

TEXAS PARKS AND WILDLIFE

WILDLIFE MANAGEMENT ACTIVITIES AND PRACTICES

COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES

for the

Pineywoods Ecological Region

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COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES

for the Pineywoods Ecological Region

(Prepared in partial fulfillment of the requirements of HB 1358 - Wildlife Management Property Tax Valuation and HB3123 - relating to the standards for determining whether land qualifies for appraisal for ad valorem tax purposes as open-space land based on its use for wildlife management.)

Introduction

The Texas Constitution and the legislature provides those landowners with a current 1-d-1 Agricultural Valuation (often known as an Ag Exemption) an opportunity to change from a traditional qualifying agricultural practice to wildlife management as a qualifying agricultural practice while maintaining the current valuation. HB 1358 by Representative Clyde Alexander provided that the landowner must implement and complete at least one management practice from at least three of the seven wildlife management activities listed in **Appendix A**. Most landowners interested in wildlife can meet this requirement, and implement several practices beyond the minimum required.

The 2001 legislative session passed HB3123, co-sponsored by Representative Bob Turner and Representative Clyde Alexander. This bill provided for further clarification of the standards required for determining whether land qualifies for appraisal as open-space land based on wildlife management. As a result of HB3123, more uniform standards of qualifying for wildlife management have been applied statewide.

Wildlife Management Tax Valuation

Land that qualifies for an agricultural valuation is appraised on its productivity value rather than on its market value. While many people refer to such land as having an “ag exemption”, in fact there is no such exemption—it is just a different method of calculating the land’s value for ad valorem tax purposes. Correctly speaking such land has an agricultural valuation.

Under Texas law, wildlife management is legally nothing more than an additional qualifying agricultural practice people may choose from in order to maintain the agricultural valuation on their land. Just as there is no real ag “exemption”, there also is no wildlife “exemption”. Wildlife management is not an additional appraisal, nor is it separate from “traditional” agriculture. For ad valorem tax purposes wildlife management is agriculture. There is no change in the ad valorem tax valuation with wildlife management, only a change in the qualifying agricultural practice.

Acreage Requirements

There are no minimum acreage requirements unless since the previous tax year the landowner has sold, gifted, or otherwise reduced the size of their ag appraised property; the landowner has purchased or otherwise acquired property that has been partitioned out of a larger agriculturally qualified tract. When either a change in ownership or tract size occurs, the minimum acreage requirements apply.

Landowners acquiring property that has been partitioned out of a larger qualifying tract since the previous tax year, and those who have reduced the size of their property need to be certain that the property will meet the minimum size as set by the county. Refer to **Appendix B** for the

maximum and minimum acreages by region, and to your county Central Appraisal District office for the minimum acreage size adopted. It is important to note that regardless of the property size, it must still be appraised for open-space use before it is eligible to change over to wildlife management use.

When a qualifying tract of land is broken into smaller tracts and sold, the standards for minimum eligible tract size take effect. These sizes are determined by location within the state. Within each area, the county has the ability to choose within a specified range the minimum qualifying acreage. Tracts below this minimum size are not eligible to manage for wildlife as their agricultural practice for ad valorem tax purposes. The exception is for landowners who are buying property in a Wildlife Management Property Owners' Association. Wildlife management property owners associations are community developments similar to wildlife management co-ops, but differ in that each person buying into the neighborhood must make a legal commitment to practice a certain level of wildlife management. Deed restrictions, conservation easements, property owner agreements, or other legally binding covenants insure that the habitat for wildlife is protected and managed in exchange for landowners being able to maintain an agricultural valuation based on wildlife management. If such legally binding covenants exist, the county may set a 1% or 2% lower minimum acreage requirement.

These same lower minimum acreages also apply to landowners who have habitat for threatened or endangered species or a species of concern. While the actual presence of the species on the property is not required, a qualified wildlife professional must verify that the habitat for the species does in fact exist on the property before this exception is granted by the county.



Although landowners with smaller tracts of land are encouraged to work cooperatively with their neighbors for some wildlife management practices, such as conducting a population census, each landowner must also individually be doing three practices of an appropriate intensity level on their property, submit their own individual wildlife management plan and be able to qualify on their own.

The Wildlife Management Plan

This guide is intended to provide landowners with information to develop their own plans. The plan may be as simple or as extensive as the landowner chooses. The practices described in this guide are intended only as guidelines. Certain site-specific situations may necessitate changes that can be allowed, if based on trained resource professionals' recommendations.

All landowners are required to develop and submit a wildlife management plan to the county Central Appraisal District along with their 1-d-1 Open Space Appraisal Application. All wildlife management plans must be on the form provided by Texas Parks & Wildlife Department. This form, PWD 885-W7000, is included in **Appendix U**.

While a comprehensive and highly detailed written wildlife management plan as described in these guidelines is not required by the county, it is highly recommended that the landowner go through this lengthier exercise and use this lengthier plan as a guide when filling out the required PWD 885-W7000 wildlife management plan form. The plan must address a separate practice in at least three of the seven wildlife management categories.

A wildlife management plan describes historic and current land use practices, establishes landowner goals and objectives (also family goals if desired) for the property, and describes specific activities and practices designed to benefit wildlife species of interest and their habitats.

This is the landowner's plan, designed by the landowner, with the possible assistance of a wildlife biologist of the Texas Parks and Wildlife Department [TPWD], Texas Agricultural Extension Service [TCE], USDA Natural Resource Conservation Service [NRCS, formerly Soil Conservation Service - SCS], Texas Forest Service [TFS], or other qualified wildlife biologist. Efforts to perform activities identified in the plan are completely voluntary on the part of the landowner, except those practices that are necessary to maintain the agricultural appraisal for wildlife management use.

A complete plan will likely include elements of all seven listed wildlife management activity categories. While Texas Parks and Wildlife Department biologists are available to assist landowners in developing a wildlife management plan for ad valorem tax purposes, it should be noted that the Department's participation is not required in order for the wildlife management plan to be valid.

What Paperwork to File

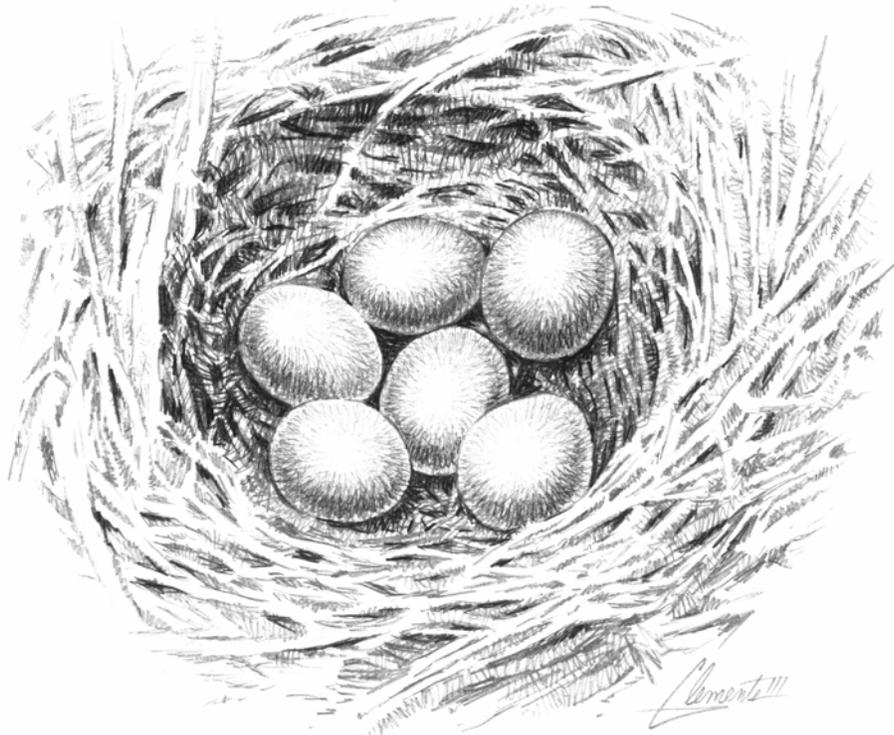
All paperwork for changing the land's qualifying agricultural practice over to wildlife management must be filed with the Chief Appraiser at the county's Central Appraisal District. No paperwork is required to be filed with Texas Parks and Wildlife Department. Landowners will need to complete a 1-d-1 Open Space Appraisal Application available from their Central Appraisal District and attach to it the completed PWD 885-W7000 wildlife management plan that is included in **Appendix U**.



With 95% of Texas privately owned, the wildlife that belongs to the people of Texas depends on private landowners to voluntarily provide them with quality habitat.

Habitat Control

Grazing Management
Prescribed Burning
Range Enhancement
Brush Management
Timber Management
Riparian Management and Enhancement
Wetland Enhancement
Habitat Protection for Species of Concern
Prescribed Control of Native, Exotic, and Feral Species
Wildlife Restoration



HABITAT CONTROL (HABITAT MANAGEMENT)

Introduction

Habitat is defined as the physical and biological surroundings of an organism and provides everything that a living organism needs to survive and reproduce. The three basic requirements of any wildlife species to survive and reproduce are food, water, and shelter. Quite frequently, we as land managers tend to focus on a specific wildlife species and its needs as opposed to the habitat or community in which they live. The key to managing wildlife and our natural resources is to use a holistic approach and promote healthy ecosystems. Single species deserve less attention, while the system in which they thrive requires more. Knowing how a system functions, and applying the techniques with which that system developed is imperative for its continued health and existence.

Ecosystems are dynamic and continuously changing. Succession is the change in plant species composition and structure over time and it is succession that we as land managers are trying to manipulate. Generally the earlier the successional stage the greater the plant diversity and the greater the number of wildlife species that are benefited. This is not to say that some species are not dependant on later successional stages or even several stages, managing for a diversity is important. Maintaining a variety of habitat types, while at the same time promoting plant diversity in both species composition and structure within each habitat type, should be the goal of all good wildlife management programs.

Aldo Leopold, who is known as the “Father of Modern Wildlife Management”, authored a book in 1933 titled *Game Management*. In this textbook Leopold wrote "...game can be restored by the *creative use* of the same tools which have heretofore destroyed it - ax, plow, cow, fire, and gun".

Habitat control or habitat management, as it is most often referred, is the active application of these “tools” to the land in order to promote land health and enhanced availability of the 3 basic requirements to all wildlife species. It is very important that land managers today understand basic ecological principles of plant succession; plant growth; food chains; and water, mineral and soil nutritive cycles as they affect range, wildlife, and grazing management. This not only produces high quality habitat and animals, but also can lead to more stable conditions during stress periods such as droughts and winter.

Grazing Management

People often view grazing livestock as being incompatible with managing for wildlife. Although this can be the case, when properly utilized grazing can be beneficial to wildlife habitat. Focusing on good land management as opposed to strictly livestock production allows a landowner to adjust the presence or absence of livestock as well as a grazing time and intensity level that is beneficial for both plant health and diversity.



Grasses evolved with grazing pressure.

Historically great herds of bison roamed the central part of the United States and stayed constantly on the move in search of new forage and in front of predators. Bison came into an area, grazed it down, and left. Herds were never in any given area for an extended length of

time. Sheer numbers of bison in the herd did not allow the animals to be selective about plants that were bitten; animals were forced to eat every palatable plant in an area. This type of grazing did several things to sustain a diverse mid- and tall-grass plant community. The intense pressure left a lot of tilled and well fertilized soil, it decreased the overall quantity of grass, allowing sunlight to reach the lower growing forbs (weeds & wildflowers), and allowed those grasses with deeper root systems to respond quicker, during the absence of bison, than those with shallower root systems. While intense for a short time period, this type of grazing provided long rest periods of the range, allowing for rapid responses of annual forbs and grasses. The final result was more plant diversity and more wildlife foods. Bison opened stands of dense grasses, providing more food for deer, turkey, quail, prairie chicken, and songbirds. Without grazing pressure neither the grasses nor the forbs respond the same. The diversity as well as the health of the system is diminished. Undoubtedly, bison were a major force that shaped the ecosystem.

European man brought with him his own form of agriculture and the range appeared unlimited in its ability to support a great number and variety of livestock (cattle, sheep, goats, oxen, hogs, and horses). The demise of the bison and changes in land use patterns eventually brought fences and livestock were increasingly grazed in pastures with limited or no rest periods. Forage availability and production is dependant on stocking rates, rest, and rainfall. Sedentary grazing or limited rotation grazing with even average stocking rates and rainfall can create severely abused and overgrazed range. Grasses are continually grazed beginning with the most palatable first and on down the line until the plant community is primarily less desirable shallow rooted grasses and a few undesirable forbs. Overall plant diversity decreases. An abused range lacks adequate groundcover and available browse to support healthy livestock and wildlife populations. Overgrazing with domestic livestock causes problems in managing for healthy ecosystems.

Good grazing management starts with the basics: 1) the kind and class of livestock grazed 2) stocking rate or intensity 3) duration of grazing to provide rest periods for the pastures and 4) excluding livestock from sensitive areas to promote vegetation protection and/or recovery.

In an ideal program the goal is high intensity short duration. The stocking rate is such that every plant should be bitten off once during each grazed period or rotation. Sedentary grazing allows plants to be bitten over and over starting with the most palatable first. The less desirables keep growing while the more palatable ones continue to get bitten. This can result in a pasture being underutilized, but still overgrazed and eventually the removal of your most desirable species. Having enough animals to bite the plants only once means livestock can only stay in one place for a short period of time before they have to be moved to another pasture. High intensity short duration grazing requires a number of pastures within the grazing system to allow for extended rest periods.

High intensity short duration grazing systems allow livestock to act as a tool to manipulate and enhance wildlife habitat and plant diversity as the bison did historically in our grassland and savannah ecosystems. There are a number of variations of this system, finding one that you are able to implement on your property is the key. If it is unrealistic to divide a property into enough small pastures to both sufficiently graze and rest the range, a small landowner may want to contact neighbors to pool property and allow each property to serve as a pasture in a grazing rotation. Properties without these options may have to use prescribed burning and/or mowing to achieve some of the results and benefits of grazing.

For additional information see Appendix D. Contact the Texas Parks and Wildlife Department's Kerr Wildlife Management Area at 830-238-4483 or write to Kerr WMA, 2625 FM 1340, Hunt, TX 78024 to schedule a visit and see the effects of both grazing systems and "over-rest" situations.

Prescribed Burning

Bison were not the only major force shaping the system in which pronghorn antelope, black bear, wolf, white-tailed deer, turkey, quail, and prairie chicken thrived historically. Fires, natural and man-made, played an integral role in managing that system. Fire is a natural ecological factor to which native vegetation is well adapted. Since the 1850s, man has suppressed fire, and the grasslands and savannahs that were once dotted with occasional mottes of trees and forests only along drainage systems are now dominated by brush and woodlands. Europeans suppressed fire to prevent damage to wooden structures, farmlands, fences, and grazing lands. In turn this eliminated or reduced the role that fire played in maintaining ecosystems that were dominated by herbaceous vegetation.



Prescribed burning is the planned application of fire to set back succession. It improves habitat and plant diversity and returns nutrients to the soil. Burning can improve accessibility, increase both quantity and quality of forage and browse production, suppress brush and cactus, improve grazing distribution of livestock and wildlife, and remove excessive mulch and debris. Prescribed burning is a tool used to maintain desired vegetation composition and structure.

Achieving a management objective requires a particular set of conditions for burning and a specific type of fire or burn prescription. A burn prescription defines the range of conditions and factors under which a fire boss will light a fire to meet these specific objectives. Factors that influence the type of fire and its intensity include time of the year, fuel quantity and moisture, air temperature, humidity, soil moisture, wind speed, geographic area, and direction of the flame front movement in relation to the wind. Generally summer fires are hotter type fires and fall-spring fires are cooler burning fires. As fuel quantity goes up and fuel moisture goes down the higher the intensity of the fire. The same goes for the higher the wind speed and air temperature and the lower the humidity and soil moisture, the hotter the fire. Fire set to move in the same direction as the wind is a headfire and fire set to move against the wind is a backfire. Headfires burn hotter than backfires.

The plant response after a fire is influenced by fire intensity, plant condition at the time of the burn as well as weather conditions and grazing management practices following the burn. For example forbs are prolific seed producers and valuable resource for white-tailed deer and other wildlife species. Forb seedlings are highly susceptible to fire, and a late winter burn after annuals have germinated may reduce forb production for the following growing season. A winter burn used to target certain evergreen trees or shrubs, such as Ashe juniper (cedar) or

yaupon holly, is less likely to harm deciduous trees, such as oaks, than a late summer fire used to target the same species. Burned pastures can be grazed immediately to reduce grasses that compete with forbs or to make use of now palatable prickly pear, then deferred to allow the pasture to rest. Whitetail and exotic wildlife numbers may have to be reduced prior to burning to allow time for preferred plants to reestablish following the burn.

A successful prescribed burn includes 3 basic steps: 1) develop a burn plan which should include management goals and objectives, burn prescription, safety plan, description and map of the burn unit, smoke management, legal requirements, contacts and notifications, control and firing plan, and evaluation 2) a safe and effective execution of the burn on the planned site and 3) good range, livestock, and wildlife management to maximize the effects of the burn. Inexperienced managers should ask for assistance and/or advice from agencies such as Texas Parks & Wildlife or the Natural Resources Conservation Service. While instructional materials are available, it is suggested that the novice assist on a burn conducted by an experienced person before attempting a prescribed burn.

Range Enhancement

Mismanagement and overgrazing can lead to abused rangeland. Continuous over-utilization by livestock and/or white-tailed deer and exotics can remove certain desirable and highly palatable plants from a system. Past land use practices such as mechanical clearing or farming may cause some plants to become rare or even nonexistent on certain ranges. Range enhancement is the re-establishment or enhancement of plant communities with native grasses and forbs. These plants provide both food and cover for wildlife and help to meet the three basic requirements.

Seeding mixes should provide for maximum native plant diversity and should include many broadleaf plants which are important forage for wildlife and seed production. Range enhancement should include appropriate plants or seed mixtures as well as methods of application for the particular ecological region where the property is located. Non-native species are not recommended and should be used only in rare and very specific cases. Even then non-natives should not exceed 25% of the seeding mix.

Managing, restoring, and/or protecting native grass prairies is also considered range enhancement. This may or may not include actual reseeding but could include utilizing some of the "tools" to manage for the earlier successional stages of a native prairie. Grazing, burning, and mechanical disturbance (plow) are all options to manage and restore native prairie.

For additional information see Appendix E.

Brush Management

Historically bison and fire had a huge impact on plant communities and with the removal of these major influences plant communities changed. Without fire and a high intensity short duration type grazing regime plant communities began to see an increase in woody plant species and a change from grassland or savannah communities to more brushland or woodland habitat types. As brush continues to increase and begins to form closed canopies, cutting off sunlight to the area underneath, grass and forb production as well as overall diversity decreases. Some woody species tend to increase at rates greater than others, such as ashe juniper, and can begin to dominate a system. Along with this domination come other changes that take place beyond what is realized by observation. Ashe juniper has had a tremendous impact on the ecosystem by causing an increase in soil erosion and significantly less water

absorption. Cedar brakes lose a significant amount of precipitation through transpiration and overland flow, leaving much less water for aquifer recharge to insure adequate groundwater in the future.

As mentioned before a diversity in both plant composition and structure within differing habitat types is the key to successful wildlife management and an area that is dominated by any single type or species of plant is rarely going to meet the needs of even a single species of wildlife. Again, utilizing the “tools” that Leopold described is the key to managing your property and providing the adequate amount and arrangement of brush to meet the needs of a multitude of wildlife species.

While a good grazing management and prescribed burn program can reduce the need for brush management, the axe may be needed when a particular piece of property is beyond the point that utilizing other tools is realistic. The axe is rarely used in the 21st century when dealing with extensive brush or woody encroachment. Today chainsaws, herbicide and mechanical equipment such as bulldozers or tree shears take the place of the axe and serve to set back succession in more advanced stages.

Brush management is only part of a good habitat management program and should be planned carefully as to how it fits in with overall management goals. The primary principles that drive any good brush management program are: 1) extent 2) pattern 3) selection and 4) method. The extent to which brush is going to be cleared is the first step in developing a program. Overall goals of the property should be examined and can help to dictate the amount of clearing needed to meet wildlife, livestock and/or aesthetic expectations. Clearing 100% of the brush may be best from a livestock production standpoint but if your overall goal includes white-tailed deer management you may only want to clear 50%. Individual plant treatment may be all you need depending on the amount of brush you have. The pattern in which brush is cleared should consider wildlife cover and accessibility. This may include cover from predators, nesting cover, and loafing or roosting cover. Maintaining travel corridors that link sections of brush is also very important. Selection includes both the site and the species of brush to be cleared. The site of brush clearing is important to make sure and keep erosion to a minimum. Soil type and slope should be considered. Certain soils may also be selected for clearing because of better forage production. Also removal of desirable plant species should be kept to a minimum. The method is determined by total cost analysis, soil erosion issues, and the type or species of brush which is being targeted.

Timber Management

The forests of Texas are as diverse as the landscape itself. Much of the historic landscape was dominated by grasslands with occasional mottes or scattered groups of trees interspersed. Aside from the pine forests of East Texas, forested areas were generally restricted to bottomlands along major rivers and creeks, or in areas protected from fire. Settlers in East Texas discovered a vast forest comprised of a variety of both pine and hardwood species. Pines, for the most part, dominated the uplands while hardwoods dominated the bottomlands. Agricultural production, commercial timber production, and other changes in land management, including virtual elimination of fire, the forests of today are very different than those present during pre-settlement times.

Forest management may include establishing, maintaining, harvesting, selectively removing or suppressing trees or woody species to allow for the growth of desirable trees, shrubs, grasses, and forbs for forage and nesting or protective cover for a variety of wildlife species. Activities

should focus on keeping the proper kind, amount, and distribution of woody cover for selected wildlife species as well as retaining snags for cavity nesters. Forested areas can be managed to produce wood fiber, while at the same time providing quality habitat for wildlife. Timber management strategies can be grouped into 2 categories, even-aged and uneven-aged.

Even-aged management is defined as the application of a combination of management actions, which results in a timber stand comprised of trees that are the same age. Harvest methods used to generate even-aged stands are clearcut, seed-tree, and shelterwood. A clearcut results in the removal of all merchantable timber and is usually followed by site preparation and planting. Both the seed-tree and shelterwood methods rely on natural regeneration. A seed-tree operation results in the removal of all merchantable timber, with the exception of a few, well-spaced high quality trees with good seed production that will be relied upon to regenerate the stand. Approximately 8-10 trees per acre may be retained for seed production. These seed-trees may be harvested after adequate regeneration has become established, or may be left indefinitely. The shelterwood method results in the removal of 40 to 60% of the merchantable timber. The residual trees are relied upon for seed production and seedlings become established in partial sunlight under the shelter of the residual trees. Similar to the seed-tree method, residual trees may be harvested after adequate regeneration has become established. Regardless of the method used, consideration should be given to the size, shape, and distribution of the harvest area prior to the final harvest operation.

Uneven-aged management is defined as the application of a combination of management actions that maintains several age-classes and tree sizes within a timber stand. In order to produce a sustained yield of forest products, uneven-aged management results in continuous canopy coverage, recurring regeneration of desirable species, and the orderly growth and development of trees in several diameter and age-classes. Regeneration is through natural methods. Under an uneven-aged management strategy, individual trees (single-tree selection) or small groups of trees (group selection) are selectively harvested every 5-10 years. An area properly managed under single-tree selection results in a forest that is comprised of evenly distributed large, medium, and small trees of various ages. This system requires the removal of trees of all ages and sizes in order to maintain a healthy stand. To prevent degradation of the stand, the application of this harvest strategy requires the expertise of a forester experienced in uneven-aged management. Diameter cutting (cutting all trees larger than a predetermined size, rather than using tree age as criteria) or "high-grading", can result in a stand comprised of inferior trees after a few cutting cycles and should be avoided.

During harvest, streamside management zones (SMZs), or a band of uncut timber, should be retained on each side of stream channels within the regeneration area. The SMZ should be a minimum width of 66 feet on each side of the channel. Along intermittent and perennial streams, widths of 100 feet or more are preferred. To provide maximum benefit to wildlife, these minimum widths should be extended to an identifiable natural break in topography (crest to crest), or to an area defined by the presence or absence of bottomland hardwoods. In addition to protecting water quality, these areas increase diversity, provide valuable mast production, and serve as wildlife travel corridors.

Effective habitat management often requires the availability and proper use of an array of management "tools". Due to varying management objectives, no one tool, or in this case timber management system, is the most appropriate for every situation. Misuse of a timber management strategy can cause degradation of habitat quality. As with all land management practices, managers should develop well-defined objectives, and select and properly implement

the strategy that is the most appropriate for their management needs.

Note: As of January 2010 property currently appraised with a timber valuation for ad valorem tax purposes now qualify for conversion to wildlife management.

Riparian Management and Improvement

Riparian area refers to the low lying areas on either side of a stream course. Management or improvement of the vegetation in these areas helps to alleviate erosion and protect water quality. Much of our bottomland hardwood forests that existed historically have been cleared for agricultural production, degraded through improper timber harvest or other mismanagement, or flooded by the construction of flat water reservoirs. Bottomland hardwoods have been referred to as the single most important wildlife habitat type and provide a wealth of benefits for wildlife, erosion control, flood control, water quality, water retention, and ecosystem health. Managers should attempt to restore and/or manage these riparian areas that include bottomland hardwoods, bogs, mixed pine and hardwood forests, and natural wetlands to promote ecosystem health and diversity.

Riparian management and improvements can include providing alternate livestock watering sites, deferring livestock from riparian areas during critical periods, excluding livestock from pastures with riparian areas, herbaceous plantings or seeding in degraded riparian zones, or replanting previously cleared or degraded bottomland hardwoods. Attention should specifically be given to protection of turkey roosting areas and snag retention for cavity nesters. The creation of permanent SMZs, as mentioned above in forest management, is also a vital part of any management program where the property is involved in timber production.

Wetland Improvements

It has been estimated that Texas has lost 54% of its total wetland acreage in the last 200 years. Wetlands were at one time regarded as waste-lands and nothing more than breeding grounds for insects, pests, and disease; they were considered obstacles to progress and development and were readily converted to other land uses. It is only in the recent past that wetlands were recognized as some of the most ecologically important systems on earth. Wetlands are invaluable for their ability to prevent erosion, purify water, prevent and minimize flooding, and replenish groundwater resources. They provide humans with fossil fuels and food and wildlife with invaluable habitat. Managing, protecting, restoring, or creating wetland habitat plays an integral part in a successful wildlife program.

Texas wetlands may include swamps, bottomland hardwoods, marshes, bogs, springs, playa lakes, or saline lakes. They are found along rivers, streams, lakes, and ponds; in uplands where surface water collects and at points of groundwater discharge such as springs or seeps. Wetlands are characterized by 1) water or saturated soils for at least a portion of the year 2) plants that are adapted to wet environments (hydrophytic vegetation) and 3) soils that develop under depleted oxygen conditions (hydric soils). Managing for wetland improvement can involve any practice that enhances, restores, or creates these 3 characters. Setting back succession in an existing wetland by using the axe, cow, plow, or fire to ensure the integrity of the wetland plant community can be important to the production of wetland wildlife food sources. Closing a ditch that was once used to drain an existing wetland or creating a ditch or drilling a water well to increase water flow into a wetland can be very important to maintaining the hydrology or flooding regime needed for that wetland to continue to function. Cleaning out a seep or spring which is experiencing reduced flow due to siltation can provide more permanent or seasonal water. And building a levee with water control structures to manage the water

regime and provide water during the growing season and for fall and winter migrants can be an important habitat source for waterfowl or shorebirds.

The management options for wetlands are as diverse as the wetlands themselves. Where the opportunity exists, wetland management provides unique opportunities for habitat management that benefits a great diversity of wildlife and overall land health.

Habitat Protection for Species of Concern

New and changing land use practices and the exclusion of fire and high intensity short duration grazing by bison has had negative impacts on a number of wildlife species. Endangered, threatened, or rare wildlife species are a by product of endangered and rare habitat. Habitat protection includes managing or developing additional areas to increase nesting sites, feeding areas, and other critical habitat types to overcome limiting factors and meet the 3 basic needs of certain wildlife species.

Habitat protection as it is defined here can include setting aside critical areas of habitat, managing vegetation for a particular species, maintaining overstory vegetation from degradation, and annually monitoring the species of concern. Management for migrating, wintering, or breeding neotropical birds and should follow specific guidelines provided by the Texas Parks and Wildlife Department specific to your ecological region. Leopold wrote "...game can be restored by the *creative use* of the same tools which have heretofore destroyed it - ax, plow, cow, fire, and gun". Broadscale habitat management for nongame species, just as for game species, should include those practices that promote an increase in plant abundance and diversity in both composition and structure.

Contact the Texas Parks and Wildlife Department for approved management guidelines before implementing activities designed to protect or enhance habitat for endangered species. For additional information see Appendix I.

Prescribed Control of Native, Exotic, and Feral Species

The appearance of most Texas rangelands is very different today compared to 150 or 200 years ago. The expansive grasslands, which were dotted with an occasional motte of trees, are no more. Mid- and tallgrass communities have been replaced with shortgrass communities or even pastures of exotic grasses. The expansive native grasslands were replaced by brush and woodlands which in turn influenced the type and number of wildlife species that flourish. The Texas white-tailed deer population is at an all time high and many ranges support more exotic and feral species now than ever before. The changing land management practices, combined with grazing pressure of too many deer, exotics, and livestock have degraded the quality of wildlife habitat across the state. Over-utilized rangelands have poor plant diversity, are often dominated by exotic or lesser quality vegetation, and support poor wildlife diversity. There may be little or no groundcover to capture runoff, rain water is lost, and groundwater is not recharged. The whole system is suffering. Using the gun, as a tool, to manage populations at or below the carrying capacity of the range is essential in providing quality wildlife habitat for a multitude of wildlife species.

White-tailed deer have a high reproduction potential, and in the absence of natural predators, can quickly overpopulate a range. If white-tailed deer are allowed to overpopulate, they can have negative effects on the habitat. Deer consume the most palatable plant species first, and excessive browsing pressure can eliminate these preferred plant species from the range. This

reduces plant diversity and has negative impacts on all wildlife species, not just white-tailed deer. Once a range is damaged by overgrazing, it can take years for a range to recover, even after deer numbers are reduced to an appropriate level. The most effective way to regulate deer numbers is through hunting. Hunting allows the land manager to maintain deer numbers at a level that the habitat can support without causing damage to the habitat. In addition to habitat damage, deer from overstocked ranges generally have poor fawn survival, low body weights, and poor antler quality. The most effective way to reduce deer numbers is through the harvest of doe deer at appropriate levels. Once deer numbers are at a desired level, doe harvest must be continued to maintain the population at a desirable level.

Each time a deer hunter chooses to shoot a deer, or not to shoot a deer, a management decision that will affect the future of that deer herd and habitat is made. For example, choosing to shoot, or not to shoot a doe, affects the sex ratio and reproductive potential of the herd. Choosing to shoot, or not to shoot, a yearling buck affects the current and future age structure of the buck population. Therefore, not only can the gun be used to manipulate deer numbers, it can also be used to manipulate sex ratios, reproductive potential, and age structure of the herd.

Exotic and feral species, that may include feral hogs or any number of exotic ungulates, compete directly with native wildlife species for available habitat. Population reduction or elimination of these non-native species will benefit your native wildlife management program (see Predator Control Activity for additional information on feral species).

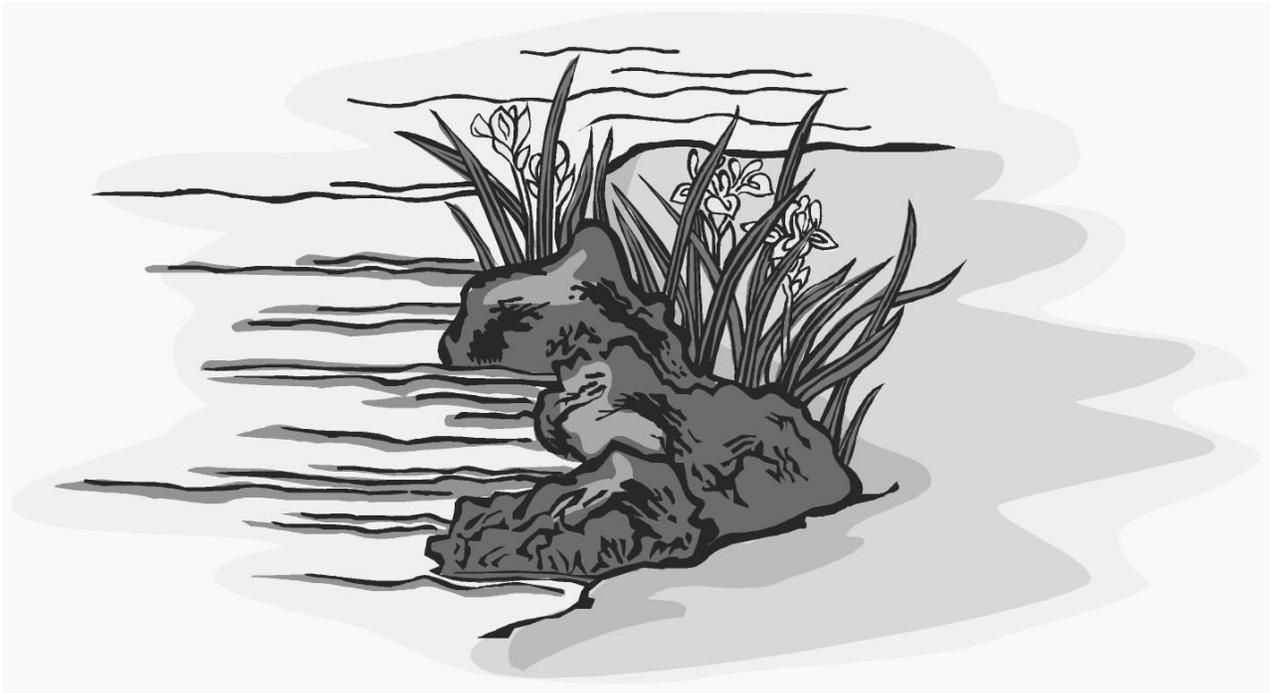
In addition land managers should attempt to control or eradicate exotic vegetation that in many cases can dominate native habitats or in the least reduce overall vegetation diversity. Native vegetation, as opposed to introduced species, provides for better, more productive wildlife habitat. Removal of species such as chinaberry, Chinese tallow, weeping lovegrass, coastal bermuda grass, King Ranch bluestem, and Kleberg bluestem will reduce competition with native vegetation. Effective control of exotic vegetation is dependant on the species and the method used should be an accepted or proven practice in the ecological region where the property is located.

Wildlife Restoration

Wildlife restoration has experienced numerous success stories. These efforts have resulted in stable populations of beavers, wood ducks, and white-tailed deer. Without the aid of private landowners these successes would not have been possible. Landowners provide trapping sites for capture of the animals to be relocated, but more importantly they manage the habitat on which these animals are dependant. Wildlife restoration means restoring or improving habitat for targeted species as part of an overall reintroduction program in a Texas Parks and Wildlife Department approved restoration area.

Erosion Control

Pond Construction and Repair
Gully Shaping
Streamside, Pond, and Wetland Revegetation
Herbaceous and/or Woody plant Establishment on Critical Areas
Dike/Levee Construction and Management
Establishing Water Diversion



Erosion Control

Any active practice that attempts to reduce or keep soil erosion to a minimum for wild animals' benefit is erosion control.

Erosion is the detachment and movement of soil by moving water, wind or ice. When raindrops hit an uncovered soil surface, they dislodge and detach soil particles (*splash erosion*). If there is more rainfall than the ground can absorb, the resulting runoff carries these detached soil particles away.

Erosion is a natural process that cannot be stopped; however, human activity such as earthmoving and tillage can accelerate the process. The erosion process advances through several stages.

- **Sheet erosion** is the removal of a fairly uniform layer of soil from the soil surface by shallow overland flow.
- **Rill erosion** occurs as shallow sheet flow concentrates into small channels. Flow in these channels causes further erosion and carries soil particles away.
- **Gully erosion** is an accelerated form of rill erosion where the channels are much deeper and carry away larger quantities of soil.

Raindrop impact on bare soil surface can also form a "crust" or pan on the soil surface that can be difficult for water to infiltrate. This creates more runoff and less water available to plants, which can decrease plant growth and ground cover leading to further erosion.

According to the U.S. Department of Agriculture the United States loses more than 2 billion tons of topsoil each year to erosion. Erosion removes fertile soil rich in nutrients and organic matter, which reduces the ability of plants to establish, grow and remain healthy in the soil. A reduction in plant growth and subsequent plant residue causes less soil cover, allowing the erosion process to perpetuate and become worse. This in turn affects the wildlife species dependent upon the affected plant communities.

Water Quality and Conservation

Erosion not only causes loss of soil productivity but also creates water quality problems once the sediment leaves the site and enters surface waters. The EPA has declared that sediment contamination of our surface waterways is one of the biggest threats to our nation's water resources. When eroded sediment is transported from its site of origin to nearby water bodies it can also carry fertilizers, pesticides and other contaminants attached to the soil particles.

Water that is loaded with sediments can lead to reduced drainage capacity, increased flooding, decreased aquatic organism populations, decreased commercial and recreational fishing catches, clogged and damaged commercial and industrial irrigation systems, increased expenditures at water treatment plants to clean the water, and decreased recreational and aesthetic value of water resources. Some erosion control practices include:

Pond construction is building a permanent water pond to prevent, stop or control erosion as

an approved Natural Resource Conservation Service (NRCS) watershed project while providing habitat diversity and benefiting wildlife. Whenever possible, owners should use ponds to help create or restore shallow water areas as wetlands and for water management.

Gully shaping involves reducing erosion rates on severely eroded areas by smoothing to acceptable grades and re-establishing vegetation. An area should be seeded with plant species that provide food and/or cover for wildlife.

Streamside, pond and wetland revegetation means revegetating areas along creeks, streams, ponds and wetlands to reduce erosion and sedimentation, stabilize streambanks, improve plant diversity and improve the wildlife value of sensitive areas.

Establishing native plants on critical areas is one method of controlling erosion. These plants also can provide food and/or cover for wildlife and restore native habitat. Some of the ways to establish these plants are listed below.

- Establish and manage wind breaks/shelterbelts by planting multi-row shelterbelts (at least four rows that are 120 feet wide by 1/4 mile), renovate old shelterbelts (re-fence, root-prune and replace dead trees) and establish shrub mottes.
- Establish perennial vegetation on circle irrigation corners by revegetating at least every other corner to reduce erosion and sedimentation, improve plant diversity and improve wildlife habitat.
- Plant permanent vegetation on terraces and field borders to reduce erosion, improve plant diversity and improve wildlife habitat.
- Conserve tillage/no-till farming practices by leaving waste grain and stubble on the soil surface until the next planting season to provide supplemental food or cover for wildlife, control erosion and improve the soil tilth.
- Manage Conservation Reserve Program (CRP) cover by maintaining perennial cover established under the CRP on erodible sites using proper management techniques such as haying, prescribed grazing or burning.

Dike, levee construction or management is a way to establish and maintain wetlands or slow runoff to control or prevent erosion and to provide habitat for wetland-dependent wildlife. Levee management may include reshaping or repairing damage caused by erosion and revegetating levee areas to reduce erosion and sedimentation and stabilize levees. This practice may include fencing to control and manage grazing use.

Water diversion systems also can be installed to protect erodible soils and divert water into wetlands to provide habitat for resident and migratory water birds and wetland-dependent species.

Minimizing Erosion

Building and construction projects can be major causes of erosion. Landowners can take steps to minimize erosion during these projects by following a few simple, commonsense precautions.

- Plan construction activities during the spring and summer months, so that erosion control measures can be in place when rain comes.
- Examine your site carefully before building. Be aware of the slope, drainage patterns and soil types. Proper site design will help you avoid expensive stabilization work.

- Preserve existing vegetation as much as possible. Limit grading and plant removal to the areas under current construction. (Vegetation will naturally curb erosion, improve the appearance and the value of your property, and reduce the cost of landscaping later.)
- Use fencing to protect plants from fill material and traffic. If you have to pave near trees, do so with permeable asphalt or porous paving blocks.
- Preserve the natural contours of the land and disturb the earth as little as possible. Limit the time in which graded areas are exposed.
- Minimize the length and steepness of slopes by benching, terracing, or constructing diversion structures. Landscape benched areas to stabilize the slope and improve its appearance.
- As soon as possible after grading a site, plant vegetation on all areas that are not to be paved or otherwise covered.
- Control dust on graded areas by sprinkling with water, restricting traffic to certain routes, and paving or graveling access roads and driveways.

Temporary Measures to Stabilize the Soil

Grass provides the cheapest and most effective short-term erosion control. It grows quickly and covers the ground completely. To find the best seed mixtures and plants for your area, check with your local nursery, the Texas Department of Agriculture, the Natural Resource Conservation Service, the Texas Cooperative Extension Service and Texas Parks and Wildlife Department.

Mulches hold soil moisture and provide ground protection from rain damage. They also provide a favorable environment for starting and growing plants. Easy-to-obtain mulches are grass clippings, leaves, sawdust, bark chips and straw. Straw mulch is nearly 100% effective when held in place by spraying with an organic glue or wood fiber (tackifiers), by punching it into the soil with a shovel or roller, or by tacking a netting over it. Commercial applications of wood fibers combined with various seeds and fertilizers (hydraulic mulching) are effective in stabilizing sloped areas. Hydraulic mulching with a tackifier should be done in two separate applications: the first composed of seed fertilizer and half the mulch, the second composed of the remaining mulch and tackifier. Commercial hydraulic mulch applicators - who also provide other erosion control services - are listed under "landscaping" in the phone book.

Mats of excelsior, jute netting and plastic sheets can be effective temporary covers, but they must be in contact with the soil and fastened securely to work effectively.

Roof drainage can be collected in barrels or storage containers or routed into lawns, planter boxes and gardens. Be sure to cover stored water so you don't collect mosquitoes, too. Excessive runoff should be directed away from your house and into wildlife watering facilities. Too much water can damage trees and make foundations unstable.

Structural Runoff Controls

Even with proper timing and planting, you may need to protect disturbed areas from rainfall until the plants have time to establish themselves. Or you may need permanent ways to transport water across your property so that it doesn't cause erosion. To keep water from carrying soil from your site and dumping it into nearby lots, streets, streams and channels, you need ways to reduce its volume and speed. Some examples of what you might use are:

- **Riprap** (rock lining) to protect channel banks from erosive water flow.
- **Sediment trap** to stop runoff carrying sediment and trap the sediment.
- **Storm drain outlet protection** to reduce the speed of water flowing from a pipe onto open ground or into a natural channel.
- **Diversion dike or perimeter dike** to divert excess water to places where it can be disposed of properly.
- **Straw bale dike** to stop and detain sediment from small unprotected areas (a short term measure).
- **Perimeter swale** to divert runoff from a disturbed area or to contain runoff within a disturbed area.
- **Grade stabilization** structure to carry concentrated runoff down a slope

Using Livestock to Repair the Effects of Erosion

Just as overgrazing can cause erosion, so too can under-utilization by livestock and permanent deferral, cause erosion. Lack of grazing can cause an algal cap to develop on the surface of the soil that with time becomes impenetrable to water. A proper stocking rate keeps the soil turned over, prevents compaction, and allows rainfall to infiltrate the soil preventing run off, and reducing erosion potential.

For information on which plants provide the best erosion control and wildlife benefit, consult the Texas Plant Information Database at <http://tpid.tpwd.state.tx.us/index.asp>.



Algal capping on the soil causes a nearly impenetrable barrier to rainfall, increasing the potential for erosion. Proper grazing helps prevent capping from occurring.

Predator Control

Imported Red Fire Ants
Brown-headed Cowbirds
Grackle, Starling, and House Sparrow Control
Coyotes
Feral Hogs
Raccoons, Skunks, Feral Cats and Dogs



PREDATOR CONTROL

There is no disputing the fact that predators including reptiles, birds, and mammals impact native wildlife populations. Whether that impact is negative or harmful is debated by farmers, ranchers, wildlife professionals and the general public.

Natural systems including predator – prey relationships are complex and evaluating predator impacts on native species may be difficult to say the least. Livestock injury and/or loss by predators are measurable with economic consequences and rarely tolerated by ranchers and managers. Loss of native species such as mule deer predation by mountain lions in West Texas may not be realized when in comparison to livestock but may have an economic impact on ranchers with possible lower lease returns and loss of trophy animals.

Landowners, livestock and wildlife managers should recognize the goal of predator control should be to protect livestock and minimize losses of native wildlife due to predation, not necessarily maximizing the take of predators.

Landowners and managers must evaluate the need for predator control on their property by assessing the abundance and diversity of predators present, the potential impacts by those predators on desired wildlife species and livestock, and the long-term habitat management goals of the property. For example, removing large predators from high deer density areas will only increase deer populations impacting plant diversity and cover, thus affecting the wildlife species dependant on those plants for food, shelter, and nesting cover.

It may be difficult for landowners new to an area or those not familiar with the needs of wildlife to evaluate the impacts of predators on the resident and migratory species on their property. The mere presence of some predatory species should prompt an immediate response from the landowner or manager. Feral cats, dogs, and hogs should be removed by whatever means from wildlife habitat and should not be tolerated by owners and managers. Imported red fire ants are another example of a species that should be controlled by every means available.

The Brown-headed Cowbird, a parasitic nester that impacts more than 225 species of birds, should be controlled by trapping when possible and only after attending a certification course given by Texas Parks and Wildlife Department at various times of the year.

Native predator species such as raccoons, ringtails, opossums, skunks, fox, and rat snakes can have localized impacts on resident bird populations especially ground nesting species such as turkey, quail, and a number of songbirds. Control of predators such as these may not need to be a top priority if habitat conditions are where they should be, offering abundant ground and understory cover for shelter, food and nesting.

Coyotes, bobcats, and mountain lions once considered predators of the “wilderness” are now found in close proximity to suburban areas as urban “sprawl” or expansion encroaches on rural farm and ranch lands. As property is developed into this habitat, interaction with these highly adaptable and mobile species is occurring more frequently. A common sense approach should be taken when considering control of these species. The landowner or manager must evaluate the predicted outcome of control measures prior to starting any control. For example, in many parts of the Edwards Plateau, as well as the State and nationwide, there are too many white-tailed deer and controlling the predators that feed on them would cause increased populations

and further loss of habitat for other wildlife species.

Some precautions can be taken when large predators are present in an area close to people. Pets and newborn livestock should be protected by any means available i.e. fencing, enclosures, housing, etc... Keep pet foods from the outdoors and restrict wildlife feeding to a safe and comfortable distance from the house. Control of prey species numbers in the form of deer harvest

to at or below carrying capacity should discourage any large predators from becoming residents in the area.

If control measures are warranted, consult with a wildlife professional prior to using any measures other than shooting or trapping. Extreme caution should be taken and only the experienced should consider methods such as poisoning.

Some species may not be recognized as predators but cause damage and loss of wildlife by actions other than direct take. For example, European Starlings and English House Sparrows displace native cavity nesting birds such as woodpeckers by taking over and actively defending nest cavities.

The presence of large grackle and blackbird colonies deter other birds from nesting in some areas. Brown-headed and Bronzed Cowbirds have tremendous impacts on songbird populations across the nation. A single female cowbird can lay up to 40 eggs per season, impacting literally hundreds of songbird species including a number of threatened and endangered species in the Edwards Plateau. Trapping and shooting are the most economic means of control with caution taken to release non-target species from traps and proper identification made prior to shooting.

A landowner or manager should first manage the wildlife habitat on his or her property, increasing the plant diversity and abundance of species that provide food, shelter, and nesting cover for all wildlife species prior to implementing a full scale predator control program for all predator species.

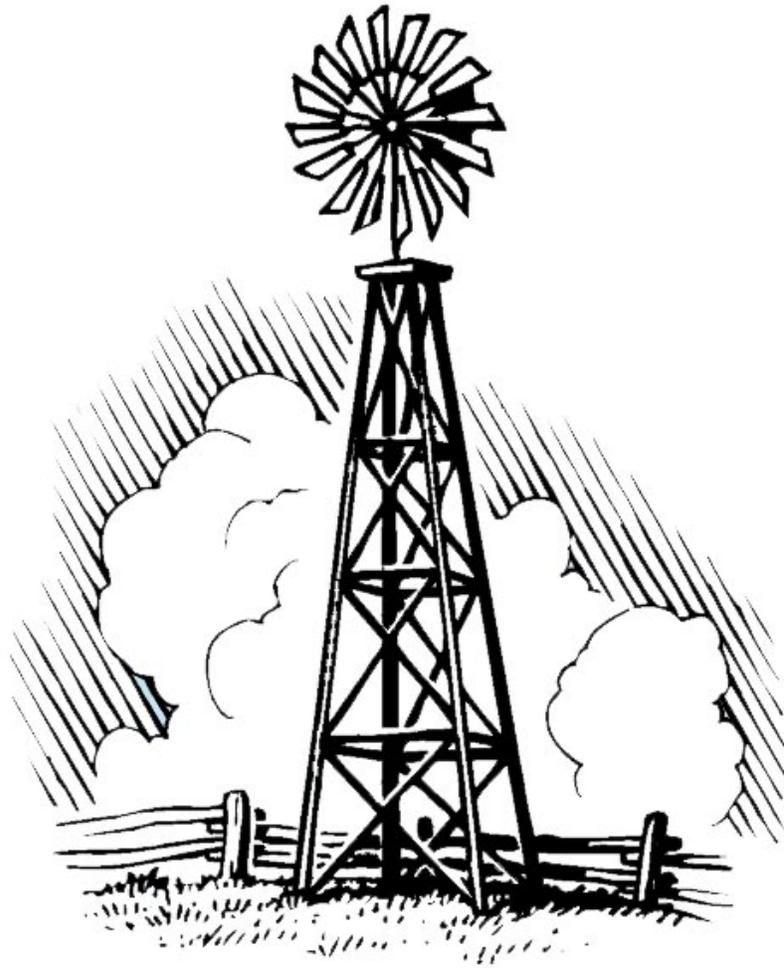
For the majority of landowners that feel predator control would be useful in meeting the criteria for H.B. 1358, the bill implemented to allow agricultural appraisal for land used to manage wildlife, a few basic practices will work. The size and location of the property, amount of wildlife habitat and the goals of the landowner will influence the practices used.

Fire ant control and cowbird trapping is not dependant on the criteria above. As well as live trapping of small and medium-sized mammals such as raccoons, opossums, rats, skunks, and others. The control of sparrows, starlings, grackles and feral animals can and should occur on any size property. On larger tracts of land, control of large predators may benefit wildlife present but should be carried out by knowledgeable land managers and/or wildlife professionals when methods other than shooting or live trapping are utilized.

On properties throughout the Pineywoods and across the State, landowners and managers have implemented every known control method for predators and yet they thrive. Landowners need to have a long range wildlife management plan in place defining the goals of any of the activities occurring on the property including predator control. Once in place, activities can be monitored and results can be recorded to aid in future management decision making.

Providing Supplemental Water

Marsh and Wetland Restoration or Development
Well, Troughs, Windmill Overflows, and Other Watering Facilities
Spring Development and/or Enhancement



Providing Supplemental Water

Natural water exists in all wildlife environments. Supplemental water is provided when the owner actively provides water in addition to the natural sources. This category of wildlife management activity includes providing supplemental water in habitats where water is limited or redesigning water sources to increase its availability to wildlife. Many people mistakenly believe that water sources suitable for livestock are also suitable for wildlife. Unfortunately that is not always the case, particularly for young wildlife and many bird species. Wildlife water developments are in addition to those sources already available to livestock and may require protection from livestock.

Marsh or wetland restoration or development can provide supplemental water in the form of shallow wetlands for wetland-dependent wildlife, even in areas where inadequate water does not limit wildlife. Owners may include seasonally available water such as:

- greentree reservoirs;
- specific shallow roost pond development;
- seasonally flooded crops and other areas;
- moist soil management;
- cienega (desert marsh) restoration, development and protection; and
- maintaining water in playa lakes.

Based on the wildlife's needs and the suitability of the property, managing water levels annually is desirable.

Managing well, trough and windmill overflow can provide supplemental water for wildlife and provide habitat for wetland plants. Owners also may drill wells if necessary and/or build pipelines to distribute water. Building devices—known as wildlife water guzzlers—to collect rainfall and/or runoff for wildlife in areas where water is limited also helps protect wildlife, but these devices must be a part of an overall habitat management program.

Spring development and/or improvements can be designed to protect the immediate area surrounding a spring. Excluding and/or controlling livestock around springs may help to maintain native plants and animal diversity. Other ways to protect areas include moving water through a pipe to a low trough or a shallow wildlife water overflow, making water available to livestock and wildlife while preventing degradation of the spring area from trampling.

Improvements also could include restoring a degraded spring by selectively removing appropriate brush and revegetating the area with plants and maintaining the restored spring as a source of wildlife water. Maintaining critical habitat, nesting and roosting areas for wildlife and preventing soil erosion must be considered when planning and implementing brush removal. This practice should be planned and implemented gradually and selectively over a period of time.

Providing Supplemental Food

Grazing Management
Food Plots
Feeders and Mineral Supplementation
Managing Tame Pasture, Old Fields and Croplands
Transition Management of Tame Grass Monocultures



Providing Supplemental Food

Most wildlife environments have some natural food. An owner supplies supplemental food by providing food or nutrition in addition to the level naturally produced on the land.

Food plots are one way to establish locally adapted forage to provide supplemental foods and cover during critical periods of the year. Livestock should be generally excluded from small food plots. The shape, size, location and percentage of total land area devoted to food plots should be based on the requirements of the targeted species.

Feeders and mineral supplements also can help dispense additional food to selected wildlife species during critical periods. These can be as simple as properly placed bird feeders, or more elaborate types of turkey feeders. Once a feeding program has been initiated, it is important to keep it implemented and insure all feeders are kept full. It is also important to clean all feeders regularly to avoid contamination from aflatoxin. Harmful aflatoxin in feed should not exceed 20 parts per billion.

Feeders for deer should not be used except to control excessive numbers of deer and/or exotic ungulates as defined within a comprehensive wildlife management plan with a targeted harvest quota that is regularly measured.

Mineral supplements also may be supplied to wildlife in several ways, however, this practice must be a part of an overall habitat management plan that addresses all animal groups and considers the habitat's carrying capacity.

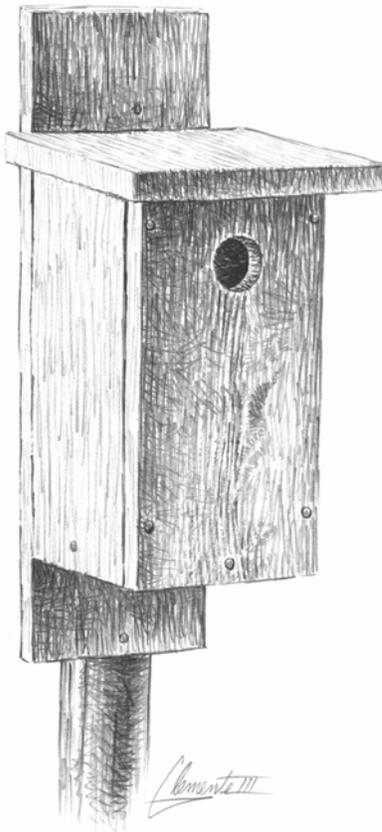
Managing tame pasture, old fields and croplands can increase plant diversity, provide supplemental food and forage and gradually help convert the land to native vegetation. Recommended practices may include:

- overseeding or planting cool season and/or warm season legumes (for example, clovers, vetches and peas) and/or small grains in pastures or rangeland;
- using plants and planting methods appropriate to the county;
- shallow tillage (discing) that encourages habitat diversity, the production of native grasses and forbs or increases bare ground feeding habitat for selected species; and
- no till or minimum till agricultural practices that leave waste grain and stubble on the soil surface until the next planting season—which provide supplemental food or cover, control erosion and improve soil tilth.

Legumes should be planted annually until all pastures are shifted to native vegetation.

Providing Supplemental Shelter

Nest Boxes
Brush Piles and Slash Retention
Fence-line Management
Hay Meadow, Pasture, and Cropland Management for Wildlife



Providing Supplemental Shelter

Cover or shelter is an important part of wildlife habitat. In fact, it is an integral part along side food and water. The arrangements of these key habitat requirements (often called juxtaposition) will often determine the success of wildlife species in a given area. Wildlife cover can take many forms and can vary greatly from one species of wildlife to another. Some species of wildlife are very specific in their need for cover while other are quite opportunistic and can readily adapt to what's available. However one thing is common when it comes to cover; they all require it.

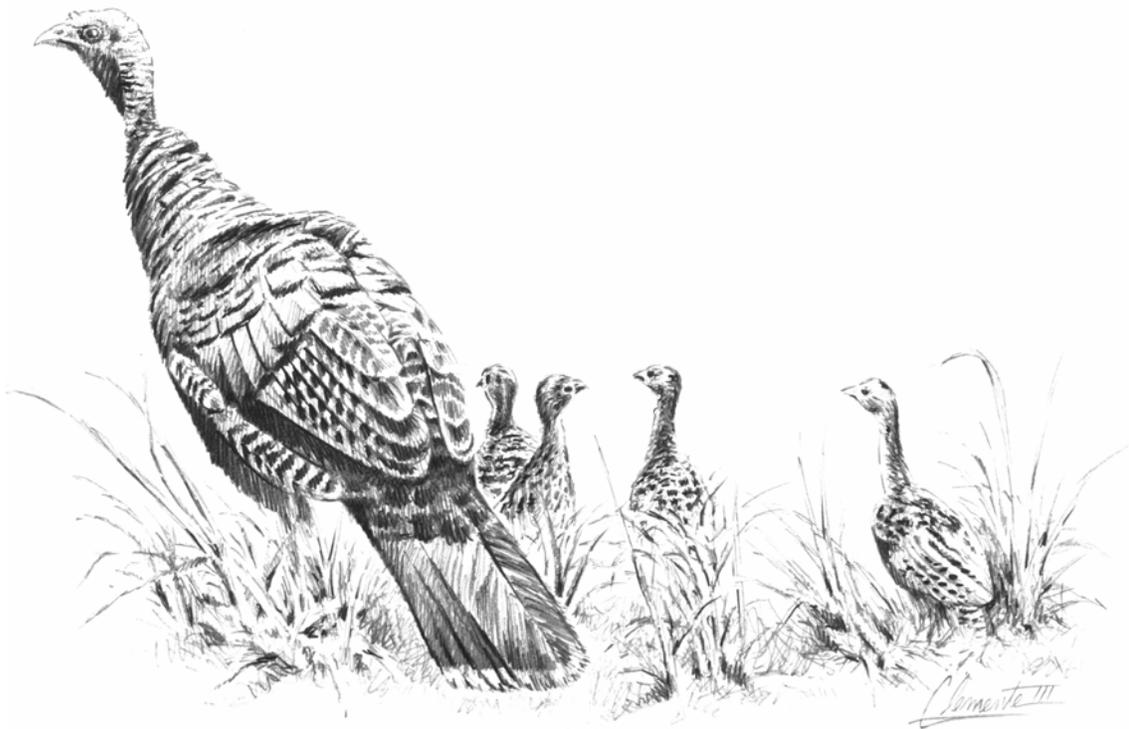
Although supplemental shelter can be provided in many ways, it will never take the place of good conservation and management of native habitats. When land is properly managed for wildlife habitat, quality cover and shelter will usually be available. Unfortunately in much of Texas, many areas have been so altered, neglected, and abused that one or more of the key requirements of wildlife (including shelter) is absent or in short supply. This is where the opportunity exists for supplementation.

Before beginning on any wildlife management practice, you must determine what wildlife species you are managing for and what its specific needs are. Some need cover on a large scale while others may need a relatively small amount of cover. Some live and reproduce exclusively on the ground while others spend most of their lives in the air or in trees. Management should be targeted to those populations of wildlife in your area and their specific needs.

Cover and shelter can be provided for wildlife in many ways. Some species of birds and mammals nest and reproduce in cavities. Nest boxes and snags (dead, standing trees) can be created for these wildlife species. Brush piles can be created to provide cover for many species of birds, reptiles, and small mammals. Other properties lack cover on a larger scale impacting larger wildlife species such as white-tailed deer. Trees and shrubs can be planted to provide this cover requirement. Mowing can be deferred in certain areas to let grasses and weeds (forbs) grow up providing both food, cover and nesting sites for some species of wildlife. Fence lines can be allowed or encouraged to grow up in trees, shrubs, and vines in areas where cover is limited. Mesquite or other brush can be half cut early in the growing season or provide low growing, ground cover in areas where this is lacking.

Census

Spotlight Counts
Standardized Incidental Observations
Stand Counts of Deer
Aerial Counts
Track Counts
Daylight Deer Herd and Wildlife Composition Counts
Harvest data Collection and Record Keeping
Browse Utilization Surveys
Census of Endangered, Threatened, or Protected Species
Census and Monitoring of Nongame Wildlife Species
Miscellaneous Counts



Census

Census counts are periodic surveys and inventories to determine the number, composition or other relevant information about a wildlife population to measure if the current wildlife management practices are serving the targeted species. Such surveys also help evaluate the management plan's goals and practices. Specifically, this activity estimates species numbers, annual population trends, density or age structure using accepted survey techniques. Annual results should be recorded as evidence of completing this practice. (Refer to Appendices L and M for more comprehensive information on conducting census.)

Spotlight counting animals at night along a predetermined route using a spotlight should follow accepted methodology, with a minimum of three counts conducted annually.

Aerial counts using a fixed-wing aircraft or helicopter to count animals also should follow accepted methodology for the region and be performed by a trained individual.

Daylight wildlife composition counts are driving counts used to census wildlife in daylight hours. Annual population trends on dove, quail, turkey and deer, as well as sex/age structure on deer, should be determined by sightings along a standardized transect of a minimum of five miles at least three times during a season.

Harvest data collection/record keeping means tracking annual production of wildlife. Age, weight and antler development from harvested deer, and the age and sex information from game birds and waterfowl should be obtained annually.

Browse utilization surveys annually examine deer browse plant species for evidence of deer use on each major vegetative site on the property. The surveys should be conducted in a way that can be repeated.

Census and monitoring of endangered, threatened or protected wildlife through periodic counts can improve management and increase knowledge of the local, regional or state status of the species.

Census and monitoring of nongame wildlife species also can improve management or increase knowledge of the local, regional or state status of the species. These practices can include developing checklists of wildlife diversity on the property and should be a part of a comprehensive wildlife management plan.

