

TEXAS PARKS AND WILDLIFE

WILDLIFE MANAGEMENT ACTIVITIES AND PRACTICES

COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES

for the

**South Texas Plains
Ecological Region**

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COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES

for the South Texas Ecological Region

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

Introduction

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

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

Wildlife Management Tax Valuation

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

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

Acreage Requirements

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

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

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

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

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



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

The Wildlife Management Plan

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

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

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

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

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

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

What Paperwork to File

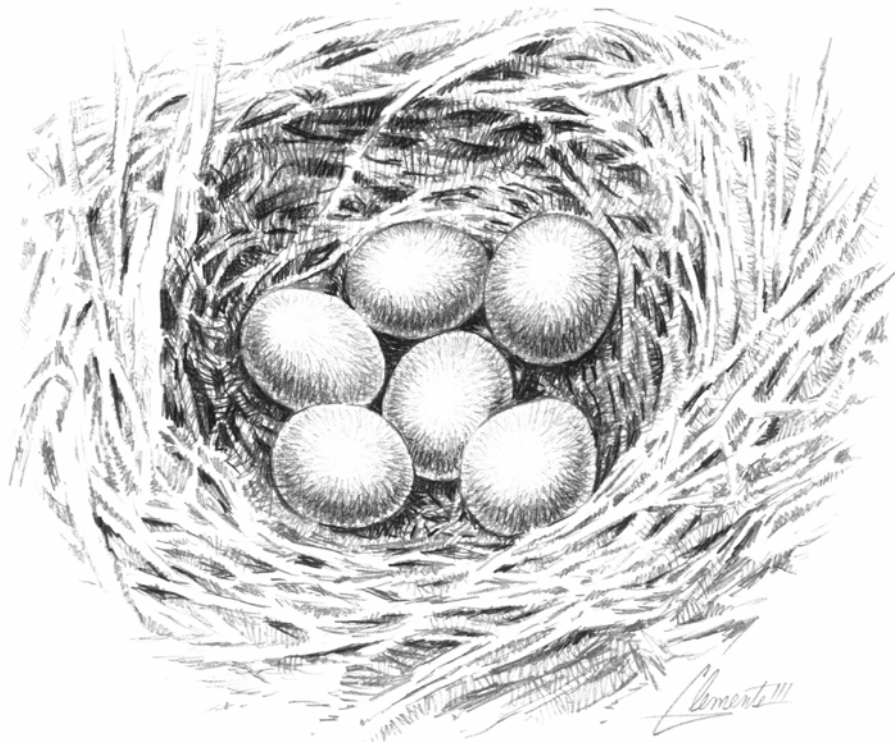
All paperwork for changing the land's qualifying agricultural practice over to wildlife management must be filed with the Chief Appraiser at the county's Central Appraisal District. No paperwork is required to be filed with Texas Parks and Wildlife Department. Landowners will need to complete a 1-d-1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



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

Habitat Control

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



HABITAT CONTROL (HABITAT MANAGEMENT)

Introduction

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

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

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

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

Grazing Management

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



Grasses evolved with grazing pressure.

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

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

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

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

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

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

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

Prescribed Burning

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



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

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

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

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

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

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 three basic requirements.

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

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

For additional information see Appendix E.

Brush Management

Historically bison and fire had a huge impact on plant communities and with the removal of these major influences plant communities changed. Without fire and a high intensity short duration type grazing regime plant communities began to see an increase in woody plant species and a change from grassland or savannah communities to more brushland or woodland habitat types. As brush continues to increase and begins to form closed canopies, cutting off sunlight to the area underneath, grass and forb production as well as overall diversity

decreases. Some woody species tend to increase at rates greater than others, such as ashe juniper, and can begin to dominate a system. Along with this domination come other changes that take place beyond what is realized by observation. Ashe juniper has had a tremendous impact on the ecosystem by causing an increase in soil erosion and significantly less water absorption. Cedar brakes lose a significant amount of precipitation through transpiration and overland flow, leaving much less water for aquifer recharge to insure adequate groundwater in the future.

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

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

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

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 manage the habitat on which these animals are dependant. Wildlife restoration means restoring or improving habitat for targeted species as part of an overall reintroduction program in a Texas Parks and Wildlife Department approved restoration area.

Erosion Control

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



Erosion Control

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

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

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

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

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

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

Water Quality and Conservation

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

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

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

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

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

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

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

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

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

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

Minimizing Erosion

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

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

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

Temporary Measures to Stabilize the Soil

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

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

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

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

Structural Runoff Controls

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

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

Using Livestock to Repair the Effects of Erosion

Just as overgrazing can cause erosion, 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.

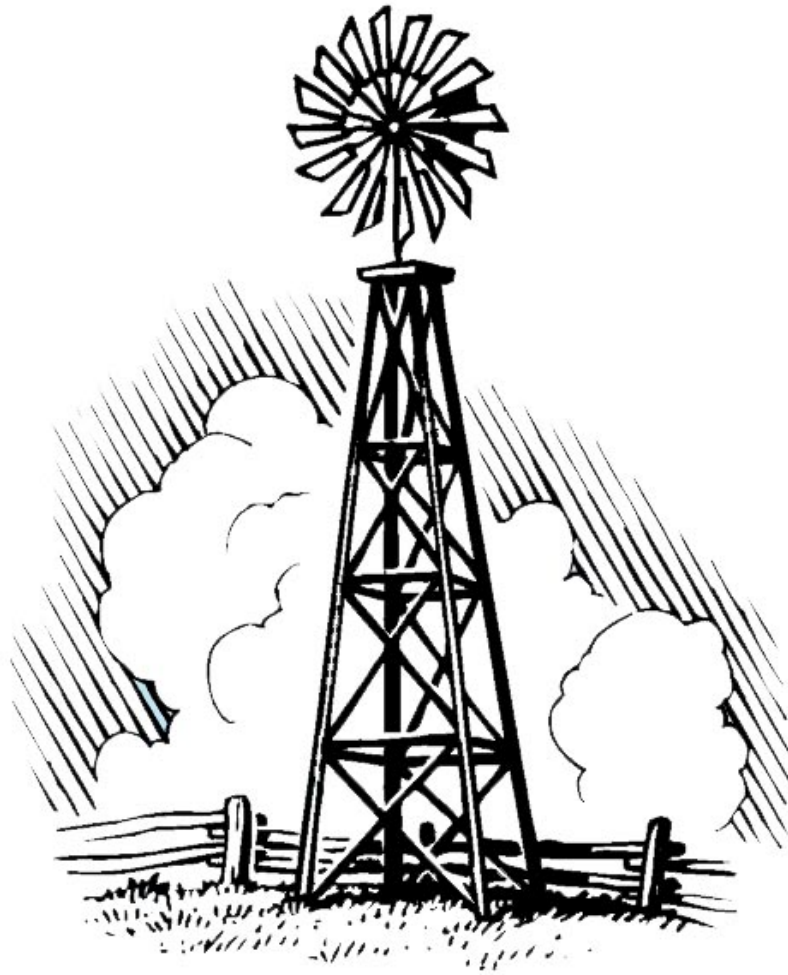
For the majority of landowners that feel predator control would be useful in meeting the criteria for H.B. 1358, the bill implemented to allow agricultural appraisal for land used to manage wildlife, a few basic practices will work. The size and location of the property, amount of wildlife habitat and 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 South Texas Plains, and across the State, landowners and managers have implemented every known control method for predators and yet they thrive. Landowners need to have a long range wildlife management plan in place defining the goals of any of the activities occurring on the property including predator control. Once in place, activities can be monitored and results can be recorded to aid in future management decision- making.

