TEXAS PARKS AND WILDLIFE

WILDLIFE MANAGEMENT ACTIVITIES AND PRACTICES

COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES

for the

Gulf Prairies and Marshes
Ecological Region

Revised
April 2010

The following Texas Parks & Wildlife Department staff have contributed to this document:

Kirby Brown, Private Lands and Habitat Program Director (Retired)
Gary Homerstad, Technical Guidance Biologist (Retired)
Matt Wagner, Technical Guidance Biologist – College Station
Jim Dillard, Technical Guidance Biologist – Mineral Wells (Retired)
Linda Campbell, Program Director, Private Lands and Public Hunting Program -- Austin
Linda McMurry, Private Lands and Public Hunting Program Assistant -- Austin

With Additional Contributions From:
Terry Turney, Rare Species Biologist, San Marcos
Trey Carpenter, Manager -- Granger Wildlife Management Area
Dale Prochaska, Private Lands Biologist – Kerr Wildlife Management Area
Nathan Rains, Private Lands Biologist – Cleburne

TEXAS
PARKS &
WILDLIFE

TABLE OF CONTENTS

Comprehensive Wildlife Management Planning Guidelines
Gulf Prairies and Marshes Ecological Region

COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES
for the
Gulf Prairies and Marshes 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 AgriLife Extension (TAE), USDA Natural Resources 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.

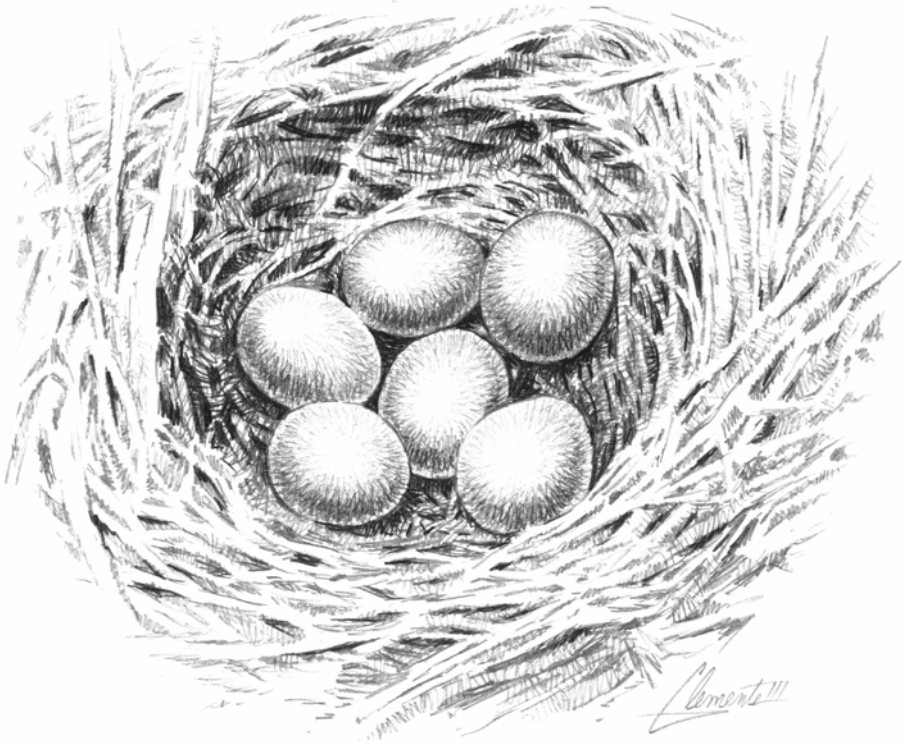
What Paperwork to File

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 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 food, cover, and space, the basic requirements of 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. Continuous or limited rotation grazing, even with moderate stocking rates and average rainfall can result in overgrazed range. Cattle and other livestock are selective grazers. They will graze the most palatable plants first and continue down the line of preference until the plant community consists of less desirable, shallow rooted grasses and undesirable forbs. Overall plant diversity decreases. An abused range lacks adequate groundcover and vegetation 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 the number of animals per acre for the ranch, 3) stocking density or the number of animals in a particular pasture for a specific period of time, 4) providing planned periodic rest periods for every pasture to keep plants healthy, and 4) excluding livestock from sensitive areas to promote vegetation protection and/or recovery.

Stocking rates should be set so that cattle graze plants only once during each grazing period. Continuous grazing allows plants to be bitten over and over starting with the most palatable first. The less desirable plants keep growing while the more palatable ones continue to be grazed. This can result in a pasture being underutilized, but still overgrazed and eventually the removal of your most desirable species. Limiting the number of times a plant is grazed means livestock can only stay in one place for a relatively short period of time before they have to be moved to another pasture. Rotational grazing systems require multiple pastures so that livestock can be rotated among pastures, providing adequate rest periods for plant recovery.

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 and 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 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. Also, 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 a 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. White-tailed deer 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 three 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 and Wildlife Department 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.

For additional information 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 a good prescribed burn program.

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 basic habitat requirements.

Seeding mixes should provide for maximum native plant diversity and should include many broadleaf plants which are important in providing forage and seed production for wildlife. 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 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.

For additional information 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 brush management programs.

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 mange 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 gravelingaccess 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 bet 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 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 provider 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 are 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, erosion can also be caused by under-utilization by livestock and permanent deferral. 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.

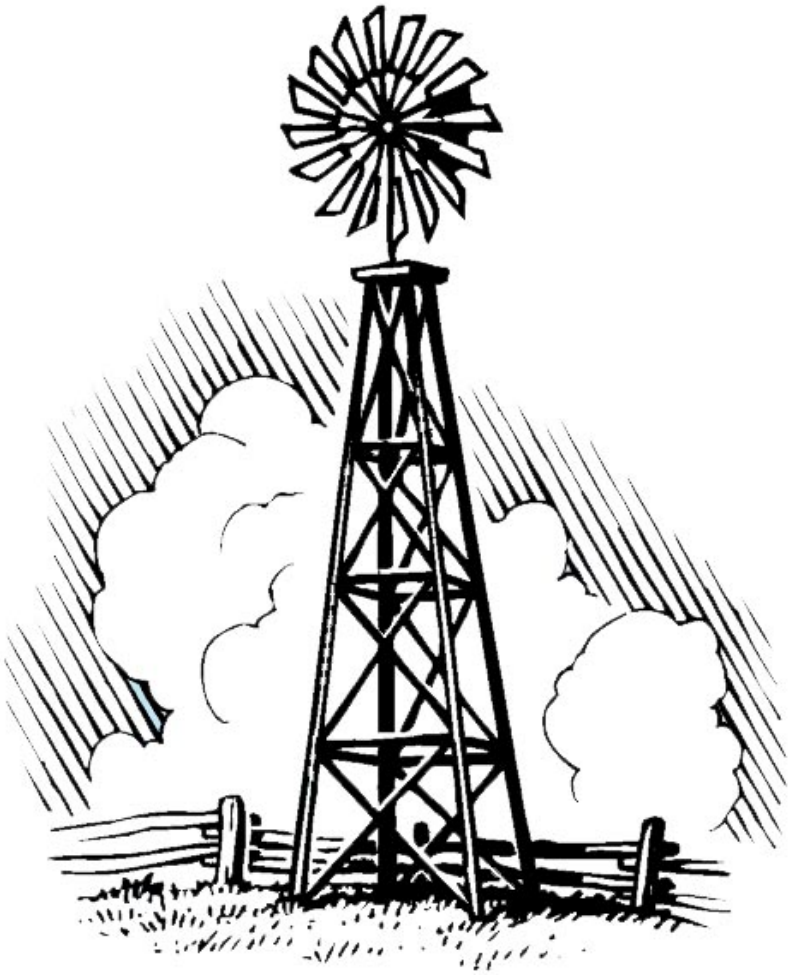
For the majority of landowners that feel predator control would be useful in meeting the criteria for H.B. 1358, the bill implemented to allow agricultural appraisal for land used to manage wildlife, a few basic practices will work. The size and location of the property, amount of wildlife habitat and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

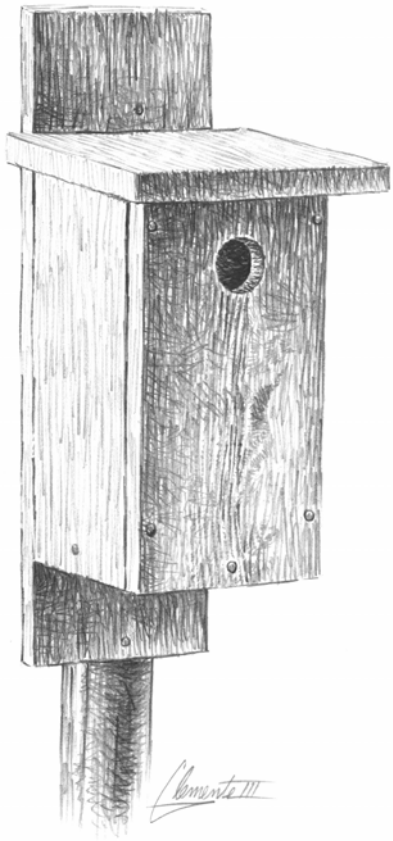
Managing tame pasture, old fields and croplands can increase plant diversity, provide supplemental food and forage and gradually help convert the land to native vegetation. Recommended practices may include:

- 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.

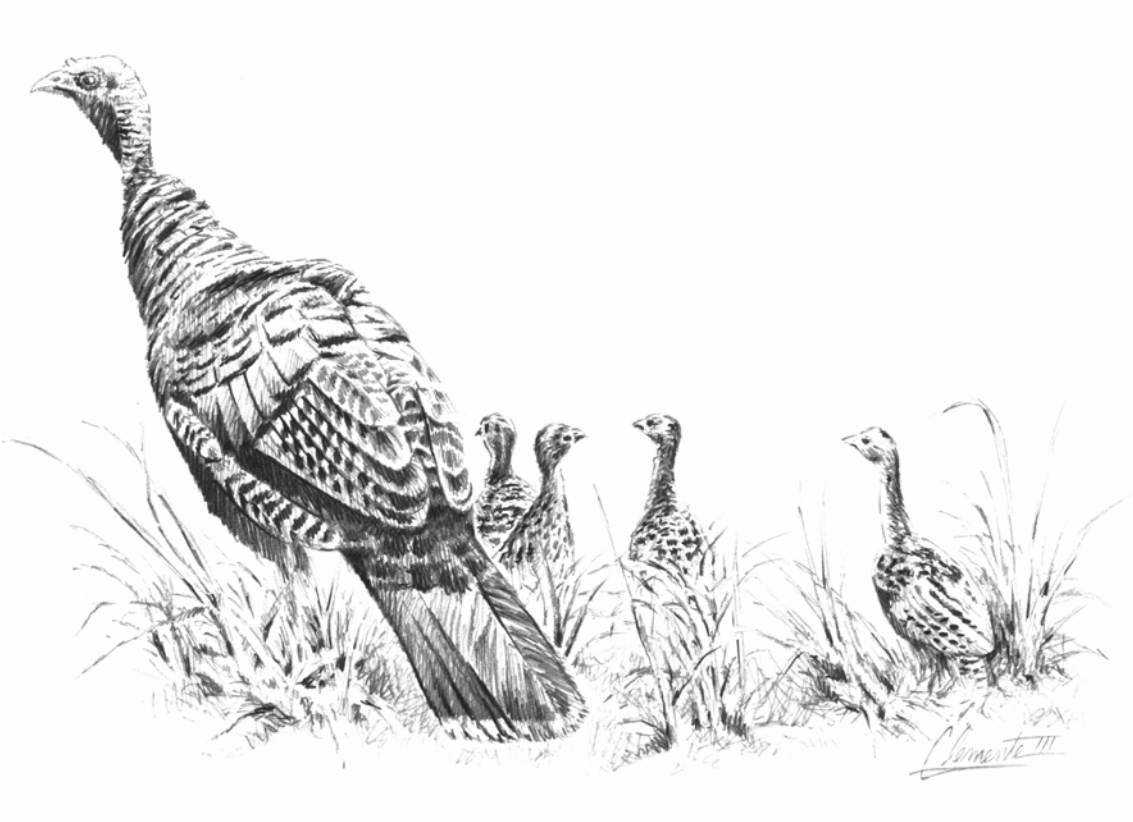
Although supplemental shelter can be provided in many ways, it will never take the place of good conservation and management of native habitats. When land is properly managed for wildlife habitat, quality cover and shelter will usually be available. Unfortunately in much of Texas, many areas have been so altered, neglected, and abused that one of 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 on 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.

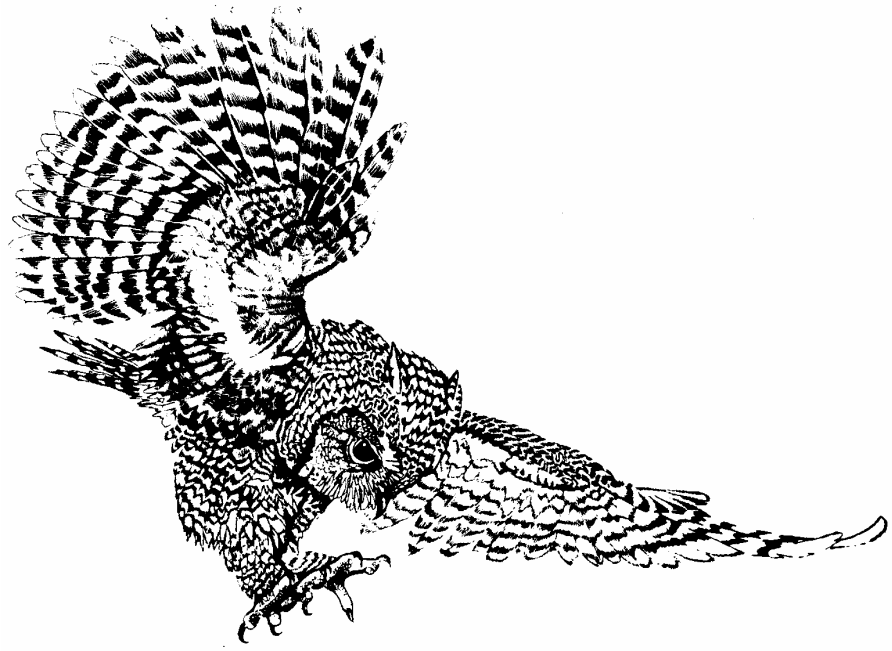
One of the most important things for a landowner to remember when designing a census protocol of nongame species on their property is the ability to be consistent. In other words, be able to do the same thing in the same way at the same time each and every time the census is conducted.

APPENDICES

STANDARD WILDLIFE HABITAT AND POPULATION MANAGEMENT RECOMMENDATIONS

For the

GULF PRAIRIES AND MARSHES
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 Gulf Prairies and Marshes 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:	Non-native Pasture:
Native Grass Pasture:	Upland Woods:
Bottomland Woods:	Wetlands(optional):

Ponds/Lakes: Other(specify):

Total Acres:

Current Habitat Description:

Describe vegetation association or type (eg. Bluestem Grassland, Pecan-Elm Forest, Marsh/Barrier Island, 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 (eg. permanent or seasonal streams, springs, stock tanks, water troughs) that are present. Documentation may include any SCS (now NRCS), 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, brush management, etc. Describe past history of cropping, livestock, and wildlife management (census, harvest, etc.). Present other biological information such as the presence of unique cover types, turkey roosts, feral hogs or other exotic big game that compete with native wildlife, et cetera.

_____
_____
_____

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 Gulf Prairies and Marshes Ecoregion	White-tailed Deer	Fox Squirrel	Cottontail Rabbit	Wild Turkey	Bobwhite Quail	Mourning Dove	Black-bellied Whistling Duck	Mottled Duck	Eastern Meadowlark	Eastern Bluebird	Hummingbirds	Barn Owl	Common Nighthawk
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	X
Range Enhancement (Reseeding)	X		X	X	X	X	X	X	X	X		X	X
Brush Management	X	X	X	X	X	X	X		X	X	X	X	X
Timber Management	X	X	X	X		X	X			X	X		
Riparian Management / Enhancement	X	X	X	X		X	X			X	X		
Wetland Enhancement	X		X				X	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					
Streamside, Pond, Wetland Regeneration	X		X				X	X					
Herbaceous &/or Woody Plant Establishment	X	X	X	X	X	X	X	X		X	X		
Dike / Levee Construction / Management							X	X					
Establish Water Diversion								X					
C. PREDATOR CONTROL													
Predator Management	X		X	X	X		X	X	X	X		X	X
Imported Red Fire Ant Control	X		X	X	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					
Spring Development &/or Enhancement	X	X		X			X				X		
E. PROVIDING SUPPLEMENTAL FOOD													
Grazing Management	X	X	X	X	X	X				X			
Prescribed Burning	X		X	X	X	X				X			
Range Enhancement	X		X	X	X	X				X			
Food Plots	X		X	X	X	X		X	X		X		
Feeders & Mineral Supplementation	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.)

Continuous grazing without rest is detrimental to wildlife.

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 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, woodlands, wetlands, riparian areas and spring sites as designated in plan. Activities should be reviewed annually.

Grazining 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.)

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 33 percent of acreage annually <u>burned</u> in coastal marshes, 15 percent in wooded uplands, and 20 percent in rangeland)**. Attach 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 approximately 25 percent of the seeding mix). 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. See key species adapted to the Gulf Prairies and Marshes in Appendix on Native Prairie planting and procedures). 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 be 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% annually, whichever is smaller, until the project is completed.**

BRUSH MANAGEMENT

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

Brush management may be the removal or establishment of woody plants.

It can be the selective removal or suppression of target 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 species. **Brush Management practices 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.** This practice includes retaining the proper kind, amount, and distribution of woody cover for selected species. Brush management planning must consider wildlife cover requirements, soil types, slope angle and direction, soil loss and erosion factors, and subsequent planning to control re-invasion. This practice also includes retention of snags to provide cover and nesting sites for cavity nesting animals. When used, herbicides should be applied in strict accordance with label directions.

This practice can include the planting of 150 native tree and shrub species per acre per year for the area designated in the plan to provide food, corridors and/or shelter using species and methods as described in appendices.

TIMBER/BOTTOMLAND HARDWOOD MANAGMENT

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 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. When used, herbicides should be applied in strict accordance with label directions. This includes pre-commercial thinning or non-commercial thinning which involves reducing the stocking levels in a stand to increase the amount of sunlight that reaches the ground to increase the growth or production of herbaceous vegetation or browse plants in the understory. Establish native tree and shrub species to provide food and cover using species and methods applicable to the county (some non-native exceptions may be noted where native species have limited success for addressing the limiting factors for wildlife). When used, herbicides should be applied in strict accordance with label directions. Restore important forested habitats including bottomland hardwoods, bogs, and upland hardwoods. **A minimum of 150 native seedlings/acre/year for the area designated in the plan.** Avoid fragmentation of large forested habitats. Maintain at least 100 yards of buffer habitat along each side of streams. This practice should be part of an overall habitat management plan and consultation with a professional forester is recommended.

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 caused by poor timber harvest 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. Restore important forested habitats including bottomland hardwoods and turkey roost sites. **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

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

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. Selective herbicide applications may be necessary for control of problem wetland vegetation. 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

Planned protection and management of land or a portion of land to provide habitat for an endangered, threatened or rare species, such as fencing off critical areas, 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/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/ breeding neotropical birds (primarily songbirds) should follow guidelines in appendix for zones of importance (See Appendix J).

(Refer to Appendix I for information on the management of the Southern Bald Eagle, Houston Toad, Attwater's Prairie Chicken, Ocelot, Jaguarundi, and other species of concern that occur in portions of the Gulf Prairies and Marshes.)

A minimum of one project must be implemented every 10 years to qualify.

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

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

PRESCRIBED CONTROL OF NATIVE, EXOTIC AND FERAL SPECIES

Feral hogs compete directly with native wildlife, and very destructive of habitats.

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 the carrying capacity of the habitat to prevent 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 impact 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.

Remove or control exotic vegetation impacting native habitats and wildlife populations (eg. large stands of Chinese tallow trees, McCartney rose, etc.). Convert tame pasture grasses (such as large areas of coastal bermuda) 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 (eg. 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, such as being 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

Revegetating areas along creeks, streams, ponds, and wetlands to reduce erosion and sedimentation, stabilize streambanks, improve plant diversity, and improve wildlife value of sensitive areas. This practice can include: the construction of permanent or temporary fences to exclude, limit, or seasonally graze livestock in order to prevent erosion; 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 revegetation); establishing vegetative buffer areas or filter strips along water courses or other runoff areas; establishment of 3:1 upland buffer to lake basin/wetland acreage in diverse grass/legume/forb mixture to prevent sedimentation; the installation of rip-rap, dredge spoil, or other barrier material - placement of material along erodible embankments to prevent erosion and protect wildlife habitat; the establishment of stream crossings to provide permanent low water crossings in order to reduce or prevent erosion; the use of "screenings" from rice harvest that contain seeds from native vegetation to revegetate wetland areas; the use of native seeds and plants to directly establish vegetation; and the planting of Japanese millet in newly constructed wetland areas. This practice must be a part of an overall habitat management plan. **A minimum of one project must be completed and maintained every 5 years, affecting a minimum of 5 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 by1/4 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 150 seedlings per acre must be planted 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. 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.**

A flashboard riser box attaches to a pipe installed in a levee to create a shallow water wetland for wildlife.

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 ants which seem to restrict the spread of the imported fire ants**; proper treatment of at least 10 acres or 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 10 years; or annual water management of project or existing wetland.** Call for TPWD OR NRCS for professional assistance when creating/enhancing wetlands.

WELL/TROUGHS/WINDMILL OVERFLOW/OTHER WILDLIFE WATERING FACILITIES

Designing and implementing water systems that provide supplemental water for wildlife and provide habitat for wetland plants. This practice may include modifying existing water systems to make water more accessible to wildlife (eg. fenced windmill overflows available to wildlife on the ground). It may also include drilling wells if necessary and/or constructing pipelines to distribute water and/or diverting water with specialized wildlife watering facilities. Water may be distributed on a ¼ mile basis to enhance distribution and abundance of a variety of wildlife species. **A minimum of one project per 10 years must be completed to qualify. Consistent water management for wildlife at sites qualifies.**

Proposed Well/Troughs/Windmill Overflow/Other Wildlife Watering Facility Project(s) may include: (see Appendix O):

- Drill new well:
  - windmill
  - pump
  - pipeline
- Modification(s) of existing water source:
  - fencing
  - overflow
  - trough modification
  - pipeline
- Distance between water sources {waters}_____

- Type of Wildlife Watering Facility
  - PVC/Quickline/Other 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 Wildlife Guzzler
  - Other_____

Capacity of Water Facility(ies): _____

SPRING DEVELOPMENT AND/OR ENHANCEMENT

IImplementing 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. This could also include restoring a degraded spring by the controlled, possibly multi-year, removal of dense brush and the revegetation of drainages 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; or existing or restored springs consistently managed to prevent degradation qualifies.**

Proposed Spring Development and/or Enhancement Project(s) may include the

following:

- Fencing
- Water diversion/pipeline
- Brush removal
- Spring clean out
- Ponds, stock tanks, water impoundments (see stock ponds, tanks, lakes)

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)

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

Cowpeas are an excellent summer forage for white-tailed deer.

meet goals of a comprehensive wildlife plan. **A minimum of 1% of the acreage should be planted in both winter and summer 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
- Year round
  - Yes
  - No, if not, when practiced_____

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 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 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 5 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 (eg., 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 tepees can provide cover for small game and other wildlife in open areas. **A minimum of 1 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. **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

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

Mowing/swathing of hay fields should be postponed until after the peak of nesting/rearing period of ground-nesting birds and mammals (July 1). 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 include roadside right-of-way management for ground-nesting birds, establishing perennial vegetation 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. **Annually mow/shred 25% of open areas per year, preferably in strips or mosaic types of patterns, to create "edge" and structural diversity**.

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 100 yards on at least 10 percent of acreage or 10 acres, whichever is smaller, annually to qualify.**

In open areas with very little near-ground cover, cutting half-way through the lower mesquite limbs and breaking them to the ground can form a "cage" that provides escape and roost cover for wildlife.

WOODY PLANT/SHRUB ESTABLISHMENT

Planting and protecting native tree and shrub seedlings to establish wind rows, thickets, mottes, corridors, and solid stands to provide optimum habitat for selected species. **A minimum of 500 seedlings annually, or 4 rows in a 120 foot width by a ¼ mile in length.** This is particularly effective around CRP lands, every ¼ to ½ mile. See last Appendix for list of native plants and shrubs.

NATURAL CAVITY/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.**

Girdling trees is an effective means of creating snags, but be selective by avoiding mast producing trees (oaks, hickories) and judicious in extent.

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.

<u>Note:</u> 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.**

STANDARDIZED INCIDENTAL OBSERVATIONS

Using standardized observation methodology, this technique is used to supplement data gathered from other sources (eg. spotlight deer counts) to strengthen composition information (eg. buck/doe/fawn ratios). Such observations are collected during daylight hours incidental to routine activities on the property. Observations may also be collected by driving about the property, sitting in blinds, watching feeders and food plots, or engaging in any other activity that would increase the sample size. Data may be collected starting July 15th. **(Not the same as Daylight Deer Herd/Wildlife Composition Counts.) Observations from may be from feeders, food plots, blinds, or vehicles. A minimum of 100 observations of adult deer plus fawns required.**

STAND COUNTS OF DEER

This method is suitable for properties of less than 1,000 acres or where spotlight routes are not at least two miles long. **One stand is required per every 100 acres (i.e. 150 acres requires two stands). Five counts are conducted at each stand. One hour of observation is required during each count** (i.e. one hour after sunrise or one hour before sunset). Deer are recorded by spike bucks, three to five point bucks, bucks with six points or more, does, and fawns. Counts may begin as early as July 15th.

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.**

TRACK COUNTS

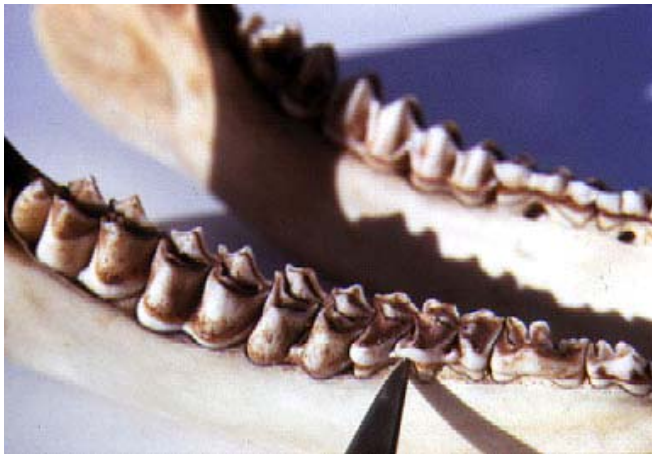
Standardized track counts at scent stations are used to census predators and furbearers. Deer numbers may be estimated by counting exit tracks on bare dirt transects that are dragged and counted for 3 continuous days. Primarily used where other accepted deer survey methods are not effective (i.e. thick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

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.**

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.



Keeping good harvest records is essential to understanding effects on target populations. Lower jaw bones are used to age deer, and deer aging publications may be obtained from Texas Parks and Wildlife or your County Extension Agent.

BROWSE UTILIZATION SURVEYS

Annually (normally during the winter) examine deer browse species for degree of utilization on each major vegetative

site on the property through vegetation analysis and stem counts.

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

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

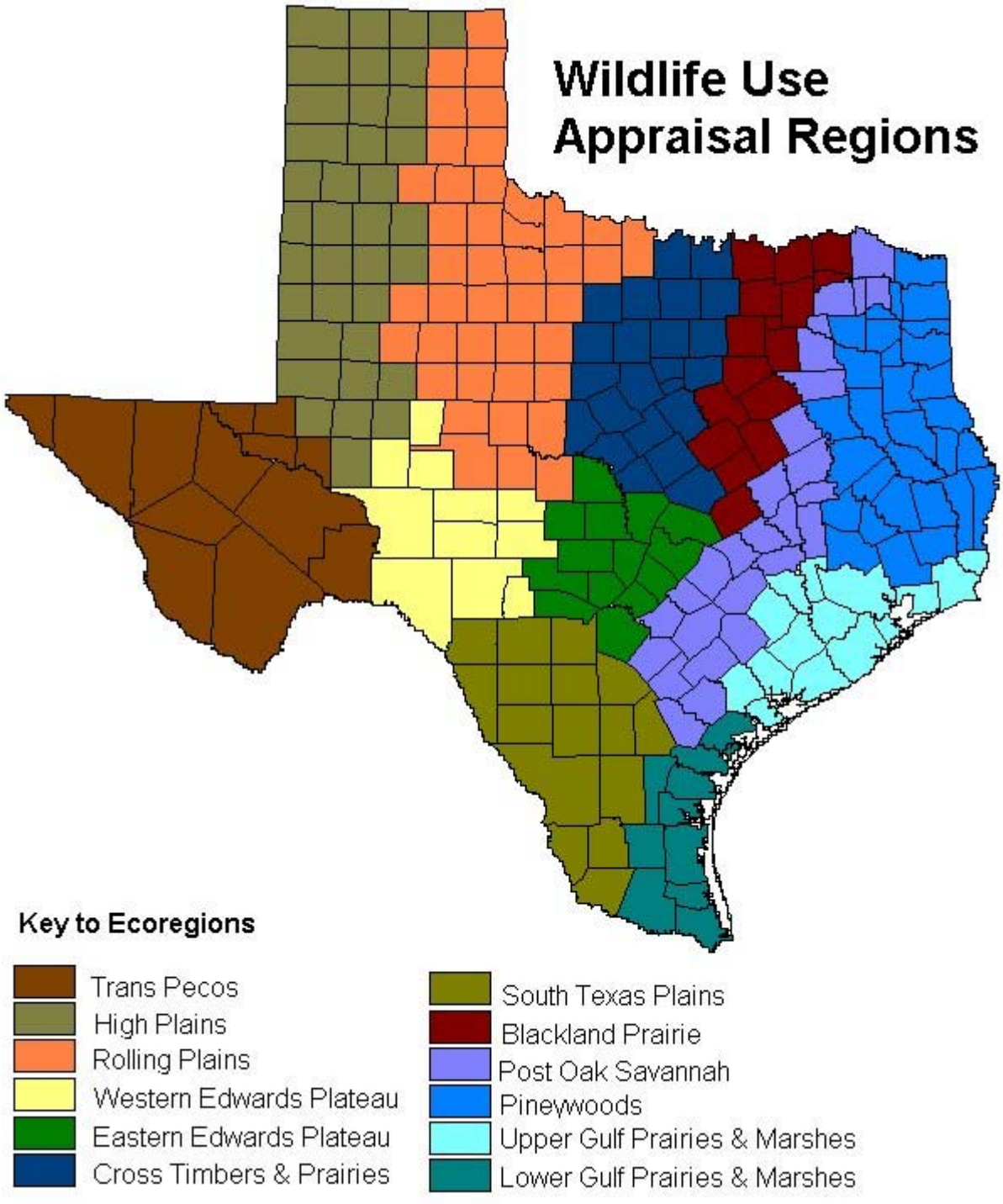
- Anderson
- Angelina
- Bowie
- Camp
- Cass
- Cherokee
- Gregg
- Hardin
- Harrison
- Houston
- Jasper
- Liberty
- Marion
- Montgomery
- Morris
- Nacogdoches
- Newton
- Panola
- Polk
- Rusk
- Sabine
- San Augustine
- San Jacinto
- Shelby
- Smith
- Trinity
- Tyler
- Upshur
- Walker
- Wood

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

CATTLE MANAGEMENT OPERATIONS ARE THE SINGLE-MOST IMPORTANT FACTOR THAT EFFECT DEER AND MOST OTHER WILDLIFE POPULATIONS IN THE GULF PRAIRIES AND MARSHES ECOLOGICAL REGION. Stock cattle at the NRCS (formerly SCS) recommended rate and where possible, rotate cattle in one herd through 3 - 10 pastures, letting pastures rest for at least as long as they are grazed. Rotate cattle out of wooded tracts wherever possible beginning in late August (when berries on American beautyberry begin to ripen) on through February - and/or - begin fencing off woods, especially bottomland areas to exclude cattle during this same fall/winter period. This practice will prevent cattle from competing with deer for browse and forbs - American beautyberry, greenbriar, elm, hackberry, yaupon, rattanvine, grape, tickseed clover, etc. - that deer normally require for healthy maintenance and growth. Also, fence off or exclude one or more acres of native pasture in scattered locations to provide tall grasses and weeds for fawn nursery areas and quail/turkey nesting areas.

These fences can be constructed of only 3-strand barbwire to discourage access by cattle. The bottom wire (this can be a smooth wire) should be at least 18 inches above the ground to permit deer easy travel under the fence instead of having to jump over. Top wires should be at least 12 inches apart.

A single electric wire fence 30 inches above the ground is also usually enough to discourage cattle access, but permit deer easy access. Cost of electric fencing, using a solar charger- powered battery, is about one-third cost of barbed wire fencing.

Grazing Management Plan should include:

Kind of Livestock: Brahman, Hereford- Brahman Cross, Angus, Horses, etc.
Type of Livestock: Cow/calf, Steers, etc.
Stocking rate: One animal unit per _____acres.
Type of Grazing System: Two Pasture, Eight Pasture, Planned Deferment 1-2 years, etc.
Intensity and Duration: High Frequency-Short Duration, Controlled Grazing, etc.

Because "weeds" (broadleafed 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 "stagnate" by becoming 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: two pasture/one herd rotation, three pasture/one herd rotation, four pasture/one herd rotation, high intensity/low frequency (HILF), and short duration. 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 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.

Two pasture/one herd rotation - All livestock are confined to one pasture, which is grazed for 3 months. The herd is then moved to the second pasture, which is grazed for 6 months. The herd is then moved back to the first pasture for 6 months, then back to the second for 3 months, and so on, continuing with the 3 month/6 month cycle.

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.

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.

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 grasslands in the Gulf Prairies and Marshes of coastal Texas is 1 animal unit (a.u.) per 10-20 acres; 3 - 6 acres on tame pasture; and 50 - 75 acres on primarily wooded areas. The combined total of all animals on the range, including all classes of livestock as well as deer, must be considered when determining stocking rates. The following equivalent values of animal unit standards can be used for planning the management of rangelands:

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	1.0 – 1.5 animal unit
Deer	
6 deer	1.0 animal unit
Exotics	
3.5 nilgai	1.0 animal unit

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

In the Gulf Prairies and Marshes, 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 has 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 in the Gulf Prairies and Marshes 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, an estimated 25 percent or more of the Gulf Prairies and Marshes has been planted (often requiring the clearing of hardwood timber) to mono-culture tame grasses such as Coastal or common bermuda, bahia, Klein grass, et cetera. Overseeding these existing pastures with clovers, or gradually returning this acreage to native grasses and forbs can make these areas more productive for wildlife.

Upland hardwoods and the associated understory vegetation over the area presently vary from heavily over-browsed by cattle and in some instances, deer to basically a stagnated state with dense yaupon understory shading out virtually all other browse and mast- bearing species. Good cattle management, utilizing rotation and/or excluding cattle from wooded areas via fences, coupled with periodic winter prescribed burning could revitalize these sites, making them much more productive. Sound deer and feral hog (including other large exotics, such as nilgai) harvest strategies are also needed to prevent overuse of food and cover. Native white-tailed deer and feral hogs (and large exotics if present) are the only wildlife species present in the Gulf Prairies and Marshes that can degrade or virtually destroy the habitat for not only themselves, but for the many smaller mammal and bird species that rely on the same vegetation for food and/or

cover.

Many bottomland hardwood sites have also been heavily grazed/browsed by cattle, and in some instances deer. As with upland sites, rotation or exclusion of cattle, coupled with sound deer and feral hog harvest strategies can improve these situations. Large (1,000 acres +), unbroken tracts of climax stands of bottomland hardwoods are scarce. At least 65 percent of bottomland hardwoods 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. Harvest of high quality (high-grading) large oaks and pecans (high mast producers) in the past in some sites has resulted in mostly "weedier species, less valuable for wildlife" such as ash, elm, hackberry, sweetgum, etc. dominating these sites. Good timber management, utilizing a competent agency or private timber consultant, can prevent this scenerio and help restore these abused sites to a more productive state.

Management of vegetation, whether it be deciduous post oak woodlands, running live oak, mesquite woods, or open grasslands, requires long-term planning. Any vegetation manipulation practice will have an impact on resident wildlife species, either good or bad, depending on the type of treatment used, the degree of use, and location. Before implementing vegetation control techniques, 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, cover, water, and space needs. Wildlife can be displaced by disturbance from an area without adequate escape or security cover. The amount and distribution of cover on adjacent lands need 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 plant species such as huisache, eastern red cedar, mesquite, prickly pear, and oak species that invade a variety of rangeland sites is often warranted. When these species dominate an area, they diminish plant diversity and the quality of habitat for most wildlife species. Vegetation manipulation may be in the form of prescribed burning, mechanical, biological, or chemical control of trees, brush, or weeds. Most of these practices will require the use of specialized equipment or machinery for plowing, discing, bulldozing, spraying, or other vegetation or soil manipulation procedures. 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. Refer to Texas Agricultural Extension Service bulletin "Prescribed Range Burning in Texas" for details on the use of fire as a range management tool.