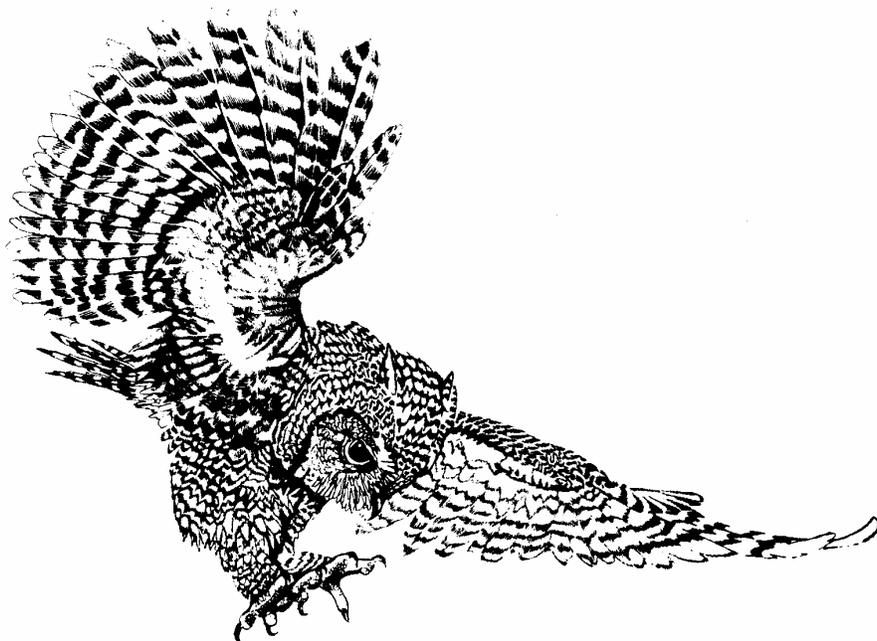
One of the most important things for a landowner to remember when designing a census protocol of nongame species on their property is the ability to be consistent. In other words, be able to do the same thing in the same way at the same time each and every time the census is conducted.

APPENDICES

STANDARD WILDLIFE HABITAT AND POPULATION MANAGEMENT RECOMMENDATIONS

For the

PINEYWOODS
ECOLOGICAL REGION



Appendix A

General Habitat Management Considerations, Recommendations, and Intensity Levels

Fundamental requirements which must be considered when managing wildlife habitat include food, cover, water and the proper distribution of these elements.

Wildlife and habitat management should be directed at maintaining a productive and healthy ecosystem. The ecosystem consists of the plant and animal communities found in an area along with soil, air, water and sunlight. All management activities should be aimed at conserving and improving the quantity and quality of soils, water and vegetation.

Managing for plant diversity is essential. A diverse habitat has a good mixture of various species of grasses, forbs (weeds), and browse (woody) plants. Many of these plants will be at various stages of growth, which adds another element of diversity. The diversity of vegetation increases the availability of food and cover for wildlife species. A greater diversity of plants results in more food being made available during different periods of the year. The volume and diversity of plants protects the soil from erosion. Also, the decomposition of vegetation helps restore needed minerals to the soil to sustain plant life. Vegetation improves the water cycle by increasing water infiltration into the soil and reducing surface runoff.

An ecologically based habitat management program serves to improve water cycling, mineral cycling, and energy flow and manipulate plant succession. These processes enhance vegetative quantity, quality and diversity. A greater diversity of all life forms, including microorganisms, insects, reptiles, amphibians, birds and mammals may be achieved under sound management. The land's long term health is improved and conserved for future generations to utilize as a source of income, recreation and for aesthetic enjoyment.

Plant communities with a diversity of grasses and native broad-leaved weeds (called forbs) are more productive than those comprised primarily of grasses. The climax plant community of most rangelands is comprised primarily of perennial grasses with a relatively low forb component. While this may be suitable for livestock and some grassland wildlife, most species are dependent on the seeds and foliage of forbs. Periodic disturbances such as fire, soil disturbance, livestock grazing, and mowing can set back plant succession and maintain a diverse plant community, simulating conditions under which plants and animals evolved within ecosystems in Texas.

Below is an example of a plan format that many landowners in the Pineywoods may find applicable to their property, depending on their particular goals and objectives. A fill-in-the-blank plan following this format is attached in Appendix U. This is presented to help landowners develop a Wildlife and Habitat Management Plan. To meet the requirements of the wildlife management tax valuation, a landowner must annually

implement and complete at least one management ACTIVITY from at least three of the seven wildlife management PRACTICES (i.e. Habitat Control, Erosion Control, Predator Control, Providing Supplemental Supplies of Water, Providing Supplemental Supplies of Food, Providing Shelter, and Making Census Counts to Determine Population). Again, a complete plan will likely include more than three activities, and may include several practices under each activity.

It is important for the landowner to be able to document the wildlife management activities that have taken place during the tax year. Receipts, photographs, and maps are some of the types of documentation a landowner might want to consider using for this purpose. If requested to do so by the county, the landowner may have to file an annual report, including documentation, on management activities undertaken during the year. The required fill-in-the-blank report form is attached in **Appendix U**.

Wildlife and Habitat Management Plan

General Information

Tract Name: _____ County: _____

Owner: _____ Manager: _____

Address: _____ Address: _____

Address: _____ Address: _____

Phone: _____ Phone: _____

Phone: _____ Phone: _____

Individual Preparing the Plan: _____

Date: _____

Is property leased for hunting? Yes No

Consultation is with: Owner Lessee Manager

Location of Property: Distance and direction from nearest town

Is acreage under high fence? Yes No

Acreage:

Cropland:

Pine:

Bottomland Hardwood:

Other(specify):

Non-native Pasture:

Mixed Pine & Hardwood:

Ponds/Lakes:

Native Grass Pasture:

Upland Hardwood:

Wetlands(optional):

Total Acres:

Current Habitat Description:

Describe vegetation association or type (e.g. Mixed Pine Hardwoods, Forest and Grassland Mosaic; Upland Pine Forest; Native or Introduced Grasses etc.) State dominant plants occurring and/or crops grown on the property. The description can include the soil types and vegetation associated with the various soil types. Describe livestock and wildlife water sources (e.g. permanent or seasonal streams, springs, stock tanks, water troughs) that are present. Documentation may include any NRCS (formerly SCS), TPWD, or other plan, map or aerial photo that may exist for the tract to identify soils, vegetation and water sources. The plant list should include browse plants utilized by deer, if deer management is a goal (see appendix F). Also, state the degree of use on key browse plants utilized by livestock and deer.

Past History of Land Use and Wildlife:

Describe past land use practices that have been implemented such as prescribed burns, range or pasture reseeding, timber management, etc. Describe past history of timber management, cropping, livestock, and wildlife management (census, harvest, etc.). Present other information such as the presence of unique cover types, turkey roosts, or etc. Also indicate presence of feral hogs or other exotics that compete with native wildlife.

Goals and Objectives:

A discussion and outline of landowner (also family if desired) goals and objectives for the property is necessary to define direction and to realistically assess the set of activities and practices that should be incorporated to integrate wildlife and habitat enhancement.

(Select one or more to guide the wildlife and habitat planning process)

1. Improve habitat for native game species (as designated in the Texas Hunting Guide.)
2. Improve habitat for native nongame species (those species not listed as game species, e.g. songbirds).

3. Manage for habitat and wildlife diversity.
4. Restore, maintain or improve native habitats for wildlife diversity.
5. Generate revenue from native wildlife resources.
6. Improve habitat for rare native species.
7. Protect sensitive habitats or critical species.
8. _____
9. _____
10. _____
11. _____
12. _____

Management Practices Normally Beneficial for Representative Wildlife in the Pineywoods Ecoregion	White-tailed Deer	Fox Squirrel	Cottontail Rabbit	Wild Turkey	Bobwhite Quail	Mourning Dove	Wood Duck	Red-Tailed Hawk	Brown Thrasher	Eastern Bluebird	Big Brown Bat	Houston Toad
A. HABITAT CONTROL												
Grazing Management	X	X	X	X	X	X	X	X	X	X	X	X
Prescribed Burning	X		X	X	X	X		X	X	X	X	X
Range Enhancement (Reseeding)	X		X	X	X	X		X	X	X	X	X
Brush Management	X	X	X	X	X	X		X	X	X	X	X
Timber Management	X	X	X	X	X	X	X	X	X	X	X	X
Riparian Management / Enhancement	X	X	X	X		X	X	X	X	X	X	X
Wetland Enhancement	X		X				X	X			X	X
Habitat Protection-Species of Concern												X
Prescribed Control-Native,Exotic,Feral Species	X	X	X	X	X		X					X
Wildlife Restoration	X			X								
B. EROSION CONTROL												
Pond Construction	X					X	X				X	
Gully Shaping												
Streamside, Pond, Wetland Regeneration	X		X				X				X	X
Herbaceous &/or Woody Plant Establishment	X	X	X	X	X	X	X		X	X		
Dike / Levee Construction / Management							X				X	
Establish Water Diversion												
C. PREDATOR CONTROL												
Predator Management	X		X	X	X		X			X		X
Imported Red Fire Ant Control	X		X	X	X	X			X	X		X
Cowbird Control						X						
Grackle / Starling / House Sparrow Control						X				X		
D. PROVIDING SUPPLEMENTAL WATER												
Marsh / Wetland Restoration							X				X	X
Spring Development &/or Enhancement	X	X		X			X					
E. PROVIDING SUPPLEMENTAL FOOD												
Grazing Management	X	X	X	X	X	X	X	X	X	X	X	X
Prescribed Burning	X		X	X	X	X	X	X	X	X	X	X
Range Enhancement	X		X	X	X	X		X		X	X	X
Food Plots	X		X	X	X	X						
Feeders & Mineral Supplementation	X											
Managing Tame Pasture, Old Fields, Croplands	X		X	X	X	X		X		X	X	
Transition Mgt. of Tame Grass Monocultures	X		X	X	X	X		X	X	X	X	X
F. PROVIDING SUPPLEMENTAL SHELTER												
Nest Boxes, Bat Boxes		X					X			X	X	
Brush Piles & Slash Retention			X		X			X	X	X		
Fence Line Management		X	X	X	X	X		X	X	X		
Hay Meadow, Pasture, & Cropland Management	X		X	X	X	X		X		X		
Half Cutting Trees & Shrubs			X		X							
Woody Plant / Shrub Establishment	X	X	X						X			
Natural Cavity / Snag Development		X					X	X		X	X	
G. CENSUS												
Spotlight Counts	X											
Aerial Counts	X											
Track Counts	X											
Daylight Deer Herd / Wildlife Composition Counts	X											
Harvest Data / Record Keeping	X			X								
Browse Utilization Survey	X											
Census & Monitoring of Endangered, Threatened, or Protected Wildlife												X
Census & Monitoring of Nongame Species								X	X	X		
Miscellaneous Counts		X	X	X	X	X	X				X	

Specific Habitat Management Practices, By Activity

HABITAT CONTROL

GRAZING MANAGEMENT

(Refer to Appendix D - Livestock Recommendations, for information to help prepare a specific grazing proposal for the plan.)



Grazing management which may include deferment, is the planned manipulation of livestock numbers and grazing intensities to increase food, cover, or improve structure in the habitat of selected species. Grazing management includes: 1) kind and class of livestock grazed, 2) determination and adjustment of stocking rates, 3) implementation of a grazing system that provides planned periodic rest for pastures by controlling grazing intensity

Continuous grazing without rest is detrimental to wildlife.

and duration, and/or 4) excluding livestock from sensitive areas to prevent trampling, allow for vegetative recovery, or eliminate competition for food and cover. Planned deferments can be short or long term up to 2 years. Extended rest from grazing (two years or more, if necessary) may be required on some ranges. Seasonal stocker operations may be appropriate to manipulate habitat. Supplemental livestock water (earthen tanks, troughs, wells, piping) to facilitate deferred-rotation grazing of livestock and disperse grazing pressure may be incorporated into planning to improve wildlife habitat. Similarly, it is important to plan and design fence construction to facilitate deferred-rotation grazing of livestock. Fencing can also be used to enhance or protect sensitive areas, woodland, wetlands, riparian areas and spring sites as designated in the plan. Activities should be reviewed annually.

Grazing management systems might include:

- 1 Herd / 3 Pasture (preferably as a step in moving toward a 1 herd / multiple pasture {4+} grazing system)
- 1 Herd / 4 Pasture

- 1 Herd / multiple pasture multiple herd / multiple pasture (goal is to move toward always resting 75% of area)
- High intensity/low frequency (HILF)
- Short duration system
- Other type of grazing system (ex. a short-term stocker system):
- Planned Deferment (e.g., number of years livestock will be deferred from the property, etc.):

PRESCRIBED BURNING

(Refer to Appendix E - Vegetation Management Recommendations, for information to help prepare a specific burning proposal for the plan.)



Using a drip torch to create a prescribed fire is an excellent management practice that simulates the natural cycles that these ecosystems evolved under, and enhances habitats and plant

Prescribed burning is the planned application of fire to enhance habitat and plant diversity, increase food, manipulate cover, or improve structure in the habitat of selected species. Plans should indicate a minimum percent of acreage and general burning cycle (**eg., minimum of 15 percent of acreage burned over 5 years in the Pineywoods**). A written burning plan as an addendum to the Wildlife and Habitat Management Plan (burn plans and prescribed burning should only be attempted with aid of professionals). The plan

should include a map that shows the areas to be burned and the planned dates (month and year) that each area will be burned during the burning cycle. It should also designate areas to be protected from burning, and should incorporate flexibility during periods/ years when conditions are not favorable.

Specific areas (eg., sensitive sites) to be protected from burning should be briefly described and shown on a map.

RANGE ENHANCEMENT (Range Reseeding)

Establish native herbaceous plants (grasses and forbs) that provide food and cover for wildlife or erosion control benefits. Plant species selected and methods for establishment should be applicable to the county (non-native species are generally not recommended, but if required for a specific purpose, non-native species should not exceed 25 percent of the seeding mix). If non-native species must be used to achieve a specific goal, species used **must not** be invasive or aggressive. Seeding mixtures providing maximum native plant diversity are recommended. Many herbaceous broadleaf plants (known as forbs - weeds and wildflowers) are beneficial to wildlife for forage and/or seed production. A list of key species adapted to the Pineywoods

can be found in the appendix. Encourage "weed and wildflower" species by selective application of chemical, biological (eg., grazing management) and/or mechanical means on native rangelands, Conservation Reserve Program lands, and tame grass pastures (eg., coastal bermuda). Some periodic weed control may be needed in fields converted to native rangeland to assist in the establishment of desirable vegetation. This practice must be a part of an overall habitat management plan and designed to reestablish native habitats within a specified time frame. **Range Enhancement should annually affect a minimum of 10% of the total area designated in the plan, or a minimum of 10 acres annually, whichever is smaller, until the project is completed.**

TIMBER MANAGEMENT

Periodic harvest, removal or suppression of trees or woody species, including exotics, to allow the increased production of desirable trees, shrubs, grasses, and forbs for forage and nesting or protective cover for selected wildlife species. Timber management includes retaining the proper kind, amount, and distribution of woody cover for selected species. This practice also includes retention of snags to provide cover and nesting sites for cavity nesting animals. Timber management can include periodic thinnings, both commercial and non-commercial. Thinning involves harvesting or cutting trees to reduce the stocking level that increases the amount of sunlight that reaches the ground. The additional sunlight increases the growth or production of herbaceous vegetation and browse plants in the understory.

Establishing native tree and shrub species to provide food, corridors and/or shelter using species and methods applicable to the county. When used, herbicides should be applied in strict accordance with label directions. Restore important forested habitats including bottomland hardwoods, longleaf pine, mixed pine-hardwood ecotone areas, and upland hardwoods. **A minimum of 150 native seedlings/acre/year for the area designated in the plan is required to qualify.** Avoid fragmentation of large forested habitats. Maintain a forested buffer at least 100 yards wide. This practice must be part of an overall habitat management plan and landowners are strongly encouraged to consult a professional forester prior to implementing any timber management practices.

Timber management for wildlife habitat management may include the manipulations and control of midstory and understory trees and shrubs. Understory and midstory vegetation can become so large and dense that habitat quality may deteriorate. This would require a practice similar to a Timber Stand Improvement (TSI) operation that improves the growth of crop trees for timber production. However, in this case the goal of the operation is to increase the amount of light reaching the ground, and/or open up the understory to improve visibility and mobility for wildlife such as turkeys.

The most cost effective and beneficial method to control understory and midstory vegetation in pine and mixed pine and hardwood stand is through the use of prescribed burning (see Appendix E). Other control methods include mechanical control or application of chemical herbicides. Types of mechanical control may include bush hogging if the vegetation is relatively small, cutting with chain saws, or control with large

equipment such as a “Hydro Ax”. Mechanical control is generally very labor intensive and may be very costly.

Herbicides can be applied in a variety of methods, such as injecting individual trees or large shrubs with an approved herbicide, basal sprays, backpack sprayers, or broadcast applications. Generally, broadcast herbicide applications are the most effective at controlling undesirable vegetation, but may eliminate desirable plant species. Vegetation control using backpack sprayers or injection can be more selective by targeting individual plants to be controlled. By killing the tree rather than cutting, foraging sites for insect eating birds will be created. The dead trees will also provide potential cavity sites for numerous species that utilize cavities for nesting. Any large diameter trees that already have cavities should not be removed from the stand. Care should be taken when implementing any vegetation control program to minimize the impact on valuable wildlife plants.

RIPARIAN MANAGEMENT AND ENHANCEMENT

Annually and seasonally protect the vegetation and soils in riparian areas (low areas on either side of stream courses) from mismanagement, such as caused by excessive, long-term livestock trampling or poor timber harvesting practices. Riparian management and enhancement can include providing livestock with alternate watering sites, deferring livestock grazing in pastures with riparian areas during critical periods of the year, total exclusion of livestock from pastures with riparian areas, and fencing riparian areas to exclude or provide short duration grazing by livestock. Establish trees, shrubs, or herbaceous vegetation along streams or water courses to provide food, cover, and travel corridors, and to reduce erosion. Corridors should be at least 100 yards wide. Livestock must be excluded from restoration areas. Restore important forested habitats including bottomland hardwoods. This practice must be a part of an overall habitat management plan. **A minimum of one Riparian Management and Enhancement project must be implemented and maintained every 10 years to qualify.** See Appendix E.

Proposed riparian management and enhancement projects might include:

- Fencing
 - complete fencing of riparian areas
 - partial fencing of riparian areas
- Deferment from livestock grazing
 - complete deferment
 - partial deferment.
- Establish vegetation
 - trees
 - shrubs
 - herbaceous
 - both sides of stream
 - one side only

WETLAND ENHANCEMENT

Annually provide seasonal or permanent water for roosting, feeding, or nesting habitat for wetland wildlife. This practice involves shallow wetland management, creation or restoration, greentree reservoir creation or management, and other moist soil management such as rotational grazing or exclusion (fencing out) of livestock from wetlands, especially during the growing season. This practice should be a



Over 50% of Texas' wetlands have disappeared. Wetland management, restoration or creation is extremely important for wetland dependent wildlife.

part of an overall habitat management plan. Annual management as described in management plan, such as water level manipulation qualifies. **Construction and maintenance of a new project will qualify for 10 years.**

HABITAT PROTECTION FOR SPECIES OF CONCERN



Endangered red-cockaded woodpecker.

(Refer to Appendix I for information on the management of the federally threatened Southern Bald Eagle and Louisiana Black Bear and endangered Red-cockaded woodpecker, both of which may occur in portions of the Pineywoods)

Planned protection and management of land or a portion of land to provide habitat for an endangered, threatened or rare species, managing vegetation structure and diversity within species parameters, establishing and maintaining firebreaks to protect critical overstory vegetation, and annually monitoring the species of concern. This practice includes the management and, or protection of nesting sites, feeding areas, and other critical habitat limiting factors, and the development of additional areas.

The broad-scale management of habitat for migrating, wintering, and/or breeding neotropical birds (primarily songbirds) should follow guidelines in appendix for zones of importance. This practice must be a part of an overall habitat management plan. **A minimum of one project must be implemented every 10 years to qualify.**

Proposed projects for habitat protection for species of concerns might include:

- Planned protection/management projects:
- fencing
- firebreaks
- prescribed burning
- habitat manipulation (e.g. thinning, etc.)
- control of nest parasites
- native/exotic ungulate control
- other _____

PRESCRIBED CONTROL OF NATIVE, EXOTIC, AND FERAL SPECIES

Use legal means to control the number of grazing and browsing animals. Maintain the population density of native wildlife (particularly white-tailed deer - see Appendix F) at or below the carrying capacity of the habitat to prevent the overuse of desirable plant species and enhance habitat for native wildlife species. **Populations of exotics, feral animals, and wildlife should be strictly controlled to minimize negative impacts on native wildlife and habitat.** This should incorporate harvest and vegetative monitoring over time to assess control intensity and impact on habitat to meet plan objectives.



Feral hogs compete directly with native wildlife.

Remove or control exotic vegetation impacting native habitats and wildlife populations (e.g. large stands of Chinese tallow tree, kudzu, Chinese and other exotic privet, etc.). Convert tame pasture grasses (such as large areas of coastal bermuda, old world bluestems) to native vegetation. **The removal or control of exotic**

vegetation or the conversion of tame grass pastures must affect a minimum of 10% of the area designated in the plan, or 10 acres annually, whichever is smaller.

WILDLIFE RESTORATION

Restoration or enhancement of habitat to good condition for target species, and reintroduction and population management of TPWD approved native species within the carrying capacity of the habitat as part of an approved restoration area at a scale capable of supporting a sustainable population (e.g. eastern turkey).

EROSION CONTROL

POND CONSTRUCTION AND MAJOR REPAIR

Construction or major repair of a permanent water pond for the purpose of preventing, stopping, or controlling erosion as part of an approved NRCS erosion control structure. The project must provide habitat diversity and wildlife benefits. Creation/restoration of shallow water areas as primary production wetlands, and associated water level control and management, should be associated with ponds at every opportunity. **A minimum of one project must be implemented and maintained every 10 years to qualify.**

GULLY SHAPING

Reducing erosion rates on severely eroded areas by smoothing with top soil to acceptable grades and reestablishing vegetation, primarily native vegetation, with sensitivity to existing wildlife cover and woody vegetation that provides travel corridors. Area must be interseeded with species that provide food and/or cover for wildlife to be applicable (see range enhancement guidelines). This practice may include the feeding of large numbers of cattle on gully sites to contour the eroded areas by way of hoof action to aid in the recovery of the site. **A minimum of one project must be implemented and maintained every 10 years to qualify.**

STREAMSIDE, POND, AND WETLAND REVEGETATION

Re-vegetating areas along creeks, streams, ponds, and wetlands to reduce erosion and sedimentation, stabilize stream banks, improve plant diversity, and improve wildlife value of sensitive areas. This practice can include: (a) the construction of permanent or temporary fences to exclude, limit, or seasonally graze livestock in order to prevent erosion; (b) the use of native hay to slow and spread water runoff, in areas where vegetation has been recently reestablished (seeds in the hay aid in re-vegetation); (c) establishing vegetative buffer areas or filter strips along water courses or other runoff areas; (d) establishment of 3:1 upland buffer to lake basin/wetland acreage in diverse grass/legume/forb mixture to prevent sedimentation; (e) the installation of rip-rap, dredge spoil, or other barrier material - placement of material along erodible embankments to prevent erosion and protect wildlife habitat; (f) the establishment of

stream crossings to provide permanent low water crossings in order to reduce or prevent erosion. **A minimum of one project must be completed every 5 years, affecting a minimum of 3 acres per project.**

Proposed streamside, pond, and wetland restoration project(s) may include the following techniques:

- native hay bales
- fencing
- filter strips
- seeding upland buffer
- rip-rap, etc.
- stream crossings

PLANT ESTABLISHMENT ON CRITICAL AREAS (Erodible)

Primarily for erosion control, the establishment of native woody or herbaceous vegetation can also provide food and/or cover for wildlife and restore native habitat. This practice can include: (a) establish and manage wind breaks/shelter-belts by planting multi-row shelter-belts (at least 4 rows in 120' width by 1/4 mile in length), renovate old shelter-belts (re-fence, root-prune, and replace dead trees), and establish shrub mottes, improve plant diversity, and improve wildlife habitat; (b) establish perennial vegetation on terraces and field borders (30 yard minimum width) to reduce erosion, improve plant diversity, and improve wildlife habitat; (c) conservation tillage/no-till farming practices by leaving waste grain and stubble on the soil surface until the next planting season to provide supplemental food or cover for wildlife, control erosion, and improve the soil tilth; (d) manage Conservation Reserve Program cover by maintaining perennial cover established under the Conservation Reservation Program (expired contracts) on erodible sites using proper management techniques such as haying, prescribed grazing or prescribed burning. **A minimum of 100 seedlings per acre must be planted and maintained annually on 10 acres or a minimum of 10% (whichever is smaller) of the total designated area treated annually.**

DIKE/LEVEE CONSTRUCTION/MANAGEMENT

To establish/maintain wetlands or slow runoff to control or prevent erosion, and to provide habitat for wetland dependent wildlife



A water control structure built into a levee can create a shallow wetland that will benefit waterfowl and other wetland species.

Levee management may include reshaping or repairing damage caused by erosion, and re-vegetating levee areas to reduce erosion and sedimentation, and stabilize levees. This practice may include fencing to control and manage grazing use, or installation of water control structures. This practice must be a part of an overall habitat management plan. **A minimum of one project must be completed and maintained every 10 years.**

ESTABLISH WATER

DIVERSION

Install water diversion systems that will protect erodible soils and divert water into wetlands to provide habitat for resident and migratory water birds and wetland dependent species. Seed diversion areas to species tolerant of seasonally standing water. **A minimum of one project must be completed and maintained every 10 years.**

PREDATOR CONTROL

PREDATOR MANAGEMENT

The management of predator populations to increase survival of target species. Key native predator species may include coyote, raccoon, bobcat, mountain lion, and rat snakes, while exotic predators may include feral house cat, feral dog, and feral hogs (see imported red fire ants in separate paragraph). Predator Control alone will not be an applicable practice unless it is part of an overall plan to manage the habitats and populations of the target species. Texas Parks and Wildlife Department advocates elimination of feral/exotic predators, with the thoughtful management of native predators as an integral part of functioning natural systems. **The predator control plan should be prepared or approved by a competent professional and include the list, duration and intensity of methods to remove the target species annually.**

IMPORTED RED FIRE ANT CONTROL

To protect native wildlife species, or their food base, including native fire ant which seem to restrict the spread of the imported fire ant; **proper treatment of at least 10 acres or 10% {1/10} of infested area per year, whichever is more.** Treatment will comply with pesticide label instructions, and information is available in Appendix P and on the internet at <http://fire ant.tamu.edu>.

CONTROL OF COWBIRDS

Reducing populations of these birds for the purpose of decreasing nest parasitism of target neotropical bird species (eg. endangered Black-capped Vireos and other songbirds) in a PLANNED PROGRAM (see Appendix J, K, and Q). **Removal of at least 30 cowbirds annually is required to qualify.**



GRACKLE/STARLING/HOUSE SPARROWS CONTROL

Reducing populations of grackles and/or starlings and/or house sparrows for the purpose of controlling avian diseases and reducing overcrowding to exclusion of other avian fauna in a planned program (see Appendix J) particularly targeting white-winged dove and other neotropical birds. **Removal of at least 30 grackles/starlings/house sparrows annually is required to qualify.**

Proposed Grackle/Starling/House Sparrow Control Project(s) may include:

- trapping
- shooting
- scare tactics

PROVIDING SUPPLEMENTAL WATER

* This category includes providing supplemental sources of water specifically for wildlife in habitats where water is limited. Wildlife water developments are in addition to those sources already available to livestock and may require protection from livestock.

MARSH/WETLAND RESTORATION OR DEVELOPMENT

Provide supplemental water in the form of shallow wetlands for wetland dependent wildlife. Applicable even in areas where water is not a critical limiting factor for upland species of wildlife. May include seasonally available water such as greentree reservoirs, specific shallow roost pond development, seasonally flooded crops and other areas, artificially created wetlands, marsh



restoration/development/protection, prairie pothole restoration/development/protection, and moist soil management. Based on wildlife needs and suitability of the property, the annual manipulation with control structures is desirable. **Minimum requirement of one marsh/wetland restored or developed per 5 years; or annual water management of project or existing wetland.** Call TPWD or NRCS for professional assistance when creating/enhancing wetlands.

SPRING DEVELOPMENT AND/OR ENHANCEMENT

Implementing methods designed to protect the immediate area surrounding a spring. This practice may include excluding and/or controlling livestock around springs to maintain native plant and animal diversity and/or moving water through a pipe to a low trough or shallow wildlife water overflow, making water available to livestock and wildlife while preventing degradation of the spring area from trampling and other animal impacts. It could also include restoring a degraded spring by the controlled, possibly multi-year, removal of dense brush and the revegetation of drainages and canyons with herbaceous plants at historic springs, and maintaining the restored spring as a source of wildlife water. Maintaining critical habitat, nesting and roosting areas for wildlife and preventing soil loss and erosion must be considered when planning and implementing

brush removal. **A minimum of one project per 10 years must be completed to qualify. Existing or restored springs consistently managed to prevent degradation qualifies.**

Proposed Spring Development and/or Enhancement Project(s) might include:

- Fencing
- Water diversion/pipeline
- Brush removal
- Spring clean out
- Other _____

PROVIDING SUPPLEMENTAL FOOD

GRAZING MANAGEMENT

(This is identical to Grazing Management in Activity A. Refer to Grazing Management in Activity A for information to prepare a specific grazing proposal for the plan under this Activity).

PRESCRIBED BURNING

(This is identical to Burning Prescribed in Activity A. Refer to Prescribed Burning in Activity A for information to prepare a specific burning proposal for the plan under this Activity)

RANGE ENHANCEMENT (Range Re-Seeding)

(This is identical to Range Enhancement (Reseeding) in Activity A. Refer to Range Enhancement (Range Reseeding) in Activity A for information to prepare a specific range enhancement proposal for the plan under this Activity)

TIMBER MANAGEMENT

(This is identical to Timber Management in Activity A. Refer to Timber Management in Activity A for information to prepare a specific range enhancement proposal for the plan under this Activity)

FOOD PLOTS

The establishment of locally adapted annual (spring and fall) or perennial forages on suitable soils to provide supplemental foods and cover during critical periods of the year. Livestock should be generally excluded from small food plots. The shape, size, location, and percentage of total land area should be based on requirements for the target species (eg., 2-5% of area for white-tailed deer) and should meet goals of a

comprehensive wildlife plan. **A minimum of 1% of the acreage should be planted in seasonal food plots.**

Managing the habitat for proper nutrition should be the primary management goal. Supplemental feeding and /or planting of food plots are not a substitute for good management. These practices should only be considered as "supplements" to the native habitat, not as "cure-alls" for low quality and/or poorly managed habitats. Supplemental feeding should always be combined



with population management, or the resulting artificially higher numbers of animals will have a negative impact on native plants. Consult with the NRCS, TCE, TPWD, and local seed dealers for food plot mixtures suitable for your area, as well as local soil conditions. Plant according to soil tests (through TCE County Extension Agent) and fertilize as necessary.

Proposed Food Plots Project(s) may include the following considerations:

- Size(s) _____
- Fencing required?
 - yes
 - no
- Plantings:
 - cool season annual crops, i.e. wheat, rye, clovers, etc.
 - warm season annual crops, i.e. sorghums, millets, cowpeas, etc.
 - annual mix of native plants
 - perennial mix of native plants
- Irrigation required?
 - yes
 - no
- Fertilizer recommended?
 - yes
 - no

FEEDERS AND MINERAL SUPPLEMENTATION

Dispensing supplemental foods from artificial devices to meet the dietary requirements

of selected wildlife species during critical periods of the year. Attractants for hunting do not apply unless used for selective harvest to control excessive numbers of deer and/or exotic ungulates as defined within a comprehensive wildlife management plan with a targeted harvest quota that is regularly measured and achieved or nearly so. Aflatoxin levels in feed should not exceed 20 ppb. Mineral supplementation may be supplied by other means than from artificial devices (poured on ground, blocks, etc.). This practice must be a part of an overall habitat management plan that addresses all animal units and attempts to maintain populations below carrying capacity. **A minimum of one free-choice feeder per 320 acres in use during the recommended time period, with a minimum of 16% crude protein feed (See Appendix F for deer), required to qualify.**

Proposed Feeders and Mineral Supplementation Project(s) should include the following considerations:

- Purpose:
 - supplementation
 - harvesting of wildlife
- Targeted wildlife species
- Feed type
- Mineral type
- Feeder type
 - Number of feeders
- Method of mineral dispensing
 - Number of mineral locations

MANAGING TAME PASTURE, OLD FIELDS AND CROPLANDS

This practice may include: over-seeding or planting cool season and/or warm season legumes and/or small grains in pastures, easements (pipelines), or range land in order to provide a supplemental food for wildlife, using plant materials and establishment methods that are applicable to the county; periodic ground disturbance through shallow discing that encourages habitat diversity, the production of native grasses and forbs for supplemental foods, increasing bare ground feeding habitat for selected species.

Conservation tillage practices are recommended that leave waste grain and stubble on the soil surface until the next planting season to provide supplemental food or cover for



Crimson clover overseeded into a pasture will provide supplemental forage for deer, turkey, & cattle.

wildlife, control erosion, and improve soil tilth. Shred, disk, and/or fertilize native vegetation to improve the growth and quality of plants. Many broadleaf plants (forbs - weeds and wildflowers) are beneficial to wildlife for forage and/or seed production. Encourage "weed and wildflower" species by selective application of chemical, biological (eg. grazing management) and/or mechanical means on native range lands and improved grass pastures. **A minimum of 3 percent of the designated area must be treated annually to qualify.**

TRANSITION MANAGEMENT OF TAME GRASS MONOCULTURES

Annually overseed improved grass pastures with locally adapted legumes (e.g. clovers, vetches, peas) to increase the plant diversity, provide supplemental wildlife foods, and gradually convert the tame pastures to native vegetation as per wildlife and habitat plan. Legumes should be planted annually until all pastures are established to native vegetation. **A minimum of 25 percent of the designated area must be treated annually to qualify.**

PROVIDING SUPPLEMENTAL SHELTER

The best shelter and cover for wildlife is provided by a well managed habitat. Some practices can be implemented to provide types of shelter that may be limited in the habitat.

NEST BOXES, BAT BOXES

The installation of artificial boxes or cavities to provide nesting or denning habitat for selected species. **Number and location of nest boxes should be consistent with habitat needs and territorial requirements of the target species, and sufficient over the area to provide a real supplement to the target population and address an identified severe limiting factor as part of a comprehensive wildlife management plan.**



Proposed Nest Boxes, Bat Boxes Project(s) may include:

- Target species?
- Box type:
 - cavity type.
 - bat boxes.
 - raptor poles.

BRUSH PILES AND SLASH RETENTION

The planned placement and/or retention of brush piles to provide additional wildlife cover in habitats where cover is a limiting factor for the selected species. This practice also includes slash retention, or leaving dead brush on the ground where it was cut or uprooted, to provide wildlife cover and protection for seedlings of desirable plant species. Stacking posts or limbs in teepees can provide cover for small game and other wildlife in open areas, however artificial cover of this type must be suspended on a frame above the ground if it is to subsist and be of any long term value (e.g. 30' diameter brush pile at 1 per acre - no more than 100 yards apart - in open areas to meet optimum overhead protective cover requirements for bobwhite quail). This practice must be part of a comprehensive wildlife management plan. **A minimum of 3 percent of the designated area must be treated annually to qualify.**

FENCE LINE MANAGEMENT

Maintain, establish, or allow the establishment of trees, shrubs, forbs, and grasses on fence lines to provide wildlife food and cover, minimum of 30 yards wide. This practice is only applicable where cover is limiting in the habitat, i.e. cropland or tame pasture, and must be part of a comprehensive wildlife management plan. **A minimum length of 100 yards of Fence Line Management per 1/4 mile of fence is required annually to qualify.**

HAY MEADOW, PASTURE AND CROPLAND MANAGEMENT FOR WILDLIFE

Mowing/swathing of hay fields should be postponed until after the peak of nesting/rearing period of ground-nesting birds and mammals (July 15). Mow/shred 1/3 of open areas per year, preferably in strips or mosaic types of patterns, to create "edge" and structural diversity. A wide bar should be placed on the front of the tractor at a height of 1' when mowing to help flush wildlife using this cover. Weeds are an important source of food for many wildlife species, therefore minimize weed control practices. Use no till/minimum till agricultural practices to leave waste grain and stubble on the soil surface until the next planting season to provide supplemental food or cover for wildlife, control erosion, and improve soil tilth. Other forms of supplementing and providing shelter



Intensively managed hay fields can benefit wildlife if mowing is delayed until after July 15.

include roadside right-of-way management for ground-nesting birds, establishing perennial vegetation on circle irrigation corners, levees, dikes, terraces, fencerows and field borders, establishing multi-row shelterbelts or renovating old shelterbelts, and protecting and managing old homesites, farmsteads and Conservation Reserve Program cover.

Proposed Hay Meadow, Pasture and Cropland Management Project(s) should consider:

- Acreage to be treated
- Shelter establishment:
 - irrigation corners
 - road side management
 - terrace/wind breaks
 - field borders
 - shelterbelts
 - Conservation Reserve Program lands management
- Type of vegetation for establishment:
 - annual
 - perennial
- List species and percent of mixture
- Deferred mowing
 - Period of deferment
- Mowing
 - Acres mowed annually
- No till/minimum till

HALF-CUTTING TREES OR SHRUBS

The practice of partially cutting branches of a live tree or shrub to encourage horizontal, living cover near the ground, providing supplemental cover in habitats where cover is lacking (see TPWD Bulletin 48) relative to an overall plan for target wildlife species. This practice is best done in the early or middle part of the growing season. **A minimum of one clump of trees/shrubs per 50 yards on at least 10 percent of acreage or 10 acres, whichever is smaller, annually to qualify.**



WOODY PLANT ESTABLISHMENT



Planting and protecting native seedlings to establish wind rows and shrub thickets, or to restore wooded habitats within former croplands, tame pastures or CRP land. **Plant a minimum of 500 seedlings annually.** Plantings should consist of native trees and shrubs that produce hard or soft mast, or provide nesting or escape cover. Plantings should be made in groups to provide both cover and additional food, rather than scattered individual trees. See Appendix for list of native plants and shrubs.

NATURAL CAVITY AND SNAG DEVELOPMENT

Retain and create snags for cavity-dwelling species. Undesirable trees can be girdled or individually treated with herbicide and left standing. **A minimum of 5 snags per acre, on 5 percent of the acreage, must be retained/created annually to qualify.**



CENSUS



A spotlight survey is an effective method to track deer populations, as well as rabbits and furbearers. This can also bring neighbors together in a common activity.

This activity provides an estimate of species numbers, population trends, population density, age structure, or sex ratio using accepted survey techniques. Results of annual surveys should be recorded on appropriate forms as evidence of completion of this practice. Selection of specific survey techniques should be appropriate to the species of interest and

at a level of intensity to achieve proper management of the resource in connection with a comprehensive wildlife management plan.

Note: For census activity to qualify for deer, a combination of methods must be used to obtain a reasonable assessment of the deer herd for habitat and harvest management. For most properties, this will require spotlight surveys, daylight or incidental observations, and harvest data for all deer (age, weight, and antler measurements). Similar intensity should be applied for other species to qualify in this activity.

SPOTLIGHT COUNTS

Counting animals at night along a predetermined route using a spotlight. Spotlight counts should follow accepted methodology. **A minimum of three counts, or a minimum of 15 surveyed miles, must be completed annually.**

AERIAL COUNTS

Use of a fixed-wing aircraft or helicopter to count animals. **Counts should employ accepted methodology for the region and be performed by a trained individual annually.**

DAYLIGHT DEER HERD/WILDLIFE COMPOSITION COUNTS/PHOTO STATIONS

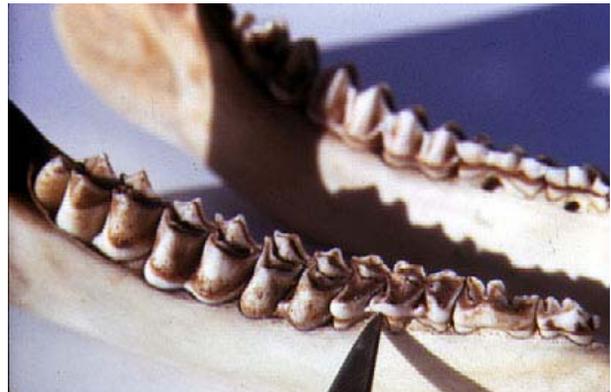
Counts used to census deer in daylight hours to enhance information of sex/age structure (buck/doe/fawn), as well as determine annual trends in populations through dove, quail, and turkey sightings. **Counts should be conducted on standardized transects along 5 mile minimum lines and run at least 3 times (if shorter lines or used, a total of at least 15 miles must be surveyed), or through other standardized methodology to obtain at least 100 observations. On smaller tracts, as least five separate, two hour counts during early morning or late afternoon from deer stands (blinds) may be used.**

TRACK COUNTS

Standardized track counts at scent stations are used to census predators and fur-bearers. **Deer numbers may be estimated by counting exit tracks on bare dirt transects that are dragged and counted for 3 continuous days, using accepted methodology.** Primarily used where other accepted deer survey methods are not effective (i.e. thick woods).

HARVEST DATA COLLECTION/RECORD KEEPING

Collect all age, weight, and antler development data from harvested deer. Age and sex information should be obtained from game birds and waterfowl to determine sex ratios and annual production.



BROWSE UTILIZATION SURVEYS

Annually (normally during the winter) examine deer browse species for degree of utilization on each major vegetative site on the property. **A minimum of 30, 12 foot circular, plots are required per each major vegetative site.**

CENSUS OF ENDANGERED, THREATENED, OR PROTECTED WILDLIFE

Regular, periodic counts of the target species used to enhance management or increase knowledge of local, regional, or state status.

CENSUS AND MONITORING OF NONGAME WILDLIFE SPECIES

Regular, periodic counts of nongame wildlife species used to enhance management or increase knowledge of local, regional, or state status. This practice would also include developing checklists of wildlife diversity for the property, and should be a part of a comprehensive wildlife management plan.



MISCELLANEOUS COUNTS

Specific species may require special survey techniques. These may include the following and should be addressed in the management plan:

- Time/area counts
- Roost counts
- Song bird transects and counts
- Quail call and covey counts
- Point counts
- Drift fences and pitfall traps
- Small mammal traps
- Bat census (ex. Departures)
- Other. Describe: _____



Appendix B

Wildlife Tax Valuation Rules

Refer to the Texas Administrative Code link below for the complete text of all rules as adopted in December 2008:

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.ViewTAC?tac_view=5&ti=34&pt=1&ch=9&sch=G&rl=Y](http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=5&ti=34&pt=1&ch=9&sch=G&rl=Y)

The following is a summary of changes made by the new rules that were adopted on December 11, 2008. Our purpose is to give an overview of rule changes for use by landowners and those that assist them. If you have questions, please contact Linda Campbell (512-389-4395) or Todd George (512-389-4329), Texas Parks and Wildlife Department, Austin.

1. New definitions have been added and some existing definitions have been clarified

- Wildlife Management Practices are defined as those listed in the Tax Code (23.51(7)(A) - Habitat Control, Erosion Control, Predator Control, Providing supplemental supplies of water, Providing supplemental supplies of food, providing shelters, Making census counts to determine population.
- Wildlife Management Activities are defined as methods of implementing wildlife management practices as described in the TPWD guidelines for each region.
- The definition of a tract of land was changed to clarify that tracts of land will be considered contiguous even though they are bisected by a public road or body of water.
- The definition of Wildlife Management Property Association was changed to clarify that tracts of land of landowners in the association will be considered contiguous even though they are bisected by a public road or body of water. Other requirements are the same.
- The term sustained breeding population was changed to breeding population to be consistent with the Tax Code and because the term sustained refers to breeding, migrating, and wintering populations of wildlife. The definition is the same.
- The term Wildlife Use Percentage has been changed to Wildlife Use Requirement in recognition that the formula that determines the minimum acreage requirements is not actually a percentage of use.

2. Changes to the Wildlife Use Appraisal Regions

The appraisal regions have been reorganized to more closely track the defined ecological regions as specified in the TPWD Wildlife Management Guidelines. If a county is in more than one ecological region, the region that comprises the majority of the county was selected.

Trans Pecos

- Brewster
- Crane
- Culberson
- El Paso
- Hudspeth
- Jeff Davis
- Loving
- Pecos
- Presidio
- Reeves
- Terrell
- Ward
- Winkler

High Plains

- Andrews
- Armstrong
- Bailey
- Carson
- Castro
- Cochran
- Crosby
- Dallam
- Dawson
- Deaf Smith
- Ector
- Floyd
- Gaines
- Glasscock
- Hale
- Hansford
- Hartley
- Hockley
- Howard
- Hutchinson
- Lamb
- Lubbock
- Lynn
- Martin
- Midland
- Moore
- Ochiltree
- Oldham
- Parmer
- Potter
- Randall
- Sherman
- Swisher
- Terry
- Upton

- Yoakum

Rolling Plains

- Archer
- Baylor
- Borden
- Briscoe
- Callahan
- Childress
- Clay
- Coke
- Coleman
- Collingsworth
- Concho
- Cottle
- Dickens
- Donley
- Fisher
- Foard
- Garza
- Gray
- Hall
- Hardeman
- Haskell
- Hemphill
- Jones
- Kent
- King
- Knox
- Lipscomb
- McCulloch
- Mitchell
- Motley
- Nolan
- Roberts
- Runnels
- Scurry
- Shackelford
- Stonewall
- Taylor
- Throckmorton
- Tom Green
- Wheeler
- Wichita
- Wilbarger

Western Edwards Plateau

- Crockett
- Edwards

- Irion
- Kimble
- Menard
- Reagan
- Real
- Schleicher
- Sterling
- Sutton
- Val Verde

Eastern Edwards Plateau

- Bandera
- Bexar
- Blanco
- Burnet
- Comal
- Gillespie
- Hays
- Kendall
- Kerr
- Llano
- Mason
- San Saba
- Travis
- Williamson

Cross Timbers and Prairies

- Bell
- Bosque
- Brown
- Comanche
- Cooke
- Coryell
- Denton
- Eastland
- Erath
- Hamilton
- Hood
- Jack
- Johnson
- Lampasas
- Mills
- Montague
- Palo Pinto
- Parker
- Somervell
- Stephens
- Tarrant

- Wise
- Young

South Texas Plains

- Atascosa
- Dimmit
- Duval
- Frio
- Jim Hogg
- Kinney
- LaSalle
- Live Oak
- Maverick
- McMullen
- Medina
- Starr
- Uvalde
- Webb
- Zapata
- Zavala

Blackland Prairie

- Collin
- Dallas
- Delta
- Ellis
- Falls
- Fannin
- Grayson
- Hill
- Hunt
- Kaufman
- Lamar
- Limestone
- McLennan
- Milam
- Navarro
- Rockwall

Post Oak Savannah

- Bastrop
- Bee
- Brazos
- Burleson
- Caldwell
- DeWitt
- Fayette
- Franklin
- Freestone
- Goliad

- Gonzales
- Grimes
- Guadalupe
- Henderson
- Hopkins
- Karnes
- Lavaca
- Lee
- Leon
- Madison
- Rains
- Red River
- Robertson
- Titus
- Van Zandt
- Washington
- Wilson

Pineywoods

- Anderson
- Angelina
- Bowie
- Camp
- Cass
- Cherokee
- Gregg
- Hardin
- Harrison
- Houston
- Jasper
- Liberty
- Marion
- Montgomery
- Morris
- Nacogdoches
- Newton
- Panola
- Polk
- Rusk
- Sabine
- San Augustine
- San Jacinto
- Shelby
- Smith
- Trinity
- Tyler
- Upshur
- Walker
- Wood

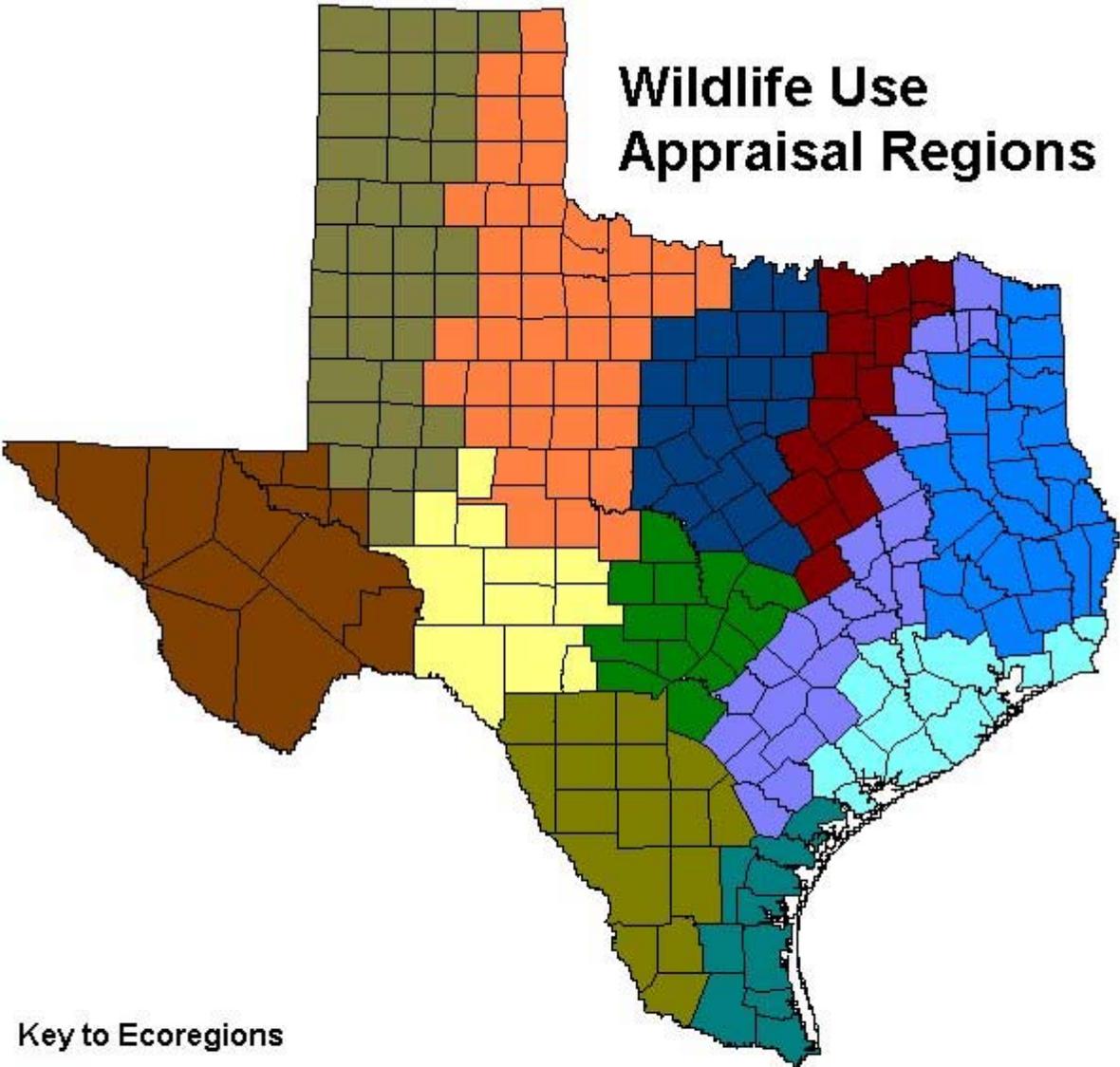
Upper Gulf Prairies and Marshes

- Austin
- Brazoria
- Calhoun
- Chambers
- Colorado
- Fort Bend
- Galveston
- Harris
- Jackson
- Jefferson
- Matagorda
- Orange
- Victoria
- Waller
- Wharton

Lower Gulf Prairies and Marshes

- Aransas
- Brooks
- Cameron
- Hidalgo
- Jim Wells
- Kenedy
- Kleberg
- Nueces
- Refugio
- San Patricio
- Willacy

Wildlife Use Appraisal Regions



Key to Ecoregions

- | | |
|--|---|
|  Trans Pecos |  South Texas Plains |
|  High Plains |  Blackland Prairie |
|  Rolling Plains |  Post Oak Savannah |
|  Western Edwards Plateau |  Pinewoods |
|  Eastern Edwards Plateau |  Upper Gulf Prairies & Marshes |
|  Cross Timbers & Prairies |  Lower Gulf Prairies & Marshes |

3. Changes to the Wildlife Management Plan (WMP) requirements are as follows:

- The Chief Appraiser may accept, but may not require, a WMP not completed on a TPWD form. All required information must be provided.
- An appraisal district may require an annual report.
- A Wildlife Management Property Association may file a single WMP or annual report, but all members must sign the WMP or annual report.
- Practices implemented in WMPs must not harm endangered species, but they are not required to benefit these species – the change mirrors requirements of the Endangered Species Act.

4. Changes to the Qualifications for Wildlife Management Use are as follows:

- The TPWD Comprehensive Wildlife Management Guidelines set the degree of intensity standard for wildlife management practices and activities implemented in the various ecological regions.
- The landowner selects which 3 of 7 wildlife management practices to implement each year.
- Property must now be "actively managed" to sustain a breeding, migrating, or wintering population of indigenous wildlife, where prior rule required that the land was "instrumental in supporting" this wildlife.
- Primary Use is the same as Principal Use and is defined as:
 - The property is actively managed according to a WMP.
 - Wildlife management practices and activities are given priority over other uses.
 - Secondary uses of the land do not significantly and demonstrably interfere with wildlife management practices and activities and are not detrimental to the wildlife being managed.

5. Changes to Wildlife Use Requirement are as follows:

- Use or minimum acreage requirements now apply only when the property has had a reduction in acreage – it no longer requires both a change in ownership and a reduction in acreage.
- The Chief Appraiser in each county, with the advice and consent of the Appraisal District Board of Directors, now selects the wildlife use requirement from the allowable range based on the appropriate appraisal region.
- Minimum acreage ranges are the same except for Terrell (increase), Clay (increase), McCulloch (increase) and Bee (decrease) counties. Changes result from the reorganization of appraisal regions.
- Existing properties in wildlife management are grandfathered and not affected by these changes.

Appendix C

Wildlife Management Plan Overview

Use this list to assist in planning your wildlife management activities

TREATMENTS	Practice	Year 1	Year 2	Year 3	Year 4	Year 5
Habitat Control:						
HC: Wildlife & Habitat Management Plan						
HC: Grazing Management						
HC: Prescribed Burning						
HC: Range Enhancement (re-seeding)						
HC: Brush Management						
HC: Vegetation Surveys						
HC: Fence Modification						
HC: Riparian Management and Enhancement						
HC: Wetland Enhancement						
HC: Habitat Protection/Species of Concern						
HC: Prescribed Control of Species						
HC: Wildlife Restoration						
Erosion Control:						
EC: Pond Construction						
EC: Gully Shaping						
EC: Streamside, Pond, Wetland Revegetation						
EC: Native Plant Establishment on Erodible Areas						
EC: Dike/Levee Construction/Management						
EC: Establish Water Diversion						
Predator Control:						
PC: Predator Management						
PC: Control of Brown-headed Cowbirds						
PC: Grackle/Starling Control						
Supplemental Water:						
SW: Marsh/Wetland Restoration or Development						
SW: Well/Trough/Windmill Overflow						
SW: Spring Development and/or Enhancement						
Supplemental Food:						
SF: Grazing Management						
SF: Prescribed Burning						
SF: Range Enhancement (Re-seeding)						
SF: Fence Modification						
SF: Food Plots						
SF: Feeders and Mineral Supplementation						
SF: Managing Tame Pasture, Old Fields, Croplands						
Providing Shelters:						
PS: Nest Boxes, Bat Boxes						
PS: Brush Piles and Slash Retention						
PS: Fence Line Management						
PS: Cropland Management						
PS: Half-Cutting Trees or Shrubs						
PS: Woody Plant/Shrub Establishment						
PS: Natural Cavity/Snag Development						
Census:						
C: Spotlight Counts						
C: Aerial Counts						
C: Daylight Wildlife Counts						
C: Harvest Data Collection & Record Keeping						
C: Browse Utilization Surveys						
C: Endangered, Threatened or Protected Species						
C: Nongame Wildlife Species						
C: Time/area Counts						
C: Roost Counts						
C: Song Bird Transects and Counts						
C: Quail Call and Covey Counts						
C: Point Counts						

Appendix D

Livestock Management Recommendations

Because "weeds" (broadleaved herbaceous plants) compete with grasses for growing space, nutrients, and moisture, their presence in rangeland plant communities is usually considered to be undesirable by most range managers, but they are important for wildlife. A well-planned livestock grazing system allows for a greater plant diversity, including a good component of forbs.

A range that has not been grazed for a long period of time, and is otherwise not periodically disturbed, can almost "stagnate" and become dominated by relatively few species of plants and exhibit limited variety and diversity. Therefore, total long-term deferment from livestock grazing is not normally recommended for optimum range and wildlife habitat management. Several growing seasons of deferment may be needed to allow an abused range to recover, but grazing should again be implemented after sufficient recovery is made.

Livestock should be considered as "tools" that can be used to maintain good wildlife habitat. A well-planned livestock grazing system is one which allows adequate rest periods for plants to recover after grazing. Most domestic livestock are selective grazers and consume the most nutritious and palatable plants first. Whenever a plant is eaten, there is not only a reduction in top growth but also a reduction in root growth. This reduces the plant's ability to rapidly regrow following defoliation. During the growing season, herbaceous plants need at least 30 to 60 days of rest to recover from grazing. Woody plants need as long as 4 to 6 months of rest to allow for regrowth. The recovery periods depend upon the severity of defoliation, moisture conditions, and temperature.

During continuous year-long grazing when livestock are left in a pasture for 365 days of the year, the most palatable plants are repeatedly defoliated. Frequent, repeated use will not allow seed production or plant recovery. Continuous grazing, even at light to moderate stocking rates, will remove the most desirable and palatable plants while the least preferred/least palatable plants that receive less grazing pressure become more dominant because of a reduction in competition. The result is a change in the species composition and an overall reduction in plant species diversity. Continuous grazing should not be used as a grazing method if the land manager's desire is to improve habitat for wildlife.

Several livestock grazing methods and systems have been developed which provide adequate periods of rest and allow vegetative recovery. There are many variations of these systems and the land manager needs to select the one that fits his particular situation. Some commonly used deferred-rotation grazing systems are: three pasture/one herd rotation, four pasture/one herd rotation, high intensity/low frequency (HILF), short duration, and four pasture/three herd rotation, or rest rotation. Regardless of the type of deferred-rotation grazing system used, the length of time that an individual pasture should be grazed, and the length of time that it would need to be rested before

being grazed again, would be dependent on the size of the pasture, its grazing capacity, the time of year (growing season versus non-growing season), the amount of rainfall received since being grazed, and the class of livestock. Grazing schedules and livestock stocking rates for pastures within a grazing system need to be flexible and continually reevaluated based on rainfall patterns, seasons of the year, and local range conditions. Knowing how long to graze and how long to rest is more an art than a science, dependent more on environmental factors and the on-site conditions than on the calendar.

Below are brief descriptions of the different deferred-rotation grazing systems. There are many variations of each system and the land manager can modify the grazing schedules to fit the local situation.

Three pasture/one herd rotation - The one herd of livestock is rotated through the pastures every 3 months. This allows each pasture to receive 6 months of rest before being grazed again. Over time, the pastures are grazed during different seasons of the year, with a 3 year interval before an individual pasture is grazed during the same time period again. For example, a pasture grazed from April through June during the first cycle, would be grazed from January through March during the second cycle, October through December during the third cycle, and July through September during the fourth cycle, before being grazed again during the April through June period during the fifth cycle. (This system should preferably be a step in moving toward a 1 herd/multiple pasture {4+} grazing system that provides a minimum of 75% of the land being rested at any one time.)

Four pasture/one herd rotation - The one herd of livestock is rotated through the pastures every 2 months. Each pasture also receives 6 months of rest before being grazed again, but the interval before an individual pasture is grazed again during the same time period is reduced to 2 years. For example, a pasture grazed April and May during the first cycle, is grazed December and January during the second cycle, and August and September during the third cycle, before being grazed again April and May during the fourth cycle.

High intensity/low frequency (HILF) - The number of pastures in this system is variable, but typically requires a minimum of 6 to 8 pastures. The livestock are kept in one herd, and each pasture is grazed intensely by the entire herd for approximately 1 to 1 1/2 months (high intensity), followed by a long period of rest (low frequency). The following are the calculations for determining how long each pasture should be grazed under a HILF system, using a system with 7 pastures as an example:

- 1.) add 1 to the number of pastures in the system ($1+7=8$)
- 2.) divide the number of days in a year by the answer from step 1 to determine how many days each pasture should be grazed (365 days divided by 8 = 46 days of grazing per pasture).

It would take 322 days (7 pastures X 46 days each = 322 days) to complete the grazing cycle, and each pasture would receive 276 days of rest between grazing periods.

Short duration system - This system requires that a ranch be divided into numerous pastures, typically a minimum of 12 to 20. The livestock are kept in one herd and the herd is rotated rapidly through the pastures. Each pasture is grazed intensely for a short period of time (a few days), followed by several months of rest. The length of the grazing cycle needs to be based on the season of the year and the amount of rainfall received during the cycle. For example, a 90 day cycle could be used during the growing season when plants recover more rapidly after being grazed. Each pasture in a short duration system that has 15 pastures, for example, would be grazed for approximately 6 days each (90 days divided by 15 pastures = 6 days per pasture) during the spring and summer growing season. The grazing cycle would be completed in 90 days. Each pasture would receive 84 days of rest between grazing periods, which would hopefully be enough for sufficient plant recovery if adequate rain was received during the cycle. The cycle could be lengthened during the non-growing system when dormant warm-season plants can withstand heavier grazing pressure without damage. Each pasture in the 15 pasture system would be grazed for 10 days at a time under a 150 day cycle used during the winter, with 140 days of rest between grazing periods.

Four pasture/three herd rotation - The livestock are divided into 3 herds and stocked within 3 of the 4 pastures. One herd is moved to a vacant pasture every 4 months. This allows for an individual pasture to be grazed for 1 year and rested for 4 months. The four pasture/three herd system is the least preferred because of the long period of time that livestock remain in each pasture.

Rest-Rotation Grazing – One pasture in a multiple pasture system receives a year of rest on a rotational basis at least every third or fourth growing season. The system allows for year-long escape cover, nesting and foraging habitat, as well as seed-set.

A ranch must be divided into at least two pastures before even the least complex two pasture/one herd deferred-rotation grazing system can be implemented. If not cross-fenced, the land manager would need to have access to other areas where livestock could be moved to during the prescribed rest periods. Electric fencing is a lower cost/less labor intensive alternative to barbed wire for dividing a ranch into multiple pastures. For a deferred-rotation grazing system to be most effective, all the pastures in the system should be more or less equal in size and/or have similar grazing capacities (e.g., pastures on the most productive, deep soils of a ranch would have higher livestock grazing capacities and should therefore be smaller than pastures on shallower, less productive soils).

Individually fenced improved grass pastures on a ranch should be incorporated into a deferred-rotation grazing system. Rotating livestock through the tame grass pastures would help provide longer/more frequent periods of deferment for the native pastures since most species of non-native forages can generally withstand more intensive grazing pressure than native plants can. Note: most species of "improved" livestock forages (such as coastal bermuda, Klein grass, Old World bluestem, etc.) do not have much value to wildlife, except possibly as cover for some species, especially if grown in

dense monocultures with very little diversity of native plants.