Providing Supplemental Water

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



Providing Supplemental Water

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

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

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

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

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

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

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

Providing Supplemental Food

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



Providing Supplemental Food

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

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

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

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

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

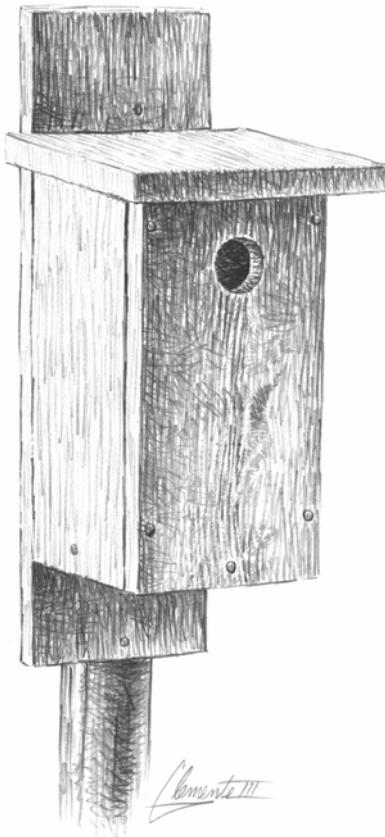
Managing tame pasture, old fields and croplands can increase plant diversity, provide supplemental food and forage and gradually help convert the land to native vegetation. Recommended practices may include:

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

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

Providing Supplemental Shelter

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



Providing Supplemental Shelter

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

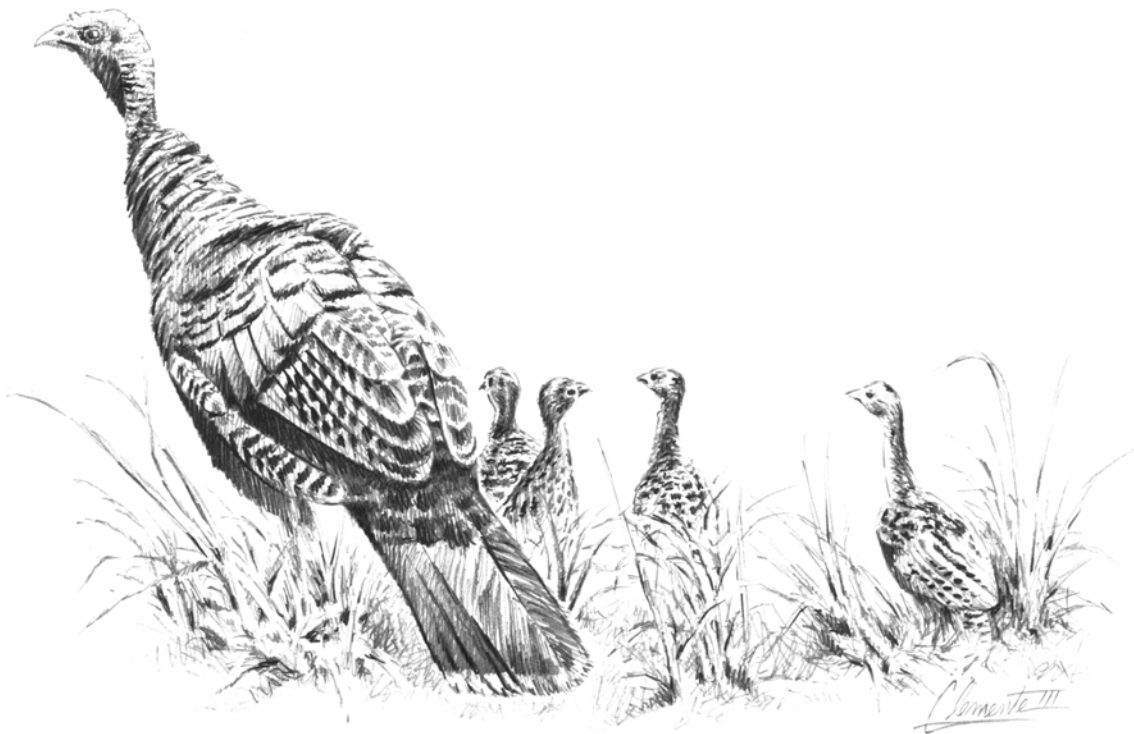
Although supplemental shelter can be provided in many ways, it will never take the place of good conservation and management of native habitats. When land is properly managed for wildlife habitat, quality cover and shelter will usually be available. Unfortunately in much of Texas, many areas have been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

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

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

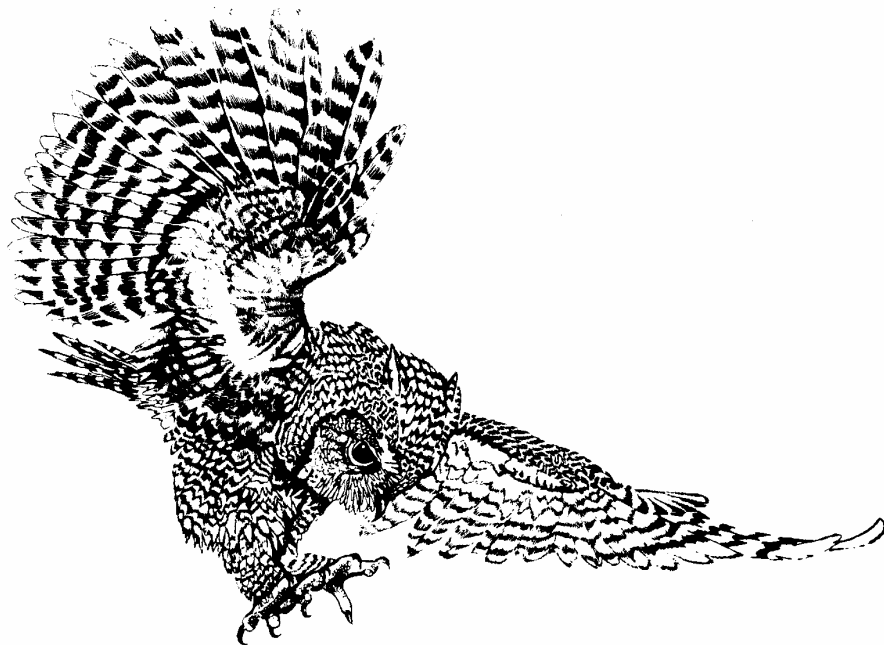
One of the most important things for a landowner to remember when designing a census protocol of nongame species on their property is the ability to be consistent. In other words, be able to do the same thing in the same way at the same time each and every time the census is conducted.

APPENDICES

STANDARD WILDLIFE HABITAT AND POPULATION MANAGEMENT RECOMMENDATIONS

For the

SOUTH TEXAS PLAINS
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 South Texas Plains 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 ACTIVITIES 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:

Native Grass Pasture:

Bottomland Woods:

Non-native Pasture:

Upland Woods:

Wetlands(optional):

Ponds/Lakes:

Other(specify):

Total Acres:

Current Habitat Description:

Describe vegetation association or type (e.g.; Mesquite-Granjeno, Cenizo-Blackbrush, Mesquite-Lotebush Elm-Hackberry; Crops; Native or Introduced Grasses, etc.). State dominant plants occurring and/or crops grown on the property. The description can include the soil types and vegetation associated with the various soil types. Describe livestock and wildlife water sources (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. _____

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.)



Good grazing management that includes deferment and rest for pastures enhances vegetative quantity, quality, and diversity.

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.

Grazing management systems might include:

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

- 1 Herd / 4 Pasture
- 1 Herd / multiple pasture multiple herd / multiple pasture (goal is to move toward always resting 75% of area)
- High intensity/low frequency (HILF)
- Short duration system
- Other type of grazing system (ex. a short-term stocker system):
- Planned Deferment (e.g., number of years livestock will be deferred from the property, etc.):

PRESCRIBED BURNING

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



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

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 3 percent of acreage annually burned in the South Texas Plains**). 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 South Texas Plains 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 a minimum 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.

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. 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. Refer to “Agroforestry Notes - A Riparian Buffer Design for Cropland” (AF Notes-5, January 1997) by the U.S. Forest Service that gives details for establishing a 50 ft. wide strip of grass, shrubs, and trees between a stream and cropland. 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

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

(Refer to Appendix F for information on the management of the endangered Ocelot and Jaguarundi, both which occur in portions of the South Texas Plains.)



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

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).

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

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

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

PRESCRIBED CONTROL OF NATIVE, EXOTIC AND FERAL SPECIES



Use legal means to control the number of grazing and browsing animals. Maintain the population density of native wildlife (particularly white-tailed deer — see Appendix F) at 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 naturalized salt cedar, etc.). Convert tame pasture grasses (such as large areas of coastal bermuda, klinegrass, old world bluestems) to native vegetation. **The removal or control of exotic vegetation or the conversion of tame grass pastures must affect a minimum of 10% of the area designated in the plan, or 10 acres annually, whichever is smaller.**

WILDLIFE RESTORATION

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

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

grass/legume/forb mixture to prevent sedimentation; (e) the installation of rip-rap, dredge spoil, or other barrier material - placement of material along erodible embankments to prevent erosion and protect wildlife habitat; (f) the establishment of stream crossings to provide permanent low water crossings in order to reduce or prevent erosion. **A minimum of one project must be completed 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 by 1/4 mile in length), renovate old shelter-belts (re-fence, root-prune, and replace dead trees), and establish shrub mottes, improve plant diversity, and improve wildlife habitat; (b) establish perennial vegetation on terraces and field borders (30 yard minimum width) to reduce erosion, improve plant diversity, and improve wildlife habitat; (c) conservation tillage/no-till farming practices by leaving waste grain and stubble on the soil surface until the next planting season to provide supplemental food or cover for wildlife, control erosion, and improve the soil tilth; (d) manage Conservation Reserve Program cover by maintaining perennial cover established under the Conservation Reservation Program (expired contracts) on erodible sites using proper management techniques such as haying, prescribed grazing or prescribed burning. **A minimum of 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/LEEVE 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. **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

Implementing methods designed to protect the immediate area surrounding a spring. This practice may include excluding and/or controlling livestock around springs to maintain native plant and animal diversity and/or moving water through a pipe to a low trough or shallow wildlife water overflow, making water available to livestock and wildlife while preventing degradation of the spring area from trampling and other animal impacts. 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 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 3 percent of the designated area must be treated annually to qualify.**

FENCE LINE MANAGEMENT

Maintain, establish, or allow the establishment of trees, shrubs, forbs, and grasses on fence lines to provide wildlife food and cover, minimum of 30 yards wide. This practice is only applicable where cover is limiting in the habitat, i.e. cropland or tame pasture. **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 31.