Prescribed Burning Recommendations: To maintain oak woodlands with dense, diverse, understory, prescribe burn about 15 percent of upland woodland sites during late November (after frost and leaf drop) through February (before green-up) on a rotating basis, burning each site every 6-7 years to remove old growth and stimulate new growth of browse and forbs (weeds and wildflowers). About 50 - 100 acres per burn site would be the maximum size to burn on these particular land tracts. In order to have enough low-level fuel to produce a hot fire, one or two years of cattle exclusion from wooded tracts may be necessary to allow growth of vegetation normally grazed by cattle. Prescribe burning of these woods shortly after leaf drop, while they are still fluffed up with air space and before winter rains and time compact this leaf litter, may be necessary for some tracts and should be considered.

To restore and maintain native grasslands, prescribe burn about 20 percent of native grass openings each year, burning each site every five years, on a rotating basis, to remove old growth and young, invasive woody growth such as huisache, mesquite, and running live oak. This will stimulate new growth of plants that may have become dormant due to not having occasional fires to stimulate growth. Pasture burn locations can be as large as can safely be burned within daily time and man power limitations. Burn in late summer (late August through September), weather conditions permitting, to get the maximum kill of brush species. To maintain grasslands and enhance forb production, burn after the first killing frost and up to the time that spring green-up begins. See included TCE publication Prescribed Range Burning in Texas for good general guidelines, especially for native pastures. About seven times more insects are usually found in burned native grass areas compared to unburned areas, thus providing much more spring and summer high protein food for quail, turkey, and other birds (especially for the young).

Wetland vegetation should be burned every three years (33 percent per year) during October.

General burn prescriptions for Gulf Prairies and Marshes woodlands, wetlands, and native pastures are:

1. Prepare disced bare-ground fire guard around all sites before burning. Disked fire guards, which can include roads and right-of-ways, should be 20 feet wide. (These disced 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 conditons 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 the local volunteer fire department before conducting burns.

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

Prescribed burning is the cheapest, most effective habitat management technique for the Gulf Prairies and Marshes area.

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 re-sprouting 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 re-growth 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.

The use of chemical herbicides can have a significant negative impact on many plant communities and may suppress or eliminate plants other than the target species. From a wildlife habitat management perspective, the use of herbicides is one of the least desirable methods of vegetation control. If herbicides are used, selective applications, rather than broad-scale applications, are recommended to avoid the elimination of plants that are important to wildlife.

Control of Running Live Oak

Running live oak is invading native grassland prairies in much of the Gulf Prairies and Marshes ecological area. It is most effectively controlled with Spike herbicide applied by helicopter at a cost of approximately $60.00 per acre. The herbicide also suppresses the forb component of the vegetation for up to five years after application, a negative aspect for wildlife. The dead live oak is left standing for up to two growing seasons, until a fuel load is established for burning. The control area is then burned to eliminate the dead plant material. Complete control of the live oak can be accomplished in this manner.

Another approach to running live oak control is to roller-chop the live oak and follow with three consecutive late summer burns of the control area. Near total control of the live oak can be attained. This is less expensive, but grazing of the pasture is limited during that time period to assure a fuel load for the burns. Roller-chopping costs run $15 - $20 per acre. This approach is better for wildlife because it enhances forb production.

Chinese Tallow Control

Chinese tallow tress are dominating moist soil sites on much of the mid to upper coastal areas and consequently eliminating species diversity of plants and animals at these sites. Mechanical control is difficult in moist soil areas and only compounds the spread of the trees from root sprouts. The best control method for large numbers of trees is application of herbicide by helicopter. Smaller numbers can be controlled by hand spraying basal cuts. Dead trees should be left standing, so not to disturb the moist soil site and possibly promote the growth of new trees. When conditions permit, the site should be burned as part of a prescribed burning plan.

Macartney Rose Control

Macartney rose hedge has invaded much of the native grass prairies and pastures, especially in the mid to upper coastal region. This plant can be controlled by spot

spraying with herbicides. It can also be controlled by periodic prescribed burning. If quail cover is lacking, a hedge can be left on a spacing of one hedge every 130 yards by discing a 20 foot border around the plant to protect it from the burn.

Mesquite Control

Mesquite is another woody invader infesting many rangesites in coastal Texas. Its growth form varies from a multi-stemmed shrub to an upright tree. Adaptable to a variety of soil types, mesquite can colonize and dominate open rangelands, old fields, and other areas where ground cover has been reduced and fire eliminated from the environment. Mesquite sprouts from buds along a compressed, buried section of the stem called the "crown". Control by grubbing, bulldozing, root plowing, and chaining of mature-size trees has proven successful under proper soil moisture conditions. Several approved herbicides are also available for control. Shredding, on the other hand, or other practices that only remove top growth but do not involve removal of the crown is not recommended and may result in further sprouting. Any control planning should proceed with good common sense and a sense of aesthetics.

Mesquite seed pods are readily eaten by wildlife and livestock, resulting in the dispersal of undigested seeds across the landscape. Seeds may remain dormant for extended periods of time and germinate when the right conditions or soil disturbances occur. Young mesquites can quickly become established and grow rapidly, particularly when competition from other plants is reduced by heavy grazing pressure.

Like red cedar, mesquite does have some redeeming qualities. It provides seed pods that are a beneficial although sporadic food source, microclimates for cool season grasses and forbs that may be important to plant diversity, nitogen fixing roots, and cover, that make its occurrence beneficial to many wildlife species.

Farming Practices: Delaying of shredding or mowing of hay or native grass pastures until after the first of July will usually avoid the accidental killing of young fawns 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 which 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 disc 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.

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 size 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 larger ranch may have home ranges located totally within the ranch, while those 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. As 60 percent of the acreage in east Texas and much of central Texas is comprised of land tracts 200 acres or less, it is important for landowners to work with neighboring adjacent 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, mesquite, or Chinese tallow tree 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. Some key browse plants occurring in

coastal Texas include honeysuckle, rattan-vine, honeylocust, Carolina jessamine, trumpet creeper, bumelia, dogwoods, American elder, dewberries/blackberres, sugar hackberry, winged elm, and cedar elm, which are rated as "preferred" species. Some "moderately preferred", but also good, species include sumacs, American beautyberry, coralberry, poisonivy, possumhaw, blackjack oak, grapes, post oak, yaupon, mulberry, common greenbrier, netleaf hackberry, and Virginia creeper. Many woody plants also produce mast (acorns, fruits, or beans) 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 and pecans.

Not all of the above species are found throughout coastal Texas. 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 property'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 the shallow soils of the prairies.

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, and controlling noxious vegetation. 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 normally produce 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 one 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 a 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 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.

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 coastal Texas is 1 adult deer per 17-18 acres.

Overuse of preferred vegetation on rangeland 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. As with cattle, it is better to maintain the deer population just below carrying capacity of the range.

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 coastal Texas is 1 to 2 does per 1 buck.

The fawn production objective is .80 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).

Standardized incidental daylight observations of deer should be used to improve herd composition data 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 or by observing deer at feeders and food plots. Hunters can also record observations of deer during the first weekend or two of hunting season to supplement herd composition information.

The surveys should be conducted on an annual basis during the late summer and early fall beginning on August 15th and continuing until bow season (or until regular season if not bow hunting) 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. A minimum of fifteen miles of accumulated route (i.e. 5 miles of route conducted three times) should be sampled. In addition, a minimum of 100 daylight observations of adult deer (plus fawns) should be recorded. Binoculars should be used to aid in identifying deer.

The aerial (helicopter) census technique is another deer census technique that can be used in coastal Texas, but it is not well-suited for estimating deer density (number of deer) in areas with dense woody cover and/or a tall overstory of trees. The greatest values of an aerial census are the herd composition and buck antler quality estimates that can be made by observing a large sample size of deer in a short period of time. A total coverage aerial census could be used periodically, perhaps every 3 years, to verify and support density, herd composition, and antlered buck quality estimates derived from annual spotlight censuses and standardized incidental observations.

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 Texas Parks and Wildlife has about the deer herd in many areas of coastal Texas is the young age structure of the buck segment of the herd. Typically, 50% 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, the bucks 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. This is one reason wildlife management cooperatives or associations are so important.

Under a Quality Management strategy, buck harvest must be restricted to 20% or less (plus spikes) 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, unless wildlife management cooperatives are organized.

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, roughly 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 in addition to the buck harvest quota in the quality and optimum management strategies. Spikes generally comprise less than 10% of the total buck population. Harvesting spikes will remove poor quality bucks from the herd at an early age. It is highly unlikely that this harvest strategy would ever equal the 50% buck harvest for quantity management, especially on a well-managed property.

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 320 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, it's 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 can be used to hold deer in an area. To provide optimum nutritional benefits to deer, Texas Parks and Wildlife recommends that 1) food plots comprise from 1% 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) each plot be between 5 and 20 acres in size, long and narrow, and well distributed over the entire area adjacent to escape cover. Food plots should be planted on the deepest soils available.

Cool season plantings are generally more successful than warm season plantings because rainfall is somewhat more dependable during the fall and winter and there is less competition from weeds. To provide a safe-guard against complete failure, it is recommended that a mixture of species be planted rather than planting a single species. A recommended cool season mixture is a combination of at least two of the following cereal grains: wheat, oats, and rye. All are annuals and will have to be replanted annually. Adding a cool season legume to the seed mixture will increase the protein content. Check with your County Extension Agent or your local Natural Resources Conservation Service (NRCS) office for recommended cool season legumes such as; vetch, Austrian winter peas and clover (Madrid, rose, Big Bee, burcane, etc.).

Warm season supplemental plantings are generally less successful than cool season plantings. Typically, during droughty conditions when native vegetation is in poor condition and supplemental plantings are most needed, there is not enough moisture for production of food plots. Under these conditions, Lablab can successfully be grown if soil moisture can be conserved. Lablab is high in protein, produces large amounts of forage per plant, is tolerant of various soil and moisture conditions, and retains it's vigor until it freezes. Deer will continue to consume the forage, even after it is frost killed. Some other NRCS recommended warm season annual species are: spanish peanuts, grain sorghum, cow peas, soybeans, and common sunflower. Most species of "improved" livestock forage grasses are not highly preferred by deer.

An NRCS recommended seed mix for permanent food plots is: bush sunflower, Engelmann daisy, maximillian sunflower, and Illinois bundleflower. All are perennials and native to coastal Texas. Engelmann daisy is a cool season species, the rest 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 Gulf Prairies and Marshes ecological region of coastal Texas is not known as one of the better quail producing areas of the state, with the exception of the lower Texas coast and a few large cattle ranches with native grassland prairies in the mid-coast area. 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. Not now. In earlier years, there were more native pastures, rural family gardens, discing and soil disturbance that created early plant succession, situations that benefited quail. As more acreage was planted to tame pasture, less quail habitat was available. In the 1970's, the imported red fire ant began it's move into the region, steadily moving southwestward. Studies indicate that they have made an impact on quail and other ground dwelling/nesting wildlife. Their direct impact on young quail by stinging is not the problem, rather their reduction of the insect food base is believed to be 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 that promotes the early growth of herbaceous plants).

<u>Basic Habitat Requirements:</u>

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 bobwhites can negotiate with safety. As a rule of thumb, bobwhites venture no further than 100 yards from patches of cover. Ideally, escape cover should be linked to food supplies with more or less continuous screening cover. The screening cover must not be dense enough to prove an obstacle to the quail's short-legged gait. Overgrazed pastures do not provide adequate screening cover. Conversely, dense stands of thick grass (i.e. tame pastures) 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.

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, 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, briers, plums, blackberries, etc. should be retained and encouraged to form. Although not as desirable, small clumps of low growing running live oak 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, but it is too open at ground level 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. The trunks of multistemmed mesquites can be half-cut and pushed over to where the limbs touch the ground but they still 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 trees 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 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. Discing the soil is a good practice that encourages the growth of forbs and other annual plants. Disced strips should be long and meandering and up to three disc widths wide. The same strips should not be disced annually. Side-by-side strips can be disced on an alternating basis every third 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. Discing 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. An occasional limiting factor of supplemental food plots is an insufficient amount of rainfall received (especially in southern coastal Texas) during the summer. During dry years when the production of native foods is limited and supplemental foods are most needed, supplemental plantings may 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. 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: an intensive program 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 an 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.

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 Rio Grande Wild Turkeys

Specific Management Recommendations for Wild Turkeys: Rio Grande Turkey - southwest portion of the Gulf Prairies and Marshes ecological region, Eastern Turkey - southeast portion of the Gulf Prairies and Marshes ecological region

Rio Grande turkeys are present in most of the southwestern counties of the area, generally where annual rainfall is below 32 inches. Fairly stable populations have been established in these counties due to suitable habitat and restocking programs by the TPWD. These populations are presently subjected to hunting during either the regular fall and spring turkey season or during only the spring season. A few counties with greater than 32 inches of rainfall have remnant populations of Rio Grande turkeys left over from previous stocking efforts. These populations are more dependent on rainfall patterns than from habitat management practices. These counties generally have a spring only season.

Eastern wild turkeys are currently being restocked in several southeastern counties of the area. Using wild-trapped birds from wild eastern turkey populations in the eastern United States, an intensive restoration effort was begun to stock these birds in southeastern Texas where there was suitable habitat and annual rainfall exceeds 35 inches. This restocking program is currently in the early stages and there are presently no populations subjected to hunting.

Both of these subspecies of turkeys generally have similar habitat requirements and have similar seasonal habits. 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 floodplains 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 nearness of a ranch to a winter roost site(s), and 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 proper numbers of both does and bucks. (4) Prescribed burns can be utilized to control invading brush, 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 managment practices are also beneficial to deer, quail, and many other wildlife species.

Preservation of roosting sites is a key factor to maintain a turkey population on a sustained basis. Turkey also need escape cover to travel to and from roosting sites. Mature trees utilized as roosting sites include pine, pecan, cypress, sycamore, cottonwood, most large oaks, elm, hackberry, western soapberry, and large mesquite. 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. Avoid removing hardwood trees such as the various species of oaks, hackberry, elm, or large mesquite. 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 Houston Toad, Ocelot/Jaguarundi, Attwater's Prairie Chicken, and Bald Eagle are some of the Federally listed endangered and threatened species that are found in portions of the Gulf Prairies and Marshes ecological area. 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.

Houston Toad

Management Guidelines for the Houston Toad

The following guidelines address land management practices that can be used to maintain existing Houston Toad habitat or enhance degraded habitat. They are intended primarily to serve as general guidance for landowners and managers in Texas. The guidelines are based on our current understanding of the biology of this species.

Protect Pond Habitat

Avoid modification or disturbance of temporary wet-weather ponds and other small natural ponds located within one-half mile of deep sandy soils supporting post oak or loblolly pine woodland or savannah. These small ephemeral wetlands are prime breeding habitat for the Houston Toad. Extensive clearing of native vegetation and alteration of drainage patterns should be avoided in and around these ponds.

Because predators and other toad species live in and near permanent ponds, it is important that these ponds be located away from breeding ponds. To reduce predation and hybridization between Houston Toads and other toads, permanent ponds for livestock water should be located as far as possible from any existing temporary or natural pond. Also, permanent ponds should not impound ephemeral ponds or wetlands, in order to discourage predation and hybridization. Alternatives for livestock water, such as pipelines and windmills, should be considered in lieu of disturbing natural ponds and seeps that could serve as breeding habitat.

Since predation can be an important factor in reducing Houston Toad populations, predatory fish should not be introduced into breeding ponds. In addition, a fungus commonly found in hatchery raised fish has been shown to be harmful to the eggs of other toad species and could be a potential problem.

Conserve and Manage Existing Post Oak or Loblolly Pine Woodland and Savannah and the Associated Native Plant Communities

Conservation and wise management of rangeland and native grassland pasture in the Gulf Prairies and Marshes ecological region are the keys to preserving Houston Toad habitat. Preventing overuse by livestock is important. Maintaining and improving range condition through moderate stocking, rotational grazing, and prescribed burning, will help restore the plant communities with which the Houston Toad evolved and is dependent. Good range management practices such as these will also benefit livestock, deer, and other wildlife.

Prescribed burning is an important management tool for maintaining the open woodland savannah preferred by the Houston Toad. Periodic burning (every 3 to 5 years) will stimulate native bunchgrasses, improve plant diversity, and reduce excessive mulch buildup. Prescribed burning also improves forage quality and availability for livestock and enhances habitat for deer, quail, turkey and other wildlife. Generally, prescribed burning should be done during cold, dry periods when toads are most likely to be hibernating in burrows. Burning prior to February 1 is recommended to avoid the breeding season. The timing of prescribed burning may vary from year to year depending on how weather conditions affect the toad's activity and the vegetation.

At this time, little is known concerning the effects of prescribed burning on Houston Toads. During the next five years, studies will be conducted to address questions concerning how prescribed burning affects Houston Toads and their habitat. Because prescribed burning could result in the death or injury of individual toads, landowners are advised to contact Texas Parks and Wildlife or U.S. Fish and Wildlife Service for further information concerning prescribed burning in Houston Toad habitat.

Clearing of trees and brush should be limited to reducing woody canopy enough to allow sufficient sunlight to reach the ground for herbaceous plant production. Initial brush management can then be followed by prescribed burning to maintain a more open savannah grassland.

Reduce Loss of Habitat Due to Pasture Establishment

The introduction of sod-forming grasses, such as bermudagrass and bahiagrass, on deep sandy soils has reduced habitat for the Houston Toad in the Gulf Prairies and Marshes ecological region. Ideally, areas of potential habitat should be managed as native rangeland pasture for the production of native bunchgrasses and forbs. If improved forage production through pasture establishment is an objective, it is better to plant high quality native bunchgrasses that are adapted to local conditions and sandy soils, such as indiangrass and little bluestem.

Use Safe, Effective Alternatives to Chemicals Whenever Possible

Amphibians such as the Houston Toad are susceptible to chemical contamination. The toads can be affected either directly, or through reduction in their food supply. Some

pesticides can impact water quality and adversely affect the Houston Toad and other species. Alternatives, such as integrated pest management, organic gardening, and the use and proper management of native vegetation, reduce reliance on chemicals and can improve cost effectiveness.

When insecticide or herbicide treatments must be used, label directions should be carefully followed. Avoid contamination of temporary ponds and other natural wetlands by limiting use of these products near them. Dispose of rinse water and empty containers in strict accordance with label directions. Contact the Texas Department of Agriculture or the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) for guidance on ways to minimize the environmental effects of agricultural chemicals.

Control Fire Ants

Although the full impact of fire ants on the Houston Toad is not known, fire ants are believed to be a serious and increasingly important threat. You can help control fire ant infestations by limiting soil disturbance, inspecting imported soil and nursery products thoroughly for fire ants, and properly disposing of trash. Controlling heavy fire ant infestations in Houston Toad habitat may help minimize their impact.

Where fire ant control is needed, the U.S. Fish and Wildlife Service recommends treatment of individual fire ant mounds with commercial fire ant bait. Bait should be placed only near fire ant mounds and not near the mounds of native ant species. To avoid affects on non-target species apply bait when ants are actively foraging and prevent accumulations of excess bait.

For More Information

Technical assistance in range and wildlife management, including management for endangered species, is available to landowners and managers by contacting Texas Parks and Wildlife, U.S. Natural Resources Conservation Service, or Texas Agricultural Extension Service. Further guidance and specific questions concerning landowner responsibilities under the Endangered Species Act, should be directed to the U.S. Fish and Wildlife Service.

Bald Eagle

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 non-nesting season if

there is no physical alteration of the habitat within the zone. Traditional farming, ranching, and hunting activites 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 activites 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 activites 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 Texas Parks and Wildlife, 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.

Jaguarundi

Scientific Name: *Felis yagouaroundi cacomitli*
Federal Status: Endangered, 6/14/76 • State Status: Endangered

Description

The Jaguarundi is a small, slenderbodied, unspotted cat, slightly larger than a domestic cat (7-22 pounds).

Jaguarundis are characterized by slender, elongated bodies, small flattened heads, and long tails (11-24 inches) more reminiscent of an otter or weasel than a cat. Other characteristics include short legs standing at a height of 11 inches at the shoulder; and short, rounded, widely spaced ears. There are three color phases: black, reddish-brown and a brownishgray. Because of similarity in size, the Jaguarundi can easily be confused with a large black feral cat, especially when seen in low light or dense cover.

Habitat

Little is known about the habitat of Jaguarundis in Texas. It is thought that they occur in the dense thorny shrublands of the Rio Grande Valley. Their habitat may be very similar to that of the Ocelot, although sightings and information from Mexico indicate that the Jaguarundi may be more tolerant of open areas, such as grasslands and pastures, than the Ocelot. Typical habitat consists of mixed thornshrub species such as spiny hackberry, brasil, desert yaupon, wolfberry, lotebush, amargosa, whitebrush, catclaw, blackbrush, lantana, guayacan, cenizo, elbowbush, and Texas persimmon. Interspersed trees such as mesquite, live oak, ebony, and hackberry may also occur. Riparian habitats along rivers or creeks are sometimes used by Jaguarundis. Canopy cover and density of shrubs are important considerations in identifying suitable habitat. Little information exists concerning optimal habitat for the Jaguarundi in Texas. Scientists speculate that these elusive cats are similar to the Ocelot in their requirement for dense brush cover. Tracts of at least 100 acres of isolated dense brush, or 75 acres of brush interconnected with other habitat tracts by brush corridors, are considered important habitat. Even brush tracts as small as 5 acres, when adjacent to larger areas of habitat, may be used by Jaguarundis. Roads, narrow water bodies, and rights-of-way are not considered barriers to movements. Brushy fence lines, water courses, and other brush strips connecting areas of habitat are very important in providing escape and protective cover. These strip corridors are considered important habitat.

Texas counties where Jaguarundis occurred during the past 30 years include Cameron and Willacy.

Life History

Little information is available concerning the biology of the Jaguarundi in Texas. Most of what is known comes from anecdotal or historical writings and information gained through the study of Ocelots in south Texas. Jaguarundis hunt primarily during the day with peak activity occurring at midday. They are less nocturnal than the Ocelot and have been observed more often during the day. Jaguarundis forage mainly on the ground. Prey includes birds, rabbits, reptiles, and small rodents. Historical accounts from Mexico suggest that Jaguarundis are good swimmers and enter the water freely. Little is known regarding Jaguarundi reproduction in Texas. In Mexico, Jaguarundis are said to be solitary, except during the mating season of November and December. Kittens have been reported in March and also in August. It is not known whether females produce one or two litters each season. The gestation period is 60 to 75 days, and litters contain two to four young.

Threats and Reasons for Decline

Historically, dense mixed brush occurred along dry washes, arroyos, resacas, and the flood plains of the Rio Grande. The extensive shrub lands of the Lower Rio Grande Valley have been converted to agriculture and urban development over the past 60 years. Much of this land, particularly the more fertile soils, has been cleared for production of vegetables, citrus, sugarcane, cotton, and other crops. Unfortunately for the Jaguarundi and Ocelot (another endangered South Texas cat), the best soil types also grow the thickest brush and thus produce the best habitat. Less than 5% of the original vegetation remains in the Rio Grande Valley. The Jaguarundi is one of the rarest cats in Texas, with only the Jaguar, which has not been reported in recent years, being rarer. Information about this species is urgently needed. Unless vigorous conservation measures are taken soon, this elusive cat may join the list of species extirpated from the United States.

Recovery Efforts

Very little is known concerning Jaguarundi biology in south Texas. Research regarding capture techniques, reproduction, rearing of young, dispersal, home range, and movements is urgently needed. Recently initiated Jaguarundi research in northeast Mexico, where they are more common, will enable biologists to better understand the requirements for a viable population. This information can then be used to assist conservation efforts for the Jaguarundi in Texas. Efforts to inform landowners and the public about the habitat needs, land management options, and biology of the Jaguarundi are also critical to recovery. Conservation of remaining habitat, and maintenance or creation of brush corridors connecting these habitats, is necessary for survival of the Jaguarundi population in Texas. The U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, The Nature Conservancy, and many local landowners have been working to protect, acquire and restore Jaguarundi habitat in the Rio Grande Valley. Restoration generally involves revegetating previously cleared areas with native trees and shrubs.

Where To Learn More About Jaguarundis

The best places to visit to learn more about the Jaguarundi are the Laguna Atascosa National Wildlife Refuge near Rio Hondo (956) 748-3607, Santa AnaNational Wildlife

Refuge near Alamo (956) 787-3079, Bentsen-Rio Grande Valley State Park near Mission (956) 585-1107, Las Palomas Wildlife Management Area near Edinburg (956) 447-2704, and Audubon's Sabal Palm Grove Sanctuary near Brownsville (956) 541-8034.

How You Can Help

You can be involved with 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. The Feline Research Program at the Caesar Kleberg Wildlife Research Institute (Texas A&M University-Kingsville) also accepts contributions to its Cat Conservation Fund. These funds are dedicated to the research and recovery of free-ranging wild cats of Texas. For more information, contact the Feline Research Program at (361) 593-3922. The public is asked to report sightings of Jaguarundis to the Feline Research Program, Texas Parks and Wildlife Department, or U.S. Fish and Wildlife Service. Be sure to note size, color, habitat, behavior, location, date, and time of day seen.

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
Laguna Atascosa National Wildlife Refuge
P.O. Box 450
Rio Hondo, Texas 78583
(956) 748-3607

or

U.S. Fish and Wildlife Service
Ecological Services – LRGV Office
Route 2, Box 202-A
Alamo, Texas 78516
(956) 784-7560

Management guidelines are available from the Texas Parks and Wildlife Department or U.S. Fish and Wildlife Service for landowners and managers wishing to conserve and improve habitat for the Jaguarundi.

References

Burt, W.H. and R.P. Grossenheider. 1964. *A field guide to the mammals*. Houghton Mifflin Company, Boston, Mass. 284pp.

Davis, W.B. and D.J. Schmidly. 1994. *The mammals of Texas*. Texas Parks and Wildlife Press. Austin, Texas. 338pp.

Tewes, M.E. and D.J. Schmidly. 1987. “The neotropical felids: jaguar, ocelot, margay, and jaguarundi” *in* M. Novak, J. Baker, M.E. Obbard and B. Malloch (eds.) Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario. 703-705.

U.S. Fish and Wildlife Service. 1990. *Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot)*. Endangered Species Office, Albuquerque, N.M.

Walker, E.P., F. Warnick, K.I. Lange, H.E. Uible, and P.F. Wright. 1975. *Mammals of the world. Vol. 2.* John Hopkins Univ. Press, Baltimore. 1500pp.

Ocelot

Scientific Name: *Leopardus pardalis*
Federal Status: Endangered, 3/30/72• State Status: Endangered

Description
The Ocelot is a beautiful medium-sized spotted cat with body dimensions similar to the bobcat (30-41 inches long and 15-30 lbs). Its body coloration is variable; with the upper parts gray or buff with dark brown or black spots, small rings, blotches, and short bars. A key feature is the parallel stripes running down the nape of the neck. The under parts are white spotted with black. The Ocelot's long tail is ringed or marked with dark bars on the upper surface. The backs of the rounded ears are black with a white central spot.

Habitat
In Texas, Ocelots occur in the dense thorny shrub lands of the Lower Rio Grande Valley and Rio Grande Plains. Deep, fertile clay or loamy soils are generally needed to produce suitable habitat. Typical habitat consists of mixed brush species such as spiny hackberry, brasil, desert yaupon, wolfberry, lotebush, amargosa, whitebrush, catclaw, blackbrush, lantana, guayacan, cenizo, elbowbush, and Texas persimmon. Interspersed trees such as mesquite, live oak, ebony, and hackberry may also occur. Canopy cover and density of shrubs are important considerations in identifying suitable habitat. Optimal habitat has at least 95% canopy cover of shrubs, whereas marginal habitat has 75-95% canopy cover. Shrub density below the six foot level is the most important component of Ocelot habitat. Shrub density should be such that the depth of vision from outside the brush line is restricted to about five feet. Because of the density of brush below the six foot level, human movement within the brush stand would often be restricted to crawling. Tracts of at least 100 acres of isolated dense brush, or 75 acres of brush interconnected with other habitat tracts by brush corridors, are considered very important. Even brush tracts as small as 5 acres, when adjacent to larger areas of habitat, may be used by Ocelots. Roads, narrow water bodies, and rights-of-way are not considered barriers to movement. Brushy fence lines, water courses, and other brush strips connecting areas of habitat are very important. Historical records indicate that the Ocelot once occurred throughout south Texas, the southern Edwards Plateau Region, and along the Coastal Plain. Over the years, the Ocelot population declined primarily due to loss of habitat and predator control activities. Today, Texas counties that contain areas identified as occupied habitat are: Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, San Patricio, Starr, Willacy, and Zapata.

Life History
Ocelots normally begin their activities at dusk, when they set out on nightly hunts for

rabbits, small rodents, and birds. They move around during the night, usually within a well-established home range (area of activity) of one to two square miles for females and three to four square miles for males. Most mornings they bed down in a different spot within the territory. Male Ocelots tend to travel more than females. Males generally cover an extensive area in a short time, whereas females cover less area but use the home range more intensively. Female Ocelots occupy a den for their kittens in thick brush or dense bunchgrass areas surrounded by brush. The den is often a slight depression with the dead leaves and mulch scraped away. The usual litter size is one or two kittens. The mother goes off to hunt at night, but spends each day at the den site. The kittens begin to accompany their mother on hunts at about 3 months of age. They stay with her until they are about a year old. Studies have shown that kittens are born from late spring through December.

Threats and Reasons for Decline

Historically, the South Texas Plains supported grassland or savanna-type climax vegetation with dense mixed brush along dry washes and flood nplains of the Rio Grande. The extensive shrub lands of the Lower Rio Grande Valley have been converted to agriculture and urban development over the past 60 years. Much of this land, particularly the more fertile soils, has been cleared for production of vegetables, citrus, sugarcane, cotton, and other crops. Unfortunately for the Ocelot, the best soil types also grow the thickest brush and thus produce the best habitat. Less than 5% of the original vegetation remains in the Rio Grande Valley. Only about 1% of the South Texas area supports what is currently defined as optimal habitat. Most of this habitat occurs in scattered patches probably too small to support Ocelots for extended periods. As a result, young cats dispersing from areas of suitable habitat have no place to go and most are probably hit by cars or die of disease or starvation. Road mortality is a more recent reason for decline. As Ocelot habitat in South Texas becomes fragmented by bigger highways with faster traffic, Ocelots have become increasingly vulnerable to being struck by vehicles while crossing roads. About half of the Ocelot mortality documented in the past 20 years has been from road mortality. The Ocelot population in Texas is very small, probably no more than 80 to 120 individuals. Approximately 30 to 35 live in the chaparral remaining at or near the Laguna Atascosa National Wildlife Refuge. Unless vigorous conservation measures are taken soon, this beautiful cat may join the list of species extirpated from the United States.

Recovery Efforts

Much information has been obtained recently concerning Ocelot biology in south Texas. However, there is still much to be learned regarding reproduction, rearing of young, dispersal, home range, and movements. Efforts to inform landowners and the public about the habitat needs, land management options, and biology of the Ocelot are critical to recovery. Conservation of remaining habitat, and maintenance or creation of brush corridors connecting these habitats, is necessary for survival of the Ocelot population in Texas. The U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, The Nature Conservancy, and many local landowners have been working to protect, acquire and restore Ocelot habitat in the Rio Grande Valley. Restoration generally involves revegetating previously cleared areas with native trees and shrubs. The U.S. Fish and

Wildlife Service and the Texas Department of Transportation are also working together to try and reduce Ocelot road mortality by installing Ocelot underpasses under roads where Ocelots are known to frequently cross.

Where To Learn More About Ocelots

The best places to visit to learn more about the Ocelot are the Laguna Atascosa National Wildlife Refuge near Rio Hondo (956) 748-3607, Santa Ana National Wildlife Refuge near Alamo (956) 787-3079, Bentsen-Rio Grande Valley State Park near Mission (956) 585-1107, Las Palomas Wildlife Management Area near Edinburg (956) 447-2704, and Audubon's Sabal Palm Grove Sanctuary near Brownsville (956) 541-8034.

How You Can Help

You can be involved with 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. The Feline Research Program at the Caesar Kleberg Wildlife Research Institute (Texas A&M University-Kingsville) also accepts contributions to its Cat Conservation Fund. These funds are dedicated to the research and recovery of free-ranging wild cats of Texas. For more information, contact the Feline Research Program at (361) 593-3922. The non-profit group, Friends of Laguna Atascosa Refuge, has an Adopt-an-Ocelot program in which 100% of the donated funds go towards ocelot conservation. For a small donation, participants receive an adoption packet that includes life histories and pictures of ocelots living at Laguna Atascosa National Wildlife Refuge, ocelot facts, and an adoption certificate. To learn more, contact Linda Laack at (956) 748-3607 or write Adopt-an-Ocelot, P.O. Box 942, Rio Hondo, Texas 78583. The public is asked to report sightings of Ocelots to the Feline Research Program, Texas Parks and Wildlife Department, or U.S. Fish and Wildlife Service. Be sure to note tail length, size, color, habitat, behavior, location, date, and time of day seen.

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
Laguna Atascosa National Wildlife Refuge
P.O. Box 450
Rio Hondo, Texas 78583
(956) 748-3607

or

U.S. Fish and Wildlife Service
Ecological Services – LRGV Office

Route 2, Box 202-A
Alamo, Texas 78516
(956) 784-7560

Management guidelines are available from the Texas Parks and Wildlife Department or U.S. Fish and Wildlife Service for landowners and managers wishing to conserve and improve habitat for the Ocelot.

References

Burt, W.H. and R.P. Grossenheider. 1964. *A field guide to the mammals.* Houghton Mifflin Company, Boston, Mass. 284pp.

Davis, W.B. and D.J. Schmidly. 1994. *The mammals of Texas.* Texas Parks and Wildlife Press. Austin, Texas. 338pp.

Tewes, M.E. and D.J. Schmidly. 1987. "The neotropical felids: jaguar, ocelot, margay, and jaguarundi" *in* M. Novak, J. Baker, M.E. Obbard and B. Malloch (eds.) Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario. 697-711.

U.S. Fish and Wildlife Service. 1990. *Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot)*. Endangered Species Office, Albuquerque, N.M.

Walker, E.P., F. Warnick, K.I. Lange, H.E. Uible, and P.F. Wright. 1975. *Mammals of the world. Vol. 2.* John Hopkins Univ. Press, Baltimore. 1500pp.

The following guidelines address land management practices that can be used to maintain, enhance, or create habitat for the Jaguarundi and Ocelot. They are intended primarily to serve as general guidance for landowners or managers of livestock/ wildlife operations in South Texas. The guidelines are based on our current understanding of the biology of these species.

Management Guidelines for the Jaguarundi and Ocelot

Habitat Preservation

Conservation of dense stands of mixed thornshrub, which serve as habitat for the Ocelot and Jaguarundi, is vital to the survival of these cats in Texas. Habitat preservation around the Laguna Atascosa National Wildlife Refuge, in the Lower Rio Grande Valley, and in counties directly north of this area is particularly important.

Mechanical or chemical brush control, including prescribed burning, should not be conducted in habitat areas or in brushy corridors connecting larger areas of habitat. In everyday agricultural operations (i.e., livestock water facilities, fence construction), it is important to minimize disturbances that would destroy the integrity of a habitat tract or corridor. Tracts of at least 100 acres of isolated brush (of the required density and structure), or 75 acres of brush interconnected with other habitat tracts by brush corridors, are considered important habitat. Useful habitat can be provided by smaller tracts especially if these tracts are adjacent to larger areas of habitat.

On rangeland that does not provide the required brush cover and density (non-habitat areas), normal brush management practices, including prescribed burning, are not considered detrimental.

Habitat Restoration

Where dense mixed brush has developed into a tree form, or shrub density below four feet is inadequate, mechanical brush treatment methods such as chaining or roller chopping may be used to restore or create suitable habitat. These mechanical methods encourage basal sprouting by breaking off limbs or trunks of established plants, and can be used to increase cover and density of brush below the four foot level. Adapted native shrubs, such as ebony, brasil, and granjeno, can be planted to increase habitat or to provide interconnecting corridors to existing habitat. Methods are currently being developed to allow for more successful establishment of these species. Technical assistance in habitat management is available to landowners and managers by contacting the Texas Parks and Wildlife Department, U.S. Natural Resources Conservation Service (formerly Soil Conservation Service), U.S. Fish and Wildlife Service, Texas Agricultural Extension Service, or the Caesar Kleberg Wildlife Research Institute.

Attwater's Prairie Chicken

Scientific Name: *Tympanuchus cupido*
Federal Status: Endangered, 3/11/67 • State Status: Endangered

Description

The Attwater's Prairie Chicken is a brownish, strongly black-barred, medium-sized grouse with a short, rounded, blackish tail. Males have long tufts on the sides of the neck, called pinnae, which point forward during courtship. Males also have a yellow-orange comb above the eyes, and, on each side of the neck, an area of yellow-orange skin that inflates during courtship display.

Habitat

Attwater's Prairie Chickens are found only in the coastal prairie of Texas. They use different areas of coastal prairie grassland for various activities; so a mixture of native grasses at different heights is optimum. For example, the birds use short grass cover

(less than 10 inches in height) for courtship, feeding, and to avoid moisture during heavy dew or after rains. Midgrass areas (10-16 inches in height) are used for roosting and feeding. Tall grasses (16-24 inches in height) are needed for nesting, loafing, feeding, and escape cover. Very dense stands of grass are generally avoided, but are occasionally used for shade during summer, and as protection against inclement weather and predators. Studies have shown that prime habitat consists of tall grass prairie dominated by bunchgrasses such as little bluestem, Indiangrass, switchgrass and big bluestem; along with flowering plants such as Ruellia, yellow falsegarlic, and ragweed. The birds prefer open prairies without any woody cover, and avoid areas with more than 25% cover of shrubs. Preferred habitat is also characterized by knolls and ridges, with the minor variations in topography and soils on these sites resulting in a variety of vegetation types.