Since livestock are confined to individual pastures in a deferred-rotation grazing system, each pasture needs to have at least one source of water available when livestock are in that pasture. Creeks may provide adequate water during most of the year, but water from seasonal streams may become limited or inaccessible during extended dry periods. Also, concentrated livestock activity around creek waterholes can cause excessive damage to the plants and soils in the area. Earthen stock tanks and/or water piped to troughs from a well may provide better, more reliable, sources of water. One water source can serve several pastures if properly located. For example, one water trough could serve two pastures if straddled by a cross-fence, or a trough in a separately fenced "waterlot" constructed at the juncture of several cross-fences could serve numerous pastures.

A deferred-rotation grazing system will fail to produce the desired results of maintaining a healthy and diverse plant community if the range is overstocked with animals, both domestic and wild. The appropriate livestock stocking rate for a specific ranch is dependent on that ranch's herbaceous plant productivity and past grazing history. The stocking rate can vary from year to year, and seasonally within a year, depending on environmental factors. Stocking rates should be calculated on grazeable land, excluding dense woods or brush, or water. The impact of grazing animals should be closely monitored and the number of livestock on a ranch may need to be frequently adjusted to account for the variations in a ranch's grazing capacity.

A rule-of-thumb livestock stocking rate for native rangelands in the eastern portions of the Cross Timbers and Edwards Plateau regions of northcentral and central Texas is 1 animal unit (a.u.) per 15-20 acres. Recommended stocking rates decrease in a westward progression across the regions in association with decreases in the average annual rainfall. A rule-of-thumb rate in central portions of the regions is 1 animal unit per 25-35 acres, while it is 1 animal unit per 40-50 acres in the most arid far west portion of the Edwards Plateau.

The combined total of all animals on the range, including all classes of livestock as well as deer and exotics, must be considered when determining stocking rates. The following equivalent values of animal unit standards can be used for planning the management of rangelands:

Cattle

weaned calves to yearlings	0.6 animal unit
steers and heifers (1 to 2 years)	1.0 animal unit
mature cows, with or without unweaned calves at side	1.0 animal unit
bulls (2 years and over)	1.3 animal unit

Sheep

5 weaned lambs to yearlings	0.6 animal unit
5 mutton or ewes (1 to 2 years)	1.0 animal unit
5 mature ewes, with or without unweaned lambs at side	1.0 animal unit

5 rams 1.3 animal unit

Goats

6 weaned kids to yearlings 0.6 animal unit

6 muttons or does (1 to 2 years) 1.0 animal unit

6 does, with or without unweaned kids at side 1.0 animal unit

6 bucks or muttons over 2 years 1.3 animal unit

Horses

1-1.5 animal unit

Deer

6 deer 1.0 animal unit

Exotics (depends on the species; use animal unit standard set for similar size domestic animal)

A well-planned cattle grazing system is compatible with wildlife habitat management. Since cattle primarily consume grass, they do not normally compete with most wildlife for the same food sources, unless forced to due to excessive stocking rates and/or continuous grazing pressure. However, goats and sheep more directly compete with wildlife. Goats prefer browse (the foliage of woody plants); sheep prefer forbs. The foliage and seeds of forbs and woody plants are important food sources for many species of wildlife. Excessive goat browsing also reduces the amount of low-growing woody brush needed for cover for many wildlife species and can limit the reproduction of woody plants. It is recommended that sheep or goats not be stocked on a ranch if maintaining and improving the habitat for wildlife is an objective, unless 4-6 months rest can be periodically provided in pastures to allow for the adequate recovery of woody plants.

It is recommended that when leasing grazing rights, there be a written livestock grazing lease agreement that as a minimum specifies a maximum stocking rate and that a rotational grazing system will be used. Grazing schedules (how long each pasture will be grazed and how long each will be rested) and stocking intensities need to be flexible and continually reevaluated based on rainfall patterns, seasons of the year, and local range conditions. The landowner needs to retain the rights to require the lessee to reduce, and in some instances increase, the number of livestock depending on range conditions, and to require that range plants receive appropriate periods of rest. As a suggestion, it may be to the landowner's benefit to receive grazing lease "payment" in the form of facilities/habitat improvements (fence repair, additional cross-fence construction, cedar control, prescribed burning, discing to encourage forb growth, etc.) in lieu of monetary reimbursement. A good, trustworthy lessee can be an asset to a landowner, helping to maintain and improve the quality of the habitat as well as serving as the landowner's "eyes and ears" in his absence. Conversely, a lessee who is more concerned with maximum, short-term economic gains rather than the long-term sustained health of the land can be a liability.

Appendix E

Vegetation Management Recommendations

Managing native vegetation (browse, weeds, grasses) to prevent continuous overuse by deer or cattle so that the native vegetation provides the majority of nutrition year-around for deer and other wildlife should be of primary concern. Over 50 percent use of most species on a continuous basis will stress vegetation, causing less production or killing of the plant.

Managing or planning for the long term, considering wet years as well as drought years, and not carrying more livestock or deer than the land will support during poor as well as good years should be the overall goal.

Wildlife have a certain requirement for cover. Cover provides a sense of security from disturbance and protection from inclement weather and predators. The amount and kind of cover vary with the species. A stand of herbaceous plants may provide adequate cover for some bird species and small mammals, while other species require woody cover (trees and shrubs) in lieu of or in addition to herbaceous cover. The best cover for a large species such as white-tailed deer is a pattern or mosaic of woody brush and trees interspersed within open areas at an approximate 1/1 ratio of open area to woody cover. Clumps or strips of brush should be wide enough so that an observer cannot see through them from one side to the other during the winter months when deciduous species are bare of leaves. Cover strips should be as continuous as possible to provide travel lanes. Deer and other wildlife can be displaced by disturbance from an area without adequate escape cover. A habitat that provides several different types and arrays of cover benefits more species of wildlife than a habitat that has limited types, amounts, and distribution of cover.

During the past 30 - 40 years, significant areas have been planted to mono-culture tame grasses such as Coastal or common bermuda, bahia, etc. (often requiring the clearing of forest land). Overseeding these existing pastures with clovers, or gradually returning this acreage to native grasses and forbs can make these areas more productive for wildlife.

Understory conditions throughout much of the Pineywoods is in less than ideal condition due to over browsing by cattle, and in some instances deer. Habitat conditions can be improved through proper timber management, prescribed burning, and in some instances periodic grazing. Sound management of large ungulate populations (deer, feral hogs, and exotics) can prevent over utilization of preferred forage species and the resulting reduction of cover.

Large (1,000 acres +), unbroken tracts of mature bottomland hardwoods are scarce. Much of the bottomland hardwood forests have been lost to reservoir construction and agriculture activities. Loss and fragmentation of this nesting habitat for neotropical migratory songbirds appears to be a prime factor in the decline of many species that

require relatively unbroken tracts of hardwoods. Past management of many bottomland hardwood stands has been limited to the harvest of only the largest and best quality trees. This “high grading” has resulted in many stands that are comprised of poorly formed trees and in some instances has resulted in a change in the species composition of the stand. Continuous “high grading” may lead to a stand that is dominated by species that are less desirable for both timber management and wildlife management. Sound timber management can lead to improved habitat conditions and the sustained production of quality hardwood timber.

Habitat management, regardless of the habitat type, is a long term process that requires planning. Any vegetation manipulation practice will have an impact on resident wildlife species. The impact may be positive or negative depending on the type of treatment used, the degree of use, and location. No single habitat management practice will benefit every species of wildlife. Before implementing any vegetation management practice, determine what the long-term effects will be for each wildlife species that occurs in the area and minimize the negative impacts. Consider the location and size of sensitive wildlife habitats that provide important nesting or roosting sites, feeding areas, desirable wildlife food producing plants, and wildlife cover, water, and space needs. Wildlife can be displaced by disturbance from an area unless adequate escape or security cover is present. The amount and distribution of cover on adjacent lands needs to be taken into consideration when assessing the cover needs of wide-ranging wildlife species such as deer and turkey. A small ranch would need a larger amount of security cover, on a percentage basis, than would a larger ranch where the vastness of the area provides security.

The control of woody plant species that invade grassland communities may be warranted to maintain agricultural production. Vegetation manipulation may be in the form of prescribed burning, mechanical, biological, or chemical control of trees, brush, or weeds, or other vegetation or soil manipulation procedures. Most of these practices will require the use of specialized equipment or machinery for plowing, discing, bulldozing, or spraying. The cost effectiveness of the different control measures must be considered prior to initiation of control measures.

Prescribed burning is an effective, low-cost habitat management tool that can be used to enhance plant diversity by stimulating the production of a variety of forb and grass species and to maintain woody plants at the low heights most beneficial to wildlife. Livestock as well as wildlife can benefit from a properly planned and conducted prescribed burn. However, there are legal constraints and liabilities in the use of fire. The land manager should be well-trained and knowledgeable on the proper use of fire before attempting a prescribed burn.

Prescribed Burning Recommendations: To maintain open understory conditions in pine and mixed pine and hardwood stands, a regular burning program should be initiated. Burns should be conducted during the dormant season, generally November through early March (before spring green up). Burning will reduce the amount of debris on the ground and improve habitat conditions for deer, turkey, and other species of wildlife.

Burning stimulates the production of herbaceous vegetation and legumes which are beneficial to a variety of wildlife species. Burning also improves the quality of existing browse plants by killing the above ground portion of the smaller plants, causing the plants to resprout from the roots. The new growth is more nutritious and palatable to deer. A regular burning program will improve habitat conditions for turkeys by reducing the dense, rank understory vegetation that blocks visibility and limits mobility. Burning also benefits turkeys and other insect eating species by increasing the insect populations in the understory. Insects are an important food source for turkeys, especially poults, in the spring and early summer.

Ideally, burns should be conducted in small blocks (30 to 50 acres) to increase the amount of edge and diversity within the stand. Approximately 20% to 30% of pine stands that are at least 15 years old should be burned annually. Pine stands less than 15 years old should not be burned because of the potential to damage the relatively young trees. Follow up burns should be conducted on a 1 to 7 year rotation in pine stands, depending on vegetation condition and the productivity of the site, to maintain the desired understory conditions. Mixed pine and hardwood stands should be burned less frequently, on a 5 to 10 year rotation, to minimize damage to hardwood timber. On highly productive sites burns will need to be conducted more frequently to maintain the desired understory conditions.

In some instances where very dense woody vegetation is present in the understory, burns may need to be conducted during the early spring (March or April) to achieve the desired results.

The use of prescribed fire is probably the most cost effective and beneficial tool that the wildlife manager can use. However, if misused, fire can be damaging to wildlife, timber, and other resources. Fire should be excluded from all bottomland areas. A low creeping fire that "backs" into a hardwood bottom is generally not damaging, but a "hot" fast moving head fire should not be allowed to burn into a hardwood bottom. A regular program of thinning and burning in pine stands will provide high quality habitat for deer and other wildlife species.

To restore and maintain native grasslands, prescribe burn about one-third of native grass openings each year, burning each site every three years, on a rotating basis. This will remove old growth and young, invasive woody growth such as pine, winged elm, and persimmon. This will stimulate new growth of plants that may have become dormant due to lack of disturbance which often stimulates growth. Pasture burn sites should normally be less than 40 acres and be burned in late summer (late August through September) weather conditions permitting. About seven times more insects are usually found in burned native grass areas compared to unburned areas. The increase of insects will provide high protein food for quail and turkey, especially the young, during the spring and summer.

General burn prescriptions for pine and mixed pine and hardwood stands and native pastures are:

1. Prepare disked bare-ground fire guard around all sites before burning. Disked fire guards, which can include roads and right-of-ways, should be 15 to 20 feet wide. (These disked areas can be planted to winter supplemental food plots between burn years.)
2. Humidity should be between 25 - 40 percent.
3. Wind speed should be between 10 - 15 miles per hour.
4. Always burn into the wind first (backfire) 50 yards into the woods or pasture, then set fire with the wind (headfire). The entire burn may be conducted with a backfire, depending on fuel and weather conditions and burning experience of crew.
5. Initiate burns in the morning, after 9:00 a.m.

Consult with TPWD, Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service, SCS), or Texas Forest Service, and notify local volunteer fire department before conducting burns.

Cattle should be excluded from burned areas for at least 3 months to allow regrowth of new, tender vegetation.

Prescribed burning is the cheapest, most effective habitat management technique for the Pineywoods. Prescribed burning under a predetermined set of guidelines and plans is the most cost-effective habitat management tool that can be used to enhance plant diversity by stimulating the production of a variety of forb and grass species. It is also effective in controlling low-growing woody plants and maintaining them at the low heights most beneficial to wildlife. Livestock as well as wildlife can benefit from a properly planned and conducted prescribed burn. However, there are legal constraints and liabilities in the use of fire. The land manager should be well-trained and knowledgeable on the proper use of fire before attempting a prescribed burn. Refer to Texas Agricultural Extension Service bulletin "Prescribed Range Burning in Texas" for details on the use of fire as a range management tool. It is often necessary for a pasture to receive a period of deferment from livestock grazing to allow for a build-up of enough fuel (herbaceous plant litter) to carry a fire.

The use of mechanical equipment to control woody plants will typically result in an initial growth of forbs and annual grasses and the resprouting of many woody species. Soil disturbance associated with mechanical controls releases the natural seed bank found in the soil, increasing the quantity, quality, and distribution of plants beneficial to wildlife. However, without periodic follow-up treatments of fire, herbicides, or additional mechanical manipulations, and/or without proper livestock grazing management, these sites will eventually again become dense stands of regrowth brush and trees. Mowing (shredding) areas of herbaceous plants and/or low density woody plants is another form of mechanical treatment. Mowing should be postponed until after the peak of the nesting/young-rearing period of local ground-nesting birds and mammals. One-third of open areas can be mowed per year, preferably in strips or mosaic types of patterns, to create "edge" and structural diversity.

Biological control is the use of heavy grazing pressure by livestock such as goats to control or suppress woody plants and sheep to control herbaceous weeds. Long-term heavy grazing pressure by goats, which prefer woody browse but will also consume forbs, will eliminate all leaves from woody plants up to a height of four feet. The creation of this "browse line" and the resulting park-like appearance of the woody plant community will have negative effects on the wildlife species that also depend on the low-growing foliage of woody plants for both forage and cover. Heavy grazing pressure by sheep, which prefer forbs, will reduce or eliminate forbs that are also beneficial to wildlife. Under certain management goals, biological control of woody plants and forbs can be a legitimate practice if done correctly. However, it is not normally a recommended wildlife habitat management practice.

Broadcast application of some chemical herbicides can have a significant negative impact on many plant communities and may suppress or eliminate plants other than the target species. If herbicides are used, selective applications, rather than broad-scale applications, are usually recommended to avoid the elimination of plants that are important to wildlife.

Farming Practices: Delaying of shredding or mowing of hay or native grass pastures until after the first of July will usually avoid accidentally killing of young fawns and/or ground nesting birds.

Keep use of herbicides to a minimum. If necessary, spot spraying with a low rate of one pint per acre of 2-4-D is much preferred over broadcast spraying of some of the newer herbicides that last longer. Spray early in the spring while plants are still small, requiring less spray. Many "weeds" are important to wildlife.

To provide weed seeds (ragweed, croton, sunflower, partridge pea, trailing wild bean, etc.) which are the basis of quail, dove, and other seed-eating bird's fall and winter diets, shallow disk 10 - 20 foot wide strips in sandy soil around the edge of brush and woods after the first freeze. This practice will promote growth of these important forbs the following spring and summer.

Timber Management - In the Pineywoods proper timber management is best method to provide a diversity of forested habitats. Proper timber harvests when combined with the periodic use of prescribed fire can create and enhance habitat conditions for a variety of wildlife species.

Upland pine and mixed pine and hardwood stands should be periodically thinned at intervals of 5 to 7 years to maintain open canopy conditions. The intervals between thinnings will vary depending on the productivity of the site and the intensity of the previous harvest. Stands on more productive sites will need to be thinned at shorter intervals, or thinned more heavily, than stands on poorer sites. The interval between thinnings can be lengthened for stands that are thinned heavily (more trees harvested), versus stands that are only lightly thinned (few trees harvested). Thinning operations allow more sunlight to

reach the forest floor that stimulates the growth of herbaceous vegetation and browse plants in the understory. Regular thinnings will provide a continuous supply of browse, and maintain vigorous growth of the crop trees. Pine stands are usually thinned from below which means that the small and poorly formed trees are removed, leaving the larger, better formed trees to continue to grow until the stand is regenerated.

Young pine stands, such as plantations, should be thinned as soon as the timber is large enough to be merchantable, usually around age 12 to 15, depending on the growth of the timber.

A variety of regeneration techniques can be used to ensure that a well stocked stand will occupy the site following the final harvest. Regeneration techniques can be grouped into two broad categories: Even-aged and Un-even-aged. Even-aged regeneration methods create forest stands in which the majority of the trees in the overstory (canopy) are about the same age. Un-even-aged regeneration methods create stands that have a variety of age classes of trees. Even-aged regeneration techniques include clearcut, seed tree, and shelterwood methods. Uneven-aged regeneration techniques include single tree selection and group selection. Even-aged regeneration techniques are generally used to regenerate tree species (such as pines) that require full sunlight to ensure growth and survival of the seedlings. Uneven-aged regeneration methods are usually used to regenerate tree species that can survive and grow in partial sunlight, such as most oaks, or in full shade such as maple, winged elm, or American beech.

Group selection can be used to regenerate pine stands, but usually requires intensive control of woody understory vegetation to ensure pine regeneration. Single tree selection has been used as a harvest technique in bottomland hardwoods forests, but usually results in a reduced component of oak species in the stand. Single tree selection maintains an almost continuous canopy layer, and allows only minimal sunlight to reach the forest floor. Thus favoring the regeneration of tree species that are more shade tolerant than most oaks.

Group selection usually involves harvest areas that are 1 to 5 acres in size, while clearcuts can be significantly larger. If clearcutting is selected, the harvest areas should be a maximum of 40 acres in size. Clearcuts that are 20 to 30 acres in size and have irregular boundaries will be more beneficial than large square or rectangular clearcuts. Harvest areas should be separated by at least 1/4 mile.

Newly regenerated stands such as clearcuts or group selection cuts (in pines and hardwoods) favor species that require brushy habitats such as deer, rabbits, yellow-breasted chats, common yellowthroat, and indigo bunting. These areas provide abundant browse for deer, abundant insects that are an important food source for many birds species, and provide an abundant source of soft mast (fruits) for a wide variety of wildlife species. Newly regenerated stands also provide nesting cover for many species of birds and provide escape cover for many wildlife species.

Regeneration areas provide little in the way of habitat for squirrels and turkeys. Squirrels

and turkeys may forage in the edges of regeneration areas, and turkeys may nest in these areas for a few years. Habitat conditions in these areas will begin to improve for turkeys when the stands begin to "open up" in the understory. This usually occurs in 15 to 20 years.

Bottomland hardwood stands should be managed to provide a continuous supply of hard mast (acorns). Acorn production is minimal in stands that are less than 20 years old, and peak acorn production occurs in stands that are between 40 and 100 years old; therefore, the majority of the stands should be at least 40 years old. It is also important to maintain some stands beyond 100 years old to provide "old growth" type habitat. Periodic partial cuttings should be conducted generally on a 10 year cutting cycle. Periodic cuttings will promote vegetative growth in the understory and maintain vigorous growth in the remaining trees.

When regenerating bottomland hardwood stands, group selection or patch clearcuts are generally the harvesting method used. Both techniques are similar in that all stems are removed during the final harvest operation and the new stand will come from sprouts and advanced regeneration present prior to the harvest. The main difference relates to the size of the opening.

To assure that adequate regeneration is present in the stand prior to the final harvest and to increase browse production, periodic light harvests should take place throughout the life of the stand. This will allow the species composition and the stocking level of the stands to be manipulated. These harvests will be similar to the thinnings described earlier, but they should also allow for the development of regeneration of desirable species i.e. oaks, in the understory of the stand. Regeneration from desirable species must be present prior to the final harvest to assure the presence of these species in the future stand.

Because of the complexities of bottomland hardwood management, a professional forester who is experienced in hardwood management should be employed prior to any harvesting.

Sawtimber rotations of 50 to 60 years for pine and 80 to 100 years for hardwood are generally more favorable to wildlife species than are shorter pulpwood rotations (20 to 30 years). During any timber harvest, especially regeneration cuts, large mast producing hardwoods should be protected if present. Groups of trees one-half to one acre in size are more beneficial than leaving scattered individual trees. Large (18+ inches) hardwoods of any species are also important as cavity trees and should be protected when and where possible. At least 2 to 3 cavity trees per acre should be retained throughout the life of a stand to provide nest sites for squirrels. Up to 7 cavities per acre may be needed to provide nest sites for most cavity nesting species.

Stream Side Management Zones (SMZ's) should be maintained along all perennial and intermittent streams to protect water quality by reducing sedimentation. By maintaining large mast producing hardwoods in the SMZ's, these areas can also enhance wildlife values. If the SMZ's are wide enough (50 yards on either side of the stream) they should

also serve as travel corridors for many species of wildlife including turkeys.

Forestry Best Management Practices (BMP's) should be followed when implementing any forest management practice. See the attached document for forestry BMP guidelines. Improper timber harvesting practices can lead to poor habitat conditions and can result in a loss of timber production. The use of a professional forester is strongly encouraged prior to any timber management activities.

Appendix F

Specific Management Recommendations for White-tailed Deer



Before entering into a discussion on the management of white-tailed deer, it should be noted that because of the large home range of deer, adjacent lands are also included in the home ranges of many of the deer on a ranch less than 3,500 acres in size. Only those deer within the interior of a large ranch are likely to have home ranges located totally within the ranch, while those deer in a wide band around the ranch's perimeter likely move back and forth onto adjacent lands. The quality of a ranch's deer population will in large part be dependent on the habitat quality and deer population management strategies (i.e. hunting pressure and deer harvest) found on the adjacent lands. Because much of east Texas is comprised of land tracts 200 acres or less, it is important for landowners to work with neighboring landowners to achieve deer/wildlife management goals. Formation of

landowner wildlife management co-ops or associations is a practical, workable solution. TPWD or TCE personnel can assist with formation of these WMA's.

General:

The key to producing a productive and healthy white-tailed deer population is dependent upon the quantity, quality, and variety of food plants produced by the habitat or range. Food availability can be improved by: (1) harvesting deer, including does, to maintain total deer numbers at or below the capacity of the habitat; (2) not stocking with exotic big game animals, or keeping their numbers at a low level, since exotics compete with white-tailed deer for browse, forbs, and mast; (3) stocking the range with a moderate number of domestic animals (preferably species that do not directly compete with deer) and utilizing some form of a deferred-rotation system of grazing, and; (4) controlling invading "noxious" woody vegetation, such as cedar, not needed for cover or food to reduce competition and increase the production of grasses for cattle and the production and availability of browse and forbs preferred by deer.

Understanding food habits of deer is fundamental to management. Studies have shown that deer prefer forbs and browse (leaves and twigs from trees or shrubs). Grasses make up a very small portion of a deer's diet and they are utilized only when tender and green. Deer cannot digest mature grasses. Forbs are generally high in protein and important to deer size, antler development, and fawn production. However the

production, quality, and palatability of forbs is highly dependent on rainfall and the season of the year. Forbs will be absent or unpalatable at least during portions of a year, typically during late summer and late winter.

Woody browse plants make up the majority of the annual diet of deer in the Pineywoods. Preferred browse plants include greenbriar, rattan vine, Carolina jessamine, honeysuckle, blackberry, sassafras. Other important browse plants are winged elm, American beautyberry, yaupon, poison ivy, dogwood, hawthorn, and red maple. Many woody plants also produce mast (acorns and fruits) that is readily eaten by deer, but mast production is erratic and therefore it is not as reliable as a food source as the foliage. Important mast producers are the oaks, hickories, beech, American beauty berry, dogwood, blackberry, hawthorn and grape.

A list of common east Texas woody browse plants and there palatability rating can be found in appendix.

Not all of the above species are found throughout the Pineywoods. Browse is the stable component of deer diets and, unlike forbs, is available throughout the year and is relatively drought resistant. Although utilized by deer throughout the year, browse becomes most important during the winter and summer stress periods when forbs are absent or unpalatable. The woody species found in an area are dependent on the ranch's geographic location and soil types. The quantity and species diversity of woody plants is typically greatest on the deeper soils of riparian areas along the stream courses and lowest on deep sandy soils.

Antler development (main beam length, antler spread, basal circumference, and number of points) is dependent upon three factors: nutrition (quantity and quality of food), age, and genetics.

Nutrition: Nutrition can be optimized by the methods discussed above: controlling the numbers of deer and exotic ungulates, utilizing a rotational system of domestic livestock grazing with moderate stocking rates, controlling noxious vegetation, and proper timber management. Supplemental feeding and supplemental plantings, in conjunction with the above practices, can be used to help meet the nutritional needs of deer. Both practices will be discussed in more detail in a later section.

Age: Maximum antler development of buck deer is attained at 5 to 6 years of age. Allowing bucks to reach older ages through selective harvest will allow them to attain their potential antler growth.

Genetics: Spike antlered bucks are the result of inadequate nutrition, genetics, or a combination of these two factors. Research has shown that yearling (1 1/2 year old) bucks have the potential to produce 4 to 8 points as their first set of antlers if nutrition is adequate and they have the proper genetic background. Conversely, bucks may only produce spike antlers as yearlings if they have "spikes genes", even with adequate nutrition. Although the subsequent sets of antlers of yearling spikes generally will not be spikes, their antlers tend to be inferior to those of bucks that were forked antlered as

yearlings. Consequently, the incidence of inferior antlered bucks in the population should be minimized by the combination of optimizing nutrition (habitat management) and including spike antlered bucks in the total deer harvest.

Stocking deer from another area into a deer population in an attempt to introduce new genes and improve quality is a controversial and much discussed subject. The genetic contribution of 1 individual buck is limited where it is introduced into a population where other bucks are already present and also breeding does. There is no research available that indicates that introducing several bucks improves quality. Unless the pedigrees of the deer (bucks as well as does) stocked are known, there is a good chance that undesirable, but not easily recognizable, characteristics are being introduced. Stocking deer is costly. Also, the animals may have difficulty adapting to their new environment and mortality can be unusually high. It is much better to work with the resident population and cull bucks with poor antler characteristics and retain bucks with desirable characteristics. There are numerous examples where the "native" deer in an area where the average antler quality has been historically low have produced outstanding antlers through a combination of good habitat management, population management, and supplemental feeding. Deer within these populations had the genetic potential for large antlers, but were unable to express their potential because of inadequate nutrition and/or they were harvested before reaching mature ages.

Cover Requirements:

The best cover for white-tailed deer is a pattern or mosaic of forestland interspersed within open areas comprised of native herbaceous vegetation (not tame pastures) at an approximate 2/1 ratio of open area to woody cover. Clumps or strips of brush should be wide enough so that an observer cannot see through them from one side to the other during the winter months when deciduous species are bare of leaves. Cover strips should be as continuous as possible to provide travel lanes.

Population Characteristics:

Maintaining the deer population density within the food supply is very important to prevent die-offs during extreme habitat conditions, such as during droughts. Maintaining deer numbers within the carrying capacity will improve fawn production and survival, increase body size and improve antler development, and prevent habitat deterioration from overuse. The rule-of-thumb winter carrying capacity for east Texas is 1 deer per 10 acres in bottomlands and 1 per 25 acres in uplands; however, these guidelines may vary greatly depending on the quality of the habitat and past management practices.

Overuse of preferred vegetation on habitat that is overpopulated with deer and/or overstocked with domestic animals on a long term basis can kill individual plants and prevent woody plant seedlings from being established, leading to a decline in the carrying capacity.

The objective is to maintain deer numbers at a level where every deer in the population is receiving adequate nutrition without causing a degradation in the quantity and quality of native range plants. Factors such as fawn production, body size, antler development, and degree of browse utilization are good indicators to monitor, to evaluate if a range is stocked at, above, or below its carrying capacity.

An unbalanced sex ratio favoring female deer results in a limited number of bucks available for harvest. Also, a surplus of does can contribute to a rapid increase in deer numbers with the potential for exceeding the carrying capacity of the range. The recommended sex ratio for a free-ranging deer herd in east Texas is 2 does per 1 buck. The fawn production objective is .75 fawns per doe or better.

Method(s) Used to Determine Population Density and Composition:

The spotlight deer census technique is the primary method used to estimate population density (acres per deer). It can also be used to make an estimate of herd composition (buck/doe/fawn ratio).

Incidental daylight observations of deer should be used to improve herd composition estimates and for rating the quality of antlered deer. Daylight observations should be recorded by sex, age (adult or fawn), and antler quality (number of points, spread, etc.). Daylight observations can be made by slowly driving pasture roads during early morning and late evening hours. Hunters can also record observations of deer during the opening weekend of hunting season to supplement herd composition estimates.

The surveys should be conducted on an annual basis during the late summer and early fall (August 1-September 15), during the time of the year when bucks have identifiable antlers and fawns are old enough to be up and moving around yet still small enough to be recognized as fawns. Replicating the spotlight census 3 to 4 times during the annual census period will increase the sample size and improve the population estimates. A minimum of 100 daylight observations (or as many as practical) of deer should be recorded. Binoculars should be used to aid in identifying deer.

Track counts are another method to monitor deer population trends over time. A track count is conducted by locating a stretch of sandy road and smoothing old tracks by raking or dragging the road, usually early in the morning. The count is conducted 24 hours after the road is dragged and the number of deer that have crossed the road are counted. Each 1 mile section of road equals 640 acres being sampled. For instance if 20 deer crossed the one mile section of road that would equate to one deer per 32.0 acres (640 acres divided by 20 deer). A one mile section of road may be suitable on small areas but larger properties will require two or more mile or survey. If 1 mile sections of suitable road are not available, the survey can be divided into several one-half mile sections.

The survey should be conducted two or three times between August 1 and September 15, and the average should be taken. Track counts should be repeated each year during the same time of year on the same sections of road. Track counts will not give an

absolute measure of the deer density, but when repeated year after year, will provide trend data to determine if the deer herd is increasing, decreasing, or remaining stable.

Biologists with the Texas Parks and Wildlife Department can provide assistance to establish the census route(s), demonstrate the techniques, and help conduct the initial census. The landowner/manager will then be encouraged to conduct all subsequent censuses and provide the data to the Department biologist for assistance in analyzing it and making harvest recommendations.

Recommendations for Harvest or Other Use:

Harvest is the key method to manage a deer population. It is utilized to maintain deer numbers within the carrying capacity, or food supply produced by the range. Harvest also is used to obtain and maintain a desired adult sex ratio and a desired age structure of the population by adjusting both the buck and doe kill.

Bucks: The harvest rate of bucks will be dependent on the objectives of the land owner/manager. One of the concerns that the Texas Parks and Wildlife Department has about the deer herd in many areas of east Texas is the young age structure of the buck segment of the herd. Typically, 40 to 70 % of the annual buck harvest is composed of 1 1/2 year old bucks, an indication of heavy hunting pressure. If one of the deer management objectives is to produce bucks with larger antlers, they must be allowed to reach older ages, which means that the harvest of young, immature bucks should be restricted. Restricting hunters to mature bucks only (in addition to spikes) is a good management strategy. Deer body characteristics, in addition to antler characteristics, should be used to determine the relative age of bucks "on-the-hoof. However, since many of the deer on a ranch will also roam onto neighboring lands, the benefits of not harvesting young bucks may be partially negated if these bucks are subject to being harvested on adjacent lands. For a deer population management program to be most successful in an area, most or all the land managers in the area must have similar deer harvest strategies.

Under a Quality Management strategy, buck harvest must be restricted to 20% or less of the estimated buck population. This limited harvest will result in low hunter success rates, but will permit a significant portion of the buck population to reach maturity (4 1/2 years old and older) and increase the proportion of bucks in the population. This strategy may only have limited success on smaller tracts of land (5,000 acres or less that are not high-fenced) where hunting pressure on surrounding lands is moderate to heavy.

Under a Quantity Management strategy, up to 50% of the estimated buck population can be harvested annually to provide maximum hunter success. This strategy will result in a relatively young, immature buck herd, with most of the bucks harvested being 1 1/2 to 2 1/2 years old.

Under an Optimum Management strategy, 30% to 33% of the estimated buck

population is harvested annually to allow for a generally acceptable level of hunter success while restricting pressure on bucks that allows a portion of the buck population to reach older age classes.

The harvest of spike antlered bucks should be included in the buck harvest quota, not added to the quota, regardless of the management strategy used. Spikes may comprise from 20% to 50% of the total buck harvest quota. Harvesting spikes will remove poor quality bucks from the herd at an early age. Also, if spike antlered bucks comprise a portion of the buck harvest quota, hunting pressure will be reduced on the better quality bucks.

Does: The recommended doe harvest will depend upon the overall deer density, the estimated carrying capacity of the range, the observed sex ratio, and fawn production and survival.

Note: Specific harvest recommendations for both bucks and does should be made annually after deer censuses are completed.

Records Management:

Records should be kept to monitor the status of the deer herd and measure the success of management over time. As a minimum, record keeping should include:

- 1) annual deer population data (census data)
- 2) number of deer harvested annually
- 3) biological data from deer harvested, to include:
 - a) field dressed weight
 - b) antler measurements: inside spread, number of points, main beam lengths, circumference of antler bases. The Boone and Crockett antler scoring system can be used to measure overall antler quality.
 - c) age: the manager can age the deer at the time they are harvested or the lower jaws can be removed from deer and stored for later aging by a biologist until the manager is proficient at aging.
 - d) presence or absence of lactation (milk production) of does (to supplement fawn production estimates).

Note: Weight, antler, and lactation data from a deer, without knowing the age of the deer, is of minimum value. Conversely, age without corresponding weight/antler/lactation data is of minimum value.

Supplemental Feeding / Food Plots:

Managing the habitat for proper nutrition should be the primary management goal. Supplemental feeding and/or planting of food plots are not a substitute for good habitat management. These practices should only be considered as "supplements" to the native habitat, not as "cure-alls" for low quality and/or poorly managed habitats.

Supplemental feeding in particular is not a recommended practice unless it is integrated with other deer population/habitat management practices. It may be beneficial if the herd is harvested adequately each year and the range is in good condition. However, most deer feeding programs which provide sufficient additional nutrients to be of value are expensive and take a long term commitment. The most popular feed used to supplement the diet of deer is corn, although it is one of the poorest types of deer feed available. Corn is low in protein (7-10%) and high in carbohydrates. It does not provide adequate protein levels needed for development of bone and muscle. Knowing these limitations, corn may be used 1) as an energy supplement (carbohydrates) during very cold periods of the winter, and 2) to "bait" and hold deer in an area. If supplemental feeding is integrated into the overall management, the preferred method is to use a 16% to 20% protein pelleted commercial feed, fed free-choice from feeders distributed at the rate of one feeder per 300-600 acres located adjacent to adequate escape cover. Feed areas would have to be fenced to exclude livestock. Refer to the Texas Parks and Wildlife bulletin "Supplemental Feeding" for details.

Planting food plots may be a more effective method to supplement well managed native habitats than feeding, but like feeding, its cost effectiveness needs to be taken into account, considering factors such as climate, soil type, slope and drainage, labor, material, and equipment costs, and fencing from domestic livestock. Like feeding corn, food plots are typically used to bait and hold deer in an area. To provide optimum nutritional benefits to deer, the Texas Agricultural Extension recommends that 1) food plots comprise between 2% to 5% of the total land acreage, 2) one-half the plots be planted in cool season species (planted in early fall with forage available during winter stress periods) and one-half be planted in warm season species (planted in spring with forage available during the summer stress period), and 3) the plots be between 1/2 to 5 acres in size, long and narrow, and well distributed over the entire area adjacent to escape cover. Food plots should be planted on the most productive soils available. These soil types are generally well drained, but not droughty, and generally should not be subject to flooding.

Planted food plots provide a highly nutritious food source that can be very beneficial during periods of stress. Summer is often the most stressful period of the year for wildlife, especially doe deer that are nursing fawns. During the dry summer months, as plant growth slows, the nutrient levels in native vegetation is much lower than when the plants are actively growing during the spring.

Warm season plantings for deer include cowpeas, alyceclover and American jointvetch. While alyceclover, jointvetch, and cowpeas are annuals, the jointvetch may reseed if it is allowed to produce seed and then mowed in the fall.

In order to insure proper growth, all warm season plantings should be planted on bottomland sites (if possible) where soil moisture will be sufficient during the summer to insure proper growth. These crops can be successfully established using "no-till" planting methods. Best results have been obtained by spreading the seed and then mowing any standing herbaceous vegetation to cover the seed. The mowed debris serves as a mulch

and protects the seed and new seedlings from drying out and from sun scald. After a few years (2-3) of planting an area by "no-till", the grass and weeds may become so thick that the food plot will need to be thoroughly disked to ensure proper growth of the forage species.

Cool season plantings for deer should be combinations of elbow rye, clovers, rye grass, and wheat. Cereal grains such as rye and wheat will also benefit quail and turkeys in the spring, and the clover will provide good bug production areas for turkeys in late spring. A variety of clovers should be planted and can include varieties such as Arrowleaf, Crimson or Louisiana S-1. Permanent strips (food plots) of arrowleaf clover should be established to provide forage for deer. These clovers are annuals, but should reseed if properly managed. Arrowleaf clover generally "comes on" later than clovers such as crimson, but will stay palatable later into the spring. If rainfall is adequate during late spring, Arrowleaf will stay palatable into early summer, and Louisiana S-1 may continue to grow throughout the year.

A good goal is to have approximately 3 to 5 percent of the area in some type of permanent opening (food plots, native openings, or managed roadsides). To minimize the distance that wildlife must travel, openings should be distributed across the property as much as possible. It is always best to establish a variety of plantings to provide more diversity and to insure against the failure of any one type of planting. It is essential that food plots are properly fertilized and limed in order to receive the maximum benefit. Each food plot should have a soil test in order to determine the correct lime and fertilizer rates.

Food plots can be established in existing open areas to prevent additional clearing. If additional openings are desired they should be planned prior to any future timber harvests. Any new openings that are developed should be at least 1 acre in size, preferably 3 to 5 acres, and should be narrow and long rather than rectangular. By distributing food plots or openings across the property it will minimize the distance that deer and other wildlife will have to travel to utilize the openings. All major food plots should have a heavy, mesh wire enclosure in the middle to measure the productivity of the food plot. This will allow you to see the amount of utilization of the food plot compared to the protected enclosure.

An NRCS recommended seed mix for permanent food plots is maximilian sunflower and Illinois bundleflower. All are perennials and native to east Texas. Both are warm season. This would be a good seed mixture to use to "reclaim" improved grass pastures, i.e. convert them from a non-native species back to native species. This mixture could also be used on other deep soil sites.

Supplemental food plots should be fenced to control livestock grazing so that the maximum amount of production is available for wildlife. It may also be necessary to control deer access into planted areas until the plants are well established (the perennial mix species may need protection for a full growing season), unless sufficiently large areas are planted so deer grazing pressure can be distributed.

Appendix G

Specific Management Recommendations for Bobwhite Quail



Before entering into a discussion on bobwhite quail, it should be noted that the Pineywoods Ecological region of east Texas is not known as a good quail producing area of the state. Although, prior to about the 1970's, quail populations were usually good enough for quail hunters to keep a bird dog and look forward to the quail season each year, however that is not the case now. In earlier years, there were more native pastures, rural family gardens, disking and soil disturbance that created early plant succession, and other situations that benefited quail. Additionally, wild and prescribed burns were much more prevalent in pine stands, which created desirable understory conditions for quail. As more acreage was planted to dense monoculture tame pasture, less quail habitat was available. In the 1970's, the imported red fire ant began its move into the region, steadily moving northward. Studies

indicate that they have made an impact on quail and other ground dwelling/nesting wildlife. Besides their direct impact on animals by stinging (one to two fire ant stings can kill a few days-old quail-D. Wilson study), their reduction of the insect food base probably is the most detrimental to quail populations.

In relative terms, the overall habitat types occurring in the region are not as suitable for quail as those found in south Texas or north-central Texas. Also, quail population densities tend to vary greatly from year to year, even in the best quail producing regions of the state. The timing and amount of fall and winter rainfall are thought to be the most critical factors that determine quail breeding success and survivability during the next year (adequate amounts of fall/winter rains improve soil moisture and promotes the early growth of herbaceous plants).

Basic Habitat Requirements:

Bobwhite quail must have a year-round adequate supply of food and reasonable protection from hazards. This includes protection from predators while feeding, resting, loafing, roosting, traveling, and nesting, as well as protection from inclement weather conditions. Both food and cover supply must be stable or continuously renewed during the entire year. It is not enough that food and cover be adequate for 11 months, if either is lacking during a single month.

Food and cover must occur in a well-arranged pattern if they are to comprise quail habitat. The distance between a source of ample food and adequate cover must not be greater than what a quail can negotiate with safety. As a rule of thumb, bobwhites venture no further than 200 yards from patches of cover. Ideally, escape cover should be linked to food supplies with more or less continuous screening cover. Overgrazed pastures do not provide adequate screening cover. However, the screening cover must not be dense enough to create an obstacle to the quail's short-legged gait. Dense stands of thick grass (tame pasture monocultures) cannot be easily negotiated. Without a suitable space relationship, a range will not be habitable for quail regardless of the quality or amount of food and cover present. In fact, ideal quail habitat consists of 30 - 60 percent bare ground interspersed with cover, forbs, and seed producing plants. This permits ease of movement and location of seeds and insects, especially for newly hatched quail.

Food:

Food supplies are usually most abundant during the spring and summer; seeds are ripening and insects and green plant material are available. The food supply begins to diminish at the time of the first killing frost in the fall, and continues to decline throughout the winter due to competition from other animals and from weathering. Seeds from forbs such as croton (doveweed), ragweed, sunflower, partridge pea, tick clover, and many others are staple winter foods. A number of woody plants provide winter quail food. Fruits and mast such as small acorns, sumac berries, hackberries, and gum elastic berries supplement quail diets. Most grasses, except for paspalums and panic grasses, do not produce seeds large enough to be worthwhile quail food. In general, forbs are the most important and most widely distributed sources of winter quail food. Green material from cool season forbs and grasses that germinate in the late winter if rainfall is adequate are essential to get quail in good body condition for the upcoming breeding season.

Cover:

Bobwhite quail need several types of cover: screening overhead cover for security while feeding and traveling, "tangled" woody cover to retreat into to escape enemies, a "living room" type of cover for dusting or resting, and nesting cover. Roosting cover is also needed, but if other types of cover are present, the roosting cover requirement is usually adequately met.

Cover can take many forms and a patch of cover can meet several of the cover requirements.

A stand of broomweed, or similar tall plants with bushy canopies and an open understory at ground level, can provide screening overhead cover.

Thickets of low brush, trees, and vines can provide escape and loafing cover. In

general, a habitat with between 5% and 15% canopy coverage of good woody cover is adequate, if it occurs in small, well distributed patches (no more than 200 yards between patches as discussed above).

Patches of residual grasses left over from the previous growing season can provide nesting cover. Individual patches should be at least 8 inches tall and 12 inches in diameter (the size of a cake pan). Ideally, there should be more than 250 well distributed clumps of suitable nesting cover per acre, or 1 clump every 15 to 20 steps. Too little nesting cover makes it easier for predators to find and destroy nests.

Habitat Management Recommendations:

A primary quail management objective is to maintain or create the mosaic of small thickets of low growing woody brush throughout a ranch, as described above in woody cover requirements. Thickets of sumac, briars, plums, blackberries, etc. should be retained and encouraged to form. Although not as desirable, small clumps of low growing cedars could have some value as cover where other species do not grow or are in short supply. Where vines have grown up into a tree leaving ground too open to serve as quail cover, the tree can be cut half through a few feet above ground and pushed over, bringing the living vines closer to the ground. In the western portion of the area, the trunks of multi-stemmed mesquites can be half-cut and pushed over so that the limbs touch the ground but continue to grow, forming small areas protected from cattle grazing/deer browsing. Half-cutting mesquite should be done during the early and middle parts of the growing season, not during the dormant season. The individual "skeletons" of large cut cedars can also form small areas protected from grazing/browsing where patches of herbaceous and woody plants suitable for cover can become established. The number of browsing animals on the range (combination of wildlife and domestic livestock) needs to be maintained at a level where browsing pressure on low growing woody cover is not excessive.

Another objective is to improve the amount and quality of herbaceous cover. A well-planned deferred-rotation livestock grazing system (as described in the Livestock Recommendations section) can be used to create the patchy pattern of lightly grazed areas interspersed among more heavily grazed areas needed for nesting cover.

Most good seed producing forbs are early successional stage annuals that respond to soil disturbance that sets back plant succession. Disking the soil is a good practice that encourages the growth of forbs and other annual plants. Disked strips should be long and meandering and 1 or 2 disc widths wide. The same strips can be disked annually, or side-by-side strips can be disked on an alternating basis every other year to create adjacent strips in various stages of succession. The best plant response will occur in areas of deeper sandy, sandy-loam soils. It is important that disced strips be located near escape cover so they are useable by quail. Disking can be done anytime between the first killing frost in the fall and the last frost in the spring, but the optimum time is near the end of winter (January, February) shortly before spring growth gets underway.

Heavy spot grazing by cattle, such as occurs around salt blocks, feed areas, and water, causes soil disturbance that encourages forb growth. Salt blocks and feeding areas should be moved around the ranch to create small patches of disturbed ground.

Managing the habitat for the production of native food plants and cover should be the primary management goal. Supplemental feeding and/or the planting of food plots are not a substitute for good habitat management. These practices should only be considered as "supplements" to the native habitat, not as "cure-alls" for low quality and/or poorly managed habitats. Food plots and feeders alone will not increase the number of quail a range can support if the supplies of other required habitat elements such as cover are limited.

Small food plots of seed producing plants including but not limited to millets, sorghum alum, and sorghum planted on deeper soils near cover can provide supplemental food sources during periods of extreme weather conditions. A limiting factor of supplemental food plots is sometimes an insufficient amount of rainfall received in western east Texas during the summer. During dry years when the production of native foods is limited and supplemental foods are most needed, supplemental plantings will also be failures. During good years when the production of native foods is adequate, supplemental plantings may do well, but are not as necessary. Also, these seeds do not normally last long into the fall and winter, due to normal fall rainfall. Another limiting factor is that most types of supplemental plantings will have to be protected from livestock grazing by fencing the plot or deferring the pasture.

Feeding can provide supplemental food during extreme weather conditions and help hold quail in an area. Broadcasting corn or sorghum by hand is one method of distributing supplemental feed. It can also be distributed from fixed feeders. An intensive feeding program would be one that provides 1 feeder per every 40 to 60 acres of quail habitat (feeders placed 440 to 540 yards apart in a grid pattern) so that every quail covey has access to several feeders. One feeder per 75 acres may be sufficient. As with all other types of food sources, feeders need to be located near escape and screening cover to be useable by quail. Some limitations of supplemental feeding are: they can be expensive and labor intensive, diseases and parasites can be spread at heavily used sites, predators learn to key on sites regularly used by quail, and, depending on the type of feeder used, they may have to be fenced from livestock.

Prescribed burning is a very effective, low-cost habitat management tool that can be used to enhance plant diversity by stimulating production of a variety of woody plants, forbs, and grasses. Burning can be used to remove rank stands of herbaceous vegetation and plant litter that hinder quail movements. Also, studies have shown that up to seven times more protein rich insects are present in burned areas compared to unburned areas.

In summary, food and all the different types of cover must be available year around and suitably arranged to have a good quail habitat. The number of quail a range can produce and support will be dependent on the habitat element that is most limited. In

other words, if cover is the limiting factor, increasing the amount of food beyond that needed for the number of quail that can be supported by the cover will not increase the range's quail carrying capacity, and vice versa.

See TPWD brochure 7000-37, Bobwhite Quail in Texas, Habitat Needs & Management Suggestions by A.S. Jackson, C. Holt, and D. W. Lay.

Notes: The same types of cover and seed producing forbs and supplemental food plants utilized by quail are also utilized by many other species of birds and mammals.

Appendix H

Specific Management Recommendations for Wild Turkeys



Eastern wild turkeys have been restocked or, are currently being restocked in most of the Pineywoods. Beginning in 1987, using wild-trapped birds from wild eastern turkey populations in the Eastern United States, an intensive restoration effort was begun to restore these native birds to eastern Texas where there was suitable habitat and annual rainfall exceeds 35 inches. This restocking program is currently (1996) in the later stages, but

hunnable populations exist only in Red River County where a spring season (gobblers only) was held in 1995.

Although turkeys are non-migratory resident species, they have large home ranges that change with the season of the year. Turkeys tend to be widely dispersed during the spring and summer nesting/brood-rearing period. Nesting and brood-rearing habitat is similar to that required for quail, but on a larger scale: scattered thickets of low growing brush, patchy residual herbaceous vegetation, a moderately grazed, diverse grass/forb plant community that produces seeds and insects.

After the breeding season, numerous smaller flocks that were widely dispersed during the summer tend to congregate into large winter flocks. The ranges of winter flocks are centered around riparian areas (the flood plains of large creeks and rivers) that have moderately dense stands of tall, full canopied trees. These winter flocks will disperse several miles from their riparian area roost sites on daily feeding forays. Turkeys are attracted to feeders (not recommended for eastern turkey) and supplemental food plantings provided for deer and quail. The availability of a food source, would determine to what extent turkeys are present during the winter months.

Habitat management for the wild turkey concerns the availability of water, food, and cover. The distribution of these key components of the range is of major importance. Turkeys require water daily and can obtain water from foods or free water (ponds, creeks, rivers, etc.) Grassy or brushy nesting and brood-rearing cover is probably the most important cover requirement. Food availability of the native range can be increased by the following activities: (1) Moderately stock the range with domestic

animals. (2) Utilize a deferred rotation system of grazing. (3) Control total deer numbers by harvesting does. (4) Proper timber management. (5) Prescribed burns can be utilized to control understory vegetation in forested areas, as well as increase production of forbs, grasses and fruit or mast producing browse plants. In summary, range management activities that increase the diversity of grasses, forbs, shrubs, trees, and vines improves the habitat for the wild turkey. These same management practices are also beneficial to deer, quail, and many other wildlife species.

Turkey also need escape cover to travel to and from roosting sites. Dense brush thickets or solid block clearing both furnish poor habitat for the turkey. Clearing programs that leave brush strips between cleared areas are advantageous. If clearing is needed to improve the range, irregular shaped cleared strips that follow topography are best.

Appendix I

Comments Concerning Federally Listed Endangered Species

The following information and management guidelines are from the 130 page book "Endangered and Threatened Animals of Texas - Their Life History and Management", by Linda Campbell. Published by the Texas Parks and Wildlife Press, Austin, Texas in 1995. Distributed by the University of Texas Press, Austin, Texas, and revised in 2003 as an electronic book available on the TPWD website at www.tpwd.state.tx.us.

Red-cockaded Woodpecker

Scientific Name: *Picoides borealis*
Federal Status: Endangered, 10/13/70 •
State Status: Endangered



Description

The Red-cockaded Woodpecker is an eight-inch long woodpecker with a solid black cap and nape, and prominent white cheek patches. The male has a tiny red streak behind the eye and near the ear (the cockade). The cockade is seldom visible in the field, making it difficult to distinguish males from females. The Red-cockaded Woodpecker is similar to the Downy and Hairy Woodpeckers in general appearance, except that it has a barred back, spotted breast, and the male has red on either side of the head rather than on the nape.

Habitat

The Red-cockaded Woodpecker is found in mature pine forests of east Texas and the southeastern United States. It is the only species of woodpecker that excavates its cavities exclusively in living pines. In Texas, cavities have been found in longleaf, loblolly, shortleaf, and slash pines.

Most cavities are found in trees 60 to 70 years of age or older. The tree must have enough heartwood (older, non-living, inner portion of wood) to contain the roosting chamber, since a chamber in sapwood (younger, living portion of wood) would fill with resin. Since heartwood is very hard, a large percentage of cavities are found in pines infected with a heart rot fungus called red heart. This fungus weakens the heartwood and makes cavity excavation easier.

A cluster is a stand of trees containing and surrounding the cavity trees in which a group of Red-cockaded Woodpeckers nest and roost. Preferred cluster sites are mature, park-like pine stands with 50 to 80 square feet of basal area per acre (about 90-145 trees averaging 10 inches in diameter). Ideally, clusters should have a grassy or herbaceous understory with few or no midstory hardwood or pine trees above 6 feet in height. Controlling midstory growth is especially

critical within 50 feet of all cavity trees. Once the midstory grows to the level of the cavities (20-50 feet above the ground), a high rate of cavity abandonment occurs. A few widely scattered hardwood trees and shrubs do not harm the woodpeckers and are beneficial to other wildlife. However, control of dense thicket-like midstory vegetation is essential to maintain the cluster site.

An important function of the cluster site is to provide a source of new cavity trees. Cavity trees are generally used for several years, but an average of 5% of loblolly and shortleaf, and 1% of longleaf pines die each year. Some causes of mortality include infestation by bark beetles, wind snap, and fire. Also, cavity enlargement by Pileated Woodpeckers often makes cavities unusable by the Red-cockaded Woodpecker. Clusters should be at least 10 acres in size, with 10-30 mature pines, to ensure cavity trees for the future.

The best cluster site will not be used if the foraging or food gathering habitat is not suitable. Red-cockaded Woodpeckers exhibit a distinct preference for large living pines as foraging sites. Good foraging habitat consists of pine stands with trees 10 inches and larger in diameter measured at 4.5 feet above the ground. These birds also forage in pole stands, consisting of pines 4 to 10 inches in diameter. However, little use is made of sapling stands, which contain pines less than 4 inches in diameter. Red-cockaded Woodpeckers are also known to actively seek and forage extensively on pines infested by southern pine beetles (bark beetles). The quality of the foraging habitat determines the amount needed to support a group of woodpeckers. While 125 acres of well-stocked (100-140, 10-inch or larger diameter trees per acre) mature pine is sufficient for some groups; where habitat conditions are less ideal, groups may require several hundred acres to meet their foraging needs.

Life History

The Red-cockaded Woodpecker has a complex social system. These birds live in groups, which usually have two to six birds, although as many as nine birds have been observed. The group may consist of only a mated pair; a mated pair with their current year's offspring; or a mated pair, their current year's offspring and helpers. These helpers are one to three year old adult birds, typically sons of one or both of the breeders. Helpers assist in incubating the eggs, feeding young, constructing new cavities, and defending the group's territory.

Although Red-cockaded Woodpecker groups may consist of a number of adult birds during the nesting season, there is only one mated pair. A breeding male may live for several years; and when he dies, one of his helper sons generally becomes the breeding male.

A woodpecker group roosts and nests in a cluster of cavity trees. The cluster may include 1 to 30 cavity trees. Most clusters have some cavities under construction, some completed and in use, and some abandoned, often occupied by competitors.

Generally, each member of a woodpecker group has its own cavity for roosting. Red-cockaded Woodpeckers defend their cavities from members of other groups and from other animals. Major competitors for nest cavities include other woodpeckers (Red-headed, Red-bellied, and Pileated) and flying squirrels. From an ecological perspective, the Red-cockaded Woodpecker is largely responsible for the majority of initiation and excavation of cavities within pine dominated forests of the southeast, and their abandoned cavities provide nesting and roosting cavities for a number of other animal species like screech owls.

Red-cockaded Woodpeckers nest from April through July. Group members assist with incubating the eggs during the day, and the breeding male stays with the eggs at night. The eggs hatch in 10 to 12 days. Young birds leave the nest in about 26 days, but remain with the group. Studies have shown higher nestling survival at nests attended by helpers.

The diet of the Red-cockaded Woodpecker consists mainly of insects (85%), but also includes small fruits and seeds (15%). The birds concentrate their search for food on the trunks and limbs of live pine trees. They scale the bark and dig into dead limbs for insects and larvae.

Compared to decayed wood, the sapwood and heartwood of a living pine is very hard and difficult to excavate. The average time required to excavate a cavity is 1 to 3 years for loblolly and shortleaf pine, and 4 to 7 years for longleaf. Once the sapwood is penetrated, the abundant resin flow that occurs creates another barrier. Most of the work on cavities occurs in summer after the young leave the nest. Cavity excavation occurs primarily in the morning, but can occur any time during the day. Once completed, a cavity is used for several years. Cavities in longleaf pine are sometimes used for 20 and even 30 years.

Cavities are constructed by tunneling at an upward slope through the sapwood so that the resin or pitch will drain from the hole. Once the birds have tunneled into the heartwood a sufficient distance, they excavate downward, forming a gourd-shaped chamber about 6 to 10 inches deep and 3 to 5 inches wide. Near the cavity entrance, numerous small holes called resin wells are chipped through the bark. The birds regularly peck at resin wells to keep resin flowing.

Red-cockaded Woodpeckers maintain open cavity holes by removing the growing tissue from around the holes. Eventually, the birds expose the sapwood for several inches around the entrance. This exposed area is called the plate. Pitch from the plate and resin wells coats the trunk of the cavity tree. The continuous flow of resin deters predators, especially snakes. Actively used trees have clear, sticky pitch, and freshly chipped, reddish bark around the resin wells and plate. These cavity trees, with resin flowing down their boles or trunks from the plate and resin wells, have an appearance similar to “melting candles” within the forest.

Threats and Reasons for Decline

The main threat to the survival of the Red-cockaded Woodpecker is the decrease in the quality and quantity of old growth pine forest nesting habitat, primarily due to short rotation (harvest cycle) timber management. Fire suppression has also been detrimental due to the importance of fire events in controlling the mid-story vegetation in Red-cockaded habitat. Additional research has shown that the well developed grassy-herbaceous plant under-story characteristic of fire-influenced ecosystems plays an important role in producing arthropod (spider) and insect populations utilized as food sources. Because of this bird’s requirement for older mature pines, habitat loss takes a long time to rectify. It may take 60 to 70 years to begin to provide suitable nesting habitat. Ideally, rotation ages of 100 years for loblolly, and 120 years or more for shortleaf and longleaf pine are needed to produce trees with the required amount of heartwood and frequency of red heart fungus.

Some of the potential adverse effects of current forest management practices on Red-cockaded Woodpecker habitat can include: (1) short timber rotations (25-45 years) result in loss of suitable nesting and roosting habitat, (2) leaving only cavity trees and cutting all others within a cluster reduces foraging habitat and does not allow for cavity tree replacement, (3) leaving isolated clusters surrounded by harvested areas reduces foraging habitat and may increase

predation by forcing birds to cross large open areas, (4) removing all dead and dying trees results in loss of habitat for other cavity-nesters, thereby increasing competition for Red-cockaded nest cavities, (5) preserving cavity trees and removing other dominant trees in a cluster makes the cavity tree the tallest in the area and subject to lightning strikes and wind damage, (6) careless use of pesticides may poison the birds directly or decrease their food supply below the minimum level needed for reproduction, and (7) noise and activity of logging operations in the vicinity of a cluster during the breeding season can disrupt nesting success.

Southern pine beetle infestations have been found to be a major cause of cavity tree loss in Texas. This is particularly true during southern pine beetle epidemics, such as the one that occurred on the Sam Houston National Forest in 1983 following hurricane Alicia. Active management is needed to reduce the loss of cavity trees and foraging habitat to southern pine beetles.

Another threat to Red-cockaded Woodpecker cavity trees is damage from meteorological events like hurricanes, tornadoes and sheer winds. A large-scale sheer wind event that occurred in February, 1998, on the Sabine National Forest resulted in loss of the majority of cavity trees. Cooperative efforts to install artificial cavity inserts to replace lost cavity trees were initiated immediately to conserve the Red-cockaded Woodpecker groups, and this effort was highly successful. However, this event reinforces the need to conserve and increase the number of groups across the region, and throughout the range of the species.

In 2002, there were 342 known active Red-cockaded Woodpecker clusters in east Texas, including 277 (81%) on National Forests, 19 (5.5%) on state lands, 29 (8.5%) on forest products company lands, and 17 (5%) on non-industrial private landowner properties. These clusters were distributed within 15 counties of the Pineywoods Region of eastern Texas.

Recovery Efforts

Despite the problems facing the Red-cockaded Woodpecker, recovery efforts are proceeding on federal, state and private properties in Texas. There are a number of management strategies that have been implemented since the first edition of this publication that are contributing significantly to the recovery of this species within eastern Texas, and across the West Gulf Coastal Plain.

As shown above, the majority of the known Red-cockaded Woodpecker clusters within eastern Texas occur on federal lands within the National Forests of Texas; including the Angelina, Davy Crockett, Sabine and Sam Houston National Forests. Under the recently revised (January, 2003) U.S. Fish and Wildlife Service Red-cockaded Woodpecker Recovery Plan, the Red-cockaded Woodpecker population on the Sam Houston National Forest has been designated as a Recovery Population in the Upper West Gulf Coastal Plain. The Angelina and Sabine National Forest populations are functionally one population, and have been designated as such under the plan as a Recovery Population in the West Gulf Coastal Plain. The Davy Crockett National Forest population has been designated in the plan as a Support Population in the West Gulf Coastal Plain. In 1996, the National Forests in Texas designated over 288,000 acres as a Habitat Management Area (HMA) to provide for recovery of this species and its ecosystem in the West Gulf and Upper West Gulf Coastal Plain of Texas. The overall established population goal for these lands is 1,385 active clusters with goals of 541 clusters on the Sam Houston, 514 on the Angelina/Sabine, and 330 on the Davy Crockett National Forests.

There are currently three state properties with active Red-cockaded Woodpecker clusters in east Texas. The Texas Forest Service manages populations on the W. Goodrich Jones State Forest near Conroe, Texas, and on the I.D. Fairchild State Forest near Rusk, Texas. There is an active group as well on the Sam Houston State University Biological Research Facility near Huntsville, Texas. Red-cockaded Woodpecker groups from the W. Goodrich Jones State Forest and The Sam Houston State Biological Research Facility contributes to, or is functionally part of the overall Sam Houston National Forest Recovery Population.

The remaining Red-cockaded Woodpecker groups within the region occur on private property; forest products corporation lands, and non-industrial private forest landowner properties. State and federal agencies are working cooperatively with these private landowners to conserve existing Red-cockaded Woodpecker groups and their nesting and foraging habitats, and to restore native ecosystems beneficial to the species across the Pineywoods landscape of east Texas.

A cooperative effort was initiated in 1994 to develop a strategy for the management of Red-cockaded Woodpecker populations on private properties within the Pineywoods of eastern Texas. This effort involved federal and state biologists and resource managers, forest product corporation biologists and resource managers, non-corporate private landowners and land managers, conservation organizations, and university academicians. These entities were divided into two working groups, a steering committee and a scientific advisory board. The work of these diverse individuals resulted in the development of a Regional Habitat Conservation Plan for Redcockaded Woodpecker in the East Texas Pineywoods (Regional RCWHCP). A Section 10(a)(1)(B) incidental take permit was issued jointly to the Texas Parks and Wildlife Department and the Texas Forest Service by the U.S. Fish and Wildlife Service on February 20, 1998.