Mowing/swathing of hay fields should be postponed until after the peak of nesting/rearing period of ground-nesting birds and mammals (July 31). 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.

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

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

HALF-CUTTING TREES OR SHRUBS

The practice of partially cutting branches of a live tree or shrub to encourage horizontal, living cover near the ground, providing supplemental cover in habitats where cover is lacking (see TPWD Bulletin 48) relative to an overall plan for target wildlife species. This practice is best done in the early or middle part of the growing season.

A minimum of one clump of trees/shrubs per 50 yards on at

least 10 percent of acreage or 10 acres, whichever is smaller, annually to qualify.



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.

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.

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

Note: For census activity to qualify for deer, a combination of methods must be used to obtain a reasonable assessment of the deer herd for habitat and

harvest management. For most properties, this will require spotlight surveys, daylight or incidental observations, and harvest data for all deer (age, weight, and antler measurements). Similar intensity should be applied for other species to qualify in this activity.

SPOTLIGHT COUNTS

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

AERIAL COUNTS

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

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

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

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

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

2. Changes to the Wildlife Use Appraisal Regions

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

Trans Pecos

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

High Plains

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

- Yoakum

Rolling Plains

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

Western Edwards Plateau

- Crockett
- Edwards

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

Eastern Edwards Plateau

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

Cross Timbers and Prairies

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

- Wise
- Young

South Texas Plains

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

Blackland Prairie

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

Post Oak Savannah

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

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

Pineywoods

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

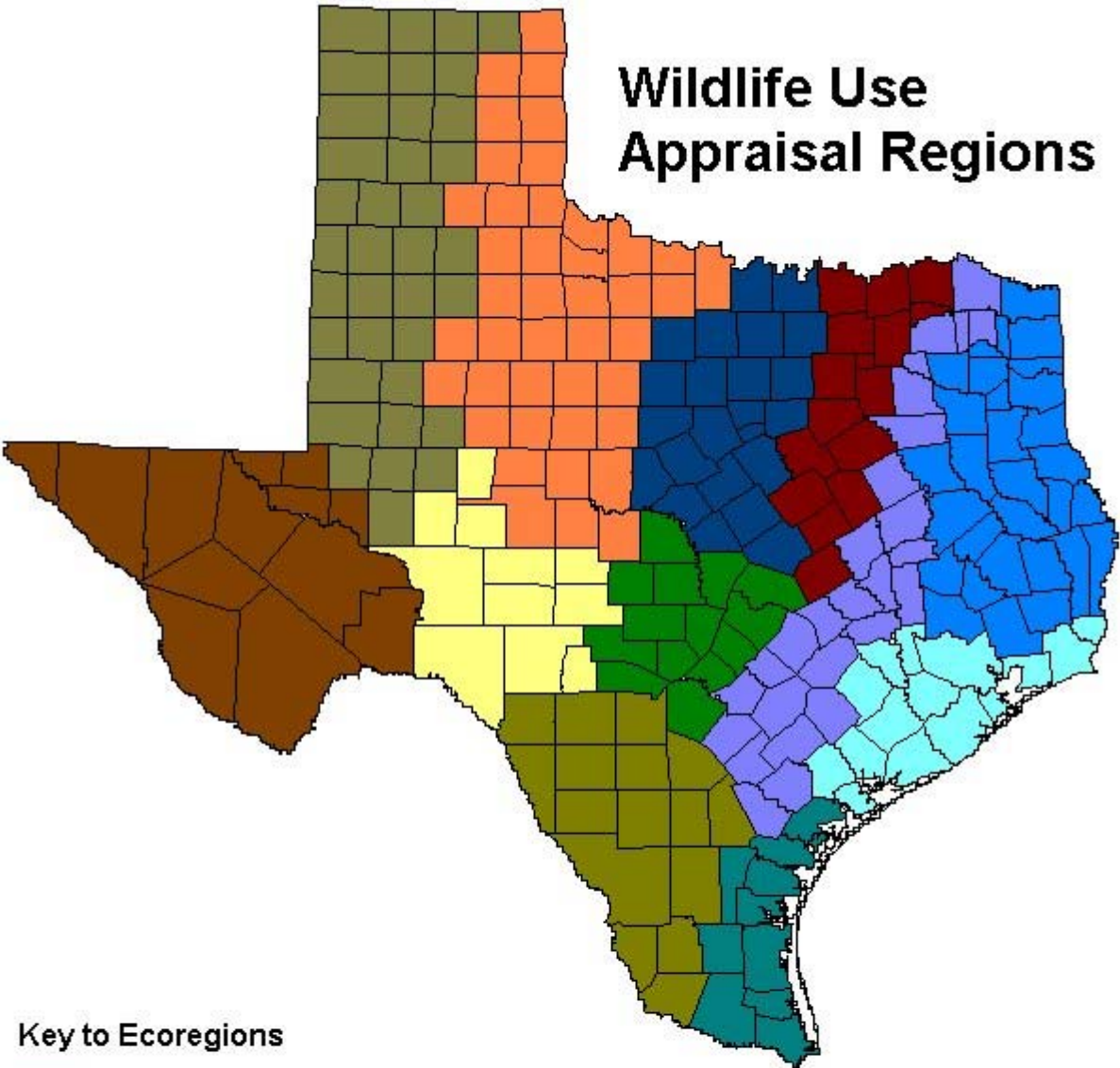
Upper Gulf Prairies and Marshes

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

Lower Gulf Prairies and Marshes

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

Wildlife Use Appraisal Regions



Key to Ecoregions

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

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

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

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

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

5. Changes to Wildlife Use Requirement are as follows:

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

Appendix C

Wildlife Management Plan Overview

Use this list to assist in planning your wildlife management activities

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

Appendix D

Livestock Management Recommendations

CATTLE MANAGEMENT OPERATIONS ARE THE SINGLE-MOST IMPORTANT FACTOR THAT EFFECT DEER AND MOST OTHER WILDLIFE POPULATIONS IN THE SOUTH TEXAS PLAINS 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 to provide tall grasses and weeds for fawn nursery areas and quail/turkey nesting areas.

These fences can be constructed of only 4-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. Moderate to light stocking rates for this area are generally: one animal unit (cow with calf) per 50 acres on native grass.

Grazing Management Plan should include:

Kind of Livestock: Cattle Sheep, Goats, 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.

High Frequency-Short Duration, 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 South Texas Plains is 1 animal unit (a.u.) per 35 acres; 20 acres on tame pasture. 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
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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 South Texas Plains, 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. Good livestock management, utilizing a deferred-rotation grazing system at proper stocking rates, can prevent overutilization of vegetation by livestock. Sound deer and feral hog (and other large exotics, such as axis, sika, etc.) harvest strategies are also needed to prevent overuse of food and cover by wildlife. Native white-tailed deer and feral hogs (and large exotics if present) are the only wildlife species present in the South Texas Plains 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.

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

Wildlife have a certain requirement for cover. Cover provides a sense of security from disturbance and protection from inclement weather and predators. The amount and kind of cover vary with the species. A stand of herbaceous plants may provide adequate cover for some bird species and small mammals, while other species require woody cover (trees and shrubs) in lieu of or in addition to herbaceous cover. The best cover for a large species such as white-tailed deer in the South Texas Plains is a diverse community shrubs, cacti, forbs (weeds) and grasses. Any clearing of shrubs should leave 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 75 percent or more of the South Texas Plains has been mechanically manipulated and seeded to introduced grasses such as Buffelgrass, Lehmann Lovegrass, Kleingrass, Guineagrass, etc. Encouraging the reestablishment of native shrubs, grasses and forbs on these acreage's can make these areas more productive habitats for all species of wildlife.

Sound deer and feral hog (including other large exotics, such as axis, sika, etc.) 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 South Texas Plains 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.

Management of any vegetative community 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, mesquite, prickly pear, and other 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 herbicide control of trees, brush, or weeds, and is important to create and maintain open rangelands for grassland dependent wildlife. Most of these practices will require the use of specialized equipment or machinery for plowing, disking, 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 restore and maintain native grasslands, prescribe burn about one-third of native grass openings each year, burning each site every three years, on a rotating basis, to remove old growth and young, invasive woody growth such as cedar, locust, and persimmon. This will stimulate new growth of plants that may have become dormant due to not having occasional fires to stimulate growth. Pasture burn sites should normally be less than 40 acres and be burned in late summer (late August through September) weather conditions permitting. 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 and turkey, especially for the young.