Life History

Prairie chicken breeding activity occurs on or near leks. A lek or booming ground is a specific area typically used year after year. They are usually located on bare ground or short grass areas which allow the males to be seen by the females. Booming grounds vary in size from one-eighth acre to several acres. They may be naturally occurring short grass flats or artificially maintained areas such as roads, runways, oil well pads, and drainage ditches. Areas around windmills, ponds, and other cattle concentration areas are often heavily grazed, and therefore provide the short grass cover used for booming sites. Active booming grounds are usually in close proximity to mid and tall grass cover.

Males begin to set up territories on the booming grounds in late January-February. Fighting ensues when one male enters the territory of another. This fighting early in the booming season determines the social structure of the males on the lek. Usually one or two males will be dominant. Booming is usually heard from about daylight to 9 a.m. and in the late evening.

The hens start coming to the booming grounds in late February and early March. They appear quietly, often staying on the edge of the booming ground. When a hen is on the booming ground, the males become much more vocal and active. This increased activity often causes males not on the ground to fly in and start booming. Most mating occurs in early March, with one or two dominant males doing the majority of the breeding. Booming activity gradually ceases during the last week of April and the first two weeks of May. By mid May, the males have abandoned the booming grounds.

Nesting is usually initiated in early March. Most nests are located within one mile of the booming ground. The nest is a well-concealed, shallow depression about eight inches in diameter lined with dry grass and feathers from the hen. Hens prefer to nest in mid to tall grass cover with the grass canopy concealing the nest. Also preferred are areas with openings that facilitate walking, including cow trails used for access to their nests. Clutch size ranges from 4 to 15 eggs, with the average being 12 eggs. During the 26 day incubation period, the hen leaves the nest only for short periods (45-90 minutes) during the morning and again in the afternoon to feed nearby (usually within 1/4 mile). The peak of the hatch is in late April to early May. If a nest is destroyed, a hen will renest; although renesting attempts are limited because males leave the booming grounds by mid-May. Nesting losses are often the result of predators such as snakes, raccoons, opossums, skunks, and coyotes, and flooding of nests. Because of the flat nature of coastal prairie rangeland, nests and small young are unable to survive heavy rains and flooding. The most detrimental rainfall pattern for nests is heavy rains in late April and early May. The April rains destroy initial nests, and May rains ruin renesting attempts. Hailstorms and human activities such as shredding during the nesting season can also destroy nests.
When the eggs hatch, the hen leaves the nest site. She takes her brood into more open areas, since it is difficult for young chicks to travel in dense vegetation, although some heavy cover is important for escape areas. The chicks are quite mobile at hatching, and can fly short distances by two weeks of age. Heavy or frequent rainfall during May is especially detrimental to young chicks.

Prairie chickens feed on a wide variety of plant parts and insects. Potential food sources, both vegetation and insects, vary by season, location, and availability. Studies have shown that green foliage and seeds make up most of the diet, whereas insects are important seasonally. The foliage and seeds of native forbs (flowering plants) are particularly important in the diet. Most commonly consumed plants include Ruellia, yellow falsegarlic, upright prairie-coneflower, leavenworth vetch, stargrass, bedstraw, doveweed, and ragweed. Predators that feed on prairie chickens include Great-horned Owls, hawks, bobcats and coyotes. Insects make up the majority of the diet of chicks. The chicks generally hatch when insect populations are high. Hens take their broods to

weedy areas where insect density is greatest.

Threats and Reasons for Decline

Habitat loss and alteration are the primary reasons for the population decline of Attwater's Prairie Chicken. Loss of habitat due to land use changes since 1930 are particularly significant. It is estimated that 6 million acres of coastal Texas were once covered with suitable tall grass prairie habitat. Only a few patches of this immense expanse of prairie chicken habitat now remain. Currently, it is estimated that less than 200,000 acres of suitable habitat remain. This represents a 97% loss of habitat within the historic range, and a 57% loss since 1937.

This loss of habitat has been the result of several factors. The biggest single change was brought about by the start of rice production along the Gulf Coast. From about 1892 to present, about two million acres of grassland were converted to rice production.

Other factors, such as overgrazing by cattle in some locations and conversion of rangeland to introduced grass pastures have also reduced habitat. High stocking rates and continuous grazing over a period of many years have caused declines in range condition on parts of the Coastal Prairie. The climax tall grass plant community with its associated native wildlife, which existed before the influence of European man, was ideal habitat for the prairie chicken. Unfortunately, tall grasses such as big bluestem, little bluestem, and Indiangrass required by prairie chickens for nesting are also preferred cattle forage. Without proper grazing management, continuous intensive grazing by livestock will reduce desirable grasses and forbs and replace them with a plant community unable to support the nesting and food requirements of prairie chickens. Also, much coastal prairie rangeland has been converted to introduced grasses such as coastal bermudagrass. Over a million acres have been planted to introduced grass pastures in an effort to boost livestock production. The conversion was especially rapid from 1940 to 1970, when fertilizer on which introduced grass production depends was relatively inexpensive. This was another setback for the prairie chicken, since introduced grass pastures do not provide habitat.

The invasion of woody species such as Chinese tallow and Macartney rose (introduced exotics), wax myrtle, Baccharis, running liveoak, huisache, and mesquite have also contributed to loss of over a million acres of coastal prairie habitat. The invasion of brush is the result of overgrazing combined with lack of fire. Historically, the coastal prairie burned periodically. These natural and man-made fires helped to maintain healthy and diverse grassland. Finally, urbanization and industrial expansion have taken their toll on prairie chicken habitat. Losses have been most evident along the upper Texas coast. The considerable urban sprawl of Houston, Galveston, and other coastal cities has led to irreplaceable habitat losses. The loss of diverse tallgrass prairie has not only affected the prairie chicken, but also plants such as Texas windmillgrass (*Chloris texensis*), Texas prairie dawn (*Hymenoxys texana*), and Houston camphor daisy (*Rayjacksonia aurea*), which have become rare components of the ecosystem.

In 2003, fewer than 60 birds remained in two fragments of habitat located in Galveston and Colorado counties. We must find a way to reverse the factors contributing to the loss of tallgrass coastal prairie and the life it supports. The Attwater's prairie chicken now literally stands on the brink of extinction. Time is running out for this spectacular inhabitant of our coastal grasslands.

Recovery Efforts

Research is continuing regarding the interaction of limiting factors on prairie chicken populations. Efforts to provide information and incentives for private landowners to manage rangeland for the benefit of prairie chickens as well as livestock are an essential part of the recovery process, and many landowners have implemented habitat improvements under the protection of a Safe Harbor Habitat Conservation Plan developed in 1995.

Cooperative habitat management projects involving private landowners, Texas Parks and Wildlife Department, and the U.S. Fish and Wildlife Service have made a start at reversing the devastating habitat losses.

An active captive breeding program began in 1993, with the first supplementation of wild populations accomplished in 1995. The captive breeding program continues to expand, with seven zoos or research facilities producing 131 Attwater's Prairie Chicken for release in 2002. Release efforts will continue to supplement wild populations, while concurrent efforts seek to increase the amount of habitat available to the species. Reintroduction may also be attempted on restored habitat owned by willing landowners.

Where To Learn More About the Attwater's Prairie Chicken

The best place to visit to learn more about prairie chickens is the Attwater Prairie Chicken National Wildlife Refuge. The refuge is located off F.M. 3013 about 6 miles northeast of Eagle Lake, Texas.

How You Can Help

You can be involved with the conservation of Texas' nongame wildlife resources by supporting the Special Nongame and Endangered Species Conservation Fund and the Adopt-A-Prairie Chicken Program (www.tpwd.state.tx.us/apc). 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. The Nature Conservancy of Texas also accepts gifts specifically for Attwater's prairie-chicken recovery efforts. For more information, contact the Attwater Prairie Chicken National Wildlife Refuge at (979) 234-3021.

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
or
U.S. Fish and Wildlife Service
Corpus Christi Ecological Services Office
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive, Room 118
Corpus Christi, Texas 78412
(361) 994-9005
or
The Nature Conservancy's Texas City Prairie Preserve website at:
http://nature.org/wherewework/northamerica/states/texas/preserves/texascity.html

Management guidelines are available from Texas Parks and Wildlife Department for landowners and managers wishing to improve habitat for Attwater's Prairie Chicken.

References

Jurries, R. 1979. *Attwater's prairie chicken*. Texas Parks and Wildlife Department. Series F.S., No. 18, Project W-100-R. 36 pp.

Lehmann, V.M. 1941. *Attwater's prairie chicken, its life history and management.* U.S. Fish and Wildlife Service, North American Fauna No. 57. 65 pp.

U.S. Fish and Wildlife Service. 1993. *Attwater's prairie chicken recovery plan.* Endangered Species Office, Albuquerque, N.M.

Management Guidelines for Attwater's Prairie Chicken

Habitat for the Attwater's Prairie Chicken consists of open tall grass coastal prairie dominated by bunchgrasses such as little bluestem, Indiangrass, switchgrass, and big bluestem, along with various flowering plants. Preferred habitat is characterized by high plant diversity and variations in grass height. Management for Attwater's Prairie Chicken involves good grazing management and carefully planned prescribed burning and brush management. Range management practices aimed at achieving and maintaining Good and Excellent Range Condition (i.e., greater than 50% climax vegetation present)

will benefit the prairie chicken, as well as other plants and animals that share its habitat, including livestock.

Grazing Management

The tall grass prairie evolved under grazing by bison and other herbivores. Carefully managed livestock grazing is a beneficial tool for maintaining healthy and diverse tall grass prairie habitat for prairie chickens. Cattle recycle nutrients, break up homogeneous grass stands, and provide trails. Prairie chickens are known to nest in proximity of these trails and other openings. Grazing also produces a patchy, open cover, and a diversity of forbs; which provide the bulk of the adult prairie chicken's diet.

Prairie chickens need rangeland in Good to Excellent Condition, with a high percentage of decreaser plants (plants which decrease with continued heavy grazing pressure) such as little bluestem and Indiangrass in the plant composition. Proper stocking and periodic deferment are the keys to preventing overuse of the range and a decline in range condition. Animal numbers should be managed to maintain the proper degree of use (i.e., no more than 50% use of annual forage production). Grazing pressure should also be balanced with soil types and rainfall. Flexible stocking and timely responses to changing environmental conditions are necessary. Implementation of rotational grazing is desirable to prevent decline of highly desirable plants through selective grazing. These desirable tall grasses and forbs provide nesting habitat and good for prairie chickens. In summary, good range management which achieves maintenance and restoration of tall grass prairie (i.e., rangeland in Good to Excellent Condition) will benefit sustained livestock production and prairie chickens.

Prescribed Burning

The coastal tall grass prairie evolved under the influence of natural and man-caused fires. Prescribed burning, therefore, is an excellent management tool for maintaining healthy grassland and improving prairie chicken habitat. Periodic burning keeps woody plant invasion under control. It also reduces rank growth of vegetation, which is unpalatable for cattle and too dense for prairie chickens. Burned areas are often used for booming grounds, especially if short grass areas are in short supply. Prescribed burning also improves plant diversity and, in the case of winter burns, provides succulent food for prairie chickens during the winter and early spring. Prescribed burning in occupied habitat should be completed by late February; however, when prairie chickens are absent, summer burns may be helpful in restoring prairie that has been heavily invaded by woody species.

Pastures generally need to be rested following a prescribed burn to allow vegetation to recover without selective grazing pressure. It may also be necessary to rest a pasture prior to the planned burn to accumulate enough grass fuel to accomplish the burn objectives. The key to a successful prescribed burning program is to have a detailed written plan and help from experienced people. Technical assistance with prescribed burning is available by contacting the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, The Nature

Conservancy of Texas, or Texas Cooperative Extension.

In summary, prescribed burning can be used to improve grazing distribution and forage quality for livestock; reduce brush encroachment and maintain productive grassland; improve range condition and plant diversity; and improve availability of food, nesting sites, and booming grounds for prairie chickens.

Brush Management

Mechanical or chemical brush management techniques are often needed to provide initial control in areas of dense, large brush. Prescribed burning is not an option in many of these areas because there is not enough grass to carry the fire or brush is too large to be effectively controlled by fire. Each brush problem is unique, and technical assistance from knowledgeable people is helpful. Factors such as type, density and size of target species, range site and soils, past history of brush management, and surrounding land use must be considered.

The right kinds, amounts, and application techniques for herbicide treatments are important in achieving good control of target species. Many herbicides are very selective, so choosing the correct formulation of one or more herbicides is very important for successful treatment of a particular brush problem. Precise application also saves money and reduces the risk of environmental contamination. In some cases, timing of application can make the difference between good and poor results. As with any chemical, label directions should be strictly followed, including those concerning disposal of rinse water and used containers.

Combining methods of brush management, such as herbicide or mechanical control and prescribed burning, is often very effective. For example, on rangeland infested with Macartney rose, herbicide application followed by periodic prescribed burning can provide good results in reducing brush and restoring grassland. Mechanical methods such as dozing, roller chopping, or shredding can be followed by prescribed burning or herbicide application, depending on the target species. Prescriptions need to be carefully designed to achieve the best results at the lowest cost. As with any range management practice, good grazing management (i.e., proper stocking and rotational grazing) is vital to achieving cost effective treatment and improvement in range condition. Technical assistance in brush management is available from the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and Texas Cooperative Extension.

Additional Management Practices

The following management practices are suggested as ways to further enhance habitat quality. However, the benefits they may provide are definitely secondary to the primary goal of providing large areas of high quality prairie habitat for nesting and brood rearing.

Food plots or weedy areas of three to five acres scattered throughout pastures provide an easily available food source, although food plots probably do not add much to habitat

quality if good prairie habitat is available. When planning food plots, it is best to locate them in areas that have already been farmed or otherwise disturbed, rather than plowing additional grassland. Crops planted should be those normally recommended for the local area, and could possibly include native forbs and legumes, rice, grain sorghum, annual legumes, and cool season small grains. Narrow strip plantings are desirable to maximize prairie chicken use and minimize waterfowl depredation.

Mixtures of native mid and tall bunchgrasses, along with perennial forbs such as Illinois bundleflower, Maximilian sunflower, and Englemann daisy, should be used if needed for range seeding following mechanical brush removal or to revegetate former cropland fields. Mulching with native hay can also help reestablish native species. The goal is to use plants, preferably native species, which are commercially available and locally adapted, to approximate the species composition and structure of the tall grass prairie.

Finally, mowing can be used to provide feeding areas and brood habitat, and to control undesirable plant growth. Shredding during the nesting and brooding season (March through July 1) should be avoided to prevent destruction of nests and young chicks unable to fly.

Whooping Crane

Scientific Name: *Grus americana*
Federal Status: Endangered, 6/2/70 •
State Status: Endangered

Description

The stately Whooping Crane is the tallest bird found in North America, with males approaching nearly five feet in height. Adult birds are white overall with some red and black on the head. Their inner wing feathers droop over the rump in a “bustle” that distinguishes cranes from herons. With a seven foot wingspan and a slow wing beat, Whooping Cranes fly with their long necks and legs fully extended. When in flight, the birds’ black wingtips or primary feathers can be seen, and their long legs extend beyond their tail. Their dark olive-gray beaks are long and pointed. The area at the base of the beak is pink and the eyes are yellow. The Whooping Crane’s call, from which it derives its name, has been described as a shrill, bugle-like trumpeting.

Whooping Crane chicks are a reddish cinnamon color. At four months of age, white feathers begin to appear on the neck and back. Juvenile feathers are replaced through the winter months. By the following spring, juvenile plumage is primarily white, with rusty colored feathers remaining only on the head, upper neck, and on the tips of wing feathers. Young birds generally have adult plumage by late in their second summer.

There are a number of birds that may appear similar to the Whooping Crane. The Sandhill Crane, the Whooping Crane’s closest relative, is gray in color, not white. Also, Sandhill Cranes are somewhat smaller, with a wingspan of about five feet. Sandhill Cranes occur in flocks of two to hundreds, whereas Whooping Cranes are most often seen in flocks of two to as many as 10 to 15, although they sometimes migrate with Sandhill Cranes. Snow Geese and White Pelicans are white birds with black wingtips, however both of these birds have short legs that do not extend beyond the tail when in flight. In addition, Snow Geese generally occur in large flocks, are much smaller, and fly with a rapid wing beat. White Pelicans fly with their neck folded and can be distinguished by their long yellow bill. Finally, swans are all white and have short legs, and herons and egrets fly with their long necks folded.

Status and Distribution

The historical range of the Whooping Crane extended from the Arctic coast south to central Mexico, and from Utah east to New Jersey, South Carolina, Georgia, and Florida. Distribution of fossil remains suggests a wider distribution during the cooler, wetter climate of the Pleistocene. Although once numbering above 10,000, it has been estimated that only 500 to 1,400 Whooping Cranes inhabited North America in 1870. Although the exact number is unknown, Whooping Cranes were uncommon, and their numbers had rapidly declined by the late 19th century.

In the mid 1800's, the principal breeding range extended from central Illinois northwestward through northern Iowa, western Minnesota, northeastern North Dakota, southern Manitoba and Saskatchewan, to the area near Edmonton, Alberta. The Whooping Crane disappeared from the heart of its breeding range in the north-central United States by the 1890's. The last documented nesting in southern Canada occurred in Saskatchewan in 1922. By 1937, only two small breeding populations remained; a nonmigratory population in southwestern Louisiana and a migratory population that wintered on the Aransas National Wildlife Refuge (NWR) on the Texas coast and nested in a location that at the time was unknown. The remnant population in southwestern Louisiana was reduced from 13 to 6 birds following a hurricane in 1940, and the last individual was taken into captivity in 1950. In the winter of 1938-39, only 14 adult and 4 juvenile Whooping Cranes were found on the Aransas NWR. The nesting area of the Aransas Wildlife Refuge population was discovered in 1954 in Wood Buffalo National Park (NP), Northwest Territories, Canada. This population is the only historical one that survives.

Whooping Cranes currently exist in three wild populations and a breeding population kept in captivity. The species numbers approximately 420 birds, all in Canada and the United States. The only self-sustaining wild population is the one that winters on the Texas coast and nests primarily within Wood Buffalo NP. In 2002, this population consisted of 50 nesting pairs, with a total of 185 birds wintering in Texas.

In 1975, Whooping Crane eggs were transferred from Wood Buffalo NP to Grays Lake National Wildlife Refuge in Idaho and placed in Sandhill Crane nests in an effort to establish a migratory population in the Rocky Mountains. The Rocky Mountain birds spend the summer in Idaho, western Wyoming, and southwestern Montana, and winter in the middle Rio Grande Valley of New Mexico. Reintroductions ended in 1989 after the adult Whooping Cranes did not pair up or mate due to imprinting problems from their foster Sandhill Crane parents. The last Whooping Crane in the flock died in 2002.

The second persisting wild population in 2003 consisted of approximately 90 birds remaining from over 250 captive-reared Whooping Cranes released in central Florida south of Orlando beginning in 1993. These birds were released as the first step in an effort to establish a nonmigratory population in Florida, and in 2002, produced the first whooping crane chick born in the wild in the United States since 1939.

The third wild population was initiated in 2001 when several young captive-reared whooping cranes were released in potential nesting habitat at Necedah National Wildlife

Refuge in Wisconsin. The young birds were trained to migrate to Florida's Gulf Coast by following ultra light aircraft. Although not yet of breeding age, the birds led south in both 2001 and 2002 returned north on their own the following spring.

Habitat

Within Wood Buffalo NP, Whooping Cranes nest in poorly drained wetlands interspersed with numerous potholes (small areas of open water). These wetlands are separated by narrow ridges that support trees such as white and black spruce, tamarack, and willows, and shrubs such as dwarf birch, Labrador tea, and bearberry. Bulrush is the dominant plant in areas used by nesting birds, although cattail, sedge, musk-grass and other aquatic plants are common. Nest sites are often located in the rushes or sedges of marshes and sloughs, or along lake margins. An abundance of invertebrates, such as mollusks, crustaceans, and aquatic insects have been found in the ponds near occupied nests.

Whooping Cranes use a variety of habitats during their long migrations between northern Canada and the Texas coast. Croplands are used for feeding, and large wetland areas are used for feeding and roosting. Whooping Cranes are known to roost in riverine habitat along the Platte, Middle Loup, and Niobrara Rivers in Nebraska, Cimarron River in Oklahoma, and the Red River in Texas. The birds often roost on submerged sandbars in wide unobstructed channels isolated from human disturbance. Whooping Cranes also use large wetland areas associated with lakes for roosting and feeding during migration.

The Whooping Crane's principal wintering habitat consists of about 22,500 acres of marshes and salt flats on Aransas National Wildlife Refuge and adjacent publicly and privately owned wetlands. Plants such as salt grass, saltwort, smooth cordgrass, glasswort, and sea ox-eye dominate the outer marshes. At slightly higher elevations, Gulf cordgrass is more common. The interior portions of the refuge are characterized by oak mottes, grassland, swales, and ponds on gently rolling sandy soils. Live oak, redbay, and bluestems are typical plants found on upland sites. Upland sites have been managed using grazing, mowing, and controlled burning. About 14,250 acres of grassland are managed for cranes, waterfowl, and other wildlife.

Life History

Whooping Cranes usually mate for life, although they will re-mate following the death of their mate. They mature at 3 to 4 years of age, and most females are capable of producing eggs by 4 years of age. It is estimated that Whooping Cranes can live up to 22 to 24 years in the wild. Captive individuals live 30 to 40 years.

Whooping Cranes begin leaving the Texas coast in late March and early April, returning to their nesting area in Wood Buffalo NP by late April. Experienced pairs arrive first and normally nest in the same vicinity each year. Nesting territories vary considerably in size, ranging from 0.5 to 1.8 square miles. From the start of egg laying until the chicks are a few months old, the birds' activities are restricted to the breeding territory. Eggs

are normally laid in late April to mid May, and hatching occurs one month later. Most nests contain 2 eggs. The eggs are light-brown or olive-buff in color with dark, purplish-brown blotches primarily at the blunt end. Whooping Cranes will occasionally renest if their first clutch is destroyed during the first half of the incubation period. They usually nest each year, but occasionally a pair will skip a nesting season for no apparent reason. When nesting conditions are unsuitable, some pairs do not attempt to nest.

Whooping Crane parents share incubation and brood-rearing duties, and one member of the pair remains on the nest at all times. Females take the primary role in feeding and caring for the young. During the first 3 or 4 days after hatching, parents and young return to the nest each night. After that, the young are protected by their parents wherever they happen to be during inclement weather or at nightfall. During the first 20 days after hatching, families generally remain within 1 mile of the nest site. Whooping cranes feed by probing the soil with their bills or taking food items from the soil surface or vegetation. Parents feed young chicks. Summer foods include large insect nymphs or larvae, frogs, rodents, small birds, minnows, and berries.

Fall migration begins in mid-September. Whooping Cranes normally migrate as a single, pair, family group, or in small flocks, sometimes accompanying Sandhill Cranes. Flocks of up to 10 sub-adults have been observed feeding at stopover areas. Whooping Cranes migrate during the day, and make nightly stops to feed and rest. Although they use a variety of habitats during migration, they prefer isolated areas away from human disturbance.

Whooping Cranes arrive on the Texas coast between late-October and mid-December. They spend almost 6 months on the wintering grounds at and near Aransas NWR. Pairs and family groups generally occupy and defend discrete territories, although close association with other Whooping Cranes is sometimes tolerated. Juveniles stay close to their parents throughout their first winter. Recent estimates of territory size average 292 acres. Studies indicate a declining territory size as the wintering population increases. Sub adults and unpaired adults form small flocks and use areas outside occupied territories. Sub adult birds often spend the winter near the territories where they spent their first year. Also, young adult pairs will often locate their first territory near the winter territory of one of their parents.

During the wintering period on the Texas coast, Whooping Cranes eat a variety of plant and animal foods. Blue crabs, clams, and the fruits of wolfberry are predominant in the winter diet. Clams are relatively more important in the diet when water depths are low and blue crabs are less abundant. Most clams and small blue crabs (2 inches or less in width) are swallowed whole. Larger crabs are pecked into pieces before being swallowed.

Whooping Cranes feed mostly in the brackish bays, marshes, and salt flats. Occasionally, they fly to upland sites for foods such as acorns, snails, crayfish, and insects, returning to the marshes in the evening to roost. Upland sites are more attractive when they are flooded by rainfall, burned to reduce plant cover, or when food

is less available in the marshes and salt flats. Some Whooping Cranes use the upland parts of the refuge occasionally in most years, but use of croplands adjacent to the refuge is rare.

As spring approaches, the courtship displays for which Whooping Cranes are famous begin. These displays include loud unison calling, wing flapping, head bowing, and leaps into the air by one or both birds, increase in frequency. These rituals serve to forge and strengthen pair bonds. Family groups and pairs usually depart first, normally between March 25 and April 15. The last birds are usually gone by May 1, but occasional stragglers may stay into mid-May. During the 16-year period between 1938 and 1992, a total of 27 birds have remained at Aransas NWR throughout the summer. Some of these birds were ill or crippled or mates of birds which were crippled.

Parents separate from their young of the previous year at the beginning of spring migration, while in route to the breeding grounds, or soon after arrival on the breeding grounds. Most juveniles spend the summer near the area where they were born.

Threats and Reasons for Decline

Whooping Cranes gradually disappeared as agriculture claimed the northern Great Plains of the United States and Canada. Man's conversion of the native prairies and potholes to pasture and crop production made much of the original habitat unsuitable for Whooping Cranes. Rural electrification brought power lines, resulting in an increase in death and serious injury due to collisions. Human disturbance has also played a role in the decline of the Whooping Crane. The birds are wary on the breeding grounds. They will tolerate human intrusion for short intervals, but will not remain near constant human activity. The mere presence of humans during settlement of the mid-continent and coastal prairies may have interfered with the continued use of traditional breeding habitat by Whooping Cranes.

The Aransas population, the only population that is self-sustaining, remains vulnerable to accidental spills that could occur along the Gulf Intracoastal Waterway. The Intracoastal Waterway carries some of the heaviest barge traffic of any waterway in the world, and it runs right through the center of the Whooping Crane winter range. Much of the cargo is petrochemical products. Although spill response plans have been developed, an accident resulting in a spill could potentially destroy Whooping Cranes or their food resources.

Records of Whooping Cranes known to have died from gunshot or other causes from colonial times to 1948 show that about 66% of the losses occurred during migration. Shooting represented a substantial drain on the population, particularly from 1870 to 1920. Large and conspicuous, Whooping Cranes were shot for both meat and sport. Laws enacted to protect the birds have led to a decline in human caused mortality, but shootings still occur. The most recent known cases involved an adult female being mistaken for a snow goose near Aransas NWR in 1989, an adult female shot by a vandal as she migrated northward through Texas in 1991, and two shot by a vandal in Florida in 1990. Biological factors such as delayed sexual maturity and small clutch size

prevent rapid population recovery.

The major population of Whooping Cranes is now restricted to breeding grounds in northern Canada. This may hamper productivity because the ice-free season is only 4 months, barely enough time to incubate their eggs for 29 to 31 days and rear their chicks to flight age in the remaining 3 months. Unless nest loss occurs early in the incubation period, there is rarely time to successfully rear a second clutch if the first clutch fails. Drought during the breeding season presents a serious hazard because nest site availability and food supplies are reduced and newly hatched chicks are forced to travel long distances between wetlands. Drought also increases the exposure of eggs and chicks to predators such as ravens, bears, wolverines, foxes, and wolves.

Although little is known about the importance of disease and parasites as mortality factors, there have been documented cases of wild Whooping Cranes dying of avian tuberculosis, avian cholera, and lead poisoning. Coccidia, a parasite which causes digestive tract disorder, has also been found in wild and captive birds.

Finally, Whooping Cranes are exposed to a variety of hazards and problems during their long migrations. Natural events such as snow, hail storms, low temperatures, and drought can make navigation hazardous or reduce food supplies. Collision with utility lines, predators, disease, and illegal shooting are other hazards that affect migrating cranes.

Recovery Efforts

The comeback story of the Whooping Crane has been heralded as one of the conservation victories of the 20th Century. The increase and stabilization of the Aransas/Wood Buffalo population has been a result of many factors, including legal protection, habitat protection, and biological research in both the United States and Canada.

In 1975, the U.S. Fish and Wildlife Service initiated a migration monitoring program to protect migrating Whooping Cranes from disease outbreaks and other potential hazards, and to compile information on the characteristics of stopover sites. This monitoring program is now coordinated with a network of people from the Canadian Wildlife Service, U.S. Fish and Wildlife Service, States, and Provinces along the migration corridor. Flightless young Whooping Cranes were captured and marked with colored plastic leg bands in Wood Buffalo NP from 1977 through 1988. Of the 133 birds banded, 14% could still be identified in the spring of 2003. This marking program has provided a wealth of information on Whooping Crane biology. A radio tracking program, in which miniature radio transmitters were attached to the color leg bands of young Whooping Cranes banded at Wood Buffalo NP, has also yielded valuable information concerning migration timing and routes, stopover locations, habitat use, social behavior, daily activity, and causes of death. Recently, tests of line marking devices have identified techniques effective in reducing collisions with utility lines.

The wintering territories of Whooping Cranes on the Texas coast place the birds in

close proximity to human disturbance factors such as tour boats, boat and barge traffic along the Intracoastal Waterway, recreational and commercial fishing boats, airboats, and air traffic. A number of recent and ongoing studies have addressed the issue of how human disturbance factors might affect wintering birds. Additional research studies currently underway include evaluating the relationship between freshwater inflows, blue crabs and Whooping Cranes. Significant habitat research has also been conducted on the nesting grounds in Canada.

Prescribed burning is used on Aransas NWR to reduce height and density of grasses, top kill brush, and to modify plant composition on the uplands to make them more attractive to Whooping Cranes. Burned areas are immediately used by the birds. Currently, 15 prescribed burning units averaging 1,410 acres in size are burned on a 3-year rotation.

The most complete count of the Aransas/Wood Buffalo population is made during the winter. Aerial counts are made weekly throughout the winter period, although counts are made less frequently during midwinter. These flights provide information on mortality, habitat use, pair formation, territory establishment, and age structure by identifying all color banded birds present. Additional protection of habitat outside Aransas NWR is provided by the National Audubon Society, which leases several islands from the State of Texas, by Texas Parks and Wildlife Department, and by private landowners, several of whom have signed conservation agreements to protect Whooping Cranes on their property. Monitoring of nesting pairs also takes place at Wood Buffalo NP. Construction of the Gulf Intracoastal Waterway through the marshes of Aransas NWR in the early 1940's, and subsequent erosion by wind and boat wakes, has resulted in 11% loss of wintering habitat. Between 1989 and 1992, volunteers placed over 57,000 sacks of cement to protect 8,752 feet of shoreline. In 1992, the U.S. Army Corps of Engineers placed 2,013 feet of interlocking cement mats to stop erosion. Between 1999 and 2001, additional armoring done by the Corps protected 15.3 miles of shoreline within critical habitat of the Whooping Crane.

Dredged material deposited from periodic maintenance of the Intracoastal Waterway has destroyed some marsh areas and unintentionally created others. In 1991, Mitchell Energy and Development Corporation built a dike around 10 acres of open shallow bay, filled the area with dredge material, and planted it to wetland vegetation. Whooping Cranes began using the area the following winter. In 1993 and 1995, Mitchell Energy built 20 more acres of marsh adjacent to the first area. In 1995, the Corps of Engineers created nearly 50 acres of marsh. The Corps has plans to create an additional 1,500 acres of marsh using dredged material beneficially over the next 50 years.

Several efforts have been initiated to establish new populations of Whooping Cranes as a means of safeguarding the species against a catastrophe in the Aransas/Wood Buffalo population. The effort in Idaho used Sandhill Cranes as foster parents to incubate Whooping Crane eggs, raise the chicks, and teach them migration paths to New Mexico. Foster-parenting has proved to be an unsuitable technique, however, as imprinting led to problems for the Whoopers in establishing pair bonds. An effort in

Florida is using techniques developed successfully with the endangered Mississippi Sandhill Crane to try to establish a non-migratory flock of Whooping Cranes. Meanwhile, new techniques for establishing a second migratory population continue to be explored. In 2001 and 2002, 23 Whooping Crane chicks were costume-raised and flown behind an ultralight aircraft from Wisconsin to Florida. In the spring of 2003, the 16 surviving birds led south by ultralight returned to their summer reintroduction site on their own.

These reintroduction efforts have been made possible by a successful captive breeding program for Whooping Cranes. Although Whoopers at Wood Buffalo NP lay two eggs, usually only one hatches. In most years between 1967 and 1996, biologists from the United States and Canada collected eggs from wild nests in order to establish captive populations and support reintroduction efforts. Three primary captive breeding facilities exist, including Patuxent Wildlife Research Center in Maryland, the International Crane Foundation in Wisconsin, and Calgary Zoo in Alberta, Canada. Additional breeding cranes are kept at the San Antonio Zoo, Texas, and the Audubon Center for Research on Endangered Species in Louisiana.

Finally, there is much evidence that people value Whooping Cranes. Numerous books, magazine articles, television programs, and nature documentary films have been produced about this magnificent bird. Each year 70,000 to 80,000 people visit Aransas NWR, most during the winter. These visitors spend a significant amount of money locally on lodging, gasoline, and supplies. In 2003, three large tour boats operating out of Rockport/Fulton offered trips to view Whooping Cranes along the Gulf Intracoastal Waterway. Approximately 10,000 people took these tours, paying an average of $30 per ticket, for a total seasonal amount of $300,000. The city of Rockport estimates that wildlife-related activities result in annual gross economic benefits of $6 million to the local economy. Some of these benefits result from the nearby presence of Whooping Cranes. The possibility of sighting Whooping Cranes, along with large numbers of migrating Sandhill Cranes, is an additional attraction to tourists in other areas of the United States. For example, approximately 80,000 people visit the Platte River area of Nebraska each year during the peak of spring crane migrations, spending approximately $15 million. The Chamber of Commerce of Grand Island, Nebraska has responded by sponsoring an annual festival, “Wings over the Platte,” to further promote this interest in birds.

Where To See Whooping Cranes

Visit Aransas National Wildlife Refuge near Austwell, Texas during November through March to see Whooping Cranes as well as migratory waterfowl and other wildlife. As mentioned above, there are a number of commercially operated boat tours, departing from both Rockport/Fulton and Port Aransas which offer visitors the chance for a close look at Whooping Cranes, waterfowl, shorebirds, herons, and hawks. Contact Aransas NWR (361) 286-3559, Rockport/Fulton Chamber of Commerce (800) 242-0071, or Port Aransas Chamber of Commerce (800) 452-6278 for more information. Also, the San Antonio Zoo exhibits captive Whooping Cranes as part of the recovery effort.

How You Can Help

Whooping Cranes migrate over north and east-central Texas on their way to and from Aransas NWR each fall and spring. The birds are particularly vulnerable to human disturbance and other hazards during this migration period. They sometimes stop in fields or wetlands near rivers or lakes to feed or rest. If you see migrating Whooping Cranes, view them from a distance and be careful not to disturb them. Report sightings to the Texas Parks and Wildlife Department (webcomments@tpwd.state.tx.us or 1-800-792-1112) or the U.S. Fish and Wildlife Service. Remember that harassing, shooting, or attempting to capture a Whooping Crane is a violation of Federal Law. If you find a dead or injured bird, report it immediately to one of the numbers listed below or to your local game warden. Since injured Whooping Cranes are delicate and require special care, you should quickly contact a representative of Texas Parks and Wildlife or U.S. Fish and Wildlife and carefully follow their instructions.

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. Some of the proceeds from the sale of these items are used to conserve habitat and provide information concerning rare and endangered species. Conservation organizations such as the Whooping Crane Conservation Association, National Audubon Society, International Crane Foundation, and The Nature Conservancy of Texas also welcome your participation and support.

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

or

U.S. Fish and Wildlife Service
Corpus Christi Ecological Services Field Office
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive, Room 118
Corpus Christi, Texas 78412
(361) 994-9005

or

Aransas National Wildlife Refuge
P.O. Box 100

Austwell, Texas 77950
(361) 286-3559

References

Allen, R.P. 1952. *The Whooping crane*. National Audubon Society Resource Report 3. 246 pp.

Bishop, M.A. and D.R. Blankinship. 1982. “Dynamics of subadult flocks of Whooping cranes at Aransas National Wildlife Refuge, Texas, 1978-1981.” Pages 180-189, *in* J.S. Lewis, eds. Proceedings 1981 International Crane Workshop. National Audubon Society, Tavernier, Florida.

Mabie, D.W., L.A. Johnson, B.C. Thompson, J.C. Barron, and R.B. Taylor. 1989. *Responses of wintering Whooping cranes to airboat and hunting activities on the Texas coast.* Wildlife Society Bulletin 17(3):249-253.

Mirande, C., R. Lacy, and U. Seal (Ed.). 1991. *Whooping crane* (Grus americana) - *conservation viability assessment workshop report.* Captive Breeding Specialist Group (CBSG/SSC/IUCN), Apple Valley, MN. 119 pp.

Slack, R.D. and H. Hunt. 1987. *Habitat use by Whooping cranes and Sandhill cranes on the Aransas Wildlife Refuge.* U.S. Fish and Wildlife Service Contract No. 14-16-0002-82-220. 146 pp.

