

Making Tracts for TEXAS WILDLIFE



Fall 2004 • Wildlife Division

Oakridge Ranch Wildlife Management Association Named 2004 Co-op Lone Star Land Stewards

At a May 26 reception in Austin, the Texas Parks and Wildlife Department and its Private Lands Advisory Board recognized the Oakridge Ranch Wildlife Management Association for their innovative and ecologically sound management of wild habitats at the 9th annual Lone Star Land Steward Awards.

Oakridge Ranch is a 4,200-acre rural subdivision comprised of 175 landowners who own an average of 24 acres each. No parcel ownership is smaller than 15 acres. The Association has essentially reversed much of the inevitable habitat fragmentation that occurs with such developments.

The Association is organized into special interest groups, which include white-tailed deer, native plants, birding, predator control, prescribed burning, game

birds, pond management, neighborly get together, an astronomy group and communication. The association follows a TPWD approved wildlife management plan.

White-tailed deer habitat and birds are the primary management targets. Annual surveys of deer, songbirds and wild turkey are community events. Landowners have built birdhouses, put up supplemental feeders, constructed ponds, planted food plots and engaged in predator control. Deer harvest is stressed, especially doe harvest, to control deer numbers. Cowbirds are trapped March-May of each year. Over 300 feral hogs are removed each year.

Education is a major part of the frequent community gatherings. Speakers on some facet of wildlife/habitat manage-

ment are a part of each function. The Association cooperates with the other four Colorado County Wildlife Management Associations by holding joint field days. Scouting groups have also participated in educational events. A Web site (<http://www.orwma.org/>) keeps members posted on habitat management activities and demonstrations.

The Natural Resources Foundation of Texas, Lower Colorado River Authority, Texas Wildlife Association, Texas Farm Bureau and the following banks helped to support the Lone Star Land Steward Awards through financial sponsorships: Farm Credit Bank of Texas, Capital Farm Credit, Heritage Land Bank, Southwest Texas Land Bank, AgriLand Farm FCS, Texas AgFinance, AgTexas FCS, Great Plains Ag Credit and Ag Credit of South Texas.



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Youth Hunts, Landowners and ... LIABILITY

Landowners everywhere are interested in their liability as property owners. Fortunately, the past few sessions of the Texas Legislature have done much to assuage landowners' fears and limit the potential for damaging lawsuits. Texas law has long recognized four categories of individuals entering private land: invitees, licensees, trespassers and children under the attractive nuisance doctrine.

Invitees have an expressed or implied invitation to enter a property. Invitees include business guests such as customers to a restaurant or fee paying hunters. Landowners have the highest legal duty to invitees; they must repair or warn invitees of known dangerous conditions or dangers that would be revealed after a reasonable inspection. However, if invitees are more than 50 percent responsible for causing their own injuries, Texas law negates any landowner responsibility. Dangerous conditions could be anything from a flood prone low water crossing to an open well or mine shaft.

Licensees have expressed or implied permission to enter property, but not for the landowner's financial gain. Social guests fit the category of licensees and landowners have a duty to warn guests or make safe all known dangerous conditions. Landowners are not obligated to do regular inspections for social guests.

Trespassers have neither an invitation nor permission to enter property. Landowners are not bound to issue warnings, inspect their property or repair dangerous

conditions for trespassers. However, landowners do not have the right to injure trespassers intentionally or through gross negligence, bad faith or malicious intent.

The *recreational guest* category was added to Texas law in the late 1980's (Chapter 75, Texas Civil Practices and Remedies Code). A recreational guest is anyone that a landowner gives permission to use his or her property for recreation, including fee paying hunters, mountain bikers or bird watchers.

Landowners owe no greater care to a recreational guest than they would a trespasser, subject to the following provisions: a) the landowner does not charge for entry (includes invited social guests), b) total charges for recreational uses during the previous calendar year do not exceed 20 times the total amount of ad valorem taxes imposed on the property for the previous calendar year, or c) the landowner earns more than 20 times their ad valorem taxes in recreational fees and has liability insurance coverage equal to the set caps. The caps are \$500,000 for each person, \$1 million for each single occurrence of injury or death, and \$100,000 for each single occurrence of damage to or destruction of property. In the event of a lawsuit, the insurance company would pay up to the cap limits depending on the court's decision.