General burn prescriptions for South Texas Plains are:

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

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

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

Prescribed burning is the cheapest, most effective habitat management technique for the South Texas Plains 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 resprouting of many woody species. Soil disturbance associated with mechanical controls releases the natural seed bank found

in the soil, increasing the quantity, quality, and distribution of plants beneficial to wildlife. However, without periodic follow-up treatments of fire, herbicides, or additional mechanical manipulations, and/or without proper livestock grazing management, these sites will eventually again become dense stands of regrowth brush and trees. Mowing (shredding) areas of herbaceous plants and/or low density woody plants is another form of mechanical treatment. Mowing should be postponed until after the peak of the nesting/young-rearing period of local ground-nesting birds and mammals. One-third of open areas can be mowed per year, preferably in strips or mosaic types of patterns, to create "edge" and structural diversity.

Biological control is the use of heavy grazing pressure by livestock such as goats to control or suppress woody plants and sheep to control herbaceous weeds. 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. 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.

There are many specifically formulated herbicides on the market today that can selectively control unwanted vegetation to enhance wildlife habitat. Determining the proper product and application technique requires consultation with TCE, NRCS, or TPWD personnel. Always advise that wildlife is a goal for your projects of this type. If herbicides are improperly use, they can have a significant negative impact on many plant communities and may suppress or eliminate plants other than the target species. Selective application methods, rather than broad-scale applications, are recommended to avoid the elimination of plants that are important to wildlife.

Mesquite Control

Mesquite is a woody plant occurring all over the South Texas Plains. 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.

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, nitrogen fixing roots, and cover, that is beneficial to many wildlife species.

Range enhancement involves range reseeding and native grass restoration.

Establishing native herbaceous plants (grasses and forbs) that provide food and cover, benefits wildlife and provides erosion control benefits. Plant species selected and methods for establishment should be applicable to the county. Non-native species are generally not recommended, but if required for a specific purpose, non-native species should not exceed 25 percent of the seeding mix. 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. 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). Natural Resource Conservation Service personnel in the area can provide detailed recommendations on range and native grass reseeding, designed to meet individual goals. Refer to Appendix K for native grass restoration guidelines.

Farming Practices: Delaying of shredding or mowing of hay or native grass pastures until after July 31 will usually avoid killing of young fawns or ground nesting birds by accident.

Use Integrated Pest Management to minimize pesticide applications (consult the Texas Department of Agriculture, Austin). If necessary, spot spraying is much preferred over broadcast spraying especially for broad-spectrum herbicides. 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.) that are the basis of quail, dove, and other seed-eating bird's fall and winter diets, shallow disk 10 - 20 foot wide strips in sandy soil around the edge of brush and woods after the first freeze. This practice will promote growth of these important forbs the following spring and summer.

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. Many areas of south Texas have land tracts significantly less than 3,500 acres in size, and 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 (weeds and wildflowers) 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. The climate in south Texas is known for its frequent drought therefore forb production 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.

Therefore the drought resistant shrubs and prickly pear cactus are the most stable part of the deer's habitat. A few of the key browse plants occurring in south Texas include prickly pear, guayacan, granjeno, coma, cenizo, guajillo, kidneywood, brasil, hackberry, and cedar elm, Many of these plants also produce mast (acorns, fruits, or beans) that are readily eaten by deer, and are an important food source.

Deer diet studies have demonstrated that these animals may consume up to 100 different species of plants. Although a few (< 10) species may present the bulk of the volume of the diet the other species may provide essential nutrients or elements required in very small amounts. Protecting the natural diversity of the mixed shrub communities which occur in south Texas is the first step in providing quality wildlife habitat. Providing the largest number of different native plant species should a key management objective.

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 an area where the average antler quality has been historically low have produced outstanding antlers through a combination of good habitat management, population management, and supplemental feeding. Deer within these populations had the genetic potential for large antlers, but were unable to express their potential because of inadequate nutrition and/or they were harvested before reaching mature ages.

Cover Requirements:

The best cover for white-tailed deer is a pattern or mosaic of 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 35 acres observed out of a helicopter.

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 South Texas is less than 2 does per 1 buck.

The fawn production objective is .50 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 (August 1-September 15), during the time of the year when bucks have identifiable antlers and fawns are old enough to be up and moving around yet still small enough to be recognized as fawns. Replicating the spotlight census 3 to 4 times during the annual census period will increase the sample size and improve the population estimates. A minimum of 100 daylight observations (or as many as practical) of deer should be recorded. Binoculars should be used to aid in identifying deer.

The aerial (helicopter) census technique is the primary method used to estimate population density (acres per deer), 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. Recent studies in South Texas have shown the helicopter census is relatively inaccurate technique counting 30 to 65% of a marked sample of deer. This data should only be used as a guide from which to make harvest recommendations. The greatest values of an aerial census are the herd composition data 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 3-5 years, to verify and support density, herd composition, and antlered buck quality estimates derived from annual spotlight censuses and 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. If one of the deer management objectives is to produce bucks with larger antlers, they must be allowed to reach older ages, which means that the harvest of young, immature bucks should be restricted. Restricting hunters to mature bucks along with the harvesting of bucks with undesirable antler only is a good management strategy. Deer body characteristics, their behavior and antler characteristics, can 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.

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

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

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

Records Management:

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

- 1.) annual deer population data (census data)
- 2.) number of deer harvested annually
- 3.) biological data from deer harvested, to include:
 - a.) field dressed weight
 - b.) antler measurements: inside spread, number of points, main beam lengths, circumference of antler bases. The Boone and Crockett antler scoring system can be

used to measure overall antler quality.

c.) age: the manager can age the deer at the time they are harvested or the lower jaws can be removed from deer and stored for later aging by a biologist until the manager is proficient at aging.

d.) presence or absence of lactation (milk production) of does (to supplement fawn production estimates).

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

Supplemental Feeding / Food Plots:

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

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

Planting food plots may be a more effective method to supplement well managed native habitats than feeding, but like feeding, its cost effectiveness needs to be taken into account, considering factors such as climate, soil type, slope and drainage, labor, material, and equipment costs, and fencing from domestic livestock. Like feeding corn, food plots are typically used to bait and hold deer in an area. To provide optimum nutritional benefits to deer, the Texas Agricultural Extension recommends that 1) food plots comprise between 2% to 5% of the total land acreage, 2) at least one-half the food plots be planted in cool season species (planted in early fall with forage available during winter stress periods) and at least one-half of the food plots be planted in warm season species (planted in spring with forage available during the summer stress period), and 3) the plots be between 1/2 to 5 acres in size, long and narrow, and well distributed over the entire area adjacent to escape cover. Food plots should be planted on the deepest

soils available.

Cool season plantings (planted in October) 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, or planting separately, will increase the protein content. However, there are very few legumes that can be incorporated into supplemental plantings that are well adapted to this region. Natural Resources Conservation Service (NRCS) recommended cool season legumes: vetch, Austrian winter peas, clover (Madrid, rose, Big Bee, burcane).

Warm season supplemental plantings are generally less successful than cool season plantings. Typically, during drought conditions when native vegetation is in poor condition and supplemental plantings are most needed, there is not enough moisture for production of food plots. There is no one species that can be recommended for a warm season planting to supplement the diets of deer. NRCS recommended warm season annual species are: spanish peanuts, grain sorghum, cowpeas, common sunflower. Most species of "improved" livestock forage grasses are not highly preferred by deer.

Appendix G

Specific Management Recommendations for Bobwhite Quail



In relative terms, the overall habitat types occurring in the region are among the best in Texas. Also, quail population densities tend to vary greatly from year to year, even in the best quail producing regions of the state. The timing and amount of fall and winter rainfall are thought to be the most critical factors that determine quail breeding success and survivability during the next year (adequate amounts of fall/winter rains improve soil moisture, and that promotes the early growth of herbaceous plants).

Basic Habitat Requirements:

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

Food and cover must occur in a well-arranged pattern if they are to comprise quail habitat. The distance between a source of ample food and adequate cover must not be greater than bobwhites can negotiate with safety. As a rule of thumb, bobwhites venture no further than 200 yards from patches of cover. Ideally, escape cover should be linked to food supplies with more or less continuous screening cover. 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 (tame pasture monocultures) cannot be easily negotiated. Without a suitable space relationship, a range will not be habitable for quail regardless of the quality or amount of food and cover present.

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. 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. In the western portion of the area, the trunks of multi-stemmed 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 cedars can also form small areas protected from grazing/browsing where patches of herbaceous and woody plants

suitable for cover can become established. The number of browsing animals on the range (combination of wildlife and domestic livestock) needs to be maintained at a level where browsing pressure on low growing woody cover is not excessive.

