. This can, at times, cause serious damage to corn crops. Significant damage also can occur in pecan orchards, and drastic measures are sometimes necessary to curtail squirrel depredation.



Section of hollow tree makes ideal squirrel box. Bottom should be smaller than tree for proper drainage

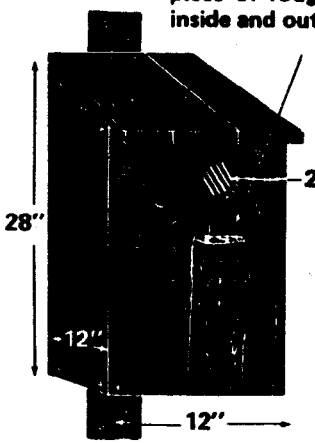


inside of box measures 6" x 7". 18" side is fastened to tree

SQUIRREL DEN BOXES

If lumber is smooth tack a piece of rough bark to inside and outside of front

Lid attached by wires & staples



Boxes should be attached to trees 20'-30' above the ground, resting on a limb, if possible.

Tighten nail keg by removing hoop staples and nails, driving hoops toward center of keg, then restapling.

Hickory nuts are favorite food of fox squirrels and a minimum of three to four hickory trees per acre should be present on squirrel habitats.

Studies on the Engeling Wildlife Management Area in Anderson County show a direct correlation between oak mast production and the following year's gray squirrel population response. Fox squirrels are considered to also respond very similarly to oak mast successes or failure.

On an annual basis, in most squirrel habitats, acorns are the most important food item in the diet. Unless oaks of acorn-producing size are available in significant quantity to produce approximately 85 pounds of acorns per acre per year, squirrels and other wildlife species may not reach optimum numbers. Almost all forest-dwelling wildlife species utilize or benefit directly from acorns. Therefore, restricted acorn crops have immediate and serious impacts on many wildlife populations including fox squirrels.

Tree and shrub species other than oak and hickory are important in squirrel management as related to food availability. Although acorns may be available for up to nine or 10 months each year, it must be realized that squirrels, like humans, must have nourishment over the entire 12 months of the year. Late winter and early spring are periods of the year when squirrel food shortages may become most critical. Supplies are usually depleted by this time. During this period, fox squirrels must seek out other sources of energy and depend primarily on new buds of elms, maples, sweetgum, or other succulent spring buds along with fruits and flowers. Unless the forest complex contains

a variety of tree species to provide the year-round needs of squirrel populations, less than optimal conditions exist.

Food habit studies indicate that fox squirrels will accept a large variety of nuts, fruits, seeds, buds, and other vegetative and animal matter found in forested areas. Some of the more important types of vegetation are listed to provide a reference to land managers who must make decisions regarding which species of trees or shrubs to leave in forest habitats or which to favor in order to enhance squirrel habitat. No order of preference is given.

- Pecan
- Shagbark Hickory
- Mockernut Hickory
- Black Hickory
- Water Oak
- Butternut Hickory
- White Oak
- Swamp Chestnut Oak
- Live Oak
- Post Oak
- Willow Oak
- Sandjack Oak
- Shin Oak
- Blackjack Oak
- Black Oak
- Beach
- Hawthorn
- Blackberry & Dewberry
- Wild Cherry
- Honeylocust
- Black Locust
- Cedar
- Pine
- Shumard Oak
- Water Oak
- Overcup Oak
- Burr Oak
- Chinkapin Oak
- Ash
- Elm
- Redbud
- Hackberry
- Mulberry
- Osage Orange
- Hercules Club
- Huckleberry
- Elderberry
- Hoptree
- Holly
- Maple
- Grape
- Blackgum
- Dogwood
- Blackhaw
- Mushrooms & Fungi

PARASITES OF FOX SQUIRRELS

Ticks, chiggers, mosquitoes, flies, fleas, and mites are the primary external parasites that attack squirrels. On good squirrel ranges with adequate dens and food sources, parasites pose no real threat to the welfare of squirrel populations. However, on ranges where dens are limited and/or food is in short supply, parasites can become serious problems.

Probably the most commonly reported problem of external parasites in East Texas is sarcoptic mange caused by the scabies mite. This is a small spider-like parasite that burrows into the skin and causes the hair to shed and scabs to form on the surface of the skin.

Mushrooms and other fleshy fungi provide a high source of protein for squirrels and other wildlife. Their growth can be encouraged by leaving decaying debris such as tree tops, logs, limbs, and stumps on the forest floor and protecting the forest from fire.

Internal parasites of significance include roundworms and flatworms, which do little apparent damage to healthy squirrel populations.