Landowners whose property is near a school or other places where children are likely to trespass have additional considerations. Under the attractive nuisance doctrine, landowners must keep their property safe in these areas. Attractive nuisances can be related to the property's proximity to a place children use, or a feature of the property that is attractive to children, such as a windmill, a swimming pool or stock pond.

Landowners can also use waivers, or legal documents signed by guests, which release the landowner from liability.



Waivers must meet certain criteria to be valid; before using a waiver, landowners should consult with an attorney.

The Texas Wildlife Association (TWA), a landowner organization supporting wildlife management and recreation on private land, can provide information on liability insurance at (800) 460-5494.

TPWD partners with the Texas Wildlife Association to provide affordable, guided youth hunting on private ranches through the Texas Youth Hunting Program.

Landowners can make a big difference by volunteering to host TYHP youth hunts. The TYHP provides volunteers to oversee firearms instruction and supervise ranges, conduct hunter education activities, serve as guides, provide medical expertise and, very important, cook! It also provides insurance for the participants and liability protection for the landowner.

To get involved check out www.texas-wildlife.org to learn how TYHP is contributing to the Future of Hunting in Texas and how it can assist landowners with their wildlife management plans, then call (800) 460-5494 or E-mail: w_dahlke@texas-wildlife.org

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MAKING TRACTS FOR TEXAS WILDLIFE

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The Texas Parks and Wildlife Department is interested in your feedback on a short customer satisfaction survey. Your input is invaluable.

Please visit us at www.tpwd.state.tx.us/feedback/ to fill in a simple on-line survey.

Mountains and Molehills

by Jim Dillard, Technical Guidance Biologist, Mineral Wells

I don't know how many times I heard my mother say "don't make a mountain out of a mole hill." It sounded like good advice at the time but I really wasn't sure what a mole hill was or how tall one was suppose to be compared to the problem I was dealing with. Since we didn't have any mountains down in the blacklands of Central Texas where I grew up, a mole hill could have been just about any size imaginable, depending on how big a mole really was. No one I knew ever saw one in that black gumbo mud country but I figured a mole hill probably wasn't all that tall, and looking back, neither were my problems.

The Eastern Mole (*Scalopus aquaticus*) is found throughout the eastern two-thirds of Texas, from the Rolling Plains and upper High Plains of the Panhandle to deep South Texas. Although there are seven mole species in the United States, this is the only one that calls Texas home. The first eastern mole ever documented in North America was found drowned in a well and someone gave it the Latin species name *aquaticus*, presuming it to be a water-loving small mammal. Actually, they avoid wetlands and prefer soft and moist sandy soils. Spring floods are probably the greatest danger for moles. They're absent from most of west and southwest Texas where the soils are shallow, rocky and perennially dry.

These small subterranean mammals seldom see the light of day, preferring to stay below ground, tunneling about in search for food including earthworms, grubs, beetles, spiders, centipedes, insect larvae and pupae. Vegetative materials are occasionally eaten but are only a small portion of their diet. Moles have an insatiable appetite, consuming 70% to 100% of their body weight in food each day and are most active during the day when earthworms are moving in and out of soil.

Since they live most of their lives underground where it's darker than a sack of black cats, vision is of little use, consequently their small pinhead-size eyes are hidden beneath a layer of fur. Hearing is acute and ears are covered beneath fur to prevent dirt from plugging them up during tunneling. A highly sensitive naked nose picks up the slightest scents and whiskers detect vibrations to help locate food. Their

teeth are white and not chestnut tipped like shrews. Mole fur is soft and velvety plush which allows them to move forward and backward in tight tunnels. Fur coloration may be gray, brown or tan and with a silvery sheen. A big male eastern mole is about seven inches long and only weighs four ounces so a mole can't make much of a mountain out of a mole hill either.

The enlarged forefeet have webbing to the base of their long claws that enables them to sort of swim through soft dirt doing the breast stroke, passing it under the body and backward by the hind legs down the tunnel. They can easily change direction by flip-flopping in their tunnels. Shallow tunnels near the surface are used for foraging and leave a small ridge of dirt where they've been and may only be used once. Deeper tunnels are used for protection from predators and rearing young and are accompanied by small volcano shaped "mole hills" 2-24 inches high where dirt has been pushed out of the tunnels to the surface to ease navigation and movement through these runways. Some permanent tunnels five to eight inches below the surface may be several hundred feet long and used for several years. Underground living chambers used for food storage and rearing young are about the size of a quart jar.