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

Most good seed producing forbs are early successional stage annuals that respond to soil disturbance that sets back plant succession. Discing the soil is a good practice that encourages the growth of forbs and other annual plants. Discing strips should be long and meandering and 1 or 2 disc widths wide. The same strips can be discing annually, or side-by-side strips can be discing on an alternating basis every other year to create adjacent strips in various stages of succession. The best plant response will occur in areas of deeper sandy, sandy-loam soils. It is important that discing 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, and sorghum planted on deeper soils near cover can provide supplemental food sources during periods of extreme weather conditions. A limiting factor of supplemental food plots is sometimes an insufficient amount of rainfall received in south Texas during the summer. During dry years when the production of native foods is limited and supplemental foods are most needed, supplemental plantings will also be failures. During good years when the production of native foods is adequate, supplemental plantings may do well, but are not as necessary. Also, these seeds do not normally last long into the fall and winter, due to normal fall rainfall. Another limiting factor is that most types of supplemental plantings will have to be protected from livestock grazing by fencing the plot or deferring the pasture.

Feeding can provide supplemental food during extreme weather conditions and help hold quail in an area. Broadcasting corn or sorghum by hand is one method of

distributing supplemental feed. It can also be distributed from fixed feeders. An intensive feeding program would be one that provides 1 feeder per every 40 to 60 acres of quail habitat (feeders placed 440 to 540 yards apart in a grid pattern) so that every quail covey has access to several feeders. One feeder per 75 acres may be sufficient. As with all other types of food sources, feeders need to be located near escape and screening cover to be useable by quail. Some limitations of supplemental feeding are: 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



Rio Grande 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 does. (4) Prescribed burns can be utilized to control regrowth cedar as well as increase production of forbs, grasses and fruit or mast producing browse plants.

In summary, range management activities that increase the diversity of grasses, forbs, shrubs, trees, and vines improves the habitat for the wild turkey. These same management practices are also beneficial to deer, quail, and many other wildlife species.

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 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.

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 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 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.
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- 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 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 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.

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

Appendix J

Nongame Wildlife Management Recommendations

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.

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

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 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 D for more information on quail and Appendix E 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, kestrels, 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 TPWD 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. Besides rooting up pastures, feral hogs compete directly with deer, turkey and most other wildlife species that rely heavily on acorns and other hard and soft mast for winter food. Deer also tend to avoid areas when feral hogs are present.

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

Appendix K

Guidelines for Native Grassland Restoration Projects

by

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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 prairie 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 cocklebur. 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.

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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 South Texas

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 South 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 significant limitations to using spotlight census for estimating densities of white-tailed deer in south Texas. Spotlight surveys have limited application on tracts of land where dense vegetation greatly reduces visibility. 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. Cornering 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 = 170.29 ac.

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

What equipment do I need to make a deer survey? Pickup trucks (4-wheel drive

may be required) are preferred over sport utility vehicles or cars. Use a 25 ft. piece of 12 gauge insulated woven wire with two "alligator" clips on one end and a two-plug outdoor type outlet box on the other. Replace the cigarette lighter plug on the spotlight cords with a standard male plug. Attach the alligator clips to the positive and negative poles of the vehicle battery and plug the light into the outlet box. Other wiring systems can also be used. Use 100,000 candlepower tractor or utility bulbs and avoid using Q-beam-type lights, which are heavy, produce excessive glare, and can quickly drain a battery. Other necessary equipment includes clipboard or tape recorder, **binoculars**, and a pencil.

How do I conduct the survey? Drive the route 5 to 8 mph. In open terrain where visibility permits, speed may be increased to 10-12 mph. Stop only to identify deer or determine the number of deer in a group. Unless all deer observed in a group can be identified by sex and age-class, record ALL these deer as unidentified. Recording only bucks from a group will bias data and reflect a better buck to doe ratio than may be present. Record deer as **bucks, does, fawns, or unidentified**. Deer are usually first spotted by their reflective eyes. Deer eye 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: $179 \text{ does} / 71 \text{ bucks} = 2.52 \text{ does per buck}$

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

The helicopter census technique is the most popular method of estimating deer population density in south Texas. This is due to the height and density of the vegetation and the relatively large areas that helicopters can easily cover. Most helicopter surveys are conducted during September through November in order to establish density estimates, herd composition (such as adult sex ratios, fawn survival, buck age structure) and harvest quotas for the upcoming hunting season.

Most surveys are complete coverage surveys, where 100% of the area to be managed is flown. This survey involves flying adjacent transects, or straight lines, beginning along one side of the property and continuing until all of the property has been flown. Most transects are flown in either a north-south or east-west direction. For complete coverage surveys, transects are spaced 200 yards apart. The helicopter is flown down the center of the transect and the pilot, plus 1-3 observers, count deer out to 100 yards on each side of the helicopter.

Since it is easier to spot a moving deer, the helicopter is flown at a low altitude (50-75 ft.) so that the sight and sound of the helicopter will cause deer to flush and run. Occasionally, stationary deer are sighted by the observers, but the vast majority of deer seen during surveys are running.

Once deer are sighted from the helicopter, they are categorized by sex and age. Bucks, does, and fawns are tallied separately. Most observers categorize bucks by antler and body size into 3 groups: small, medium, and large. These groups roughly translate into young bucks (1.5-2.5 yrs. old), middle age bucks (3.5-4.5 yrs. old), and mature bucks (5.5+ yrs. old). Some biologists and managers further categorize mature bucks into "average" and "trophy" groups according to antler size.

Recent studies in South Texas have shown the helicopter census is a relatively inaccurate technique counting 30 to 65% of a marked sample of deer. This data should only be used as a guide from which to make harvest recommendations. The greatest values of an aerial census are the herd composition data 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 3-5 years, to verify and support density, herd composition, and antlered buck quality estimates derived from annual spotlight censuses and incidental observations.

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 Data: An Essential Element of White-tailed Deer Population and Harvest Management in South Texas

Herd composition data refers to the **buck to doe ratios, fawn survival, and relative age structure of bucks within a population.** These key population parameters are used to implement and evaluate management and harvest strategies. 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. Herd composition data through field observations provide supplemental information which is essential.

Deer herd composition data through field observations should be made during that time of the year when bucks, does, and fawns are most easily identifiable. The best time of the year for the collection of reliable herd composition data in South Texas seems to be from October through November. Observations initiated before October tend to underestimate fawn survival because fawns are not actively up and moving with does until they are 6-8 weeks of age. December observations may result in skewed sex ratios and inaccurate fawn survival estimates because of the rutting activity which occurs in South Texas during this period.

Herd compositions counts can be made any time of the day. Record **only** deer which can be identified as a buck, a doe, or a fawn. 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. 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. In South Texas baiting deer through the feeding of senderos, roads, and established feeder locations is a common practice. Deer become accustomed to bait and can be readily observed in a very relaxed setting. The use of binoculars or spotting scopes allows for reliable herd composition data to be collected and enables the observer to classify bucks into relatively broad age classes.

Data should be recorded on a simple forms that has columns for the date, bucks, does, fawns, and total. When all herd composition observations are completed, simply add to total number of bucks, does, and fawns observed together. It is recommended that a minimum of **200** individual deer be identified if possible. **The more the better!**

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 (*fawn survival*)**, **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**

Appendix N

Managing Red Imported Fire Ants in Wildlife Areas

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

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

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

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

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

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

in wildlife areas are discouraged unless the benefits from such treatments have been documented. Many pesticides are toxic to non-target organisms (particularly to aquatic organisms) and may directly or indirectly affect game species if not used properly. Below are some considerations when selecting management options:

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

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

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

Insecticide-based management program: Fire ant populations can be suppressed in pastureland using currently available methods for \$10 to \$15 per acre per year. Current methods are not capable of eradicating this species and treatments need to be periodically re-applied. Applications of some bait-formulated insecticides also affect

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

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

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

Appendix O

Wildlife Watering Facilities



By
Jerry Turrentine, NRCS Biologist

USDA – Natural Resources Conservation Service

WILDLIFE WATERING FACILITIES DESIGNS AND DRAWINGS

Designs for wildlife watering facilities can be simple or very complex. A simple facility works well in many situations by more complex facilities are needed in some situations. Each situation needs to be evaluated and the proper facility recommended to the 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 1 inch of the open end of sink trap. Glue end plug and sink trap to PVC pipe. To fill, turn upside down and fill through sink trap. After filling, use hose clamps to fasten PVC pipe to T post. If larger PVC pipe is used, it can be necked down to 2 inch sink trap. A 3 inch PVC will hold 1 gallon, and a 4 inch will hold 4 gallons.