The basic concept of the Texas Regional RCW-HCP, is that cooperating landowners properties are surveyed for existing RCW groups, and then a baseline responsibility is established to maintain the number of existing RCW clusters occurring on the private property at the time of survey. The private landowner then develops a Conservation Agreement with the State to manage existing, or baseline RCW groups, and their necessary nesting and foraging habitat into the future. The benefit to the RCW groups on these properties is easily understood, and the existing number of RCW groups is conserved for the future. The primary benefit to the private landowner, who is already responsible for management of existing RCW groups on their property under the Endangered Species Act, is that the establishment of a baseline condition provides certainty for future land management. By working cooperatively with the State, and through the use of modern technology used in RCW management, forest management objectives and RCW conservation objectives can be integrated. This integrated management provides a “win-win” situation for the landowner and the RCW groups. In addition, landowners enrolled in the program can produce “RCW-friendly” pine forest habitat without the fear of loss of control of the property.

The first two landowners within the State to enroll in the Regional RCW-HCP were Champion International Corporation (1,038,000 acres), and Temple-Inland Forest Products Corporation (1,247,260 acres). These companies enrolled jointly in the program in March, 1999. Temple-Inland established a baseline of 14 RCW groups and designated 3,000 acres specifically for RCW at its Scrappin’ Valley Habitat Management Area in Newton County, Texas. Champion established a baseline of 4 RCW groups and designated 2,000 acres specifically for RCW at its Brushy Creek Experimental Forest. Temple-Inland has actually performed significant RCW

management actions at Scrappin' Valley, and corporately has RCW groups that are presently in excess of their baseline condition. Champion International subsequently sold their properties to International Paper Company, and International Paper assumed their obligations under the Regional RCW-HCP. Subsequently, and presently, International Paper is divesting itself of a number of properties within Texas. The RCW Habitat Management Area at Brushy Creek Experimental Forest has been assumed by the Heartwood Forestland Fund IV Investment Group, and they have assumed baseline responsibilities under the Regional RCW-HCP. Currently active RCW management tasks are being performed there, and current RCW groups exceed the original baseline initially established by Champion International. Both of the RCW Habitat Management Areas previously discussed provide habitat linkages or corridors across the landscape to existing RCW population centers on National Forest and State Forest lands.

In addition, to these corporate properties, there are presently 17 non-industrial private forest landowners enrolled in the Regional RCW-HCP. These landowners have a combined total of 8,477 acres enrolled in the program, with a combined baseline of 14 groups. One of these properties enrolled, Cook's Branch Conservancy in Montgomery County, Texas, contains approximately 5,600 acres of mature pine forest habitat, and has a baseline of 13 active RCW groups. In addition to providing habitat linkages or corridors to existing RCW population centers, this property contains the largest number of active RCW groups on a non-industrial private forest west of the Mississippi River. This landowner's overall goal is conservation of the RCW and the natural ecology of the property. Their management plan includes active forest management, wildlife management and recreation management. This property was awarded a Texas Lone Star Land Steward Award for its efforts.

Most of these non-industrial forest landowners have RCW baseline conditions of 0 (zero), but have properties in close proximity to existing RCW core populations. Enrollment in the program will encourage these landowners, through active forest management, to produce suitable nesting and foraging habitat for RCW, and could prevent a number of them from taking their properties out of forest production resulting in significant loss of critical RCW foraging habitat near RCW population centers. The cooperative atmosphere between RCW biologists and landowners will enhance adaptive management strategies to utilize any RCW groups that may occur on these lands with baseline conditions of 0 (zero). Ultimately, these landowner's maintain control of these properties in their baseline condition, and any further provisions for RCW on their part are voluntary.

Overall Red-cockaded Woodpecker populations across the region are mostly stable or increasing as a result of active management through habitat improvements (removal of mid-story vegetation, and prescribed burning), insertion of artificial cavity inserts (nest boxes placed on the inside of the tree), and relocation strategies known as augmentations or translocations. These relocation strategies involve moving young females or males to single bird clusters or pairs to established recruitment clusters in suitable habitat in an effort to conserve existing clusters and to start new clusters. Recent techniques such as artificial cavities and augmentation are helping to prolong the useful life of some cavities, to create man-made cavities where suitable natural cavities are limited, and to address short-term problems of isolation and fragmentation. Texas participates in an annual interstate effort known as the West Gulf Coastal Plain RCW Augmentation/Translocation Cooperative with the states of Arkansas, Louisiana and Oklahoma. The purpose of this effort is to increase RCW populations, and ultimately recover all RCW populations west of the Mississippi River.

State and federal agencies are working with private landowners interested in developing Red-

cockaded woodpecker conservation and habitat management plans for their property. Conservation planning and habitat management, providing information to landowners and the public, and monitoring woodpecker populations are all important parts of the recovery process. In addition to these tasks, both the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service are providing monetary incentives to private landowners that are managing properties for RCW. The Department has a program entitled the Landowner Incentive Program, and the Service has a program entitled Partners for Wildlife that provide challenge cost-share grants to landowners in the performance of management for habitats of rare species like the RCW, and native ecosystems that are in decline.

Where To See Red-cockaded Woodpeckers

A number of state and federal properties offer opportunities to see and learn more about Red-cockaded Woodpeckers. These include the Alabama Creek, Bannister, and Moore Plantation Wildlife Management Areas; the W. Goodrich Jones and I.D. Fairchild State Forests; the Angelina, Davy Crockett, Sabine and Sam Houston National Forests.

How You Can Help

There are a number of things that you can do to help with conservation of the Red-cockaded Woodpecker in eastern Texas. First, if you own mature pine, and pine-hardwood forests in eastern Texas, you can consider forest management strategies that promote the mature forest conditions preferred by this rare species. In managing these forests, strategies that promote open, “park-like” forest conditions like thinning and prescribed burning will provide habitat. The importance of fire events in the ecology of the upland pine ecosystem of Texas, particularly in the herbaceous/grassy layer of the under-story in these forests, is paramount in restoration and conservation of this ecosystem. In addition, forest landowners within the habitat of the RCW, can take advantage of the Regional RCW-HCP, the Landowner Incentive Program and the Partners for Wildlife Programs, for assistance in management of these upland pine habitats.

Conservation organizations in Texas also welcome your participation and support. Finally, you can encourage and support private landowners who are managing their land to protect endangered species and their habitat.

For More Information Contact

Texas Parks and Wildlife Department
Wildlife Diversity Program
4200 Smith School Road
Austin, Texas 78744
(512) 912-7011 or (800) 792-1112

or

Texas Parks and Wildlife Department
Regional Wildlife Diversity Biologist
P.O. Box 4655, SFA Station
Nacogdoches, Texas 75962
(936) 564-0234

or

U.S. Fish and Wildlife Service
Ecological Services Field Office
10711 Burnet Road, Suite 200

Austin, Texas 78758
(512) 490-0057

or

U.S. Fish and Wildlife Service
East Texas Field Office
701 N. First Street
Lufkin, Texas 75901
(936) 639-8546

Management guidelines are available from the Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service for landowners and managers wishing to manage timberlands to benefit the Red-cockaded Woodpecker.

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Management Guidelines for the Red-cockaded Woodpecker

Landowners with Red-cockaded Woodpeckers can implement management practices that enhance survival, regardless of the size of their property. However, because these birds forage over large areas, forest conditions on adjacent land may ultimately determine the fate of the birds. On larger tracts, particularly those 200 acres or larger, these birds can be maintained with greater assurance. Successful management for Red-cockaded Woodpeckers must do five things: (1) retain existing cavity trees, (2) provide trees for new cavities, (3) provide adequate foraging habitat, (4) control hardwood and pine mid-story in the cluster site, and (5) provide for future cluster sites.

Cluster Site

Do not remove or damage active cavity trees. Selective cutting within cluster sites can be used to maintain the desired basal area. However, thinning within a cluster site should not be done if stocking is below 50 square feet of basal area per acre of stems 10 inches DBH or larger. Also, all potential cavity trees (older, relict pines) within the cluster should be retained for replacement cavities. Do not isolate cluster sites from foraging areas of pines 4 inches or greater in diameter.

Burning or otherwise treating cluster areas to control mid-story vegetation is vital. Do not allow mid-story to exceed 6 feet in height, especially within 50 feet of the cavity trees. In cluster sites lacking past hardwood control, the fuel load may be too great to burn without destroying the cavity trees. In these cases, it may be necessary to remove them by cutting or use of herbicide. Raking to remove mulch at the base of cavity trees is also helpful in preventing fire damage. Regular, periodic prescribed burning should be implemented to control mid-story growth and maintain the open forest preferred by the birds.

Pine stands surrounding cluster sites should be thinned to 50 to 80 square feet of basal area per acre. Maintain groups of larger pines (10 to 12 inches or larger DBH) within the surrounding forest for future cluster sites. Leave some dead and abandoned cavity trees of both pine and hardwood for other cavity nesters, to reduce competition for the Red-cockaded cavities. Maintain a spacing of 20 to 25 feet between trees to maintain stand vigor and minimize the probability of southern pine beetle infestation and spread.

Foraging Area

Provide adequate foraging habitat to support existing clusters and to facilitate establishment of new territories. A minimum of 3,000 square feet of pine basal area (10-inch DBH or larger) should be provided on at least 60 acres and up to 300 acres for each active cluster. Avoid

isolating cluster sites from foraging areas. Most of the foraging acreage should be adjacent to (within 300 ft.) or within 1/4 mile of the cluster site. Thin sapling and pole stands to improve diameter growth and open the pine stand to a condition more favorable for the woodpecker. Prescribe burn for hardwood control. When regenerating stands, plant pines at 10x10 or 12x12 foot spacing to encourage rapid stand development. Use natural regeneration, such as seed tree, shelterwood, and group selection to develop an open park-like stand of pines. Favor longleaf pine over loblolly and shortleaf whenever possible.

Rotation Age

Generally, the longer the rotation age, the greater the opportunity the Red-cockaded Woodpecker has to maintain existing clusters and to create new ones. Rotation cycles of 80 to 120 years are encouraged. When it is not feasible to have long rotations over the entire ownership, setting aside smaller acreages of older pines will benefit the bird. Also, leaving old-growth remnant groups of trees well distributed throughout younger stands, and maintaining small remnant stands or patches of old-growth pines throughout the forest are helpful.

For More Information Contact

For detailed timber management guidelines, private landowners are referred to the U.S. Fish and Wildlife Service, Draft Red-cockaded Woodpecker Procedures Manual for Private Lands, by Ralph Costa. A number of management options are available for landowners with Red-cockaded Woodpeckers on their land. Contact the Texas Parks and Wildlife Department at (800) 792-1112 (Austin), (512) 912-7011 (Austin), or (409) 564-7145 (Nacogdoches); or the U.S. Fish and Wildlife Service at (409) 639-8546 (Lufkin) for more information.

Bald Eagle

Scientific Name: *Haliaeetus leucocephalus*

Federal Status: Threatened • State Status: Threatened

Description

The Bald Eagle is one of nature's most impressive birds of prey. Males generally measure 3 feet from head to tail, weigh 7 to 10 pounds, and have a wingspan of 6 to 7 feet. Females are larger, some reaching 14 pounds with a wingspan of up to 8 feet. Adults have a white head, neck, and tail and a large yellow bill. First year birds are mostly dark and can be confused with immature Golden Eagles. Immature Bald Eagles have blotchy white on the under wing and tail, compared with the more sharply defined white pattern of Golden Eagles. While gliding or soaring, Bald Eagles keep their wings flat, and their wing beats are slow and smooth. In contrast, Turkey Vultures soar with uplifted wings, and they fly with quick, choppy wing beats. Bald Eagles require 4 or 5 years to reach full adult plumage, with distinctive white head and tail feathers.



Distribution and Habitat

The Bald Eagle, our National Symbol, occurs throughout the United States, Canada, and northern Mexico. Bald Eagles are present year-round throughout Texas as spring and fall migrants, breeders, or winter residents. The Bald Eagle population in Texas is divided into two populations; breeding birds and nonbreeding or wintering birds. Breeding populations occur primarily in the eastern half of the state and along coastal counties from Rockport to Houston. Nonbreeding or wintering populations are located primarily in the Panhandle, Central, and East Texas, and in other areas of suitable habitat throughout the state.

The Bald Eagle in Texas formerly nested in the Panhandle, throughout East Texas, and at localized sites in central Texas. Populations declined throughout the lower 48 states during the 1900's with habitat destruction and use of pesticides detrimental to the species. Nesting populations are now increasing in most areas of the country. Active nests in Texas increased from 13 in 1982 to 117 in 2003. Breeding territories are located mostly along rivers and near reservoirs in East Texas, the Post Oak region, and the Gulf Coast. The nesting near reservoirs by Bald Eagles is a rather recent event, since this habitat type was not available to eagles historically. As of 2003, Bald Eagle nests are known to occur in Angelina, Austin, Bastrop, Bell, Bosque, Brazoria, Burlison, Calhoun, Cass, Chambers, Colorado, Fayette, Fort Bend, Freestone, Goliad, Grimes, Harris, Henderson, Jackson, Jasper, Kaufman, Lavaca, Liberty, Limestone, Llano, Marion, Matagorda, Montgomery, Nacogdoches, Navarro, Navasota, Newton, Panola, Polk, Refugio, Robertson, Rusk, Sabine, San Augustine, San Jacinto, Shelby, Smith, Trinity, Victoria, Walker, Wharton, and Wood counties.

In Texas, Bald Eagles nest in areas along river systems, reservoirs or lake shores with large, tall

(40- 120 ft.) trees for nesting and roosting. Nests are usually located within 1 mile of water, such as lakes, reservoirs, creeks or rivers, and are often located in the ecotone or edge between forest and marsh or water. Bald Eagles often build their nests in the tallest trees in an area, providing an unobstructed view and flight path to the nest. Nests are built in a variety of tree species. Eagles nest primarily in loblolly pine in East Texas.

Throughout the rest of its Texas breeding range, nests are found in a variety of trees, including bald cypress, water oak, live oak, American elm, cottonwood, sycamore, and pecan. Open water or wetland areas located within approximately 1 mile of nesting habitat are needed to provide feeding areas.

Most of the Bald Eagles seen in Texas breed in the northern states and spend the winter (December through March) in Texas. Wintering populations may occur statewide, but generally are found near large lakes and reservoirs, such as Lake Meredith, Buffalo Lake, Lake Texoma, Wright-Patman Lake, Lake O' the Pines, Lake Fork, Lake Tawakoni, Lake Whitney, Lake Fairfield, Toledo Bend Reservoir, Sam Rayburn Reservoir, Lake Livingston, Lake Conroe, Lake Buchanan, Lake Cooper, Lake Palestine, Lake Pat Mayse, Lake Warren, and Palo Duro Lake, or in the rice growing region hunting waterfowl.

Bald Eagle wintering habitat is characterized by abundant, readily available food sources. Most wintering areas are associated with open water or waterfowl concentration areas, where eagles feed on fish or waterfowl. Wintering populations are also found on rangelands of the Davis Mountains, western Edwards Plateau, and the Panhandle, where eagles may take rabbits and feed on carrion.

The availability of night roost sites is often an important characteristic of wintering habitat. Bald Eagles may roost singly or in groups, and the same roosts are used from year to year. Roost trees are usually the oldest and largest trees in an area, and most have large horizontal limbs and open branching that allows plenty of room for takeoff and landing. Eagles generally choose roosts that allow unobstructed visibility to the surrounding areas, with a minimum of human activity in the immediate vicinity. Roost sites are often located near water, but eagles also roost on windbreaks and in secluded canyons well away from water.

Life History

Bald Eagles are opportunistic predators. They feed primarily on fish, but also eat a variety of waterfowl and other birds, small mammals, and turtles, when these foods are readily available. Carrion is also common in the diet, particularly in younger birds. Bottom-dwelling fish tend to occur more frequently in the diet. It is thought that the downward visual orientation of bottom-feeding fish makes them more vulnerable to eagle attacks than surface sight-feeders, which are more aware of movements from above. Eagles capture fish by extending their talons a few inches below the water's surface. Therefore, live fish are vulnerable only when near the surface or in shallows. Studies in Texas have shown that eagles commonly eat coots, catfish, rough fish, and soft-shell turtles.

In Texas, Bald Eagles nest from October to July. Nests are constructed primarily by the female, with the male assisting. The typical nest is constructed of large sticks, with softer materials such as leaves, grass, and Spanish moss used as nest lining. Nests are typically used for a number of years, with the birds adding nest material every year. Bald Eagle nests are often very large, measuring up to 6 feet in width and weighing hundreds of pounds. Eagles often have one or

more alternative nests within their territories.

Peak egg-laying occurs in December, with hatching primarily in January. The female lays a clutch of 1 to 3 eggs, but the usual clutch is 2 eggs. A second clutch may be laid if the first is lost. Incubation begins when the first egg is laid and usually lasts 34 to 36 days. The young generally fledge (fly from the nest) in 11 to 12 weeks, but the adults continue to feed them for another 4 to 6 weeks while they learn to hunt. When they are on their own, young Bald Eagles migrate northward out of Texas, returning by September or October.

Nest surveys in Texas from 1981-2003 have shown that greater than 80% of the active nesting territories successfully produced young, with production averaging greater than 1 young per active nest found. Studies show that at least 70% of the juveniles survive their first year. Causes of first year mortality include disease, lack of food, inclement weather, and human interference. Bald Eagles reach sexual maturity at 4 to 6 years of age; however, they have been known to successfully breed at 3 years. They are monogamous and are believed to mate for life; however, if one of the pair dies, the surviving bird will accept another mate. Bald Eagles are believed to live up to 30 years or more in the wild.

Threats and Reasons for Decline

Habitat loss over the past 200 years is the factor most consistently associated with declines in Bald Eagle populations. Unfortunately for eagles, people also like to live and spend their leisure time near water. In recent decades, the accelerated pace of development along the coast and near inland rivers and waterways is a primary cause of habitat loss. There are, however, encouraging signs in Texas that a significant amount of new habitat has been created in the form of man-made reservoirs. Most reservoirs in eastern Texas, especially those bordered by national forests, are used by nesting eagles, and are also used to some degree by wintering birds. Hopefully, if human disturbance is kept to a minimum, a redistribution of nesting to reservoirs may offset some habitat loss in other areas. Shooting has long been recognized as a major human-caused factor in the decline of Bald Eagles. Although primarily fish and carrion eaters, eagles were thought to be a major threat to chickens, livestock, and game animals. As a consequence, many were killed by farmers, ranchers, and hunters. In 1940, Congress passed the Bald Eagle Protection Act, which made it illegal to shoot or harass eagles. In 1969, Bald Eagles gained further legal protection under federal endangered species laws. With heightened public awareness and sensitivity to the plight of the Bald Eagle, coupled with strict laws, shooting mortality has declined from 62% of total reported deaths from 1961-1965 to 18% from 1975-1981. Although this downward trend is encouraging, shooting mortality could still be a limiting factor, particularly in remote areas.

Human disturbance can also be a cause of population decline. Activities such as logging, oil exploration and extraction, construction, and recreational activity certainly do disturb eagles in some instances. However, the impact of these disturbances is highly variable, depending on the activity, its frequency and duration, its proximity to areas used by eagles, the extent to which the activity modifies the habitat or its use, and timing in relation to the reproductive cycle. Also, some birds are more tolerant of disturbance than others, with adults generally less tolerant than immature birds. Despite this variability, disturbance near nests has caused nesting failures.

Finally, the most dramatic declines in Bald Eagle populations nationwide resulted from environmental contaminants. Beginning in 1947, reproductive success in many areas of the country declined sharply, and remained at very low levels through the early 1970's. After several

years of study, the low reproduction of Bald Eagles and many other birds was linked to widespread use of the insecticides DDT and Dieldren. These insecticides were used extensively in agriculture and forestry beginning in 1947. As DDT entered watersheds, it became part of the aquatic food chain, and was stored as DDE in the fatty tissue of fish and waterfowl. As eagles and other birds of prey fed on these animals, they accumulated DDE in their systems. Although occasionally causing death, DDE mainly affected reproduction. Some birds affected by the chemical failed to lay eggs, and many produced thin eggshells that broke during incubation. Eggs that did not break were often addled or contained dead embryos, and the young that hatched often died. Dieldren killed eagles directly rather than causing thin eggshells, but compared to DDT, Dieldren was probably not as important in overall Bald Eagle declines. In 1972, the EPA banned the use of DDT in the United States. Since the ban, DDE residues in Bald Eagle eggshells have dropped significantly, and a slow recovery of eagle productivity has occurred. Most populations appear to be producing chicks at the expected rate.

Of more recent concern is evidence that lead poisoning may be a significant cause of death in eagles. Chronic low levels of lead can produce nervous system disorders, affect behavior and learning, cause anemia, and increase susceptibility to disease. As laws requiring the use of steel shot to hunt waterfowl become effective, accumulation of lead in the food chain is expected to decline.

Since 1981, Texas Parks and Wildlife Department has conducted extensive aerial surveys to monitor Bald Eagle nesting activity. The 2003 survey identified 117 active nests which fledged at least 144 young. This compares with only 7 known nest sites in 1971. Midwinter Bald Eagle counts coordinated by TPWD and conducted by birding enthusiasts throughout the state reported 325 eagles in 2002. From 1986-1989, midwinter counts averaged less than 15 Bald Eagles per survey site. Since 1990, the average number of eagles per survey site has increased to 18. These numbers show encouraging trends for Texas. With continued vigilance, protection, and informed management, today's Texans can insure that future generations will have the opportunity to enjoy the sight of our majestic national symbol – the only eagle unique to North America.

Recovery Efforts

During the 1970's and 1980's, major efforts were directed toward captive breeding and reintroducing young birds into the wild. A total of 124 Bald Eagles were hatched at the Patuxent Wildlife Research Center in Maryland from 1976-1988. These captive-hatched eaglets were an important source for restocking wild populations. One successful reintroduction program placed young eaglets in the nests of adults whose own eggs were infertile or failed to hatch. The "foster" parents readily adopted the chicks and raised them as their own.

Another method, called "hacking" places young birds on man-made towers in suitable habitat where populations are low. The nestlings are kept in an enclosure and fed by humans that stay out of sight. When they are able to fly, the enclosure is opened and the birds are free to leave. Food is still provided at the release site until no longer used or needed by the young birds. Hacking has been used very successfully in at least 11 states.

In Texas, the greatest challenge for the future will be to prevent further destruction of habitat and retention of sufficient creek and river flows to support a food base for breeding and wintering eagles. The Texas Parks and Wildlife Department, in cooperation with landowners, other agencies and conservation groups, is continuing to monitor breeding and wintering Bald

Eagle populations. Monitoring of nesting success is particularly important in detecting any problems associated with contaminants in the environment. Finally, appropriate management of nesting, feeding, loafing, and wintering habitat must be a priority if we are to maintain the current upward trend in Bald Eagle numbers in Texas.

Where To See Bald Eagles

There are a number of State Parks where visitors have the opportunity to see and learn more about Bald Eagles. These include Lake Brownwood, Lake Livingston, Lake Texana, Lake Whitney, and Possum Kingdom State Parks. The Vanishing Texas Rivers Cruise, a privately operated excursion boat, also provides visitors with excellent opportunities to see wintering eagles on Lake Buchanan in Burnet and Llano Counties. Because the Bald Eagle is a protected species and sensitive to human disturbance, birders and other observers should carefully follow certain viewing ethics. Recorded calls of prey species should not be used to attract birds. Also, observers should be careful not to approach too closely or otherwise disturb or stress birds.

How You Can Help

If you see a Bald Eagle nest, remember that eagles are vulnerable to disturbance throughout the nesting period (October to July in Texas), and are easily disturbed particularly during the first 12 weeks of nesting activity. Observers should remain a safe distance away from the nest (at least 750 feet) and keep noise and other human impacts to a minimum. Private landowners are encouraged to report new Bald Eagle nests to Texas Parks and Wildlife Department.

You can be involved in the conservation of Texas' nongame wildlife resources by supporting the Special Nongame and Endangered Species Conservation Fund. Special nongame stamps and decals are available at Texas Parks and Wildlife Department (TPWD) Field Offices, most State Parks, and the License Branch of TPWD headquarters in Austin. Conservation organizations in Texas also welcome your participation and support. Finally, you can encourage and support private landowners who are minimizing nest disturbance and managing their land to protect Bald Eagle habitat.

For More Information Contact

Texas Parks and Wildlife Department
Wildlife Diversity Branch
4200 Smith School Road
Austin, Texas 78744
(512) 912-7011 or (800) 792-1112

or

U.S. Fish and Wildlife Service
Ecological Services Field Office
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057

Management guidelines are available from Texas Parks and Wildlife Department or the U.S. Fish and Wildlife Service for landowners wishing to protect and manage Bald Eagle habitat.

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Habitat Management Guidelines for Bald Eagles in Texas

The following guidelines were developed to help landowners and managers maintain or improve their land for the benefit of the Bald Eagle. Information is also provided so that landowners may recognize and avoid or minimize human-related disturbance to eagles, particularly nesting pairs.

Nesting Habitat

The protection of an actual nest is important, but so is protection of the nest area and all the surrounding habitat factors that attracted the nesting pair to the area. Once the eagles establish a suitable breeding territory, they will return to the same area year after year, often using several nests within the territory during different years. When a given nest or the tree that it is in falls, a pair generally returns to the same territory to begin another nest. If one member of a pair dies, the nest may go unused for several years and then be recolonized by the surviving member returning with a new mate. Nesting territories can even be inherited by offspring. Therefore, protection of nesting territories should apply to "abandoned" nests for at least five consecutive years of documented nonuse.



The following habitat management guidelines are based on two management zones surrounding each nest site, with certain restrictions recommended for each zone.

Primary Management Zone For Nest Sites

This zone includes an area extending 750 to 1,500 feet outward in all directions from the nest site. It is recommended that the following activities not occur within this zone:

1. Habitat alteration or change in land use, such as would result from residential, commercial, or industrial development; construction projects; or mining operations.
2. Tree cutting, logging, or removal of trees, either living or dead.
3. Use of chemicals labeled as toxic to fish and wildlife.
4. Placement of above-ground electrical transmission or distribution lines. Since collision with powerlines and electrocution on powerline structures remain an important cause of death, placement of underground lines is recommended near Bald Eagle nests and winter concentration sites.
5. Helicopter or fixed-wing aircraft operation within 500 feet vertical distance or 1,000 feet horizontal distance of the nest site during the nesting season (October-July).
6. Activities which create minimal disturbance, such as hiking, fishing, camping, and bird-watching can be carried out safely during the nonnesting season if there is no physical alteration of the habitat within the zone. Traditional farming, ranching, and hunting activities which are existing practices and have occurred historically on the site can be carried out safely during the non-nesting season as long as habitat alteration is avoided.

Human presence within this zone should be minimized during the nesting season, especially during the early nesting period from October- April. Traditional agricultural activities and low impact recreational activities are generally not a problem even during the nesting season as long as they do not appear to be adversely affecting nesting success, there is no increase in the level of disturbance from historic levels, and physical alteration of the habitat is avoided. However, activities of any kind should be stopped if it becomes apparent that the birds are suffering from disturbance. The key point is whether the activities keep the breeding birds away from the nest, eggs, or young for extended periods of time. If they do, they are harmful. In general, it is important to protect the nest from human disturbance during very hot or very cold weather, since the parents' absence at these times can be particularly deadly for the eggs or young.

Secondary Management Zone For Nest Sites

This zone encompasses an area extending outward from the primary zone an additional 750 feet to 1 mile. Recommended restrictions in this zone are intended to protect the integrity of the primary zone and to protect important feeding areas, including the eagle's access to these areas. The following activities are likely to be detrimental to Bald Eagles at any time, and in most cases should be avoided within the secondary zone:

1. Development of new commercial or industrial sites.
2. Construction of multi-story buildings or high-density housing developments between the nest and the eagle's feeding area.
3. Placement of electrical transmission or distribution lines between the nest site and the eagle's feeding area.
4. Construction of new roads, trails, canals, or rights-of-way which would tend to facilitate human access to the eagle nest.
5. Use of chemicals labeled as toxic to wildlife.

Certain activities that involve only minimal alteration or disturbance to the habitat can be carried out safely in the secondary zone during the non-nesting season. Examples of these activities include: minor logging or land clearing, minor construction, seismographic exploration employing explosives, oil well drilling, and low-level aircraft operation. However, these activities should avoid major alteration or loss of Bald Eagle habitat as much as possible. If logging is

done, it is best to retain as many large trees as possible for roost and perch trees. Retention of at least 10 to 15 live trees per acre is suggested. Ideally, the trees left uncut should be the largest in the stand, preferably those with open crowns and stout lateral limbs. Selective forestry practices such as seedtree, shelterwood, and single tree selection are recommended over clear-cutting.

Minimal disturbance recreational activities (hiking, fishing, camping, picnicking, bird-watching, hunting) and everyday farming and ranching activities that cause no new alteration of habitat can be safely carried out in the secondary zone at any time.

Feeding Areas

The use of toxic chemicals in watersheds and rivers where Bald Eagles feed should be avoided as much as possible. Where agricultural herbicides and pesticides are used within the watershed, label directions should be strictly followed, including those describing proper disposal of rinse water and containers. Alteration of natural shorelines where Bald Eagles feed should be avoided or minimized as much as possible. Degraded or eroded shorelines should be revegetated whenever possible.

Winter Roost Concentration Areas

Logging or land clearing activity should be avoided within 1,500 feet of a roosting concentration area. Disruptive, noisy, or out-of-the-ordinary land use activities should be avoided near communal roost sites. Normal agricultural activities which have occurred traditionally on the land are generally acceptable near these roost sites as long as they do not appear to be affecting roosting eagles. However, it is best to avoid even normal activities during evening, night, and early morning hours.

For More Information

Landowners and managers can contact the Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, U.S. Natural Resources Conservation Service (formerly Soil Conservation Service), or Texas Agricultural Extension Service for technical assistance in managing habitat and protecting Bald Eagle nest sites.

Louisiana Black Bear

Scientific Name: *Ursus americanus luteolus*

Federal Status: Endangered, 2/17/92• State Status: Threatened

Description

The Louisiana Black Bear is one of 16 currently recognized subspecies of American Black Bear. This subspecies is a large, bulky mammal with long black hair and a short, well-haired tail. The facial profile is rather blunt, the eyes small, and the nose pad broad with large nostrils. The muzzle is yellowish-brown with a white patch sometimes present on the lower throat and chest. There are five toes with short, curved claws on the front and hind feet. Adult males may weigh 300 to 400 pounds or more, and adult females 120 to over 180 pounds. Body length of adults ranges from 4 to 7 feet.



Louisiana black bear skulls, when contrasted with other black bear skulls, are relatively long, narrow, and flat, and have proportionately large molar teeth.

Distribution and Habitat

The Louisiana Black Bear was once a common inhabitant of forested regions of eastern Texas, Louisiana and Mississippi. According to the U. S. Fish and Wildlife Service Recovery Plan for the species (1995), the Louisiana Black Bear occurred in all Texas counties east of and including Cass, Marion, Harrison, Upshur, Rusk, Cherokee, Anderson, Leon, Robertson, Burleson, Washington, Lavaca, Victoria, and Refugio.

According to survey work by Bailey in 1905, black bears were considered as being rare throughout Texas at the beginning of the twentieth century. Their last strongholds in eastern Texas were in the swamps and thickets of the Big Thicket Region of southeast Texas. According to Schmidly (1983) the majority of the final remaining bears were exterminated from this area during the period between 1900, to 1940.

Presently the Louisiana black bear primarily occurs within the boundaries of the state of Louisiana. The largest concentrations are in the Atchafalaya and Tensas River Basins. There are occasional movements, primarily of solitary juvenile males, into western Mississippi, and eastern Texas. A resident breeding population does not currently exist in Mississippi or eastern Texas; however this could occur at some point in the future. Some professionals think that this subspecies may also occur in portions of southeast Arkansas. Ongoing genetics research will answer this question sometime in the near future.

Black bear populations in the neighboring states of Arkansas, Louisiana and Oklahoma are stable or increasing. Concurrently, the frequency of occurrence of black bears, primarily dispersing juvenile males, within eastern Texas is on the increase. This has been documented

in the Red River and Sulphur River Basins in northeast Texas, and at other locations in eastern Texas. There have been some 24 confirmed black bear sightings within eastern Texas since 1977. There have been reliable black bear sightings in the following counties: Anderson, Angelina, Bowie, Cass, Fannin, Franklin, Harrison, Henderson, Hopkins, Jasper, Lamar, Marion, Morris, Nacogdoches, Newton, Panola, Polk, San Jacinto, and Shelby Counties. Approximately 67 percent of these sightings have occurred since 1990. Additionally, approximately 70 percent of these sightings have occurred within the northeastern counties of eastern Texas. Several of these sightings involved direct observations of a black bears, and one involved a roadkilled black bear along Interstate Highway 30 east of Mount Vernon, Texas, on the Franklin-Hopkins County Line when a black bear was struck by a tractor-trailer rig in 1999.

Louisiana Black Bear (*Ursus americanus luteolus*), and American Black Bear (*U. americanus*) have been given the same protection within the historic range of the Louisiana black bear in eastern Texas, and both subspecies will essentially be treated as the *U. luteolus* subspecies. All free-ranging black bear subspecies within the historic range of Louisiana Black Bear are federally listed as threatened due to similarity in appearance, and given the same legal protection.

Key habitat requirements of black bears include food, water, cover, and denning sites spatially arranged across sufficiently large, relatively remote blocks of land. Louisiana black bears typically inhabit bottomland hardwood forests but also utilize other types of forested habitats. Other documented habitat types used include brackish and freshwater marshes, salt domes, wooded spoil levees along canals and bayous, and agricultural fields. Although black bears originally occurred throughout the lower southeastern coastal plain, bear densities were probably historically greater within bottomland hardwood and other forested communities where hard (acorns and nuts) and soft mast (berries and fleshy fruits) production was higher than in the fire-maintained, pine-dominated upland communities.

Remoteness is an important spatial feature of black bear habitat. In the southeast, remoteness is relative to forest tract size and the presence of roads. Forest tract size and the number of roads reflect the likelihood of human disturbance that can limit habitat suitability and use.

Quality cover for bedding, denning and escape is very significant as forests become smaller and more fragmented, and as human encroachment and disturbance to habitats increases. Black bears are adaptable and opportunistic, and can survive in proximity to humans if afforded areas of retreat that minimize chance of close contact or visual encounters.

The federal listing of the Louisiana Black Bear was made without formally designating critical habitat. In addition, a special rule was included allowing for normal forest management activities to continue within the bear's range.

Life History

Although classified as carnivores, bears are not usually active predators, and have an omnivorous diet consisting primarily of vegetable matter. They are opportunistic feeders, eating almost anything that is readily available. Hard and soft masts like acorns and berries, carrion, and insect larvae found in dead and decaying wood are typical food sources. However, agricultural crops like corn, wheat and sugarcane may also be utilized. Bears are considered to be very intelligent animals. They are basically shy and secretive, and usually intentionally avoid contact with humans. Conversely, bears have a keen sense of smell, and will locate and feed on human garbage. This tendency can sometimes create problems with humans. Proper

management of human garbage, making it inaccessible to bears, can minimize this problem, and is paramount to successful conservation of this species.

Males typically have larger home ranges than females, and are usually solitary except during the breeding period. The breeding period occurs during the summer. Females usually begin breeding at 3 to 4 years of age. Female black bears undergo induced ovulation and delayed implantation, and have a gestation period lasting between 7 and 8 months. Usually 1 to 3 black bear cubs are born every other year around mid-January, to mid-February. An average litter size is typically 2 cubs, but 3- to 4-cub litters are not uncommon. Cubs remain with their mother the first year, and then disperse to establish their own territories usually during their second summer. Cubs are vulnerable to a number of threats, and juvenile mortality can be high.

Threats and Reasons for Decline

Decline of this species, throughout its range, was due to depletion of populations through over harvest by humans, and to loss and fragmentation of suitable forested habitats. Presently human population density with its high potential for human/bear conflicts is probably the most significant threat. Continued alteration, conversion and fragmentation of forested habitats throughout its range, including eastern Texas, are equal, if not greater threats to the long-term survival of the species.

Recovery Efforts

The U.S. Fish and Wildlife Service (Service) formally listed the Louisiana Black Bear as threatened on February 7, 1992. The Service published the Louisiana Black Bear Recovery Plan in 1995. This plan was designed to assure long-term conservation of the black bear and its habitat within Louisiana. This plan was basically designed to maintain current black bear populations within the Atchafalaya and Tensas Basins and adjacent areas, and to create suitable bottomland hardwood habitat corridors to link these two populations. The goal is for these populations to be connected, and self-sustaining.

Field studies by the Texas Parks and Wildlife Department from 1994 through 1996 (Garner and Willis, 1998) used a Habitat Suitability Index to analyze 4 potential habitat areas in eastern Texas for suitability for black bears. Area A included a significant portion of the Sulphur River and its tributary White Oak Creek; Area B included the Middle Neches River Corridor; Area C included the Lower Neches River Corridor; and Area D included the Big Thicket National Preserve. Each of these areas provided suitable habitat and food sources, but areas A, C and D had a high occurrence of potential human/bear conflict zones. Area B, the Middle Neches River Corridor, had a much lower potential for human/bear conflicts, and was thus the most suitable potential habitat for black bears identified in the study.

Additional ongoing measures by the Department, Service and their cooperators to assure conservation of this species in eastern Texas include: (1) Minimizing loss of suitable forested habitats, particularly mature bottomland hardwood forests; (2) Promoting reforestation programs (including TPWD's Landowner Incentive Program, the U.S. Fish and Wildlife Service's Partners for Wildlife Program, East Texas Wetland Project, and numerous USDA Farm Bill Programs) that create or restore areas of new habitat for the species; (3) Monitoring and documenting movements of black bears into Texas from populations in Arkansas, Louisiana and Oklahoma; (4) Developing management strategies to protect and conserve black bears that move into Texas from bordering states (in addition to current protection by federal and state law); (5) Continuing participation in the interstate Black Bear Conservation Committee as a conservation partner for the species throughout its range; and (6) developing and implementing programs to

educate the public about this species, its biology, and its management.

Department staff and a coalition of partners including state and federal agency biologists, forest products industry biologists, non-governmental conservation professionals, citizen groups, landowners and a number of private sector stakeholders are currently engaged in preparing a management plan for black bears within eastern Texas. This is an on-going process that has had, and will continue to have input from a number of stakeholders that will ultimately provide well-defined guidelines and strategies for long-term conservation of this species within the region.

In addition to the efforts previously discussed, the Black Bear Conservation Committee (BBCC), formed in 1990, is a regional nongovernmental organization focused on the restoration of the Louisiana black bear throughout its historic range in Louisiana, Mississippi, and eastern Texas. The BBCC is a coalition of very diverse parties, or stakeholders with an interest in the Louisiana black bear, and has brought together people that previously had adversarial roles, and created a cooperative working environment. The BBCC, whose headquarters is in Baton Rouge, Louisiana, has been actively engaged in Louisiana black bear conservation for the past thirteen years. They have been actively working with governmental agencies, forest product companies, non-governmental organizations and private landowners within occupied black bear habitats, and habitats that could potentially become occupied. In addition to providing direct management assistance, the BBCC spends significant energies educating the public about the plight of this threatened species. BBCC is currently engaged in the coalition to prepare a management plan for black bear in eastern Texas. In addition, the BBCC published a Black Bear Conservation Plan in 1997 to restore this species throughout its entire historic range.

Where To See Louisiana Black Bear

There are currently no well-defined populations of black bears within the boundaries of eastern Texas. Black bears in eastern Texas have largely been considered as nomadic wandering males visiting or moving in from adjacent states. A person wanting to see Louisiana black bears in the wild, a difficult task at best, would have greater chance of success by going to the Tensas River National Wildlife Refuge in Tallulah, Louisiana, or the White River National Wildlife Refuge in southeast Arkansas.

How You Can Help

There are a number of things that you can do to help with conservation of the Louisiana Black Bear in eastern Texas. First, if you own bottomland property in eastern Texas, you can conserve existing mature bottomland hardwood forest, and restore retired bottomland agricultural lands back to bottomland hardwood forests. For managed bottomland hardwood forests, creative management strategies that maintain multiple age classes of preferred hard and soft mast species through time will assure long-term habitat needs for Louisiana black bear. For adjacent slope forests, and upland forests, it is critical to leave significant streamside management zones (SMZs). These SMZs, in addition to providing food and cover for bears, can be utilized to provide corridors or linkages between areas of suitable habitats. It is of critical importance in these bottomland hardwood forests, and within these SMZs to conserve mature hardwood trees with significant hollows that could be utilized by black bears as den trees. In addition to creation of black bear habitats through management of bottomland hardwood forests, it is important to minimize dumping of human garbage and foods near rural homes, and/or hunting camps. Bears are attracted to these areas, and can become acclimated to locating them for easy sustenance. This creates a situation that will lead bears into situations where they may actually be killed out of fear by some homeowners. In addition to problems with

dumping, well-intentioned citizens, actually interested in bears near their homes, can create the same problem by actively feeding bears. The thing that must be avoided is training the bear to associate man with food. The natural fear that a bear has of man must be maintained for the safety of both the bear and man.

In addition, you can become a member of the Black Bear Conservation Committee. You can become either a supportive, or active member, and become active in the conservation of this species throughout its range.

For More Information Contact

Texas Parks and Wildlife Department
Wildlife Diversity Program
4200 Smith School Road
Austin, Texas 78744
(512) 912-7011 or (800) 792-1112
www.tpwd.state.tx.us

or

U.S. Fish and Wildlife Service
Ecological Services Field Office
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057
www.usfws.gov

or

Black Bear Conservation Committee
P.O. Box 4125
Baton Rouge, Louisiana 70821
(504) 338-1040
www.bbcc.org

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Appendix J

Nongame Wildlife Management Recommendations

by

Matt Wagner and Rick Larkin
Texas Parks & Wildlife Department

Follow guidelines provided through TPWD's Texas Wildscapes program for specific practices to provide food, water and cover requirements for various nongame species. Following is a list and brief description of habitats and various management practices that are beneficial to nongame species of wildlife in the Pineywoods. It should be noted that many of the practices are also beneficial to and recommended for game species (eg., deer, dove, turkey, quail, etc.). Conversely, most management practices directed at managing game species will also be beneficial to many species of nongame wildlife.

HABITAT CONTROL

Prairie/grassland restoration – Establishing a mixture of native grasses and forbs on disturbed range or farm land to provide habitat for wildlife diversity. Use TPWD Wildscapes plant list.

Forest/woodland restoration - Establishing native trees and shrubs where appropriate to restore native habitats for wildlife diversity. Use the TPWD Wildscapes plant list. Maintain larger tracts of 100 acres or more of late successional woodland for area - sensitive species. Allow regeneration of seedlings to develop sapling/small-sized trees for well-developed understory. Of particular concern is the continued decline of the longleaf pine ecosystem. Re-establish longleaf pine on suitable sites throughout the historic range in the Pineywoods.

Shrubland restoration - Establishing native shrubs or small trees where appropriate to restore native habitats for wildlife diversity. Use TPWD Wildscapes plant list. Early-successional habitats can be provided by establishing hedgerows or plots of fruit-bearing native shrubs in open areas. Maintain brush along fencelines or shelterbelts with saplings and dense thickets of shrubs and vines for nongame birds such as Loggerhead shrike and Blue grosbeak.

Wetland restoration - Establishing water flows and native vegetation in former wetlands to provide wildlife habitat.

Riparian area management - Provide alternate livestock feeding and watering sites, exclude pastures with riparian areas from livestock grazing or fence out livestock. Defer grazing in riparian areas during April - October.

Prescribed burning - The use of fire to restore, enhance or maintain native habitats for wildlife diversity. Prescribed burns should be conducted according to TPWD, USDA

Natural Resource Conservation Service, Texas Agricultural Extension Service and Texas Natural Resource Conservation Commission protocols in coordination with local Fire Department.

Mowing - Used to manage invading woody plants and maintain desirable herbaceous vegetation for wildlife food and cover. Mow before or after nesting season to avoid grassland nesting birds (most nesting occurs generally April-June).

Exotic or "weedy" plant control - Use of fire, selective herbicides, and mechanical methods to control invasive plants in important habitat types to maintain or restore wildlife populations.

Conversion of exotic vegetation - Removal and replacement of exotic vegetation with native plants for wildlife habitat.

Restore and maintain oak savannah/grassland – Prescribed burns should only be conducted according to TPWD, USDA Natural Resources Conservation Services, Texas Forest Service, Texas Agricultural Extension Service, and Texas Natural Resource Conservation Commission protocols in coordination with local Fire Department. Most prescribed burns are conducted during December-March. Late winter-early spring burns will not impact cool season forbs as much as mid-winter burns. Summer burns are more risky, but could be more effective at woody plant control. If mechanical brush control is used leave brush piles for small mammals. Reseed areas with native grass/forb mixtures as necessary. Avoid fragmentation of large blocks of habitat or maintain shrubs and small trees in savannah habitat for song posts, and perch sites.

Maintain oak woodlands with dense understory - Exclude livestock from woodlands, especially during the early spring green-up, and the late summer-fall and winter peak stress periods for wildlife. This allows for understory regeneration, and berry and mast production, and keeps livestock from reducing evergreen browse during periods of reduced forage availability. Maintain dense horizontal layers of understory vegetation for nesting warblers, vireos and other songbirds. Connect fragmented blocks of habitat by planting a diversity of native, fruit-bearing trees and shrubs.

Protect/restore oak woodlands - Maintain areas with hardwoods, the broad - leaved species (post oak, red oak, water oak, white oak, etc.) with at least 50% canopy cover. Control overbrowsing by white-tailed deer, exotic game and livestock.

Enhance mid-succession brush habitat - Promote brush regeneration with prescribed fire and/or mechanical methods that remove the top-growth of woody plants but encourage root sprouting. Use proper grazing management.

EROSION CONTROL

Riparian area management - Provide alternate livestock feeding and watering sites,

exclude pastures with riparian areas from livestock grazing or fence out livestock. Defer grazing in riparian areas during April - October. Control erosion using water structures and native plants.

Prairie/grassland restoration - Establishing a mixture of native grasses and forbs on disturbed range or farm land to provide habitat for wildlife diversity. Use the TPWD Wildscapes plant list.

Forest/woodland restoration - Establishing native trees and shrubs where appropriate to restore native habitats for wildlife diversity. Use the TPWD Wildscapes plant list.

Trails and signs - Create walkways or paths to manage human impact and reduce erosion in sensitive areas.

PREDATOR CONTROL

Avian predator and nest parasite – Selected avian predators (grackles, starlings, and brown-headed cowbirds) may be controlled as a part of a PLANNED PROGRAM to reduce impacts on nesting neotropical and resident songbirds through shooting and trapping, grazing management, and maintenance of large blocks of wildlife habitat. A planned trapping program, that minimizes capture of non-target species in cowbird traps, is being tested and developed for use by landowners. All non-target species are protected by state and federal law, and must be released unharmed following developing protocol.

Carnivore-furbearer control - Reduce the impact of coyotes, raccoons and other carnivores on colonial nesting birds. Control of feral dogs and cats by humane methods can enhance grassland bird nesting success and survival.

Fire ant control - Control fire ants using Logic or other approved product during spring-fall.

PROVIDING SUPPLEMENTAL WATER

Wetland restoration - Establishing water flows and native vegetation in altered coastal and inland wetlands.

Well/trough/pond with overflows - Establish additional shallow water supplies through construction of ground-level wildlife ponds, or adding overflow systems on existing wells and troughs. Protect these areas from livestock use. Follow TPWD Wildscapes Program guidelines and guidelines in Appendix O.

PROVIDING SUPPLEMENTAL FOOD

Establish food plots ½ to 1 acre in size by shallow discing and/or sowing native seed-producing food plants for birds (ie., Sunflower, millet, partridge pea, sesame).

Butterfly and hummingbird gardens - Establish native wildflowers, trees, shrubs, vines, or cultivated flowers as food sources for butterflies and hummingbirds. Follow the TPWD Wildscapes Program plant list.

Feeding stations - Set up liquid, seed and free-choice feeding stations for resident and migratory birds. Especially critical during migration and winter months when natural food sources are scarce. Follow TPWD Wildscapes Program guidelines.

Reduction of broadcast insecticides - Increases the amount of insects available as a wildlife food source for birds, reptiles and amphibians.

PROVIDING SUPPLEMENTAL SHELTER

Brush piles/rock piles - Leaving or stacking cleared brush and rock to create denning and escape cover for birds, small mammals, reptiles and amphibians. Follow TPWD Wildscapes Program guidelines.

Thickets of native brush - Create or maintain thickets of native shrubs/trees for refuge.

Snag maintenance and creation - Protect snags and deadfall for cavity-dwelling species. Create snags using selective herbicides or girdling undesirable woody plants.

Nest boxes and perching platforms/poles - Provide nest structures for songbirds, owls, small mammals, bats, raptors, herons, and other nongame species. Where suitable nest cavities are in short supply due to lack of dead timber snags that provide cavities or natural timber hollows, artificial nest/roost boxes can be erected to help alleviate these shortages for particular species. Some of the birds and mammals that can benefit from these structures are: bluebirds, chickadees, titmice, prothonotary warbler, wrens, woodpeckers, screech owls, kestrels, wood ducks, squirrels, and bats. The TPWD Wildscapes Program can furnish additional information regarding number, specifications, placement, and maintenance of these structures for specific species.

CENSUS

Time area counts - The number of individual species seen or heard during a fixed time frame per unit area (eg., point counts for birds, squirrels).

Drift fences/pit fall traps - A system of flashing or similar material arranged on the ground to funnel small wildlife species into buried buckets or other pitfall trap. (used primarily for reptiles and amphibians).

Small mammal traps - Small live traps arranged along a trapline to sample small

mammals.

Neotropical Migratory Birds: These are birds that breed in the United States and Canada, and migrate to the Neotropical regions of Mexico, Central and South America, and the Caribbean during the nonbreeding season. As mentioned in the General Habitat Management section at the beginning of this example plan, loss and fragmentation of woodland and native grassland habitat has reduced populations of many neotropical populations. Neotropicals include the following groups of birds: kites, hawks, cuckoos, nightjars, hummingbirds, flycatchers, swallows, thrushes, vireos, warblers, tanagers, grosbeaks, buntings, orioles, and blackbirds. For more information regarding neotropical status, surveys, and possible management strategies, contact the Partners in Flight Program Coordinator at TPWD Headquarters in Austin.

Birds of management concern for Pineywoods region include:

Henslow's Sparrow	Loggerhead Shrike	Prairie Warbler
Swallow-tailed Kite	American Kestrel	Prothonotary Warbler
Swainson's Warbler	Wood Thrush	Yellow-billed Cuckoo
Acadian Flycatcher	Eastern Wood-Pewee	Hooded Warbler
Louisiana Waterthrush	Nothorn Parula	Bachman's sparrow
Red-cockaded Woodpecker	Red-headed Woodpecker	Brown-headed Nuthatch
Wood Stork		

Waterfowl/Wading Birds: To improve the habitat for dabbling ducks and wading birds, construction of 3 - 4 foot high levees with a drop-board water control structure in suitable low areas could back up and hold water during the fall, winter, spring, summer months, depending on water management strategy. This could provide shallow (6 to 24 inches) water feeding areas for migrant ducks, wading birds, and spring-nesting wood ducks. Exclude livestock from this area with installation of an electric or barbed wire fence around the perimeter, at least 50 yards away from the maximum flooded area. Contact the local Natural Resources Conservation Service or TPWD waterfowl biologist for assistance in location and construction of the levee.

Installation of wood duck nest boxes in and around the edge of shallow water areas can increase nesting sites for wood ducks that are normally present in the summer, but lack suitable nesting sites due to lack of natural cavities in older, damaged trees or lack of these type of trees. One nest box (not within view of other nest boxes) per acre of brood-rearing wetland habitat is usually sufficient. These should be erected on 10 foot metal or treated wooden posts in or at the edge of wetlands.

Feral Hogs should be controlled by shooting and live trapping whenever possible. Most success at this usually occurs during the winter when feral hogs are having to travel more to find food. Besides rooting up pastures, feral hogs compete directly with deer, turkey and most other wildlife species that rely heavily on acorns and other hard and soft mast for winter food. Deer also tend to avoid areas when feral hogs are present.

Other Comments: The development of a Landowner Wildlife Management Association with adjacent and neighboring landowners will greatly enhance any management that you apply to your ranch, and is strongly encouraged. TPWD and TCE personnel are available to assist in this endeavor

Appendix K

PALATABILITY RATING OF BROWSE SPECIES FOR DEER OF EASTERN TEXAS

First Choice (Preferred)

St. Peterswort	Alabama supplejack
American cyrilla	Brook euonymus, strawberry bush
White ash	Carolina jessamine
Honeylocust	St. Johnswort
Georgia holly	Virginia sweetspire
Japanese honeysuckle	Blackberry
Sassafras	Greenbrier
American snowbell	Kentucky viburnum

Second Choice (Moderately Preferred)

Red maple	Peppervine
Chokeberry	Common pawpaw
Azalea	Crossvine
American berry	Buttonbush
White fringetree	Flowering dogwood
Roughleaf dogwood	Hawthorn
Largeleaf gallberry	Deciduous holly
Sweetbay magnolia	Partridgeberry
Red mulberry	Black tupelo
Virginia creeper	Redbay persea
Flatwoods plum	White oak
Water oak	Willow oak
Smooth sumac	Black willow
Common sweetleaf	Poison sumac
Poisonoak	Elm
Mapleleaf viburnum	Possumhaw viburnum
Blackhaw viburnum	Rusty blackhaw
Muscadine	Yaupon

Third Choice (Least Preferred)

American hornbeam	Hickory
Florida chinkapin	Eastern redbud
Common persimmon	American beech
Two-wing silverbell	Common witchhazel
American holly	Eastern redcedar
American sweetgum	He-huckleberry
Southern magnolia	Southern waxmyrtle
American hophornbeam	Shortleaf pine
Loblolly Pine	Carolina laurelcherry
Black cherry	Bluejack oak
Southern red oak	Post oak
Blackjack oak	Flameleaf sumac
Dwarf greenbrier	Mexican buckeye
Blueberry	Carolina buckthorn

Appendix L

CONDUCTING WHITE-TAILED DEER SPOTLIGHT SURVEYS IN CENTRAL TEXAS

by

Steve Jester, Wildlife Biologist, Decatur

Jim Dillard, Technical Guidance Biologist, Mineral Wells

This brief overview of the **deer spotlight survey** is designed to answer some of the most commonly asked questions about this method for censusing white-tailed deer and its application in central Texas. A deer spotlight survey is only one part of a comprehensive deer management program that must also include proper habitat management, harvest management, and record keeping. Why a deer census is needed, what it will and will not tell you, the type of equipment necessary for conducting spotlight surveys, and how to interpret data collected will be discussed.

There are some limitations to using spotlight census for estimating densities of white-tailed deer in central Texas. Spotlight surveys have limited application on small tracts of land or where dense vegetation such as juniper or oaks greatly reduces visibility. Land holdings of 1,000 acres or greater offer better potential for application of this sampling technique. Spotlight surveys are not designed to observe a total deer population, rather to sample a representative portion of habitat and the number of deer found there.

What is a deer spotlight survey? A deer spotlight survey is a method of sampling a given area of land and the density of deer found there. Area is expressed as the number of **visible acres** which is determined by taking a series of visibility readings along the designated route at 10th mile intervals. Data collected on a deer spotlight survey is expressed as the number of **acres per deer**. Multiple counts are required on the repeatable route for reliable information on deer density.

Why do I need to know about estimated deer density and herd composition? Estimates of deer density and habitat surveys can help determine whether your deer herd is at, above or below carrying capacity of the habitat. Deer **carrying capacity** is the density of healthy and productive deer the land can support without causing habitat damage. A knowledge of the deer density and herd composition is necessary to regulate annual deer harvest (how many bucks or does to harvest). Daylight herd composition counts may be used in conjunction with spotlight census data to more accurately estimate percentages of bucks, does, and fawns in the deer herd. The spotlight census also enables landowners to monitor progress of habitat and harvest strategies in reaching specific deer management goals and objectives.

Where do I set up my deer census line? Select all-weather roads that go through a variety of habitat types. Avoid roads that frequently wash out or become impassable following heavy rain. The transect should sample different habitat types in proportion to number of acres they represent on the property. Avoid roads by feeders or food plots where deer may be concentrated. Spotlight surveys conducted during August and

September are less likely to be influenced by seasonal environmental factors, food distribution, acorn-drop, or other biological events affecting deer. On large tracts, more than one route may be required to adequately sample a ranch. **Make a map of the route(s) for future reference.**

How do I set up my line and determine visible acres? Once a route has been selected, an estimate of the number of visible acres along the route must be determined. During the summer months and prior to the first official count, drive the route at night with two observers on the back of the vehicle. Using the same type of spotlight you will use to count deer, have the driver stop every **1/10 mile**. The observers estimate how far they can see a deer (or where the brush becomes too thick to see deer) in a straight line perpendicular to the truck (**left 150 yards and right 50 yards, etc.**) up to maximum of 250 yards from the road. A visibility estimate is also needed at the start point of the line. Visibility estimates made on census routes 12 miles long or greater can be taken ever **2/10 mile**. Visibility readings may be recorded on a form or tape recorded for later tabulation. This process is repeated for the length of the route. On dead-end roads, record visibilities only going down the road and resume taking visibilities when a new portion of the route is begun. When conducting additional counts on the same census route, it is **not** necessary to retake visibilities. Visibility estimates may be used for several years unless significant changes in vegetation have occurred along the route. The following formula is used to convert 1/10 mile visibility estimates into **acres of visibility**:

Total yards of visibilities / number of 1/10mile stops +1 X Number of miles X 1,760 / 4,840 = Visible Acres

For a 7.7 mile line with 4,744 total yards of visibility the formula would be:

4,744 / 77 + 1 X 7.7 X 1,760 / 4,840 = 170.29 ac.

When do I conduct deer spotlight counts? In central Texas, spotlight surveys should be conducted during the months of August, September and early October. Deer are generally well distributed in their home ranges during this period of the year and are more easily identified by sex and age-class (fawns). Each route should be counted 3-4 times to improve reliability of the data. Do not conduct surveys during rain, high wind or following significant disturbance along the route during the day of the count (working cattle, construction, seismograph work, etc.) Begin all counts one hour after official sunset. Contact the local Texas Parks and Wildlife Department game warden prior to conducting spotlight surveys. Also, notify neighbors or adjoining landowners who might see the lights to alert them about your activity.

What equipment do I need to make a deer survey? Pickup trucks (4-wheel drive may be required) are preferred over sport utility vehicles or cars. Use a 25 ft. piece of 12 gauge insulated woven wire with two "alligator" clips on one end and a two-plug outdoor type outlet box on the other. Replace the cigarette lighter plug on the spotlight cords with a standard male plug. Attach the alligator clips to the positive and negative

poles of the vehicle battery and plug the light into the outlet box. Other wiring systems can also be used. Use 100,000 candlepower tractor or utility bulbs and avoid using Q-beam-type lights which are heavy, produce excessive glare and can quickly drain a battery. Other necessary equipment includes clipboard or tape recorder, **binoculars**, and a pencil.

How do I conduct the survey? Drive the route 5 to 8 mph. In open terrain where visibility permits, speed may be increased to 10-12 mph. Stop only to identify deer or determine the number of deer in a group. Unless all deer observed in a group can be identified by sex and age-class, record **ALL** these deer as unidentified. Recording only bucks from a group will bias data and reflect a better buck to doe ratio than may be present. Record deer as **bucks, does, fawns, or unidentified**. Deer are usually first spotted by their reflective eyes. Deer eye reflection is greenish-white. Other wildlife, birds, fence posts, and livestock are often mistaken for deer. It is **imperative** that binoculars be used to identify **all** deer observed. Keep the lights moving as the truck moves, checking both ahead of and behind the vehicle. The observer on each side of the vehicle shines only his/her side to prevent blinding the other observer. Deer observed over 250 yds. from the vehicle should **not** be recorded.

How do I interpret the spotlight census data? Divide the **total number of deer** into the **total number of visible acres** observed to determine the number of **acres per deer** on the route. For example: **1,260 acres** (one spotlight survey route counted 3 times with 420 acres of visibility) divided by 90 (total number of deer observed on one spotlight survey route counted 3 times) = **one deer per 14.00 acres**. The estimated deer population for the ranch can then be estimated by dividing the total acres of the ranch by the estimated acres per deer figure. For example, the deer **population estimate** for a **5,000 acres** ranch with a deer density of one deer per **14.00 acres** is **357 total deer**. An **estimate** of the number of bucks, does, and fawns in the population may then be determined by multiplying the **total number of deer** by the **percent** of all deer identified that were bucks, does, and fawns. For example:

$$\begin{aligned} 357 \text{ Deer} \times 0.20 \text{ (\% identified as bucks)} &= 71 \text{ bucks} \\ 357 \text{ Deer} \times 0.50 \text{ (\% identified as does)} &= 179 \text{ does} \\ 357 \text{ Deer} \times 0.30 \text{ (\% identified as fawns)} &= \underline{107} \text{ fawns} \\ \text{TOTAL} &= \text{357 deer} \end{aligned}$$

In addition, deer identified as bucks, does, and fawns from spotlight surveys combined with daylight herd composition counts will provide important information on the buck to doe and fawn to doe ratios. These ratios are important population parameters of your deer herd that allow you to measure the success of your management program.

For example: 179 does / 71 bucks = 2.52 does per buck

$$107 \text{ fawns} / 179 \text{ does} = 0.59 \text{ fawns per doe}$$

How can Texas Parks and Wildlife Department help me? On written request, department wildlife biologists and technicians provide technical assistance to landowners on wildlife and habitat management planning, including establishing deer management programs and deer spotlight surveys. Under the Private Lands Enhancement Program, department personnel are available to assist landowners with setting up and conducting an initial spotlight survey. In addition, assistance is available for interpreting census data collected by landowners and with formulating harvest recommendations based on that information. Literature and data forms are available on request. For assistance, contact Texas Parks and Wildlife Department, Wildlife Division, 11942 FM 848, Tyler, TX 75707 or your local Texas Parks and Wildlife Department wildlife biologist.

APPENDIX M

Herd Composition: An Essential Element of White-tailed Deer Population and Harvest Management in Central Texas

by

Jim Dillard, Technical Guidance Biologist, Texas Parks & Wildlife Department

INTRODUCTION

White-tailed deer management consists of a series of strategies, practices, and other actions taken on the part of landowners and land managers to produce and sustain populations of this important game animal. **Habitat management, population management, and harvest management** are all essential ingredients for accomplishing a successful white-tailed deer management program. It is the degree of importance that landowners or wildlife managers place on these different stages of management that will determine long term results. Knowledge of the composition of a deer herd is fundamental to making sound management decisions.

Herd Composition - What Is It?

Herd composition refers to the **ratio of bucks, does, and fawns in the population**. In addition, the ratio of does to bucks and fawns to does are also key population relationships used to implement and evaluate management and harvest strategies. An estimate of the **percent bucks, does, and fawns** in the total population is one of the most important factors that must be known before harvest rates can be formulated.