U.S. Fish and Wildlife Service. 1994. *Whooping Crane Recovery Plan.* Albuquerque, New Mexico. 76 pp.

Appendix J

Nongame Wildlife Management Recommendations

by
Matt Wagner and David Rideout
Texas Parks & Wildlife Department

Following is a list and brief description of management practices that are beneficial to nongame species of wildlife. 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 the TPWD wildscape plant list.

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

Shrubland restoration - Establishing native shrubs or small trees where appropriate to restore native habitats for wildlife diversity. Use TPWD the wildscape plant list.

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

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 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. Most 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.

Maintain oak woodlands with dense understory - Exclude livestock during early spring, and late summer-fall and winter. This allows for understory regeneration, and berry and mast production, and keeps livestock from reducing evergreen browse during periods of reduced forage availability.

Protect/restore oak woodlands - Maintain areas with mature cedar and 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.

Protect karst, caves and other underground resources - Construct appropriate cave gates or other features to minimize human disturbance to roosting bats. Insure quality underground water resources through proper disposal of toxicants and runoff management. Maintain unobstructed cave entrance for easy access by bats.

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 wildscape plant list.

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

Trails and signs - Create walkways or paths to manage human impact and

reduce erosion in sensitive areas.

PREDATOR CONTROL

Avian predator and parasite control - Reduce the impact of selected avian predators (grackles, ravens, crows) and brown-headed cowbirds on nesting birds through shooting and trapping, grazing management, and maintenance of large blocks of wildlife habitat.

Carnivore-furbearer control - Reduce the impact of coyotes, raccoons and other carnivores on colonial nesting birds.

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.

PROVIDING SUPPLEMENTAL FOOD

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 wildscape plant list.

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

Butterfly and hummingbird gardens - Establish native wildflowers, trees, shrubs, vines, or cultivated flowers as food sources for butterflies and hummingbirds. Use the TPWD wildscape 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.

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

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

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.

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

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 wildscape plant list.

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.

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.

Other or Indicator Species: Bobwhite quail, dove, and wild turkey may be desired game species to have in the area, which may be expressed in the overall objective. The land management techniques that have been recommended primarily for the deer population **(Appendix F)** can benefit these game birds and many other wildlife species also. These are: prescribed burning, disking, cattle rotation or exclusion from woods and certain native grass areas during certain periods, and supplemental food plots. See **Appendix G** for more information on quail and **Appendix H** for turkey.

Nest/Roost boxes for Cavity Nesters/Roosters: 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, kestrals, wood ducks, black-bellied whistling ducks, squirrels, and bats. The TPWD Nongame and Urban Program can furnish additional information regarding number, specifications, placement, and maintenance of these structures for specific species.

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, falcons, owls, cuckoos, nightjars, hummingbirds, flycatchers, swallows, thrushes, vireos, warblers, tanagers, grosbeaks, buntings, sparrows, orioles, and blackbirds. For more information regarding neotropical status, surveys, and possible management strategies, contact the Partners in Flight Program Coordinator at TPW Headquarters in Austin.

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. Beside 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

Guidelines for Native Grassland Restoration Projects

by
Jim Dillard, Technical Guidance Biologist
Texas Parks and Wildlife Department, Mineral Wells

INTRODUCTION

Native grasslands and prairies, with their ecologically complex plant and animal communities, were an important component on the landscape of early Texas. They were dominant features on the landscape in the Edwards Plateau, Cross Timbers and Prairies, Coastal Plains, High Plains, and Lower Rolling Plains. They contributed significantly to forage production for livestock grazing and habitat for a wide variety of wildlife species. Most of the native prairies found in the Blackland Prairie and Coastal Prairie Regions of Texas have been depleted. Only isolated relic native prairies sites remain. Native prairies were also found within most of the other ecological regions of the state where adaptable soils site occurred. Soil that once supported these vast plant communities of native perennial grasses and forbs now maintain a thriving farming economy. Most of these lands are now devoted to the production of wheat, milo, corn, cotton, hay, improved pastures, and an array of other cash crops to meet our demands for food and fiber.

It is not possible to totally replicate the native grasslands and prairies that once existed in the different ecological regions of Texas. These guidelines, however, represent basic and fundamental techniques and procedures that should be addressed when attempting to restore or reconstruct range sites to resemble native prairie plant communities in Texas. Only with time can land truly evolve through the stages of natural plant succession to replicate the diverse flora and fauna characteristic of climax native prairies. There are land management steps that can be taken to speed up this process by reintroducing native plants or their cultivars on those lands that once supported native grasslands and prairies. Texas Parks and Wildlife Department recognizes the importance of native prairies and grasslands and their function as habitat for many wildlife species including native and migratory birds, small and large mammals, reptiles and amphibians, insects, and invertebrates. Each ecological region will require different techniques, planting procedures, species selections, and site preparations to be successful. It will be imperative that a coordinated effort be made to draw upon the expertise of other agencies and groups with knowledge and training on native grassland and prairie restoration before undertaking a restoration project. Agencies such as the United States Department of Agriculture Natural Resources Conservation Service (NRCS), Texas Agricultural Extension Service, Soil and Water Conservation Districts, Native Prairies Association of Texas, Texas Parks and Wildlife Department, United States Forest Service, and universities are logical sources of information concerning the specifics to formulate grassland and prairie restoration plans. Many of these organizations have identified successful techniques and procedures through research and demonstration projects in different parts of Texas. No plan should be considered

complete that has not taken into consideration the experience and knowledge already available from such sources.

The following outline covers most of the major elements that should be addressed in a grassland restoration plan. Many variables in techniques are possible and may be considered adequate if supporting evidence is presented to justify the approach to grassland and prairie restoration. As each site will be different, every effort should be made to identify specific techniques or steps that are applicable to each site.

GRASS SPECIES

Native grasslands/prairies are diverse plant communities where 50 to 90 percent of the vegetation is grasses. They are the basic framework of the site and are associated with a wide variety of forbs or other plants. The more individual grass species planted, the better. However, initiation of a restoration project can include the initial planting of as few as four species for the site. Grasses planted, if from commercial seed sources, should be climax grass species for the ecological region of the state being considered and adapted to the soils found on the site. Sites may be suited to tall, mid-, or short grass species, depending on individual site classification or soil type. It may be necessary to plant different grass species on different locations of the site due to differences in soil type, moisture retention properties of the soil, PH considerations, or other microhabitat factors.

Selection of individual grass species to plant should be based on information obtained from the local NRCS or Soil and Water Conservation District (SWCD) office or other recognized source with knowledge about climax grass species of the area. Their range site descriptions will also be useful. Seed sources should be from within 300 miles of the site or nearer to assure adaptability and improve success of initial establishment. Grass seed will have a PLS (pure live seed) or germination rating which should be checked - the higher the better. Many commercial seed companies also will mix seed on request when ordering. Seed should be clean to improve flow through grass seed drills during planting. Soil type is also a factor to be considered when selecting grass species to plant.

FORB SPECIES

Forbs or broadleaf herbaceous plants represent a major component of native grasslands/prairies and may be seasonally co-dominant. Annual and perennial species are found in native prairies and are responsible for the majority of species diversity. Planning native grassland/prairie projects should also incorporate initial introduction of a selected number of forb species. A plan should provide for the planting of at least four perennial species from the ecological region and adapted to the site. Range site descriptions and climax vegetation check list from the local NRCS or other recognized source should be reviewed. The planting of additional species of annual and perennial species is encouraged as the site develops over time.

Annual forb species should not be introduced on the site until planted grass species become established. Establishment of grasses may require periodic mowing, at least initially, and will make establishment of annual forbs difficult. Most sites will produce annual forbs and some perennials from existing seed banks in the soil. Annual forb diversity will increase over time. Annual forbs should not be planted during the first two years of the project.

A listing of seed sources for native grasses and forbs is also available from the National Wildflower Research Center in Austin. When ordering seed from any commercial seed dealer, always ask about the source of the seed you want. Be selective and shop around for seed availability when you will need it and the price you are willing to pay.

Native grasslands/prairies may also be reestablished using cut seed hay from an existing native prairie site. Seed can also be combined from an existing stand of native grassland. Techniques for planting seed obtained by these methods will be discussed. Annual forb seeds may also be collected by hand, stored to dry, and planted on selected sites throughout the life of the restoration project to improve plant diversity.

SITE PREPARATION

Site preparation is perhaps the most important element to be addressed in planning a native grassland/prairie restoration project. The initial success of plantings will often be dependent on those steps taken to reduce weed competition, provide a suitable seedbed, and promote growth of seedlings. Competition by cool-season grasses and weeds will make initial establishment of native grass plants difficult and require site management. Many of these plants are alien species and are undesirable in the completed project.

As each site will be different, an evaluation should be made to determine what existing vegetation complex is present and what steps will be necessary to set back plant succession so species planted can germinate and grow. It is important to determine the history of the site including past land use, crops grown, species of improved grasses planted, cultivation or other mechanical soil disturbances, herbicides used, etc. A check with the local NRCS or Farm Service Agency (FSA) office will be helpful. Aerial and topographic maps will help you evaluate the site to determine important features such as drainages, slope, or other physical features important in planning the restoration project. County soil maps should be closely reviewed during the early planning stages to determine soil types and adaptability of grass and forb species to be planted on the site.

One approach to grassland/prairie restoration is to plant forbs initially during the first fall period of the project and grasses during the late winter months of the following year. For a fall planting of forbs during October, the site must be prepared well in advance. Mowing and periodic light disking during the spring and summer months prior to planting will help set back germination and establishment of existing weeds and grasses. Shallow disking is recommended to avoid stimulating the existing dormant weed seed

bank in the soil. Several diskings will be required initially and again just prior to planting. Application of an approved herbicide such as Roundup may be necessary on some sites prior to planting to control vegetation regrowth or undesirable species such as Johnsongrass, coastal bermudagrass, or cockleburs. A year's lead time is preferred for initial site preparation. Fire may also be used in initial site preparation to reduce rank vegetation.

A cover crop such as Haygrazer or other sorghum varieties may be planted on some sites to be restored during the summer, harvested in the fall, and the remaining stubble used to stabilize the soil surface for planting with grass seed drills. Not all sites require such plantings, depending on the individual site and strategy being used to establish grass and forbs. This technique reduces soil erosion by wind and water and may be necessary on some sites. Stubble should be left to a height of at least four inches.

Soil preparation specifications and guidelines for specific soil types and range classifications have been developed by the NRCS and are available at local SWCD offices.

PLANTING

Preferred planting dates for perennial forb seed is during the fall, particularly the October-November period. Although most perennial forb species will not germinate until the spring, it is necessary that they undergo the chilling and softening process in the soil. Forb seeds may be planted with mechanical seed drills or broadcast spreaders, hand-carried seeders, broadcast by hand, or be mixed and incorporated with grass seeds during the grass planting process. Most forb seeds require shallow planting depths into a firm seed bed. Forbs should not be planted earlier than the first freeze of the fall. Planting date information is also available from commercial seed dealers who provide recommendations for seed they sell. Planting dates will also vary, depending on what part of the state the site is located in. Native grass seed should be planted in Texas between January and April. Dry conditions during this period may substantially influence germination and growth of grass seedlings.

Seeding rates of commercial seed are available from the dealer. Seeding rate information for soil and range sites are also available from the local Natural Resources Conservation Service office. Seeding rate recommendations for pure stands of individual grass species may require adjustment to allow for planting of multiple species or mixes. Generally, a generous seeding rate for native grass species will improve the odds for a good stand the first year. Seeding rates will depend on the number of individual species being planted, type of equipment, and proportion of species desired in the final stand.

There are several types of equipment that are effective for planting grass seed. Grass drills are probably the best equipment and have greater reliability in establishing a stand. Grass drills are often available for use from local SWCD offices. Also, commercial contract farmers who specialize in grass plantings normally have this type

of equipment. Common brand names are Tye, Nesbitt, John Deere, and Turax. Cultipackers are also used and consist of a seed box and roller system to pack seed into the ground. Seeds may also be planted by a fertilizer spreader followed by a harrow to work seed into the soil. Hand-held broadcast spreaders or those operated by small all terrain vehicles may also be used.

Seed hay taken from a native prairie site can be scattered over prepared ground by hand from a trailer, followed by a light harrowing to incorporate it into the soil. Prairie hay bales may be available and are easily stored. Such plantings should be done in the fall following the harvest of native seed hay. This method is not reliable because there is no guarantee that viable seeds have been produced and that germination will occur. Although native grasses may appear to have good seed production, only by conducting a germination test will you know if live seed are present and establishment of seedlings is likely.

Fertilization is optional during the initial planting of native grasses and forbs. It may serve to promote the growth of undesirable forbs and annual grasses and slow establishment of the desired species planted. Fertilization rates can be determined by soil analysis tests or based on recommendations from the NRCS or Texas Agricultural Extension Service.

Forb seed purchased from seed dealers should be specified as native, not domesticated seed. Mixes are generally not recommended unless they contain a desired species composition adapted to the region and are those species you want. Individual species plantings are preferred. One approach to seeding forbs is to mass plant a variety of adaptable species and let the site, through the process of natural selection, determine where certain species will do best. A continuing effort should be made by the landowner to introduce additional forb species to the site as the project progresses over time.

SITE MANAGEMENT

During the first year, growth of grass seedlings and perennial forbs may not appear impressive. Most growth of these plants will be below ground in the development of root systems. Annual weeds and other on-site grasses will respond to soil disturbances associated with initial planting operations. Mowing will be necessary during the first two years. Restoration sites should be mowed to a height of no less than 4 inches to reduce competition from annual weeds and undesirable grasses. It will also serve to reduce moisture loss from the soil. It may take 2 to 3 years growing time for native grasses to dominate the site vegetatively. Perennial forbs should respond sooner and become established along with annuals. Timing for mowing will have to be determined on-site and will require regular attention by the landowner.

Grazing is not recommended during the first three years. If vigorous growth of planted grass species does occur during this time, limited grazing during the dormant season may be possible. After three years, grazing may be incorporated into the management

plan for the site by grazing during the growing season under a rest and rotation system. Grazing is not required for grassland/native prairie restoration projects, rather it should be used as a tool in their management.

Control burning is also a tool that can be used for site management. No burning should be conducted during the first three years after grasses have been planted. After that time, if the site has developed sufficiently and forage and thatch becomes excessive, burning on a 3 to 4 year rotation can be initiated. Fire is a natural event for grasslands and prairies that benefit from its occurrence. Burning will stimulate growth of dormant forb seed, promote growth of above ground vegetation, improve soil fertility, and help control the invasion of undesirable woody plant species found in the area. Fire releases nutrients back into the soil and reduces shading of new grass and forb seedlings. Many new species will also germinate from the existing soil seed bank. Winter burns benefit warm-season dominant plants, whereas summer burns promote growth of cool-season plants. Depending on individual site management strategies, the use of prescribed burning, mowing, and grazing will be the primary tools available for site management of grassland/prairie restoration projects.

LITERATURE CITED

Recreating A Prairie. National Wildflower Research Center, Austin, Texas.

A Guide For Re-Creating Your Own Prairie. The Prairie Dog, Newsletter of the Native Prairies Association of Texas

Wildflower Meadow Gardening. National Wildflower Research Center, Austin, Texas.

Burleson, Bob and Micky. Homegrown Prairies. Reprint. The Prairie Dog, Newsletter of the Native Prairies Association of Texas.

Native Plant and Seed Sources of Texas and Oklahoma. National Wildflower Research Center, Austin, Texas.

SUGGESTED INFORMATION SOURCES

USDA Natural Resources Conservation Service (local)
Soil and Water Conservation Districts (local)
Native Prairies Association of Texas
3503 Lafayette Avenue, Austin, TX 78722-1807
Texas Parks and Wildlife Department
4200 Smith School Rd., Austin, TX 78744
National Wildflower Research Center
2600 FM 973 North, Austin, TX 78725
Plant Materials Center, NRCS, Knox City, TX
The Nature Conservancy of Texas
P.O. Box 1440, San Antonio, TX 78295
Texas Agricultural Extension Service (local)
Native Plant Society
USDA Farm Service Agency (FSA) (local)
USDA US Forest Service

USDA US Fish and Wildlife Service
Texas A&M University/College Station
Texas Tech University/Lubbock
Texas A&M University/Kingsville
Southwest Texas State University/San Marcos
Sul Ross State University/Alpine
East Texas State University/Nacogdoches
Other Universities

Appendix L
Conducting White-tailed Deer Spotlight Surveys in Texas

By
Steve Jester, Wildlife Biologist, Decatur
Jim Dillard, Technical Guidance Biologist, Mineral Wells
Gary Homerstad, Technical Guidance Biologist, Victoria

This brief overview of the **deer spotlight survey** is designed to answer some of the most commonly asked questions about this method of counting white-tailed deer and its application in 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 Texas. Spotlight surveys have limited application on small tracts of land or where dense brushy vegetation greatly reduces visibility. Land holdings of a section (640 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 1/10- mile intervals. Data collected on a deer spotlight survey is expressed as the number of **acres per deer**. Three or more counts are normally required on the designated 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. Deer "carrying capacity" can vary greatly from one property to the next. Annual winter **browse utilization surveys** must be used to monitor/determine long-term carrying capacity on a given property. 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 are 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 route should transect different habitat types in proportion to the number of acres they represent on the property. Avoid roads that go by feeders or

food plots where deer may be concentrated. Corning roads will greatly bias spotlight survey data. 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. Two miles of transect for every 1,000 acres of habitat is required to minimally sample an area. Spotlight route segments may vary from a minimum of 2 miles to up to 15 miles. The spotlight survey must be conducted along the exact route segments each time. **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. Preferably 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 **10th of a 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. To many observers, objects often appear farther away than they actually are when using a spotlight at night. It is recommended that first time observers practice on a few variable known distances at night using a spotlight before estimating visibility along the route segments. 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 recorder for later tabulation. This process is repeated for the length of the route. On dead-end roads, record visibility estimates only to the end of the road. Only resume taking visibility estimates after backtracking to a new portion of the route. When conducting additional counts on the same census route, it is **not** necessary to retake visibility estimates. The original 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 visibility estimates into **acres of visibility:**

Total yards of visibility / number of 1/10mile stops +1 (start) X Number of miles X 1,760 (yards in a mile) / 4,840 (square yards in a acre) = Visible Acres

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

4,744 / 78 X 7.7 X 1,760 / 4,840 = <u>170.29 ac</u>.

When do I conduct deer spotlight counts? In Texas, spotlight surveys should be conducted during the months of August and September. 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 at least 3 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. Avoid repeating counts on consecutive nights along. Space each count a week apart, if possible. Contact the local Texas Parks and Wildlife Department game warden prior to conducting spotlight surveys. Also, notify neighbors or adjoining landowners that 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 reflections are greenish-white. Birds, spiders, numerous other wildlife species, livestock, and even some fence posts give off reflections that may be 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 yards from the vehicle should **not** be recorded. **If a large sample size (100+) of deer observations can be identified during daylight hours, it is better to forego sex and age determination of deer during spotlight counts.**

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 established by dividing the total acres of the ranch by the estimated acres per deer figure. For example, the deer **populations estimate** for a **5,000-**acre 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:

357 Deer X 0.20 (% identified as bucks) = 71 bucks
357 Deer X 0.50 (% identified as does) = 179 does

357 Deer X 0.30 (% identified as fawns) = 107 fawns

TOTAL = 357 deer

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 the deer herd that allow measurement of the success of the management program.

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

107 fawns / 179 does = 0.59 fawns per doe

How can Texas Parks and Wildlife help me? On written request, 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, 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, Wildlife Division, 4200 Smith School Road, Austin, Texas 78744 or your local Texas Parks and Wildlife biologist.

Appendix M

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

By
Jim Dillard, Technical Guidance Biologist, Mineral Wells
Gary Homerstad, Technical Guidance Biologist, Victoria

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 5000-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 (with the exception of helicopter counts) 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 deer herd composition counts in 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 during any time of the day. 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 spotlight counts is discouraged because they are too easily misidentified. 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 recommended.**

Record **only** deer that 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. Your objective is to observe a representative cross section of deer throughout the total population on your ranch.

Remember that many deer during this time of the year will still be in small family groups that 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 grouped away from the does. As

September progresses, buck 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 a total. When deer composition observations are completed, simply add the entries in each column to total the number of bucks, doe, and fawns. It is recommended that a minimum of **100** identified observations of deer be gathered. **The more the better!**

How Do You Determine Herd Composition from the Data?
From your data sheet, **total** the columns for bucks, does, 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:

20 (# of identified Bucks) divided by 100 (total identified Deer)=.20 *x* 100 = **20% Bucks**
50 (# of identified Does) divided by 100 (total identified Deer) = .50 *x*100 = **50% Does**
30 (# of identified Fawns) divided by 100 (total identified Deer)=.30*x*100 = **30% Fawns**
100 Total Identified Deer **100%**

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:

Divide 50 (# identified Does) *by* 20 (# identified Bucks) = **2.50 Does per Buck**
Divide 30 (# identified Fawns) *by* 50 (# identified Does) = **0.60 Fawns per Doe**

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:

100 Total Deer ***X*** .20 percent (% identified Bucks) = **20 Bucks**
100 Total Deer ***X*** .50 percent (% identified Does) = **50 Does**
100 Total Deer ***X*** .30 percent (% identified Fawns) = **30 Fawns**
100 Total Deer

With the knowledge of approximately how many bucks, does, and fawns are present on your ranch, you may now make important decisions about how many deer should be

harvested during the upcoming deer season. Buck to doe ratios and fawn to doe ratios also are good indicators of your progress toward obtaining your goals and objectives.

Stand deer counts may be conducted on properties of less than one section (640 acres) where spotlight counts or other census techniques may not be suited for gathering deer density information. This technique provides a systematic method of estimating deer density, albeit conservative, and composition information on small properties that may otherwise have difficulty meeting minimum data collection requirements. The technique requires one stand location per each 100 acres (i.e. 150 acres requires two stands). Five counts are conducted from each stand. It is not necessary to conduct simultaneous counts. One hour of observation during each count is required. It is recommended that the counts be conducted one hour after sunrise and/or one hour before sunset. Deer are recorded during these periods in the same manner as described in the proceeding paragraphs, with the exception that unidentified deer are also recorded. It is suggested that bucks be recorded as spikes, 3 to 5 points, and six points or more. The deer observed are totaled by buck, doe, fawn, and unidentified for each count period. These numbers are then added together for total deer by category and total deer observed at each individual stand for the five count periods. This information from each stand is added together for the total deer by category and total deer for the property for the five count periods. Divide each category total and the deer total by five to provide an estimate of composition and number of deer on the property. The unidentified deer need to be factored into each category according to the ratios or percentages. The stand count technique has always yielded a lower deer density estimate compared to spotlight counts on the same properties. This is because one is not likely to see every deer on 100 acres during a one-hour count period. The density estimates are relatively close to those of spotlight counts, however.

As an example, we will use a 275-acre property. Since there are over 249 acres, three stand locations are required. There is one stand on each 100-acre portion. The property owner has no assistants, so he or she is going to do the counts alone. The landowner makes one count in the morning and one in the evening. It will take seven and one-half days to complete the counts for the 15 one-hour count periods (3 stands X 5 counts each = 15 hours). The counts go as follows:

Stand #1	Bucks	Does	Fawns	Unidentified	
Count 1	3	6	3	1	
Count 2	1	5	3	3	
Count 3	2	8	4	0	
Count 4	5	4	2	2	
Count 5	2	6	3	3	
	13 +	29 +	15 +	9 =	66 Total Deer

Stand #2	Bucks	Does	Fawns	Unidentified
Count 1	4	4	4	4
Count 2	4	8	4	0
Count 3	2	4	2	1

Count 4	0	3	1	0	
Count 5	1	6	3	2	
	11 +	25 +	14 +	7 =	57 Total Deer

Stand #3	Bucks	Does	Fawns	Unidentified	
Count 1	6	9	5	5	
Count 2	3	10	5	1	
Count 3	5	10	5	3	
Count 4	6	8	4	0	
Count 5	3	5	2	0	
	23 +	42 +	21 +	9 =	95 Total Deer

Total	47 +	96 +	50 +	25 =	218 Total Deer

218 Total Deer divided by 5 = 43.6 deer observed on average on 275 acres or **6.31** acres per deer

47 Bucks + 96 Does + 50 Fawns = 193 Identified Deer
96 Does divided by 47 Bucks = **2.04** Does per Buck
50 Fawns divided by 96 Does = **52%** Fawn Crop
47 divided by 193 = **24%** Bucks .24 X 25(unidentified deer) = 6 47 + 6 = 53 Bucks
96 divided by 193 = 50% Does .50 X 25(unidentified deer) = 13 96 + 13 = 109 Does
50 divided by 193 = **26%** Fawns .26 X 25(unidentified deer) = 6 50 + 6 = 56 Fawns

53 Bucks divided by 5 = 10.6 bucks observed on average on 275 acres or **25.94** acres per buck
109 Does divided by 5 = 21.8 does observed on average on 275 acres or 12.61 acres per doe
162 Adults divided by 5 = 32.4 adults observed on average on 275 acres or **8.49** acres per adult
56 Fawns divided by 5 = 11.2 fawns observed on average on 275 acres or 24.55 acres per fawn
Estimated population; 11 Bucks, 22 Does, & 11 Fawns

In most instances these data are used to make conservative doe and buck harvest recommendations on small properties. While these data can often be confidently extrapolated for use in harvest recommendation formulas, a more cautious approach is taken when the data sizes are limited. If 96 does were identified during the counts, one would not assume that any of the unidentified deer were necessarily does. The 96 doe would be divided by 5, which equals 19.2 doe. That number would then be multiplied by .2(20%), which equals 3.84 doe. Since one cannot harvest part of a deer, the harvest recommendation would be 3 doe on the 275 acres. The same approach would be taken for the buck harvest recommendation.

Appendix N

Food Plots for White-tailed Deer

By
Jim Dillard, Technical Guidance Biologist, Mineral Wells
Gary Homerstad, Technical Guidance Biologist, Victoria

INTRODUCTION

Planting food plots for wildlife has long been used by landowners in Texas as a means to supplement the diets of wildlife during times of stress or during periods of the year when nutritious native forage may be deficient or lacking in the environment. They are also used to concentrate wildlife species such as white-tailed deer or turkeys for hunting or viewing. There are many misconceptions about food plots and their role in wildlife and habitat management. Food plots should never be planted as a substitute for native forage or to artificially increase populations of wildlife above the carrying capacity of the land. Planting food plots will not make up for improper range management, overgrazing by livestock, excessive stocking rates, low reproduction, or poor native habitat for white-tailed deer.

Annual food plots are expensive to develop and maintain and require a long-term commitment on the part of the landowner. Will the economic investment in materials, equipment, seeds, fuel, and labor translate into a significant measurable return? To what extent will the overall health of your white-tailed deer population, the size of individual animals, antler development, or improved habitability of the land for deer result? Landowners must weigh these and other considerations before undertaking development and planting of food plots for white-tailed deer. Once the decision has been made by a landowner to develop food plots, a comprehensive plan must be developed to address long-term goals and objectives. Food plots that are poorly planned, incorrectly planted or located in the wrong place will ultimately fail. The following guidelines are presented to assist landowners who want to plant food plots for white-tailed deer with information about why, what, when, where, and how to plant them.

White-tailed Deer Habitat: White-tailed deer habitat in Texas is varied. Deer occur in riparian bottomland hardwoods, wooded uplands, prairies, and wetlands. Their primary food is forbs (weeds/broadleaf herbaceous plants) that supply higher levels of digestible protein. When forbs are not available, deer rely on the leaves and twigs of browse (woody) plants. Green forage during the winter period is available primarily from winter forbs, winter grasses, and small grain crops. Winter browse for white-tailed deer is critical. Mast (acorns, pecans, etc.) is also an important dietary component during the fall and winter. Browse during the spring and early summer is more abundant and digestible than at other times of the year. Extremes in temperatures and unpredictable rainfall patterns often result in extended periods of drought, cold winters and/or hot summers. These periods of extremes may result in short supplies of forage during the spring and late summer-early fall period. To be effective, food plots should target these

stress periods of the year.

Deer often adopt food sources within their home ranges that are planted as cultivated crops. Crops such as peanuts, wheat, oats, milo, sorghum, truck crops (fruit, watermelons, cantaloupes, peas, etc.) and vegetable gardens receive use when available. Multiple use of these croplands by domestic livestock and wildlife is often compatible. Heavy use, on the other hand, may result in severe depredation by wildlife and become unacceptable to landowners.

Why plant food plots for deer? Planting food plots specifically for white-tailed deer in Texas is an increasing practice today for many landowners and land managers. Food plots should be considered only as a "hedge" against the climatic extremes and their effect on native plants. White-tailed deer are selective feeders, preferring highly digestible foods. Deer feed within their home range and select specific plants that are palatable and highly nutritious. Deer will typically eat certain preferred native plants when they are available, even if food plots are present. Plant composition in their diet changes throughout the year depending on availability, stage of growth, palatability, and distribution. Deer in Texas will benefit most from food plots during the spring and fall when their nutritional requirements are greatest. Food intake for deer increases during these times of the year as bucks are growing antlers and accumulating fat for the winter, does are nursing and weaning their young, and fawns are shifting their diet from milk to solid foods. If deer become totally dependent on food plots or supplemental feeding, serious problems are occurring in the habitat and deer or livestock numbers should be reduced.

Where deer are confined on high-fenced ranches, development of food plots should be strongly considered. In most cases, deer density levels will exceed the carrying capacity for the native range. Food plots will receive heavy use and will help provide nutritious forage throughout the year. Deer numbers should be reduced through a program of proper harvest management, or native habitat degradation will occur.

What should I plant in a deer food plot in Texas? Food plot plantings can be divided into several categories including warm season, cool season, annual or perennial plants, with each having different growth periods, management requirements, or nutritional benefits for white-tailed deer. Food plots must be designated as either warm season or cool season. A complete food plot program should have plots designated for both seasons of the year. Many of the cultivated **annual cool season forage plants** or grasses such as **oats, wheat, rye, and ryegrass** may be planted in **cool season food plots** for deer for availability during the late fall to early spring period. Crude protein content ranges from 15-20%. Studies have indicated that deer may consume oats more readily during the early winter and shift their preference to wheat later in the winter. Planting of both oats and wheat may be more beneficial than selecting one over the other. Most varieties of oats are not as cold tolerant as some varieties of winter wheat.

As wheat and oat food plots mature during March and April, plants will receive limited

grazing use by white-tailed deer. Other wildlife species such as turkey, quail, doves, songbirds, and small mammals will continue to feed on seeds that fall to the ground. Mature stands of wheat or oats may be lightly disked back into the soil to a depth of 1-1 1/2 inches following a good rainfall event during May or June for additional short-term grazing by white-tailed deer. Under good moist soil conditions, an additional month of grazing can be obtained from wheat or oat food plots before high summer temperatures kill these cool season plants.

Cool season varieties of clover and vetch (legumes) such as Yuchi arrowleaf clover, Cherokee red clover, armadillo clover, subterranean clover, hairy vetch, and Austrian winterpeas are also used by white-tailed deer. Legumes must be inoculated for good nodulation of plant roots and proper nitrogen fixation. With proper cultivation and management, many of these varieties are reseeding and can be managed for crops for several years without replanting. Consult with your county extension agent for varieties suited to your area and soil type. They have often conducted "trials" on new varieties. Late summer mowing and light cultivation of food plots planted to reseeding annuals will help increase soil contact by seeds and improve stands. Where possible, plant a variety of these forage plants in the same or separate food plots to extend use by deer and other wildlife species. Some landowners are also beginning to experiment with plantings such turnips and beets as winter forage for deer. The key is to experiment to maximize forage production with a variety of food plot items.

Warm season annuals such as millets, milo and other sorghum varieties, and legumes (beans, cow pea varieties, black-eyed peas, singletary peas, Catjung peas, soybeans, and lablab) may be planted after the danger of frost passes to **warm season food plots.** Varieties of dry land alfalfa, a warm season perennial legume (comes back from the roots each year) or other grazing type varieties of alfalfa may also be planted. Legumes have 20-30% protein content and fix nitrogen into the soil. Planting a variety of these forages will increase the success of a food plot program. A combination planting of 2/3 legumes and 1/3 grain sorghum is recommended for most warm season food plots.

Food plots may also be planted to **native perennial forb** species. Illinois bundleflower, Maximillian sunflower, bushsunflower, and Engelmanndaisy are eaten by white-tailed deer. These deep-rooted native plants are adapted to relatively low rainfall and a variety of soil types found in Texas. Combination plantings of these native perennial forbs is recommended. Engelmanndaisy is a cool season plant that should be planted in late summer or early fall. It can also be interseeded into an existing stand using a no-till drill. To plant Illinois bundleflower, Maximillian sunflower, and bushsunflower, begin seedbed preparation the summer and fall prior to a scheduled spring planting. Literature is available from the Natural Resources Conservation Service on how to establish and manage these native perennial forbs. These and many other native plant seeds are now available from commercial seed companies. There are now several varieties of bundleflower showing great promise in field trials. Contact the Texas Agricultural Extension Service for more information.

When do I plant food plots for white-tailed deer in Texas? Warm season planting of sorghum and legumes should be done in the early spring when soil temperatures rise and seeds will germinate. The danger of a freeze should have passed prior to planting. Planning for soil preparation activities well in advance of anticipated planting dates is a must for successful food plots. When possible, warm season food plots should be **cultivated during late summer or early fall of the year prior to planting** by deep double disking. Some varieties of peas can be planted into early summer if soil moisture is adequate for germination and plant growth. Fall planting of **cool season** annuals should be conducted during late September and October when soil moisture is adequate and before soil temperatures begin to drop. Specific planting date information for selected forage plantings and locally adapted varieties is also available from seed dealers, local Texas Agricultural Extension Service county agents, or the Natural Resources Conservation Service (SCS).

Where should food plots be located and how many do I need? Food plots should be located near cover used by deer. Deer prefer to feed in areas where escape from predators or other disturbances can be achieved quickly. Placement of food plots should take into consideration the location of dense brush or other escape cover, the terrain or topographic features on the land, drainages or water courses, the distance from property lines, and the location of soil suitable for cultivation. First, look for any existing or previously cultivated fields for food plot development. Clearing new locations for food plots is expensive and may be cost prohibitive. Food plots should ideally be long and narrow. Larger food plots may be irregular or kidney shaped with some brushy cover. It may also be desirable to provide a small watering device within the brushy cover.

Knowledge of soil types is necessary in locating sites for food plots. Soils must be capable of growing plants you select for planting. Local soil map books are available from the Natural Resources Conservation Service to assist you in selecting good soil types for planting food plots. Be sure the crops you plant are compatible with the soil properties of pH, drainage, texture, permeability, available water capacity, and depth. Avoid cultivation of soils on slopes or those prone to water and wind erosion. Food plots should be located in areas accessible to the highest density of deer on the property. Well traveled deer trails, watering areas, and other high deer use areas will give you a clue about where to locate a food plot. Food plots located near surface water sources such as creeks, rivers, ponds and stock watering tanks may increase visitations by deer. Placement of food plots near the center of your property may influence seasonal movements of deer during the stress periods of the year. Studies indicate that deer regularly travel a half-mile to visit food plots. One set of food plots per section (640 acres) should be sufficient.

The number and size of deer food plots planted depends on the size of the ranch, habitat type, deer density, capital investments and equipment, and your overall goals and objectives for habitat enhancement. Food plots smaller than 5 acres may be over-utilized by moderate to high deer populations. Therefore it is recommended that a food plot be a minimum of 5 acres. Food plot acreage may range up to 10% of the total

ranch acreage, but one to five percent is usually sufficient. Separate cool and warm season food plots should be established. Warm season food plots should be larger than cool season plots. Where deer densities are high, larger food plots may be required to provide enough forage for deer and in an amount sufficient to do them any good. A number of smaller plots distributed over a greater area may be desirable, but increased costs for fencing, plowing, and planting may result. Deer may also devastate small food plots during early growth stages of plants. Fencing sufficient to exclude deer during this time is often necessary to allow for initial establishment and growth. Livestock should be excluded. Deer can easily access food plots fenced with standard livestock fencing materials. Net wire fencing may exclude fawns and should be avoided. The bottom strand of barbed wire should be 18 inches off the ground. The top two strands should be at least one foot apart.

Where feral hogs are present, it may be necessary to exclude them by using heavy-gauge cattle panels or high-voltage wires on the lower portion of fences around food plots. Hogs can also be trapped, hunted, or otherwise dispatched to reduce damage to food plot plantings.

Cool season annuals (wheat, oats, rye, etc.) can also be overseeded during the late fall into tame pastures containing species such as coastal bermudagrass by using a minimum-tillage drill and proper fertilization. This practice can be used in pastures where early haying is not likely or in those used strictly for grazing by livestock. Overseeding may reduce initial growth of tame grasses during the early spring. Grazing by livestock on overseeded pastures may also limit growth of winter annuals for use by wildlife. Adequate fencing to exclude livestock is required. Another option is to overseed strips of winter annuals adjacent to field border edges or brush lines. Deer and other wildlife species often feed near escape cover and along these "edges" within their home ranges.

How do I plant a deer food plot? Planting successful deer food plots requires using the right equipment, properly preparing the seed bed, controlling weeds, and getting a rain when you need it. The best source of information about how to plant can be obtained from local farmers and ranchers who have experience in crop production in your area. An understanding of the principals of dry land farming is imperative. Farming procedure information is also available from the NRCS and Texas Agricultural Extension Service.