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

1. Materials:

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

2. Construction and Installation:

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

B. Small Game Guzzler (Drawing #4)

1. Materials:

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

2. Construction and Installation:

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

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

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

C. Windmill Supply Pie Dripper (Drawing #6)

1. Materials:

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

2. Construction and Installation:

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

D. Plastic Container (Drawing #13)

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

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

COST SHAREABLE FACILITIES

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

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

Pipe and Pipeline:

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

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

Additional Requirements:

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

B. Big Game Guzzler (Drawing #9)

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

C. Inverted Umbrella Guzzler (Drawing #10)

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

D. Flying Saucer Guzzler (Drawing #11)

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

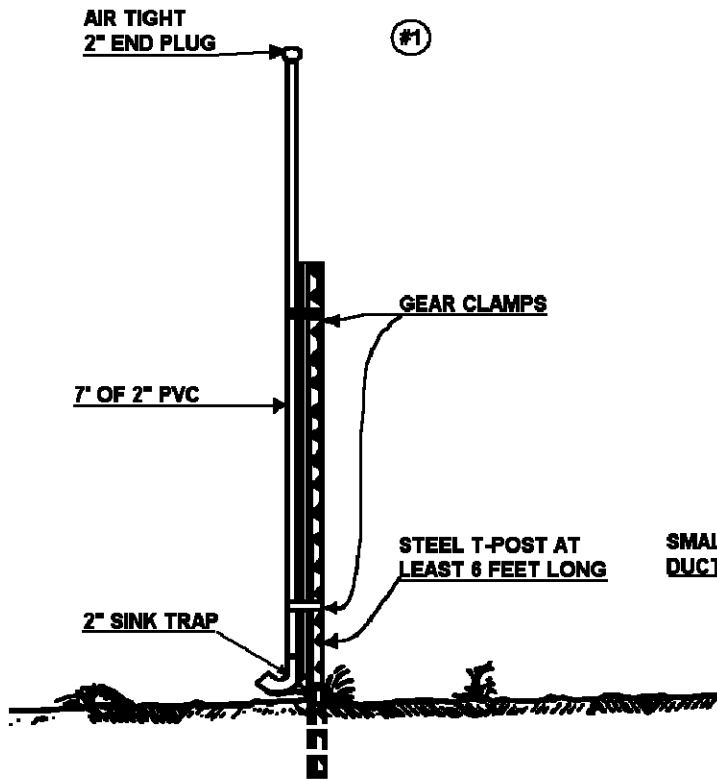
E. Ranch Specialties Wildlife Waterer (Drawing #15)

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

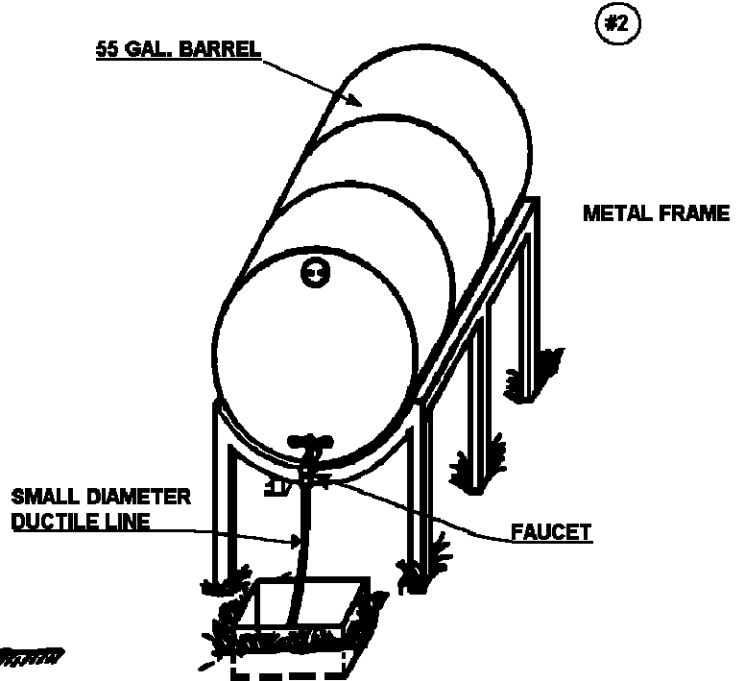
WILDLIFE WATERING FACILITIES

SCALE: 3/8" = 1'

SCALE: 3/4" = 1'

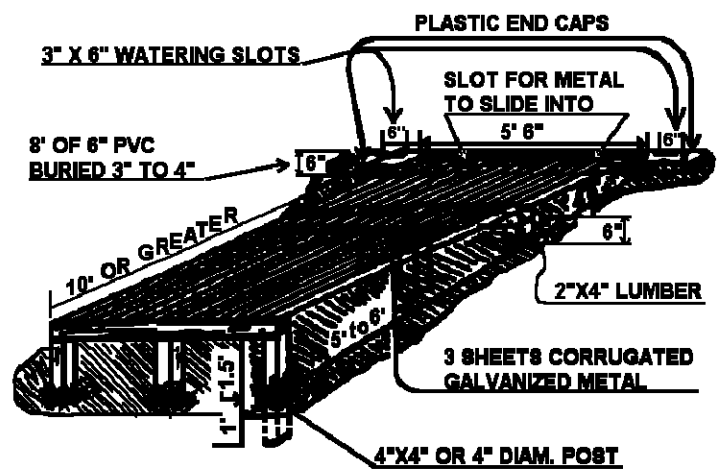
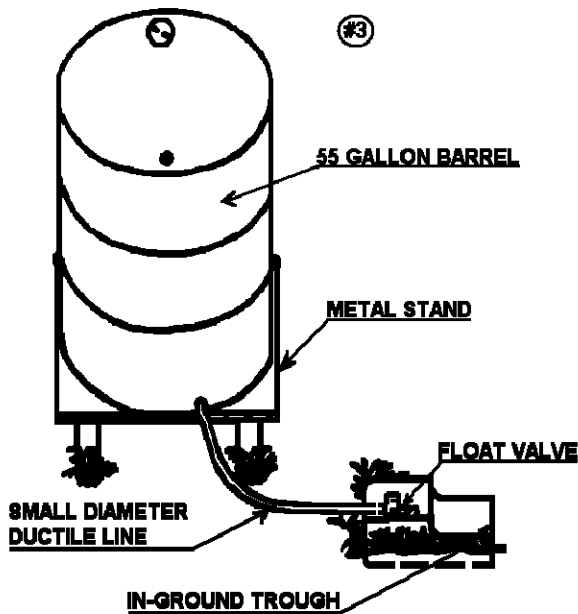


SCALE: 3/4" = 1'



#4

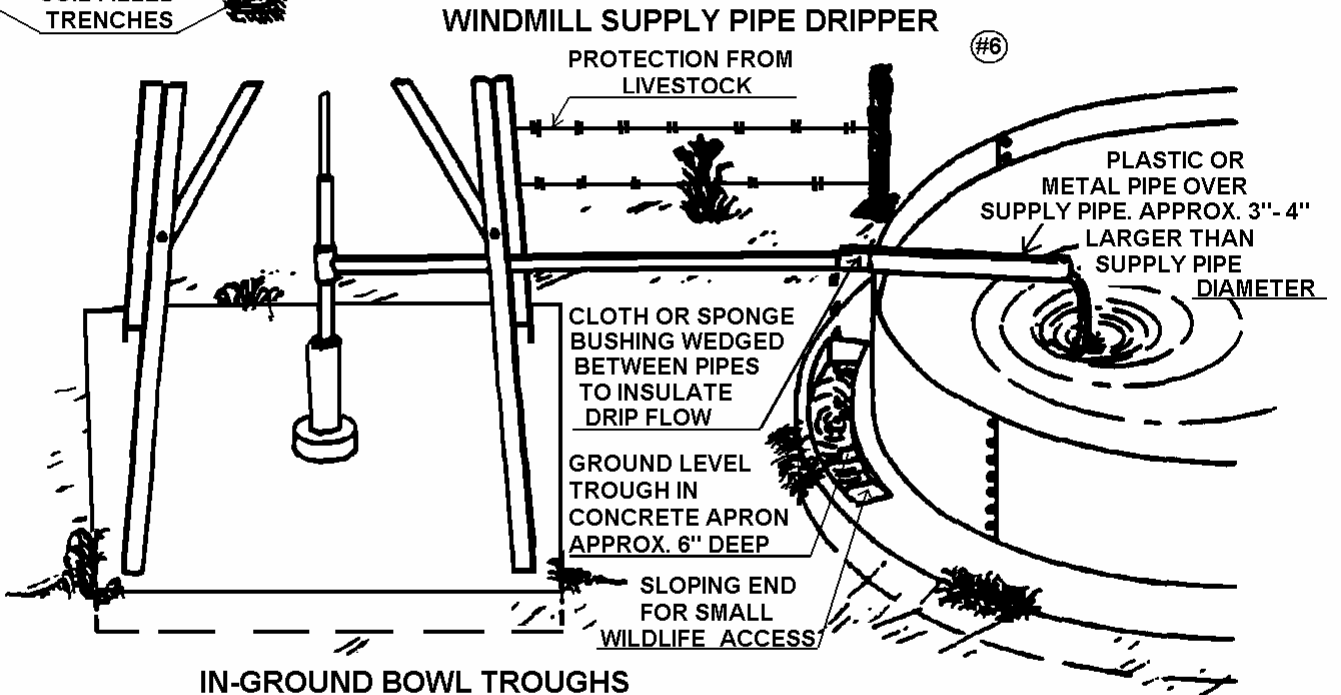
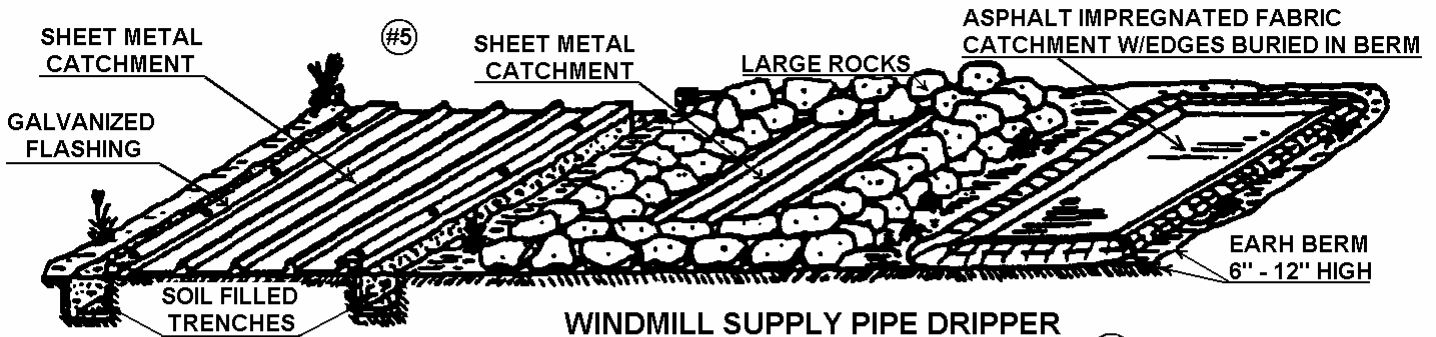
SCALE: 1/4" = 1'