Moles seldom venture out of their tunnels to the surface except during the mating season when males, bent on companionship, can't find a blind date underground. They may also surface to search for new territories or softer digging-dirt. Mating occurs during late winter or early spring and a litter of 2-6 hairless young are born during March or early April after a gestation period of 42 days. Females mature in one year. For most of the year, moles live solitary lives and avoid contact with other moles. They do not hibernate.

Moles are not always welcome around gardens, golf courses or manicured lawns where their tunneling activity leaves unsightly mounds and ridges. In farmlands, moles tunneling in soft dirt in search of prey may inadvertently kill plants or seedlings. Other small mammals that forage for seeds and vegetation often use mole tunnels. Although they aerate soil and eat many harmful insects, mole control may be necessary and there are many methods and techniques used for that purpose. Before declaring war on moles, be sure gophers aren't the culprit.

Ask people these days about moles and they may think you're talking about subversive undercover agents infiltrating some government intelligence agency, a reality TV program or unwanted black spots on their skin. But any critter that can eat its weight in grub worms in my backyard can't be all bad.

Wildlife Conservation News

This past August, President Bush announced a new Continuous Conservation Reserve Practice (CP33) called Habitat Buffers for Upland Birds. Texas was allotted 20,000 acres under the program (somewhere between 1,400-5,400 miles of buffers).

The practice allows borders of natural succession or planted warm season grasses, forbs, legumes and wildflowers around the edges of cropland fields. The practice includes incentive payments as well as cost share, maintenance payments and an annual rental rate.

In keeping with his commitment to increase the number of wetland acres, President Bush also announced an expansion of the Farm Service Agency's Farmable Wetlands program that would allow larger seasonal or depressional

farmed wetlands located outside of 100 year floodplains to be enrolled in this restoration program. This is great news for farmland playas which often exceeded the previous 10-acre size limit and were located outside of traditional floodplains.

Research by U.S. Geological Survey has shown that playas are the key recharge source for the Ogallala Aquifer. Restoring playa wetland functions will help protect and recharge this important high plains water resource.

Texas has been allotted 25,000 of the 250,000 acres set aside nationally for this program which provides incentive, cost share and rental payments to interested landowners.

For more information about these new wildlife conservation initiatives, contact your local U.S.D.A. office.

Managing Your Land for Bats

by Meg Goodman, Bat Biologist, Austin

Bats throughout the world evoke many mixed emotions from fascination to fear. Many myths have contributed to negative emotions about bats. In truth, bats are not blind, will not get stuck in your hair, and not all bats are vampires or transmit rabies!

Bats are an important part of science, agriculture and commerce with new discoveries being made all the time. For example, bats are important predators of night flying insects, many of which are costly agricultural pests; bat guano is sold as a good source of fertilizer throughout the world; and it was just recently reported that the anticoagulant in the blood of vampire bats is useful to heart patients seeking a way to stop blood clots.

Bats make up approximately a quarter of all mammals on earth and are the only mammals capable of true flight. Another unique thing about bats is the way they navigate with echolocation. Echolocation is a complex sonar system where bats emit sounds through their mouth or nose that bounce off objects in their environment and return to them as echoes to provide them information on their surroundings.

The state of Texas is home to 31 species of bats, the highest diversity in the United States. Texas bats live in a variety of habitats such as cliffs, caves and mines, tree hollows, snags and tree foliage, highway bridges and culverts, and abandoned buildings.

Our most famous bats in Texas are the 1.5 million Mexican free-tailed bats that roost under the Congress Avenue Bridge in Austin, Texas. Central Texas is also home to the largest bat colony in the world, Bracken Cave, which is home to 20-30 million Mexican free-tailed bats. Both of these colonies are maternity colonies, where female bats migrate up from Mexico each spring to give birth to their babies in these warm cave or bridge environments. Mother bats from these colonies can eat up to their body weight in insects each night in the summer. Bats from just these two colonies can consume over 200 tons of insects each night! Current research has shown that these bats are essential in keeping costly agricultural pests in check, such as the cotton boll worm moth and corn ear worm moth. Other species of bats consume costly beetles and other pests. Just ask Baxter Adams, a central Texas apple grower. "We're in the fruit business and own an apple orchard. Larvae from the codling moth have been found in the Texas Hill Country, and can cause severe damage in orchards. Bats are natural enemies of moths, which are night fliers. We haven't had to use insecticides in several years. I like that and so do our customers."