There is no substitute for a good seedbed. The soil seedbed should be well cultivated, weed free, firm, moist, and fertilized. An initial deep plowing is recommended on land not formerly cultivated or that have been out of cultivation for an extended period of time. A soil test should be made prior to planting a food plot to determine the amount of fertilizer or other additives needed in the soil. Fertilizer improves palatability of plants and improves the odds that a good stand of your plantings will be established. Seeds should be planted at the proper depth according to planting specifications and with the proper equipment. Most food plots can be planted with seed drills or broadcast spreaders. Broadcast plantings should be followed by a roller or drag to insure contact

with the soil to improve germination. Row or skip-row crop planting techniques should be used for some crops such as sorghum or lablab to allow for cultivation and weed control. Small seeds such as legumes and ryegrass should be planted no more than 1/4 to 1/2 inch deep. Larger seeds such as wheat, oats, peas, or beans are planted at 1 to 1 1/2 inch depths. Use of pre-emergent herbicides and cultivation may be required to get a good stand on some forage plantings.

Warm season food plots should be double-disked during the **late summer and early fall of the year <u>prior</u> to spring planting.** Lightly disk the food plot again 30-45 days prior to planting 1 to 1 1/2 inches deep to reduce weed growth and help accumulate soil moisture. A final light disking 1 - 1 1/2 inches deep just prior to planting will complete soil preparation.

Cool season food plots should be lightly disked 1 to 1 1/2 inches deep 30-45 days prior to a late summer or early fall planting date. Disk lightly again 1 to 1 1/2 inches deep just prior to planting.

Where can I get seeds for white-tailed deer food plots? Most of the forage crop seeds such as legumes, sorghum, clovers, and vetch are available form local seed dealers, farm and ranch stores, or feed stores located throughout the region. In the planning process, locate seed sources well in advance and shop around for the best price, seasonal availability, and quantities you require. Check seed bag tags for seed germination tests and the percent of pure live seed. Use locally adapted varieties, and where possible, obtain seeds produced in or close to the area where they will be planted. Costs of these varieties may be considerably lower than those magic seeds you read about in the magazines. Seeds produced in other states or from great distances away may not perform as well, regardless of advertising to the contrary. Check with the Natural Resources Conservation Service, Texas Agricultural Extension Service, or Texas Parks and Wildlife Department for the name and location of local seed dealers.

Deer Food Plots and Other Wildlife: Food plots planted specifically for white-tailed deer will also benefit other wildlife species in Texas. Rio Grande turkeys will graze winter wheat during the winter months and eat seed heads of mature plants in the spring. Turkey, bobwhite quail, mourning doves, songbirds, small mammals, and a variety of other wildlife species also eat seeds from warm and cool season plantings. Large food plots may also provide short term grazing for livestock.

CONCLUSION

Planting food plots for white-tailed deer or any wildlife species is not a solution for deficiencies in the habitat or improper land management practices. In some cases, only marginal returns can be expected. In Texas, food plots for white-tailed deer may provide nutritious forage during short periods of the year when climatic extremes occur. Lack of timely rainfall or adequate soil moisture may influence establishment of annual white-tailed deer food plots. If food plots are planted, both cool and warm season plots

should be developed. Planting native perennial forbs may be more cost effective over the long term. Proper planning and soil preparation is necessary to successfully grow food plots. Food plots should be located near cover and in areas frequently used by deer on good soil-type sites not subject to erosion. Fertilization increases palatability for plants. Overseeding tame pastures during the fall can provide forage for wildlife with minimum soil cultivation. Always use recommended equipment, seeding rates, and planting depth instructions for selected plantings. Then, pray for rain!

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 evalluated and the proper facility recommended to the landuser. 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 I 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 s 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-1527 (sch. 40 or 80)
PE D-2239 (SIRD-PR)
PE D-3035 (SRD-PR)
PVC D-2241 (SDR-PR)
PE D-2247 (Sch. 40 or 80)
ABS D-2282 (SDR-PR)
PE D-2104 (Sch. 40)
PE D-2737 (PE Tubing-PR)
PVC D-1785 (Sch. 40, 80, or 120)
PVC D-2740 (PVC Tubing – PR)

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)

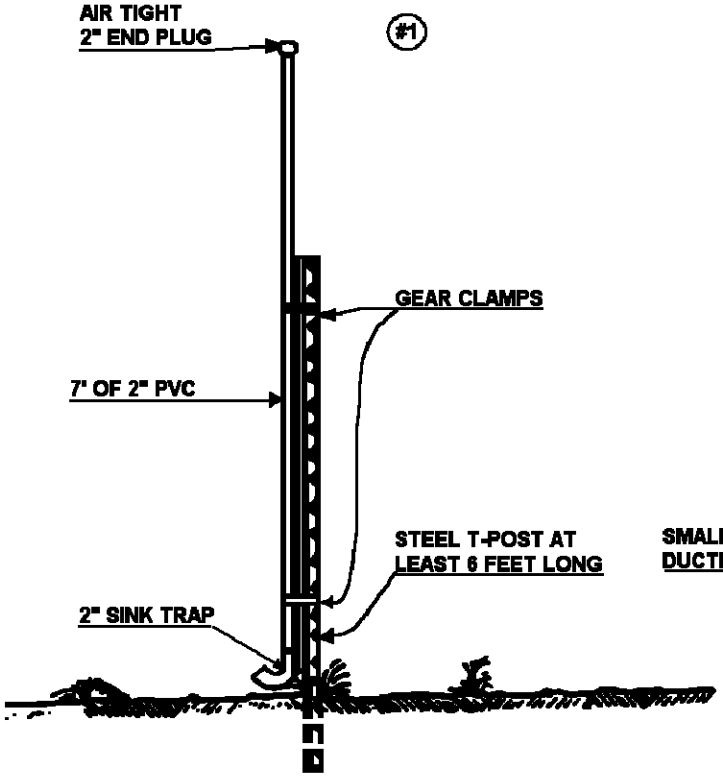
This facility is commercially produced. It is available in 200 to 2100 gallon sizes. It takes 6 inches annual rainfall for 200 gallon size, 8 inches for 1000 gallon size and 17 inches for 2100 gallon size. No float needed if trough and tank set at same level.

E. Ranch Specialties Wildlife Waterer (Drawing #15)

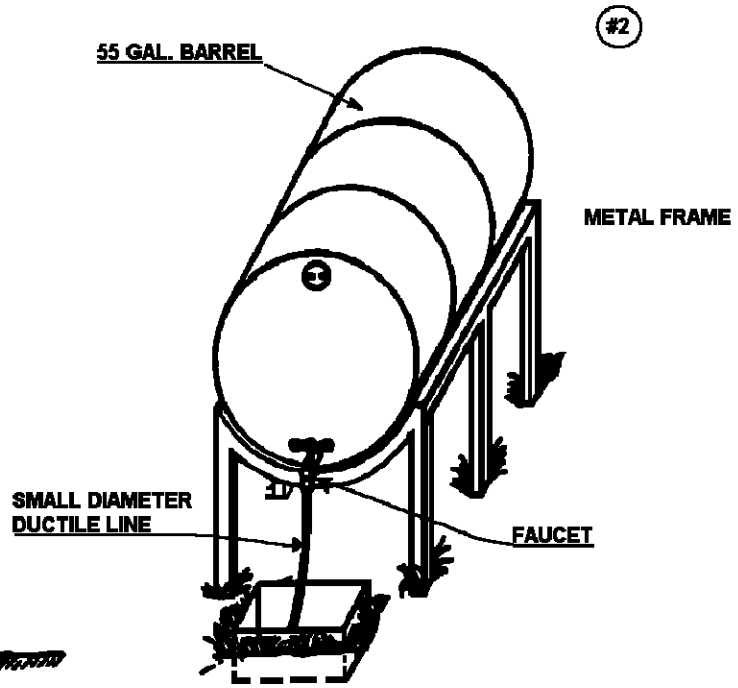
This facility is commercially produced. It holds 9.5 gallons of water. The float is built into the facility. The facility is 42 inches by 42 inches and 7.5 inches deep with a 3 foot diameter bowl. To be eligible for cost share, the facility must be connected to a permanent water source.

WILDLIFE WATERING FACILITIES

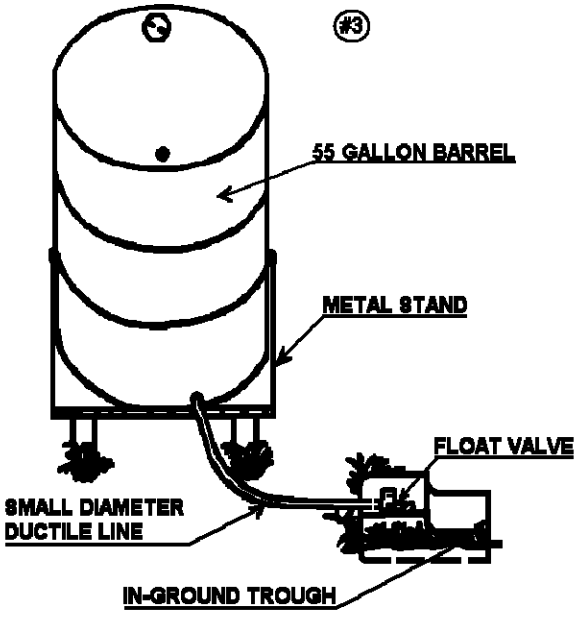
SCALE: 3/8" = 1'



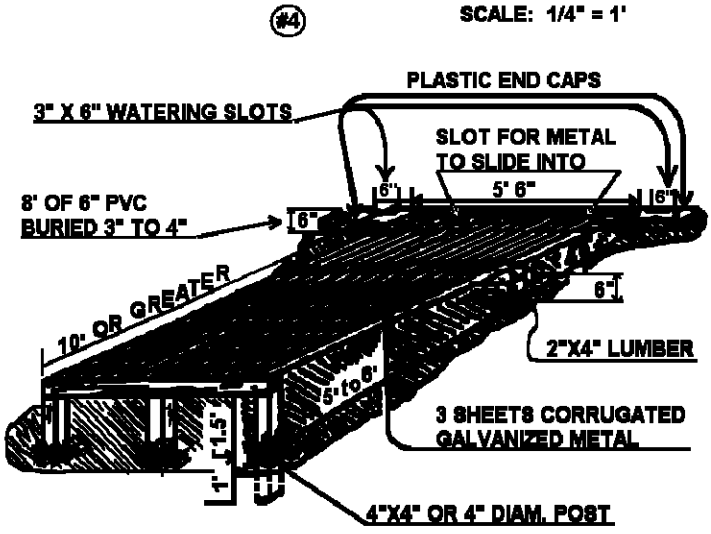
SCALE: 3/4" = 1'



SCALE: 3/4" = 1'



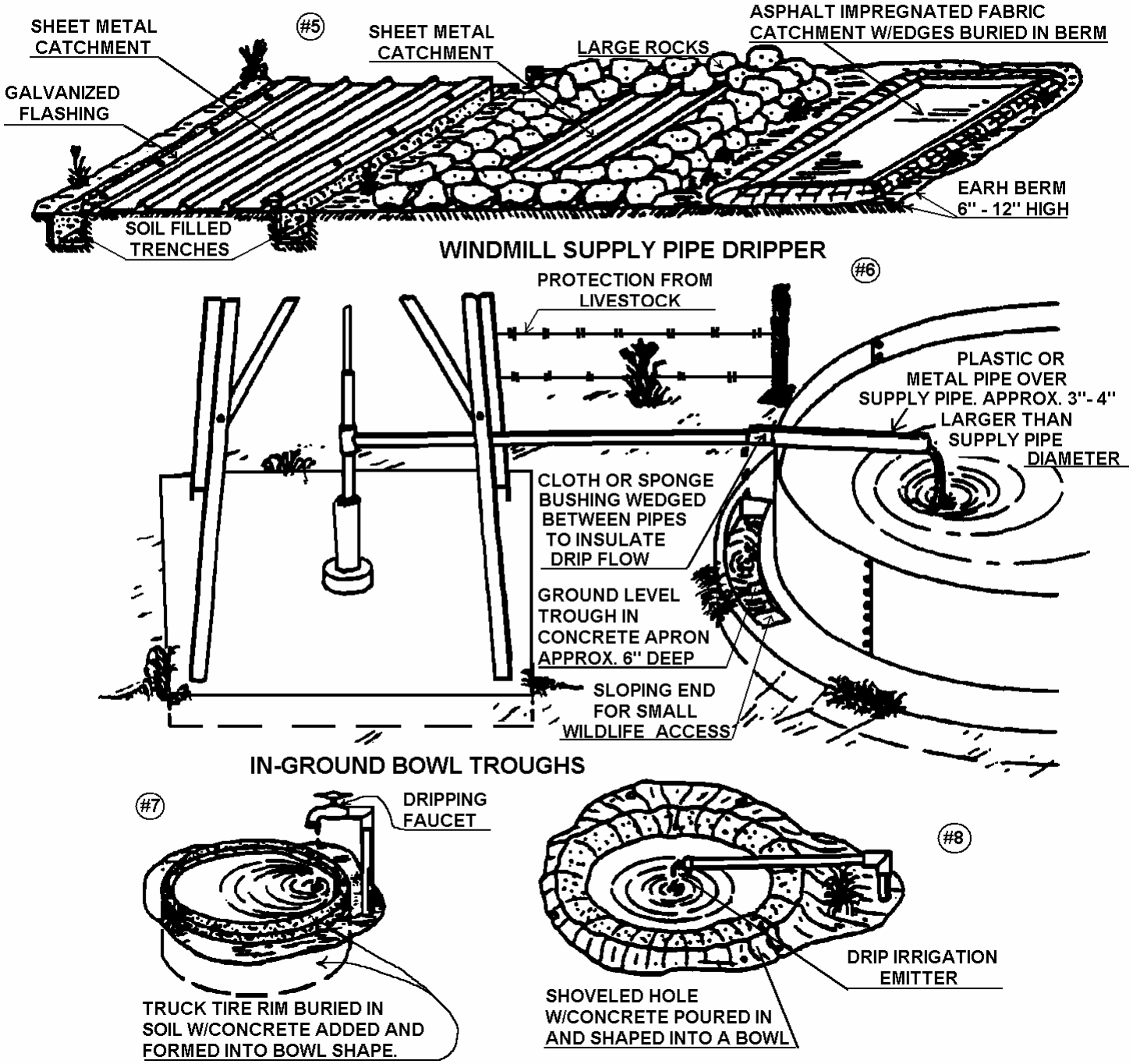
SCALE: 1/4" = 1'



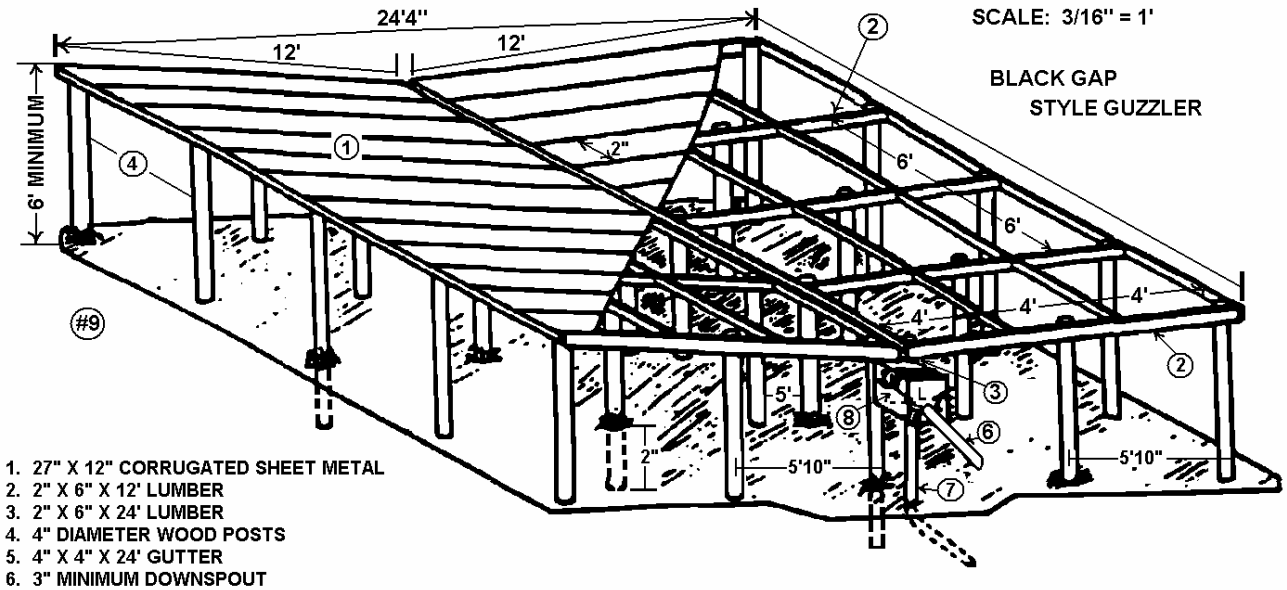
DRAWINGS BY TODD A. MAREK
SEPT. 1991

WILDLIFE WATERING FACILITIES

3 METHODS OF ANCHORING ON-THE-GROUND CATCHMENTS

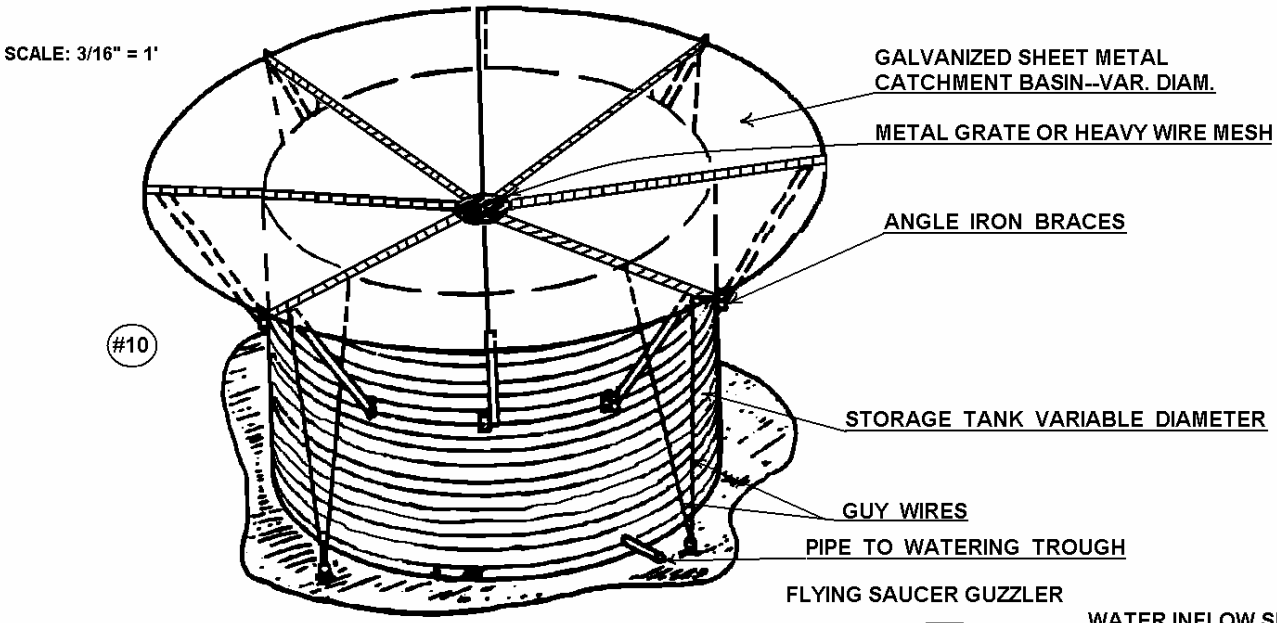


WILDLIFE WATERING FACILITIES

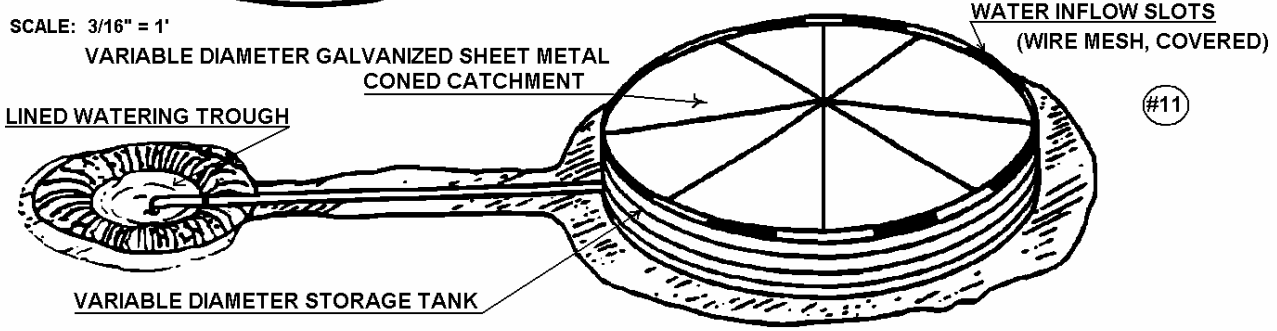


1. 27" X 12" CORRUGATED SHEET METAL
2. 2" X 6" X 12' LUMBER
3. 2" X 6" X 24' LUMBER
4. 4" DIAMETER WOOD POSTS
5. 4" X 4" X 24' GUTTER
6. 3" MINIMUM DOWNSPOUT
7. ALTERNATE DIRECTION FOR DOWNSPOUT
8. 1'6" X 1'6" X 1' SUMP COVERED WITH 1/4" - 1/2" HARDWARE CLOTH

INVERTED UMBRELLA GUZZLER

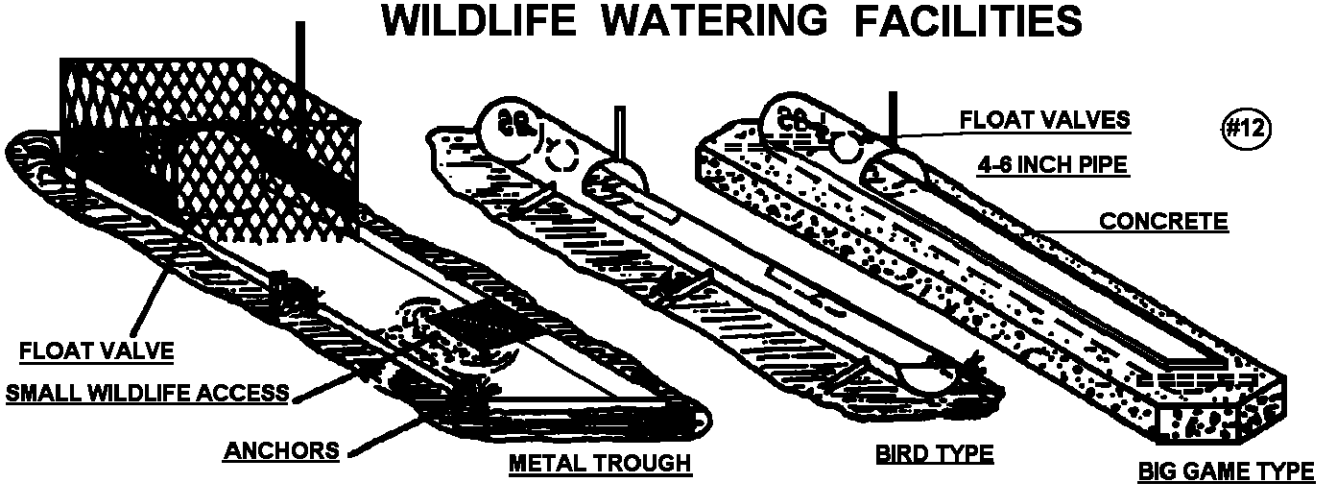


FLYING SAUCER GUZZLER



DRAWINGS BY TODD MAREK SEPT. 1991

WILDLIFE WATERING FACILITIES



#12

SCALE: 1 1/2 " = 1'

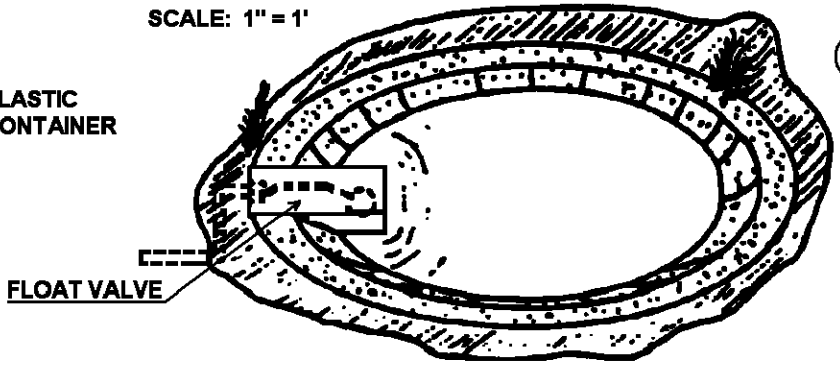
#13

PLASTIC CONTAINER

DRINKING BOWL

SCALE: 1" = 1'

#14

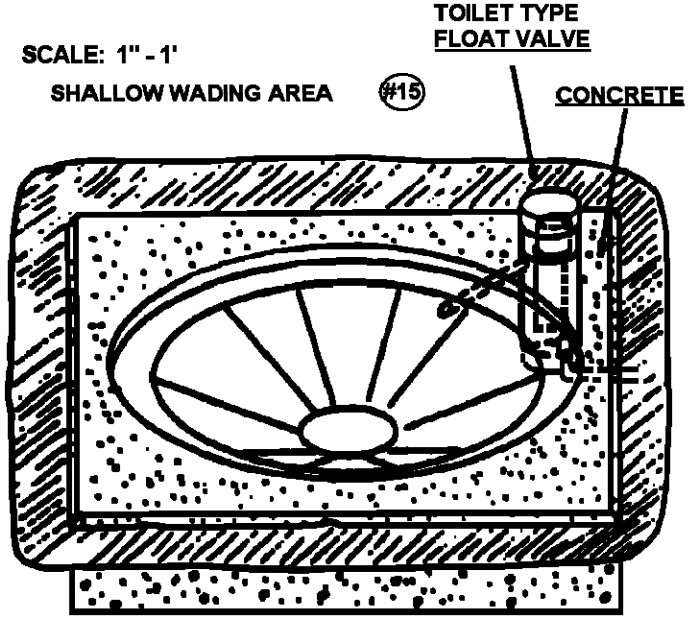


3 FT. DIAMETER BOWL APPROX. 8 IN. DEEP

SCALE: 1" - 1'

SHALLOW WADING AREA

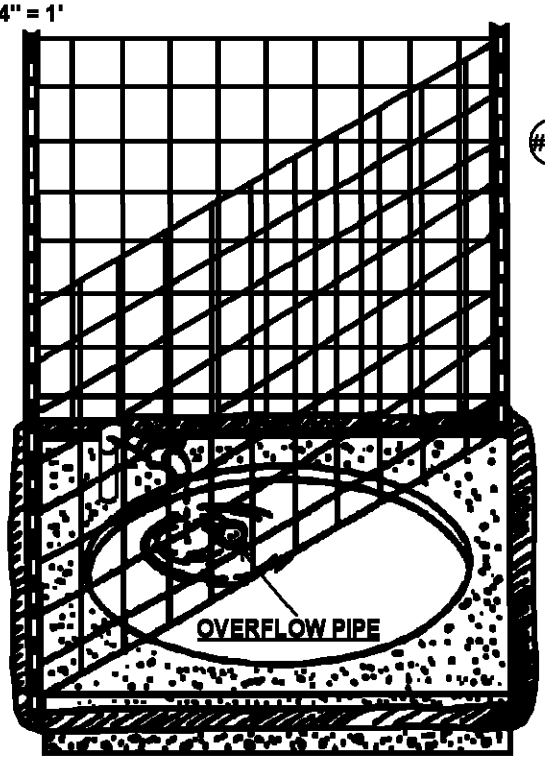
#15



RANCH SPECIALTIES

SCALE 3/4" = 1'

#16



3 FT. DIAM. BOWL APPROX 8 IN. DEEP

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 though 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 avioding 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 (CO_2) 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: _____

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

Date: _____

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

Date: _____

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

Date: _____

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

Date: _____

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

Date: _____

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.

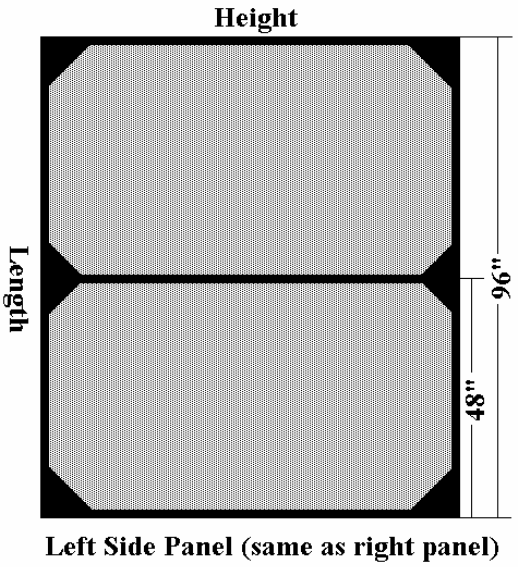
- This pattern is designed to use 48" wide hailscreen to maximize efficiency. Internal cross members are placed to allow for slight overlap. Wide hailscreen will probably not be readily available in stock, but any building supply can order it. Use of narrower hailscreen requires repositioning of tack 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.

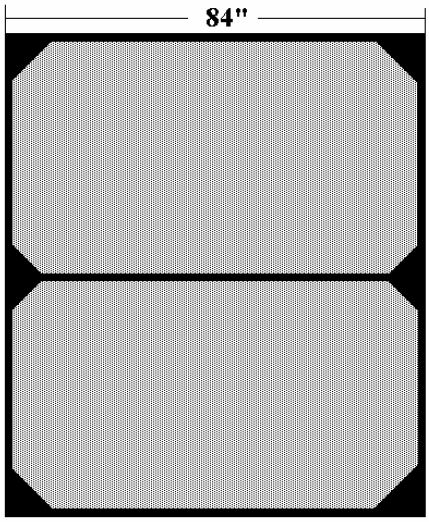
- ***Slot width of 1.25 inches in slot assembly is critical***. Wider slots will increase non-target captures, including small raptors, which will feed on your decoy birds. Escapes by females may also increase with wider slots.

- Side panels attach to the outside of end panels. Nothing else will fit if you attach ends outside.

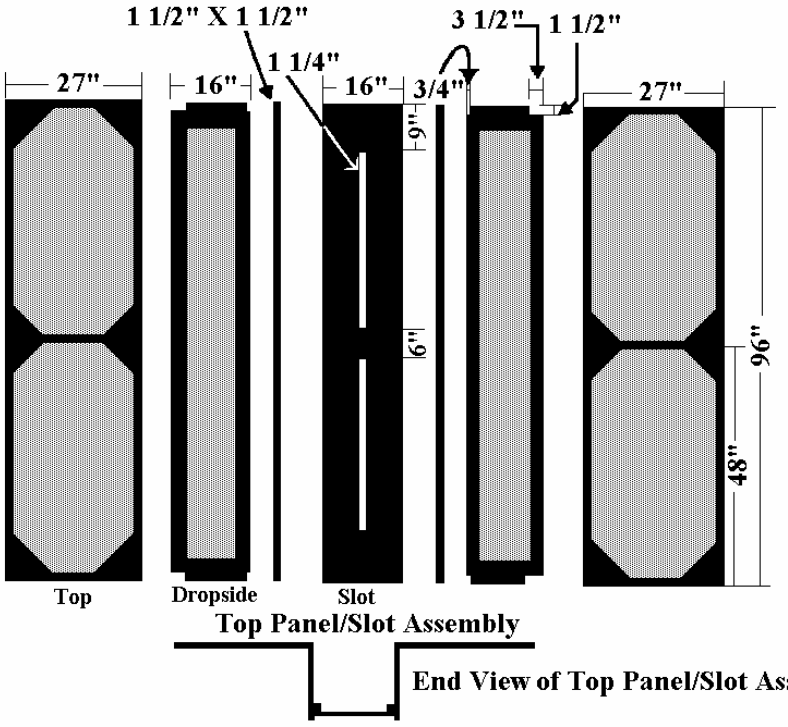
- During final assembly assemble in this order: end, side, side, top, top, dropping slot assembly (3 pieces), then finish with the other end.



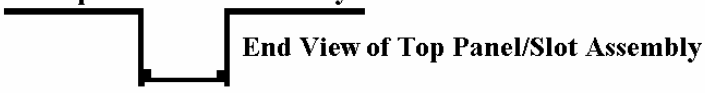
Left Side Panel (same as right panel)



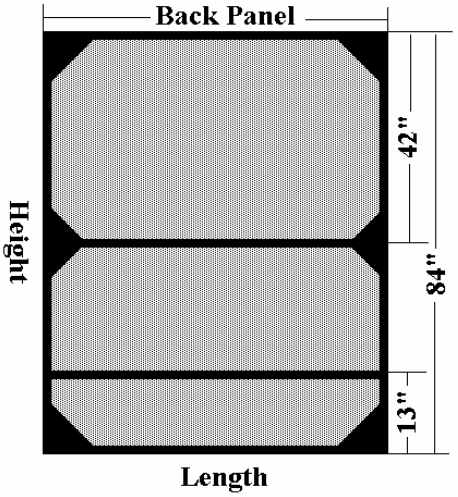
Right Side Panel



Top Panel/Slot Assembly

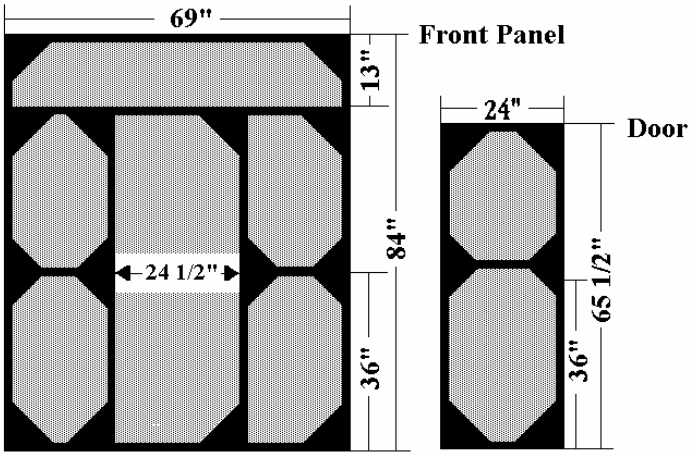


End View of Top Panel/Slot Assembly



Cowbird Trap Plans

Plans developed by Fort Hood Environmental Division.



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 ½" x 1 ½" 14 gauge square tubing (upper frame for trap funnel).
2 cuts 93" of 1 ½" x 1 ½" x ⅛" angle iron. (lower trap entrance plate supports).
15" wide x 94 ½" long ⅛" plate (trap entrance plate). Cut two openings 36 ¼" x 1 ¼" as shown in the diagram. *The exact 1 ¼" 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 ¾" x 23 ½". Trim to fit.

Placement Notes:
A. ¼" 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 ½"	Both Sides:	6 – 95 ¾"
	2 – 23 ½"		4 – 6"
	2 – 27 ½"		
	2 – 11"	Rear:	3 – 74 ½"
			2 – 11 ½"
Door:	3 – 23 ½"		1 – 19"
	2 – 21" (upper sides)		
	2 – 42 ¾" (lower sides)	Center Trap Angle:	2 – 93"

Hold all screen in place with 1" x ⅛" plate with screws placed every 6 inches.

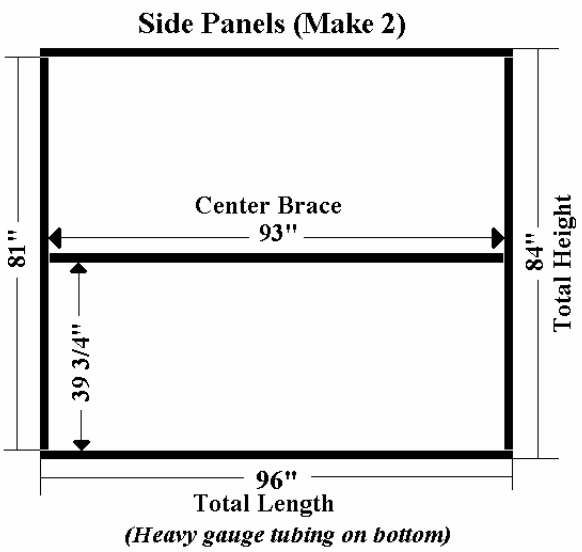
Alternate Door Hinges and Latch Construction:
Note: Put door latch on first, then install frame latch to fit.