Deer are born at approximately a one-to-one sex ratio; however, few free ranging populations reflect this ratio. Herd composition is not static but changes throughout the year due to the cumulative influences of hunting pressure, reproduction, natural mortality (diseases, accidents, predation, etc.), range conditions and land use, and environmental factors such as rainfall patterns, temperatures, drought, or floods.

Although the exact number of deer living on most ranches is impossible to determine, various techniques are available that estimate their numbers. Techniques such as spotlight surveys, walking Hahn transects, mobile daytime census, and aerial counts are common methods used to estimate the relative density of deer. With each of these techniques, deer are counted on a given area of space or acreage. The number of deer observed divided by the number of acres sampled is expressed as **acres per deer**. An estimate of the total population can then be determined by expanding this figure to the total ranch acreage. For example, a 5,000 acre ranch with an estimated density of 25 acres per deer has an estimated total deer population of 200 deer. Unless a significant number of observed deer are identified as to sex and age class, estimated herd composition is unknown. In most situations, not enough deer are identified while conducting these types of surveys which must be supplemented by additional **herd composition counts**.

When Do You Conduct Herd Composition Counts?

Deer herd composition counts should be made during that time of the year when bucks,

does, and fawns are most easily identifiable. The exact time of the year may vary across the state due to differences in fawning dates and antler formation on bucks. Counts initiated before peak fawning has occurred or prior to advanced antler formation will not provide data reflective of the population sex or age composition. Also, fawns are not actively up and moving with does until they are 6-8 weeks of age. It is recommended that herd composition counts in central Texas be conducted during **August and September**. The differential size between fawns and adult deer is most evident during this period. The spotted hair coat on fawns begins to disappear during late September when molt occurs, making identification difficult unless a mature size deer is nearby. Fawns also begin to grow rapidly by this time, making positive identification difficult. Early fawns may be misidentified as yearlings on counts made after this time. Antler development on bucks has also progressed during this period so that they too are readily identifiable.

Herd composition counts should also be completed by the end of September to allow time for harvest rates to be calculated and preparations made for the upcoming archery and general gun seasons.

How Do You Make Herd Composition Counts?

Herd composition counts can be made any time of the day or night. However, since deer are most active during the **early morning and late evening**, efforts to observe deer during these periods are most productive. Identification of deer during daylight hour is also easier than night observations with spotlights and a higher percentage of deer can be identified. Most counts can be made from a slow moving vehicle along ranch roads. Counts can be made at random, along a systematic route, or at specific locations where deer are feeding or congregating. Grain fields, food plots, water sources, natural crossings, or tree lines are good places to observe deer. Counts may also be made from hunting blinds or other stationary structures where deer are known to occur. **The use of binoculars or spotting scopes is a must!**

Record **only** deer which can be identified as a buck, a doe, or a fawn. When a group of deer is observed, **do not** record **any** of the deer unless **all individuals** can be positively identified. If you see a deer but can not identify it - don't record it. Do not assume the identity of deer or counts will become biased. Fawns and mature bucks are usually easy to identify. Yearling bucks or spikes are often mistaken as does. Every effort must be made to be sure you properly identify all deer. Avoid recording the same individual deer on different dates if possible. Your objective is to observe a representative cross section of deer throughout the total population on your ranch.

Remember, many deer during this time of the year will still be in small family groups which may consist of a doe with this year's fawn or fawns, and her doe or buck yearling from the previous year. Other groups may consist of several does and their collective fawns. And, during August, bucks are often observed in groups away from the does. As September progresses, bucks become less tolerant of each other and begin to be observed more as singles.

Take your time when you see a deer. Often, there are other deer standing nearby that you won't see unless the group begins to move or run. Fawns may be hidden in tall grass and not seen until the doe begins to move away. Be patient!

Data should be recorded on a simple form that has columns for the date, bucks, does, fawns, and total. When all herd composition observations are completed, simply add to total number of bucks, does, and fawns observed together. It is recommended that a minimum of **100** individual deer be identified if possible. **The more the better!**

How Do You Determine Herd Composition from the Data?

From your data sheet, **total** the columns for **bucks, does, and fawns** and **add them together**. This figure represents **total deer identified**. To determine estimated herd composition, **divide** each individual group (bucks, does, and fawns) by the **total identified deer figure**. For example, if a total of 100 deer were identified and 20 were bucks, 50 were does, and 30 were fawns, calculate herd composition as follows:

$$\begin{array}{r}
 20 \text{ (# of identified Bucks) divided by } 100 \text{ (total identified Deer)} = .20 \times 100 = \mathbf{20\% \text{ Bucks}} \\
 50 \text{ (# of identified Does) divided by } 100 \text{ (total identified Deer)} = .50 \times 100 = \mathbf{50\% \text{ Does}} \\
 \underline{30 \text{ (# of identified Fawns) divided by } 100 \text{ (total identified Deer)} = .30 \times 100 = \mathbf{30\% \text{ Fawns}}} \\
 \mathbf{100 \text{ Total Identified Deer} \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \mathbf{100\%}}
 \end{array}$$

In addition, **doe to buck** and **fawn to doe** ratios can also be determined. To determine the **doe to buck ratio**, **divide the number of identified does by the number of identified bucks**. To determine the **fawn to doe ratio**, **divide the number of identified fawns by the number of identified does**: For example:

$$\begin{array}{l}
 \text{Divide } 50 \text{ (# identified Does) } \underline{\text{by}} \text{ } 20 \text{ (# identified Bucks)} = \mathbf{2.50 \text{ Does per Buck}} \\
 \text{Divide } 30 \text{ (# identified Fawns) } \underline{\text{by}} \text{ } 50 \text{ (# identified Does)} = \mathbf{0.60 \text{ Fawns per Doe}}
 \end{array}$$

How Do You Use Herd Composition Data?

Once you have estimated what your deer herd composition is and expressed it as **percent bucks, does, and fawns**, you may now apply these figures to your total estimated deer population. For example, a ranch containing 2,000 acres with an estimated deer density of one deer per 20 acres has an estimated population of 100 deer. Calculate herd composition as follows:

$$\begin{array}{r}
 100 \text{ Total Deer } \mathbf{X} \text{ } .20 \text{ percent (\% identified Bucks)} = \mathbf{20 \text{ Bucks}} \\
 100 \text{ Total Deer } \mathbf{X} \text{ } .50 \text{ percent (\% identified Does)} = \mathbf{50 \text{ Does}} \\
 100 \text{ Total Deer } \mathbf{X} \text{ } .30 \text{ percent (\% identified Fawns)} = \underline{\mathbf{30 \text{ Fawns}}} \\
 \mathbf{100 \text{ Total Deer}}
 \end{array}$$

With the knowledge of approximately how many bucks, does, and fawns are present on your ranch, you may now made important decisions about how many deer should be harvested during the upcoming deer season. Buck to doe ratios and fawns to doe ratio also are good indicators of your progress toward obtaining your goals and objectives.

Appendix N

SUPPLEMENTAL FORAGE MANAGEMENT FOR EAST TEXAS WHITE-TAILED DEER

by Billy Higginbotham and James C. Kroll

The white-tailed deer is the most popular big game species in Texas. Our large deer population has generated a tremendous sport hunting demand, which has developed into more than a billion-dollar-a-year industry.



Landowners are becoming more interested in intensive deer management strategies in order to conserve deer management strategies in order to conserve deer populations in the face of decreasing deer habitat. Existing habitat is threatened by the growing human population in East Texas, as well as by land use changes, urbanization, highway and road construction, water development and certain cattle management, timber

management and farming methods.

The establishment of supplemental food plots is an important deer management strategy which is becoming widely accepted throughout eastern Texas and much of the southeastern U. S. However, most plantings are not aimed at improving the nutrition of white-tails. This is critical since much of the southeastern deer range (including East Texas) provides substandard nutrition for desirable deer production. The use of supplemental food plots as an intensive management tool evolved from hunters' efforts to concentrate deer in one area for harvest. It is just as important to use plots to improve the nutrition of white-tails and add critical minerals (particularly calcium and phosphorus) to the diet of a deer herd.

Description of the region

East Texas is composed of two major ecological regions - the northern part of the Post Oak Savannah and the Pineywoods (Figure 1). The Post Oak Savannah lies northeast to southwest between the Blackland Prairie of Central Texas and the Pineywoods in eastern Texas. The upland soils of East Texas are light-colored sandy loams and sands, while bottomlands are typically light-brown to dark gray sandy loams, clay loams and some clays. Soils throughout East Texas are generally acid (pH below 7.0). Annual rainfall is usually the highest of any region in the state - 35 inches on the western edge of the region up to 55 inches along the eastern boundary.

Abundant rainfall is a mixed blessing when managing deer habitat. It quickly leaches nutrients from the soil, which lowers the quality of food supplies. It also results in the rapid succession of vegetation, and causes native food supplies to grow beyond the reach of deer. On the other hand, the amount of rainfall East Texas receives annually is generally sufficient to produce consistent crops of supplemental forages. For these reasons, planting supplemental forage is a sound strategy for managing white-tailed deer in East Texas.

Planning the food plot

Well-planned food plots can increase forage availability and at least partially compensate for decreases in suitable deer habitat. However, maximum benefits can be obtained only if forages complement the diet available from native vegetation and if forages are available when native vegetation is lacking or low in nutritional value. In East Texas these stress periods occur in late summer and late winter (Fig. 2).

In addition to timing the availability of supplemental forage properly, landowners also must plant appropriate species in the best available sites, use correct planting techniques and ensure soil fertility.

Site selection and preparation

The area selected for planting will depend on the plant species to be established (warm-versus cool-season) and the goals of the landowner/deer manager. The landowner may want to plant both types to supplement the usual lack of nutritious native forage in both late summer and late winter.

Warm-season species are more reliable when planted in bottomland soils that retain moisture during the drier summer months. However, care should be taken to select a site that is not prone to flooding from nearby streams and rivers. Droughty upland soils are not good sites for warm-season species. Warm-season species should be selected for their ability to grow quickly and compete with native weeds.

Cool-season species are not as susceptible to drought or weed competition as warm-season species. One exception may be legumes, which may require delayed planting if rainfall is deficient in the early fall months (September and October). Cool-season species can be planted on either upland or bottomland sites.

Whenever possible, food plots should be planted in existing openings to reduce costs. Examples include fallow fields, pipeline and transmission line rights-of-way, logging roads, firelanes and interior road rights-of-way. Areas adjacent to public roads or areas of public access are poor planting sites since they may encourage poaching.

With either warm- or cool-season supplemental forages, soil samples should be taken to determine lime and fertilizer requirements. Failure to properly amend the soil may

result in drastically reduced yield or excessive weed competition. Your county Extension agent can help with soil testing.

If soil testing is not possible, food plots should be:

- 1) limed every 3 years at the rate of 2 tons per acre;
- 2) fertilized after germination with 200 pounds per acre of 6-24-24 (cool season plots) or 0-24-24 (warm-season plots); and 3) top-dressed with 200 pounds per acre of 34-0-0 fertilizer in mid-December (cool-season small grains).

The site should be shredded and disked to prepare a clean seedbed. Agricultural limestone (if needed to correct pH) should be applied prior to disking and worked into the soil. Planting sites should not be shaded by nearby trees, but should be adjacent to adequate escape cover. Since cool-season plantings are often established in hunting areas, particular care should be given to placing these plots near adequate escape cover, travel corridors and other types of habitat frequented by deer.

All legumes should be inoculated to increase nitrogen fixation. This will lower fertilizer needs and improve soil quality over time. Planting depth is also critical for successful establishment. Failure to plant species (especially legumes) at the recommended depth may result in poor stands.

Food plot size and shape

The sizes and shapes of supplemental food plots vary tremendously. Most plots are from 0.5 to 3.0 acres in size. Since deer are more apt to feed along the edges of plots than in the center, several small plots are more effective than one large plot. Larger food plots can be established, especially if the shape is long and narrow instead of square. Long, narrow food plots maximize the edge available and can cut across more home ranges of deer. However, plots must be wide enough to prevent excessive shading from nearby trees.

Properly established food plots are expensive, and this may limit the acreage that can be established. Therefore, it is important to maximize productivity and carefully select planting sites. A good rule of thumb is to plant 1 to 3 percent of the total habitat in both warm- and cool-season forages. For instance, 1 to 3 acres of food plots should be established for every 100 acres of habitat present. Food plots should be distributed at the rate of at least one plot per 160 acres of habitat.

Species selection

Unfortunately, there is no one forage species that can satisfy all the nutritional requirements of the white-tailed deer throughout the year. For this reason, warm- and cool-season forage combinations are recommended over the establishment of individual species.

In choosing a species or combination, keep in mind that the forage should: 1) increase

the nutrition available to deer; 2) be readily accepted by deer; 3) be available at times when native forage is lacking in quality and quantity; and 4) be adapted to both the region (Post Oak Savannah or Pineywoods) and the site (bottomland or upland). In other words, if a forage species does not improve nutrition, if deer won't eat it, if it's not available during periods of stress or if it won't yield sufficient quantities to justify establishment, DON'T PLANT IT! Furthermore, since most plant species are commercially available in several varieties, care should be taken to plant a variety adapted to a particular area.

Warm-season forages supplement the deer diet throughout the important summer and early fall months when doe lactation, fawn growth and antler development occur. Alyceclover and forage cowpeas has proven to be an excellent combination planting for the warm season, producing 3 to 4 tons of forage per acre in performance trials. "Iron and clay" cowpeas produced higher yields and matured later than other forage cowpea varieties in recent trials in East Texas. Other forage combination recommendations are given in Table 1.

Cool-season forages provide additional nutrition during the hunting season as well as during the critical stress period in January and February prior to spring green-up. Cool season combinations can extend forage availability into early summer, about the time warm-season plots become useable by deer.

Rye is an excellent cereal grain to include in a cool-season forage combination because of its cold hardiness. Grains that can supplement rye in a combination plot include oats and wheat; however, rye should constitute at least two-thirds of the small grain component. Arrowleaf clover, a legume, is also a valuable component of cool-season forage plots. It provides forage through late spring and early summer. Once established, arrowleaf clover should not have to be replanted. An annual program of shredding in late summer, followed by light disking or late summer burning of the clover, will result in sufficient seed to develop a stand the following year.

Since the arrowleaf clover component of the stand requires slightly different management than the cereal grains, the clover should be planted with the arrowleaf clover since it will also reseed itself and responds favorably to the same management. Cool-season forage combinations of small grains, arrowleaf clover and ryegrass have yielded as much as 4 to 5 tons of forage per acre per year.

Other good cool-season forage species include subterranean clover, sweetclover and Austrian winter peas. Subterranean clover and sweetclover varieties should be selected to produce in the spring and early summer months. Austria winter peas provide some early growth and may be established alone or in combination with cereal grains (Table 2).

Whenever possible, livestock should be excluded from food plots established for deer. Failure to exclude livestock may result in stand failure and certainly will limit the forage available for deer. Fence wires should be spaced to permit deer easy access to plots

(i.e., the bottom wire should be 18 inches from the ground).

Supplemental forages versus corn

Hunters commonly use shelled corn as a “supplemental” deer feed. Commercial producers even market “deer corn” or “apple flavored corn” to take advantage of the popularity of this grain. Deer are attracted to corn because its relatively high carbohydrate content makes it sweet. Unfortunately, however, corn is low in crude protein (only 7 to 9 percent) and deficient in certain important amino acids.

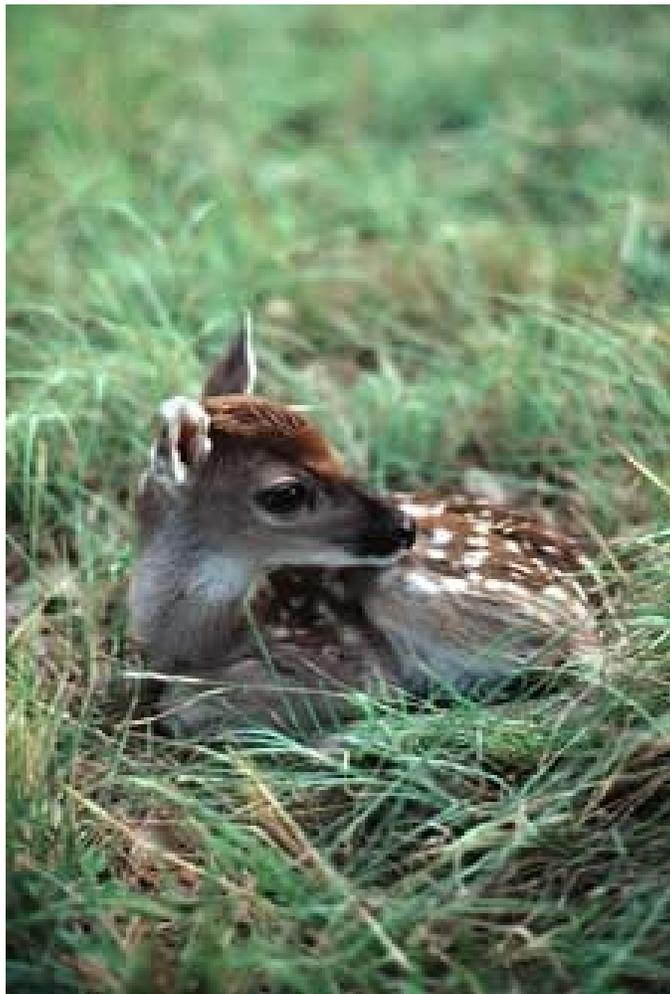
Does corn have a place in supplemental feeding? The answer is *perhaps*. Corn can be used to increase energy availability during extremely cold periods. When offered as a high energy supplement to a well planned forage management of supplemental feeding program, corn can increase the winter survival of white-tailed deer. Corn also can be used as a bait to aid in hunting, especially for antlerless deer.

Conclusions

Supplemental forages are not cure-alls for poor deer management practices. Without proper habitat management and population control, food plot establishment is a waste of time and money for the hunter, landowner and deer manager. However, food plots can be an important part of the overall management of deer in East Texas. Properly established food plots can increase the production capacity of deer habitat by enhancing the nutritional level of white-tails throughout the year.

Appendix O

Wildlife Watering Facilities



By
Jerry Turrentine, NRCS Biologist
USDA – Natural Resources Conservation Service

WILDLIFE WATERING FACILITIES DESIGNS AND DRAWINGS

Designs for wildlife watering facilities can be simple or very complex. A simple facility works well in many situations by more complex facilities are needed in some situations. Each situation needs to be evaluated and the proper facility recommended to the land-user. To assist in making recommendations and designing these facilities and to supplement the standard and specifications, this technical note outlines specific criteria for a number of facilities.

GENERAL GUIDELINES

1. Where livestock or larger wildlife species are present, the facilities should be fenced to provide proper protection. One example is shown in drawing number 16.
2. Plastic and PVC materials can be damaged by rodents and ultraviolet light. As little as possible of this material should be left accessible to rodents or sunlight.
3. In areas with hard winter freezes, some facilities can be damaged by hard freezes. Provisions should be made to drain or shut off water supply during these periods.
4. Proper maintenance of equipment will ensure adequate wildlife water and increase life of facilities. As with all equipment, facilities should be checked on a regular basis.
5. Algae growth can be a problem in many facilities. The less sunlight, the less algae growth problems will be encountered. As much as possible, the facility should be shaded. If algae growth becomes too bad, the facility may have to be drained and cleaned.

NON COST SHARE FACILITIES

A. PVC (over other flexible type) Pipe Facility (Drawing #1)

1. Materials:

- 7 feet of 2 inch or larger PVC pipe
- 1 end plug to fit PVC pipe
- 1 sink trap to fit PVC pipe
- 1 six foot steel T post
- 2 four inch hose clamps.

2. Construction and Installation:

Cut off 1 inch of the open end of sink trap. Glue end plug and sink trap to PVC pipe. To fill, turn upside down and fill through sink trap. After filling, use hose clamps to fasten PVC pipe to T post. If larger PVC pipe is used, it can be necked down to 2 inch sink trap. A 3 inch PVC will hold 1 gallon, and a 4 inch will hold 4 gallons.

B. Drum with facet or Float (Drawing #2 and #3)

1. Materials:

- 1 drum (can use metal or plastic).
- 1 facet or float valve
- 1 stand (metal or wood)
- 18 inches of ¼ inch hose
- 1 metal or concrete trough (Should be at least 6" x 6" x 4" deep)

2. Construction and Installation:

Stand should be constructed so as to hold weight of filled drum. Stand should be leveled when installed. Insure that drum did not contain toxic material or is rusted wither inside or outside. If float valve is used, insure that trough is firmly installed and leveled. Most drums hold about 50 gallons.

B. Small Game Guzzler (Drawing #4)

1. Materials:

3 sheets corrugated galvanized metal (at least 10 feet long)
8 feet minimum of 6 inch PVC (over other flexible) pipe
2 six inch PVC caps or end plugs
11 feet of 4 inch post
11 feet of 2x4 inch lumber
30 one inch sheet metal screws
30 sixteen penny nails

2. Construction and Installation:

Three posts should be cut 2.5 feet in length and 3 posts cut 1.5 feet in length. Set post level in ground at 1 foot depth. The front post should be 6 inches lower than back post. Nail a 2x4 to top of back post and one to top of front post. Attach sheet metal together, making sure it is square, and attach to 2x4's. Cut a slot 1 inch wide, the same length as width of assembled sheet metal, out of PVC. Make sure the slot is centered in PVC. Six inches from each end of PVC, cut a 6 inch by 3 inch wide slot on the opposite side of the long slot. Install end plugs or caps.

Dig out soil at lower end of sheet metal. Install and level PVC in dug out area with sheet metal inserted into 1 inch slot. Metal should extend into PVC at least 2 inches. Put enough soil around PVC to ensure that it is stable.

A 0.3 inch rain will fill the PVC, and PVC will hold 12.5 gallons.

C. Windmill Supply Pie Dripper (Drawing #6)

1. Materials:

3 feet of metal or PVC (over other flexible) pipe (should be ½ inch larger in diameter than water supply pipe)
1 cloth or sponge bushing
1 metal or concrete trough

2. Construction and Installation:

Slip metal or PVC pipe sleeve over water supply line. Wedge cloth or sponge bushing between the two pipes. Make sure water discharge will enter trough. The rate of water flow can be regulated by sliding sleeve up or down water supply pipe. Area of pipe and trough should be protected from livestock.

D. Plastic Container (Drawing #13)

1. Materials:

- 1 plastic or metal container (smallest size should be 5 gallons)
- 1 commercial spring operated chicken watering bowl
- 2 cement blocks or 6 bricks

2. Construction and Installation:

Install watering bowl to bottom of watering container. Set facility on blocks or bricks at a height that allows target wildlife species to utilize. Make sure facility is level.

COST SHAREABLE FACILITIES

A. In Ground Bowl Trough (Drawings #7, #8, #12, #14, and #16)

Storage Trough:

1. Trough Material: Concrete will be at least 5 sack cement mix. Concrete will be reinforced using 6" x 6" welded wire. Metal trough using pipe should meet criteria for pipe material listed below under heading "Pipe Material". If the trough is constructed of sheet metal it should be new and at least 12 gauge.
2. Trough Size: Concrete troughs for upland game birds should be at least 1 foot by 4 inches deep at the center (will hold 2 gallons). Concrete troughs for big game should be at least 1.5 foot by 6 inches deep at the center (will hold 6.5 gallons). Metal troughs for upland game birds should be at least 4 inch pipe, 3 feet long (will hold 2 gallons). Metal troughs for big game should be at least 6 inch pipe, 5 feet long (will hold 6.5 gallons).

Pipe and Pipeline:

1. Pipe Material: May use existing pipeline or new pipeline and either used shall be at least ¾ inch diameter and can be galvanized steel, aluminum or plastic complying with the following specifications:

Steel A-120 (galvanized)	ABS D-2282 (SDR-PR)
ABS D-1527 (sch. 40 or 80)	PE D-2104 (Sch. 40)
PE D-2239 (SIRD-PR)	PE D-2737 (PE Tubing-PR)
PE D-3035 (SRD-PR)	PVC D-1785 (Sch. 40, 80, or 120)
PVC D-2241 (SDR-PR)	PVC D-2740 (PVC Tubing – PR)
PE D-2247 (Sch. 40 or 80)	

Additional Requirements:

If a facet is used it shall be new and shall meet or exceed pipe used. After water volume is set the handle should be removed. If a float is used it should be new and of good quality. If a drip emitter is used it should have the capability of being cleaned out. Metal pipe trough will be anchored by use of concrete or metal legs buried in the ground at least 18 inches.

B. Big Game Guzzler (Drawing #9)

For specifications to big game guzzler, see supplement to standard and specifications for wildlife watering facility.

C. Inverted Umbrella Guzzler (Drawing #10)

This facility is commercially produced. It is available in 2000 to 5000 gallon sizes. The basin diameters are 16 to 32 feet. It takes 8 inches annual rainfall for 2000 to 3000 gallon size and 10 inches for the 5000 gallon size. No float needed if trough and tank set at same level.

D. Flying Saucer Guzzler (Drawing #11)

This facility is commercially produced. It is available in 200 to 2100 gallon sizes. It takes 6 inches annual rainfall for 200 gallon size, 8 inches for 1000 gallon size and 17 inches for 2100 gallon size. No float needed if trough and tank set at same level.

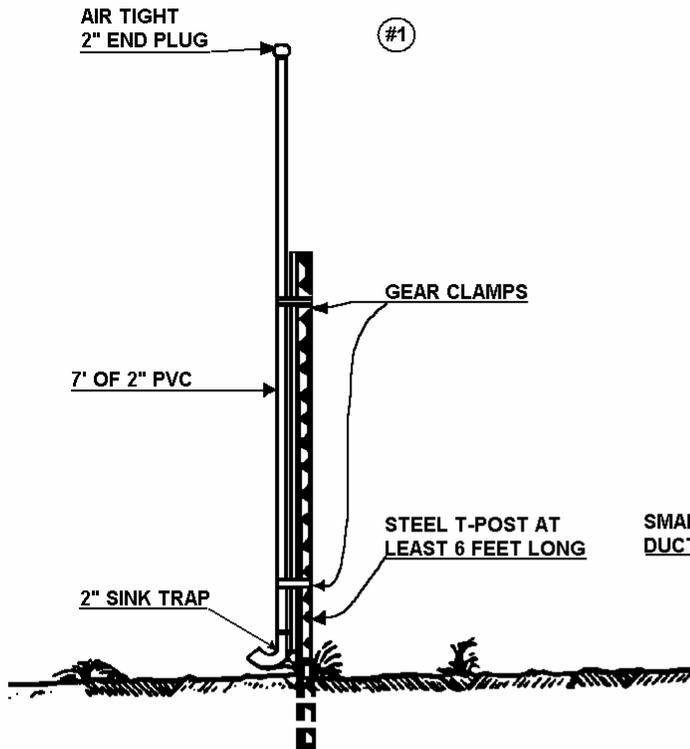
E. Ranch Specialties Wildlife Waterer (Drawing #15)

This facility is commercially produced. It holds 9.5 gallons of water. The float is built into the facility. The facility is 42 inches by 42 inches and 7.5 inches deep with a 3 foot diameter bowl. To be eligible for cost share, the facility must be connected to a permanent water source.

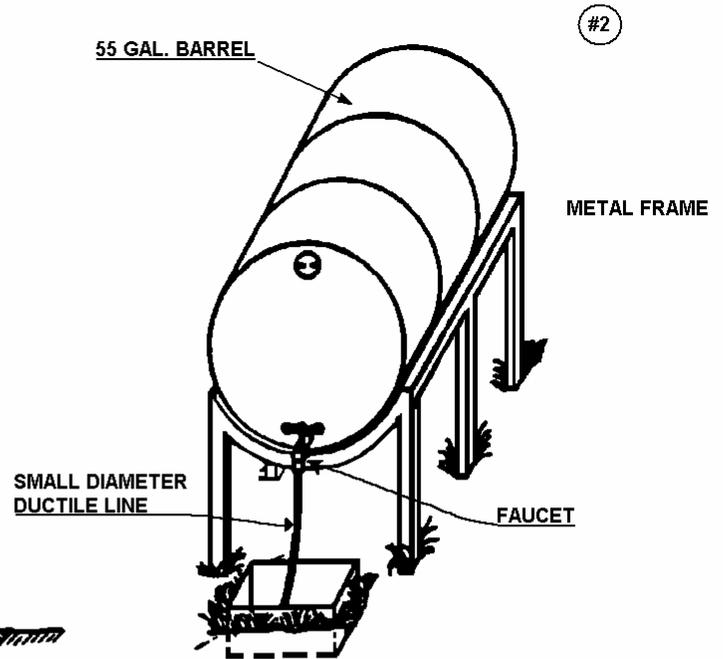
WILDLIFE WATERING FACILITIES

SCALE: 3/8" = 1'

SCALE: 3/4" = 1'

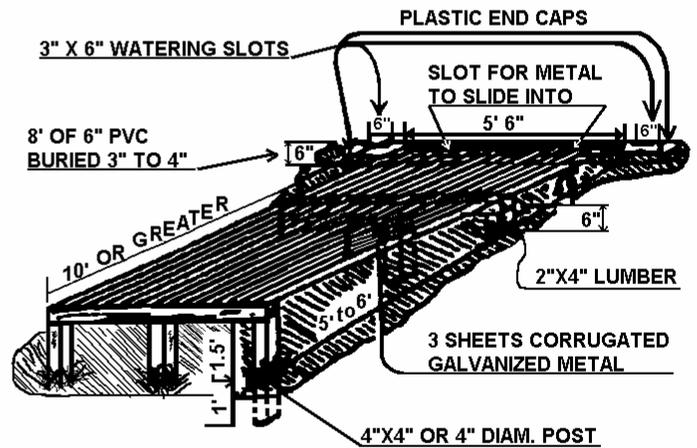
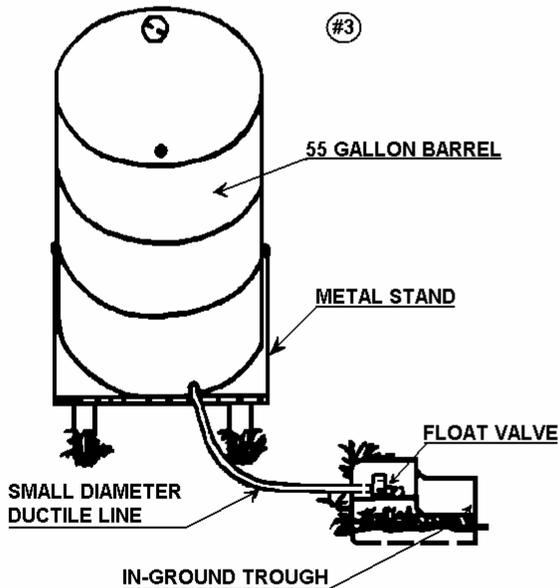


SCALE: 3/4" = 1'



#4

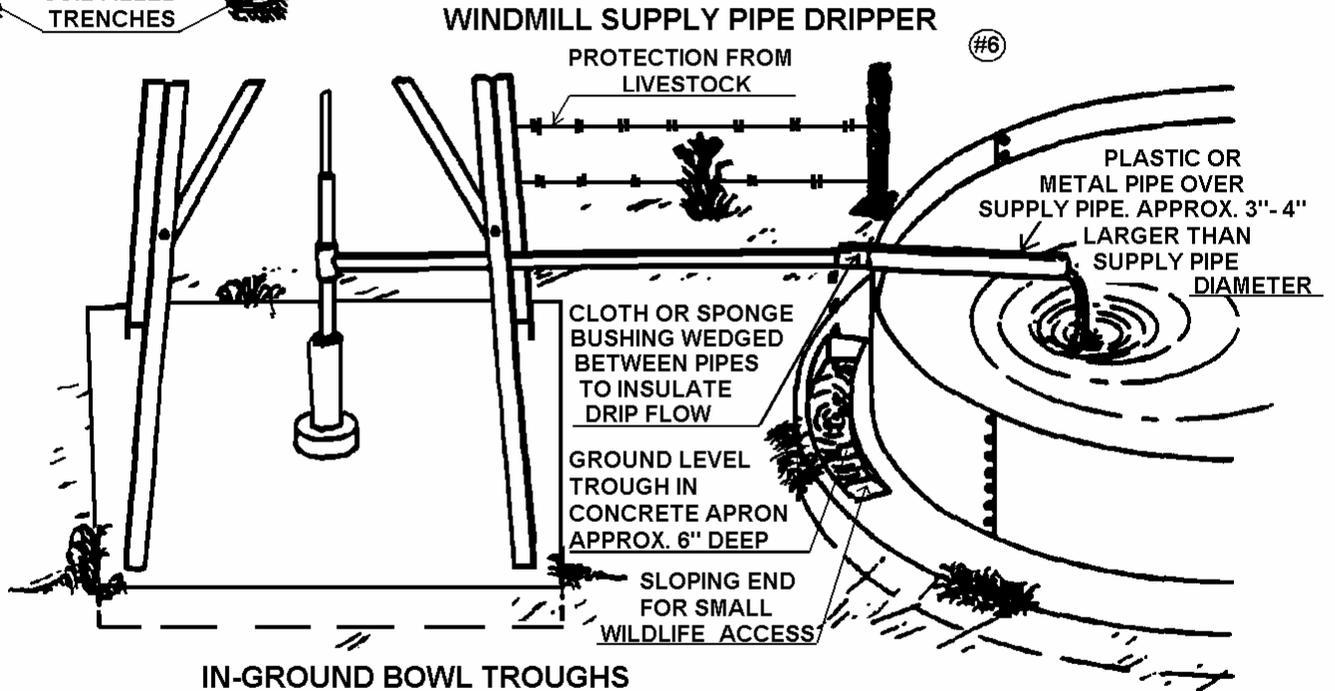
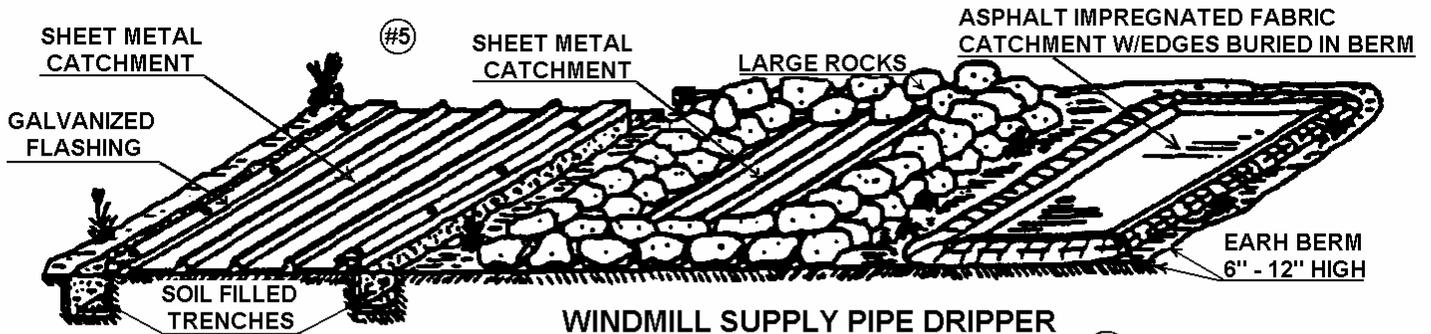
SCALE: 1/4" = 1'



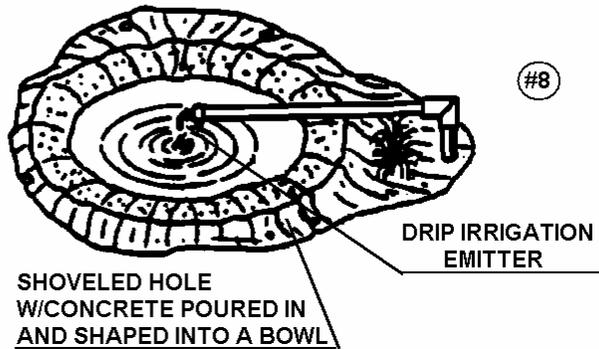
DRAWINGS BY TODD A. MAREK
SEPT. 1991

WILDLIFE WATERING FACILITIES

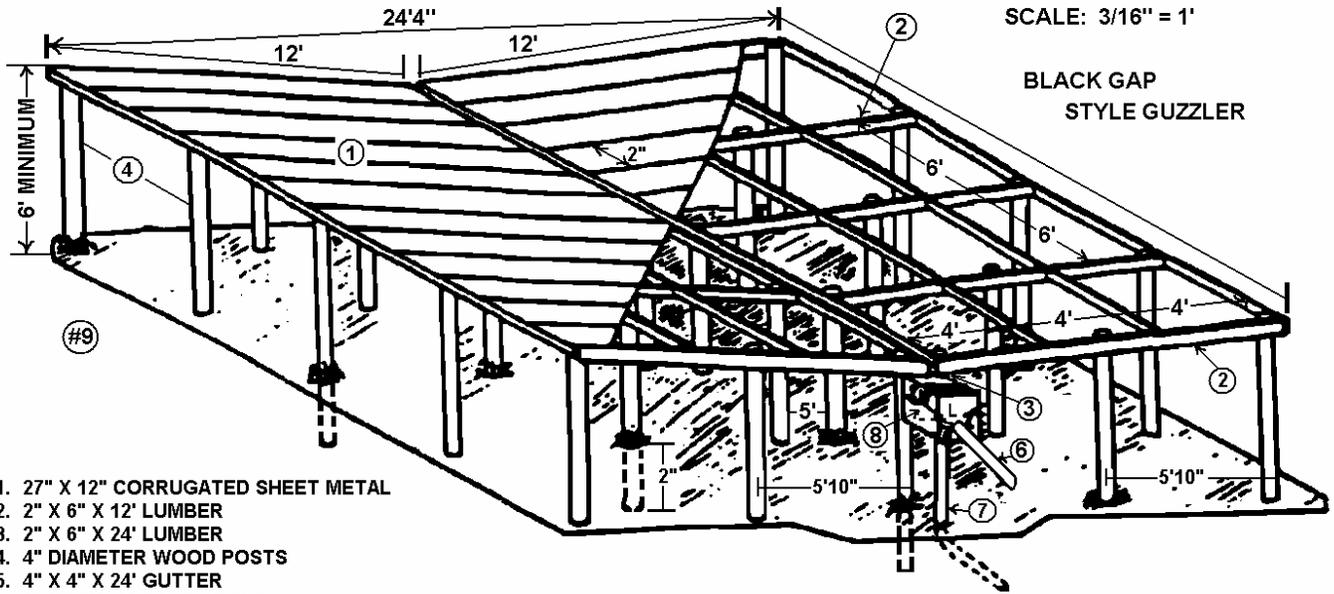
3 METHODS OF ANCHORING ON-THE-GROUND CATCHMENTS



IN-GROUND BOWL TROUGHS



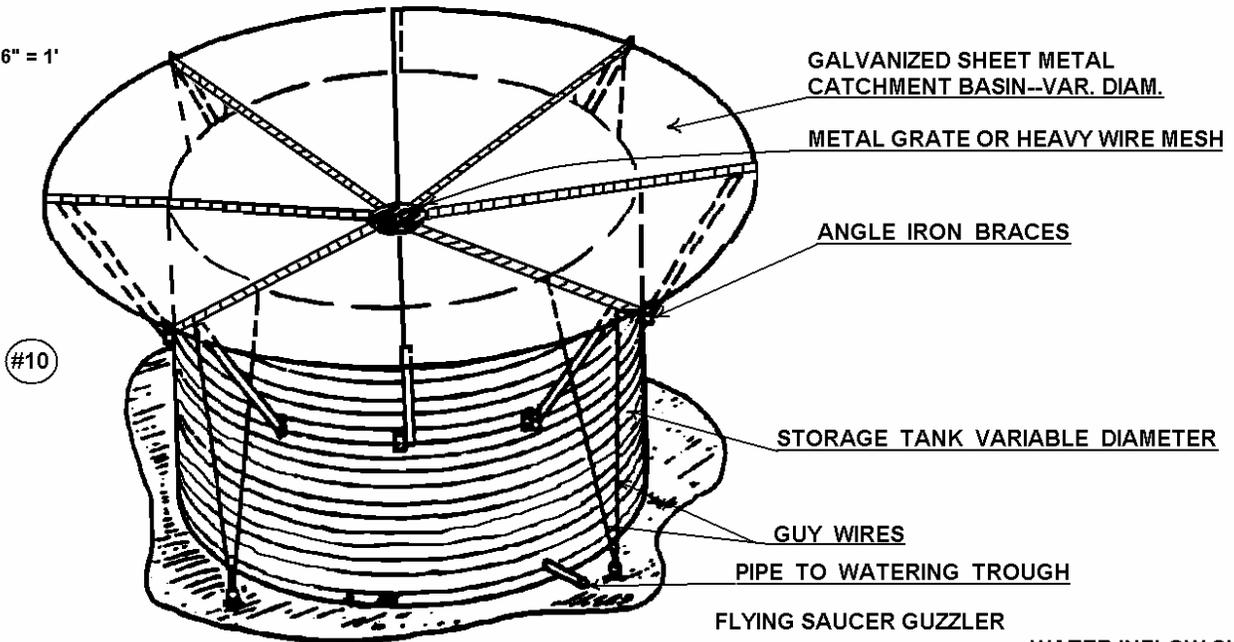
WILDLIFE WATERING FACILITIES



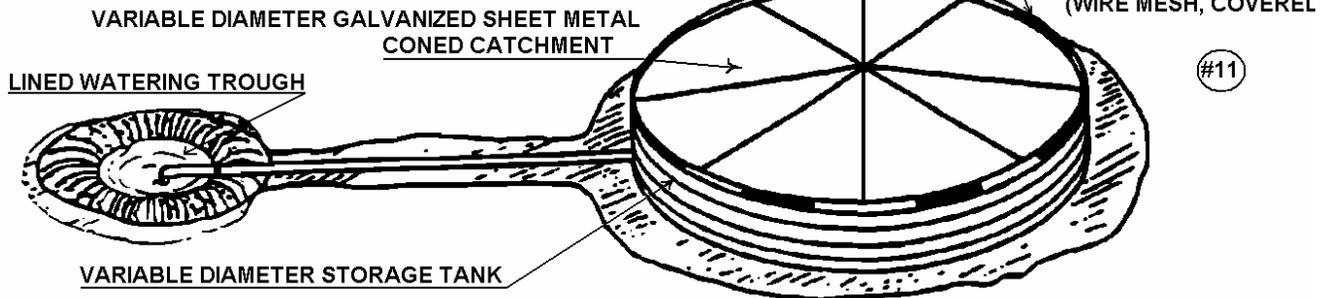
1. 27" X 12" CORRUGATED SHEET METAL
2. 2" X 6" X 12' LUMBER
3. 2" X 6" X 24' LUMBER
4. 4" DIAMETER WOOD POSTS
5. 4" X 4" X 24' GUTTER
6. 3" MINIMUM DOWNSPOUT
7. ALTERNATE DIRECTION FOR DOWNSPOUT
8. 1'6" X 1'6" X 1' SUMP COVERED WITH 1/4" - 1/2" HARDWARE CLOTH

INVERTED UMBRELLA GUZZLER

SCALE: 3/16" = 1'

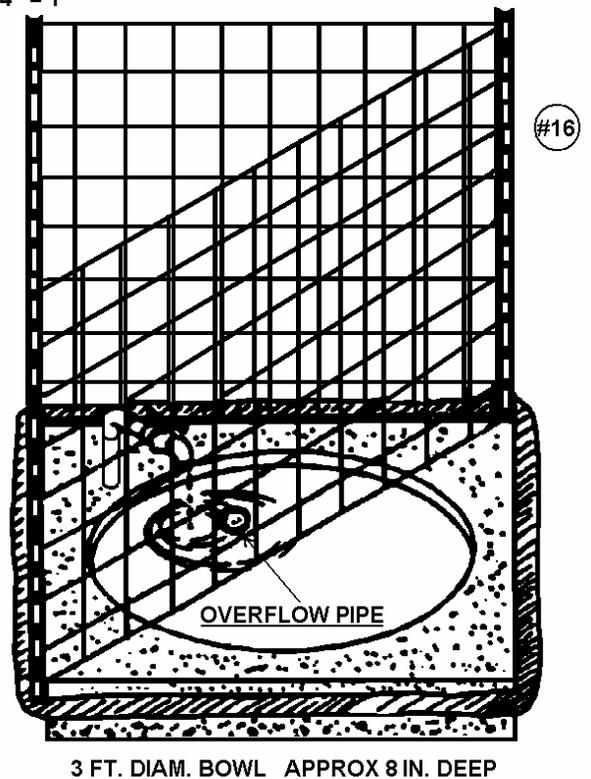
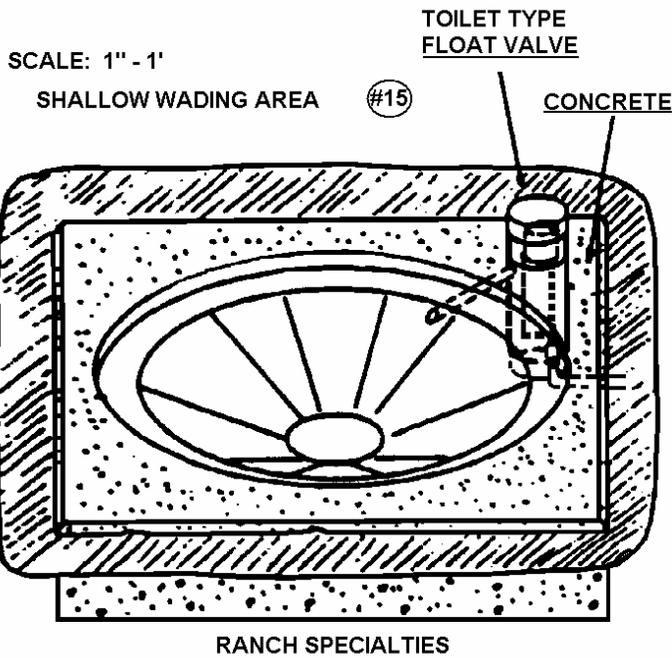
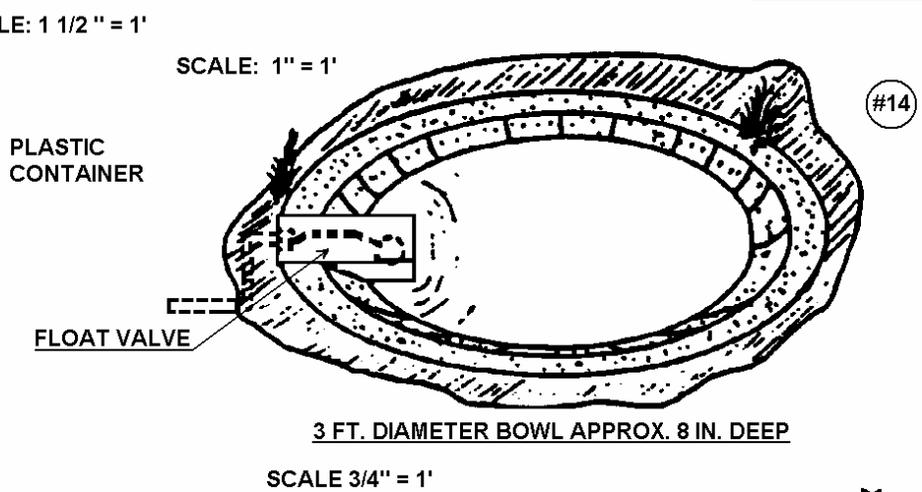
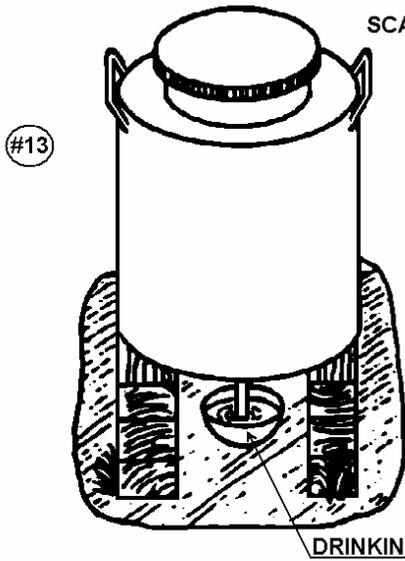
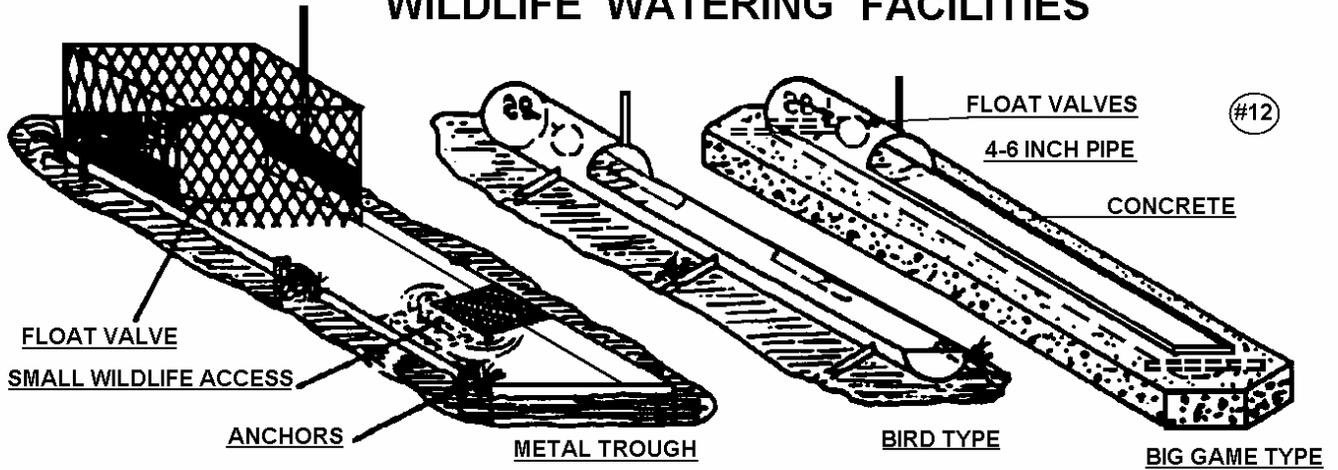


SCALE: 3/16" = 1'



DRAWINGS BY TODD MAREK SEPT. 1991

WILDLIFE WATERING FACILITIES



DRAWINGS BY TODD A. MAREK

Appendix P

Managing Red Imported Fire Ants in Wildlife Areas

by Bastian Drees, Extension Entomologist and Fire Ant Project Coordinator
Texas A&M University

The red imported fire ant, *Solenopsis invicta* (Buren), is an introduced species that arrived in Mobile, Alabama from South America around the 1920s. This species has had an enormous impact in the southeastern United States, and continues to spread into areas of North America with mild climates and adequate moisture and food. About two thirds of eastern Texas is currently infested.

Biology of the red imported fire ant: Like other ants, the fire ant is a social insect and colonies reside in mounds of dirt that may exceed 18 inches in height. Mounds commonly occur in open, sunny areas. Periodically, winged reproductive male and female ants leave colonies on mating flights. Mated females (queens) can fly for miles, land and start a new colony. Development from egg to adult occurs in about 30 days, progressing through four larval stages and a pupal stage. Worker ants (sterile female ants capable of stinging) can number in the hundreds of thousands in a mature colony. Two forms of fire ants occur: single queen and multiple queen colonies. Multiple queen colony infested land can harbor 200 to 800 or more colonies per acre since worker ants are not territorial and move freely from mound to mound.

Fire ant mounds can rapidly become numerous on lands disturbed by mechanical methods, pesticide use or flooding. The ants disperse naturally through mating flights, mass movement of colonies or by floating to new locations in flood water. Fire ants can travel long distances when newly-mated queens land in cars, trucks or trains. Shipments of hay, nursery stock or soil from an infested area may relocate entire colonies or nests. Quarantine regulations, enforced by the Texas Department of Agriculture, prevent movement of infested articles from infested (quarantined) to non-infested areas.

Fire ants feed primarily on other insects and arthropods (ticks, chiggers), although they "tend" some species of sucking insects (aphids) which provide them with a sugary solution (honeydew) upon contact. This imported species has displaced many native ant species and eliminated food used by some wildlife. Fire ants recruit to newborn livestock and wildlife on the ground or those nesting in low trees, causing medical problems associated with multiple stings and, occasionally, death. Populations of some wildlife species may be dramatically reduced.

Impact on wildlife: Certain forms of wildlife, such as deer, ground-nesting birds, and reptiles, are especially affected by ants during and soon after birth or hatching. The risk is greatest during the warm months. Fawns are vulnerable because they are born in June and because they instinctively remain motionless in their hiding places. Hatching quail and ground-nesting waterfowl chicks are also attacked. However, the impact of fire ants on area-wide populations of wildlife remains controversial and largely undocumented with data from scientific studies. In Texas, no endangered species has

been reported lost because of fire ants. ***Insecticide-based fire ant control programs in wildlife areas are discouraged unless the benefits from such treatments have been documented.*** Many pesticides are toxic to non-target organisms (particularly to aquatic organisms) and may directly or indirectly affect game species if not used properly. Below are some considerations when selecting management options:

1. If wildlife breeding areas are considered non-agricultural lands, fire ants on these lands can be treated with insecticide products registered for this kind of usage site, e.g., non-agricultural lands, ornamental turfgrass, way-side areas). However, if these lands are claimed to be agricultural lands, or if the game/wildlife or other livestock is being produced to be harvested and consumed, insecticide products selected to treat ants on these lands must be registered for use on those sites, e.g., wildlife or livestock areas, pastures, rangeland, etc.
2. Exotic game ranches are considered commercial agriculture areas. Breeding areas may be treated with products registered for use in wildlife or livestock areas, pastures, rangeland, etc.

Management Strategies: Non-chemical or cultural approaches to avoiding fire ant problems can reduce various problems caused by fire ants while maintaining a stable ant population that will help suppress lone star ticks, filth breeding flies and other pests, while also deterring the multiple queen form. These include:

1. In operations where wildlife breeding is being managed, try to schedule breeding to assure that young are born during cooler months of the year when fire ants are less active (soil temperature below 65 degrees F). This will reduce the probability of ant attacks.
2. Use shallow discing or drag heavy objects such as railroad ties across pastures particularly after rotating livestock out of a pasture to temporarily flatten tall, hardened mounds (although this practice seldom eliminates fire ants) and scatter manure. Manure can breed fly larvae upon which fire ants feed.
3. Use disc-type (Kountz) cutters to cut hay. These machines are designed and promoted to withstand the impact of fire ant mounds, to reduce equipment damage.
4. Use mechanized balers and bale movers characteristic of round bale production to reduce human contact with potentially infested bales.
5. Remove hay bales from the field immediately to prevent ants from invading them, particularly when rain is anticipated.
6. Store bales off the ground or in an area around which the ants have been treated (Note: A quarantine is in effect which prohibits the shipment of hay from infested to non-infested counties without certificates. Call Texas Department of Agriculture personnel to certify that hay shipments are ant-free).

Insecticide-based management program: Fire ant populations can be suppressed in pastureland using currently available methods for \$10 to \$15 per acre per year. Current methods are not capable of eradicating this species and treatments need to be

periodically re-applied. Applications of some bait-formulated insecticides also affect native ant species that compete with fire ants. However, in "fully-infested areas" (20 or more mounds per acre), implementation of the "Two-Step Method" of fire ant management may be justified. This program relies on the periodic (annual, semi-annual) broadcast application of an effective fire ant bait product. These treatments can reduce mound numbers by up to 90 percent, but reduction requires several weeks to months to achieve, depending upon the product chosen, e.g., Amdro® (hyrdamethylnon), the only bait product currently registered for use in cattle pastures takes 3 to 6 weeks; Logic® (fenoxycarb), currently registered for non-agricultural lands and horse pastures usually requires 2 to 6 months but suppresses ants for over a year). Individual mound treatments registered for use in livestock pastures (*i.e.*, Sevin® (carbaryl) formulations applied as individual mound drench cost about \$0.10 per mound) can be used to treat "nuisance colonies" between bait applications. Additional insecticides being promoted for fire ant control in pastures include Organic Plus? Crop Insecticide (0.2% pyrethrins, 97.9% silicon dioxide from diatomaceous earth, and 1.1% piperonyl dioxide) and True Stop? Fire Ant Insecticide (0.21 percent rotenone and 0.41% cube root extract). **Always follow closely the instructions provided for pesticide use on the product's label.**

In the future, there is great hope that research entomologists will be able to successfully import and release natural enemies of the fire ant from the native habitats in South America to permanently suppress the red imported fire ant. One potential parasite being investigated is a phorid fly which develops inside the heads of ants. In theory, adult phorid flies looking for worker fire ant hosts suppress ant foraging activities during the day, thereby allowing native ant species time to look for food and better compete with the fire ant. Support for fire ant research may allow other sustainable solutions to be developed.

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas Agricultural Extension Service or the Texas Agricultural Experiment Station is implied.

Appendix Q

Trapping Brown-headed Cowbirds to Control Songbird Nest Parasitism



Trapping Brown-headed Cowbirds

The purpose of this guide is to assist landowners that wish to help songbird reproduction by building and operating a cowbird trap. Please note that all persons wishing to trap cowbirds must be certified through an approved training program before the trap is put into operation. This training is offered at no cost by **Texas Parks and Wildlife (TPW)** and affords the landowner with permit coverage to handle and release non-target birds that may inadvertently enter the trap. All applicable state and federal laws must be observed during the duration of trapping. If questions arise, contact your closest **TPW** office for assistance.

Why Trap Cowbirds?

Throughout North America songbird numbers are declining. While there is no one single reason for this decline, one major contributing factor is the spread of the brown-headed cowbird. These birds were once limited to the short-grass prairies, where they followed the herds of buffalo, feeding on the insects stirred up by the movement of herds as they moved from place to place. Today however, this highly adaptive bird is found throughout North America. This is a problem because of the reproductive strategies the species employs. The cowbird is what is referred to as a brood parasite.

This means the female lays her eggs in the nests of other birds, abandoning them to the care of foster parents. The foster birds raise the cowbird chick to the detriment of their own young. Because the female cowbird can lay as many as 70 eggs per season, susceptible species of songbirds, such as the black-capped vireo and the golden-cheeked warbler, that are already endangered, are particularly at risk.

One of the most effective ways of controlling cowbirds is through trapping. Traps are operated from March 1 through May 31 only. During this time they are checked frequently, preferably every day, and data is collected. Any birds that are not cowbirds that have accidentally been trapped must be released as soon as possible. Female cowbirds are humanely euthanized through cervical dislocation. Males may be released, often after being banded for study purposes. Cowbird parasitism on vulnerable species cannot be systematically brought under control without the help of trapping.

Collecting Data

As with any scientific endeavor, cowbird trapping requires that data be collected in order to determine how effective it is. Collecting data also allows scientists to track the movements of banded birds, and hopefully to find new ways to reduce the parasitism rate that has caused many songbird populations to decline. By participating in this project landowners have the opportunity to help songbirds, and make a genuine contribution to the threatened and endangered wildlife in Texas.

Once the data has been collected, landowners should keep a copy, and forward a copy to **Texas Parks and Wildlife**. This allows **TPW** to monitor the total numbers of birds being trapped and the locations of the traps. **All data and information submitted is strictly confidential** Data to be collected should include the date, the number and type of non-target species that might get into the trap, the number of males,

the number of females, and the numbers off any banded birds that might be caught. *Banded birds are to be released* after the data is collected. While any data sheet will do, a data page is included in this material that may be copied and used immediately.

Selecting a Trapping Location

The location of the trap is critical to maximize cowbird capture and to minimize non-target birds being caught. The idea is to put the trap in a place that is as attractive to cowbirds as possible, without being disruptive to other species. Ideally the trap should be located in areas that include the following:

- Close to where cattle or other livestock graze.
- In open pasture, away from any brush, and in low grass.
- The trap should be readily accessible to vehicles, even after heavy rain.
- Water and some perching snag (dead trees) nearby.

Site Precautions

Even on a perfect location site there are precautions that should be taken to insure the safety of landowners and others participating in cowbird trapping.

One of the hazards to be aware of is that of predators. Any mammal, bird, or reptile that eats birds will be attracted to the traps in search of an easy meal. Keep the grass around the trap short. This will not only make it easier to spot snakes, but it will also make it more attractive to cowbirds. Raccoons and skunks will dig under the traps if precautions are not taken to keep them out. Owls and hawks also try to swoop down on the birds inside the trap. Fire ants can pose an additional hazard. Before using fire ant bait, check with your local Extension Service office for application recommendations. Always be sure to read and follow pesticide label directions. Never use any insecticides in the trap itself.

TRAP OPERATION: Traps are permitted to operate from March 1 to May 31 **ONLY**. This is to avoid incidental catch of non-target species. After May 31, fledglings of beneficial species such as cardinals, mockingbirds, buntings, and finches are most abundant and are more likely to be accidentally trapped.

Setting up the Trap

Erect the trap on a level site with no gaps between the frame and the ground. Use a shovel to fill in any gaps, if necessary.

Place a one gallon poultry waterer on level ground inside the trap. Scatter about a half a coffee can of cleaned milo (grain sorghum) on the ground, being careful to avoid getting it in the water. Do not feed milo during rainy weather because the birds do not like soggy grain. Wait until the ground has dried up before scattering it out again.

Since cowbirds are gregarious birds, the traps work best if about 10-15 live cowbirds are present to act as decoys. When first starting a trap without decoys, be patient. If cowbirds are in the area, they'll find and enter the trap.

Use a large minnow dip or trout net to catch birds in the trap. You must **immediately release** any non-target bird species. Any bird not a cowbird is a non-target bird.

Always remove and dispose of any dead or injured birds (usually a result of avian predator attack on the trap). The most common species of non-target birds that have been found in traps are mockingbirds, cardinals, various sparrows, grackles, blackbirds, and loggerhead shrikes. Consult a bird field guide to help you identify these species. Non-target birds will enter the traps for a variety of reasons. Some are attracted to the grain, some for company, and still others just out of curiosity. Putting a board across one side at the top to provide shade to trapped birds is recommended. Humanely treating birds while in the trap and humanely euthanizing birds is important.

Euthanizing Cowbirds

This is the real job of protecting songbirds from nest parasitism. Whichever method is used to kill cowbirds, it must be humane, fast, and certain. The recommended method is cervical dislocation, or separating the vertebra.

Cervical dislocation: Hold top of neck between thumb and forefinger, grab head with other hand, turn and lift until you feel the cervical vertebrae detach from the head – HINT: hold the bird away from you when you do this the first few times until you have the “touch”. A catch box, net, gloves, and a light for night time are useful items to have on hand.

Alternative Dispatch Methods: Carbon dioxide (CO₂) gas in a 5-gallon bucket may be used to euthanize brown-headed cowbirds. Use dry ice as the source of carbon dioxide. Cut a hole in the top of the bucket, cover opening with a piece of inner tube, or similar material, that has a slash in it to facilitate putting birds inside. Birds must not be touching the dry ice! Birds should be dead within 20 seconds.