Since Texas is approximately 94% privately owned it is absolutely necessary that we each do our part to protect our essential allies. Texas bat habitat is variable throughout the state and while each

region will have specific needs, some land management practices will be common for all regions, including protecting existing sites and providing supplemental water and shelter. Examples of protecting existing roost sites include leaving hollow trees or snags standing, limiting access to caves on your property during certain times of the year when the bats may be present, or leaving abandoned buildings standing. Providing supplemental water for bats would include providing an area free from obstructions since bats drink on the wing. You can also provide supplemental habitat for bats by building a bat house. Organic gardeners are enjoying the benefits of reductions in pesticide use needs by providing bats supplemental homes on their land. Bat houses provide wildlife viewing opportunities and are useful in situations when there is a need to exclude bats from an existing building.

Bat Conservation International, a non-profit organization in Austin, Texas dedicated to conservation of bats has been studying and modifying bat houses over the past 10 years. Through their North American Bat House Research Project they have discovered that up to 10 different species of bats will use bat houses provided that they are constructed to the correct specifications. We have provided a plan for a single chamber bat house on the following page but you can also purchase these from the BCI Web site at www.batcon.org. You can also learn more about bats and the North American Bat House Research project on this site. If you do decide to provide these supplemental homes for bats it is important that you mount your bat house in the best location. A single chamber bat house is most successful if mounted on the side of a building at least 10-12 feet off of the ground. It has been shown that bat houses mounted on trees are not very successful due to easy access of predators.

More specific management guidelines for Texas bats will be available in the near future, until then, we encourage you to do what you can to preserve bats on your property. The results will be rewarding and you will be contributing to the survival of such an interesting and beneficial mammal.

Meg Goodman is the state bat biologist for Texas. She has a joint position working for Texas Parks and Wildlife Department and Bat Conservation International. You may contact Meg Goodman at meg.goodman@tpwd.state.tx.us or at (512) 912-7042 or (512) 327-9721.



Building a Small Bat House

Plans courtesy of Bat Conservation International

Materials Needed (makes 1)

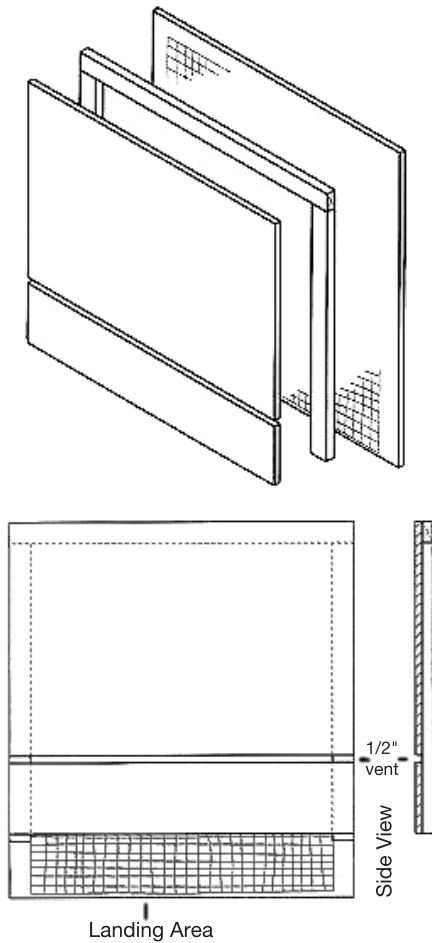
- 1/4 sheet (2' x 4') 1/2" AC, BC, or T1-11 (outdoor grade) plywood. DO NOT use pressure treated wood.
- One piece 1" x 2" (3/4" x 1 1/2" finished) x 8' pine (furring strip)
- 20-30 1 1/4" coated deck or exterior-grade Phillips screws
- One pint dark, water-based stain, exterior-grade
- One pint water-based primer, exterior-grade
- One quart flat water-based paint or stain, exterior-grade
- One tube paintable latex caulk
- 1" x 3" x 28" board for roof (optional, but highly recommended)
- Black asphalt shingles or galvanized metal (optional)
- 6-10 7/8" roofing nails (optional)