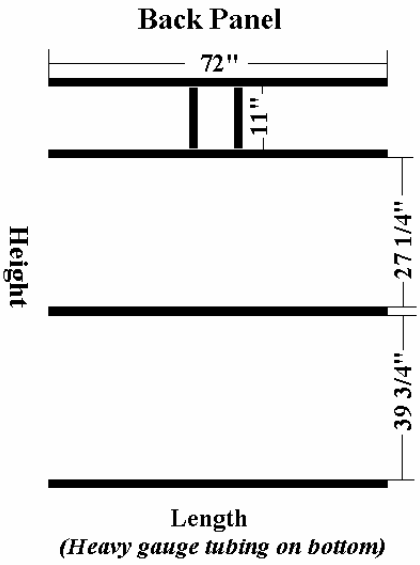
1 ft. of 1" x ¼" strap
2 ft. of ⅜" tubing
2 ft. of 7/16" rod

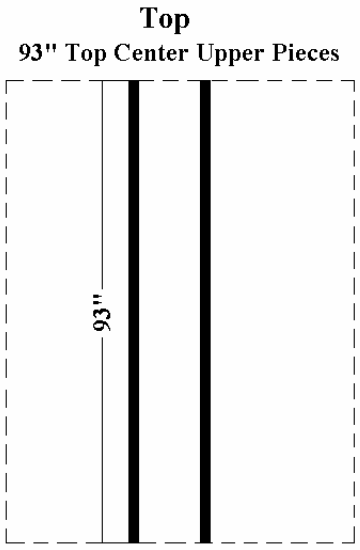
Make the following cuts:

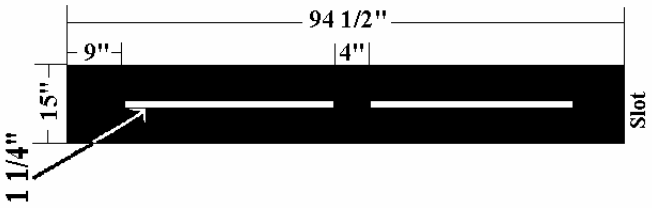
4 cuts 2” of 3/8” tubing (door hinge part)
2 cuts 5” of 7/16” rod (door hinge part)
1 cut 7” of 1” x ¼” strap (door latch)
1 cut 5” of 1” x ¼” strap (on door)
1 cut 2” of 3/8” tubing (on door)
1 cut 3 ¼” 7/16” rod

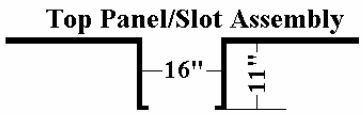
Alternate Trap Entrance Plate:
2 pieces of plate 7” wide x 94 ½” long, separated by 1 ¼” inches that will form the opening. *The exact 1 ¼” width of the opening is critical.*



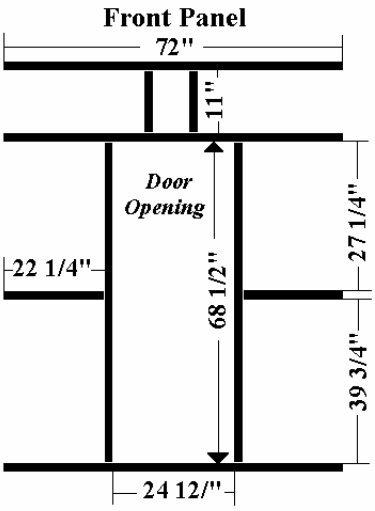




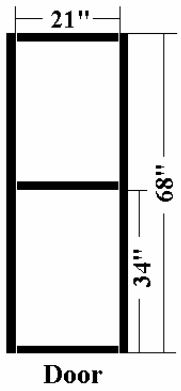


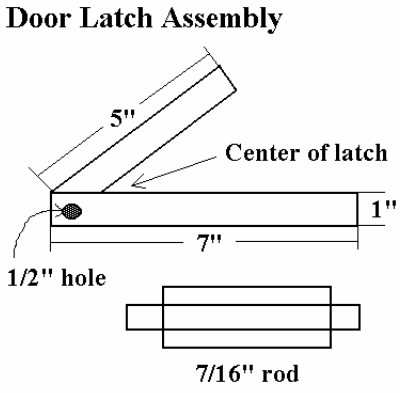


End View of Top Panel/Slot Assembly
Lower Cross pieces 93" angle iron

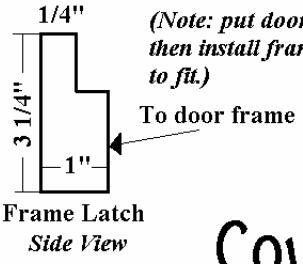


(Heavy gauge tubing on bottom)





Weld rod to both sides of latch

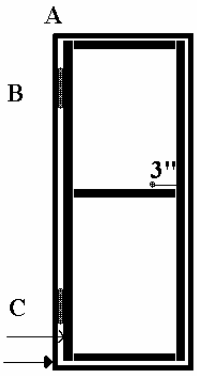


(Note: put door latch on then install frame latch to fit.)

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.

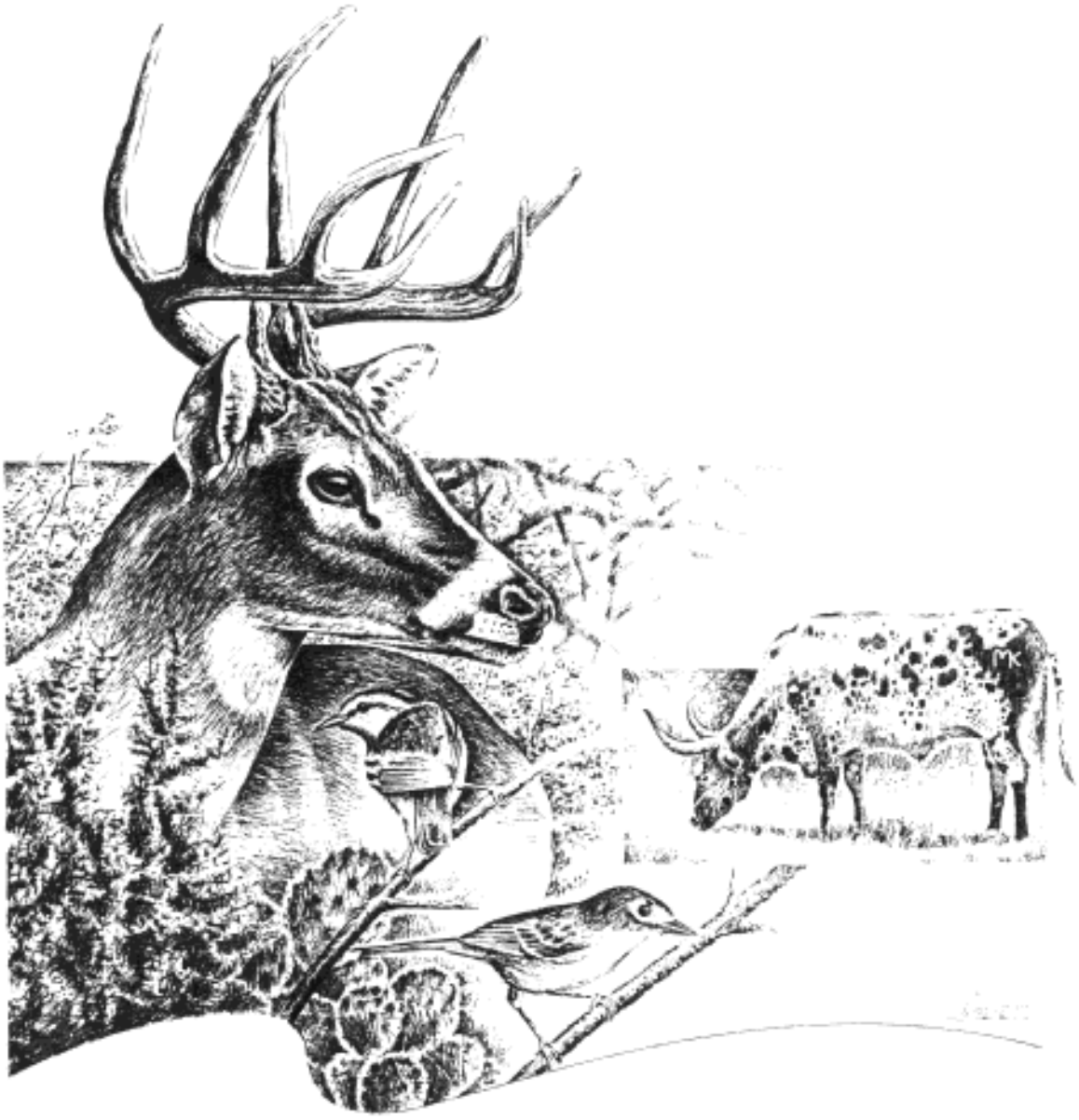
Texas Parks and Wildlife Department. 4200 Smith School Rd., Austin, TX 78744. Ph. (800) 792-1112. www.tpwd.state.tx.us.

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 tow 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 is 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.

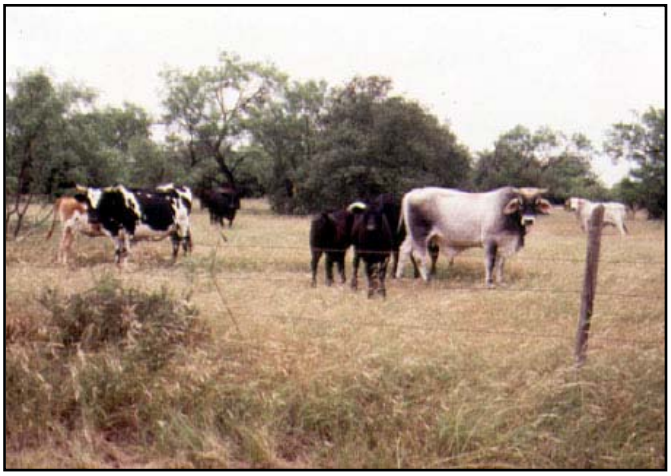
Escape cover can include brush piles, half-cut trees, and shrub plantings. These happen to be among some of the most popular wildlife enhancement projects. Most wildlife species are edge dwellers, and escape cover is necessary to provide protection from predators. Wildlife is not comfortable

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.

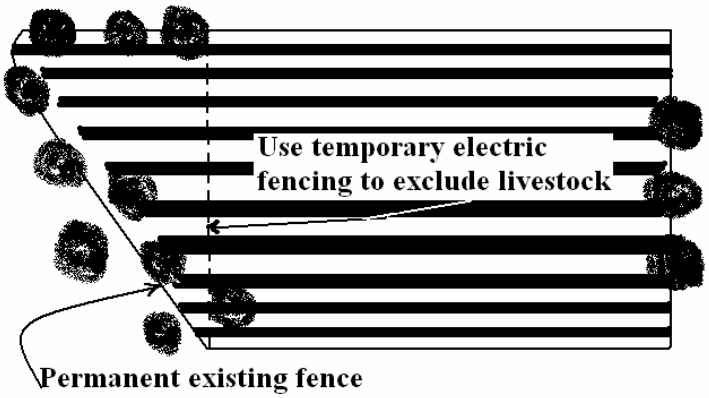
A good scenario for wildlife is a high intensity low frequency grazing system. By moving a large number of grazers into a pasture, a "mowing" effect can be achieved. Removal of old grass growth during late summer and winter can greatly benefit wildlife. The timing of grazing is important to prevent damage 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.

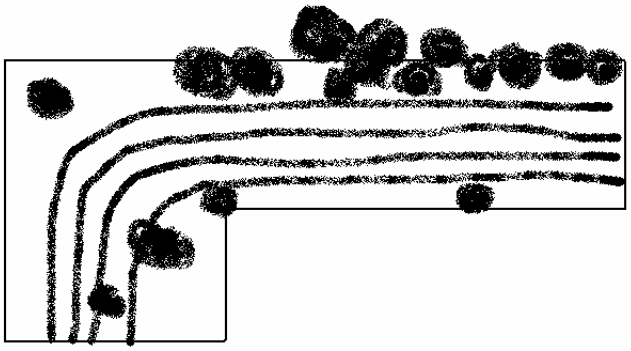
Modifying Existing Agricultural Stands

Allow irregular areas in cultivation, such as this triangular plot, to go fallow for winter food—especially adjacent to brushy cover.

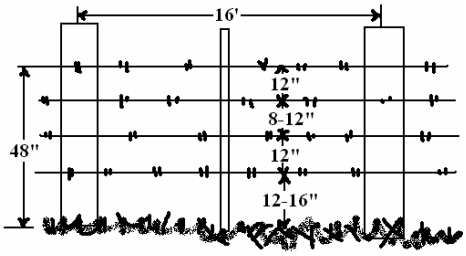


Food Plot. In Conservation Reserve Program (CRP) or old field.

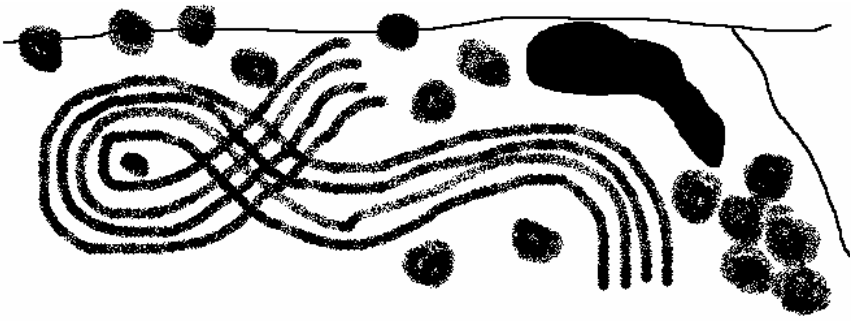
- Useful in areas where row cropping and necessary foods are scarce
- Plant row type crops specifically for wildlife
- Maximum edge can be created by long narrow plots (1/8 – 2 acres)
- Position between two cover types (ex. Between mature tree stand and open area).
- These areas can serve as wildlife corridors.



Fencing. Food plots specifically for wildlife, should be excluded from livestock with electric or barbed wire fence.



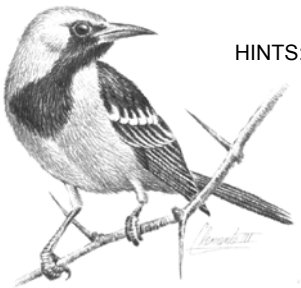
Barbed-wire Hints. Bottom wire should be a minimum of 12-16” from ground and smooth. Top wire should be no more than 48” (preferably lower), and 12” between it and next wire down. Fence stays should be used between posts to create a more rigid fence; this allows deer a better chance of struggling free 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



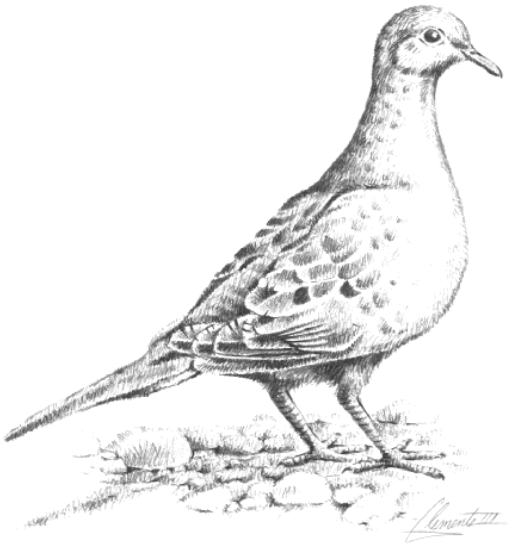
HINTS:
--Need 25 inches of annual precipitation to be beneficial.
--Irrigation is an expensive alternative.
--Supplemental feeding is cheaper and more reliable.
--Use seed sources from within 200 miles north and south, and 100 miles east and west.
--Exclude from livestock.

Seed Species	Rate (lbs/acre)	Depth (inches)	Planting Time	Time to Maturity (days)	Drought Tolerance	Species Benefited*
Annual Sunflower	3-5	.25-.5	Mar.-May	100	High	MD,Q
Good drought insurance; will reseed yearly with spring discing.						
Fox-tail Millet	15-20	1-1.5	Apr-June	60-80	Good	MD,Q,T,WF
Similar to native bristle grass; can be planted 0 days before frost.						
Proso Millet	20-50	1-1.5	Apr-June	50-70	Good	MD,Q,T
Best adaped for North Texas (Rolling Plains)						
Japanese Millet	15-20	1-1.5	Apr-June	60-80	Poor	WF
Good in playa lakes in High Plains for waterfowl						
Sorghum Alum	3-6	2-Jan	Apr-June	100-120	Fair	MD,Q,T,D,WF
Do not plant too thick, to allow free movement throughout food plot						
Corn	7- 10	2-Jan	Apr-June	170-190	Poor	MD,Q,T,D,WF
Should not be planted in areas less than 30 inches precipitation (unless irrigated). Shred in strips to allow free movement of wildlife.						
Sesbania	20-30	.5-1	June-July	120	Poor	MD,Q,T,D
Might require irrigation in arid areas						
Partridge Pea	2	1	Feb-March	120	Fair	ALL
Use local strains for best production						
Annual Pespedeza (Korean)	20-25	.25-.50	Post Frost	120	Poor-Fair	D,Q,T
Need 30+ inches of precipitation or irrigation						
Sesame (Benne)	1	.25-.50	Post Frost	120	Fair	D,Q
Use shattering variety for doves and quail						
Austrian Winter Peas	20-30	1-2	Fall			D,T
Illinois Bundle Flower	3	0.5	Spring-Fall		Good	MD,Q,T
Mix into areas when reestablishing grasses and other perennials.						
Clover	8-10	1-2	Fall		Poor	D,T
Engleman Daisy	3	1/8	Spring		Good	D,T
Four-wing Saltbush	8-10	0.5	Winter-Spring		Good	D,T
Oats	40-50	1-2	Fall-Spring		Fair	D,T,WF
Not as freeze resistant as wheat						
Reseeding Cow Peas	50-100	1-2	Spring		Fair	ALL
Maximillian	3	1/8	Fall-Winter		Good	D,Q,T

Sunflower					
Vetch	20-30	1-2	Fall	Fair	Q,D,T,MD
Egyptian Wheat	3-6	1-2	Spring	Fair	Q,MD,T
Winter Wheat	30-50	1-2	Fall-Spring	Fair	ALL

Best all round winter forage

***MD=mourning dove Q=Quail T=turkey WF=waterfowl D=deer**



RECOMMENDED SPECIES FOR CENTRAL TEXAS

Botanical Name	Common Name	Site Preference
WILDFLOWERS		
Annuals		
Amblyolepis setigera	Huisache daisy	Dry, well-drained soil; sun
Cassia fasciculata	Partridge pea	Open, sandy fields; sun
Castilleja indivisa	Indian paintbrush	Sandy loam; sum
Centaurea americana	Basket flower	Dry, well-drained soil; sun
Coreopsis tinctoria	Coreopsis	Moist, sandy soil; sun
Dracopis amplexicaulis	Clasping-leaf coneflower	Moist areas, ditches; sun
Eryngium leavenworthii	Eryngo	Plains, prairies; sun
Eustoma grandiflorum	Texas bluebell	Moist areas in prairies; sun
Gaillardia pulchella	Indian blanket	Variety of soils, disturbed areas; sun
Linum lewsii	Blue flax	Sandy or rocky soils; sun
Lupinus texensis	Bluebonnet	Well-drained, alkaline soil; sun
Machaeranthera tanacetifolia	Tahoka daisy	Rocky or sandy soils; sun
Monarda citriodora	Horsemint	Well-drained, sandy loam-rocky soil
Palafoxia callosa	Palafoxia	Limestone soil; sun
Phacelia congesta	Blue curls	Moist, well-drained soils; sun-shade
Phlox drummondii	Drummond's phlox	Prefers sandy soil; sun-part sun
Rudbeckia hirta	Black-eyed Susan	Varies widely; sun-part sun
Thelesperma filifolium	Greenthread	Calcareous soils; sun
Perennials		
Aquilegia canadensis	Columbine	Rocky, well-drained sites; part shade
Asclepias tuberosa	Butterfly weed	Moist areas in prairies, roadsides; sun
Callirhoe digitata	Winecup	Open woods, plains; sun
C. involucrata	Winecup	Open woods, rocky hills; sun
Calvlophus drummondianus	Square-bud primrose	Sandy or rocky soils; sun
Cooperia drummondii	Rain lily	Open fields, prairies, lawns; sun
C. pedunculata	Rain lily	Open fields, prairies, lawns; sun
Coreopsis lanceolata	Lanceleaf coreopsis	Variety of soils; sun
Delphinium carolinianum	Prairie larkspur	Dry, open woods and fields; sun
Echinacea angustifolia	Purple coneflower	Dry, rocky prairies and hillsides; sun
E. purpurea	Purple coneflower	Rocky, open woods; sun-part sun
Engelmannia pinnatifida	Engelmann daisy	Open, calcareous sites; sun
Eryngium leavenworthii	Eryngo	Plains and prairies; sun
Eupatorium coelestinum	Mistflower	Moist, sandy wooded area; sun-part sun
Helianthus maximiliani	Maxilillian sunflower	Moist, clay-like soil; sun
Hymenoxys scaposa	four-nerve daisy	Dry, well-drained sites; sun

Ipomopsis rubra (biennial)	Standing cypress	Dry, sandy or rocky soil; sun
Liatris mucronata	Gayfeather	Well-drained soils; sun
L. pycnostachya	Gayfeather	Well-drained, calcareous soil; sun
Lobelia cardinalis	Cardinal flower	Wet to moist soil; sun-part shade
Melampodium leucanthum	Blackfoot daisy	Calcareous soil; sun
Monarda fistulosa	Beebalm	Dry, open woods, wet meadow
Oenothera macrocarpa	Missouri primrose	Limestone hills and prairies; sun
O. speciosa	Showy primrose	Open areas in a variety of soils; sun
Penstemon baccharifolius	Rock penstemon	Limestone crevices; sun-part shade
P. cobaea	Wild foxglove	Loamy soil, prairies; sun
P. triflorus	Hill Country penstemon	Limestone soil; sun-part shade
Physostegia pulchella	Obedient plant	Wet soils of bottomlands; part shade
Ratibida columnifera	Mexican hat	Variety of soil; sun-part sun
Salvia coccinea	Scarlet Sage	Thickets and open woods; part shade
S. engelmannii	Englemann sage	Limestone soils; sun
S. farinacea	Mealy blue sage	Wide variety of soils; sun-part sun
S. roemeriana	Cedar sage	Woody, rocky areas; part shade
Solidago spp.	Goldenrod	Sandy to clay soil; sun
Tradescantia spp.	Spiderwort	Prairies, plains, moist areas; part sun
Verbena bepennatifida	Dakota vervain	Fields; sun
V. elegans var. asperata	Mountain vervain	Limestone & sandstone outcrops; sun
Vernonia baldwinii	Ironweed	Dry, well-drained sites; sun
V. lindheimeri	Wooly ironweed	Limestone soil; sun
Wedelia hispida	*Wedelia*	Dry, well-drained sites; sun

SHRUBS

Blackland Prairie (east of the Balcones fault line)

Amorpha fruticosa var. angustifolia	False indigo	Moist woods, stream banks; calcareous soil
Anisacanthus wrighii	Flame acanthus	Dry, well-drained soil
Berberis swasevi	Texs barberry	Dry, well-drained soil
B. trifoliolata	Agarito	Dry, well-drained soil
Callicarpa americana	American beauty bush	Rich woods, thickets
Dalea frutescens	Black dalea	Dry soil in full sun
Erythrina herbacea	Coral bean	Sandy or loamy soils; sun-part shade
Eupatoruim havenense	Mistflower	Well-drained soil; rocky ravines
E. odoratum	Blue mistflower	Well-drained soil; full sun
Eysenhardtia texana	Kidneywood	Dry hills and canyons
Hesperaloe parviflora	Red yucca	Dry, well-drained soil; full sun
Lantana horrida	Trailing lantana	Dry, well-drained soil; sun-part-sun
Leucophyllum frutescens	Cenizo, Texas sage	Dry, well-drained soil; sun
Malvavixcus drummondii	Turk's cap	Moist, shaded areas
Mimosa borealis	Fragrant mimosa	Well-drained soil; sun

Nolina texana	Bear grass	Well-drained sites; full sun
Pavona lasiopetala	Rose pavonia	Dry, rocky woods or stream banks
Rhus aromatica	Fragrant sumac	Wooded areas; rocky soil
R. virens	Evergreen sumac	Rocky hillsides
Ruellia brittoniana	Narrow-leaf petunia	Well-drained sites; full sun
Salvia greggii	Autumn sage	Dry, well-drained soils; full sun
Viburnum rufidulum	Rusty blackhaw	Wood borders, stream edges, thickets

Edwards Plateau (west of the Balcones fault line)

Amorpha fruticosa	False indigo	Moist woods, streambanks; calcareous soil
Anisacanthus wrightii	Flame acanthus	Dry, well-drained soil
Bauhinia congesta	Orchid tree	Dry, well-drained soil; S. side of bdg.
Berberis swasevi	Texas barberry	Dry, well-drained soil
B. trifoliolata	Agarito	Dry, well-drained soil
Callicarpa americana	American beauty bush	Rich woods and thickets
Capsicum frutescens	Chile piquin	Well-drained sites
Chrysactinia mexicana	Damianita	Dry, rocky well-drained sites; sun
Colubrina texensis	Texas snakewood	Dry, well-drained sites
Dalea frutescens	Black dalea	Dry soil in full sun
Dasylirion texanum	Texas sotol	Dry, well-drained sites; full sun
Erythrina herbacea	Coral bean	Sandy or loamy soils; sun-part shade
Eupatorium havanense	Mistflower	Well-drained soil, rocky ravines
E. odoratum	Blue mistflower	Well-drained soil, full sun
Hesperaloe parviflora	Red yucca	Dry, well-drained soil; full sun
Hibiscus cardiophyllus	Heart-leaf hibiscus	Well-drained soil; sun-part-sun
Lantana horrida	Trailing lantana	Dry, well-drained soil; sun-part-sun
Leucophyllum frutescens	Cenizo, Texas sage	Dry, well-drained soil; sun
Lonicera albiflora	White honeysuckle	Rocky or sandy soils; cedar brakes
Malvavixcus drummondii	Turk's cap	Moist, shaded areas
Mimosa borealis	Fragrant mimosa	Well-drained soil; sun
Nolina texana	Bear grass	Well-drained sites; full sun
Pavona lasiopetala	Rose pavonia	Dry, rocky woods or stream banks
Pistacia texana	Pistache	Rocky, limestone stream banks, cliffs
Rhus aromatica	Fragrant sumac	Wooded areas; rocky soil
R. lanceolata	Flame-leaf sumac	Rocky hillsides; sun or shade
R. virens	Evergreen sumac	Rocky hillsides
Ruellia brittoniana	Narrow-leaf petunia	Well-drained sites; full sun
Salvia greggii	Autumn sage	Dry, well-drained soils; full sun
S. regia	Royal sage	Rocky, wooded slopes
Viburnum rufidulum	Rusty blackhaw	Wood borders, stream edges, thickets
Yucca rupicola	Twist-leaf yucca	Dry, rocky soil; full sun

TREES

Blackland Prairie (east of the Balcones fault line)

Conifers

Juniperus virginiana	Eastern red cedar	Fields, grasslands
Taxodium distichum	Bald cypress	Along stream banks

Shade Trees

Carya illinoinensis	Pecan	Rich, river-bottom soil
Catalapa speciosa	Catlpa	Deep, rich, moist soil
Fraxinus texensis	Texas ash	Prefers limestone hills
Juglans nigra	Eastern black walnut	Well-drained, loamy soil
Plantanus occidentalis	Sycamore	Rich bottomland soils along streams
Quercus glaucoides	Lacy oak	Limestone soils
O. macrocarpa	Bur oak	Moist forests along streams
O. muhlenbergii	Chinkapin oak	Calcareous uplands
O pungens var. vaseyana	Vasey oak	Dry, rocky slopes
O. shumardii	Shumard red oak	Moist hills, bottomlands, clay soils
O. texana	Texas red oak	Dry uplands
O. fusiformis	Escarpment live oak	Sandy loam soils, also clay soils
Sapindus drummondii	Western soapberry	Moist soils along streams
Ulmus crassifolia	Cedar elm	Prefers limestone soils

Small Trees

Cercis canadensis var. mexicana	Mexican redbud	Rich, moist sandy loam
C. canadensis var. texensis	Redbud	Rich, moist sandy loam
Chilopsis linearis	Desert willow	Dry, well-drained areas
Cotinus obovatus	Smoketree	Rocky banks and hillsides
Diospyros texana	Texas persimmon	Dry, well-drained sites
Eysenhardtia texana	Texas kidneywood	Dry, well-drained sites
Ilex decidua	Possom-haw holly	Rich, moist soils
I. vomitoria	Yaupon	Low, moist woods
Parkinsonia aculeata	Retama	Moist, sandy soils
Pistacia texana	Texas pistachio	Rocky limestone soil
Prosopis glandulosa	Mesquite	Variety of soils, well-drained site
Prunus mexicana	Mexican plum	Well-drained, but moist sites
Rhamnus caroliniana	Carolina buckthorn	Low areas, moist site
Rhus glabra	Scarlet sumac	Moist, rich soil
Sophora affinis	Eye's necklace	Limestone soils on hills and banks
S. secundiflora	Mountain laurel	Limestone soils
Ungnadia speciosa	Mexican buckeye	Limestone soils and moist areas

TREES

Edwards Plateau (west of the Balcones fault line)

Conifers

Juniperus virginiana	Eastern red cedar	Fields, grasslands
Taxodium distichum	Bald cypress	Along stream banks

Shade Trees

Arbutus xalapensis	Texas madrone	Limestone or igneous hills
Carya illinoinensis	Pecan	Rich, river-bottom soil
Fraxinus texensis	Texas ash	Prefers limestone hills
Juglans microcarpa	Texas black walnut	Valleys and rocky stream beds
J. nigra	Eastern black walnut	Well-drained, loamy soil
Plantanus occidentalis var. glabrata	Texas plane tree	Limestone soils
Quercus glaucoides	Lacy oak	Limestone soils
O. buckleyi	Buckley oak	Limestone soils
O. macrocarpa	Bur oak	Moist forests along streams
O. muhlenbergii	Chinkapin oak	Calcareous uplands
O pungens var. vaseyana	Vasey oak	Dry, rocky slopes
O. fusiformis	Escarpment live oak	Sandy loam soils, also clay soils
Sapindus drummondii	Western soapberry	Moist soils along streams
Ulmus crassifolia	Cedar elm	Prefers limestone soils

Small Trees

Acacia wrightii	Wright acacia	Dry, rocky soils
Acer grandidentatum	Bigtooth maple	Valleys & canyons (protected areas)
Aesculus arguta	White buckeye	Limestone and granite soils
A. pavia	Red buckeye	Limestone canyons and rocky hills
Cercis canadensis var. mexicana	Mexican redbud	Rich, moist sandy loam
C. canadensis var. texensis	Redbud	Rich, moist sandy loam
Chilopsis linearis	Desert willow	Dry, well-drained areas
Cotinus obovatus	Smoketree	Rocky banks and hillsides
Diospyros texana	Texas persimmon	Dry, well-drained sites
Eysenhardtia texana	Texas kidneywood	Dry, well-drained sites
Ilex decidua	Possom-haw holly	Rich, moist soils
I. vomitoria	Yaupon	Low, moist woods
Parkinsonia aculeata	Retama	Moist, sandy soils
Pistacia texana	Texas pistachio	Rocky limestone soil
Prosopis glandulosa	Mesquite	Variety of soils, well-drained site
Prunus mexicana	Mexican plum	Well-drained, but moist sites
Rhamnus caroliniana	Carolina buckthorn	Low areas, moist site
Rhus glabra	Scarlet sumac	Moist, rich soil
Sophora affinis	Eye's necklace	Limestone soils on hills and banks
S. secundiflora	Mountain laurel	Limestone soils
Ungnadia speciosa	Mexican buckeye	Limestone soils and moist areas
Yucca thompsonia	Thompson yucca	Dry, rocky sites

VINES

Campsis radicans	Trumpet vine	Sun to part sun

Clematis pitcheri	Purple leatherflower	Sun to part sun
C. texensis	Scarlet leatherflower	Limestone cliffs, rocky areas, sun to part sun
Lonicera sempervirens	Coral huneysuckle	Sun
Parthenocissus quinquefolia	Virginia creeper	Sun to part sun
Passiflora incarnata	Passion flower	Sun to shade, part sun

GRASSES

Andropogon gerardi	Big bluestem	Prairies, open woods, sandy-loamy soil
A. glomeratus	Bushy bluestem	Prairies, open woods, sandy-loamy soil
Bouteloua curtipendula	Sideoats grama	Prairies, open woods, sandy-loamy soil
B. hirsuta	Hairy grama	Low, moist sites
B. pectinata	Tall grama	Loose, alkaline soils
Buchloe dactyloides	Buffalograss	Variety of soils
Hilaria belangeri	Curly mesquite	Limestone outcrops and hilltops
Melica nitens	Threeflower melic	Full sun; prefers clay soils
Muhlenbergia hindheimeri	Lindheimer muhly	Rocky slopes, hillsides, grassy plains
M. reverchonii	Seep muhly	Calcareous moist sites
Panicum virgatum	Switchgrass	Moist lowlands
Schizachyruim scoparium	Indiangrass	Open woods and prairies
Sporobolus asper	Tall dropseed	Borders of woods and prairies
Tripsacum dactyloides	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 frikarti (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 byzintina (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 leucanthurn (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 distichurn (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)

The Value of Dead and Down Wood

by John M. Davis, Urban Biologist
TX. Parks and Wildlife Department

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 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	*Aix sponsa*	x	x	
American Kestrel	*Falco sparverius*	x	x	
Barn Owl	*Tyto alba*		x	
Eastern Screech Owl	*Otus asio*	x	x	
Great Horned Owl	*Bubo virginianus*		x	x
Barred Owl	*Strix varia*		x	
Red-headed Woodpecker	*Melanerpes erythrocephalus*	x		
Red-bellied Woodpecker	*Melanerpes carolinus*	x		
Downy Woodpecker	*Picoides pubescens*	x		
Ladder-backed Woodpecker	*Picoides scalaris*	x		
Hairy Woodpecker	*Picoides villosus*	x		
Northern Flicker	*Colaptes auratus*	x		
Great Crested Flycatcher	*Myiarchus crinitus*	x	x	
Carolina Chickadee	*Parus carolinensis*	x	x	
Tufted Titmouse	*Parus bicolor*	x	x	
Carolina Wren	*Thyrothorus ludovicianus*	x	x	x
Bewick's Wren	*Thryomanes bewickii*	x	x	
Eastern Bluebird	*Sialia sialis*	x	x	
* European Starling	*Sturnus vulgaris*	x	x	
* English Sparrow	*Passer domesticus*	x	x	
Prothonotary Warbler	*Protonotaria citrea*	x	x	
Big Brown Bat	*Eptesicus fuscus*		x	
Evening Bat	*Nycticeius h. humeralis*		x	
Silver-haired Bat	*Laionycteris noctivagans*		x	
Brazilian Free-tailed Bat	*Tadarida braziliensis*		x	
Eastern Flying Squirrel	*Glaucomys volans*	x	x	
Eastern Fox Squirrel	*Sciurus niger*		x	
White-footed Mouse	*Peromyscus leucopus*		x	
Gray Fox	*Urocyon cinereoargenteus*		x	
Ringtail	*Bassariscus astutus*		x	
Raccoon	*Procyon lotor*		x	
Long-tailed Weasel	*Mustela frenata*		x	
Eastern Spotted Skunk	*Spilogale putorious*		x	

Appendix T
References

Literature:

Refer to the following books, bulletins and pamphlets for additional habitat management and specific species management information:

Habitat:

Prescribed Range Burning in Texas by L.D. White and C. W. Hanselka, TAEX, Reprinted by TPWD, # PWD-BK-7100-196-7/91

Getting Started in Prescribed Burning by Guy R. McPherson, G. Allen Rasmussen, Henry A Wright, and Carlton M. Britton, Texas Tech University, Management Note 9, 1986.

Grazing Bibliography - Interaction of Range Management or Nonmanagement with Wildlife Habitat and Wildlife by Edward L. Kozicky (TPWD) and Timothy E. Fulbright (CKWRI), TPWD #PWD-RP-N7100-185A

Symposium Proceedings - Managing Livestock Stocking Rates on Rangeland, Edited by Jerry R. Cox and J. F. Cadenhead, TAEX, Project Range Care 10/93

Coastal Marsh Management - Southeast Texas by Southeast Texas Resource Conservation and Development, Inc., Livingston, Texas

Green-tree Reservoir Management by Brent Ortego, Carl Frentress, Hayden Haucke, and Julie Hogan Rose, TPWD, #PWD-BK-7100-157-11/88

Wetlands Assistance Guide for Landowners by J. K. Anderson, TPWD, #PWD BK R2000-020 (7/95)

Wildlife Planting Guide - Southeastern States by Don Dietz (TIFPC) and Mike Whiteman (TAEX), Published by Temple-Inland Forest Products Company, Diboll, Texas

Designing a Wildscape by Diana Foss, TPWD, #PWD-BK-W7100-242L-2/97

Deer:

Learn About Whitetails by R. L. Cook, # PWD-BK-N7100-7-2/93

Deer Census Techniques by Milo J. Shult (TAEX) and Bill Armstrong (TPWD), TAEX #L-5057

Determining the Age Of a Deer by C. W. Ramsey, D. W. Steinbach, D. W. Rideout ,

TAEX #B-1453

Harvest: An Essential Strategy for White-tailed Deer Management by Fielding Harwell, TPWD, #PWD-BR-N7100-244-4/94

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)

Supplemental Forage Management for East Texas White-tailed Deer by B. J. Higginbotham and J. C. Kroll, TAEX # L12457

Supplememtal Feeding by J. R. Perkins, TPWD, #PWD-BK-N7100-033-11/91

Symposium Proceedings - Supplemental Feeding for Deer: Beyond Dogma, Edited by Charles W. Ramsey, TAEX #1000-10-96

Basics of Brush Management for White-tailed Deer Production by Tommy L. Hailey, TPWD, #PWD-BK-7100-35-12/88

Deer Management in the South Texas Plains by Ernie Davis, TPWD, #PWD-BK-7100-183-8/90

Effects of Genetics and Nutrition - On Antler Development and Body Size of White-tailed Deer by Donnie E. Harmel (TPWD), John D. Williams (TAMU), and William E. Armstrong (TPWD), TPWD #PWD-BK-7100-155-2/90

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 Quail Management in South Texas by C. Wayne Hanselka TAEX) and Fred S. Guthery (CKWRI), TAEX #B-5005

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

The 567 page book “Ecology and Management of the Mourning Dove” compiled and edited by Thomas S. Baskett, Mark W. Sayre, Roy E. Tomlnson, and Ralph E. Mirarchi. A Wildlife Management Institute book. Published by Stackpole Books, Harrisburg, Pennsylvania in 1993.