Taking Traps out of Operation

Because cowbirds are a native species in North America, they are protected under the Migratory Bird Treaty Act. However, there are exceptions to this law for acts of depredation by a few select species. Under the **Texas Parks and Wildlife Code**, Section 64.002(c) brown-headed cowbirds are included among this small group of eight non-protected bird species that “may be killed at any time and their nests or eggs may be destroyed.” State regulations may not supersede federal regulations, so it is important that all participants in this project follow the protocols outlined here in this module. Again, remember that no traps are to be in operation either before March 1, or after May 31.

If it is not possible to remove the trap to a location where it can be stored under cover, then certain precautions must be taken because birds, including non-target species, will tend to enter the trap. The traps may be taken out of operation by placing boards over the entry slots or by securing the door in an open position. Be sure to remove all cowbirds, and release any banded birds, disposing of any dead or injured birds.

Reporting the Data

Be sure to record all data on birds captured on an approved data form and forward copies to Texas Parks and Wildlife in Austin. This is a necessary part of your permit

requirements. Landowners who are certified through Parks and Wildlife and actively participating in trapping brown-headed cowbirds will be provided with self-addressed envelopes and data forms on a weekly basis. **ALL information submitted to TPW is strictly confidential.** Submit data to:

Texas Parks and Wildlife
Private Lands and Habitat Program
4200 Smith School Road
Austin, TX 78744

COWBIRD TRAPPING DATA SHEET

NAME*: _____

*Optional, but desired. Information provided is strictly confidential.

TRAP # _____

LOCATION: _____

Date: _____

Date: _____

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Date: _____

Date: _____

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Date: _____

Date: _____

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Females	
Males	
Band Numbers (If Any)	
Non-Targets (record # and species)	_____
Comments	

Submit Data to: Texas Parks and Wildlife, Private Lands & Habitat Program, 4200 Smith School Rd., Austin, TX 78744

Materials List for 6x8 Portable Wood Cowbird Trap

Number	Description	Comments
16	2x4x8 (treated)	Rip 2x4 into 2x2
2	Sheets ½" CDX plywood	1 sheet is for slot assembly, 1 sheet is to cut up for gussets.
64 linear ft	½" mesh hailscreen	Bought in 100 ft. rolls
1 pair	Tight pin hinges (3")	Door hinges
1	Screen door-handle	Outside of door
1	Galvanized hasp (4½")	Use with padlock for security
1	Screen door latch	Used on inside of door
14	10"x12" shelf brackets	Used to square panels (2 per panel)
125 (approx)	1" drywall screws	Field assembly of slot assembly, attaching shelf brackets to panels.
50 (approx)	3" galvanized deck screws	Field assembly (panel to panel)
300 (approx)	1½" pneumatic staples	Used attach gussets
600 (approx)	1 pneumatic staples	Used to attach screen to panels
300 (approx)	½" staples	Used to attach screen to slot assembly

Recommended Tools For Construction

Shop Assembly of Panels

- Table saw – for ripping 2x2
- Chop saw – for cutting boards to length
- Electric hand saw – for cutting out gussets and slot assembly
- Retractable rule – for measuring dimensions
- Electric or cordless drill/driver – for driving screws
- Pneumatic or electric nibbler – for cutting hail screen
- Pneumatic stapler – for attaching gussets and wire
- Pneumatic nailer – for assembly of panels
(optional but helpful – Panels can be assembled with 3" deck screws if nailer is not available.)

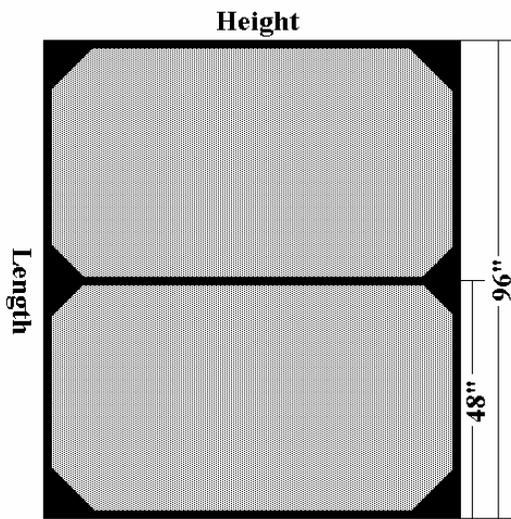
Field Assembly

- Cordless drill/driver – for driving screws
- Bar of soap – to lubricate screw threads
- Hand stapler – to secure wire to ends of drop entrance
- Step ladder – for attaching top panels

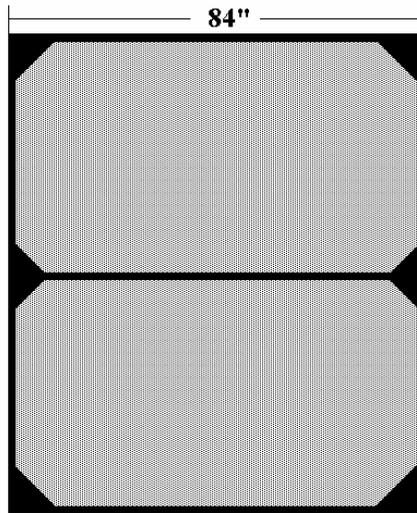
Construction Tips

- Use treated lumber throughout. Added initial cost is compensated for by longer field life and reduced maintenance.
- Don't rip lumber until you are ready to start construction. Ripped lumber will bow and twist if allowed to sit for several days.
- Use a shelf bracket on diagonal corners to square each panel before attaching gussets. To cut gussets, lay out sheet of plywood in 12" squares, then draw diagonals across the square. A sheet of plywood will make 64 gussets.
- Gussets go on one side of panel, hailscreen attaches to the other side. For side and top panels, wire will end up being on the inside on the panel. This prevents birds from roosting on framework next to wire where they are prone to predation. **Exception:** End panels are constructed the same way, but during final trap assembly, the wire goes on the outside, because the drop entrance attaches to horizontal members for structural stability.
- This pattern is designed to use 48" wide hailscreen to maximize efficiency. Internal cross members are placed to allow for slight overlap. Wide hailscreen will probably not be readily available in stock, but any building supply can order it. Use of narrower hailscreen requires repositioning of tack strips, and results in higher lumber use.
- To maximize shop efficiency: cut gussets; rip lumber; pre-cut lengths; cut out slot assembly; assemble side, top, and end panels; attach hailscreen; final assembly. When building multiple units, performing similar actions for several traps at the same time will allow you to develop an assembly line process that cuts construction time per unit.
- ***Slot width of 1.25 inches in slot assembly is critical.*** Wider slots will increase non-target captures, including small raptors, which will feed on your decoy birds. Escapes by females may also increase with wider slots.
- Side panels attach to the outside of end panels. Nothing else will fit if you attach ends outside.
- During final assembly assemble in this order: end, side, side, top, top, dropping slot assembly (3 pieces), then finish with the other end.

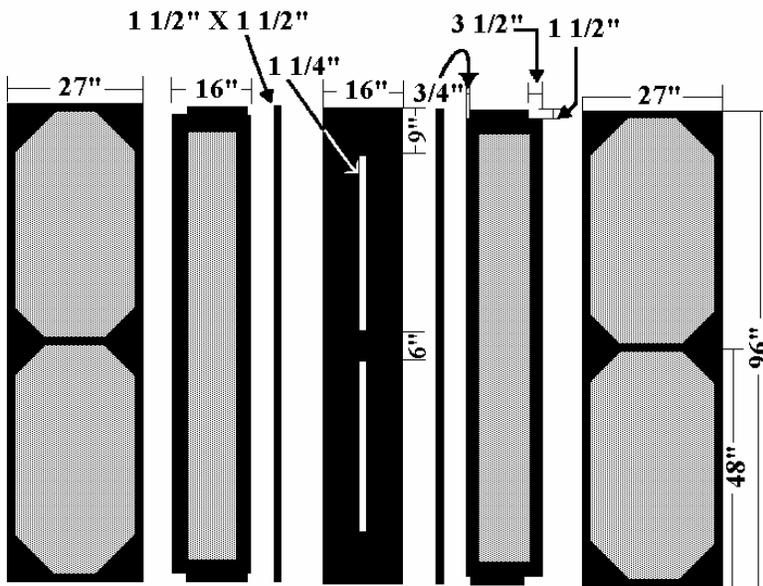




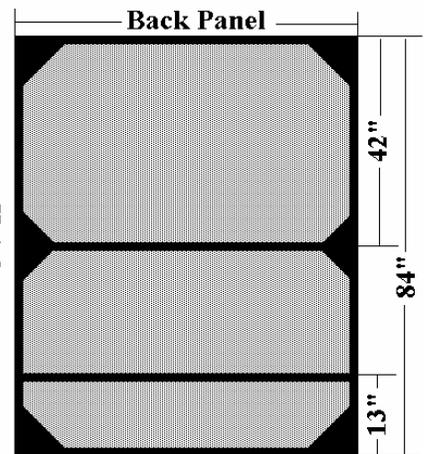
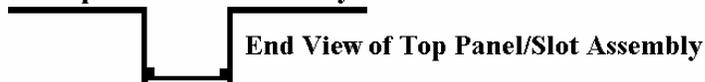
Left Side Panel (same as right panel)



Right Side Panel



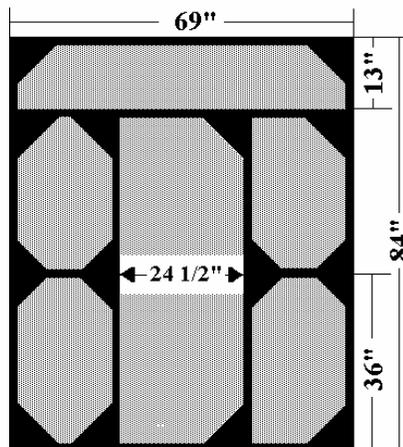
Top Panel/Slot Assembly



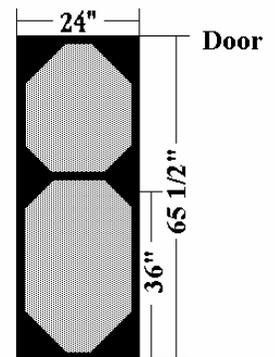
Length

Cowbird Trap Plans

Plans developed by Fort Hood
Environmental Division.



Front Panel



Materials List for 6x8 Portable Metal Cowbird Trap

Number	Description	Comments
300	1 ½" fender washers*	attach wire to the trap frame
210 ft.	1 ½" 14 gauge square tubing	frame
16 ft.	1 ½" x 1 ½" x ⅛" angle iron	trap funnel base
15" w x 94 ½" lg	⅛" plate*	funnel entrance floor
2	2" weld-on hinges*	door hinge
1	weld-on door latch*	used to keep door secured
50 ft. of 48"	½" hardware cloth	bought in 100 ft. rolls
40 ft. of 36"	½" hardware cloth	bought in 100 ft. rolls

Recommended Tools:

220 amp electric wire feed welding machine	Vise-grip pliers
Oxyacetylene cutting torch or pipe saw	6 3 or 4 inch C-clamps
Electric drill and metal bits	Metal measuring tape
Driver for self-tapping metal screws	Wire brush
Hacksaw	Wire shears or tin snips
Hammer	Metal dirt rake

Order of Construction: *(Refer to diagram for placement before welding)*

Sides (Cuts necessary for both sides)

- 2 cuts 96" of 1 ½" x 1 ½" 14 gauge square tubing (top of side panels).
- 2 cuts 96" of 1 ½" x 1 ½" heavy gauge square tubing (base of side panels).
- 4 cuts 81" of 1 ½" x 1 ½" 14 gauge square tubing (vertical corner posts).
- 2 cuts 93" of 1 ½" x 1 ½" 14 gauge square tubing (center braces).

Front

- 2 cuts 72" of 1 ½" x 1 ½" 14 gauge square tubing (door headers).
- 1 cut 72" of 1 ½" x 1 ½" heavy gauge square tubing (base piece).
- 2 cuts 11" of 1 ½" x 1 ½" 14 gauge square tubing (bracing over the door).
- 2 cuts 22 ¼" of 1 ½" x 1 ½" 14 gauge square tubing (mid-section bracing by door).
- 2 cuts 68 ½" of 1 ½" x 1 ½" 14 gauge square tubing (doorframe).

Door

- 3 cuts 21" of 1 ½" x 1 ½" 14 gauge square tubing (top, middle, bottom bracing).
- 2 cuts 68" of 1 ½" x 1 ½" 14 gauge square tubing (sides of door).

Back

- 3 cuts 72" of 1 ½" x 1 ½" 14 gauge square tubing (top, center frame pieces).
- 1 cut 72" of 1 ½" x 1 ½" heavy gauge square tubing (base piece).
- 2 cuts 11" of 1 ½" x 1 ½" 14 gauge square tubing (top bracing pieces).

Top

2 cuts 93" of 1 1/2" x 1 1/2" 14 gauge square tubing (upper frame for trap funnel).
2 cuts 93" of 1 1/2" x 1 1/2" x 1/8" angle iron. (lower trap entrance plate supports).
15" wide x 94 1/2" long 1/8" plate (trap entrance plate). Cut two openings 36 1/4" x 1 1/4" as shown in the diagram. *The exact 1 1/4" width of each opening is critical. (Note: If desired, this plate can be made of wood, rather than metal.)*

Wire Mesh covering

Center the wire at the door and wrap it around the entire trap, using a dirt rake to pull the wire tight. Don't forget to cover the floor of the trap (this will help keep predators out). Attach the wire to the frame with fender washers and self-tapping screws placed every 12 inches apart.

Door: 1 piece 67 3/4" x 23 1/2". Trim to fit.

Placement Notes:

- A. 1/4" gap on hinge side of door between door and frame.
- B. Hinge starts 10" from the top.
- C. Hinge starts 10" from the bottom.

***ALTERNATE CONSTRUCTION METHODS**

Attaching Wire Mesh (Alternate Method)

If desired, the screen mesh can be attached to the trap using 130 feet of 1" x 1/8" strap, and 275 self-tapping metal screws. Make the following cuts if this method is used:

Front: 2 – 74 1/2"	Both Sides: 6 – 95 3/4"
2 – 23 1/2"	4 – 6"
2 – 27 1/2"	
2 – 11"	Rear: 3 – 74 1/2"
	2 – 11 1/2"
Door: 3 – 23 1/2"	1 – 19"
2 – 21" (upper sides)	
2 – 42 3/4" (lower sides)	Center Trap Angle: 2 – 93"

Hold all screen in place with 1" x 1/8" plate with screws placed every 6 inches.

Alternate Door Hinges and Latch Construction:

Note: Put door latch on first, then install frame latch to fit.

1 ft. of 1" x 1/4" strap
2 ft. of 3/8" tubing
2 ft. of 7/16" rod

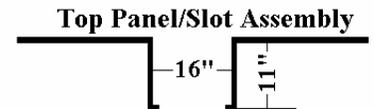
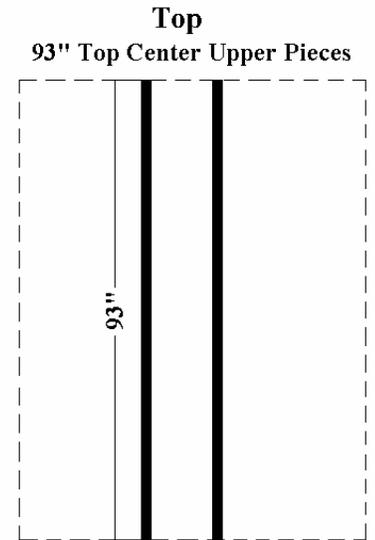
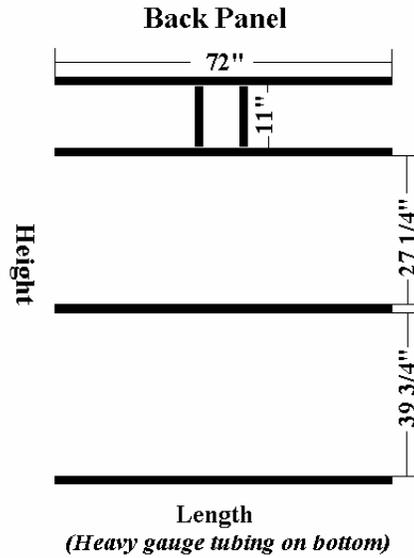
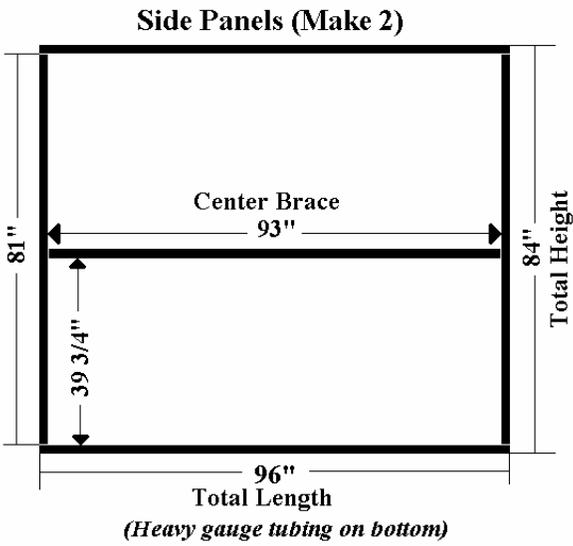
Make the following cuts:

4 cuts 2" of 3/8" tubing (door hinge part)
2 cuts 5" of 7/16" rod (door hinge part)
1 cut 7" of 1" x 1/4" strap (door latch)
1 cut 5" of 1" x 1/4" strap (on door)
1 cut 2" of 3/8" tubing (on door)
1 cut 3 1/4" 7/16" rod

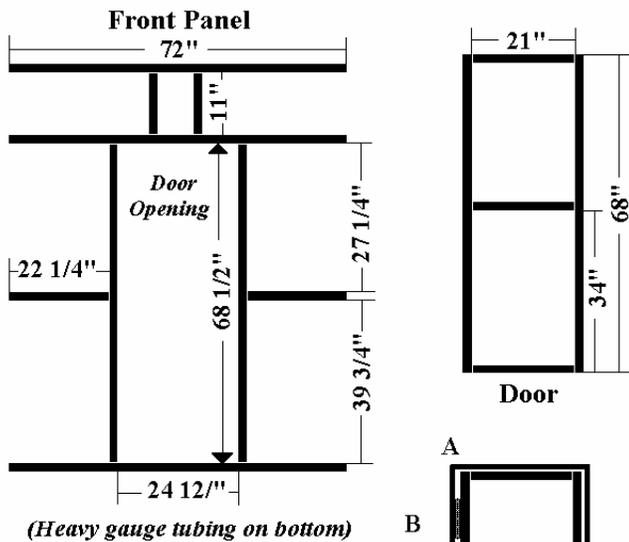
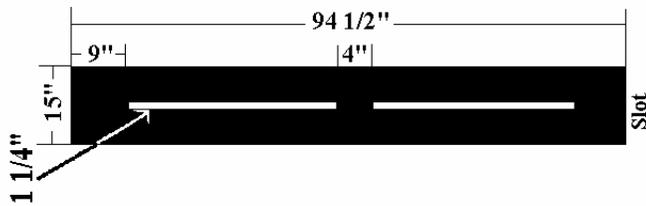
Alternate Trap Entrance Plate:

2 pieces of plate 7" wide x 94 1/2" long, separated by 1 1/4" inches that will form the opening. *The exact 1 1/4" width of the opening is critical.*

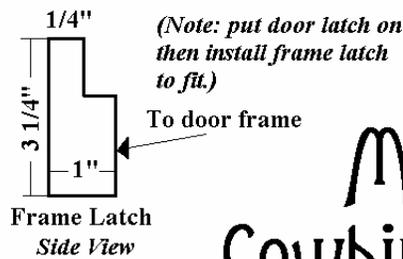
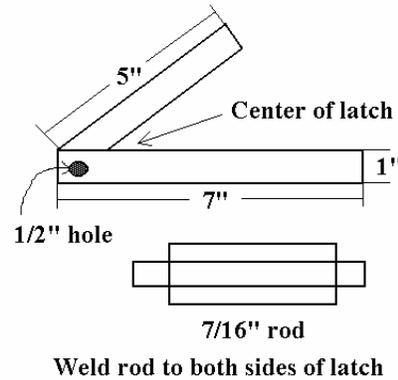




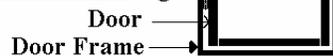
End View of Top Panel/Slot Assembly
Lower Cross pieces 93" angle iron



Door Latch Assembly



- A. 1/4" gap between hinge side of door between door and frame.
- B. Hinge starts 10" from top.
- C. Hinge starts 10" from bottom.



**Metal
Cowbird Trap
Plans**

Resources

The following organizations and their web-sites are recommended as sources of further information on cowbird parasitism, cowbird trapping, and other wildlife information.

Central Texas Cattlemen's Association. Steve Manning, Vice President. 4125 FM 116, Gatesville, TX 76528.

Kerr Wildlife Management Area. Route 1, Box 180, Hunt, TX 78024. Ph. 830-238-4483.

The Nature Conservancy of Texas. P.O. Box 1440, San Antonio, TX 78295-1440.
www.tnctexas.org

Texas Department of Agriculture. P.O. Box 12847, Austin, TX 78711. Ph. (512) 463-7476. www.agr.state.tx.us.

Texas Farm Bureau. P.O. Box 2689, Waco, TX 76702-2689. Ph. (254) 772-3030.
www.txfb.com.

Texas Parks and Wildlife Department. 4200 Smith School Rd., Austin, TX 78744. Ph. (800) 792-1112. www.tpwd.state.tx.us.

Texas Wildlife Association. 401 Isom Rd., Suite 237, San Antonio, TX 78216.
Ph. (210) 826-2904. www.texas-wildlife.com.

Appendix R

Small Acreage Management Techniques

(Abridged)



By
Trey Carpenter
Texas Parks and Wildlife Department

Small Acreage Management Techniques

By Trey Carpenter



The goal of this publication is to present wildlife habitat improvement projects to landowners with the least amount of narration as possible. The workbook describes the three necessary ingredients for wildlife habitat. Habitat is where wildlife lives, and they require food, water, and cover. The abundance and diversity of these three elements are directly proportional to the number of plant and animal species one can expect to attract.

Projects described in this workbook are intended to be as useful to an urban backyard wildlife enthusiast or a manager of a large ranch. The booklet will be most attractive to owners of small properties that want to attract wildlife and develop habitats for it. Incorporating the FOOD, WATER, and COVER projects laid out in this booklet will ensure good wildlife habitat. Managing properties for wildlife should be a holistic (big picture) practice, therefore much overlapping and duplication of the sections will occur.

FOOD

Providing food is an obvious and simple wildlife enhancement concept. There are many ways of supplying food to wildlife ranging from simple bird feeders to fenced food plots. It is a common misconception that an area knee-high in grass or a mature, closed-canopy forest is good wildlife habitat. There is little diversity in these situations and consequently these type habitats produce poor food sources for wildlife. Diversity is the key to quality wildlife habitat. This booklet will show how to create more edge effect to enhance wildlife habitat. The edge effect is the result of two adjoining plant communities coming together. The



Food section describes how to put “food on the table” for wildlife. Supplemental feeding is not a replacement for good habitat. Corn, milo, etc. are good attractants and can help hold wildlife in a given area; however, they are low in protein and do not meet the nutritional requirements for most wildlife. Periodic moving of feeders is necessary to prevent disease transmission among wildlife species. In addition, washing with a 10%

bleach solution is a safe way to keep structures germ-free.

WATER

Water is a necessity for most wildlife. If the property in question has an existing stream, creek, or pond, most of a wildlife manager's problems are solved. This booklet



will show how to improve these riparian habitats for wildlife and how to more evenly distribute wildlife by creating new watering situations and improving existing structures. The more diverse the watering situations are, the greater the number of species that will benefit. The ideal situation is to have many watering type areas ranging from fast moving water to pools. A small dam on a creek is a good way to change and diversify an existing water system. Wet marshy

areas, excluded from livestock, will benefit many wildlife species. These water projects also produce many unseen creatures that provide food for other animals along the food chain.

COVER

Cover can be broken down into three categories: nesting, escape, and feeding, with some overlapping of the three. Nesting boxes for birds are some of the most visible and enjoyable COVER projects. Cavity nesters such as bluebirds, and wrens are delightful to watch and easy to attract. Leaving snags, dead or dying trees may seem unattractive, but many birds depend upon them for their "natural" shelters.



Snags can be created by girdling a live tree. This entails ringing a tree's bark below the cambium level with a chain saw or axe. On small properties or around a house, a less drastic approach such as building a structure from limber products should be considered. Basic designs and dimensions for such structures have been included in the Nesting Cover portion of this workbook.

Escape cover can include brush piles, half-cut trees, and shrub plantings. These happen to be among some of the most popular wildlife enhancement projects. Most wildlife species are edge dwellers, and escape cover is necessary to provide protection from predators. Wildlife is not comfortable out in the wide open, and foods that they search out are not always readily available in dense wooded situations. The line where these two areas



meet compose the edge.

Feeding Cover is necessary for wildlife to forage over a large area. Brush clearing strategies are important to consider when trying to improve habitat in a small area. The more edge created, the more wildlife will benefit. Another method creating edge for wildlife is leaving fallow strips in agricultural plantings. This allows for year around feeding. Patterns and food sources will be described in the Cover Project section.

The amount of edge created can be greatly limited by thick matted amounts of grass if livestock is totally excluded. Many properties are too small to support livestock grazing. Continuous grazing of livestock is not recommended for small acreage. Continuous grazing of livestock, even if not “overstocked”, could lead to less biodiversity. A single cow will select towards the most choice forage. This leads to over utilization of these preferred foods and allows secondary, invader type species, to flourish. This ultimately leads to less desirable type foods.

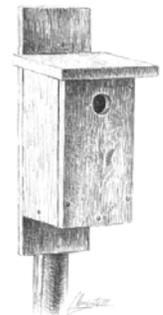
A good scenario for wildlife is a high intensity low frequency grazing system. By moving a large number of grazers into a pasture, a “mowing” effect can be achieved. Removal of old grass growth during late summer and winter can greatly benefit wildlife. The timing of grazing is important to prevent damage to vulnerable wildlife and plant species.



Young trees and plants can be damaged, and nesting birds disturbed, during springtime grazing. Livestock should be rotated in and out of an area once the desired mowing effect has been achieved. For small property owners this poses a problem. A good solution is to incorporate the small property into a grazing system of a neighbor with a herd. Both parties can benefit if approximately 50% of grass is removed. Care should be taken that critical areas, such as food

plots, structures and fragile riparian areas are restricted from the herd. Cattle are the best choice for grazing excess grass and the soil disturbance created by their “hoof action” will stimulate forb growth. Sheep, goats, and exotic species of deer will compete directly with native species for desirable food, water and space. Cattle are primarily grass foragers and do not pose a threat to native species for food if moderately stocked. “Moderation” is the key to deciding how many cows, goats, sheep, etc. are to be stocked. Remember that too many deer can over-utilize the vegetation in an area as drastically as sheep and goats.

Hunting, where permitted, is an important tool to keep many wildlife populations in check. Again, “moderation” is the key; care should be taken not to over-utilize any given species. Stay within the limits and recommendations provided by TPWD biologists for a given area.

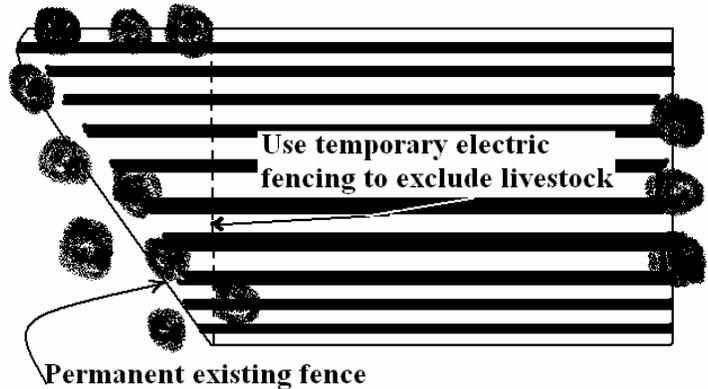


Modifying Existing Agricultural Stands

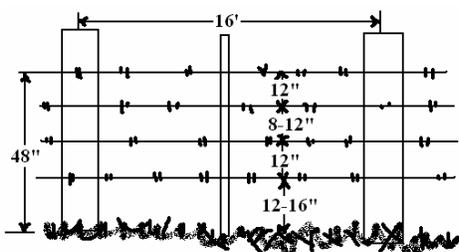
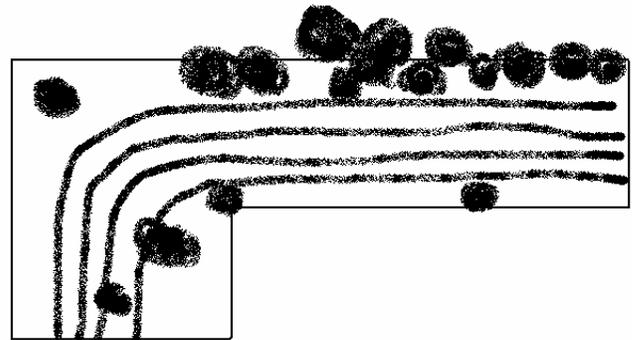
Allow irregular areas in cultivation, such as this triangular plot, to go fallow for winter food—especially adjacent to brushy cover.

Food Plot. In Conservation Reserve Program (CRP) or old field.

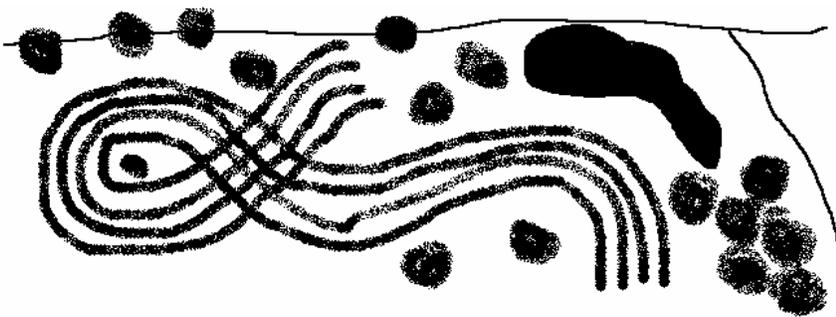
- Useful in areas where row cropping and necessary foods are scarce
- Plant row type crops specifically for wildlife
- Maximum edge can be created by long narrow plots (1/8 – 2 acres)
- Position between two cover types (ex. Between mature tree stand and open area).
- These areas can serve as wildlife corridors.



Fencing. Food plots specifically for wildlife, should be excluded from livestock with electric or barbed wire fence.

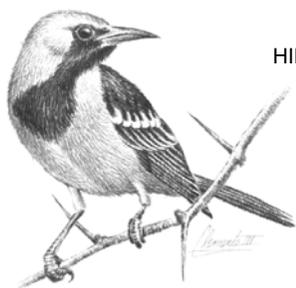


Barbed-wire Hints. Bottom wire should be a minimum of 12-16" from ground and smooth. Top wire should be no more than 48" (preferably lower), and 12" between it and next wire down. Fence stays should be used between posts to create a more rigid fence; this allows deer a better chance of struggling free should they become entangled.



Random Discing.

- Pull a disc or chisel plow behind tractor in early spring to stimulate native forbs for wildlife production.
 - Slightly disc soil in non-highly erodable areas with good soil moisture.
- Try sparsely broadcasting wildlife food producing seeds. Follow up by dragging a log or chain to create a simple food plot.



Wildlife Plantings

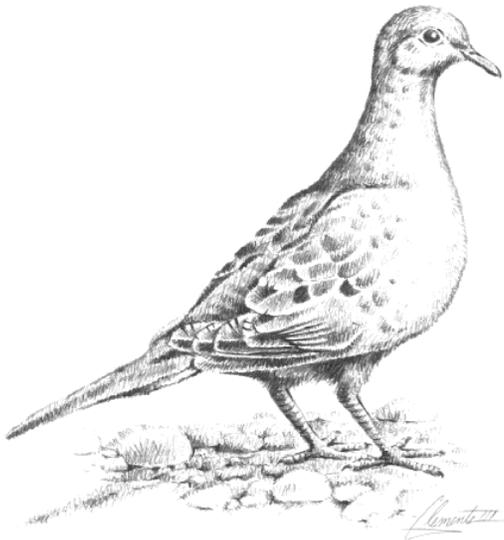


- HINTS: --Need 25 inches of annual precipitation to be beneficial.
 --Irrigation is an expensive alternative.
 --Supplemental feeding is cheaper and more reliable.
 --Use seed sources from within 200 miles north and south, and 100 miles east and west.
 --Exclude from livestock.

Seed Species	Rate (lbs/acre)	Depth (inches)	Planting Time	Time to Maturity (days)	Drought Tolerance	Species Benefited*
<u>Annual Sunflower</u>	3-5	.25-.5	Mar.-May	100	High	MD,Q
<i>Good drought insurance; will reseed yearly with spring discing.</i>						
<u>Fox-tail Millet</u>	15-20	1-1.5	Apr-June	60-80	Good	MD,Q,T,WF
<i>Similar to native bristle grass; can be planted 0 days before frost.</i>						
<u>Proso Millet</u>	20-50	1-1.5	Apr-June	50-70	Good	MD,Q,T
<i>Best adapted for North Texas (Rolling Plains)</i>						
<u>Japanese Millet</u>	15-20	1-1.5	Apr-June	60-80	Poor	WF
<i>Good in playa lakes in High Plains for waterfowl</i>						
<u>Sorghum Alum</u>	6-Mar	2-Jan	Apr-June	100-120	Fair	MD,Q,T,D,WF
<i>Do not plant too thick, to allow free movement throughout food plot</i>						
<u>Corn</u>	10-Jul	2-Jan	Apr-June	170-190	Poor	MD,Q,T,D,WF
<i>Should not be planted in areas less than 30 inches precipitation (unless irrigated). Shred in strips to allow free movement of wildlife.</i>						
<u>Sesbania</u>	20-30	.5-1	June-July	120	Poor	MD,Q,T,D
<i>Might require irrigation in arid areas</i>						
<u>Partridge Pea</u>	2	1	Feb-March	120	Fair	ALL
<i>Use local strains for best production</i>						
<u>Annual Pespedeza (Korean)</u>	20-25	.25-.50	Post Frost	120	Poor-Fair	D,Q,T
<i>Need 30+ inches of precipitation or irrigation</i>						
<u>Sesame (Benne)</u>	1	.25-.50	Post Frost	120	Fair	D,Q
<i>Use shattering variety for doves and quail</i>						
<u>Austrian Winter Peas</u>	20-30	1-2	Fall			D,T
<u>Illinois Bundle Flower</u>	3	0.5	Spring-Fall		Good	MD,Q,T
<i>Mix into areas when reestablishing grasses and other perennials.</i>						
<u>Clover</u>	8-10	1-2	Fall		Poor	D,T
<u>Engleman Daisy</u>	3	1/8	Spring		Good	D,T
<u>Four-wing Saltbush</u>	8-10	0.5	Winter-Spring		Good	D,T
<u>Oats</u>	40-50	1-2	Fall-Spring		Fair	D,T,WF
<i>Not as freeze resistant as wheat</i>						
<u>Reseeding Cow Peas</u>	50-100	1-2	Spring		Fair	ALL
<u>Maximillian Sunflower</u>	3	1/8	Fall-Winter		Good	D,Q,T
<u>Vetch</u>	20-30	1-2	Fall		Fair	Q,D,T,MD

<u>Egyptian Wheat</u>	3-6	1-2	Spring	Fair	Q,MD,T
<u>Winter Wheat</u>	30-50	1-2	Fall-Spring	Fair	ALL
<i>Best all round winter forage</i>					

*MD=mourning dove Q=Quail T=turkey WF=waterfowl D=deer



RECOMMENDED SPECIES FOR CENTRAL TEXAS

Botanical Name	Common Name	Site Preference
WILDFLOWERS		
Annuals		
<i>Amblyolepis setigera</i>	Huisache daisy	Dry, well-drained soil; sun
<i>Cassia fasciculata</i>	Partridge pea	Open, sandy fields; sun
<i>Castilleja indivisa</i>	Indian paintbrush	Sandy loam; sun
<i>Centaurea americana</i>	Basket flower	Dry, well-drained soil; sun
<i>Coreopsis tinctoria</i>	Coreopsis	Moist, sandy soil; sun
	Clasping-leaf	
<i>Dracopis amplexicaulis</i>	coneflower	Moist areas, ditches; sun
<i>Eryngium leavenworthii</i>	Eryngo	Plains, prairies; sun
<i>Eustoma grandiflorum</i>	Texas bluebell	Moist areas in prairies; sun
<i>Gaillardia pulchella</i>	Indian blanket	Variety of soils, disturbed areas; sun
<i>Linum lewisii</i>	Blue flax	Sandy or rocky soils; sun
<i>Lupinus texensis</i>	Bluebonnet	Well-drained, alkaline soil; sun
<i>Machaeranthera tanacetifolia</i>	Tahoka daisy	Rocky or sandy soils; sun
<i>Monarda citriodora</i>	Horsemint	Well-drained, sandy loam-rocky soil
<i>Palafoxia callosa</i>	Palafoxia	Limestone soil; sun
<i>Phacelia congesta</i>	Blue curls	Moist, well-drained soils; sun-shade
<i>Phlox drummondii</i>	Drummond's phlox	Prefers sandy soil; sun-part sun
<i>Rudbeckia hirta</i>	Black-eyed Susan	Varies widely; sun-part sun
<i>Thelesperma filifolium</i>	Greenthread	Calcareous soils; sun
Perennials		
<i>Aquilegia canadensis</i>	Columbine	Rocky, well-drained sites; part shade
<i>Asclepias tuberosa</i>	Butterfly weed	Moist areas in prairies, roadsides; sun
<i>Callirhoe digitata</i>	Winecup	Open woods, plains; sun
<i>C. involucreta</i>	Winecup	Open woods, rocky hills; sun
<i>Calvophus drummondianus</i>	Square-bud primrose	Sandy or rocky soils; sun
<i>Cooperia drummondii</i>	Rain lily	Open fields, prairies, lawns; sun
<i>C. pedunculata</i>	Rain lily	Open fields, prairies, lawns; sun
<i>Coreopsis lanceolata</i>	Lanceleaf coreopsis	Variety of soils; sun
<i>Delphinium carolinianum</i>	Prairie larkspur	Dry, open woods and fields; sun
<i>Echinacea angustifolia</i>	Purple coneflower	Dry, rocky prairies and hillsides; sun
<i>E. purpurea</i>	Purple coneflower	Rocky, open woods; sun-part sun
<i>Engelmannia pinnatifida</i>	Engelmann daisy	Open, calcareous sites; sun
<i>Eryngium leavenworthii</i>	Eryngo	Plains and prairies; sun
		Moist, sandy wooded area; sun-part sun
<i>Eupatorium coelestinum</i>	Mistflower	sun
<i>Helianthus maximiliani</i>	Maxillilian sunflower	Moist, clay-like soil; sun
<i>Hymenoxys scaposa</i>	four-nerve daisy	Dry, well-drained sites; sun

<i>Ipomopsis rubra</i> (biennial)	Standing cypress	Dry, sandy or rocky soil; sun
<i>Liatris mucronata</i>	Gayfeather	Well-drained soils; sun
<i>L. pycnostachya</i>	Gayfeather	Well-drained, calcareous soil; sun
<i>Lobelia cardinalis</i>	Cardinal flower	Wet to moist soil; sun-part shade
<i>Melampodium leucanthum</i>	Blackfoot daisy	Calcareous soil; sun
<i>Monarda fistulosa</i>	Beebalm	Dry, open woods, wet meadow
<i>Oenothera macrocarpa</i>	Missouri primrose	Limestone hills and prairies; sun
<i>O. speciosa</i>	Showy primrose	Open areas in a variety of soils; sun
<i>Penstemon baccharifolius</i>	Rock penstemon	Limestone crevices; sun-part shade
<i>P. cobaea</i>	Wild foxglove	Loamy soil, prairies; sun
	Hill Country	
<i>P. triflorus</i>	penstemon	Limestone soil; sun-part shade
<i>Physostegia pulchella</i>	Obedient plant	Wet soils of bottomlands; part shade
<i>Ratibida columnifera</i>	Mexican hat	Variety of soil; sun-part sun
<i>Salvia coccinea</i>	Scarlet Sage	Thickets and open woods; part shade
<i>S. engelmannii</i>	Englemann sage	Limestone soils; sun
<i>S. farinacea</i>	Mealy blue sage	Wide variety of soils; sun-part sun
<i>S. roemeriana</i>	Cedar sage	Woody, rocky areas; part shade
<i>Solidago</i> spp.	Goldenrod	Sandy to clay soil; sun
<i>Tradescantia</i> spp.	Spiderwort	Prairies, plains, moist areas; part sun
<i>Verbena bepennatifida</i>	Dakota vervain	Fields; sun
<i>V. elegans</i> var. <i>asperata</i>	Mountain vervain	Limestone & sandstone outcrops; sun
<i>Vernonia baldwinii</i>	Ironweed	Dry, well-drained sites; sun
<i>V. lindheimeri</i>	Wooly ironweed	Limestone soil; sun
<i>Wedelia hispida</i>	<i>Wedelia</i>	Dry, well-drained sites; sun

SHRUBS

Blackland Prairie (east of the Balcones fault line)

<i>Amorpha fruticosa</i> var. <i>angustifolia</i>	False indigo	Moist woods, stream banks; calcareous soil
<i>Anisacanthus wrighii</i>	Flame acanthus	Dry, well-drained soil
<i>Berberis swasevi</i>	Texs barberry	Dry, well-drained soil
<i>B. trifoliolata</i>	Agarito	Dry, well-drained soil
<i>Callicarpa americana</i>	American beauty bush	Rich woods, thickets
<i>Dalea frutescens</i>	Black dalea	Dry soil in full sun
<i>Erythrina herbacea</i>	Coral bean	Sandy or loamy soils; sun-part shade
<i>Eupatoruim havenense</i>	Mistflower	Well-drained soil; rocky ravines
<i>E. odoratum</i>	Blue mistflower	Well-drained soil; full sun
<i>Eysenhardtia texana</i>	Kidneywood	Dry hills and canyons
<i>Hesperaloe parviflora</i>	Red yucca	Dry, well-drained soil; full sun
<i>Lantana horrida</i>	Trailing lantana	Dry, well-drained soil; sun-part-sun
<i>Leucophyllum frutescens</i>	Cenizo, Texas sage	Dry, well-drained soil; sun
<i>Malvavixcus drummondii</i>	Turk's cap	Moist, shaded areas
<i>Mimosa borealis</i>	Fragrant mimosa	Well-drained soil; sun

<i>Nolina texana</i>	Bear grass	Well-drained sites; full sun
<i>Pavona lasiopetala</i>	Rose pavonia	Dry, rocky woods or stream banks
<i>Rhus aromatica</i>	Fragrant sumac	Wooded areas; rocky soil
<i>R. virens</i>	Evergreen sumac	Rocky hillsides
<i>Ruellia brittoniana</i>	Narrow-leaf petunia	Well-drained sites; full sun
<i>Salvia greggii</i>	Autumn sage	Dry, well-drained soils; full sun
<i>Viburnum rufidulum</i>	Rusty blackhaw	Wood borders, stream edges, thickets

Edwards Plateau (west of the Balcones fault line)

<i>Amorpha fruticosa</i>	False indigo	Moist woods, streambanks; calcareous soil
<i>Anisacanthus wrightii</i>	Flame acanthus	Dry, well-drained soil
<i>Bauhinia congesta</i>	Orchid tree	Dry, well-drained soil; S. side of bdg.
<i>Berberis swasevi</i>	Texas barberry	Dry, well-drained soil
<i>B. trifoliolata</i>	Agarito	Dry, well-drained soil
<i>Callicarpa americana</i>	American beauty bush	Rich woods and thickets
<i>Capsicum frutescens</i>	Chile piquin	Well-drained sites
<i>Chrysactinia mexicana</i>	Damianita	Dry, rocky well-drained sites; sun
<i>Colubrina texensis</i>	Texas snakewood	Dry, well-drained sites
<i>Dalea frutescens</i>	Black dalea	Dry soil in full sun
<i>Dasylyrion texanum</i>	Texas sotol	Dry, well-drained sites; full sun
<i>Erythrina herbacea</i>	Coral bean	Sandy or loamy soils; sun-part shade
<i>Eupatorium havanense</i>	Mistflower	Well-drained soil, rocky ravines
<i>E. odoratum</i>	Blue mistflower	Well-drained soil, full sun
<i>Hesperaloe parviflora</i>	Red yucca	Dry, well-drained soil; full sun
<i>Hibiscus cardiophyllus</i>	Heart-leaf hibiscus	Well-drained soil; sun-part-sun
<i>Lantana horrida</i>	Trailing lantana	Dry, well-drained soil; sun-part-sun
<i>Leucophyllum frutescens</i>	Cenizo, Texas sage	Dry, well-drained soil; sun
<i>Lonicera albiflora</i>	White honeysuckle	Rocky or sandy soils; cedar brakes
<i>Malvavixcus drummondii</i>	Turk's cap	Moist, shaded areas
<i>Mimosa borealis</i>	Fragrant mimosa	Well-drained soil; sun
<i>Nolina texana</i>	Bear grass	Well-drained sites; full sun
<i>Pavona lasiopetala</i>	Rose pavonia	Dry, rocky woods or stream banks
<i>Pistacia texana</i>	Pistache	Rocky, limestone stream banks, cliffs
<i>Rhus aromatica</i>	Fragrant sumac	Wooded areas; rocky soil
<i>R. lanceolata</i>	Flame-leaf sumac	Rocky hillsides; sun or shade
<i>R. virens</i>	Evergreen sumac	Rocky hillsides
<i>Ruellia brittoniana</i>	Narrow-leaf petunia	Well-drained sites; full sun
<i>Salvia greggii</i>	Autumn sage	Dry, well-drained soils; full sun
<i>S. regia</i>	Royal sage	Rocky, wooded slopes
<i>Viburnum rufidulum</i>	Rusty blackhaw	Wood borders, stream edges, thickets
<i>Yucca rupicola</i>	Twist-leaf yucca	Dry, rocky soil; full sun

TREES

Blackland Prairie (east of the Balcones fault line)

Conifers

<i>Juniperus virginiana</i>	Eastern red cedar	Fields, grasslands
<i>Taxodium distichum</i>	Bald cypress	Along stream banks

Shade Trees

<i>Carya illinoensis</i>	Pecan	Rich, river-bottom soil
<i>Catalpa speciosa</i>	Catlapa	Deep, rich, moist soil
<i>Fraxinus texensis</i>	Texas ash	Prefers limestone hills
<i>Juglans nigra</i>	Eastern black walnut	Well-drained, loamy soil
<i>Plantanus occidentalis</i>	Sycamore	Rich bottomland soils along streams
<i>Quercus glaucooides</i>	Lacy oak	Limestone soils
<i>O. macrocarpa</i>	Bur oak	Moist forests along streams
<i>O. muhlenbergii</i>	Chinkapin oak	Calcareous uplands
<i>O. pungens var. vaseyana</i>	Vasey oak	Dry, rocky slopes
<i>O. shumardii</i>	Shumard red oak	Moist hills, bottomlands, clay soils
<i>O. texana</i>	Texas red oak	Dry uplands
<i>O. fusiformis</i>	Escarpment live oak	Sandy loam soils, also clay soils
<i>Sapindus drummondii</i>	Western soapberry	Moist soils along streams
<i>Ulmus crassifolia</i>	Cedar elm	Prefers limestone soils

Small Trees

<i>Cercis canadensis var. mexicana</i>	Mexican redbud	Rich, moist sandy loam
<i>C. canadensis var. texensis</i>	Redbud	Rich, moist sandy loam
<i>Chilopsis linearis</i>	Desert willow	Dry, well-drained areas
<i>Cotinus obovatus</i>	Smoketree	Rocky banks and hillsides
<i>Diospyros texana</i>	Texas persimmon	Dry, well-drained sites
<i>Eysenhardtia texana</i>	Texas kidneywood	Dry, well-drained sites
<i>Ilex decidua</i>	Possom-haw holly	Rich, moist soils
<i>I. vomitoria</i>	Yaupon	Low, moist woods
<i>Parkinsonia aculeata</i>	Retama	Moist, sandy soils
<i>Pistacia texana</i>	Texas pistachio	Rocky limestone soil
<i>Prosopis glandulosa</i>	Mesquite	Variety of soils, well-drained site
<i>Prunus mexicana</i>	Mexican plum	Well-drained, but moist sites
<i>Rhamnus caroliniana</i>	Carolina buckthorn	Low areas, moist site
<i>Rhus glabra</i>	Scarlet sumac	Moist, rich soil
<i>Sophora affinis</i>	Eye's necklace	Limestone soils on hills and banks
<i>S. secundiflora</i>	Mountain laurel	Limestone soils
<i>Ungnadia speciosa</i>	Mexican buckeye	Limestone soils and moist areas

TREES

Edwards Plateau (west of the Balcones fault line)

Conifers

<i>Juniperus virginiana</i>	Eastern red cedar	Fields, grasslands
<i>Taxodium distichum</i>	Bald cypress	Along stream banks

Shade Trees

<i>Arbutus xalapensis</i>	Texas madrone	Limestone or igneous hills
<i>Carya illinoensis</i>	Pecan	Rich, river-bottom soil
<i>Fraxinus texensis</i>	Texas ash	Prefers limestone hills
<i>Juglans microcarpa</i>	Texas black walnut	Valleys and rocky stream beds
<i>J. nigra</i>	Eastern black walnut	Well-drained, loamy soil
<i>Plantanus occidentalis</i> <i>var. glabrata</i>	Texas plane tree	Limestone soils
<i>Quercus glaucooides</i>	Lacy oak	Limestone soils
<i>O. buckleyi</i>	Buckley oak	Limestone soils
<i>O. macrocarpa</i>	Bur oak	Moist forests along streams
<i>O. muhlenbergii</i>	Chinkapin oak	Calcareous uplands
<i>O. pungens var. vaseyana</i>	Vasey oak	Dry, rocky slopes
<i>O. fusiformis</i>	Escarpment live oak	Sandy loam soils, also clay soils
<i>Sapindus drummondii</i>	Western soapberry	Moist soils along streams
<i>Ulmus crassifolia</i>	Cedar elm	Prefers limestone soils

Small Trees

<i>Acacia wrightii</i>	Wright acacia	Dry, rocky soils
<i>Acer grandidentatum</i>	Bigtooth maple	Valleys & canyons (protected areas)
<i>Aesculus arguta</i>	White buckeye	Limestone and granite soils
<i>A. pavia</i>	Red buckeye	Limestone canyons and rocky hills
<i>Cercis canadensis</i> <i>var. mexicana</i>	Mexican redbud	Rich, moist sandy loam
<i>C. canadensis var. texensis</i>	Redbud	Rich, moist sandy loam
<i>Chilopsis linearis</i>	Desert willow	Dry, well-drained areas
<i>Cotinus obovatus</i>	Smoketree	Rocky banks and hillsides
<i>Diospyros texana</i>	Texas persimmon	Dry, well-drained sites
<i>Eysenhardtia texana</i>	Texas kidneywood	Dry, well-drained sites
<i>Ilex decidua</i>	Possom-haw holly	Rich, moist soils
<i>I. vomitoria</i>	Yaupon	Low, moist woods
<i>Parkinsonia aculeata</i>	Retama	Moist, sandy soils
<i>Pistacia texana</i>	Texas pistachio	Rocky limestone soil
<i>Prosopis glandulosa</i>	Mesquite	Variety of soils, well-drained site
<i>Prunus mexicana</i>	Mexican plum	Well-drained, but moist sites
<i>Rhamnus caroliniana</i>	Carolina buckthorn	Low areas, moist site
<i>Rhus glabra</i>	Scarlet sumac	Moist, rich soil
<i>Sophora affinis</i>	Eye's necklace	Limestone soils on hills and banks
<i>S. secundiflora</i>	Mountain laurel	Limestone soils
<i>Ungnadia speciosa</i>	Mexican buckeye	Limestone soils and moist areas
<i>Yucca thompsonia</i>	Thompson yucca	Dry, rocky sites

VINES

<i>Campsis radicans</i>	Trumpet vine	Sun to part sun
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<i>Clematis pitcheri</i>	Purple leatherflower	Sun to part sun Limestone cliffs, rocky areas, sun to part sun
<i>C. texensis</i>	Scarlet leatherflower	part sun
<i>Lonicera sempervirens</i>	Coral honeysuckle	Sun
<i>Parthenocissus quinquefolia</i>	Virginia creeper	Sun to part sun
<i>Passiflora incarnata</i>	Passion flower	Sun to shade, part sun

GRASSES

<i>Andropogon gerardi</i>	Big bluestem	Prairies, open woods, sandy-loamy soil
<i>A. glomeratus</i>	Bushy bluestem	Prairies, open woods, sandy-loamy soil
<i>Bouteloua curtipendula</i>	Sideoats grama	Prairies, open woods, sandy-loamy soil
<i>B. hirsuta</i>	Hairy grama	Low, moist sites
<i>B. pectinata</i>	Tall grama	Loose, alkaline soils
<i>Buchloe dactyloides</i>	Buffalograss	Variety of soils
<i>Hilaria belangeri</i>	Curly mesquite	Limestone outcrops and hilltops
<i>Melica nitens</i>	Threeflower melic	Full sun; prefers clay soils
<i>Muhlenbergia hindheimeri</i>	Lindheimer muhly	Rocky slopes, hillsides, grassy plains
<i>M. reverchonii</i>	Seep muhly	Calcareous moist sites
<i>Panicum virgatum</i>	Switchgrass	Moist lowlands
<i>Schizachyrium scoparium</i>	Indiangrass	Open woods and prairies
<i>Sporobolus asper</i>	Tall dropseed	Borders of woods and prairies
<i>Tripsacum dactyloides</i>	Eastern gramagrass	Low, moist grasslands

Deer Resistant Plants That Are Well-adapted to Central Texas

Loss of habitat and other environmental stress can result in almost any plant being eaten by deer. Moreover, deer tastes vary widely. This list ranks each plant for deer resistance through the number in parentheses at the end of the listing.

1 = Safe; Deer don't eat

2 = Deer eat flowers only

3 = Deer sometimes eat

4 = Deer eat plants and flowers, but it's not a first choice

Annuals

Bluebonnet, LUPINUS (1)

Marigold, TAGETES spp. (3)

Periwinkle, VINCA rosea (3)

ZINNA (3)

Bulbs

CALADIUM (3)

Daffodil (1)

IRIS (1)

Snowdrop (1)

Tulip (1)

Grasses

Bamboos, BAMUSA (3)

Beargrass, NOLINA spp. (1)

Fescues, FESCUEA spp. (3)

Little bluestem (1)

Muhly Grass, MUHLENBERGIA lindeim (1)

Pampas grass, CORTADERIA spp. (1)

Purple Fountain Grass (1)

Seep Muhly (1)

Herbs

ALOE (1)

ARTEMISIA (3)

English Lavender (3)

Mexican Marigold Mint (3)

Mexican Oregano (1)

Rosemary (1)

Sage (1)

Yarrow (3)

Perennials

AGAVE (1)

AJUGA reptans (3)

Artichoke (3)

ASTER frikartii (3)

Bee Balm, MONARDA (3)

Black-eyed Susan, RUDECKIA hirta (3)

Blackfoot Daisy, MELAMPODIUM leucanthum (3)

Butterfly Weed, ASCLEPIAS tuberosa (3)

Cactus (1)

Columbine, AQUILEGIA canadensis (3)

Coneflower, ECHINACEA spp. (3)

COREOPSIS hyb. And spp. (2)

Dusty Miller, CENTAUREA cineraria (3)

Ferns: Wood fern, DRYOPTERIS spp. (1)

Foxglove, DIGITALIS (2)

Gayfeather, LIATRIS (2)

Hummingbird Bush, ANISACANTHUS (1)

IRIS (1)

Lamb's Ear, STACHYS byzantina (1)

LANTANA (horrida, no nibbling) (3)

Lavender Cotton, SANTOLINA (1)

Lily of the Nile, AGAPANTHUS (1)

Mexican Marigold Mint, TAGETES lucida (3)

Mexican Petunia, RUELLIA spp. (1)

OXALIS (3)

Oxeye Daisy, CHRYS leucanthum (1)

PENSTEMON (3)

Red Yucca, HESPERALOE parvifolia (2)

Rock Rose, PAVONIA (3)

Roses (Lady Banks Rose, no nibbling) (4)

Rosemary, ROSMARINUS officinalis (1)

Russian Sage, PAERVOSDIA (1)
SALVIA coccinea (3)
SALVIA greggii (Cherry sage, less nibbling) (3)
SALVIA leucantha (1)
Silver Artemisia, ARTEMISIA ludoviciana (2)
Sotol, DASYLIRION spp. (1)
Spiderwort, TRADESCANTIA spp. (3)
Turks Cap, MALVAVISCUS arboreus (3)
Yarrow, ACHILLEA spp. (3)
YUCCA (2)
Zexmenia, WEDELIA hispida (1)

Shrubs

ABELIA spp. (3)
Agarito, BERBERIS trifoliata (1)
AGAVE
Barberry, BERBERIS (pygmy not resistant) (1)
Bear Grass, NOLINA spp. (1)
Beautyberry, CALLICARPA americana (1)
Buckeye, AESCULUS pavia (3)
Butterfly Bush, BUDDLEIA (3)
CASSIA spp. (3)
Cast Iron Plant, ASIDISTRA (3)
Cacuts (1)
Cenizo, LEUCOPHYLLUM frutescens (1)
Cherry Sage (3)
COTONEASTER (3)
Dwf. Chinese Holly, ILEX (1)
Dwf. Yaupon, ILEX (stokes variety) (1)
ELEAGNUS (3)
Evergreen Sumac, RHUS virens (1)
Germander, TEUCRIUM fruticans (3)
HYPERICUM (3)
Junipers (most varieties) (1)
Kidneywood, EYSENHARDTIA texana (3)
Mistflower, EUPATORIUM (1)
Mexican Oregano, POLIOMINTHA longiflora (1)
Mountain Laurel, SOPHORA secundiflora

NANDINA nana and domestica (3)
Oleander, NERIUM (1)
Pampas Grass, CORTADERIA selloana (1)
Prickly Pear Cactus (1)
Privet (3)
PYRACANTHA spp. (1)
Red Yucca, HESPERALOE parviflora (3)
Rosemary, ROSMARINUS officinalis (1)
SALVIA greggii (red) (3)
SALVIA leucantha (1)
SANTOLINA (1)
Sotol, DASYLIRION (2)
SPIREA (3)
Sumac, RHUS spp. (1)
Texas Persimmon, DIOSPYROS texana (1)
Texas Sage, LEUCOPHYLLUM frutescens (1)
VIBURNUM (1)
Wax Myrtle, MYRICA cerifera (1)
Yaupon, ILEX (Use Stokes, not Strahn) (1)
Yew Pine, PODOCARPUS macrophyllus (1)
YUCCA

Trees

Anacacho Orchid (1)
Ash, FRAXINUS spp. (1)
Bald Cypress, TAXODIUM distichum (1)
Bois d'arc (1)
Cedar Elm (1)
Chaste Tree, VITEX spp. (1)
Cherry Laurel, PRUNUS caroliniana (1)
Crepe Myrtle (old varieties) (1)
Deodora Cedar (1)
Elm (all varieties) (1)
Fig, FICUS spp. (1)
Juniper (1)
Maple, ACER grandidentatum (1)
Mesquite, PROSOPIS (beans eaten) (1)
Mexican Persimmon, DIOSPYROS texana (1)
Mexican Plum, PRUNUS mexicana (1)

Mountain Laurel (1)
Oaks, QUERCUS spp. (1)
Palm (all varieties) (1)
Pecan (1)
Pine (3)
Possum Haw, ILEX decidua (1)
Redbud (Eastern & Mexican nibbled) (3)
Retama (3)
Smoke Tree, COTINUS obovatus (1)
Sumac, RHUS spp. (1)
Walnut (1)
Yaupon, ILEX vomitoria (1)

Vines & Groundcovers

AJUGA (3)
Asiatic Jasmine (1)
Carolina Jessamine (3)
CLEMATIS (3)
Confederate Jasmine (3)
Cross Vine (1)
English & Algerian Ivy (1)
Ferns (3)
Fig Ivy (3)
Honeysuckle (Coral & Purple nibbled less) (3)
Liriope (4)
Monkey Grass (3)
Muhly Grass (3)
SANTOLINA (1)
VERBENA (3)
Virginia Creeper (3)
WISTERIA (3)
Yarrow (3)



Appendix S



The Value of Dead and Down Wood

by John M. Davis, Urban Biologist
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In a healthy forested area, there are trees that are in many different stages of life. There are young trees, mature trees, old trees, and dead trees. Most everyone understands the value of living trees. They provide shade, homes for wildlife, and increase property values. However, many people don't understand the value of dead trees. Dead trees (or "snags") are caused many different factors. Natural processes such as wind, fire, flooding, drought, disease, and old age all function as natural controls on tree populations. Tree mortality is a natural process. (Unfortunately, many processes of man such as overwatering, construction damage to root zones, root suffocation, herbicides, etc., contribute unnaturally to the death of trees.)

Typically society wants to remove snags. We seem to think that once a tree has died, it is no longer useful and should be removed. That, however, is not the case. Standing snags and fallen logs are extremely valuable to the forest ecosystem.

Wildlife Benefits of Standing Dead Trees (Snags)

Many different species of wildlife rely heavily on snags to survive (see the attached list). While some woodpeckers nest in cavities excavated in living trees, many of them nest only in cavities excavated in snags. Without snags, these woodpeckers can't exist. Once cavities are excavated, used, and abandoned by woodpeckers, secondary cavity-nesters move in. These birds include: Chickadees, Titmice, Wrens, and Bluebirds. In addition to excavated cavities, the often hollow trunks and limbs of snags provide excellent homes for owls, raccoons, squirrels, and certain species of bats.

Wildlife Benefits of Fallen Logs

The shelter provided by logs on the forest floor is also valuable to many different species of wildlife (see the attached list). Many different types of invertebrates, reptiles, amphibians, and mammals can be found on, in, or under fallen logs. These logs may be used as nesting sites, feeding sites, or escape cover. Fireflies require decaying logs to complete their life cycle. Without fallen logs, many of these animals could not exist. This is important because these animals form much of the foundation of the food web. Without them, hawks, owls, and other interesting animals would not be able to survive.

Nutrient Cycling Benefits of Fallen Logs

When a dead tree or limb falls to the ground, fungi, invertebrates, and other decomposers accelerate the process of decomposition. These decomposers

disassemble the complex chemical structure of the wood and release nutrients back into the soil. Without this process, the forest ecosystem would have no way of recycling its nutrients. The newly available nutrients are then taken up by the living vegetation and life benefits from death.

Management Recommendations

Dead and down woody material is certainly valuable to wildlife and the forested ecosystem, but there may be situations that require human action to maximize the usefulness of snags and fallen logs while minimizing any drawbacks. If the snag is located away from structures or walkways, then it can be left alone with no serious drawbacks. However, if the snag is near a structure, driveway, or walkway, then steps should be taken to reduce the risk of the trunk or limbs falling on them, causing damage to people or property.