Recommended Tools

- Table saw or handsaw
- Caulking gun
- Variable speed reversing drill
- Paintbrushes
- Phillips bit for drill
- Tape measure or yardstick
- Scissors (optional)
- Staple gun (optional)

Construction Procedure

1. Measure and cut plywood into three pieces:
 - 26 1/2" x 24"
 - 16 1/2" x 24"
 - 5" x 24"
2. Roughen inside of backboard and landing area by cutting horizontal grooves with sharp object or saw. Space grooves about 1/2" apart, cutting 1/16" to 1/32" deep.
3. Apply two coats of dark, water-based stain to interior surfaces. Do not use paint, as it will fill grooves, making them unusable.
4. Measure and cut furring into one 24" and two 20 1/4" pieces.



5. Attach furring strips to back, caulking first. Start with 24" piece at top. Roosting chamber will be 3/4" wide (front to back).
6. Attach front to furring strips, top piece first (don't forget to caulk). Leave 1/2" vent space between top and bottom front pieces.
7. Caulk around all outside joints to further seal roosting chamber.
8. Attach a 1" x 3" x 28" board to the top as a roof, if desired (optional, but highly recommended).
9. Paint or stain exterior three times (use primer for first coat).
10. Cover roof with shingles or galvanized metal (optional).

Optional Modifications to the Small Economy Bat House

1. Wider bat houses can be built for larger colonies. Be sure to adjust dimensions for back and front pieces and ceiling strip. A 3/4" support spacer may be required in the center of the roosting chamber for bat houses over 24" wide to prevent warping.
2. Two bat houses can be placed back to back, mounted on poles. Before assembly, a horizontal 3/4" slot should be cut in the back of each house about 9" from the bottom edge of the back piece to permit movement of bats between houses. Two pieces of wood, 1" x 4" x 4 1/4", screwed horizontally to each side, will join the two boxes. To provide additional roosting space, leave a 3/4" space between the two houses, and roughen the wood surfaces or cover the back of each with plastic mesh. (Do not cover the rear exit slots; see item 4 below).

One 1" x 4" x 34" vertical piece attached to each side over the horizontal pieces blocks light, but allows bats and air to enter. A galvanized metal roof, covering both houses, protects the center roosting area from rain. Eaves should be about 3" in southern areas and about 1 1/2" in the north.

3. Ventilation may not be necessary in cold climates. In this case, the front should be a single piece 23" long. Smaller bat houses like this one will be less successful in cool climates. However, those mounted on buildings gain heat faster, maintain thermal stability better and are more likely to attract bats.
4. Durable plastic mesh can be substituted for roughening to provide footholds for bats. Attach one 20" x 24 1/2" piece to backboard after staining interior, but prior to assembly.

Squirrels and Oaks:

An Ecological Relationship

by Carl Frentress, retired TPWD Biologist, Athens

Some say that beaver are the only animals capable of modifying their environment to suit their needs. However, ecological considerations can lead us to awareness that other animals affect their surroundings in profound ways. Within the web of relationships in and among ecosystems, certain species are allied strongly to others. These phenomena are notable in forest ecosystems containing oaks and squirrels. Perhaps, squirrels have much to do with the characteristics of oak-dominated forests.

Fox squirrels and gray squirrels are the two primary squirrel species in Texas. Gray squirrels occur only in the Post Oak Savannah and Pineywoods ecoregions in East Texas with ranges extending to the middle coast. In East Texas gray squirrels are known as “cat” squirrels. Fox squirrels are found over more of Texas. They occur in all areas of the state except the lower portion of South Texas, the Trans-Pecos and the High Plains in the Panhandle. Generally, fox squirrels are found in upland forests with more open structure. Gray squirrels prefer bottomland hardwoods and associated stream corridors characterized by vines and a well developed mid-story. As a rule, gray squirrels are more abundant per unit of habitat than are fox squirrels. Populations of both species exhibit a “shadow effect” in relation to the pattern of annual acorn production. That is, when acorns are abundant in one fall, squirrels will be abundant the following year. This latter point is a signal to the strong ecological connections among squirrels and their habitats.

The capability of squirrels to influence forest characteristics is related to squirrel food habits. When seed crops are abundant, squirrels feed heavily on acorns. However, all acorns are not treated equally. Within this variety of acorn handling resides the story of the influences of squirrels on oak forests.