FOX SQUIRREL PREDATORS

Fox squirrels are sought by almost all predatory animals that inhabit the forests of Texas. These include hawks, owls, foxes, coyotes, bobcats, mink, raccoons, ringtailed cats, and snakes. Domestic dogs and cats may also prey on fox squirrels. Due to the fox squirrel's natural agility and quick reactions, predators do not normally constitute a serious threat to the overall welfare of squirrel populations. This is especially true in forests containing adequate numbers of tree dens. However, many potential mammalian predators do compete directly with fox squirrels for food supplies as well as dens. Competition between squirrels and raccoons for mast supplies is particularly stringent and may reach critical proportions during periods of acorn shortages.

OTHER ENEMIES

Perhaps the most dangerous threat to the fox squirrel is man himself. Man's influence on squirrels is not primarily from hunting but from his impact on natural squirrel habitats. Almost since the time the first European

set foot on this continent his influence has been primarily of a negative, destructive nature as related to squirrel environments.

Through a better understanding of squirrel habitat requirements and more intensive efforts to see that those requirements are provided, it is hoped man's influence in the future will be positive and constructive.

FOREST MANAGEMENT FOR FOX SQUIRRELS

The manner in which forested habitats are managed is of utmost importance to squirrel populations. Therefore, squirrel management is nothing more than a forest management program geared to produce squirrels as well as other renewable forest resources.

Although composition of forests vary throughout the state, primarily reflecting soil and climatic conditions, the basic requirements that must be provided in order to sustain squirrels remain the same. Those basic requirements, as mentioned previously, include availability of a year-round supply of nuts, fruits, berries, buds, seeds, and other vegetable and animal matter as food sources and dens in the form of tree hollows or leaf nests.

Good habitat for fox squirrels consists of a diverse mixture of hardwood species of all ages, preferably occurring in small irregularly shaped tracts

Good fox squirrel range should include a variety of species and age classes of oaks to ensure adequate acorn production and den sites. A minimum of 8 to 10 oaks of both the white oak and the black oak group should be present on each acre of habitat, with at least two being den trees and at least one-half the total being mature, acorn-producing trees.

of from five to 20 acres in size and connected by strips of timber that serve as travelways. Fox squirrels prefer the more open "edge" of forests rather than the deep forest interior. Small, irregularly shaped tracts afford more "edge" than large solid blocks of timber. For variety, and to enhance the aesthetic quality of the environment, some softwoods such as pine may be included but pure pine forests constitute very poor squirrel habitat.

TIMBER HARVESTS AND SQUIRRELS

On commercial forest lands the best management for both timber **and** squirrels would be a harvest program whereby individual trees would be cropped when they were at their most marketable condition. Under this type of harvest program the forest will support an uneven-aged timber stand and continual production of both timber and squirrel habitat will be assured. Another important aspect of having a mixture of age classes and diversity of species is that such a forest type is much less susceptible to disease and/or insect damage.

GRAZING

Fox squirrels prefer the more open woodlots and forest edges around fields and meadows. Often they feed on grass seed, roots and tubers of

A forest composed totally of pine trees constitutes the poorest of fox squirrel habitats. Good fox squirrel habitat is composed of a mixture of hardwood and pine with all age classes represented.

Clear-cutting of forest habitat eliminates squirrels and squirrel habitat for generations. Selective harvest of individual trees is the most desirable timber harvest technique for continuation of good squirrel resources.

various plants and on mushrooms and fungus growing on or near decaying litter on the forest floor. Light to moderate grazing by livestock is normally an advantage to fox squirrel habitat by keeping the habitat in a semi-open state through controlling excessive growth of shrubs and grasses and tree sprouts. Heavy grazing by livestock results in damage to plants and deterioration of range conditions.

Free-ranging hogs are destructive to the welfare of both timber and squirrel resources. In their quest for food they root up many tree seedlings and mar the forest floor with wallows. They compete directly with squirrels and other wildlife species for mast and consume large quantities of mast in short periods of time. They should be restricted from squirrel habitats if at all possible.

FIRE

Fire is a dangerous tool. It is useful for the management of some wildlife species but is generally considered detrimental in forest habitats managed for squirrels. Fire can destroy young hardwood seedlings, dead snags, and den trees, and reduce understory fruit production. Forests being managed for fox squirrels and/or hardwood timber should be protected from fire.

SOME MANAGEMENT SUGGESTIONS

Forested habitats over large areas present an array of problems too great in scope to allow for anything but general management recommendations in this type publication. Land managers desiring more specific information for particular situations should contact the Texas Parks and Wildlife Department and request assistance from a professional biologist experienced in forest habitats.

The recommendations presented here are based on the minimum requirements necessary to sustain huntable populations of fox squirrels on typical squirrel ranges in East Texas and are not necessarily applicable to ranges in other areas of the state.