The height of the tree determines the radius that could be affected should any part of the tree fall. For example, if a 30 foot tree falls, then anything within a 30 foot radius of the tree could be affected. To reduce the risk of damage, you can "limb" the tree or remove the major limbs leaving only the main trunk standing. You may also consider "topping" the snag or removing just enough of the top so that it does not extend beyond the height of surrounding trees. (Hire a professional to do this. It is not a job for someone without the right equipment.) Both of these techniques will reduce the wind stress on the snag, thus allowing it to stand longer.

Although fallen trees and limbs are valuable to wildlife and the forest itself, they may appear unsightly to some people. To minimize this, simply cut the multi-branched limbs into smaller sections and scatter them on the forest floor. If this practice is not satisfactory, you may create lots of small "criss-crossed" stacks of limbs located throughout the property or simply hide the limb sections within shrubbery. These practices will eliminate unsightliness while allowing the decaying wood to serve its purpose.

For large logs, you may consider splitting them and laying them on the forest floor with the flat side in contact with the soil. This isn't necessary as the log will decay by itself. However, doing this will create more surface area in contact with the soil. This will provide more shelter for wildlife and allow fungi and decomposers to disassemble the wood more quickly.

Because dead and down woody material is extremely valuable for many species of wildlife, it is often recommended that snags be "created" if none exist in the area. To do this, carefully select a tree and "girdle" it. To girdle a tree, you simply cut a ring into the base of the tree that is about an inch deep and an inch wide at the bark. Since it is only the outer rim of the tree that is alive and transporting nutrients, cutting this section will kill the standing portion of the tree. Depending on the species, the roots may or may not remain alive and re-sprout. When selecting the tree to girdle, consider those that are not native to the area, are short lived, or are undesirable for some other reason. Remember to also consider the tree's proximity to structures, driveways, etc. before girdling it.

Finally, it is important to help others understand the value of dead and down woody material. Educating others will not only help them understand why snags and logs are

needed by wildlife, but will also help them to understand the actions of those who are employing the management practices previously described.

Species in North Central Texas That Will Use Standing Snags

* Denotes non-native

Common Name	Scientific Name	Uses Excavated Cavities	Uses Hollow Trunk or Limbs	Nests in Crotch of Snag
Wood Duck	<i>Aix sponsa</i>	x	x	
American Kestrel	<i>Falco sparverius</i>	x	x	
Barn Owl	<i>Tyto alba</i>		x	
Eastern Screech Owl	<i>Otus asio</i>	x	x	
Great Horned Owl	<i>Bubo virginianus</i>		x	x
Barred Owl	<i>Strix varia</i>		x	
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	x		
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	x		
Downy Woodpecker	<i>Picoides pubescens</i>	x		
Ladder-backed Woodpecker	<i>Picoides scalaris</i>	x		
Hairy Woodpecker	<i>Picoides villosus</i>	x		
Northern Flicker	<i>Colaptes auratus</i>	x		
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	x	x	
Carolina Chickadee	<i>Parus carolinensis</i>	x	x	
Tufted Titmouse	<i>Parus bicolor</i>	x	x	
Carolina Wren	<i>Thryothorus ludovicianus</i>	x	x	x
Bewick's Wren	<i>Thryomanes bewickii</i>	x	x	
Eastern Bluebird	<i>Sialia sialis</i>	x	x	
* European Starling	<i>Sturnus vulgaris</i>	x	x	
* English Sparrow	<i>Passer domesticus</i>	x	x	
Prothonotary Warbler	<i>Protonotaria citrea</i>	x	x	
Big Brown Bat	<i>Eptesicus fuscus</i>		x	
Evening Bat	<i>Nycticeius h. humeralis</i>		x	
Silver-haired Bat	<i>Laionycteris noctivagans</i>		x	
Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i>		x	
Eastern Flying Squirrel	<i>Glaucomys volans</i>	x	x	
Eastern Fox Squirrel	<i>Sciurus niger</i>		x	
White-footed Mouse	<i>Peromyscus leucopus</i>		x	
Gray Fox	<i>Urocyon cinereoargenteus</i>		x	
Ringtail	<i>Bassariscus astutus</i>		x	
Raccoon	<i>Procyon lotor</i>		x	
Long-tailed Weasel	<i>Mustela frenata</i>		x	
Eastern Spotted Skunk	<i>Spilogale putorius</i>		x	

Appendix T

References

Literature:

Refer to the following Texas Parks and Wildlife Department (TPWD) and Texas Agricultural Extension Service (TCE) bulletins and pamphlets for additional habitat management and specific species management information:

Habitat:

Wildlife Management: Past, Present and Future, A Field Guide to Demonstrations of Wildlife Management Practices and Principles on the Engeling Wildlife Management Area by H. Haucke and J. Hogan Rose, #TPWD-BK-N7100-10L-8/92

Prescribed Range Burning in Texas by L.D. White and C. W. Hanselka, TAEX, Reprinted by TPWD, # PWD-BK-7100-196-7/91

Management Options in Post Oak Woodlands For Wildlife by D. W. Rideout, TPWD, #PWD LF N7100-237A (10/93)

Wetlands Assistance Guide for Landowners by J. K. Anderson, TPWD, #PWD BK R2000-020 (7/95)

Deer:

Learn About Whitetails by R. L. Cook, # PWD-BK-N7100-7-2/93

The Post Oak Savannah Deer Herd: Past, Present, Future by D. W. Rideout, # PWD RP W7100-237B (9/94)

Determining the Age Of a Deer by C. W. Ramsey, D. W. Steinbach, D. W. Rideout , TAEX #B-1453

Pineywoods Deer Management, by Gary Spencer, TPWD # PWD BK W7100-088 (5/87)

The Management of Spike Bucks in a White-tailed Deer Population by B. Armstrong, D. Harmel, B. Young, and F. Harwell, TPWD, #PWD LF N7100-247 (8/94)

Coyote Creek Ranch - A Success Story by D. W. Rideout, TPWD, #PWD LF N&100-241 (10/93)

Supplemental Forage Management for East Texas White-tailed Deer by B. J.

Higginbotham and J. C. Kroll, TAEX # L12457

Supplemental Feeding by J. R. Perkins, TPWD, #PWD-BK-N7100-033-11/91

Squirrel

Fox Squirrel Management in East Texas by B. G. Alexander, TPWD #PWD BK W7100-028 (10/94)

Quail:

Bobwhite Quail in Texas-Habitat Needs and Management Suggestions by A.S. Jackson, Clyde Holt, and Daniel Lay, TPWD, # PWD Brochure 7000-37 5/84

Bobwhite Facts & Fantasies by Horace Gore and Don Wilson, TPWD, #PWD LF (leaflet) C2000-063 (11/87).

The 182 page book "Beef, Brush and Bobwhites - Quail Management in Cattle Country" by Fred S. Guthery. Published by the Caesar Kleberg Wildlife Research Institute, Texas A&I University (now Texas A&M at Kingsville), Kingsville, Texas in 1986.

Dove:

Mourning Doves in Texas, Life History, Habitat Needs, and Management Suggestions by R. R. George, TPWD, #PWD-BK-7100-009A-3/88

Turkey:

The Eastern Wild Turkey in Texas by J. J. Campo and J. G. Dickson, TPWD, # PWD-BR-71---137B-2/90

Rio Grande Turkey Habitat Management by G. W. Litton and F. Harwell, TPWD, # PWD RP W7100-263 (10/95)

Feral Hog:

The Feral Hog in Texas by R. Taylor, TPWD, #PWD-BK-7100-195-10/91

Purple Martin:

The Purple Martin and Its Management in Texas by J. D. Ray, TPWD, # PWD BK W7100-254 (04/95)

Other Nongame:

Cantle P.C. 1978. Avian population densities and species diversity on reclaimed strip-mined land in east-central Texas. M.S. Thesis , Texas A&M University. College Station. 131 pp.

Faanes, C.A. 1987. Bird behavior and mortality in relation to power lines in prairie habitats. U.S. Fish and Wildl. Serv. Tech. Rep. 7. 31pp.).

Mitchnick, A.D. 1979. Avian populations of urban woodlands: comparisons, habitat requirements, and management implications. M.S. Thesis, Texas A&M Univ., College Station. 120pp.;

Mitchnick, A.D., and R.D. Slack. 1979. Comparison and management of avian populations of urban woodlands. Am. Ornithol. Union 97:51

Owens, L.K. 1989. Avian use of fencerow habitat in a predominantly agricultural area. Ph.D. Thesis, Texas A&M Univ., College Station. 157pp

Senzota, R.B. M. 1985. Effects of prescribed burning on a small mammal community in Post Oak Savannah, Texas. Ph.D. Thesis, Texas A&M Univ., College Station. 105pp.

Texas Wildscapes Program. Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas, 78744.

Appendix U

FORMS

Forms contained in this appendix include:

PWD 153-7100-10/03: Landowner Request for Technical Assistance. Landowners desiring technical assistance from Texas Parks and Wildlife Department should fill in this form and mail it to their local biologist.

PWD 885-W7000: 1-d-1 Open Space Agricultural Valuation Wildlife Management Plan. Landowners wishing to manage their property for wildlife as their agricultural practice must fill in and attach this form to their **1-d-1 Open Space Agricultural Valuation Application** form that is available from the county Central Appraisal District. *Do not return this form to Texas Parks and Wildlife Department.*

PWD 885-W7000: 1-d-1 Open Space Agricultural Valuation Annual Reporting Form. This form is not automatically required. For counties requesting a landowner report on wildlife management activities, this form will be provided to the landowner by the Chief Appraiser. *Do not return this form to Texas Parks and Wildlife Department.*





1-D-1 Open Space Agricultural Valuation Wildlife Management Plan for the Year(s) _____

Submit this plan to your County Chief Appraiser, not to Texas Parks and Wildlife Department

Part I. Owner Information

Account Number: _____

Owner's Name: _____
 Current mailing address: _____
 City, town, post office, state and zip code: _____
 Phone number: _____
 Tract Name: _____ Majority County: _____
 Additional Counties (if any): _____

Part II. Property Description

Legal Description of Property: _____
 Location of Property (distance and direction from nearest town; specify highway/road numbers):

 Is Acreage under high fence: Yes No Partial: (Describe) _____
 Total Acreage: _____ Ecoregion _____
 (refer to Comprehensive Wildlife Management Planning Guidelines)
 Habitat Types and Amounts of Acres:
 Cropland _____ Bottomland/Riparian _____ wetlands _____
 Non-native Pasture _____ Native Pasture/Grassland _____ timberlands _____
 Native Range/Brush _____ Other (describe) _____

III. Species targeted for management. (List all that apply. Attach additional page(s) if needed)

Deer turkey quail songbirds waterfowl doves bats
 Neotropical songbirds (List) _____
 Reptiles (list) _____ Amphibians (list) _____
 Small mammals (list) _____ Insects (list) _____
 Identified species of concern (List) _____
 Other (List) _____

Part IV. Management Plan Goals and Objectives

Describe the wildlife management **goals** (what you want the property to look like, or want to be able to do with it) and **objectives** (how you intend to achieve these goals) for this piece of property. You may use an additional page if needed. (Note: This space will expand as you type.)

Part V. Qualifying Wildlife Management Activities

Check the wildlife management practices to be implemented on the property during the coming year that will support and achieve your management goals. A minimum of three practices is required.

Habitat control Provide supplemental supplies of water
 Erosion control Provide supplemental supplies of food
 Predator control Provide shelters
 Making census counts to determine population.

Part VI. White tail Deer and Mule Deer Population Management

Is hunting to be a part of this wildlife management plan? Yes No
If YES, type of hunting: Lease hunting Family/guests only Both
List deer harvest for past three seasons:
Year: _____ Bucks: _____ Does: _____
Year: _____ Bucks: _____ Does: _____
Year: _____ Bucks: _____ Does: _____
Population Management Goals:
Target Density for Pre-season Deer Population (fall density) _____
Target Sex Ratio (does/buck): _____
Target Production (fawns/does): _____
Other (may be age, weight, antler measurements, browse conditions, etc.)

Deer Harvest Strategy (numbers, types of deer to be harvested to achieve goals):

Part VII. Wildlife Management Association Membership

Are you a member of a wildlife management association (co-op)? Yes No
Are you a member of a wildlife property association? Yes No
Name of wildlife property co-op/association, if YES is checked. _____

Part VIII. Wildlife Management Activities

Check the activities you intend to implement during the year to support each of the wildlife management activities listed in Part V.

<p>1. HABITAT CONTROL</p> <p><input type="checkbox"/> <i>Grazing management.</i> Check grazing system being utilized.</p> <p><input type="checkbox"/> 1 herd/3pasture <input type="checkbox"/> 1 herd/4 pasture <input type="checkbox"/> 1 herd/multiple pasture</p> <p><input type="checkbox"/> High intensity/low frequency (HILF) <input type="checkbox"/> Short duration system</p> <p><input type="checkbox"/> Other type of grazing system (describe) _____</p> <p><i>Additional Information:</i> _____</p>
<p><input type="checkbox"/> <i>Prescribed Burning</i></p> <p>Acres to be burned: _____ Planned burn date: _____</p> <p><i>Additional Information:</i> _____</p>
<p><input type="checkbox"/> <i>Range Enhancement (Range Reseeding)</i></p> <p>Acres to be seeded: _____ Date to be seeded: _____</p> <p>Seeding Method: <input type="checkbox"/> Broadcast <input type="checkbox"/> Drilled <input type="checkbox"/> Native Hay</p> <p>Seeding mixture to be used:</p> <p>Fertilized: <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Weed control needed for establishment? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><i>Additional Information:</i> _____</p>
<p><input type="checkbox"/> <i>Brush Management.</i> Acres to be treated: _____ Check method of brush management:</p> <p><input type="checkbox"/> Mechanical</p> <p><input type="checkbox"/> grubber <input type="checkbox"/> chain <input type="checkbox"/> roller chopper/aerator <input type="checkbox"/> rhome disc</p> <p><input type="checkbox"/> brush hog (shredder) <input type="checkbox"/> dozer <input type="checkbox"/> hand-cutting (chainsaw)</p> <p><input type="checkbox"/> hydraulic shears <input type="checkbox"/> other (describe): _____</p> <p><input type="checkbox"/> Chemical Kind: _____ Rate: _____</p> <p><input type="checkbox"/> Brush management design:</p> <p><input type="checkbox"/> block <input type="checkbox"/> mosaic <input type="checkbox"/> strips: width: _____ Length: _____</p> <p><i>Additional Information:</i> _____</p>
<p><input type="checkbox"/> <i>Fence Modification</i></p> <p>Target species: <input type="checkbox"/> pronghorn antelope <input type="checkbox"/> bighorn sheep</p> <p>Technique: <input type="checkbox"/> fold up bottom of net-wire Gap width: _____</p> <p><input type="checkbox"/> replace sections of net-wire with barbed wire. Gap width: _____</p> <p>Miles of fencing that will be modified: _____</p> <p><input type="checkbox"/> replace entire net-wire fence with barbed wire. Miles replaced: _____</p> <p><i>Additional Information:</i> _____</p>

Riparian management and enhancement

Fencing of riparian area

Complete fencing Partial fencing

Deferment from livestock grazing

Complete deferment partial deferment Season deferred : _____

Establish vegetation

Trees (list species) _____

Shrubs (list species) _____

Herbaceous species (list) _____

Additional Information: _____

Wetland enhancement

Provide seasonal water Provide permanent water Moist soil management

Other (describe) _____

Additional Information: _____

Habitat Protection for species of concern

Fencing Firebreaks Prescribed burning Control of nest parasites

Habitat manipulation (thinning, etc.) Native/exotic ungulate control

Other (describe) _____

Additional Information: _____

Prescribed Control of Native, Exotic and Feral Species

Prescribed control of vegetation Prescribed control of animal species

Species being controlled: _____

Method of control: _____

Additional Information: _____

Wildlife Restoration

Habitat restoration

Wildlife restoration

Target species: _____

Method of restoration: _____

Additional Information: _____

2. EROSION CONTROL

Pond construction and repair

Surface area (acres): _____ Number of cubic yards of soil displaced: _____

Length of dam (feet): _____ Planned date of construction: _____

Additional Information: _____

Gully shaping

Total acres to be treated: _____ Acres treated annually: _____

Seeding mix used for reestablishment of vegetation: _____

Planned date of construction: _____

Additional Information: _____

Streamside, pond, and wetland revegetation. Techniques used:

Native hay bales Fencing Filter strips Seeding upland buffer

Rip-rap, etc. stream crossings Other: _____

Planned date of construction: _____

Additional Information: _____

Herbaceous and/or woody plant establishment on critical areas (erodible)

Establish windbreak Establish shrub mottes Improve plant diversity

Improve wildlife habitat Conservation/no-till practices Manage CRP cover

Additional Information: _____

Dike/Levee Construction/Management

Reshaping/repairing erosion damage Revegetating/stabilize levee areas

Install water control structure Fencing

Additional Information: _____

Establish water diversion

Type: Channel Ridge

Slope: level graded Length (feet) _____

Vegetated: No YES

If YES: Native: _____ Crop: _____

Additional Information: _____

3. PREDATOR CONTROL

- Imported red fire ants (verify prior to application that product is labeled for pasture use)
- Control of cowbirds Grackle/starling/house sparrow control
Method of control: Trapping Shooting Baiting Scare tactics _____
- Coyotes Feral hogs Raccoon Skunk Bobcat Mountain lion
- Rat snakes Feral cats/dogs
Method of control: Trapping Shooting M-44 (licensed applicators)
 Poison collars (1080 certified, licensed, applicator) Other _____

Additional Information: _____

4. SUPPLEMENTAL WATER

- Marsh/Wetland Restoration or Development*
- Greentree reservoirs Shallow roost pond development Seasonally flooded crops
- Artificially created wetlands Marsh restoration/development/protection
- Prairie pothole restoration/development/protection Moist soil management units
- Planned date of construction: _____

Additional Information: _____

- Well/trough/windmill overflow/other wildlife watering facilities*
- Drill new well Depth: _____ Gallons per minute: _____
 Windmill Pump Pipeline: Size _____ Length: _____
- Modification(s) of existing water source
- Fencing Overflow Trough modification Pipeline
- Distance between water sources (waterers): _____

Type of wildlife watering facility

- | | | | | | |
|--|---|-------|---|---|-------|
| <input type="checkbox"/> PVC pipe facility | # | _____ | <input type="checkbox"/> Drum with faucet or float | # | _____ |
| <input type="checkbox"/> Small game guzzler | # | _____ | <input type="checkbox"/> Windmill supply pipe dripper | # | _____ |
| <input type="checkbox"/> Plastic container | # | _____ | <input type="checkbox"/> In-ground bowl trough | # | _____ |
| <input type="checkbox"/> Big game guzzler | # | _____ | <input type="checkbox"/> Inverted umbrella guzzler | # | _____ |
| <input type="checkbox"/> Flying saucer guzzler | # | _____ | <input type="checkbox"/> Ranch Specialties guzzler | # | _____ |
| <input type="checkbox"/> Other: | | _____ | | | _____ |

Additional Information: _____

- Spring development and/or enhancement*
- Fencing Water diversion/pipeline Brush removal Spring clean out
- Other: _____

Additional Information: _____

5. PROVIDING SUPPLEMENTAL FOOD

- Grazing management Prescribed burning Range enhancement

- Food plots Size: _____ Fenced: Yes No

Irrigated: Yes No

Plantings: Cool season annual crops: _____

Warm season annual crops: _____

Annual mix of native plants: _____

perennial mix of native plants: _____

Additional Information: _____

- Feeders and mineral supplementation*

Purpose: Supplementation Harvesting of wildlife

Targeted wildlife species: _____

Feed type: _____ Mineral type: _____

Feeder type: _____ Number of feeders: _____

Method of mineral dispensing: _____

Number of mineral locations: _____

Year round: Yes No If not, state when: _____

Additional Information: _____

- Managing tame pasture, old fields and croplands*

Overseeding cool and/or warm season legumes and/or small grains

Periodic disturbance (Discing/Mowing/Shredding) Conservation/no-till

Additional Information: _____

- Transition management of tame grass monocultures*

Overseed 25% of tame grass pastures with locally adapted legumes

Species planted: Clover Peas Vetch Other: _____

Additional Information: _____

6. PROVIDING SUPPLEMENTAL SHELTER

Nest boxes Target Species: _____

Cavity type. # _____ Bat boxes. # _____ Raptor pole. # _____

Additional Information: _____

Brush piles and slash retention

Type: Slash Brush piles Number per acre: _____

Additional Information: _____

Fence line management Length: _____ Initial establishment: Yes No

Plant type established: Trees Shrubs Forbs Grasses

Additional Information: _____

Hay meadow, pasture and cropland management for wildlife Acres treated: _____

Shelter establishment: Roadside management Terrace/wind breaks Field borders

shelterbelts Conservation Reserve Program lands management

Type of vegetation: Annual Perennial

Species and percent of mixture _____

Deferred mowing Period of deferment: _____

Mowing Acres mowed annually: _____

No till/minimum till

Additional Information: _____

Half-cutting trees or shrubs

Acreage to be treated annually: _____ Number of half-cuts annually: _____

Additional Information: _____

Woody plant/shrub establishment

Pattern: Block Mosaic Strips: Width: _____

Acreage or length established annually: _____ Spacing: _____

Shrub/tree species used: _____

Additional Information: _____

Natural cavity/snag development

Species of snag _____ Size of snags: _____ Number/acre _____

Additional Information: _____

7. CENSUS

Spotlight counts Targeted species: _____
Length of route: _____ Visibility of route _____
Dates (3 required) A. _____ B. _____ C. _____
Additional Information: _____

Standardized incidental observations Targeted species: _____
Observations from: Feeders Food plots Blinds Vehicle Other _____
Dates: _____
Additional Information: _____

Stand counts of deer (5 one hour counts per stand required). Number of stands: _____
Dates: _____
Additional Information: _____

Aerial Counts Species counted: _____
Type of survey: Helicopter Fixed-wing
Percent of area surveyed: Total 50% Other: _____
Additional Information: _____

Track counts: Predators Furbearers Deer Other: _____
Additional Information: _____

Daylight deer herd/wildlife composition counts
Species: Deer Turkey Dove Quail Other _____
Additional Information: _____

Harvest data collection/record keeping: Deer Game birds
 Age Weight Sex Antler data Harvest date
Additional Information: _____

Browse utilization surveys (thirty 12 foot circular plots required)
Additional Information: _____

Census of endangered, threatened, or protected wildlife. Species: _____
Method and dates: _____
Additional Information: _____

Census and monitoring of nongame wildlife species. Species: _____
 Method and dates: _____
 Additional Information: _____

Miscellaneous Counts: Species being counted: _____

Remote detection (i.e. cameras) Hahn (walking) line Roost counts

Booming ground counts Time/area counts Songbird transects and counts

Quail call and covey counts Point counts Small mammal traps

Drift fences and pitfall traps Bat departures Dove call counts

Chachalaca counts Turkey hen/poult counts Waterfowl/water bird counts

Alligator nest/census counts Other: _____

Additional Information: _____

IX. Additional Supporting Information. (Optional)

Attach any other supporting information, such as maps or photographs that you believe to be relevant to this wildlife management plan.

I certify that the above information provided by me in this application is to the best of my knowledge and belief, true and complete.

 Landowner Signature Date

This area for use only if the wildlife management plan was prepared for the above landowner for a fee by a wildlife professional or consultant. *

Signature of person preparing wildlife management plan.	Date
Company	Phone Number
*Signature by TPWD not required for this plan to be lid.	

Texas Parks and Wildlife does not maintain the information collected through this form. This completed form is only provided to the County Tax Appraiser. Please inquire with your County Central Appraisal District on any local laws concerning any information collected through this form.



**1-D-1 Open Space Agricultural Valuation
Wildlife Management Annual Report for the Year(s) _____**
Submit this plan to your County Tax Appraiser, not to Texas Parks and Wildlife

Part I. Owner Information

Account Number: _____

Owner's Name: _____
Current mailing address: _____
City, town, post office, state and zip code: _____
Phone number: _____
Tract Name: _____ Majority County: _____
Additional Counties (if any): _____

Part II. Qualifying Wildlife Management Activities

Check the wildlife management practices implemented on the property during the year being reported. A minimum of three practices is required.

- Habitat control
- Erosion control
- Predator control
- Making census counts to determine population.
- Provide supplemental supplies of water
- Provide supplemental supplies of food
- Provide shelters

Part III. Wildlife Management Association Membership

Are you a member of a wildlife property association? Yes No

Name of wildlife property co-op/association, if YES is checked. _____

Part IV. Wildlife Management Activities

Check the activities you have implemented during the year to support each of the wildlife management activities listed in Part II.

1. HABITAT CONTROL

- Grazing management.* Check grazing system being utilized.
- 1 herd/3pasture 1 herd/4 pasture 1 herd/multiple pasture
- High intensity/low frequency (HILF) Short duration system
- Other type of grazing system (describe) _____

Additional Information: _____

- Prescribed Burning*

Acres to be burned: _____ Planned burn date: _____

Additional Information: _____

- Range Enhancement (Range Reseeding)*

Acres to be seeded: _____ Date to be seeded: _____

Seeding Method: Broadcast Drilled Native Hay

Seeding mixture to be used: _____

Fertilized: Yes No

Weed control needed for establishment? Yes No

Additional Information: _____

- Brush Management.* Acres to be treated: _____ Check method of brush management:

Mechanical

grubber chain roller chopper/aerator rhome disc

brush hog (shredder) dozer hand-cutting (chainsaw)

hydraulic shears other (describe): _____

Chemical Kind: _____ Rate: _____

Brush management design:

block mosaic strips: width: _____ Length: _____

Additional Information: _____

- Fence Modification*

Target species: pronghorn antelope bighorn sheep

Technique: fold up bottom of net-wire Gap width: _____

replace sections of net-wire with barbed wire. Gap width: _____

Miles of fencing that will be modified: _____

replace entire net-wire fence with barbed wire. Miles replaced: _____

Additional Information: _____

Riparian management and enhancement

Fencing of riparian area

Complete fencing Partial fencing

Deferment from livestock grazing

Complete deferment partial deferment Season deferred : _____

Establish vegetation

Trees (list species) _____

Shrubs (list species) _____

Herbaceous species (list) _____

Additional Information: _____

Wetland enhancement

Provide seasonal water Provide permanent water Moist soil management

Other (describe) _____

Additional Information: _____

Habitat Protection for species of concern

Fencing Firebreaks Prescribed burning Control of nest parasites

Habitat manipulation (thinning, etc.) Native/exotic ungulate control

Other (describe) _____

Additional Information: _____

Prescribed Control of Native, Exotic and Feral Species

Prescribed control of vegetation Prescribed control of animal species

Species being controlled: _____

Method of control: _____

Additional Information: _____

Wildlife Restoration

Habitat restoration

Wildlife restoration

Target species: _____

Method of restoration: _____

Additional Information: _____

2. EROSION CONTROL

Pond construction and repair

Surface area (acres): _____ Number of cubic yards of soil displaced: _____

Length of dam (feet): _____ Planned date of construction: _____

Additional Information: _____

Gully shaping

Total acres to be treated: _____ Acres treated annually: _____

Seeding mix used for reestablishment of vegetation: _____

Planned date of construction: _____

Additional Information: _____

Streamside, pond, and wetland revegetation. Techniques used:

Native hay bales Fencing Filter strips Seeding upland buffer

Rip-rap, etc. stream crossings Other: _____

Planned date of construction: _____

Additional Information: _____

Herbaceous and/or woody plant establishment on critical areas (erodible)

Establish windbreak Establish shrub mottes Improve plant diversity

Improve wildlife habitat Conservation/no-till practices Manage CRP cover

Additional Information: _____

Dike/Levee Construction/Management

Reshaping/repairing erosion damage Revegetating/stabilize levee areas

Install water control structure Fencing

Additional Information: _____

Establish water diversion

Type: Channel Ridge

Slope: level graded Length (feet) _____

Vegetated: No YES

If YES: Native: _____ Crop: _____

Additional Information: _____

3. PREDATOR CONTROL

Imported red fire ants (verify prior to application that product is labeled for pasture use)

Control of cowbirds Grackle/starling/house sparrow control

Method of control: Trapping Shooting Baiting Scare tactics _____

Coyotes Feral hogs Raccoon Skunk Bobcat Mountain lion

Rat snakes Feral cats/dogs

Method of control: Trapping Shooting M-44 (licensed applicators)

Poison collars (1080 certified, licensed, applicator) Other _____

Additional Information: _____

4. SUPPLEMENTAL WATER

Marsh/Wetland Restoration or Development

Greentree reservoirs Shallow roost pond development Seasonally flooded crops

Artificially created wetlands Marsh restoration/development/protection

Prairie pothole restoration/development/protection Moist soil management units

Planned date of construction: _____

Additional Information: _____

Well/trough/windmill overflow/other wildlife watering facilities

Drill new well Depth: _____ Gallons per minute: _____

Windmill Pump Pipeline: Size _____ Length: _____

Modification(s) of existing water source

Fencing Overflow Trough modification Pipeline

Distance between water sources (waterers): _____

Type of wildlife watering facility

PVC pipe facility # _____ Drum with faucet or float # _____

Small game guzzler # _____ Windmill supply pipe dripper # _____

Plastic container # _____ In-ground bowl trough # _____

Big game guzzler # _____ Inverted umbrella guzzler # _____

Flying saucer guzzler # _____ Ranch Specialties guzzler # _____

Other: _____

Additional Information: _____

- Spring development and/or enhancement*
- Fencing Water diversion/pipeline Brush removal Spring clean out
- Other: _____

Additional Information: _____

5. PROVIDING SUPPLEMENTAL FOOD

- Grazing management Prescribed burning Range enhancement

- Food plots Size: _____ Fenced: Yes No

Irrigated: Yes No

Plantings: Cool season annual crops: _____

Warm season annual crops: _____

Annual mix of native plants: _____

perennial mix of native plants: _____

Additional Information: _____

- Feeders and mineral supplementation*

Purpose: Supplementation Harvesting of wildlife

Targeted wildlife species: _____

Feed type: _____ Mineral type: _____

Feeder type: _____ Number of feeders: _____

Method of mineral dispensing: _____

Number of mineral locations: _____

Year round: Yes No If not, state when: _____

Additional Information: _____

- Managing tame pasture, old fields and croplands*

Overseeding cool and/or warm season legumes and/or small grains

Periodic disturbance (Discing/Mowing/Shredding) Conservation/no-till

Additional Information: _____

- Transition management of tame grass monocultures*

Overseed 25% of tame grass pastures with locally adapted legumes

Species planted: Clover Peas Vetch Other: _____

Additional Information: _____

6. PROVIDING SUPPLEMENTAL SHELTER

Nest boxes Target Species: _____
 Cavity type. # _____ Bat boxes. # _____ Raptor pole. # _____
Additional Information: _____

Brush piles and slash retention
 Type: Slash Brush piles Number per acre: _____
Additional Information: _____

Fence line management Length: _____ Initial establishment: Yes No
Plant type established: Trees Shrubs Forbs Grasses
Additional Information: _____

Hay meadow, pasture and cropland management for wildlife Acres treated: _____
Shelter establishment: Roadside management Terrace/wind breaks Field borders
 shelterbelts Conservation Reserve Program lands management
Type of vegetation: Annual Perennial
Species and percent of mixture _____
 Deferred mowing Period of deferment: _____
 Mowing Acres mowed annually: _____
 No till/minimum till
Additional Information: _____

Half-cutting trees or shrubs
Acreage to be treated annually: _____ Number of half-cuts annually: _____
Additional Information: _____

Woody plant/shrub establishment
Pattern: Block Mosaic Strips: Width: _____
Acreage or length established annually: _____ Spacing: _____
Shrub/tree species used: _____
Additional Information: _____

Natural cavity/snag development
Species of snag _____ Size of snags: _____ Number/acre _____
Additional Information: _____

7. CENSUS

Spotlight counts Targeted species: _____
Length of route: _____ Visibility of route _____
Dates (3 required) A. _____ B. _____ C. _____
Additional Information: _____

Standardized incidental observations Targeted species: _____
Observations from: Feeders Food plots Blinds Vehicle Other _____
Dates: _____
Additional Information: _____

Stand counts of deer (5 one hour counts per stand required). Number of stands: _____
Dates: _____
Additional Information: _____

Aerial Counts Species counted: _____
Type of survey: Helicopter Fixed-wing
Percent of area surveyed: Total 50% Other: _____
Additional Information: _____

Track counts: Predators Furbearers Deer Other: _____
Additional Information: _____

Daylight deer herd/wildlife composition counts
Species: Deer Turkey Dove Quail Other _____
Additional Information: _____

Harvest data collection/record keeping: Deer Game birds
 Age Weight Sex Antler data Harvest date
Additional Information: _____

Browse utilization surveys (thirty 12 foot circular plots required)
Additional Information: _____

Census of endangered, threatened, or protected wildlife. Species: _____
Method and dates: _____
Additional Information: _____

Census and monitoring of nongame wildlife species. Species: _____
 Method and dates: _____
Additional Information: _____

Miscellaneous Counts: Species being counted: _____

Remote detection (i.e. cameras) Hahn (walking) line Roost counts
 Booming ground counts Time/area counts Songbird transects and counts
 Quail call and covey counts Point counts Small mammal traps
 Drift fences and pitfall traps Bat departures Dove call counts
 Chachalaca counts Turkey hen/poult counts Waterfowl/water bird counts
 Alligator nest/census counts Other: _____

Additional Information: _____

Part V. Attach copies of supporting documentation such as receipts, maps, photos, etc. Use additional pages if necessary.

I certify that the above information provided by me is to the best of my knowledge and belief true and complete.

Signature

Date

Texas Parks and Wildlife does not maintain the information collected through this form. This completed form is only provided to the County Tax Appraiser. Please inquire with your County Central Appraisal District on any local laws concerning any information collected through this form.

Appendix V Description and Bibliography

East Texas Pineywoods

Mostly deep, dark, and evergreen, the Piney Woods region of East Texas is an extension of the rich pine/hardwood forests of the southeastern United States. Gently rolling hills cloaked with pines and oaks, and rich bottomlands with tall hardwoods characterize these forests, while intermittent pockets of evergreen shrub bogs, open seepage slopes, and cypress-tupelo swamps form a patchwork quilt throughout. Frequent long-term flooding plays an essential role in maintaining these bottomland hardwood communities. Flowering dogwoods are scattered about the moist uplands -- their beautiful white bracts gleaming through the oak woodlands in the spring. The region's 35 to 60 inches of rain each year support not only pines -- mainly loblolly, shortleaf, and longleaf -- but also swamp and streamside stands of hardwoods (beech oaks, elm, and magnolia) and a myriad of woodland specialties -- sphagnum mosses, ferns, pitcher plants, sundews, pipeworts and orchids (Winkler, 1982).

Elevations range from near sea level to almost 500 feet with an average annual temperature of 66° F. The growing season approaches 250 days in the south and 230 days near the Red River in the north. Highly weathered soils are sandy or loamy and very deep. As most of the 15.8 million acres of the region is prime timber land, conversion of these woodlands to plantations of loblolly or slash pine has permanently altered many of the natural forest communities.

East Texas boasts a rich diversity of wildlife. Fifteen species of Texas breeding birds nest predominantly in this eco-region. Three of these species, including the Pine Warbler, Brown-headed Nuthatch and the endangered Red-cockaded Woodpecker are confined almost exclusively, in Texas, to the Piney woods forest for breeding. The Bachman's Sparrow nests locally in Texas only in the longleaf pine uplands of this region, while wintering Bald Eagles set up winter roosts in undisturbed woodlands near rivers and lakes. Other avian specialties of the Piney Woods include the Wood Thrush, Hooded Warbler, Prothonotary Warbler, and Barred Owl, the dark-eyed, noisy denizen of deep bottomland forests. Characteristic mammals of the region include River Otter, Gray Squirrel, Flying Squirrel, and the erstwhile Louisiana Black Bear. Although the Louisiana Black Bear is currently absent from the Piney Woods, suitable habitat still exists to support future populations of this East Texas specialty.

TEXAS WILDSCAPES NATIVE PLANT TABLES BIBLIOGRAPHY - EAST TEXAS PINEY WOODS

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WildScapes Plant Tables -- Pineywoods

SPECIES	FAMILY	HABIT/ HEIGHT	FLOWER	FRUIT	SUN EXPOSURE	HABITAT	SOILS & MOISTURE REGIME	VEGETATION ZONE										WILDLIFE VALUE					
								1	2	3	4	5	6	7	8	9	10		ORNAMENTAL VALUE				
<i>Acer rubrum v. drummondii</i> Drummond red maple	Aceraceae - Maple Family	90'-100' Tree, large	Showy bright red clusters, before leaves. Feb.	Samara with two wings. March-June	Full sun, Part shade	Prefers wet areas on sandy lands, swamps & alluvial forest. Also found on drier ridges throughout Piney woods in East TX.	Sands, loams, and clays. Likes acid soils. Mesic-hydric, poor drainage O.K.	X	X	X												Large shade tree with simple distinctively-shaped leaves which turn red in the fall. Popular ornamental and shade tree, as they are beautiful both spring & fall. Relatively short-lived with shallow root system. Does well in Houston. Deciduous.	Many kinds of birds feed on the winged seeds, i.e. woodpeckers, cardinals, finches, robins, cedar waxwings, warblers, & sparrows, also squirrels & rabbits. Good cover & nesting tree. Good substrate for insectivorous birds. Foliage browsed by deer.
<i>Betula nigra</i> River birch	Betulaceae - Birch Family	25' - 90' Tree, large	inconspicuous catkins, m brown & f green on same tree. Feb. - March	Cones, cylinder-shaped with small winged seeds. April-June	Full sun, Part shade	Occurs in wetlands near creeks, swamps & sloughs	Sands, loams, or clays. Mesic-hydric, poor drainage O.K.	X		X												Attractive ornamental tree with dark red-brown bark peeling off branches in papery sheets. Has graceful silhouette and good yellow fall color. Fast grower but short lived. Doesn't tolerate flooding, but likes moist soils. Does well in Houston. Deciduous.	Several species of small birds including chickadees and finches eat the ripe seeds. Twigs & buds are browsed by white-tailed deer. Beaver, rabbits & squirrels also eat various parts.
<i>Celtis laevigata</i> Sugarberry	Ulmaceae - Elm Family	40' - 60' Tree, large	inconspicuous, small, greenish. May-June	Berry (drupe), orange-red to purplish-black. July-Aug.	Full sun, part shade	Rocky or alluvial soils along streams, in woodlands & thickets.	Sands, loams, and clays. Prefers rich soils, but will tolerate wide range. Well-drained, mesic to xeric; drought tolerant once established.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Fast-growing shade tree adapted to most soils. Very drought tolerant. Yellow autumn color. Deciduous.	Fruit eaten by bluebirds, robins, cardinals, mockingbirds, cedar waxwings, thrashers, & sparrows. Good nest & cover tree, esp. for neotropical migrants. Larval food plant for Question Mark, Mourning Cloak, Pale Emperor, Snout & Hackberry butterflies.
<i>Fagus grandifolia</i> American beech	Fagaceae - Beech Family	80' - 100' Tree, large	inconspicuous m & f flowers on same tree. April-May	Nut. Sept. - Nov	Full sun, part shade	Grows in deep, rich, fertile soils along streams & woodlands of Piney woods region.	Sandy loams, alluvial soils. Well-drained, mesic.	X														Handsome shade tree with beautiful shiny green leaves and smooth gray bark. Leaves turn copper gold in the fall. Deciduous.	Excellent cover & nesting tree. Prickly burrs contain sweet nuts relished by several kinds of game & songbirds, i.e. woodpeckers, titmice, nuthatches, jays & sparrows. Also eaten by raccoon, beaver, opossum & fox. Deer eat nuts & browse leaves.

<i>Fraxinus americana</i> White ash	Oleaceae - Olive Family	60' - 70' Tree, large	inconspicuous m & f flower clusters. April-May	Samara. Aug.- Sept.	Full sun, part shade	Grows in deep, rich moist soils on slopes & stream bottoms in eastern third of Texas.	Sands, loams & clays. Needs moisture, but good drainage.	X	X	X	X								Beautiful shade tree with compound leaves turning delicate shades of pink, orange & purple in fall. Trees in open condition have short trunk & round top, in the forest, long trunk & narrow crown. Deciduous.	Excellent cover & nesting tree. Seeds are eaten by several species of birds, i.e., wood duck, bobwhite, sapsuckers, cedar waxwings, finches, cardinals & sparrows. Deer browse leaves. LHP for Mourning cloak, Two-tailed and Tiger swallowtails.
<i>Liquidamber styraciflua</i> Sweetgum	Hamamelidaceae Witch hazel Family	60' - 100' Tree, large	inconspicuous m & f greenish flowers on same tree. March-May	Capsules arranged in spiny globe. Sept. - Nov.	Full sun, part shade	Grows in low wet areas on acid sands, flooded river bottoms, also in drier upland hills.	Sands, loams & clay loams. Needs moisture, mesic.	X	X	X									Beautiful tall shade tree with symmetrical pyramidal crown and striking star-shaped leaves. Leaves turn gorgeous colors in the fall, from gold to bright scarlet, then to deep crimson. Fast growing & long lived. Highly ornamental. Deciduous.	Good protective cover and nesting tree. At least 25 specie of birds feed upon the fruit as do beaver, gray & fox squirrels. Birds include mallards, doves, finches, juncoes, sparrows, towhees, chickadees, titmice & siskins.
<i>Nyssa sylvatica</i> Black gum	Nyssaceae - Tupelo Family	80' - 100' Tree, large	inconspicuous m & f greenish flowers, sometimes on same or different trees. April- June	Drupes, blue- black. Sept.-Oct.	Full sun, part shade	Rich bottomland soils in East TX. Piney Woods, along streams and creek bottoms, or moist open woods in sandy soils.	Sands, sandy loams, and clays. Likes acid soils. Mesic-hydric, likes moisture, poor drainage O.K.	X	X	X									Tall shade tree with short, crooked branches & narrow, flat-topped crown. Has gorgeous, early red fall color. Does well in gumbo. Good tree for Houston area. Deciduous.	Dark fruits provide an early source of food for a variety of birds & mammals. Favored by bluebirds, catbirds, mockingbirds, robins, summer tanagers & finches. Good substrate for insectivorous birds. Foliage browsed by deer. Bees attracted to flowers.
<i>Quercus alba</i> White oak	Fagaceae - Beech Family	80' - 100' Tree, large	inconspicuous m & f catkins in clusters & at tips. April-May	Acorn, maturing in one year. Sept.-Oct.	Full sun, part shade	Prefers rich, deep soils of East Texas Piney woods forests	Sands, loams & loamy clays. Acid soils. Well-drained mesic-hydric. Seasonal poor drainage tolerated.	X	X	X									Magnificent long-lived shade tree with dark green simple leaves, paler below. Slow- growing but good fall color, leaves turning bright red. Bark is off-white & flaky. Well adapted to rich sandy loams & black gumbo soils. Grows well in Houston. Deciduous.	Squirrels, deer, wild turkey & bobwhite eat acorns, as do jays, woodpeckers & wood duck. Good cover & nest tree & good substrate for insectivorous birds. Larval host plant of Juvenile duskywing, Banded hairstreak, White H hairstreak & Edwards hairstreak.

<i>Crataegus marshallii</i> Parsley hawthorn	Rosaceae - Rose Family	10' - 25' Tree, small	Showy white flowers. March	Red haws. Sept.-Oct.	Full sun, dappled shade, part shade	Prefers sandy woodlands & pastures. Found mostly along fencelines and woodland edges in East Texas.	Sands & sandy loams, acid. Also tolerates calcareous soils. Well-drained, mesic.	X	X									Beautiful blossoms add a touch of ethereal beauty to this understory tree. Usually with several trunks & flaky gray bark revealing an orange layer underneath. Fruits are a shiny bright red color. Deciduous.	Beautiful white blossoms attract nectar lovers. Red haws are gone in a flash as they are highly prized by many species of birds, also by mammals. Large thorns make it a good protective cover & nest tree. Larval host plant of the Gray Hairstreak.
<i>Hamamelis virginiana</i> Common witch hazel	Hamamelidaceae - Witch Hazel Family	10' - 30' Tree, small	Yellow, narrow petals, appear when leaves drop in fall. Oct. - Nov.	Capsules are woody & 2-celled with torpedo like seeds which explode from capsule. Nov. - Dec. of the next year.	Dappled shade, part shade, shade	Prefers dry or moist, well-drained woodlands, often associated with creeks & streams.	Sands, loams & clays, acid or calcareous. Well-drained, mesic.	X	X	X	X							Attractive fall-blooming understory large shrub or small tree. Often used as ornamental. Yellow blossoms appear in fall after leaves have dropped. Provides excellent fall color of gold. Deciduous.	Birds of at least 5 species eat the seeds, if they get to them before they are shot out of "ballistic" capsules. Cottontails, beaver & white-tailed deer also eat seeds on the ground as well as young twigs.
<i>Ilex decidua</i> Deciduous Holly	Aquifoliaceae Holly Family	10' - 30' Tree, small	inconspicuous m & f flowers on separate trees. March-May	Drupes, orange-red on tree. Sept.-Feb.	Full sun, part shade	Prefers moist areas near streams and woodlands	Sands, loams & clays. Well-drained, mesic. Seasonal poor drainage O.K.	X	X	X	X	X						Good understory tree or accent tree with spreading open crown, often with inclined trunk. Female trees have red berries held over winter, very ornamental. Deciduous.	Fruits are eaten by several species of birds, bobwhite, doves, robins, cedar waxwings, bluebirds, jays & mockingbirds. Squirrels, opossum, rabbits & fox eat berries too. Flower nectar & pollen attract several insects. Good nest tree.
<i>Ilex opaca</i> American holly	Aquifoliaceae Holly Family	15' -25' Tree, small	inconspicuous m & f greenish flowers on separate trees. March-April	Berries, red on tree, persist through winter. Sept. - Dec.	Full sun, part shade, dappled shade, shade	Prefers moist woods; hammocks along streams, upper river bottoms; can tolerate drier soils on hillsides. Found in East Texas west to Wilson Co.	Sands & loams, acidic soils. Well-drained, mesic.	X	X	X								Slow-growing, long-lived understory leaves with narrow bushy triangular crown and Christmas holly evergreen leaves and brilliant red berries on female trees. This is a handsome ornamental all year round, also useful as a screening plant. Evergreen.	Excellent cover and nesting tree. Red berries are relished by several species of birds. Larval host plant for Henry's Elfyn.

<i>Morus rubra</i> Red mulberry	Moraceae Fig Family	35' - 40' Tree, small	inconspicuous m & f greenish flowers. March-June	Mulberry (syncarp of aggregated red-black drupelets) . April-Aug.	Full sun, part shade, dappled shade	Prefers rich soils along streams, creek bottoms & moist woodlands	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X	X	X	X	Handsome understory tree with polymorphic leaves, reddish black fruit and broad spreading crown. Deciduous.	Red mulberries are the prime source of spring fruit for neotropical migrant birds. 21 species devour them as soon as they ripen as do squirrels, raccoons, opossums & skunks. Larval host plant for Mourning Cloak.
<i>Prunus caroliniana</i> Cherry-laurel	Rosaceae - Rose Family	20' - 30' Tree, small	Showy creamy white elongated spike-like racemes. March-April	Berries, blue-black. Aug.-Sept.	Full sun, part shade, dappled shade	Prefers well-drained, deep moist bottomland soils in fields, woodlands & creek bottoms.	Sands, loams & clay loams. Well-drained, mesic.	X	X									Attractive tree with shiny green simple evergreen leaves with finely serrated edges. Fast-growing, but somewhat short-lived; is easy to train into a hedge or can grow to handsome shade tree. Evergreen.	Good nectar plant for bees & other insects in the spring. Birds love the black berries which persist throughout the winter. Sometimes the berries ferment making robins, cedar waxwings tipsy. Larval host plant for a few species of butterflies.
<i>Rhamnus caroliniana</i> Carolina buckthorn	Rhamnaceae - Buckthorn Family	12' - 20' Tree, small	inconspicuous, small greenish-yellow flowers. May - June	Drupes, reddish brown. Aug.-Sept.	Full sun, part shade, shade	Prefers moist woods, fence rows, along creeks, heads of draws & canyon slopes.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X				Very attractive understory tree with pretty leaves and berries. Quite ornamental and adapted to a wide range of sites. Has good fall color & fruits borne over a long time. Deciduous.	When ripe, fruits are devoured by several species of birds, i.e. thrashers, robins, mockingbirds, cardinals, finches, etc. Flowers are good nectar source for bees, butterflies & other insects. Larval host plant for Gray hairstreak.
<i>Rhus copallina</i> Flameleaf sumac	Anacardiaceae Sumac Family	15' - 25' Tree, small	m & f flowers, small greenish white, on separate trees. July-Aug.	Drupes, small red, in clusters, remain after leaves fall. Sept. - Nov.	Full sun, part shade, dappled shade	Prefers fence rows, fields and bottomlands in East & East Central TX. Tolerates rocky areas.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X					A small, commonly clump-forming shrub or small tree with elegant compound leaves and showy red fruit clusters. Only trees with f flowers have fruit. Beautiful red color in the fall. Fast growing. Deciduous.	Fruit is eaten by at least 21 species of birds, Flowers attract numerous insects in spring, good nectar source for bees & butterflies. Larval host plant for Red-banded hairstreak.
<i>Vaccinium arboreum</i> Farkleberry	Ericaceae - Heath Family	15' - 30' Tree, small	small drooping, urn-shaped white flowers. May-June	Berries, blue. Sept.-Oct.	Part shade, dappled shade	Prefers open mixed woods, dry sterile hillsides or pimple mounds in bottomland woods. Found in East Texas west to Bastrop & Nueces counties.	Sands & sandy loams. Well-drained, mesic.	X	X	X								Attractive irregular shrub to small tree with shiny smooth dark green leaves. Good understory tree. Tree had good red fall color fading to deep purple. Persistent to Evergreen.	The small blue berries which ripen in the fall are devoured by several species of resident & wintering birds. Berries also sought after by various small mammals, i.e., squirrels, rabbits, etc. Larval host plant to Henry's elfin & Striped hairstreak.
<i>Acer barbatum</i>	Aceraceae -	30' - 40'	inconspicuous	Samara,	Full sun, part	Prefers rich moist	Sands, loams	x										Medium-sized ornamental	Many species of birds

Southern sugar maple (Florida maple)	Maple Family	Tree, small ornamental	ous, yellowish green flowers. March-April	double-winged, rose colored. June-July	shade	soils in low woodlands or along streams in East Texas.	& clays. Well-drained, mesic.											shade tree with beautiful leaves which turn yellow to salmon then to scarlet in the autumn. In summer the leaves are dark green above & somewhat hairy & whitish below. Deciduous.	forage on the winged seeds in the autumn such as purple finches, pine siskins, American goldfinch, woodpeckers, cardinals & sparrows. Seeds are also eaten by white-tailed deer.	
<i>Aesculus pavia</i> Red buckeye	Hippocastanaceae Horse chestnut Family	10' - 35' Tree, small ornamental; also shrub	Showy red/yellow tubular flowers in clusters. March	Capsule, round & leathery. Sept.	Part shade, dappled shade, shade	Prefers moist soils in forests, along streams, thickets & rocky hills	Sands, loams & clays. Well-drained, mesic. Moderate moisture.	X	X	X	X						X	X	Showy small tree or shrub with rounded crown, distinctive flower clusters and attractive palmate leaves. Blooms very early; loses leaves early. Good understory tree. Deciduous, early.	The scarlet tubular flowers are visited by hummingbirds. Butterflies are also attracted to the nectar. Seeds are poisonous, however, and not eaten by wildlife.
<i>Cercis canadensis</i> v. <i>canadensis</i> Eastern redbud	Leguminosae - Legume Family	10' - 40' Tree, small ornamental	Showy magenta pea-like flowers, before leaves. March	Legumes, brownish-red, in clusters. Sept.	Full sun, part shade, dappled shade	Prefers forested sandy areas, upland woods, woodland edges & and along stream banks in Eastern Texas.	Sands, loams & heavy black clays. Well-drained, mesic. Moderate moisture.	X	X	X	X								Highly ornamental and showy small tree with spreading, flat or rounded crown. Good understory tree or accent plant. Fast growing, usually with single trunk. Deciduous.	Beautiful magenta flowers are copious early nectar source for butterflies, moths, bees, etc. Seeds are eaten by a number of species of birds; foliage browsed by white-tailed deer. Larval host plant to Henry's Elfin.
<i>Chionanthus virginica</i> Fringe Tree	Oleaceae - Olive Family	15' - 20' Tree, ornamental	Showy white flowers in loose hanging clusters with subtle fragrance. April	Drupes, dark blue, in grape-like clusters. Aug.-Sept.	Full sun, partial shade, dappled shade	Prefers moist woods & thickets throughout Piney Woods of East Texas west to Brazos County.	Sands, loams & clays, prefers acid soils. Well-drained, mesic.	X	X										Highly ornamental tree which is breathtaking when in bloom. Males plants have more spectacular flowers. Leaves are dark green & glossy and turn yellow in the autumn. Deciduous.	Flowers are excellent nectar source for butterflies, moths, & bees. Fruit is relished by many species of birds including woodpeckers, bluejays, mockingbirds and cardinals.
<i>Cornus florida</i> Flowering dogwood	Cornaceae - Dogwood Family	25' -40' Tree, ornamental	Showy white flowers (bracts). March-May	Berries, red. Aug.-Sept.	Dappled shade, part shade; can tolerate full sun. Very shade tolerant.	Prefers moist woodlands and edges of thickets, also along streams.	Sands, sandy loams, loams, slightly acid soils. Well-drained, mesic.	X		X									Medium-sized tree with graceful horizontal branches turning up at the tip. Single trunk is short & dark green leaves are opposite, simple, turning various red shades in the fall. Spectacular in spring, striking in fall. Good under shade trees. Deciduous.	Twenty-eight species of birds forage on the berries, from large gamebirds to small songbirds. Squirrels & white-tailed deer also favor fruit. Larval host plant for Spring Azure butterfly.

<i>Crataegus viridis</i> Green hawthorn	Rosaceae - Rose Family	20' - 35' Tree, ornamental	Showy, white perfect flowers. March-April	Pome (apple-like fruit) orange or red in color. Sept. - Nov.	Full sun, part shade	Prefers low, wet alluvial woods, also sandy fields in East Texas & Upper Texas Coast.	Sands, loams & clays. Medium to high moisture. Seasonal poor drainage O.K.	X	X	X	X	X	X			Medium-sized tree forming a broad rounded crown, serrated dark green shiny leaves, with bark that shreds into small scales. Often thornless. Deciduous.	Beautiful white flowers with yellow stamens attract bees & butterflies. Red orange haws disappear quickly, highly prized by several species of birds & mammals. Good cover & nesting tree. Larval host plant for some Hairstreaks.
<i>Halesia diptera</i> Two-winged silverbell	Stryracaceae Styrax Family	15' 25' Tree, ornamental	Showy white flowers, four petaled, bell-shaped. March-April	Winged, corky fruit, July	Sun, dappled shade, part shade	Prefers moist woods & streamsid es in southern half of East Texas Piney Woods	Sands, sandy loams; prefers acid soils. Well-drained, mesic.	X								Beautiful white-flowering ornamental understory tree. Excellent accent plant. Will tolerate sun or shade; blooms best with more sun. Fast growing. Deciduous.	Hummingbirds are attracted to the flowers, as well as several kinds of insects. Gray & Fox squirrels eat the fruit.
<i>Liriodendron tulipifera</i> Yellow poplar (Tulip tree)	Magnoliaceae Magnolia Family	80' - 100' Tree, ornamental	Showy greenish yellow flowers. April	Capsules. Sept.-Oct.	Full sun, part shade	Prefers moist, fertile soils of rich woodlands	Sands, sandy loams. Well-drained, mesic.	X								Introduced & not native to Texas, but fast-growing ornamental related to the magnolia. Beautiful leaves and flowers. Excellent shade tree. Leaves turn yellow in the fall. Persistent.	Hummingbirds feed on flower nectar & seed-eaters like the cardinals, finches & sparrows eat the seeds from the cone-like fruit. Larval host plant for Spicebush swallowtail.
<i>Magnolia grandiflora</i> Southern magnolia	Magnoliaceae Magnolia Family	40' - 80' Tree, large ornamental	Showy creamy white flowers, very fragrant. April-July	Capsule, cone-like. July-Oct.	Full sun, part sun	Deep, rich soils of woodlands, along streams & bottomlands	Sands, loams & clays, acid or calcareous. Well-drained, mesic.	X								Magnificent shade tree with stately appearance, deep, dark leather leaves & gorgeous white flowers. Highly ornamental. Will grow well outside its natural range once established. Good growth rate, will tolerate pollution. Evergreen.	Red seeds are eaten by squirrels & many species of birds, i.e., woodpeckers, vireos, kingbirds, robins, thrashers & cardinals. Good cover & nest tree for birds. Colorful beetles & moths are attracted to flowers. Old specimens are good den trees.
<i>Magnolia virginiana</i> Sweet bay	Magnoliaceae Magnolia Family	20' 50' Tree, ornamental	Showy white flowers, fragrant. April-July	Capsules, reddish, woody & cone-like with bright red flattened seeds. Aug.-Sept.	Full sun, part sun, dappled shade	Prefers moist soils of swamps & baygall woodlands	Sands, sandy loams & loams, acid soils preferred. Mesic-hydric, poor drainage O.K.	X	X							Semi-evergreen ornamental tree with leaves bright & glossy green on top & silky white underneath. Beautiful, fragrant flowers very showy. Other plantings can grow underneath. Tolerates Houston gumbo. Persistent to almost evergreen.	Moths & beetles are attracted to the lemon-scented flowers.

<i>Prunus umbellata</i> Flatwoods plum	Rosaceae - Rose Family	10' - 15' Tree, ornamental	Showy, white perfect flowers, fragrant. April	Plum, red-purple. Aug.-Sept.	Full sun, part shade	Prefers woodland edges & fencerows..	Sands, sandy loams, acid soils. Well-drained, mesic.	X											Very beautiful small flowering plum makes excellent accent plant. Does not sucker or form thickets. Leaves are smaller than other plums. Deciduous.	Bees & butterflies seek nectar from the clouds of flowers. Bluebirds, mockingbirds & woodpeckers all love the fruit as do small mammals. Larval host plant for some species of Swallowtail butterflies.
<i>Prunus serotina v. serotina</i> Black cherry	Rosaceae - Rose Family	60' - 100' Tree, ornamental	Showy racemes of white perfect flowers, fragrant. March-April	Cherries, small purple black, sweet or tart. June-Oct.	Full sun, part shade	Prefers eastern woodlands, thickets, fencerows & areas along roadsides.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X								Attractive ornamental with decorative flowers, copious fruits, shiny green leaves & grayish brown horizontally striped bark. Easy to grow. Other varieties available for all regions of Texas except South TX. Deciduous.	Copious fruits are eagerly devoured by a wide variety of wildlife including 33 kinds of birds, raccoons, opossums, squirrels & rabbits. Foliage is not browsed by deer. Larval host plant to some Hairstreak species.
<i>Styrax americana</i> Big-leaf snowbell	Styracaceae - Styrax Family	12' - 15' Tree, ornamental	Showy, elegantly shaped white flowers. May-June	Drupes, round & pea-sized. Sept.-Oct.	Part shade, dappled shade	Prefers moist soils of the Big Thicket, in moist woods & river bottoms.	Sands, sandy loams, prefers acid soils. Mesic-hydric, poor drainage O.K.	X											Beautiful white flowering ornamental small tree, similar to Two-winged Silver-bell. Does well in Houston. Deciduous.	White flowers attract many kinds of insects, especially bees & butterflies. Fruit is especially favored by the wood duck. Also eaten by other species of birds.
<i>Juniperus virginiana</i> Eastern red-cedar	Cupressaceae Cypress Family	30' - 60' Conifer	inconspicuous m catkins, f cones, appearing on separate trees. March-May	Cones, berry-like, bluish, sweet & resinous when ripe. Aug. - Dec.	Full sun, part shade, dappled shade	Prefers dry hillsides, old fields, pastures, areas along fence rows.	Sands, loams & clays. Well-drained, mesic. Tolerate dry land.	X	X	X	X					X	X		Evergreen tree of variable shape, with scalelike or appressed leaves. Foliage is dense and aromatic. Often planted as an ornamental. Long-lived and slow-growing. Evergreen.	Dense-foliaged tree is excellent cover and nesting tree. Bluebirds, mockingbirds, robins, cedar waxwings, thrashers, warblers, finches & sparrows relish fruit, esp. in winter. Opossum also eat fruit. Larval host plant to Olive hairstreak.
<i>Pinus echinata</i> Short-leaf pine	Pinaceae - Pine Family	80' - 100' Conifer	inconspicuous, m & f cones. Feb.-March	Cones, mature in fall, persist on branches. Sept.-Oct.	Full sun, intolerant of shade	Prefers well-drained slopes, hills & flat woodlands, old fields & upland woods in East Texas	Sands, loams, clays. Tolerates a variety of soils, but prefers acid. Well-drained, mesic.	X	X										Small-coned pine, relatively fast growing, makes a good ornamental. Will reliably sprout from the base. Evergreen.	Provides excellent cover & nesting substrate for birds, cavities for woodpeckers. Many birds & mammals eat the seeds exposed as 2-year old cones open, i.e., doves, woodpeckers, chickadees, titmice, sparrows, goldfinch, siskins. LHP of Eastern Pine Elf.