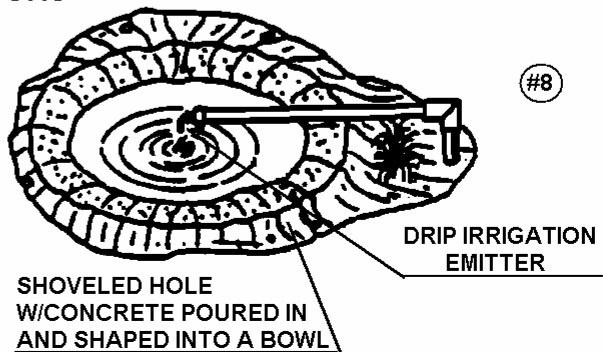
DRAWINGS BY TODD A. MAREK
SEPT. 1991

WILDLIFE WATERING FACILITIES

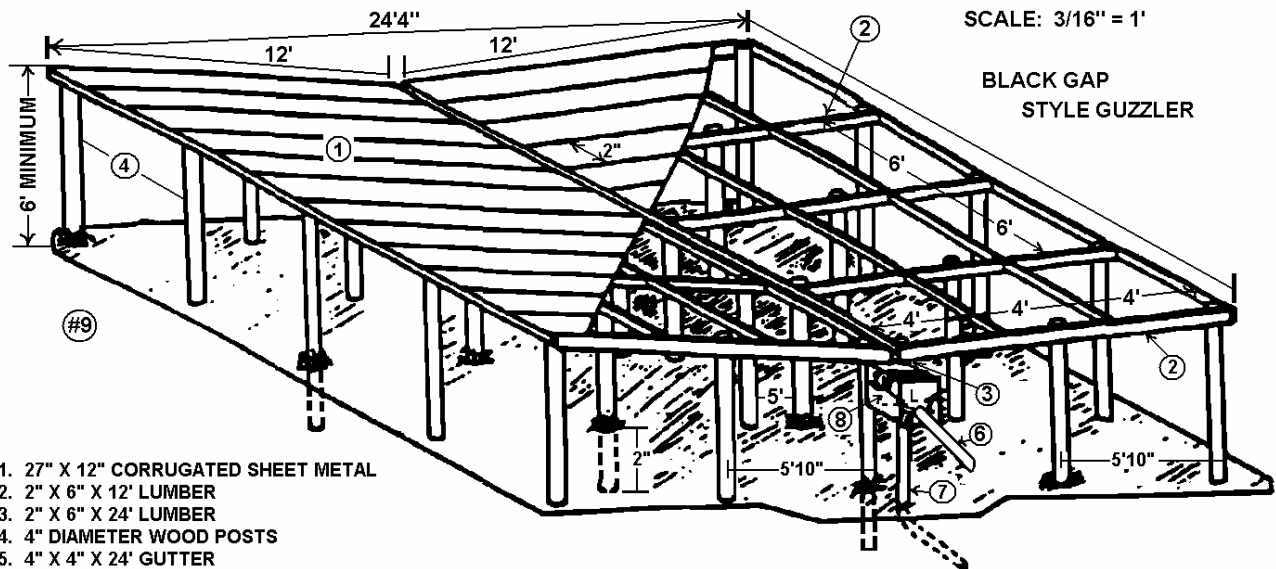
3 METHODS OF ANCHORING ON-THE-GROUND CATCHMENTS



IN-GROUND BOWL TROUGHS



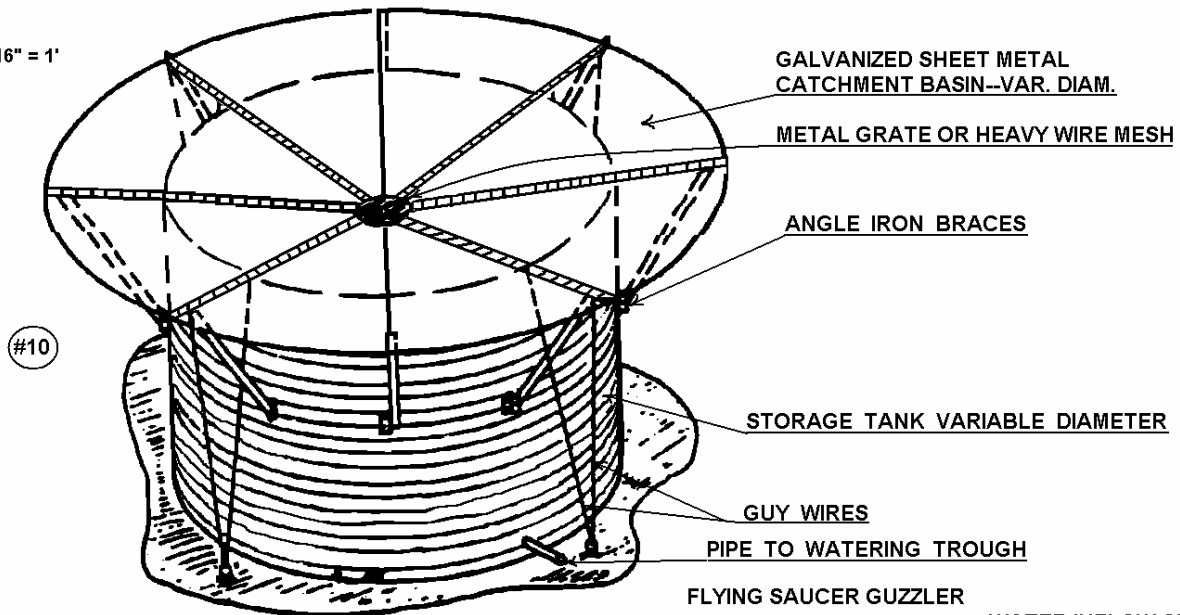
WILDLIFE WATERING FACILITIES



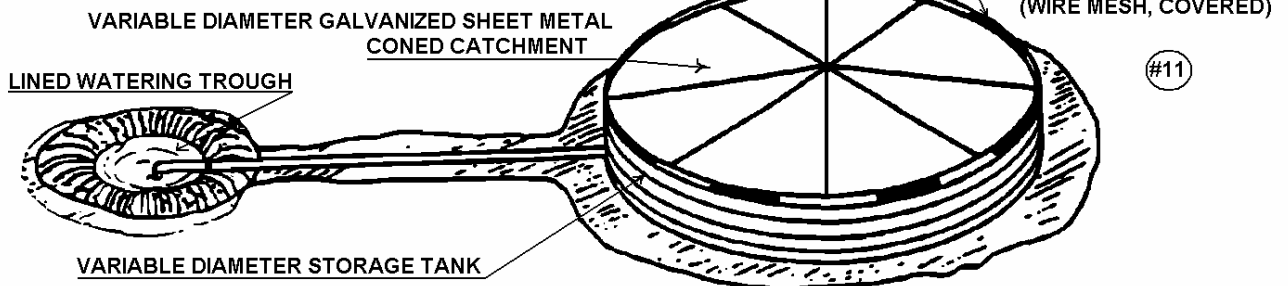
1. 27" X 12" CORRUGATED SHEET METAL
2. 2" X 6" X 12' LUMBER
3. 2" X 6" X 24' LUMBER
4. 4" DIAMETER WOOD POSTS
5. 4" X 4" X 24' GUTTER
6. 3" MINIMUM DOWNSPOUT
7. ALTERNATE DIRECTION FOR DOWNSPOUT
8. 1'6" X 1'6" X 1' SUMP COVERED WITH 1/4" - 1/2" HARDWARE CLOTH