Oak species are divided into two basic groups: 1) the white oak group and 2) the red oak group. Some Texas examples of species in the white oak group include post oak, overcup oak, white oak and swamp chestnut oak. Examples of the red oak group include water oak, willow oak, Shumard oak and southern red oak. A number

of botanical characteristics distinguish the two groups. For instance, the lobes of leaves of oaks in the white oak group are rounded while lobes of leaves in the red oak group are pointed or have a hair-like projection at the tip. Also, the acorns of the white oak group mature in the same growing season as flowering whereas those of the red oak group do not mature until the next growing season after flowering. Additionally, acorns from species in the white oak group begin germination soon after they fall. Red oak acorns, on the other hand, require a period of dormancy during the cold winter months before germination is possible. Nutrients in the acorns also differ. White oak acorns are lower in fat content and tannin concentrations than red oak acorns that have high amounts of lipids and tannins. These acorn characteristics are important to squirrels.

The influence squirrels have on forest composition is related to the way they use acorns. Research reveals that squirrels handle white oak acorns differently than red oak acorns. This likely is influenced by a number of factors including the biology, chemistry, and shape of the acorns in the two respective groups. When acorns of the white oak group begin to fall, squirrels usually eat them immediately. By burying, they cache only a small portion of white oak acorns. In this behavior, they first chew away the end of the acorn containing the embryo. This prevents the acorn from germinating after it is buried. Recall that white oak acorns germinate immediately after falling. Thus, without “de-germinating” the white oak acorns, squirrels would find their cached supplies spoiled by germination and initiation of seedling growth. As noted, white oak acorns contain considerably less tannin and fats than acorns from the red oak group. Squirrels are believed to be able to detect this difference in chemical composition of acorns in the two oak groups. In contrast, acorns from the red oak are handled with more intricacy. This seems to be related to lipid and tannin content.

Acorns from the red oak groups may be the food supply plus ultra for gray



squirrels especially. These squirrels exhibit more complicated behavior in dealing with red oak acorns. This may be because red oaks offer more challenges for using their acorns as food supplies. In fact, some characteristics seem to be opportunities for squirrels to benefit these oaks. The relationship is strong between gray squirrels and oaks in the red oak group.

Generally, squirrels cache red oak acorns when they fall. In addition to contributing to future food stores, this caching also may serve to leach some of the tannins from buried acorns. This tannin reduction makes the acorns more palatable. Red oak acorns also have a period of winter dormancy allowing them to be buried without germination. However, in two circumstances, gray squirrels may feed heavily on red oak acorns as soon as they ripen. Studies show that gray squirrels distinguish between sound acorns and those that are infested with insect larvae. In a practical sense, they immediately eat insect-infested acorns, frequently consuming the larvae also. The sound acorns are reserved for storage. In the second circumstance, gray squirrels seem to optimize food availability in years of excellent production of red oak acorns. As soon as these acorns ripen, squirrels feed profusely, chewing away a portion of the basal end of these acorns. Interestingly, this end is highest in lipid content and lowest in tannin content. By contrast, the tip end containing the embryo is lowest in lipids and highest in tannins. (Tannins tend to repulse feeding because of their bad taste.) Therefore, squirrels can feed on the high-energy end of the acorns without damaging the embryos. Squirrels seem to detect the appropriate end for feeding by using the shape of the acorn. If these partially eaten acorns later are cached

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but not recovered by squirrels, they will germinate after dormancy. In fact, squirrels bury many of these acorns and some do germinate to produce seedlings that ultimately become trees.

Consequently, squirrels do not recover some cached red oak acorns, thus finally leading to establishment of new trees. In this way, squirrels directly affect species composition in forests. Furthermore, in their caching behavior, squirrels may carry acorns some distance from the parent tree. In effect, squirrels become acorn planters for oaks in the red oak group. Because they eat white oak acorns as soon as they fall, squirrels do not move these as far from the parent tree. Also, some rapidly germinating white oak acorns will take root before being located by squirrels. These acorns fall, germinate in place and ultimately produce trees close to the parent tree. Forest surveys correspond to this situation. In these studies, white oak seedlings and saplings are found close to the parent tree and red oak seedlings and saplings are distributed farther from the parent tree. Based on their feeding and caching behavior, squirrels offer an explanation for this different distribution of tree species.