<i>Callicarpa americana</i> American beauty-berry	Verbenaceae - Vervain Family	3' - 9' Shrub	Small clusters of white or pink flowers at nodes. May-July	Berries, magenta, in clusters at nodes. Aug. - Nov.	Part shade, dappled shade.	Prefers moist soils of canyons and bottomlands, woods & thickets.	Sands, loams & clays. Likes rich soils. Well-drained, mesic.	X	X	X	X	X	X				Open, much branched shrub with showy magenta berries. Has mounding form. Likes to be watered during dry periods. Deciduous.	Fruits are favored by several species of birds, i.e., bobwhite, mockingbirds, cardinals, thrashers, robins, finches & towhees. Raccoons, opossum & gray fox also relish berries.
<i>Cephalanthus occidentalis</i> Buttonbush	Rubiaceae - Madder Family	5' - 20' Shrub	Showy, creamy white round heads. June-Sept.	Capsule clusters, round & dark brown. Aug. - Nov.	Full sun, part shade	Prefers moist soils near swamps, ponds, along streams & stream margins.	Sands, loams, clays. Likes limestone soils. Mesic/hydric. Moderate to high moisture. Seasonally poor drainage O.K.	X	X	X	X	X	X	X	X	X	Shrub or small tree growing in low areas, often with swollen base. Leaves opposite & whorled, variously shaped. Bright yellow anthers around white flower balls create a halo effect. Highly ornamental. Suitable for bog or pond area. Deciduous.	Flowers attract hordes of bees, butterflies & other insects. Fruits are highly favored by more than 25 species of birds, including waterfowl, cardinals, finches, sparrows, etc.
<i>Euonymus americanus</i> Strawberry bush	Celastraceae - Strawberry Bush Family	4' - 6' Shrub	Small greenish purple flowers. May - June	Capsule containing red fruits. Sept. - Nov.	Part shade, dappled shade, shade	Prefers muddy moist soils along streams & woods.	Sands, sandy loams, clays & gumbos. Mesic-hydric, likes moisture, poor drainage O.K.	X	X								Airy understory shrub with bright red fruits held for a long time through the fall. It prefers the shade and tolerates poor drainage. Drier areas are O.K., if it stays in the shade. Good for Houston. Deciduous.	Several species of birds favor the red fruits, including Eastern bluebirds, mockingbirds, thrashers, sparrows & warblers. Small terrestrial mammals such as rabbits, squirrels & raccoons also enjoy eating the fruit.
<i>Itea virginica</i> Virginia sweetspire	Saxifragaceae - Saxifrage Family	4' - 6' Shrub	Showy white flowers in terminal raceme. April-June	Capsule, two-parted with dark brown seeds. Sept.-Oct.	Part shade, dappled shade	Prefers rich soils along swamps & streamsides.	Sands, loams, & clays, acid soils preferred. Hydric, poor drainage O.K.	X	X								Attractive understory shrub that does well in moist situations. Excellent erosion control. Flowers showy, drooping white spires, leaves turn a bright red in the fall. It is highly tolerant of poor drainage. Need lots of water in the summer. Deciduous.	The flowers are an excellent nectar source for various kinds of insects. Shrub provides good cover for small animals.
<i>Lantana horrida</i> Lantana	Verbenaceae - Vervain Family	3' - 6' Shrub	Showy yellow & orange heads made up of tiny florets. May to December (first frost)	Berries, green then dark blue-black. Sept. - Nov.	Full sun, part shade	Occurs in fields, thickets, swamps, rich sandy woods, scrub & gravelly hills.	Sands, loams & clays. Well-drained, xeric to mesic.	X	X	X	X	X	X				This showy shrub is planted has a long, profuse blooming season. Though not a native of Texas, it is planted almost throughout the state. It loves the hot weather. It's good to prune it back to the ground each winter. Deciduous.	Colorful, long-blooming flowers attract both butterflies and hummingbirds throughout the season. Northern cardinals and other species of birds eat the ripe fruit. Fairly deer resistant. Larval host plant of the Painted Lady.

<i>Aristolochia reticulata</i> Pipevine	Aristolochiaceae Pipevine Family	Weak climber. Vine	Showy, dark brown amazingly shaped flower. May - July	Capsules with many seeds. Aug.	Part shade, full shade	Prefers humus of pine hardwood forest, pine savannahs & rocky woods	Sands, sandy loams, loams. Well-drained, mesic.	X	X									Vine with very unusual flower. Plant is good ground cover. Deciduous.	The leaves and stems of this vine are used as a larval host plant for the Pipevine swallowtail
<i>Bignonia capreolata</i> Cross-vine	Bignoniaceae Catalpa Family	Climber to 50'. Vine	Showy, tubular flowers, red on outside, yellow on inside. March-April	Capsule with winged seeds. Aug.-Sept.	Full sun, part shade, dappled shade, shade	Prefers cool moist soils of woodlands, pinelands, also creek bottoms.	Sands, loams & clays. Moderate to high moisture. Seasonal poor drainage O.K.	X	X	X	X							Beautiful flowering vine clinging to bricks, stones & fences as well as other shrubs & trees. Profuse flowers when in bloom. Tolerates pollution well. Persistent.	Striking orange & yellow tubular flowers are highly attractive to butterflies and especially the Ruby-throated hummingbird. Bloom time coincides with migration when other sources of nectar are scarce, helping this little mite on the way.
<i>Campsis radicans</i> Trumpet-creeper	Bignoniaceae Catalpa Family	Climber "to the sky". Vine	Showy orange tubular flowers in dense clusters. June-Sept.	Capsule with winged seeds. Sept. - Nov.	Full sun, part shade	Tolerates a variety of soils throughout Eastern half of Texas	Sands, loams & clays. Mesic; moderate moisture; poor drainage O.K.	X	X	X	X	X	X					Striking vine adapted to nearly every soil type. Excellent for hiding ugly structures. Sometimes can do too well & needs to be cut back. Persistent.	This is premier plant to attract hummingbirds. Both Ruby-throat and Black-chinned hummers are highly fond of it. Copious nectar sustains these beauties. The plant is also an excellent nectar source for the larger butterflies.
<i>Clematis crispa</i> Blue jasmine	Ranunculaceae Buttercup Family	Climber to 10'. Vine	Showy lavender bell-shaped flowers with flared edges. March-June	Achenes. Aug.-Sept.	Part shade, dappled shade	Prefers moist soils in low woods.	Sands, loams & clays. Will tolerate gumbo. Mesic-hydric. Poor drainage O.K.	X	X	X	X							Very elegant flowers. Works well on a lattice but does not climb high. Can sprawl over low structures such as planter boxes or patio pots. Deciduous.	Lavender blue flowers attract many kinds of insects including butterflies. Several species of birds eat the ripe achenes.
<i>Cocculus carolinus</i> Carolina moonseed	Menespermeaceae Moonseed Family	Climber to 15'. Vine	inconspicuous greenish flowers. July-Aug.	Conspicuous brilliant red berries (drupes). Sept.-Oct.	Full, part shade	Prefers rich moist soils of woods & thickets	Sands, loams & clays. Tolerates gumbo soils of Houston. Well-drained, mesic.	X	X	X	X	X	X					Relatively fast growing, slender twining vine that prefers full sun & some kind of support. Leaves are attractively shaped and fruits are highly ornamental. Will grow over shrubs & small trees. Evergreen.	Dense clusters of brilliant red fruit are relished by bluebirds, mockingbirds, cardinals, robins, warblers & sparrows.

<i>Gelsemium sempervirens</i> Carolina jessamine	Loganiaceae Logania Family	Climber to 50'. Vine	Showy yellow tubular flowers in clusters, fragrant. January - April	Capsule, flattened, elliptic with numerous dull brown narrowly winged seeds. Sept.-Oct.	Full sun, part shade, dappled shade	Prefers woodlands in East Texas	Sands, sandy loams, loams, clays. Mesic.	X	X	X									Highly ornamental climbing vine with opposite leaves and gorgeous yellow flowers. Sometimes forms rich carpets on the ground. Parts of this plant are poisonous. Often planted in areas where it is not native. Used as a screen or to cover walls. Evergreen.	Cascades of yellow flowers attract myriads of insects. Provides good cover and hiding places for small birds. Seeds are eaten by the bobwhite quail and leaves are eaten by the marsh rabbit.
<i>Lonicera sempervirens</i> Coral honeysuckle	Caprifoliaceae Honeysuckle Family	Climber to 40'. Vine	Showy orange red tubular flowers in clusters. March - Dec.	Berries, red. April-Jan.	Full sun, part shade	Prefers moist fertile soils of East Texas, woods & thickets	Sands, loams & clays. Mesic-hydric, poor drainage O.K.	X	X	X	X	X							A beautiful everblooming vine that grows well & is well-behaved. Likes morning sun & afternoon dappled shade. Needs extra water when getting established, but not later. Persistent.	Ruby-throated and Black-chinned hummers are attracted to this vine spring, summer and fall, esp. during migration. Orioles also sip nectar, as do butterflies. Fruit-eating birds relish the succulent red berries in the fall. LHP of Spring Azure.
<i>Parthenocissus quinquefolia</i> Virginia creeper	Vitaceae Grape Family	Climber & ground cover. Vine	inconspicuous greenish flowers. May-June	Berries, blue-black. Sept.-Nov.	Full sun, part shade, dappled shade	Prefers rich soils of woodlands & thickets & rocky banks in eastern half of TX.	Sands, loams, clays. Tolerates gumbo soils. Well-drained, mesic.	X	X	X	X	X	X						Very attractive vine with lush green palmate leaves. Vigorous climber well able to cloak walls, columns, etc by fastening on to masonry. Also good ground cover. Striking red-orange fall color. Deciduous.	Many species of birds compete for the blue-black berries including woodpeckers, kingbirds, great-crested flycatchers, titmice, cardinals, mockingbirds, bluebirds, warblers & sparrows.
<i>Passiflora incarnata</i> May-pop	Passifloraceae Passionflower Family	Climber to 6', also ground cover. Vine	Showy Pink-purple flower. April-Sept.	Ovoid fruit with seeds. June-Oct.	Full sun, part shade, dappled shade	Grows in old fields, along roadsides & streams & woodland edges in Eastern 1/3 of TX.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X							This healthy climber is graced with an unbelievable intricate & eye-catching flower. It uses its tendrils for climbing & is often found sprawling over the ground, thus serving as excellent ground cover. Dormant in winter.	These beautiful vines are larval food plants for the Zebra long-wing, Gulf Fritillary & Julia butterflies. Several species of birds dine on the ripened fruits.
<i>Rosa setigera</i> Prairie rose	Rosaceae Rose Family	Climber from 9' -15'. Vine	Showy rose-pink flowers. May	Rosehips, red. July-Aug.	Full sun, part shade	Prefers openings and post oak woodlands	Sands, loams & clays, esp. calcareous soils. Well-drained, mesic.	X	X	X	X								Luscious rose-red blossoms gradually fade to white, leaving all shades in between in a tapestry of pinks. Shiny leaves turn reddish in the fall. This vine has no thorns. Fruits are bright red and highly decorative. Deciduous.	Several species of birds devour the red fruits including cardinals, mockingbirds, bluebirds, woodpeckers, Great-crested flycatchers, catbirds & thrashers.

<i>Panicum virgatum</i> Switchgrass	Poaceae Grass Family	3' - 6' . Grass	Flowering spikelets green turning rich gold. Aug.-Sept.	Seeds. Oct. - Nov.	Full sun, part shade	Prefers seasonally moist, open areas throughout Texas.	Sands, loams & clays. Moist. Seasonal poor drainage O.K.	X	X	X	X	X	X	X	X	X	X	X	Gorgeous tall-grass can be used as dramatic accent plant. Turns deep, rich golden color in fall. Has airy, filigreed seedhead. Can also be used in small pocket prairie. Does great in Houston, loves the extra water. Warm-season perennial bunch grass.	Provides fair grazing for wildlife, seeds sought after by seed-eating birds. Excellent sparrow food in winter. Provides good protective cover and nesting & denning material. Good place for butterflies to get out of the wind. LHP for Delaware skipper.
<i>Schizachyrium scoparium</i> Little bluestem	Poaceae Grass Family	2' - 5' Grass	Flowering spikelets blue-green to silvery gold. Aug.-Dec.	Seeds. Sept.- Dec.	Full sun, part shade	Prefers woods openings, rocky slopes of pastures & rangeland, along forest borders and prairies throughout Texas.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X	X	X	X	X	Wide-ranging bunchgrass, a dominant of the tallgrass prairie. Tolerant of a wide variety of moisture & drought. Little bluestem is a symphony of beautiful color changes through the year from blue-green to coppery gold in the fall. Winter dormancy.	Provides fairly good grazing for wildlife. Good cover grass, grass parts provide denning & nesting material for birds & mammals. Larval host plant for Dusted skipper, Delaware skipper, Dixie skipper, Cross-line skipper & Cobweb skipper.
<i>Sorghastrum nutans</i> Indiangrass	Poaceae Grass Family	3' - 8'. Grass	Flowering spikelets a deep yellow. Oct. - Nov.	Seeds - Nov.- Dec.	Full sun, some shade O.K.	Prefers moist rich soils of tall-grass prairies of central & coastal TX	Sands, loams & clays. Likes calcareous soils. Likes moisture, mesic.	X	X	X	X	X	X	X	X	X	X	X	This gorgeous grass was major component of tallgrass prairie. Striking accent plant or member of pocket tallgrass prairie. Does well in a naturally moist rich swale area. Warm-season perennial bunch grass, dormant in winter.	Fairly good grazing for wildlife when green. Seed-eating birds and small mammals eat ripe seeds. Stems, leaves used as nesting & denning material. Provides excellent protective cover for wildlife. Larval host plant of Pepper-and-salt skipper.
<i>Sporobolus asper</i> Tall dropseed	Poaceae Grass Family	3' - 5'. Grass	Flowering spikelets light green to straw, in contracted panicles. Aug.-Oct.	Seeds . Sept.- Dec.	Full sun, some shade O.K.	Prefers open, rocky prairie sites, open meadows & woods	Sands, loams, clays; likes limestone soils. Mesic, tolerates dry soils.	X	X	X	X	X	X	X	X	X	X	X	There are many varieties of this species that are adapted to the various soils. Warm-season perennial.	Provides good forage for seed-eating mammals & birds, also fair grazing for larger mammals. Grass parts used as nesting & denning material.
<i>Tripsacum dactyloides</i> Eastern gammagrass	Poaceae Grass Family	3' - 8'. Grass	Flowering spikelets yellow & cornlike. July-Sept.	Seeds. April - Nov.	Full sun, part shade, dappled shade	Prefers low moist grassland sites in eastern portion of state.	Sands, loams & clays. Mesic, likes extra moisture. Seasonal poor drainage O.K.	X	X	X	X	X	X	X	X	X	X	X	Forms very dense clump useful for buffer or areas of separation. Likes more shade & moisture than most grasses. Also dramatic accent plant. Can be grown in pure stands as pasture grass. Warm-season perennial bunch grass.	Good protective cover for small birds & mammals. Grass parts provide nesting & denning material. Provides very good forage for wildlife. Larval host plant to the Bunchgrass skipper.

<i>Callirhoe involucrata</i> Winecup	Malvaceae Mallow Family	6" - 12" Wildflower	Showy deep magenta to wine-red flowers. March-May	Capsules. May-July	Full sun, part shade, dappled shade	Prefers open woods, prairies, meadows & fields	Sands, loams, clays or gravelly soils, either calcareous or acid-based. Well-drained, mesic.	X	X	X	X	X	X	X	X	X	X	Beautiful wine-colored wildflowers. Grace any wildflower meadow garden. Tend to sprawl & have trailing stems. They can even clamber over small shrubs. They respond to extra watering by blooming for a much longer of period of time. Perennial.	Winecup is visited by bees which gather pollen from the flowers.
<i>Coreopsis lanceolata</i> Lance-leaf coreopsis	Asteraceae Sunflower Family	8" - 48" Wildflower	Ray flowers splashy yellow, disk flowers deep yellow. March-May	Achene, black, flattened & winged. May-July	Full sun, part shade, dappled shade	Prefers open flat woods & fields in East & South East Texas.	Sands, clays & loams. Well-drained, mesic.	X	X	X								Lance-leaf coreopsis is a very showy wildflower that grow very easily & provides a wonderful splash of color for the garden. It is widely found in cultivation. Perennial.	Growing in healthy clumps, these flowers provide abundant nectar for butterflies & bees. Ripe seed heads are eaten by several species of granivorous birds.
<i>Erythrina herbacea</i> Coralbean	Leguminosae - Legume Family	6' - 15' Wildflower; shrub in S. Texas	Showy coral red tubular flowers. May- Dec.	Pods with poisonous red seeds. Oct.- Dec.	Full sun, part shade	Prefers sandy woods on coastal plain, but will grow elsewhere.	sands, loams & clays. Well-drained, mesic.	X	X	X	X							Striking shrubby wildflower dies back in winter like a perennial in all areas but south Texas. Flamboyant summer flowers are highly ornamental. Seeds are also attractive, though extremely poisonous. Perennial.	Elegant tubular flowers have copious nectar & are highly attractive to the Ruby-throated hummingbird. Seeds, though highly appealing visually, are poisonous and not eaten by wildlife.
<i>Hibiscus militaris</i> Halbert-leaf Rose-mallow	Malvaceae - Mallow Family	3' - 8' Wildflower	Showy white or pink flowers. May-Oct.	Capsules, smooth with several seeds in each section. July - Nov.	Full sun, part shade	Prefers freshwater marshes & shallow water areas in East & north central Texas.	Sands, clays & loams. Mesic-hydric, poor drainage O.K.	X	X	X	X							This spectacular flower can grow to almost 6 feet tall. Once established it provides lots of showy blooms throughout the summer & into the fall. Perennial.	Insects are attracted to the flowers for the abundant pollen & nectar.
<i>Liatis pycnostachya</i> Kansas gayfeather	Asteraceae - Sunflower Family	2' - 5' Wildflower	Showy purple to pale lavender flowers in solitary spikes. Aug.-Oct.	Achenes, cylindrical, ribbed & tapered at base. Oct. - Nov.	Full sun, a little shade O.K.	Prefers sandy, acid bogs in East Texas; also open prairie habitats	Sands & loams. Well-drained sandy or rocky soils.	X			X							Very splashy fall flowers that grows well in rock garden or in a pocket prairie or wildflower meadow mixed in with grasses. Perennial.	Gayfeather is highly sought after by bees, butterflies & other small insects for its abundant nectar in the fall.

<i>Lobelia cardinalis</i> Cardinal flower	Campanulaceae Campanula Family	6" - 6' Wildflower	Showy red tubular flowers, fragrant. May-Oct.	Capsules with seeds. June - Nov.	Full sun, part shade, dappled shade	Prefers moist soils in open places along streams, meadows & along roadsides; also about ponds & springs, & near swamps where the shade is not too dense.	Sands, loams, clays & limestone based soils. Moist soils, poor drainage O.K.	X	X	X	X	X	X	X	X	X	X	Cardinal flower cannot be equalled for sheer visual impact, planted in dense stands in a shady part of the garden. In peak bloom they create an incredible spectacle. Bright scarlet flowers are clustered on racemes as long as 18". Perennial.	Cardinal flower is a premiere hummingbird plant and will not fail to draw in any Rubythroats passing through your area.
<i>Malvastrum drummondii</i> Turk's cap	Malvaceae - Mallow Family	4' - 9' Wildflower; shrub in S. Texas	Showy red flowers. May - Nov.	Berry-like fruit, red, flattened. Aug.-Sept.	Part shade, dappled shade, shade	Prefers moist woodlands, wood margins, streamsides, river edges in shady conditions. Low grounds.	Sands, loams & clays. Likes limestone soils, tolerates gumbo. Hydric-mesic, likes moisture.	X	X	X	X	X	X	X				A good ornamental for shady situations. Forms colonies in shady spots. Serves as good ground cover. Best pruned back after 2 years. Perennial.	Attractive red flowers are very popular with hummingbirds. Butterflies, diurnal moths & other insects are also attracted to the flowers. The bland fruit is eaten by several species of birds & small mammals.
<i>Phlox divaricata</i> Louisiana phlox	Polemoniaceae Phlox Family	4" - 18" Wildflower	Showy lavender to white flowers about 1 inch across. March-May	Seeds 1 to several, May-July	Full sun, part shade, dappled shade	Prefers humus-rich woodland soils in East Texas	Sands, loams & clays. Well-drained, mesic.	X										Louisiana phlox add highly attractive splash of lavender pink color to a garden. They definitely appreciate an extra dash of water & deep soils. They sometimes come in blue. Perennial.	Louisiana phlox attracts myriads of insects in the spring that forage for nectar.
<i>Phystostegia pulchella</i> Obediant plant	Lamiaceae Mint Family	1' - 3' Wildflower	Showy magenta or deep reddish-purple flowers. May-June	Fruiting calyx. July - Nov.	Full sun, part shade, dappled shade	Prefers wet soils of bottomland hardwood forest also along streams in East Texas.	Sands & clays. Mesic, seasonal poor drainage O.K.	X										Very showy wildflower that is widely cultivated. It spreads by rhizomes to form large colonies. It loves areas along wet depressions & streams. Fairly drought tolerant once established & will grow in a garden away from flowing water. Perennial.	Obediant plant also called beautiful false dragon-head attracts many insects, especially the larger bees.
<i>Salvia coccinea</i> Scarlet sage	Lamiaceae Mint Family	2' - 4' Wildflower	Showy red tubular flowers. May- Dec.	Calyx with nutlets. June-Dec.	Full sun, part shade, dappled shade	Prefers sandy soils in thickets, chaparral, on edges of open woods from East to South Texas.	Sands, loams, clays & caliche-type soils. Mesic, seasonal poor drainage O.K.	X	X	X	X	X	X	X				Scarlet sage can thrive in any part of the state. It is not very cold-hardy, however. Oddly, it looks better if planted in dry, shady areas with poor soil. In rich soils with lots of water it gets very tall, coarse & slightly unattractive. Perennial.	Scarlet sage is another excellent hummingbird plant & will draw in the hummingbirds of your area, including any migrants passing through in spring & fall. Bees & other insects are also attracted to the nectar, despite the red flower color.

<i>Castilleja indivisa</i> Indian paintbrush	Scrophulariaceae Figwort Family	6" - 12" Wildflower	Showy orange to red bracts. March-May	Capsules with seeds, May-July	Full sun, a little shade O.K.	Prefers fields, meadows, prairies & roadside areas in Eastern portion of the state including the Coastal plains	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X			Indian paintbrush is an excellent choice for a pocket prairie or meadow garden. Grows very well when planted with native grasses. Looks great when interspersed among masses of bluebonnets & showy evening primrose. Annual.	Insects of several varieties are attracted to the small flowers. Hummingbirds will also feed from them, attracted to the red-orange bracts that surround them. Larval host plant of the Buckeye.
<i>Eustoma grandiflora</i> Texas bluebells	Gentianaceae Gentian Family	1' - 2' Wildflower	Showy blue-purple flowers. June-Oct.	Capsule with seeds. Aug. - Nov.	Full sun, part shade	Prefers damp prairies, pond edges, open fields & banks along streams throughout much of Texas	Sands, loams & clays. Mesic, seasonal poor drainage O.K.	X	X	X	X	X	X	X			Texas Bluebell, otherwise known as Bluebell Gentian is a showy wildflower that responds favorably to good soils, extra water & a little fertilizer. Leaves are pale greenish blue & very attractive also. Annual.	Texas bluebell is very attractive to several kinds of insects, especially bees & butterflies.
<i>Gaillardia pulchella</i> Indian blanket	Asteraceae Sunflower	1' Wildflower	Showy yellow & red daisy-like flowers. March-Oct.	Achenes, May - Nov.	Full sun, part shade	Prefers open grassy areas, prairies, meadows, also disturbed areas in a variety of soils	Sands, loams & clays. Well-drained, xeric to mesic.	X	X	X	X	X	X	X	X	X	This is a marvelously easy wildflower to grow & it comes in various coloration patterns from mainly yellow to mostly reddish. Blooms most of the season from spring to late fall & provides lots of color to a wildflower meadow. Annual.	Indian blanket attracts bees, butterflies & several other varieties of small insects who forage on the nectar. Ripe seed heads are favorites with many species of seed-eating passerines like the Painted Bunting.
<i>Monarda citriodora</i> Horsemint	Lamiaceae Mint Family	1 - 2" Wildflower	Showy purple tripartite spikes. April-June	Schizocarps with 4 brown nutlets. June-Aug	Full sun, part shade	Prefers slopes, prairies & meadows throughout Texas	Sands, loams & clays. Well-drained, xeric to mesic.	X	X	X	X	X	X	X	X	X	Aromatic meadow wildflower that is easy to grow. Flowers continue to bloom right through the summer. Does really well planted with Indian blanket amongst species of native grasses. Annual.	Horsemint attracts butterflies, bees & a wide variety of other insects who forage on the nectar.
<i>Rudbeckia hirta</i> Brown-eyed Susan	Asteraceae Sunflower Family	1' - 2' Wildflower	Showy yellow ray flowers with dark brown centers, May-Sept.	Achenes. July - Nov.	Full sun, part shade, dappled shade	Prefers open prairies, grasslands & woodland meadows in the eastern two-thirds of the state.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X			Black-eyed Susans provide a lush splash of color in your meadow garden or pocket prairie. It does especially well if the rains are good or with a little extra watering. It will grow well in both partially shady areas & the sun. Annual.	Bees, butterflies & many other kinds of insects forage for nectar from these flowers all summer. In the fall when the flowers have good to seed, numerous seed-eating birds forage on the ripe achenes.



Learn About Whitetails

by *Robert L. Cook*

Updated and revised by Horace G. Gore, 1989

From *Texas Parks and Wildlife Magazine*

October 1975

Exploration and settlement of the American frontier would have been extremely difficult without the white-tailed deer. Early colonists and explorers utilized the meat and skins of these animals extensively, and deer hides later served as a medium of exchange between trappers, frontier scouts, Indians and traders.

Deer were even more important to the American Indians prior to settlement of the nation, providing clothing and food. Deer were also an important factor in the folklore and religion of native tribesmen.

Indiscriminate slaughter by commercial meat and hide hunters and ignorance of the deer's habitat requirements almost caused its extermination near the end of the 19th century. It was reported, for example, that an early Texas trader operating in Indian country at Trading House Creek (near present site of Waco) shipped approximately 75,000 deer skins from 1844 through 1853.

Public concern for survival of the species brought about a series of protective measures by the Texas Legislature near the turn of the century. A five-month closed season during

which deer could not be hunted was enacted in 1881. The bag limit was established at six bucks per season in 1903 and was reduced to three bucks per season in 1907.

The first hunting licenses were sold in Texas in 1909. In 1919, six game wardens were hired to patrol the entire state.

Additional interest and protection by landowners, sportsmen and law enforcement personnel helped deer populations increase steadily during the 1930s and 1940s. Statewide trapping and restocking programs established deer herds in previously uninhabited areas. Sales of hunting licenses increased dramatically—382,249 in 1955, 571,058 in 1964 and over one million in 1972.

The white-tailed deer is now the most numerous big game animal in Texas and in the United States. Aesthetically and emotionally, the whitetail holds a place of distinction in the hearts and minds of many Texans.

Research and management projects concerning the whitetail and its habitat requirements are conducted by wildlife biologists of the Texas Parks and Wildlife Department, federal agencies, many universities and several private research establishments in Texas.

Research activities by the wildlife biologists of the Texas Parks and Wildlife Department are 75 percent funded from federal excise taxes on firearms and ammunition. Deer are of primary importance on several of the 119 wildlife management areas (900,000 acres) operated by this department. Research activities also are conducted on National Wildlife Refuges, National Forests and Department of Defense lands. The Texas Parks and Wildlife Department game warden field force now numbers some 460 officers. These highly skilled and trained officers provide law enforcement services essential to continued survival of the whitetail.

The whitetail is one of the most researched, observed, sought after, cussed and discussed of all wildlife species in Texas. Few of us, however, are aware of the basic principles which rule this majestic animal's life. Following are some of the most frequently asked questions about white-tailed deer in Texas.

How many kinds of deer are there in Texas?

The Texas white-tailed deer, *Odocoileus virginianus texana*, occurs almost statewide. There were several subspecies of whitetail in the state years ago. However, due to expanding-overlapping ranges and restocking efforts in recent times, the subtle differences between subspecies have been lost except for the isolated population of Carmen Mountain white-tailed deer, *Odocoileus virginianus carminus*, in the Big Bend National Park area. Although found almost statewide in brushy or wooded areas, the heaviest deer populations are located in the central one-third of the state. The mule deer, *Odocoileus hemionus*, is a different species which occurs primarily west of the Pecos River and in parts of the High Plains of the Texas Panhandle.

How many deer are there in Texas?

Texas has more white-tailed deer than any other state. Population estimates in recent years range from three to four million. Current census data indicate that there are more than

four million whitetails in Texas. Population estimates vary from year to year, depending upon reproduction, survival and losses due to malnutrition and disease.

How many white-tailed deer are legally harvested by sportsmen in Texas each year?

An estimated 500,000 whitetails are harvested by sportsmen in Texas annually—more than any other state.

Isn't that too many?

No. Current harvest rates account for only about ten percent of the herd annually. Research indicates that about 20 percent of most populations should be removed annually by sportsmen. Biologically sound harvest rates and habitat management programs are necessary in Texas to prevent waste due to overpopulation, to achieve maximum utilization of this valuable natural resource and to insure the whitetail's continued survival. For example, since the initiation of the program in 1953, more than two million antlerless or doe deer have been harvested from the established deer herds in the state.

How are deer counted?

Several methods of estimating deer numbers are used in Texas:

1. The walking deer cruise line. During the fall months, wildlife biologists walk census lines which have been placed in representative deer habitat and count the deer observed. This method is used extensively in Texas, and there are several hundred such deer census lines in the state.

2. Counts from fixed-winged aircraft. This method is used in areas of the South Texas brush country. Observers count deer seen on strips of deer habitat of known width and length.

3. Track count method. Counting deer tracks on selected sites during late summer is a method frequently used in heavily wooded areas of East Texas.

4. Spotlight counts. Counting deer at night with the use of spotlights along pasture roads or lightly traveled public roads is a method biologists have recently put into use. It is an excellent census method in areas with low deer populations. **Caution:** Biologists always notify all landowners along their spotlight census routes. They drive vehicles clearly marked "Texas Parks and Wildlife Department" and "Deer Census." Any other spotlighters should be reported to the local game warden.

5. Several other deer census methods are used by Parks and Wildlife Department personnel. Counts from helicopters and late evening counts from vehicles are good deer census techniques.

What do deer eat?

Deer eat mostly browse (leaves, twigs, young shoots of woody plants and vines) and forbs (weeds and other broad-leaved flowering plants). They eat some grass, but only when



Each summer the whitetail grows a new set of antlers. When the breeding season begins, the velvet (above) is shed and the antlers become hard and polished.

it is green and succulent. Sheep, goats and foreign big game species compete directly with the whitetail for preferred deer foods. Deer food shortages usually occur during late summer and winter months. Adequate forage is usually available during spring and fall seasons. A variety of foods and habitat types is essential to good deer production and survival.

The following plants are examples of some good native deer foods in Texas which are readily taken by deer when and where they are available.

Browse: oak leaves and acorns, yaupon, greenbriar, prickly pear and fruit, hackberry, mulberry, rattan or supplejack, sumac, mesquite beans and dried leaves, hawthorns, poison oak, American beautyberry, wild cherry and plum, wild grape, honeysuckle, dogwood, elm, blackberry and dewberry, gum elastic (chittum), acacias (catclaw), ephedra, walnut, guayacan, wild chinaberry, kidneywood, Brasil and other condalias.

Grasses: rescue grass, Texas wintergrass, Ozarkgrass, fall witchgrass, panic grasses, sedges and rushes.

Forbs: bundle flower, euphorbia(s), whorled nodviolet, bayflower, oxalis, wooleywhite, tickclovers, filaree, clover, verbena, arrowleaf sida, wild lettuce, wild onions, old man's beard, wildbean, snoutbean, lespedezas, spiderwort, vetches (milkveitch, etc.) lamb's quarters, plantain, groundcherry, pigweed or carelessweed and partridge peas.

How long do deer live?

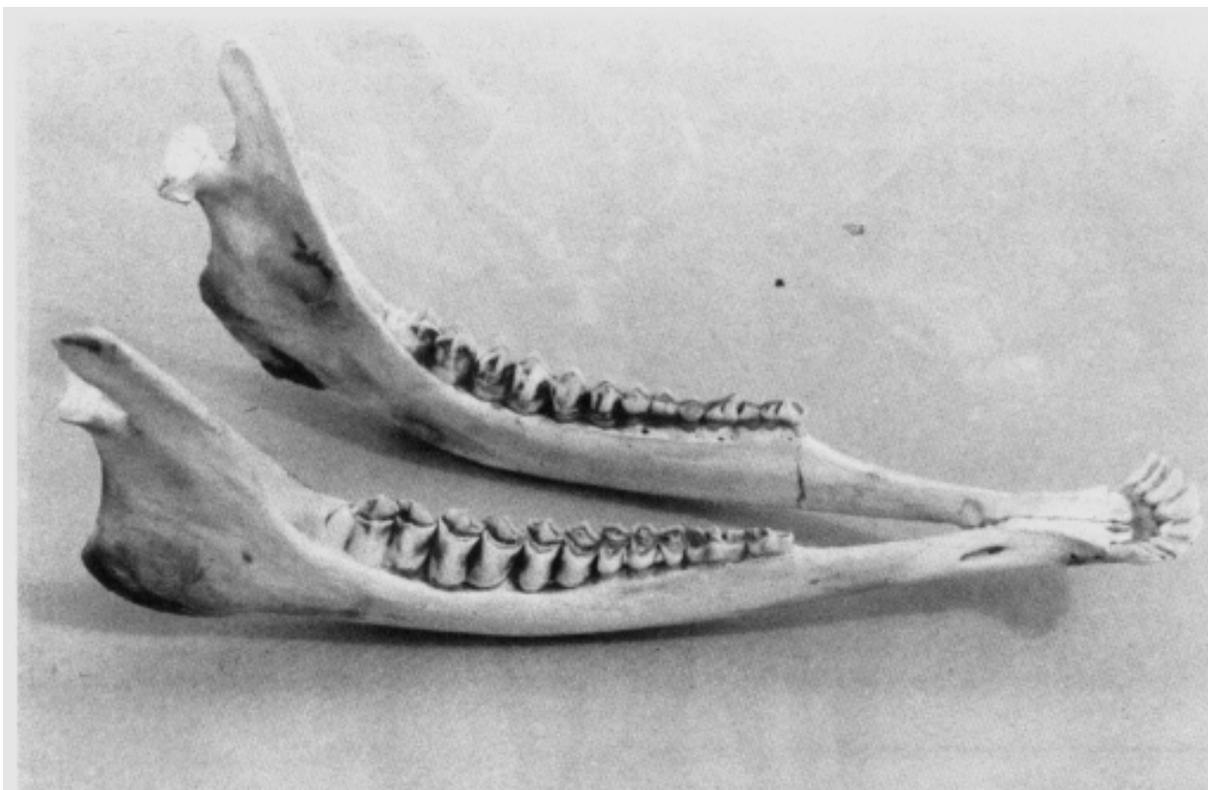
Deer in controlled situations have been known to live 15 to 20 years. It is unusual, however, for a deer in the wild to live more than 10 years, because its teeth usually wear out during the eighth or ninth year.

How can the age of a deer be determined? Is the number of antler points one method?

Deer age is determined by tooth replacement and tooth wear of the premolars and molars (back teeth) of the lower jaw. Unlike sheep, deer cannot be aged by their front teeth, and age cannot be determined by antler characteristics.

Does a buck deer keep the same set of antlers each year?

No. A buck grows a new set of antlers (not horns) each summer. The size of the antlers depends primarily upon the quality and quantity of food the buck eats and his age. The more nutritious the food and the more there is of it during the antler-growing season, the better his antlers will be. With favorable conditions, antler size and spread will increase with deer age. After the sixth year, however, antlers usually decline in size due to the deer's inability to properly chew and digest food.



By noting tooth replacement and tooth wear of the premolars and molars of the lower jaw, biologists determined that this deer was 1½ years old.

What happens to the antlers each year?

Buck deer shed their antlers following the mating season each year. Antler shedding is triggered by the cessation of production of a hormone which also terminates the breeding season. Most bucks in Texas shed their antlers during late January and February. Shed antlers quickly deteriorate or are eaten by rodents and other animals for their calcium content. New antlers start growing and become noticeable "in velvet" during May and June. Good nutrition during this period is critical for good antler growth.

Shouldn't spike bucks be protected since they are young and will be the breeding bucks of the future?

Not necessarily. Most spike bucks are young deer, but if range conditions are poor, there may be spikes of any age. If a herd contains many spikes, the deer probably did not have sufficient quality forage during antler-growing season (May-August). It would serve no logical purpose to protect the spike buck. Research conducted on the Kerr Wildlife Area has shown that all young spike bucks do not develop into the same quality of buck as do most yearling bucks with forked antlers. Some young spikes will produce very good antlers later in life, but the chances for massive antlers is not as good as with forked antlered yearlings. Spikes should be harvested based on the intensity of management desired by each landowner or group of hunters. Spikes should never be protected from hunting. The idea that the removal of spikes is a cure-all for antler development has little merit.

When is the breeding season?

The breeding season for white-tailed deer in Texas ranges through the fall and winter months from about the first of September through mid-January. The peak breeding activity occurs in mid-November in Central Texas and late December in South Texas.

What is a good buck-doe ratio?

The buck-doe ratio in most of Texas is about one buck per three to five does (adult deer) which is satisfactory for good production and hunting. This ratio is not a major problem in Texas deer herd management at this time. An adequate harvest of antlerless deer would help maintain a good ratio of both sexes. It is recommended that game managers and landowners strive for a ratio of 2.5 does per buck.

Won't the deer become smaller due to inbreeding if we don't bring some new blood lines?

No. The deer of Texas are direct descendants of isolated deer herds of many years ago. Inbreeding may occur in the wild, but it apparently is no problem. New blood lines are quickly absorbed into established genetic pools and no improvement in quality is noticed. Inferior quality or small deer result from poor range conditions or insufficient preferred forage and will not be improved by bringing in new bucks.

Does the Texas Parks and Wildlife Department restock deer?

Yes, but only in approved areas judged as potentially good deer habitat which presently have few or no deer. The deer trapping and restocking program was initiated in 1938 by the Game, Fish and Oyster Commission, predecessor of the Texas Parks and Wildlife Department. Since that time, more than 30,000 deer have been released in 160 Texas counties.

How many fawns will a doe have?

Normally, a doe deer in Texas will have her first fawn, which is usually a single, when she is two years old. Thereafter, if food conditions are adequate, the doe should normally have twin fawns almost every year until her sixth or seventh year, when the reproductive rate will begin to decline. Triplet fawns are uncommon, but do occur. Quadruplets have been reported.

The gestation period for deer is seven months.

According to reproductive studies, "old barren does," or does that have never produced fawns, are uncommon and are no problem to deer herd management. The key to maximum production is an adequate supply of nutritious natural food.

Are more female fawns born than male fawns?

No. Male and female fawns are born in approximately equal numbers.

What are the most serious threats to deer herds in Texas?

1. Habitat destruction such as land clearing, root plowing, improved grass pastures, subdivisions, new lakes, expanding cities, etc.
2. Poor range or inadequate food supplies due to overgrazing by domestic livestock and overpopulations of deer, resulting in large-scale deer die-offs.
3. Disease and parasites.
4. Illegal hunting.

What are some of the most important limiting factors affecting white-tailed deer?

Rainfall is an important limiting factor. Extended periods of severe drought during the late summer and fall are especially harmful to fawns, yearlings and very old deer. Coyotes are a limiting factor in South Texas and in portions of Southeast-Central Texas. However, natural predators, such as coyotes, bobcats or eagles presently pose no serious threats to established deer herds of Texas. Efforts to control these predators are usually expensive and ineffective with regard to white-tailed deer.

What about hunting?

Legal hunting can be a limiting factor but is not currently a threat to deer populations. In fact, regulated hunting is the best way to crop the deer herd annually, much like a farmer-rancher would crop his herds of domestic livestock. Properly controlled and regulated, hunting is the most reasonable and humane method of maintaining and utilizing the extensive deer populations of Texas.

Will deer move great distances?

Not normally. A deer chased by dogs may run several miles, but will often circle and end up close to home. During the breeding season, some bucks will trail female deer out of their normal home range but will later return. Movement studies and radio-tracking research in Texas indicated that most deer spend their lives within about 1.5 miles of their birthplace.

What can I do to help the deer, increase deer numbers or improve the quality of deer?

1. Learn about the habitat requirements of deer. Become familiar with preferred deer foods in your area or the area where you vacation or hunt. Support practices which create good wildlife habitat and prevent destruction of existing habitat.
2. Landowners and operators should make every effort to provide adequate habitat and forage for deer and other wildlife. Competition by domestic sheep and goats should be reduced in some cases. Both sexes of deer should be reasonably, but adequately, harvested each year from well-established herds.
3. Sportsmen should obey state laws and those rules established by landowners. Sportsmen should not abuse the land on which they hunt, trespass where they do not have permission, take "sound shots" or misuse a firearm.
4. Everyone should cooperate with law enforcement officers responsible for protection of our wildlife. Violations should be reported immediately to the nearest game warden of the Parks and Wildlife Department, or to Operation Game Thief at 1-800-792-GAME.
5. Landowners and hunters can provide a significant service to the game management programs of Texas by completely and accurately providing harvest data. Whether it is solicited by mail questionnaire or in person by biologists in the field, at check stations or cold storage facilities, valid harvest information is vital to the formulation of effective hunting regulations. These regulations will allow the maximum harvest of surplus animals without endangering the broodstock necessary to replenish those populations.

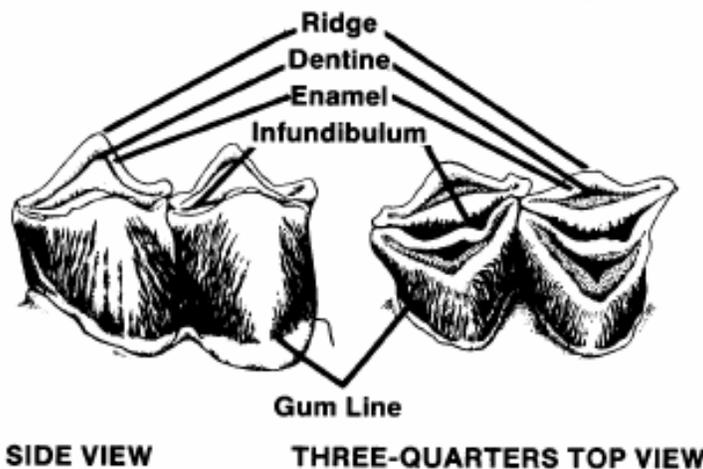
Would it help to feed the deer some supplemental feed?

If deer take large quantities of supplemental feed (corn, etc.), there probably is a shortage of their natural preferred foods. The best solution to the problem is to improve availability of natural foods. Obviously, this cannot be achieved quickly and will result only from proper range management practices (grazing moderately, rotation grazing systems, etc.). If artificial feeding is necessary, deer should be supplied high-quality (14 to 16 percent protein) 3/16" pellets instead of corn, which is about eight percent protein. Marked improvement in body size and antler development should not be expected from artificial or supplemental feeding.

Researchers in Texas and other states have worked many years to obtain answers to some of the many questions concerning the white-tailed deer, its requirements and management. Continued research will reveal additional necessary information about this and other wildlife species. The well-being and continued survival of the whitetail in Texas, however, is dependent primarily upon the interest and concern of sportsmen, landowners and the conservation-minded public of our state.

How To Age Deer

GENERAL ANATOMY OF LOWER MOLAR



Age of a deer is determined by tooth replacement and wear on molars and premolars of the lower jaw. As a deer grows older, certain portions of its teeth are worn enough to show definite differences from the teeth of other age classes.

A deer has only six jaw teeth, although they appear to have many more. The teeth are broken into two distinct categories: the premolars, which are numbered 1, 2, and 3, and the molars, which are numbered 4, 5, and 6.

Deer are aged in fractions because they are born around July and are killed during the hunting season.

1½ year old: (long yearling): The long yearling deer is the most easily recognized of all age classes. The first three jaw teeth are milk teeth, which will be replaced around two years of age. These are worn smooth as a long yearling, while the last three teeth remain sharp. The number 3 tooth has three cusps in the milk tooth stage, but only two cusps appear on the replaced tooth. Fawns in their first season will show little evidence of wear on their milk teeth.

2½ year old: The first three jaw teeth have been replaced by permanent teeth and all molars are sharp. The dentine of the first molar (tooth 4) is not as wide as the enamel which surrounds it.

3½ year old: The dentine in the first molar (tooth 4) is now as wide or wider than the enamel which surrounds it, and this is not true of the second molar or tooth 5.

4½ year old: The dentine of the first and second molars (teeth 4 and 5) is as wide or wider on both teeth, but not in tooth 6.

5½ year old: The dentine of all molars (teeth 4, 5, and 6) is now as wide or wider than the enamel surrounding it.

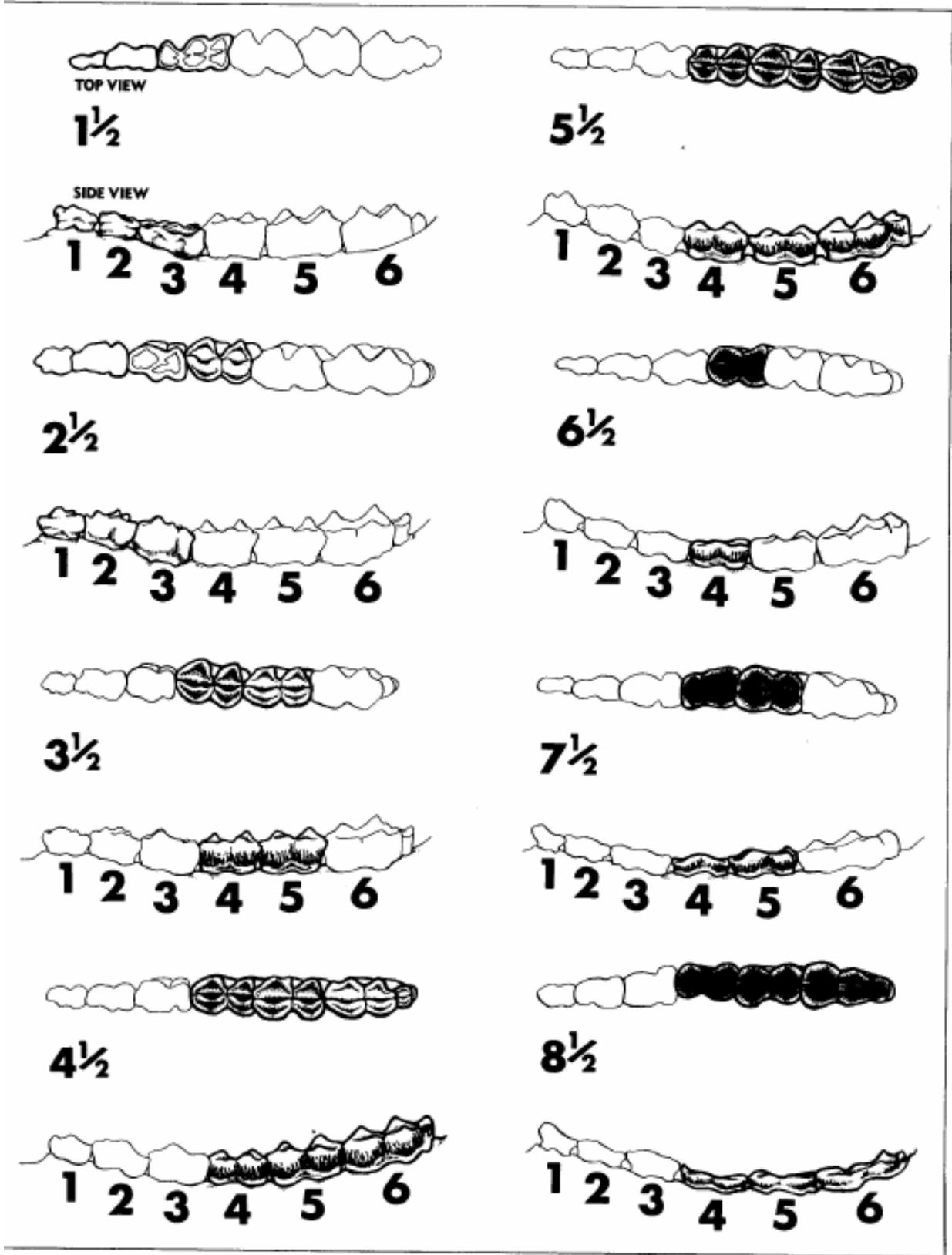
6½ year old: The first molar (tooth 4) is worn smooth, but teeth 5 and 6 are not smooth.

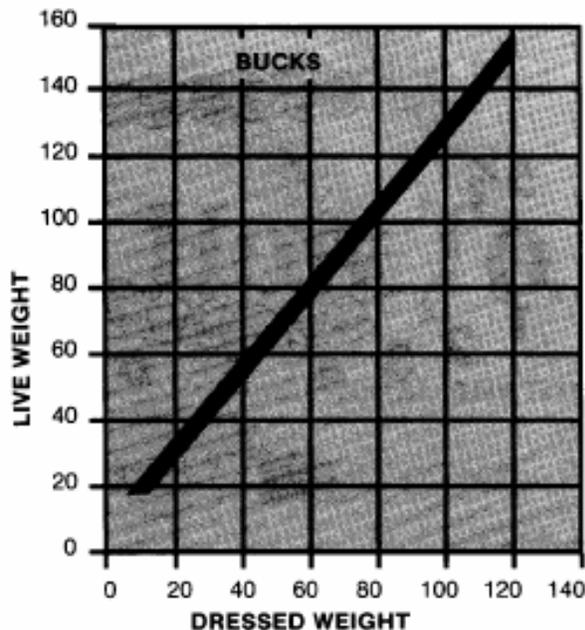
7½ year old: The first and second molars (teeth 4 and 5) are worn smooth, or tooth 5 may still have a small ridge left.

8½ year old: All molar teeth are worn smooth (teeth 4, 5, and 6), but tooth 6 may still have a small ridge left.

Older than 8½ year old: Unable to determine, because characteristic formations have all been worn smooth.

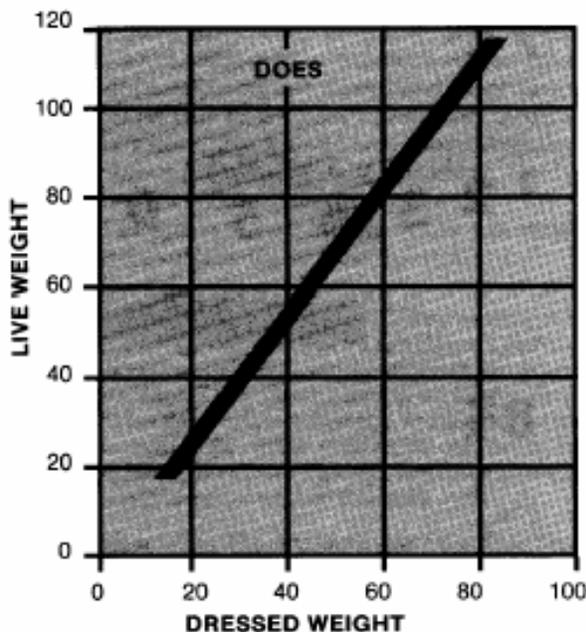
The primary factor governing antler formation is food supply. As deer grow older and their teeth wear flatter, food becomes harder and harder to chew. Body condition will drop and, simultaneously, so will antler development.





Find dressed weight of buck in figures at bottom of chart and trace line up to diagonal. From intersection, trace line to scale at left and read live weight. Reverse this procedure to determine dressed weight of live animal.

Does are lighter than bucks so a different chart must be used. As above, find dressed weight of doe in scale at bottom, trace up to diagonal, then from intersection trace line to left and read estimated live weight.



The Way to Weigh

by Charles Ramsey
and
Melvin J. Anderegg

A PICKUP with two hunters drove up to the deer check station on the Kerr Wildlife Management Area. Both hunters climbed out, and walked around to the back of the truck and began unloading a couple of deer.

The first deer, a small doe, was tossed upon the table in the check station. Area personnel field dressed the deer and recorded descriptive measurements and weights. Then the doe was loaded back into the truck.

The second deer, a large buck, was lifted onto the table and the process of measuring and recording was repeated. Since the buck was already field dressed, only a dressed weight was taken—106 pounds field dressed. How big was that deer on the hoof?

This question has been repeated so many times at the check station that two graphs were prepared to help with the answer. These graphs represent the weights taken from approximately 200 deer in good body condition killed on the Kerr Wildlife Management Area. Since these deer were typical of the Edwards Plateau, the graphs will be applicable for deer taken within the Hill country. Although not as accurate, they are also good guides for deer taken from other areas of the state.

Dressed weight means "field dressed" with head, hide, and feet left on the carcass.

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Appendix X

Pesticides and Brush Control Texas Department of Agriculture

Pesticide Registration and Safety

The U.S. Environmental Protection Agency (EPA) and the Texas Department of Agriculture (TDA) register all pesticides used for brush control in the state of Texas. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Food Quality Protection Act (FQPA), and Federal Food, Drug and Cosmetic Act (FFDCA) all regulate the use of pesticides in Texas to some degree. However, FIFRA and Texas pesticide laws and regulations are primarily involved in the registration process of brush control herbicides.



To be eligible for registration and use in Texas, pesticide products must first undergo a rigorous testing protocol required by EPA and then be registered federally. The testing protocol is extensive and must address issues such as efficacy and toxicity to non-target species. The vast majority of pesticide products that are registered in Texas are subject to over 140 scientific or toxicological tests in order to receive and maintain EPA product label approval, and subsequent Texas registration. Automatic approval does not occur for use of a pesticide in Texas if it is approved by EPA. Pesticides must meet state use and registration regulations in addition to strict EPA standards. The exact number of tests that must be performed for a pesticide to be allowed in Texas varies with its end-use, but it is extensive whatever the case. EPA evaluates a plethora of scientific studies before registering a product and uses a series of safety factors to determine the appropriate use patterns considering worst-case exposure scenarios.

Native Texas wildlife, especially threatened and endangered species, are given further consideration when performing risk assessments for the special use of pesticides in many brush control projects. Various classes of species are specifically targeted for detailed assessment, namely the chemical effects on amphibians and reptiles, birds, fish and invertebrates. The environmental fate of most compounds used in brush control is also carefully reviewed in order to protect water supplies. Factors such as degradative processes, absorption and mobility, field dissipation, as well as local ground and surface water concerns are considered in risk assessments, especially during special use considerations such as a FIFRA Section 24(c) allowances as discussed below.

Toxicity Category	Herbicide / Substance	Oral LD ₅₀	Equivalent Human Dose
I Severe Danger	Botulinus	0.00001	1 teaspoon or less
	TCDD (a dioxin)	0.1	
	Parathion	13	
	Strychnine	30	
	Nicotin	50	
II Moderate	Caffeine	200	1 teaspoon to 1 ounce
	2,4-D	375	
III Slight (caution)	Formaldehyde	800	1 ounce to 1 pint
	Aspirin, Vitamin	1700	
	Bleach	2000	
	Table	3750	
	Diuron	3750	
	Glyphosat	4320	
IV Very Slight	Imazapy	>5000	More than 1 pint
	Diesel	7380	
	Kerosen		
	Sugar		

Table 1: The equivalent human dose is that physical amount of the compound that would contain the oral lethal dose 50 (LD₅₀) amount.

In reality and for all practical purposes of assessment, the amount of pesticide that a sensitive species must be exposed to and cause a harmful effect is very unlikely to be seen with any use of a pesticide product (Table 1). Even when these species may encounter these registered pesticides in a natural setting, most of these chemicals have relatively low toxicity or similar toxicity to that of many household or natural materials (Table 2).

Table 2: Overall toxicity rating based on the LD₅₀ and the dermal response rating are from 1 to 5, with 5 being the least severe

COMMON NAME	TRADE NAME	ORAL LD50 mg/Kg	TOXICITY RATING	DERMAL RESPONSE RATING
nicotine	for comparison	50-60	2	-
paraquat	Surefire	120	3	3
caffeine	for comparison	200	3	-
diquat	Diquat	230	3	4
2,4-D	various brands	600	4	4
tebuthiuron	Spike	644	4	4
MSMA	various brands	1,800	4	4
Aspirin	for comparison	1,240	4	-
hexazinone	Velpar	1,690	4	4
dicamba	Banvel	2,900	4	4
prometon	Pramitol	2,980	4	-
atrazine	various brands	3,080	4	5
pendimethalin	Pendulum	3,277	4	4
Table salt	for comparison	3,320	4	-
diuron	Direx, Karmex	3,400	4	4
bromacil / diuron	Krovar	4,260	4	5
glyphosate	Roundup	4,320	4	5
sulfometuron methyl	Oust	>5000	5	4
imazapyr	Arsenal	>5000	5	4
imazapic	Plateau	>5000	5	5
prodiamine	Endurance	>5,000	5	4
simazine	Princep	5,000	5	4
bromacil	Hyvar	5,200	5	4
chlorsulfuron	Telar	5,545	5	5
picloram	Tordon	8,200	5	4
oryzalin	Surflan	10,000	5	4
norflurazon	Predict	>10,000	5	4
fosamine	Krenite	24,000		4

FIFRA Section 24(c) Special Registration

A FIFRA Section 24(c) is designed to expand a currently registered product label in the state of Texas for a documented special local need (SLN). A SLN means an existing or imminent pest problem within Texas for which TDA, based upon satisfactory supporting information, has determined that an appropriate federally registered pesticide product is not sufficiently available.

Documentation of need for the 24(c) registration in the form of letters from producers, grower organizations, experiment station personnel, and/or extension service personnel, must be provided to EPA. Research and/or test data, or summaries supporting efficacy and safety must be submitted. In addition, data documenting expected residue levels (when appropriate, mainly when food or feed crops are involved) must also be supplied with the application packet to EPA. Prior to issuing a Section 24(c), EPA and TDA determine that use of the product for which registration is sought will not cause unreasonable adverse effects



on man or the environment when used in accordance with labeling directions or widespread and commonly recognized practices. Endangered and threatened species are especially considered when evaluating special uses of pesticides. The U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department and TDA are in regular contact concerning the well being of all native Texas species.

The Texas Department of Agriculture obtained a FIFRA Section 24(c) Special Local Need registration to use *Arsenal*[®] (active ingredient imazapyr) to control saltcedar to conserve water and protect native habitats.

In fact, in several cases, saltcedar is being controlled with *Arsenal*[®] to enhance wildlife habitat. The Canadian Municipal Water District is planning to control salt cedar beginning in September 2004 along the Canadian River. This effort is being made to stop the spread of salt cedar, which is estimated to consume almost 70,000 acre feet of water each year in the river basin, and to enhance habitat for the Arkansas River Shiner. In addition, U.S. Fish & Wildlife Service and Panhandle Water Conservation District officials have proposed a joint project to finance the control of salt cedars along the Canadian River to enhance habitat for the Arkansas River shiner.

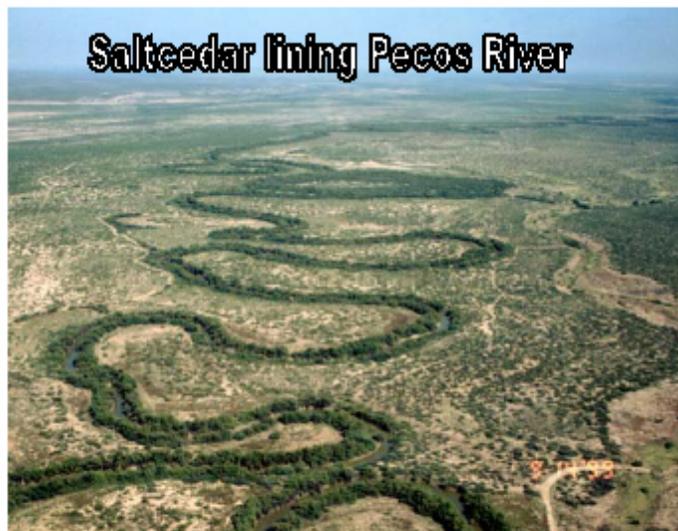
In another instance, the U.S. Fish & Wildlife Service and Fort Worth Zoo requested that TDA change the restriction on the use of *Arsenal*[®] in Salt Creek in Culberson County to enhance habitat for the endangered Pecos Gambusia. Additionally, the Colorado River Municipal Water District has worked with U.S. Fish & Wildlife and the Texas Parks and Wildlife Department to use *Arsenal*[®] along the Colorado River to preserve habitat for the endangered Concho water snake and the endangered Texas poppy-mallow. The Concho water snake is not affected by *Arsenal*[®] because this chemical generally only affects plant species. The Texas poppy-mallow is not affected by the saltcedar spraying because its habitat is not near saltcedar due to different soil preferences between the two plant species. Additionally, GIS mapping is done before helicopter spraying of *Arsenal*[®] to pinpoint Texas poppy-mallow habitat.

Saltcedar (*Tamarisk*) Control in Texas

Saltcedar (*Tamarix spp.*) was introduced into the southwestern United States in the early 1800s from Eurasia as an ornamental shrub that aided in erosion control. A mature saltcedar may consume up to 200 gallons of water per day and is a problem for most of the western United States. Saltcedar trees occur in almost all of the water bodies of west Texas including the Pecos, Brazos, Canadian, Colorado, Rio Grande and Red rivers, and their tributaries.

Saltcedar has the ability to change its physical environment giving it a competitive advantage over native trees and shrubs. This occurs through increased surface soil salinity, lowered soil water potential and increased fire frequency. This invasive increases surface soil salinity by absorbing salts from deeper soil layers and groundwater and transporting these salts to their leaves, subsequently releasing the salts back into the surrounding soils through accumulation of leaf litter. The high tolerance for salt that saltcedar possesses allows for a competitive advantage. Increased soil salinity inhibits germination and growth of most other plant species.

The Texas Department of Agriculture is leading the Texas Riparian Invasive Plant (TXRIP) Taskforce in its endeavors to combat the spread of invasive riparian plants, especially saltcedar. This Taskforce is composed of almost every major state and federal agency with a mandate on this issue. TXRIP joins the US



Tamarisk Coalition, the US Department of Interior, and the US Department of Agriculture in addressing this serious national problem. All scientifically tested methods for saltcedar control are assayed for use in control programs, including biological, chemical, and mechanical options.

Recent applications of federally approved herbicides, including *Arsenal*[®], has proven to be a very effective and safe tool to control saltcedar in selected segments of Texas waterways. This has spurred an interest in using this means of control in other infested water systems.



Appendix Y

Minimum Requirements for Supplemental Shelter, Pineywoods

NEW: Summary guidance for supplemental shelter intensity levels. The following documents are intended for guidance only, and represent what would be the desired number of supplemental shelters for various species that a landowner should strive for. Because each individual property is different and effective use of supplemental shelter for wildlife enhancement will vary based on individual site characteristics, these numbers should be used as guidance only. Additional information is available from your local biologist or on the TPWD web site at www.tpwd.state.tx.us/wildscapes. Be sure to study the general guidelines for agricultural tax valuation based on wildlife management. See Wildlife Management Activities And Practices: Comprehensive Wildlife Management Planning Guidelines for your region. It's the book to which this is an appendix.

Species:	Shelter type:	Minimum no. per area of suitable habitat:
<i>E. bluebird, Tufted titmouse, Bewick's wren, Carolina chickadee</i>	<i>Nest boxes</i>	One nest box per 3 acres of suitable habitat. Minimum number of boxes required: 6. Maximum number of boxes required: 40
	<i>Snag development</i>	Create or maintain one snag per 3 acres.
<i>Screech owl</i>	<i>Nest boxes</i>	One nest box per 10 acres of suitable habitat.
	<i>Snag development</i>	Create or maintain one snag per 10 acres.
<i>Wood duck</i>	<i>Nest boxes</i>	One nest box per 8 acres of suitable lake, pond, riverine or stream habitat.
<i>Bat spp.</i>	<i>Bat house</i>	Houses should be erected in groups of 3 or more per 100 acres.
<i>Bobwhite quail</i>	<i>Half-cutting mesquite</i>	One per acre, in areas where suitable woody plant cover is lacking.
	<i>Brush piles</i>	One per acre, in areas where suitable woody plant cover is lacking.
	<i>Shrub planting</i>	One group of shrubs per acre, in areas where suitable woody plant cover is lacking.
<i>Other</i>	<i>Slash retention</i>	One per acre in areas where woody plant reproduction is inadequate