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. Harwel, TPWD, # PWD RP W7100-263 (10/95)

The 463 page book “The Wild Turkey - Biology & Management” compiled and edited by James G. Dickson. A National Wild Turkey Federation book. Published by Stackpole Books, Harrisburg, Pennsylvania in 1992.

Feral Hog:

The Feral Hog in Texas by R. Taylor, TPWD, #PWD-BK-7100-195-10/91

Animal Damage Control - Controlling Feral Hog Damage by Martin Mendoza, Jr. and Saidor H. Turman, TADCS, #5M-7-91

Symposium Proceedings - Feral Swine: A Compendium for Resource Managers, Edited by C. Wayne Hanselka and J. F. Cadenhead, TAEX, #750-3-93

Javelina:
Learn About Javelina by J. E. Ellisor, TPWD, #PWD-LF-7100-146-11/90

Ecology and Management of Javelina in South Texas by John E. Ellisor and Fielding Harwell, TPWD, FA Report Series No. 16, 1979

Purple Martin:

The Purple Martin and Its Management in Texas by J. D. Ray, TPWD, # PWD BK W7100-254 (04/95)

Waterfowl:

Waterfowl Management on Agricultural Land in Southeast Texas by Dale F. Prochaska (TAEX), David Lobpries (TPWD), and Don Steinbach (TAEX), #TAEX B-5040

Symposium Proceedings - Waterfowl and Wetland Management on Private Land,

Edited by Jack Payne, TAEX, #500-9-90

The Mottled Duck by Charles D. Stutzenbaker, TPWD, #PWD-BK-7100-154-5/88

Migratory Shore and Upland Game Birds:

The 223 page book “Migratory Shore and Upland Game Bird Management in North America” edited by Thomas C. Tacha and Clait E. Braun. Published by The International Association of Fish and Wildlife Agencies, Washington, D.C. in 1994. Printed by Allen Press, Lawrence, Kansas

Predator Control:

Animal Damage Control - Trapping Coyotes by John Dorsett, TADCS, #L-1908

Using the M-44 in Coyote Control by Milo J. Schult, Charles W. Ramsey, and Wallace G. Klussmann, TAEX, #MP-1181

Procedures for Evaluating Predation on Livestock and Wildlife by Dale A. Wade (TAEX) and James E. Bowns (USU & SUSC), TAES 20 M-10-82

Symposium Proceedings - Coyotes in the Southwest: A Compendium of Our Knowledge, Symposium Coordinator - Dale Rollins, Printing by: Texas Parks and Wildlife Department, Austin, Texas 1995

Furbearers:

The Furbearers of Texas by David J. Schmidly (TAMU), TPWD Bulletin No. 111

Neotropical Migratory Birds:

Population Ecology, Habitat Requirements, and Conservation of Neotropical Migratory Birds by Deborah M. Finch, USDA Forest Service, General Technical Report RM-205

Neotropicals in Trouble - How do we assure the survival of our migratory songbirds? By Dr. Gary Graham, Madge Lindsay, and Kelly Bryan, TPWD, Austin, Texas.

Appendix U

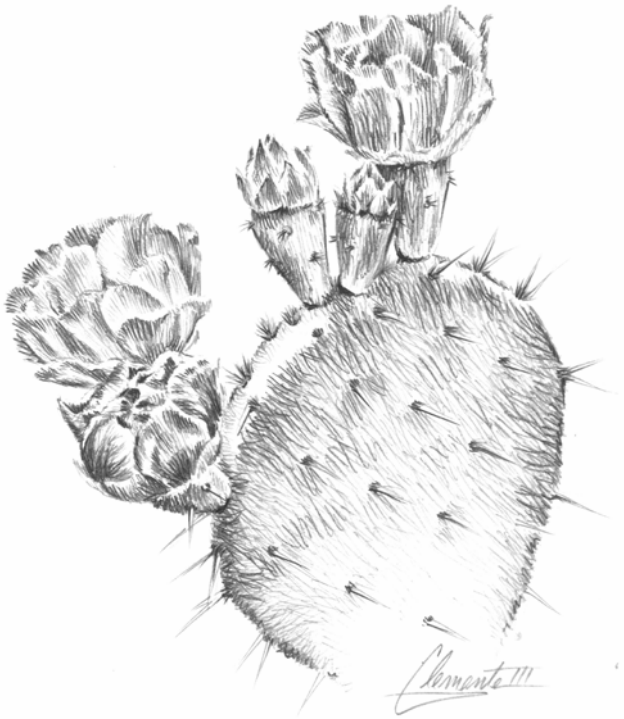
FORMS

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.*



LANDOWNER REQUEST FOR TECHNICAL GUIDANCE

1. I hereby request technical assistance of the Texas Parks and Wildlife Department, Wildlife Division field staff, in my efforts to enhance habitat and manage wildlife populations on lands under my control.

2. Permission is granted to the Texas Parks and Wildlife Department, Wildlife Division field staff, to enter upon these lands and conduct, at a mutually agreeable time, wildlife and habitat inventories which may include the use of ground vehicles, aircraft, or nighttime spotlight counts to gather data necessary for the development of management recommendations.

Section 12.0251 of the Parks and Wildlife Code provides that information collected in response to a landowner request for technical guidance on private land relating to the specific location, species identification or quantity of any animal or plant life is confidential and may not be disclosed. The Department may release game census, harvest, habitat or program information if the information is summarized in a manner that prevents the identification of an individual or specific parcel of land and the landowner.

3. I understand that recommendations will be provided to me in the form of oral and/or written guidelines, which are non-binding and voluntary on my part. By my signature, I certify that I am the owner of the below-described property or that I have been specifically authorized by the landowner to act as their agent in this matter.

Signed:_____
Landowner or Authorized Agent Date

Name of Property:_____

County:_____Acres:_____

City, State, Zip:_____

Phone Number(s):

Home:_____Office:_____Other_____

Title V Compliance: The Texas Parks and Wildlife Department provides this service to land managers without discrimination in respect to race, color, national origin, age or handicap.

Texas Parks and Wildlife Department maintains the information collected through this form. With few exceptions, you are entitled to be informed about the information we collect. Under Sections 552.021 and 553.023 of the Texas Government Code, you are also entitled to receive and review the information. Under Section 559.004, you are also entitled to have this information corrected. For assistance call 512-389-4959.

PWD 153-W7000 (10/03)

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
- ☐ Erosion control
- ☐ Predator control
- ☐ Making census counts to determine population.
- ☐ Provide supplemental supplies of water
- ☐ Provide supplemental supplies of food
- ☐ Provide shelters

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/doe): _____

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.

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: _____

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 valid.**	

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

Gulf Coastal Prairies and Marshes including the Coastal Bend

Following the lip of the Texas coast, and extending inland about 60 miles, are the Gulf Coastal Prairies and Marshes. This 9,500,000-acre swath of land traces a broad arc along the coast from the Sabine River to Baffin Bay. Elevations range from near sea level to almost 150 feet, while annual average temperatures range from 74□ F to 70□ F. Soils of the marshy areas include acid sands, sandy loams and clay. Soils of the Gulf Prairies contain more clay than the marsh areas and are very rich in nutrients (Simpson, 1988). The character of the coastline is shaped by the long and continuous confrontation with the sea, wind, and rain. Storms shape this place as a sculptor works clay, creating here and inland, a tapestry of shallow bays, estuaries, salt marshes, dunes and tidal flats. Because of the proximity to the Gulf of Mexico, many plants are highly salt tolerant or halophytic. The Coastal Bend begins at mid-coast near Corpus Christi where the shoreline is edged by Mustang and Padre Islands, described as part of the longest chain of barrier islands in the world. Here, Island dunes are dappled with sea oats, glasswort, beach evening primrose and railroad vine, hardy colonizers of the shifting beach-head sands. Sandy soils of the Coastal Bend also support distinctive chenier woodlands of scrub oaks, yaupon, red-bay, and wax-myrtle. Tallgrass and midgrass prairies, as well as spartina marshes, make up a major portion of the coastal vegetation. Much of the upland areas are dissected with numerous sluggish rivers, bayous, creeks, and sloughs. Between the rivers, extensive open prairies are dominated by little bluestem, Indiangrass and various sedges. At one time, the coastal river bottoms of this area were clothed in woodlands of sugarberry, pecan, elms and coastal live oaks. Few such areas remain today, as most of these prairies are farmed, or absorbed into urban areas. Much of the remaining native sod of the Coastal Prairies has been invaded by exotics such as MaCartney rose and Chinese tallow or native woody species including mesquite, prickly-pear, acacias and scrub oaks (Gould, 1975). Today rich coastal prairie soils are grazed for cattle production or farmed in rice, corn, grain sorghum, and cotton, while the northeastern end of this region is intensively devoted to the oil and petrochemical industries (Winckler, 1982).

Coastal areas are rich in wildlife. Where treeless earth meets endless sky, coastal marshes harbor hundreds of thousands of wintering geese and ducks and provide critical landfall in the spring for neotropical migratory birds. The area is home to important wildlife sanctuaries and refuges -- notably those protecting the endangered Attwater's Prairie-Chicken and the Whooping Crane. In the fall, coastal dunes serve as sentry roosts for northward-bound migrating peregrine falcons, while at any season there are lone willets, mini battalions of sanderlings, and congregations of gulls, terns and black skimmers feeding or loafing near the surf.

TEXAS WILDSCAPES NATIVE PLANT TABLES

BIBLIOGRAPHY - GULF COAST PRAIRIES & MARSHES

The following references were used to compile the above tables and regional description of the Gulf Coast Prairies & Marshes, including the Coastal Bend:

Ajilvsgi, G. 1984. Wildflowers of Texas. Bryan, Texas: Shearer Publishing Inc.

Ajilvsgi, G. 1991. Butterfly Gardening for the South. Dallas, Texas: Taylor Publishing Company.

Cannatella, M. 1985. Plants of the Texas Shore: A Beachcombers Guide. College Station, Texas: Texas A&M University Press.

Correll, D. and M. Johnston. 1979. Manual of the Vascular Plants of Texas. Richardson, Texas: University of Texas.

Cox, P. and P. Leslie. 1988. Texas Trees; A Friendly Guide. San Antonio, Texas: Corona Press.

Duncan, W.H. and M.B. Duncan. 1987. The Smithsonian Guide to Seaside Plants of the Gulf and Atlantic Coasts. Washington, D.C.: Smithsonian Institution Press.

Gould, F. 1975. The Grasses of Texas. College Station, Texas: Texas A&M University Press.

Gould, F., G.O. Hoffman, and C.A. Rechenthin. 1960. Vegetational Areas of Texas. College Station, Texas: Texas Agricultural Experiment Station L-492.

Jones, F. 1975. Flora of the Texas Coastal Bend. Corpus Christi, Texas: Mission Press.

Lonard, R.I., and F.W. Judd. 1981. The Terrestrial Flora of South Padre Island, Texas. Misc. Paper #6. Austin, Texas: Texas Memorial Museum, University of Texas at Austin.

Martin, A.C., H.S. Zim, and A.L. Nelson. 1951. American Wildlife and Plants - A Guide to Wildlife Food Habits. New York: Dover Publications.

Pope, T., N. Oldenwald, and C. Fryling. 1993. Attracting Birds to Southern Gardens. Dallas: Taylor Publishing Company.

Rappole, J.H. and G.W. Blacklock. 1985. Birds of the Coastal Bend: Abundance and Distribution. College Station: Texas A&M University Press.

Simpson, B.J. 1989. A Field Guide to Texas Trees. Austin, Texas: Texas Monthly Press.

Texas General Land Office. 1980. “The Natural Heritage of Texas.” Austin, Texas: Nature Conservancy.

Tveten, J and G. Tveten. 1993. Wildflowers of Houston. Houston, Texas: Rice University Press.

Vines, R.A. 1960. Trees, Shrubs, and Woody Vines of the Southwest. Austin, Texas: University of Texas Press.

Wasowski, S. and A. Wasowski. 1989. Native Texas Plants: Landscaping Region by Region. Austin, Texas: Texas Monthly Press.

Winckler, S. 1982. Texas Diversity: From the Piney Woods to the Trans-Pecos. In: The Nature Conservancy News: 32(5)

Wildscapes Plant List -- Gulf Prairies and Marshes

SPECIES	FAMILY	HABIT HEIGHT	FLOWER	FRUIT	SUN EXPOSURE	HABITAT	SOILS & MOISTURE REGIME	VEGETATION ZONE									ORNAMENTAL VALUE	WILDLIFE VALUE
								1	2	3	4	5	6	7	8	9	10	
Acer rubrum v. drummondii Drummond red maple	Aceraceae Maple Family	Tree, large 90' - 100'	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 Texas also Upper Texas Coast.	Sands, loams, and clays. Likes acid soils, but tolerates gumbo 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.
Bumelia lanuginosa Woolly-bucket bumelia	Sapotaceae Sapodilla Family	Tree, large 40' - 80'	White perfect flowers, fragrant June - July	Berries, blue-black, Sept.-Oct.	Full sun, Part shade	Mostly uplands, sometimes bottomlands, woodlands, edges and fencerows.	Sandy loams, loams, and clays. Tolerates gumbo. Well-drained, mesic.	X	X	X	X	X	X	X	X		X	Large shade tree with simple green leaves with white woolly undersurface. Persistent.	Several species of birds feed on the fruit, including cardinals, finches, robins, cedar waxwings, warblers, and vireos. Good cover and nesting tree due to protective thorns. Good substrate for insectivorous birds.
Carya ovata Shagbark hickory	Juglandaceae Walnut Family	Tree, large 60' - 100'	inconspicu-ous green m catkins & f spikes on same trees March - June	Hickory, Sept.-Oct.	Full sun, part shade	Prefers rich woodlands, bottoms & slopes, often near streams & swamps	Sands, loams & clays. Well-drained, mesic.	X	X									Tall shade tree with oblong crown & shaggy bark. Slow-growing, but long-lived. Leaves are compound with serrated edges. Next to pecan, this tree has tastiest nuts. Very shade-tolerant when young. Sometimes subject to insect damage. Deciduous.	Game birds such as turkey, bobwhite quail love the nuts as do many kinds of mammals. Several other birds, i.e., jays, woodpeckers & doves will eat the nuts too. Good cover & nesting tree. Good substrate for insectivorous birds.

Celtis laevigata Sugarberry	Ulmaceae - Elm Family	Tree, large 40' - 60'	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	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.
Fagus grandifolia American beech	Fagaceae - Beech Family	Tree, large 80' - 100'	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.
Fraxinus americana White ash	Oleaceae - Olive Family	Tree, large 60' - 70'	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	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.
Fraxinus pensylvanica Green ash	Oleaceae - Olive Family	Tree, large 30' - 80'	inconspicuous m & f yellowish catkins & spikes April - May	Samara, Sept.-Oct.	Full sun, part shade	Alluvial woods & swamps along rivers & streams, swales & depressions in prairies	Acid sands, sandy loams & heavy limestone clays. Needs moisture; poor drainage O.K.	X	X	X	X	X	X	X	X			Fairly fast-growing & long-lived shade tree. Brilliant yellow autumn color. Deciduous.	Excellent cover and nesting tree. Cardinals, finches, red-winged blackbirds relish fruit. Foliage browsed by cottontails and white-tailed deer. Larval host plant for Two-tailed tiger swallowtail and Tiger swallow-tail.

Liquidamber styraciflua Sweetgum	Hamamelidaceae Witch hazel Family	Tree, large 60' - 100'	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.
Nyssa sylvatica Black gum	Nyssaceae - Tupelo Family	Tree, large 80' - 100'	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.
Quercus falcata Southern red oak	Fagaceae - Beech Family	Tree, large 60' - 70'	inconspicuous m & f downy catkins, on the same tree March - May	Acorns, rounded with shallow cup, ripening every fall, Sept.-Oct.	Full sun, part shade	Prefers upland sites in the forests of East Texas.	Sands, to sandy loams. Likes acid soils. Well-drained, mesic.	X	X	X								Large shade tree with open, round-topped crown & stout branches. Deeply lobed leaves are attractive & produce showy red autumn color. Fast growing & long-lived. Does not like clay soils. Deciduous.	Small acorns are eaten by several species of birds, woodpeckers, jays, game birds, etc. Deer, fox & squirrels also relish them. Good cover & nesting tree & good substrate for insectivorous birds. LHP of Banded hairstreak & White M hairstreak.
Quercus michauxii Swamp chestnut oak	Fagaceae - Beech Family	Tree, large 60' - 80'	inconspicuous greenish m & f catkins April - May	Acorns, Sept.-Oct.	Full sun, part shade	Prefers moist woods associated with major rivers & streams in East Texas.	Sands, loams & clays; likes acid soils. Mesic-hydric.	X	X									Attractive shade tree with simple shallowly toothed leaves, woolly on the bottom. This long-lived tree prefers moist soils. Grows well in Houston; tolerates gumbo soils. Deciduous.	Acorns are sought after by many species of wildlife esp. wild turkey, quail, mourning dove, woodpeckers & jays. Good cover & nesting tree & good substrate for insectivorous birds. LHP of Juvenal's & Horace's duskywing, Northern & White M hairstreaks.

Quercus nigra Water oak	Fagaceae - Beech Family	Tree, large 60' - 80'	inconspicuous m catkins & f spikes April - May	Acorns ripening every 2 years, Sept.-Oct	Full sun, part shade	Occurs along streams & river bottoms, also moist upland woods in timber region of East Texas.	Sands, loams, clays, likes acid soils. Tolerates gumbo. Fast growing & easy to transplant. Mesic-hydric, poor drainage O.K.	X	X	X							Medium to large-sized shade tree with a round top and dull blue-green leaves held until December. Grows on variety of sites, tolerates gumbo. Does well in Houston. Deciduous.	Sweet edible acorns favored by over 17 species of birds & also mammals, i.e. deer, raccoons, opossums & squirrels. Good nesting & cover tree. Good substrate for insectivorous birds. Larval host plant of Horace's Duskywing, White M & Northern hairstreaks.
Quercus phellos Willow oak	Fagaceae - Beech Family	Tree, large 60' - 100'	inconspicuous m hairy catkins & f clusters on same tree March - May	Acorns, ripening every 2 years, Sept.-Oct	Full sun, part shade	Grows in bottomlands & floodplains associated with major rivers, streams & creeks throughout East Texas.	Sands, loams & clays; tolerates poorly drained hardpans. Mesic-hydric.	X	X	X							A graceful, airy oak with attractive golden leaves in the fall. This fast-growing shade tree has lustrous foliage & a high-branching crown. Does not tolerate dry sites. Grows well in Houston. Deciduous.	Abundant acorns eaten by several species of wildlife that feed in bottomlands, i.e, squirrels, beaver & fox; jays, woodpeckers & wood duck. Good cover & nesting tree. Good substrate for insectivorous birds. LHP of Horace's duskywing & White M hairstreak.
Quercus shumardii Shumard red oak	Fagaceae - Beech Family	Tree, large 50' - 100'	inconspicuous catkins, m & f, greenish March - May	Acorns, Sept.-Oct., every 2 years.	Full sun, part shade	Prefers moist forest & limestone upper woods of Piney woods, Blackland Prairies, Oak Woods & Prairies & Gulf Coast Prairies.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X					Gorgeous shade tree with beautiful leaves. Red color in autumn. Fast-growing & disease resistant. Deciduous.	Acorns eaten by a number of birds & mammals. Good cover and nesting tree. Good substrate for insectivorous birds. Larval host plant for a few species of Duskywings.
Quercus virginiana Southern Live oak	Fagaceae - Beech Family	Tree, large 40' - 60'	inconspicuous m & f reddish green catkins on same tree. April - May	Acorns, Sept.-Oct	Full sun, part shade	Prefers timberlands east of the Brazos in Gulf Coastal Prairies and south central Texas	Sands, loams & clays. Prefers clay loams & gravelly clay loams. Well-drained, mesic.	X	X	X			X				Gracious yet powerful shade tree usually festooned with Spanish moss. Long-lived & resistant to salt spray. Often planted as ornamental outside of natural range. May be susceptible to oak wilt. Evergreen.	Excellent cover & nest tree. Good substrate for insectivorous birds. Acorns relished by many species of small mammals (squirrels & raccoons), gamebirds & songbirds (woodpeckers & jays). LHP of Horace's duskywing & Northern white M hairstreak.

Tilia caroliniana Carolina basswood	Tiliaceae - Linden Family	Tree, large 40' - 80'	Showy clusters of white, 5-petaled flowers, highly fragrant April - June	Nutlets May - August	Full sun, slight shade	Prefers deep rich soils of open woodlands along forested streams & lowlands in East or Central Texas, also part of Upper Texas Coast.	Sands, loams & clays. Well-drained, mesic.	X	X	X				X				Large, often leaning shade tree with narrow irregularly rounded crown, attractive lopsided heart-shaped leaves & highly fragrant blooms. You can smell the tree before you see it. You can also hear all the buzzing from bees. Fast grower. Deciduous.	Fragrant flowers literally drip with nectar & attract all kinds of nectar-loving insects. Excellent honey tree. Fruit is eaten by several species of birds & small mammals. Good cover & nesting tree.
Ulmus alata Winged elm	Ulmaceae - Elm Family	Tree, large 30' - 60'	inconspicu-ous, perfect, petalless flowers, red to yellow Feb. to March	Samara, reddish, winged May - August	Full sun, part shade	Prefers woodlands, thickets & streamside areas, also fencerows & abandoned fields, in East Texas Piney Woods, Oak Woods & Prairies, Blackland Prairies, & Upper Gulf Coast.	Sands & sandy loams, neutral to acid. Well-drained, xeric-mesic.	X	X	X	X	X						Handsome shade tree with an open, round-topped crown, straight trunk and alternate simple coarsely toothed leaves. Beautiful yellow autumn color. Rapid growing, & easy to transplant. Deciduous.	Excellent cover & nesting tree; also good substrate for insectivorous birds. Seeds eaten by gamebirds, songbirds & squirrels. Twigs & leaves browsed by deer, opossum & rabbits. Larval host plant of the Question Mark.
Ulmus americana American elm	Ulmaceae Elm Family	Tree, large 40' - 80'	inconspicu-ous red to green flowers Feb.-April	Samara March - June	Full sun, part shade	Prefers rich soils along streams & lowland areas	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X		X	X			Excellent shade tree turning yellow gold in autumn. Fast growing & handsome shape. Long-lived. Larval host plant to Comma, Question Mark, Mourning Cloak & Painted Lady. Deciduous.	Seeds & buds eaten by gamebirds, woodpeckers, chickadees, robins, vireos, sparrows, orioles & finches. Good cover & nest tree with plenty of insects for insectivorous birds. Deer browse leaves; squirrels, foxes & rabbits eat seeds & buds.
Ulmus crassifolia Cedar elm	Ulmaceae - Elm Family	Tree, large 30' - 60'	inconspicu-ous greenish flowers July.-Sept.	Samara Aug. - Oct.	Full sun, part shade	Prefers woodlands, ravines & open slopes	Sands, loams & clays. Mesic, seaasonal poor drainage O.K.	X	X	X	X	X	X	X	X			Good shade tree, each with a unique shape. Fast growing & long lived. Excellent yellow fall color. LHP for Mourning Cloak & Question Mark. Deciduous.	Seeds & buds eaten by gamebirds, woodpeckers, chickadees, finches, sparrows & warblers. Good nesting and cover tree with lots of insects for insectivorous birds. Deer browse leaves; squirrels, foxes & rabbits eat seeds & buds.

Aralia spinosa Devil's walking-stick	Araliaceae - Ginseng Family	Tree, small 12' - 30'	Showy, large 1-foot clusters of small yellowish white flowers July.-Aug.	Drupes, wine-red to black & juicy with a single seed, Sept.-Oct	Part shade, dappled shade, shade	Prefers rich moist soils along streams, woods & thickets, moist bottomlands of East Texas and Upper Texas Coast. Grows in Houston.	Sandy loams, loams. Mesic, likes moist soils.	X	X									Highly unusual understory tree with incredible twice pinnate leaves up to 4-feet long. Leaf stalks armed with small spines. Gorgeous bronze red & yellow fall color. Fast-growing, but rather short lived. Ornamental possibilities. Bizarre. Deciduous.	Flowers attract many insects, bees & butterflies, etc. Fruits are relished by many species of birds 7 the leaves are browsed by deer. Definitely a conversation piece.
Asimina triloba Common paw paw	Annonaceae - Custard Apple Family	Tree, small 20' - 30'	Exotic maroon fleshy flowers April - May	Paw paw, Sept.-Oct	Full sun, part shade, dappled shade	Prefers deep rich soils of bottomlands & creek valleys in deep East & northeast Texas.	Sands, sandy loams, loams & clays. Mesic-hydric soils; prefers moist situations.	X	X	X								Tropical-looking understory tree with large aromatic leaves. Leaves turn rich butter yellow in the fall. Prefers moist situations protected from the wind. Deciduous.	The luscious fruit is eaten by several kinds of wildlife, both birds & mammals. Fruits rarely stay on the tree long enough to get ripe. Larval host plant of the Zebra swallowtail.
Carpinus caroliniana American hornbeam (Blue beech)	Betulaceae - Birch Family	Tree, small 15' - 30'	inconspicu-ous m & female catkins on same tree March - May	Nutlets, in clusters, Sept.-Oct	Part shade, dappled shade, shade	Prefers rich bottomlands, often along steams in moist woods.	Sands, loams & clays. Well-drained, mesic-hydric soils.	X	X	X								Airy, graceful understory tree with simple, alternate leaves & jaunty fruits. Notable for its beautiful trunk which is smooth & sinewy. Very shade tolerant. Though it likes moisture, it doesn't tolerate flooding. Slow-growing & short-lived. Deciduous.	Nutlets are eaten by squirrels & other small mammals. Birds such as cardinals & finches also savor them. Larval host plant of Striped hairstreak, Red-spotted purple & Tiger swallowtail.
Cyrilla racemiflora Titi	Cyrillaceae Cyrilla Family	Tree, small 10' - 30'	Showy racemes of yellowish white flowers, fragrant. May	Capsules, egg-shaped with one to several small hard seeds August - Sept.	Full sun, part shade, dappled shade	Prefers wetland areas, swamps & bottomlands of Piney Woods & Gulf Coast Prairies & Marshes. Also occurs on sandy ridges.	Sands, sandy loams, loams, acid soils preferred. Tolerates gumbo. Hydric, poor drainage O.K.	X	X									Highly attractive almost evergreen tree which can form thickets. Great around shallow ponds & bog areas. Smooth cinnamon colored trunk with interesting flowers. Leaves reddish yellow in the fall. Persistent to evergreen.	Bees are highly attracted to the fragrant flowers. Fruits turn a mellow yellowish brown when ripe & seeds are eaten by small mammals & a few species of birds.
Diospyros virginiana Common persimmon	Ebenaceae - Ebony Family	Tree, small 30' - 40'	inconspicu-ous, m & f greenish yellow flowers on separate	Berry (persimmon) August - Feb.	Full sun, part shade	Prefers dryish woods, old fields & clearings, ditch banks in East Texas. Also mud bottomlands.	Sands, loams & clays. Thrives on almost any kind of soil. Well-drained, mesic.	X	X	X	X	X			X			Good understory tree or accent tree with drooping branches & conical crown. Good erosion control plant. Deciduous.	Fruit eaten by 16 species of birds, also by skunks, raccoons, opossums gray & fox squirrels. Leaves browsed by deer.

			tree, fragrant April - June																
Ilex vomitoria Yaupon	Aquifoliaceae Holly Family	Tree, small 15' - 25'	inconspicu-ous m & f creamy white flowers on separate trees. April	Drupes, (berry-like fruits) red on f tree Sept. - Dec.	Full sun, part shade, dappled shade, shade	Prefers low woods, hammocks & sandy pinelands along streams, East Texas Piney Woods, Gulf Coast, eastern Edwards Plateau and Oak Woods & Prairies.	Sands, loams & clays. Well-drained, mesic. Seasonal poor drainage O.K.	X	X	X			X	X				Good understory tree or accent tree with a "branchy" appearance. Female trees have red berries held over winter, very ornamental. Shiny dark evergreen leaves attractive. Adaptable, grows in sun or shade, dry or moist soils of various types. Evergreen.	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 many insects. Good nest tree. LHP of Henry's Elfin.
Morus rubra Red mulberry	Moraceae Fig Family	Tree, small 35' - 40'	inconspicu-ous 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	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.
Myrica cerifera Wax myrtle	Myricaceae - Wax myrtle Family	Tree, small 6' - 12'	inconspicu-ous whitish flowers March - April	Berries, globose, waxy Nov. - Dec.	Full sun, part shade, dappled shade	Prefers moist or dry soils of piney woods & hardwoods. Woodlands & grasslands in East Texas, Gulf Coast Prairies & Marshes.	Sands, loams & clays. Mesic, poor drainage O.K. can tolerate drier substrate.	X	X	X								Softly shaped, low-growing evergreen shrub or small tree. Is fast growing & has aromatic leaves & distinctive waxy pale bluish berries. If left unpruned, it is naturally shrubby looking. Tolerates poor drainage. Evergreen.	Dense growth provides excellent cover & nesting sites. Over 40 species of birds eat the waxy berries, cedar waxwings, robins, cardinals, mockingbirds, warblers, towhees, & sparrows. Eaten by bobwhite, quail & turkey, too. LHP for Red-banded hairstreak.

Prunus caroliniana Cherry-laurel	Rosaceae - Rose Family	Tree, small 20' - 30'	Showy creamy white elongated spike-like racemes March - April	Berries, blue-black August - 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.
Rhamnus caroliniana Carolina buckthorn	Rhamnaceae - Buckthorn Family	Tree, small 12' - 20'	inconspicu-ous, small greenish-yellow flowers May - June	Drupes, reddish brown August - 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.
Rhus copallina Flameleaf sumac	Anacardiacea e Sumac Family	Tree, small 15' - 25'	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.
Vaccinium arboreum Farkleberry	Ericaceae - Heath Family	Tree, small 15' - 30'	small drooping, run-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.

Aesculus pavia Red buckeye	Hippocastanaceae Horse chestnut Family	Tree, ornamental 10' - 35'	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.
Cercis canadensis v. canadensis Eastern redbud	Leguminosae - Legume Family	Tree, ornamental 10' - 40'	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.
Chionanthus virginica Fringe Tree	Oleaceae - Olive Family	Tree, ornamental 15' - 20'	Showy white flowers in loose hanging clusters with subtle fragrance. April	Drupes, dark blue, in grape-like clusters August - 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.
Cornus florida Flowering dogwood	Cornaceae - Dogwood Family	Tree, ornamental 25' - 40'	Showy white flowers (bracts) March - May	Berries, red August - 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. Trunk is short & dark green leaves are opposite, simple, turning various shades of red in the fall. Spectacular in spring, striking in the 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.
Crataegus marshallii Parsley hawthorn	Rosaceae - Rose Family	Tree, ornamental 10' - 25'	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.
Crataegus viridis Green hawthorn	Rosaceae - Rose Family	Tree, ornamental 20' - 35'	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.
Ilex opaca American holly	Aquifoliaceae Holly Family	Tree, ornamental 15' - 25'	inconspicu-ous m & f greenish flowers on separate trees March - April	Berries, red on f 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., Gulf Coast Prairies, Oak Woodlands & Prairies.	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: robins, cedar waxwings, thrashers, towhees, etc. Small mammals also eat berries as winter food. LHP for Henry's Elfin.
Ilex verticillata Common winterberry	Aquifoliaceae Holly Family	Tree, ornamental 15' - 25'	inconspicu-ous m & f greenish flowers on separate trees April - June	Berries, red on f tree, persist through winter Sept. - Oct. ripens.	Full sun, part shade	Prefers wet woods; hammocks along streams, swamps, pond margins, river banks. Found in East Texas, & Upper Texas Coast.	Sandy loams & clays. Mesic-hydric, seasonal poor drainage O.K.	X	X									This ornamental holly is most beautiful early Nov. on through the winter when bright red berries cover the limbs, hence its name. Tolerates wet soils. Grows in gumbo; good for Houston. Deciduous.	Excellent cover and nesting tree. Flowers attract several kinds of insects. Red berries are relished by several species of birds. Good food source for them in the winter. Larval host plant for Henry's Elfin.

Magnolia virginiana Sweet bay	Magnoliaceae Magnolia Family	Tree, ornamental 20' - 50'	Showy white flowers, fragrant April - July	Capsules, reddish, woody & cone-like with bright red flattened seeds August - Sept.	Full sun, part sun, dappled shade	Prefers moist soils of swaps & 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.
Prunus caroliniana Cherry-laurel	Rosaceae - Rose Family	Tree, ornamental 20' - 30'	Showy creamy white elongated spike-like racemes March - April	Berries, blue-black August - 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.
Prunus mexicana Mexican plum	Rosaceae - Rose Family	Tree, ornamental 15' - 35'	Showy, white perfect flowers, fragrant. Feb.-April	Plum, red-purple, Sept.-Oct	Full sun, part shade	Prefers river or creek bottoms, hardwood slopes & hillsides, & prairies.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X		X			Medium sized, single-trunked ornamental tree with broad crown and satiny silver bark with dark fissures. Excellent accent plant with heavenly fragrance when in bloom. Deciduous.	Early spring clouds of white flowers are wonderful nectar source, attracting bees, butterflies & diurnal moths. Gamebirds, songbirds & several species of mammals feast on the ripe plums. Larval host plant for Tiger swallowtail.
Pyrus arbutifolia Red chokecherry	Rosaceae - Rose Family	Tree, ornamental, small 8' - 12'	Showy, white to pink flowers March - May	Pome, Sept.-Oct	Full sun, part shade	Prefers wet woods & swamps of East Texas, Upper Texas Coast.	Sands, loams & clays. Mesic-hydric, seasonal poor drainage O.K.	X	X								Ornamental shrub to small tree with good fall color, turning bright red. Flowers are also quite showy in the spring. Deciduous.	The fruit is a highly valuable wildlife food in the fall & winter & is eaten by at least 13 species of birds including quail, pheasant, turkey, robins & cedar waxwings. Beautiful flowers attract several varieties of insects: bees, butterflies & moths.

Styrax americana Big-leaf snowbell	Styracaceae - Styrax Family	Tree, ornamental 12' - 15'	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 small white flowering ornamental 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.
Symplocos tinctoria Sweetleaf	Symplocaceae Sweetleaf Family	Tree, ornamental 30' - 50'	Showy clusters of yellow flowers, fragrant Feb. to May	Drupes, blue-gray to orange brown, Sept.-Oct	Full sun, part shade	Prefers low moist grounds of river bottoms & bay flats.	Sands & sandy loams, acid soils preferred. Mesic-hydric, poor drainage O.K.	X	X								Semi-evergreen small tree with slender upright branches & beautiful bright yellow flower clusters. Leaves are thick, leathery & lustrous. Persistent to evergreen.	Flowers attract many different kinds of insects. The leaves are sweet & greedily eaten by several herbivorous species of wildlife. Seeds from the fruit are eaten by Eastern phoebe & many other species of birds. Larval host plant of King's hairstreak.
Viburnum rufidulum Rusty black-haw viburnum	Caprifoliaceae - Honeysuckle Family	Tree, ornamental, also a shrub 20' - 30'	Showy creamy-white clusters of flowers March - May	Berries, bluish-black (drupes), Sept.-Oct	Full sun, part shade	Prefers moist soils along streamsides, in open woods & thickets.	Sands, loams & clays, esp. limestone soils. Well-drained, mesic.	X	X	X	X	X		X	X		X	Small, single-trunked, ornamental with broad crown. Attractive as understory tree, also beautiful in the open. Leaves very glossy, turning red, mauve or orange in fall. Slow growing, staying shrub size for a long time. Deciduous.	Flowers are good nectar source for bees, butterflies & other insects. Fruits relished by several kinds of birds & small mammals. Robins, cedar waxwings, cardinals, bluebirds & mockingbirds love fruit, as do squirrels, opossum, raccoons & rabbits.
Juniperus silicicola Southern red-cedar	Cupressaceae Cypress Family	Conifer 20' - 30'	inconspicuous m & f cones March - May	Cones, berry-like, bluish, small Aug. - Dec.	Full sun, part shade	Prefers areas near water with shallow water table, mostly near the coast.	Clays, acidic soils preferred. Mesic, seasonal poor drainage O.K.		X								Small evergreen tree with slender pendulous branches & usually single trunk. Fairly handsome with ornamental qualities, having scalelike or appressed leaves. Foliage is dense, cones are small & berry-like. Evergreen.	Dense-foliaged tree is excellent cover and nesting tree. Bluebirds, mockingbirds, robins, cedar waxwings, thrashers, warblers, finches & sparrows relish fruit, esp. in winter. Small mammals also eat fruit. LHP of Olive hairstreak.