Therefore, if gray squirrels, particularly, are modifying their environment through behavior that favors red oaks, why are red oaks the privileged group of species? Perhaps this is because red oak acorns offer a more reliable and durable food supply. Red oak acorns are more nutritious than white oak acorns. Also, these acorns can be eaten partially then stored, or, stored whole for later retrieval in a more palatable condition. Either way, germination still is possible. They offer squirrels more flexibility in using them as food supplies. In the long run, squirrels have a better chance of prospering in forests dominated by red oaks than in white oak forests. The respective population densities of the two squirrel species reflect this. Consequently, squirrels also may be animals capable of modifying their environments to their benefits. They help perpetuate oak forests.

Conservation of forests obviously dictates management methods for squirrels. An assortment of practices can be devised to benefit squirrels. These practices should favor older trees because mast and dens required by squirrels are most abundant in forests containing older trees. Sawtimber silviculture is compatible with squirrel management. Timber harvest using small group selection or single-tree selection techniques in uneven-age forests produce

timber revenue while retaining squirrel habitat. However, older den trees and some non-commercial species that produce fleshy fruit are retained to favor squirrels. This approach is known to be useful in bottomland hardwood forests preferred by gray squirrels if the mid-story is fairly thick and a substantial vine component is present.

In more open upland forests composed of both pine and hardwoods the composition of mixed species should be maintained. In forests without pines, larger den trees and mast-producing species must be present in good numbers. These types of upland forests usually will be favored more by fox squirrels.

In woodlots or younger forest stands, den sites and food supplies can be supplemented artificially. Nest boxes similar to wood duck nest boxes can be installed in trees at a height of 20-30 feet. These boxes are about two feet in height and about one foot on each side. The entrance should be cut in a side of the box as compared to the hole being in the front on a wood duck nest box. The proper entrance hole for squirrels is about three inches in diameter. Locate the boxes such that the entrance hole easily

is accessible from the tree bole or a nearby limb.

Corn is useful in supplementing food supplies. It can be provided in feeders or by planting corn patches adjacent squirrel habitat. Squirrels will feed on whole kernel corn scattered by spin feeders of the type used in deer hunting. Dry whole ears also can be used even with the shucks intact. This technique involves dumping about a bushel of ear corn onto a section of chicken wire of sufficient size to wrap the corn into a bundle. With a rope attached, this wire-wrapped bundle of corn can be hoisted into a tree. To allow access by squirrels, the bundle should be close to a horizontal limb or secured against the main tree bole. Squirrels will feed by pulling the corn through the holes in the chicken wire wrapping.

These artificial management techniques should be considered transitory because the ultimate objective is to establish a natural forest condition conducive to squirrel prosperity. As we have seen, squirrels have the capacity to steer oak forests to their particular needs. In themselves, these ecological relationships may be among the most powerful management tools.

TPWD on the Forefront of Turkey Research

by T. Wayne Schwertner, Upland Game Bird Specialist

Good wildlife management requires good information. To ensure that our turkey management is based on sound science, the Wildlife Division has embarked on an extensive program of research into wild turkey biology. Some of the ongoing research projects include:

- Texas A&M and Texas Tech researchers have embarked on an ambitious project to study the ecology of the Rio Grande wild turkey in the Edwards Plateau and Rolling Plains. They are particularly interested in determining the specific factors that influence turkey survival and reproduction.
- Researchers from Texas A&M-Kingsville are studying the effect of winter nutrition on Rio Grande wild turkey production in south Texas.
- Researchers from Texas A&M and Texas Tech are attempting to develop an accurate method of estimated turkey populations. They are trying such innovative techniques as helicopter-mounted, forward-looking infra-red (FLIR) technology.

- TPWD biologists are investigating the feasibility of using infra-red triggered cameras to survey eastern wild turkey populations in the Pineywoods, where dense vegetation make this bird especially difficult to survey.
- Researchers from Sul Ross State University are studying the ecology of Merriam's turkey in the mountains of west Texas. Merriam's turkey is a western subspecies that reaches the southeastern limit of its distribution in the Trans-Pecos region of Texas.

These projects represent one of the most ambitious and comprehensive research efforts ever focused on wild turkey. Much of this research is being funded with dollars generated from turkey hunting through the Texas Turkey Stamp program. Through the combined research and management efforts of private landowners, hunters, universities and TPWD, we can ensure that future generations of Texans will continue to enjoy the abundant wild turkey populations we have today.