1. Ensure that eight to 10 oak trees are present on each acre of habitat, with at least two being usable den trees. At least one-half of the oaks should be mature. For most species of oak the most productive producers are those which are at least 15 inches in diameter at breast height. A few oaks such as the sandjack and the blackjack do not attain this size but are good producers. Den trees should be selected on the basis of current or recent use. Trees with extremely large cavities are not as desirable as those with smaller cavities with external openings of approximately three inches in diameter.
2. Ensure that three to four mature hickory trees are available per acre.
3. Each acre of habitat should include several other hardwood species such as osage orange, mulberry, elm, ash, hackberry, maple, beech, wild cherry, blackgum, sweetgum, plum, and locust.
4. Strips of timber should be left between woodlots to provide travelways.
5. Woodlands should be protected from overgrazing. Light grazing by livestock is appropriate, but the habitat should be protected from free-ranging hogs.
6. In habitats where nut-producing hardwoods are not available, plant native species such as oaks, hickories, pecan, black locust, and fruit producers such as osage orange, mulberry, and hackberry.
7. Erect artificial dens in areas where natural dens are not available. Den boxes, resting on limbs if possible, should be attached to trees at a height of from 20 to 30 feet above the ground. Nail kegs and sections of hollow trees make good dens. They also can be constructed from rough sawed lumber such as cypress.
8. Accelerate formation of natural dens by sawing off several limbs of "softer" hardwoods such as elm, hackberry, sweetgum, maple, or blackgum. Select limbs four to five inches in diameter on older trees at a height of at least 20 feet above the ground. Nests should be on the most shaded area of the tree when possible. Probabilities of cavities forming are better on the older trees where wounds heal slower and more time is available for decay to take place.
9. During periods of restricted food availability, provide emergency rations by providing ear corn placed in poultry wire baskets nailed to trees

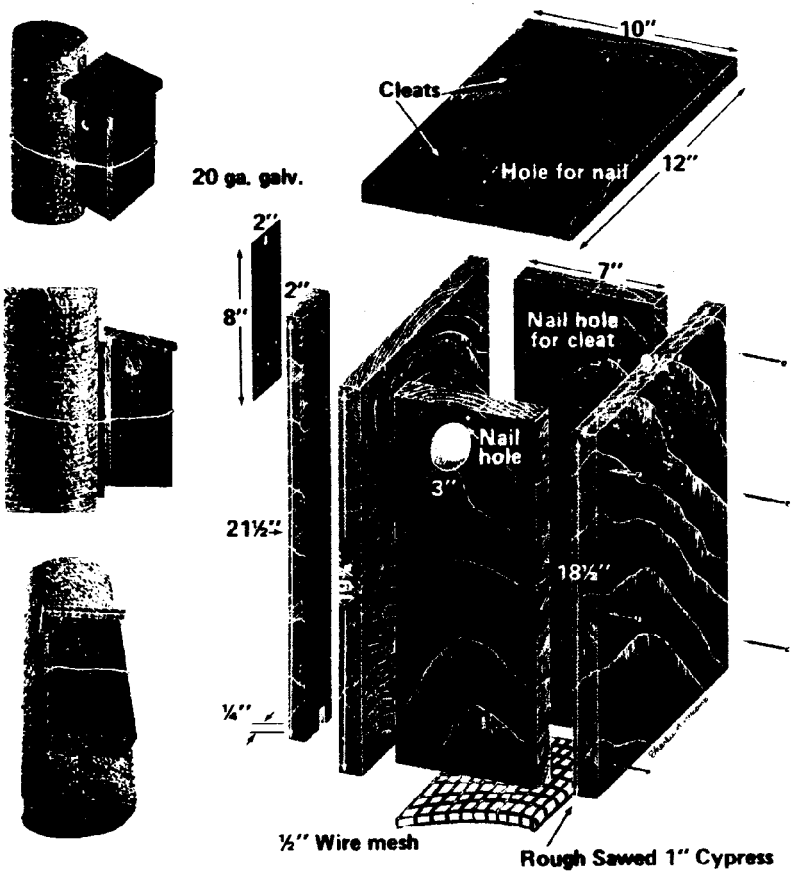
Supplemental feeding can be conducted during periods when natural food supplies are inadequate to support squirrel populations. Planting corn adjacent to fox squirrel habitat is another way of providing supplemental food supplies.

near den sites. Small patches of corn planted along woodland margins will provide good supplemental food supplies.

10. Protect fox squirrel habitat from fire.
11. In stands of pole-size hardwoods, release selected trees by cutting the surrounding trees to allow the selected individuals to make maximum growth and develop crowns.

Each tract of land has its own individual potential for the development of squirrel habitat and each recommendation listed in this publication may not be feasible or needed on all lands. However, trained wildlife biologists with the Texas Parks and Wildlife Department are available in all sections of the state and will welcome the chance to assist landowners in determining the practices that could be initiated on each individual tract of land which could result in increased squirrel numbers. For assistance in squirrel or other wildlife management, contact the TPWD wildlife biologist in your area or contact:

Program Director
Private Lands Enhancement Program
Texas Parks & Wildlife Department
Austin, Texas 78744
(512) 389-4395



SPECIFICATIONS FOR THE CONSTRUCTION
OF ONE TYPE OF SQUIRREL NEST BOX

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