Juniperus virginiana Eastern red-cedar	Cupressaceae Cypress Family	Conifer 30' - 60'	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. Tolerates 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.
Pinus echinata Short-leaf pine	Pinaceae - Pine Family	Conifer 80' - 100'	inconspicuous, m & f cones Feb. to 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 Elfin.
Pinus taeda Loblolly pine	Pinaceae - Pine Family	Conifer 60' - 100'	inconspicuous, m & f cones Feb. to March	Cones, medium-sized, 2-6" long, light reddish brown, often armed with prickles, Sept.-Oct	Full sun, some shade	Prefers gravelly uplands & bottomlands of East Texas Piney Woods, Gulf Coast Prairies & Marshes & Oak Woods & Prairies, west to Bastrop.	Sands, sandy loams, acid soils preferred; but tolerates many other soil types. Also tolerates poor drainage. Well-drained, mesic. More drought tolerant than long-leaf.	X	X	X								Fast-growing, medium-coned pine with spreading branches & compact rounded crown. Also fire resistant. Highly drought tolerant. Most common pine in Eastern forests. Has good ornamental potential. 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 Elfin.
Taxodium distichum Bald cypress	Taxodiaceae Bald Cypress Family	Conifer 45' - 100'	inconspicuous 5'-long drooping clusters of m cones. F cones at branch tips. March - April	Cones, wrinkled, rounded, 1-inch in diameter, Sept.-Oct.	Full sun, part shade	Prefers moist soils in swamps, river bottoms, forests along streams.	Sands, loams & clays. Mesic-hydric, seasonal poor drainage O.K.	X	X	X	X		X	X				Large conifer with feathery, deciduous, needle-like leaves. Fast-growing with reliable bronze fall color. Long-lived tree often used as ornamental. Spanish moss (good nesting material) festoons branches. Deciduous.	Excellent cover & nesting tree. Seeds eaten by many different kinds of birds, esp. waterfowl & sandhill cranes. Squirrels, & many other forms of wildlife eat seed cones. Good foraging substrate for insectivorous birds.

Amorpha fruticosa False indigo	Leguminosae - Legume Family	Shrub 5' - 10'	Showy purple flower spikes with yellow anthers. April - May	Pods, clustered, small & brown. July - Aug.	Full sun, part shade	Prefers low areas at the water's edge, along streams.	Sands, loams & clays. Mesic, seasonal poor drainage O.K.	X	X	X		X	X					This moisture loving shrub is notable for its beautiful flowers, attractive leaves & airy form. Relatively fast growing. Deciduous.	Flowers are a good nectar source for bees, butterflies & other insects. Leaves are browsed by deer. Larval host plant for Dogface butterfly, Gray hairstreak, Silver-spotted skipper, Hoary edge skipper.
Callicarpa americana American beauty-berry	Verbenaceae - Vervain Family	Shrub 3' - 9'	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.
Castanea pumila Allegheny chinquapin	Fagaceae - Beech Family	Shrub, large 15' - 30'	Showy white m catkins in clusters, f flowers inconspicu-ous on same tree, fragrant March - June	Spike-like burs with nuts August - Sept.	Full sun, part shade	Prefers open woodlands & thickets in East Texas & Upper Texas Coast. Occurs on dryish, upland sandy soils.	Sands, sandy loams. Well-drained, mesic-xeric.	X	X									A large deciduous spreading shrub or small tree with simple, shiny green leaves with white hairy underside. Leaves are attractively scalloped on edges. Bark in distinctively furrowed. Mildfly resistant to Chestnut blight. Deciduous.	Fragrant flowers attract a wide variety of insects. Catkins are alse eaten by birds. Nuts are delicious & sweet & highly sought after by several species of gamebirds, woodpeckers & jays, as well as small mammals.
Cephalanthus occidentalis Buttonbush	Rubiaceae - Madder Family	Shrub 5' - 20'	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	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.

Euonymus americanus Strawberry bush	Celastraceae Strawberry Bush Family	Shrub 4' - 6'	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.
Itea virginica Virginia sweetspire	Saxifragaceae Saxifrage Family	Shrub 4' - 6'	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 are showy, drooping white spires, & the leaves turn bright red in the fall. It is 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.
Lantana horrida Lantana	Verbenaceae Vervain Family	Shrub 3' - 6'	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, mesic to xeric.	X	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.
Leucothoe racemosa Sweetbells Leucothe (Fetter-bush)	Ericaceae Heath Family	Shrub 3' - 12'	Showy racemes of pinkish urn-shaped flowers, all facing downward April - June	Capsules with wingless seeds August - Sept.	Full sun	Prefers moist thickets & swamp forests, sunny lakeshores in East Texas, Upper Texas Coast.	Sands, sandy loams, loams & clays, acid soils preferred. Mesic-hydric.	X	X								WIdely branching, erect shrub with racemes of pinkish white urn-shaped flowers. Leaves are simple, elliptic with finely toothed margins. Good understory tree for low woods & acid swamps. Quite ornamental. Persistent.	This attractive shrub is NOT browsed by white-tailed deer.

Myrica cerifera Wax myrtle	Myricaceae - Wax myrtle Family	Shrub 6' - 12'	inconspicu-ous whitish flowers March - April	Berries, globose, waxy Nov. - Dec.	Full sun, part shade, dappled shade	Prefers moist or dry soils of piney woods & hardwoods. Woodlands & grasslands in East Texas.	Sands, loams & clays. Mesic, poor drainage O.K. can tolerate drier substrate.	X	X	X								Softly shaped, low-growing evergreen shrub. Is fast growing & has aromatic leaves & distinctive waxy pale bluish berries. If left unpruned, it is naturally shrubby looking. Tolerates poor drainage. Evergreen.	Dense growth provides excellent cover & nesting sites. Over 40 species of birds eat the waxy berries, cedar waxwings, robins, cardinals, mockingbirds, warblers, towhees, & sparrows. Eaten by bobwhite, quail & turkey, too. LHP for Red-banded hairstreak.
Sabal minor Dwarf palmetto	Palmae Palm Family	Shrub 3' - 5'	Small, whitish flowers with yellow anthers on stalk (Spadix) May - June	Drupes, black, in drooping clusters, Sept.-Oct	Full sun, part sun, dappled shade, shade	Prefers lowland swamps, river terraces & floodplains.	Sands, loams & clays. Mesic-hydric, poor drainage O.K.	X	X	X				X				Highly dramatic accent plant for shady, moist location. Fairly drought resistant once it is established. Evergreen.	Excellent cover & nesting plant for small birds. Affords protection all year round. Flowers significant source of honey. Fruits eaten by several species of birds & small mammals.
Sambucus canadensis American elderberry	Caprifoliacea e Honeysuckle Family	Shrub 15' - 30'	Showy white 4-8' flower clusters June - Sept.	Berries, blue-black Sept. - Nov.	Full sun, part shade	Prefers wet soils in low places esp. along streams & swamp edges.	Sands, loams & gravelly clays. Mesic-hydric, poor drainage O.K.	X	X	X	X	X		X				Attractive erect shrub or small tree with white flower pompoms, preferring moist conditions in alluvial soils. Attractive pinnate leaves. It loves extra water & will grow fast if well supplied. Rather drought-tolerant. Ornamental qualities. Persistent.	Flowers are an excellent source of nectar for bees, butterflies, diurnal moths & other insects. Fruits are eaten by several species of birds, including gamebirds & songbirds. Small mammals also relish the ripe fruit. Leaves are browsed by deer.
Symphoricarpus orbiculata Coral-berry	Caprifoliacea e Honeysuckle Family	Shrub 1.5' - 6'	Showy, many-flowered greenish-white or pink, in terminal spikes June - Aug.	Drupe, berry-like, pink to coral-red, Sept.-Oct	Dappled shade, part shade	Prefers woods, thickets & streamside areas in eastern 1/3 of Texas	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X		X				Hardy, slender erect thicket-forming shrub with brown shreddy bark & opposite oval-shaped leaves. Great erosion control plant. Highly ornamental. Deciduous.	Excellent cover shrub when bushy. Fruits are eaten by at least 12 species of birds including cardinals, bobwhite, quail, wild turkey bluebirds, robins, mockingbirds, thrashers & cedar waxwings.

Viburnum acerifolium Maple-leaf viburnum (Arrow-wood)	Caprifoliaceae Honeysuckle Family	Shrub 2' - 6'	Showy small white flowers in flattened cymes. April - May	Drupes, red to purplish black, persistent Aug. - Oct.	Part shade, dappled shade	Prefers moist woods & thickets of East Texas	Sands, loams & clays. Likes acid soils. Well-drained, mesic.	X		X							Thicket-forming shrubs with erect or ascending branches and attractive maple-like leaves. Quite ornamental with attractive flowers &fruits. Has excellent fall color of crimson to dark purple. Deciduous.	Flowers are popular with nectar-loving insects such as bees & butterflies. Fruits are relished by several species of birds. Foliage is browsed by white-tailed deer.
Yucca treculeana Spanish dagger	Agavaceae - Agave Family	Succulent 5' - 15'	Showy, white & waxy flowers on tall flower stalk, fragrant at night Feb.-April	Capsules, Sept.-Oct	Full sun, part shade, dappled shade	Prefers tall chaparral or brushland	Sands, loams, & clays. Well-drained, mesic.		X				X	X			Dramatic accent plant with lush tropical-looking flowers. Hard to transplant old ones. Evergreen.	Moths pollinate fragrant white flowers by night. Good nesting shrub, well-protected. Flowers eaten by many specie of mammals. Larval host plant for Strecker's giant skipper, Ursine giant skipper & Yucca giant skipper.
Aristolochia tomentosa Pipevine	Aristolochiaceae Pipevine Family	Vine, weak climber	Showy, purple & yellow, amazingly shaped flower April - June	Capsules with many seeds Aug.	Full sun, part shade	Prefers moist bottomland woods, also along rivers	Sandy loams, loams & clays. Well-drained, mesic.	X	X	X	X						Vine with very unusual flower with ascending spreading habit. Plant is good ground cover. Deciduous.	The leaves and stems of this vine are used as a larval host plant for the Pipevine swallowtail.
Bignonia capreolata Cross-vine	Bignoniaceae Catalpa Family	Vine, climber to 50'	Showy, tubular flowers, red on outside, yellow on inside March - April	Capsule with winged seeds August - 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.
Campsis radicans Trumpet-creeper	Bignoniaceae Catalpa Family	Vine, climber "to the sky"	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	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.
Clematis crispa Blue jasmine	Ranunculaceae Buttercup Family	Vine, climber to 10'	Showy lavender bell-shaped flowers with flared edges March - June	Achenes August - 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.
Cocculus carolinus Carolina moonseed	Menespermaceae Moonseed Family	Vine, climber to 15'	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 some & 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.
Gelsemium sempervirens Carolina jessamine	Loganaceae Logania Family	Vine, climber to 50'	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.

Lonicera sempervirens Coral honeysuckle	Caprifoliaceae Honeysuckle Family	Vine, climber to 40'	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.
Parthenocissus quinquefolia Virginia creeper	Vitaceae Grape Family	Vine, climber and ground cover	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.
Passiflora incarnata May-pop	Passifloraceae Passionflower Family	Vine, climber to 6' and ground cover	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.
Smilax laurifolia Laurel greenbriar	Smilacaceae Smilax Family	Vine, climber from 5' - 15'	inconspicuous greenish-white flowers July - August	Drupes, black & berry-like Oct. - Nov.	Part shade, dappled shade, shade	Prefers swamps & wet woods in East Texas & Upper Texas Coast.	Sands, sandy loams, acid soils prefered. Mesic-hydric, poor drainage O.K.	X	X									Thorny vine with attractive leaves of pale green color setting upright on the stem. Good protective screening plant. Keep away from human traffic areas. Evergreen.	At lease five species of birds eat the fruit, as do small mammals. Excellent protective cover plant. Tubers are also eaten by mammals.
Vitis rotundafolia Muscadine grape	Vitaceae - Grape Family	Vine, climber to 40'	inconspicuous greenish white flowers May - June	Grapes, purple-bronze, Sept.-Oct	Part shade, dappled shade	Prefers forests & woods of East Texas	Sands, loams & clays. Well-drained, mesic.	X	X	X								Vigorous climbing vine with attractive orbicular leaves & luscious fruit. Grapes make good jelly. Deciduous.	The ripe grapes are eaten by several species of game & songbirds, as well as by mammals such as gray fox, white-tailed deer, skinks, rabbits, opossums & raccoons.

Andropogon gerardi Big blue stem	Poaceae Grass Family	Grass 3' - 6'	Flowering spikelets of green to golden-tan in form of turkey foot. Aug. - Nov.	Seeds Sets seed shortly after flowering	Full sun	Prefers moist soils of meadows & prairies in the eastern 1/2 of state	Sands, loams & clays, acid or calcareous. Mesic; moderate moisture.	X	X	X	X	X	X	X	X	X	X	Can be used as a perennial meadow grass with wildflowers, a pocket tallgrass prairie or a garden accent. Adds a dramatic component. Needs rich, deep soil with moisture present. Good erosion control. Best placed at bottom of slope. Dormant in winter.	Provides good cover & food for many species of wildlife. Grass parts used as nesting & denning material. Larval host plant of Delaware Skipper, Dusted Skipper, Bunchgrass Skipper, Large Wood Nymph, Cobweb, Clouded & Beard grass skippers.
Andropogon glomeratus Bushy bluestem	Poaceae Grass Family	Grass 3' - 4'	Flowering spikelets green to buffy gold Sept. - Nov.	Seeds Sets seed shortly after flowering	Full sun, part shade	Prefers low moist sites.	Sands, sandy loams, soils can be fairly sterile. Mesic, poor drainage O.K.	X	X	X	X	X	X	X	X	X	X	Very attractive bunch grass for moist areas. Especially pretty in the fall. Tolerates poor drainage. Warm-season perennial.	Provides food & cover for many species of wild birds & mammals. Culms, leaves are used as nesting & denning material. Larval host plant of several eastern skippers.
Andropogon ternarius Split-beard bluestem	Poaceae Grass Family	Grass 1.5' - 4'	Flowering spikelets green to silvery gold Aug. - Nov.	Seeds Sets seed shortly after flowering	Full sun, part shade	Prefers open areas & woodland edges, cut over woodland pastures	Sands & sandy loams. Mesic, well-drained.	X	X	X	X	X						This beautiful grass is its most beautiful in the autumn backlit by the sun. A good meadow grass planted with wildflowers. Warm-season perennial.	Provides food & cover for many species of wild birds & mammals. Culms, leaves are used as nesting & denning material. Butterflies use grass as shelter on windy days. Larval host plant of several skippers.
Andropogon virginicus Broomsedge	Poaceae Grass Family	Grass 3' - 4'	Flowering spikelets green to yellow gold Sept. - Nov.	Seeds Sets seed shortly after flowering	Part shade, dappled shade	Prefers loose moist soils of oak woods & prairies, also shaded banks along streams.	Sands & sandy loams, loams. Mesic.	X	X	X	X							This beautiful grass is its most beautiful in the fall with its perky bushy head that looks like a broom. Takes on a lovely golden color. Warm-season perennial, dies back in winter.	Provides food & cover for many species of wild birds & mammals. Culms, leaves are used as nesting & denning material. Provides fair grazing for wildlife. Butterflies use grass as shelter on windy days. Larval host plant of Zabulon skipper.

Chasmanthium latifolium Inland sea-oats	Poaceae Grass Family	Grass 2' - 4'	Flowering spikelets green to buffy tan June - Oct.	Seeds Sets seed shortly after flowering	Part shade, dappled shade, full shade	Prefers moist woodland soils, often along creek bottoms & near streamsides.	Sands, loams & clays. Mesic, seasonal poor drainage O.K.	X	X	X	X	X	X	X	X			In moist soils in shaded areas, this beautiful grass makes a solid mat. Big drooping spikelets are especially fetching, whitish gold in the fall. Great garden accent plant in shady moist areas. Warm-season perennial, dies back in winter.	Serves as excellent forage for wildlife esp. birds & mammals. Many parts of the grass used as nesting & denning material. Larval host plant for Northern pearly eye, Pepper & salt skipper, Bell's roadside skipper & Bronzed roadside skipper.
Erianthus giganteus Sugarcane plumegrass	Poaceae Grass Family	Grass 6' - 10'	Flowering spikelets green turning peach Sept. - Nov.	Seeds Sets seed shortly after flowering	Full sun, part shade	Prefers moist areas near streams & lakes, swales, swamps & bogs.	Sands, loams & clays. Mesic-hydric, poor drainage O.K.	X	X	X	X							Excellent grass near a large water garden or near a small stream or lake. Seed heads are gorgeous, glowing a deep peach esp when back-lit by the sun. Warm-season perennial, dies back in winter.	While not an excellent forage grass for wildlife, it provides good cover for both terrestrial and small aquatic animals. Grass parts are used as nesting & denning material.
Muhlenbergia capillaris Hairyawn muhly	Poaceae Grass Family	Grass 1.5' - 3'	Flowering spikelets delicate & green turning pink or coppery magenta August - Oct.	Seeds Sets seed shortly after flowering	Full sun, part shade	Prefers prairies & openings in pine forests, also in Bastrop Co.	Sands & sandy loams. Well-drained, fairly dry.	X		X								Very beautiful feathery clumps are a great accent for garden. Perfect for a meadow garden with wildflowers. Warm-season perennial, dormant in winter.	Provides forage for seed-eating terrestrial birds & mammals, especially sparrows. Parts of plant are used as nesting & denning material.
Panicum virgatum Switchgrass	Poaceae Grass Family	Grass 3' - 6'	Flowering spikelets green turning rich gold August - 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	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.

Schizachyrium scoparium v. littoralis Little bluestem	Poaceae Grass Family	Grass 2' - 5'	Flowering spikelets blue-green to silvery gold August - 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	Most wide-ranging bunchgrass, a dominant of the tallgrass prairie. Tolerant of a wide variety of moisture & drought. A symphony of beautiful color changes through the year from blue-green to coppery gold in the fall. Warm-season perennial bunch grass.	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.
Setaria geniculata Knotroot bristlegrass	Poaceae Grass Family	Grass 2' - 3'	Flowering spikelets a greenish yellow. December	Seeds Dec.	Full sun, part shade	Prefers moist areas along streams &ditches & lake borders	Sands, loams & clays.	X	X	X	X	X	X	X	X	X	X	This perky grass is the most widespread species of bristlegrass. Does well in a naturally moist rich swale area. Bunch grass. Flowers year-round.	Fairly good grazing for wildlife when green. Seed-eating birds and small mammals eat ripe seeds, especially the Painted Bunting. Stems, leaves used as nesting & denning material.
Sorghastrum nutans Indiangrass	Poaceae Grass Family	Grass 3' - 8'	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. Mesic, likes moisture.		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.
Tripsacum dactyloides Eastern gammagrass	Poaceae Grass Family	Grass 3' - 8'	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				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.

Coreopsis lanceolata Lance-leaf coreopsis	Asteraceae Sunflower Family	Wildflower 8" - 48"	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.
Erythrina herbacea Coralbean	Leguminosae - Legume Family	Wildflower 6' - 15'	Showy coral red tubular flowers May - Dec.	Pods with poisonous red seeds Oct. to 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.
Herbertia lahue Herbertia	Iridaceae Iris Family	Wildflower 4' - 12'	Showy purple flowers March - May	Capsules with seeds May - July	Full sun, part shade	Prefers open grasslands & meadows	Sands, loams & clays. Well-drained, mesic.	X	X				X						Pretty, delicately colored flowers growing from a roundish bulb usually forming large colonies. When in large numbers if forms areas of solid blue. Perennial.	Bees are attracted to these delicate lavender flowers.
Hymenocallis liriosme Spider lily	Amaryllidaceae Amaryllis Family	Wildflower 1' - 2'	Showy white flowers with long narrow petal-like segments, fragrant May - July	Capsule, tri-partite July - Sept.	Full sun, part shade, dappled shade	Prefers periodically inundated bottomlands, marshes, along stream banks or in ditches in various soils	Sands, loams & clays, acid or calcareous. Poor drainage O.K. Even tolerates standing water.	X	X	X									Very striking white flower, each blossom about 7" across. Flowers are very fragrant. Flowers often grow in clumps. Very good plant for a bog garden. Grows well in Houston gumbo. Perennial.	Several varieties of insects are attracted to these very fragrant flowers.
Lobelia cardinalis Cardinal flower	Campanulaceae Campanula Family	Wildflower 6" - 6'	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 Ruby-throats passing through your area.

Malvaviscus drummondii Turk's cap	Malvaceae - Mallow Family	Wildflower 4' - 9'	Showy red flowers May - Nov.	Berry-like fruit, red, flattened August - 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.
Penstemon tenuis Gulf Coast penstemon	Scrophulariaceae Figwort Family	Wildflower 1' - 2'	Showy pale pink to purple flowers March - May	Capsules, ovoid with numerous seeds May - July	Full sun, part shade, dappled shade	Prefers poorly drained soils of the Gulf Prairies & Marshes.	Sands, loams & clays. Poor drainage O.K.	X	X								This penstemon does well on gumbo soils of the Houston area. Creates masses of beautiful color in the spring which may last for several weeks. They respond to extra watering in the summer to prolong bloom time. Perennial.	A wide array of insects are attracted to the flowers, including bees & syrphid flies.
Physostegia intermedia False dragon-head	Lamiaceae - Mint Family	Wildflower 4' - 5'	Showy pink to pale purple flowers April - June	Schizocarp with 4 nutlets June - Aug.	Full sun, part shade, dappled shade	Prefers moist to wet areas, growing along aquatic ditches, in swamps, marshes & bottomlands in East & southeast Texas.	Sands, loams & clays. Poor drainage O.K.	X	X				X				False dragon-head prefers damp areas and does very well in a water garden. They are highly showy when in bloom. Perennial.	False dragon-head attracts a wide assortment of insects, especially bees.
Salvia coccinea Scarlet sage	Lamiaceae Mint Family	Wildflower 2' - 4'	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.

Castilleja indivisa Indian paintbrush	Scrophulariaceae Figwort Family	Wildflower 6" - 12"	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.
Chamaecrista fasciculata Partridge pea	Leguminosae Legume Family	Wildflower 6" - 12"	Showy yellow flowers June - Oct.	Legume with seeds Aug. - Nov.	Full sun, part shade	Prefers sandy soils in old fields, open woodlands & pastures in Eastern half of the state & coastal plains	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X					Partridge pea offers bright yellow splashes of color from June to October. Flowers open early in the morning, often closing up later in the day. Good border plant. Also does well in unattended natural areas. Annual.	Partridge pea attracts bees, butterflies and ants. Ripe seeds are eaten by a number of species of gamebirds as well as songbirds. Larval host plant for Cloudless giant sulphur, Orange sulphur & Sleepy orange butterflies.
Gaillardia pulchella Indian blanket	Asteraceae Sunflower	Wildflower 1'	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, mesic-xeric.	X	X	X	X	X	X	X	X	X	X	This is a marvelously easy wildflower to grow & it comes in various coloration patters 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.
Lupinus texensis Texas bluebonnet	Leguminosae Legume Family	Wildflower 8" - 16"	Showy blue and white pea-like flowers in racemes, fragrant March - May	Legume May - July	Full sun, a little shade O.K.	Prefers open fields, meadows & prairies, also roadside areas throughout much of the state from Corpus Christi to Abilene.	Sands, loams, clays & limestone soils; really likes calcareous soils. Well-drained, mesic-xeric.	X	X	X	X	X	X	X	X			Our state flower, this Texas endemic cloaks meadows, prairies & roadsides come spring in an ocean of blue. An incredible sight that dazzles all newcomers to the state. Bluebonnets take a little work to get established and depend on fall rains. Annual.	Bluebonnets are attended by bees & other insects who forage on the nectar & pollinate the plants. Plants let the bees know a particular flower has been pollinated by turning from white to dark red at the center of the banner. LHP of hairstreaks & elfins.

Phacelia patuliflora Purple phacelia	Hydrophyllaceae Waterleaf Family	Wildflower 10" - 12"	Showy purple & white flowers Feb. to May	Capsule with seeds May - July	Full sun, part shade	Prefers sandy soils in fields, prairies, openings & edges of woods, also along stream banks in Southeast, South Central and Coastal Texas.	Sands & sandy loams. Well-drained, mesic.	X	X	X	X						This attractive low growing wildflower grows in clumps. Flower color varies from lavender to purplish-violet. They are an attractive addition to any garden. Annual.	Bees & butterflies are highly attracted to these flowers.
Rudbeckia hirta Brown-eyed Susan	Asteraceae Sunflower Family	Wildflower 1' - 2'	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	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-leafed 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 (milkvetch, etc.) lamb's quarters, plantain, groundcherry, pigweed or carelessweed and partridge peas.

How long do deer live?

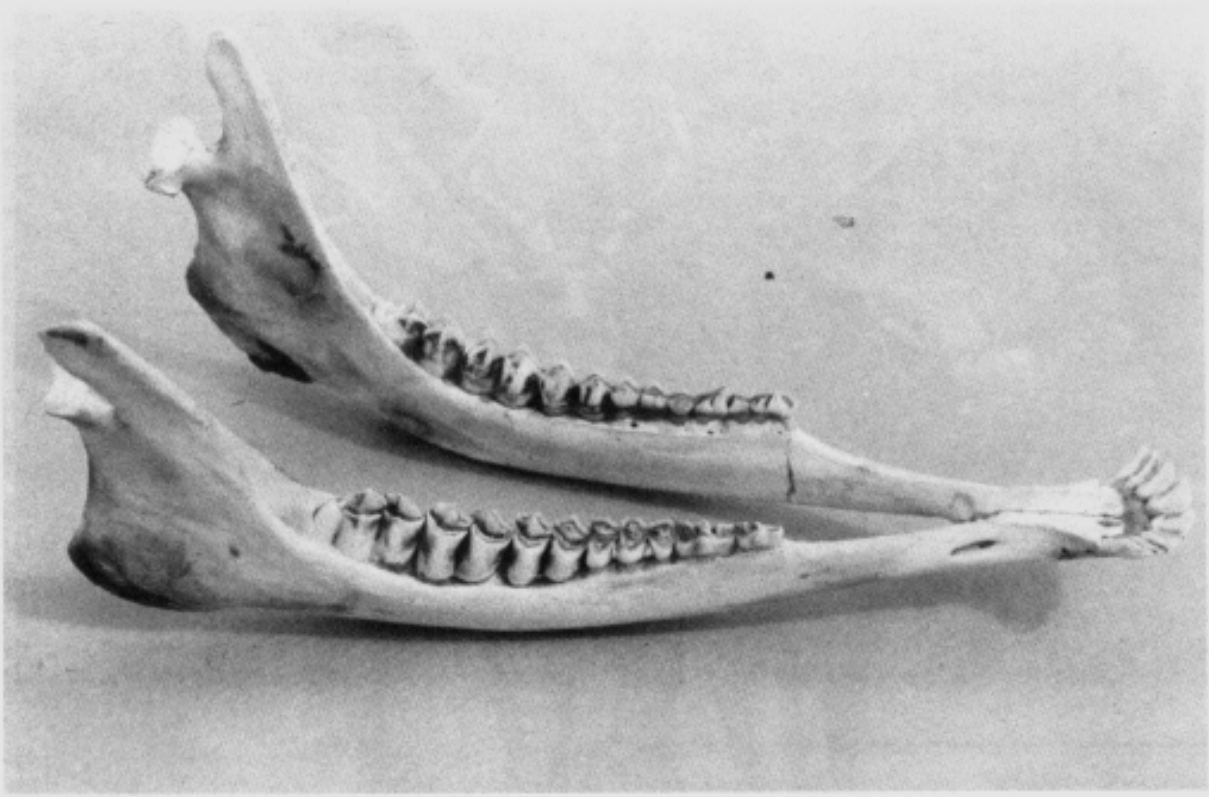
Deer in controlled situations have been known to live 15 to 20 years. It is unusual, however, for a deer in the wild to live more than 10 years, because its teeth usually wear out during the eighth or ninth year.

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 by 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.

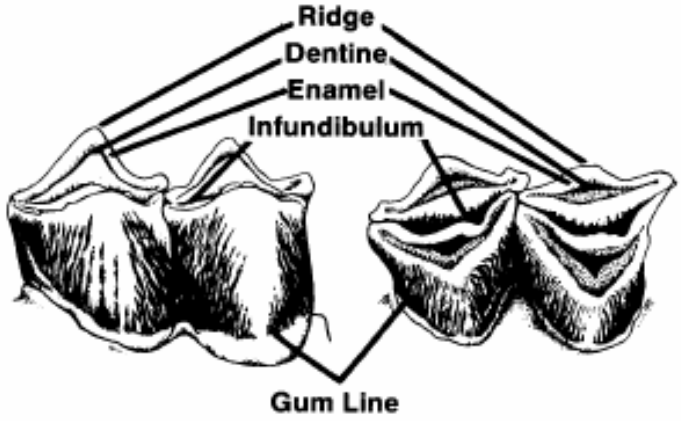
Would it help to feed the deer some supplemental feed?

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



SIDE VIEW **THREE-QUARTERS TOP VIEW**

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.

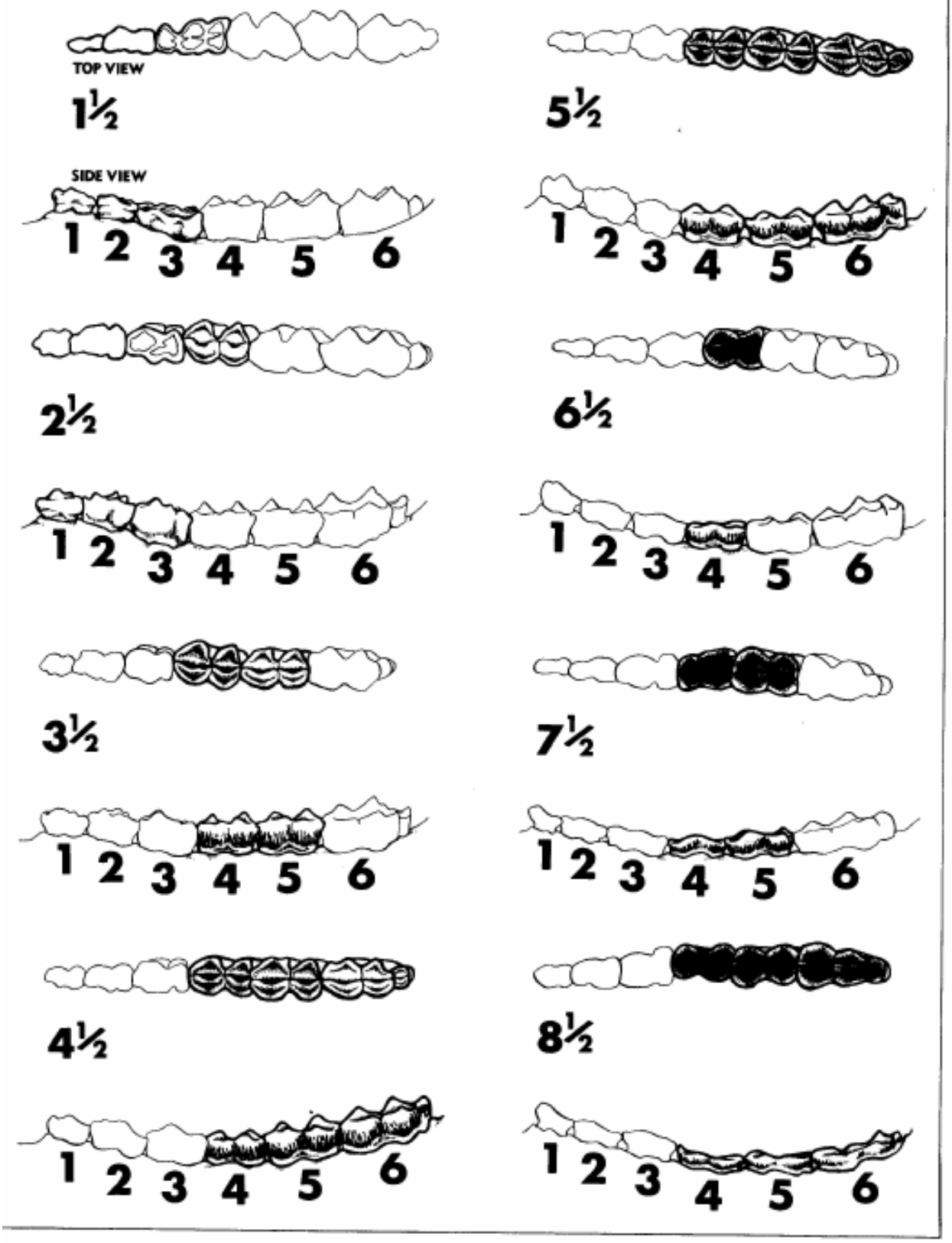
6½ year old: The first molar (tooth 4) is worn smooth, but teeth 5 and 6 are not smooth.

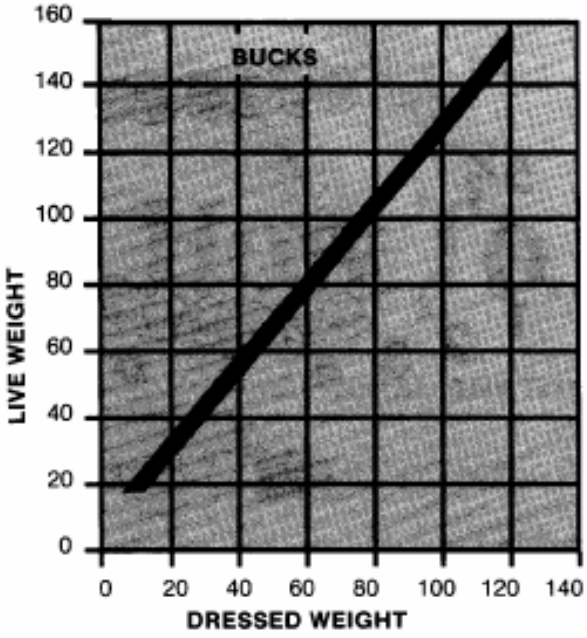
7½ year old: The first and second molars (teeth 4 and 5) are worn smooth, or tooth 5 may still have a small ridge left.

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.

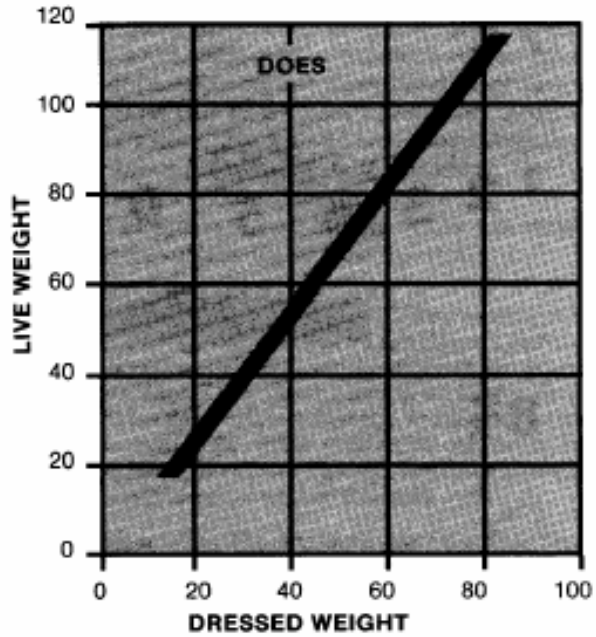
The primary factor governing antler formation is food supply. As deer grow older and their teeth wear flatter, food becomes harder and harder to chew. Body condition will drop and, simultaneously, so will antler development.


TOP VIEW
1½
5½
SIDE VIEW
1 2 3 4 5 6
1 2 3 4 5 6
2½
6½
1 2 3 4 5 6
1 2 3 4 5 6
3½
7½
1 2 3 4 5 6
1 2 3 4 5 6
4½
8½
1 2 3 4 5 6
1 2 3 4 5 6



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.

Dispersal of this publication conforms with Texas State Documents Depository Law, and it is available at Texas State Publications Clearinghouse and Texas Depository Libraries.

PWD-BK-7100-7-12/89

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 (LD_{50}) 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 LD_{50} 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.

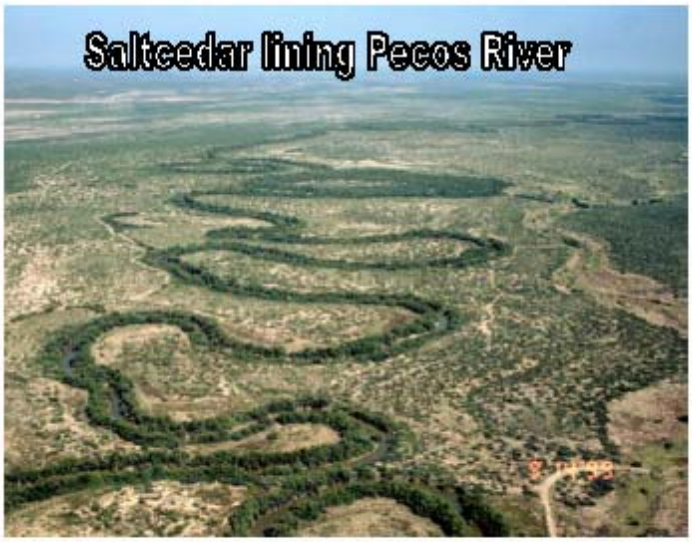
In fact, in several cases, saltcedar is being controlled with *Arsenal®* to enhance wildlife habitat. The Canadian Municipal Water District is planning to control salt cedar beginning in September 2004 along the Canadian River. This effort is being made to stop the spread of salt cedar, which is estimated 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 endangeredTexas 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.