INVERTED UMBRELLA GUZZLER

SCALE: 3/16" = 1'

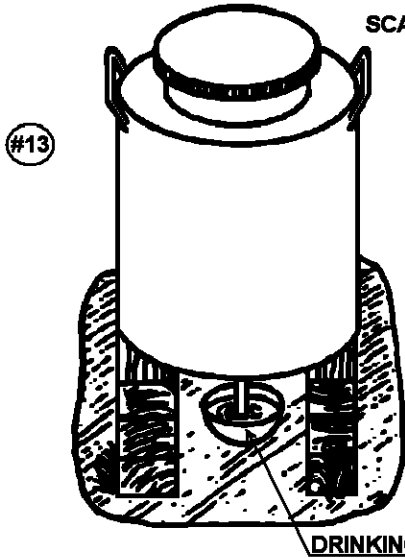
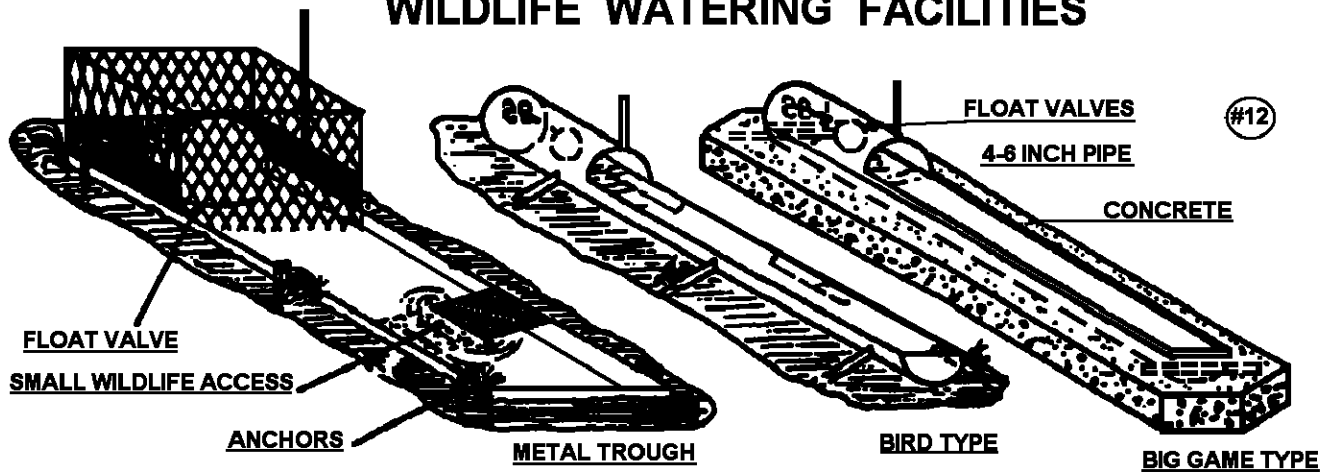


SCALE: 3/16" = 1'



DRAWINGS BY TODD MAREK SEPT. 1991

WILDLIFE WATERING FACILITIES



SCALE: 1 1/2" = 1'

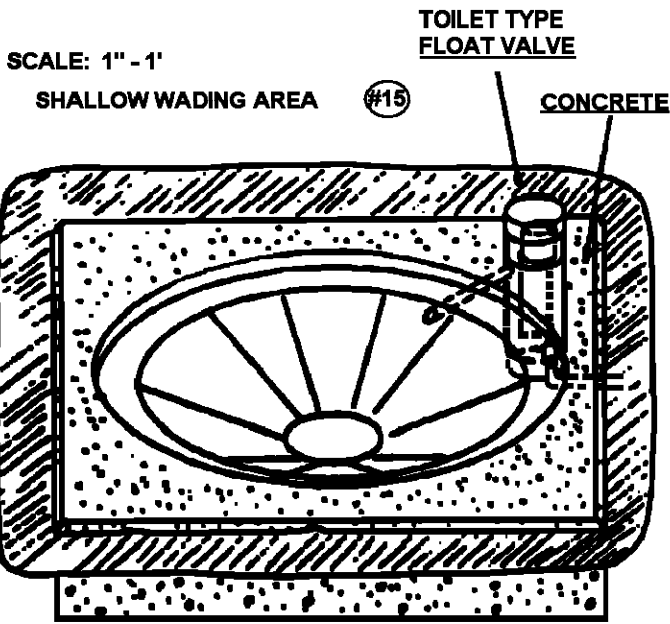
SCALE: 1" = 1'

PLASTIC CONTAINER

FLOAT VALVE

3 FT. DIAMETER BOWL APPROX. 8 IN. DEEP

SCALE 3/4" = 1'



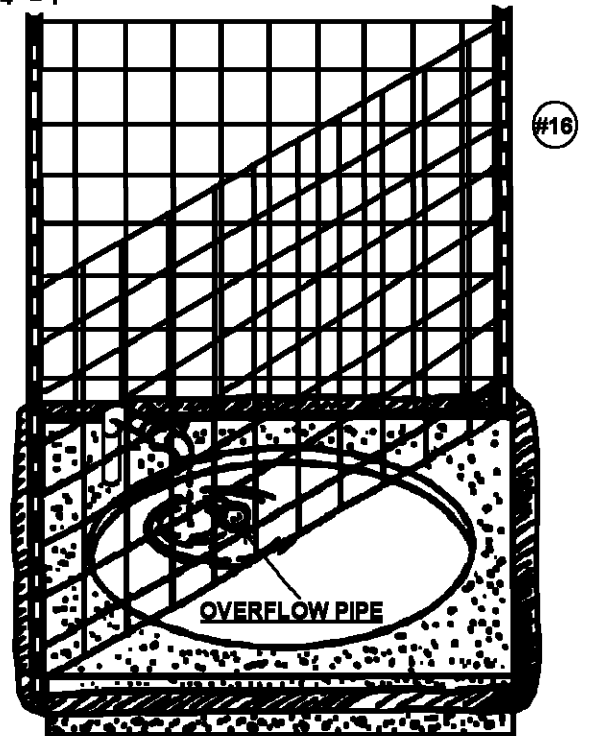
SCALE: 1" = 1'

SHALLOW WADING AREA

#15

CONCRETE

RANCH SPECIALTIES



#16

3 FT. DIAM. BOWL APPROX 8 IN. DEEP

DRAWINGS BY TODD A. MAREK

Trapping Brown-headed Cowbirds to Control Songbird Nest Parasitism



Trapping Brown-headed Cowbirds

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

Why Trap Cowbirds?

Throughout North America songbird numbers are declining. While there is no one single reason for this decline, one major contributing factor is the spread of the brown-headed cowbird. These birds were once limited to the short-grass prairies, where they followed the herds of buffalo, feeding on the insects stirred up by the movement of herds as they moved from place to place. Today however, this highly adaptive bird is found throughout North America. This is a problem because of the reproductive strategies the species employs. The cowbird is what is referred to as a brood parasite. This means the female lays her eggs in the nests of other birds, abandoning them to the care of foster parents. The foster birds raise the cowbird chick to the detriment of their own young. Because the female cowbird can lay as many as 70 eggs per season, susceptible species of songbirds, such as the black-capped vireo and the golden-cheeked warbler, that are already endangered, are particularly at risk.

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

Collecting Data

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

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

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

Selecting a Trapping Location

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

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

Site Precautions

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

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

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

Setting up the Trap

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

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

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

Use a large minnow dip or trout net to catch birds in the trap. You must **immediately release** any non-target bird species. Any bird not a cowbird is a non-target bird. Always remove and dispose of any dead or injured birds (usually a result of

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

Euthanizing Cowbirds

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

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

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

Taking Traps out of Operation

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

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

Reporting the Data

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

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

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

COWBIRD TRAPPING DATA SHEET

NAME*: _____

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

TRAP # _____

LOCATION: _____

Date: _____

Date: _____

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

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

Date: _____

Date: _____

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

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

Date: _____

Date: _____

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

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

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

Materials List for 6x8 Portable Wood Cowbird Trap

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

Recommended Tools For Construction

Shop Assembly of Panels

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

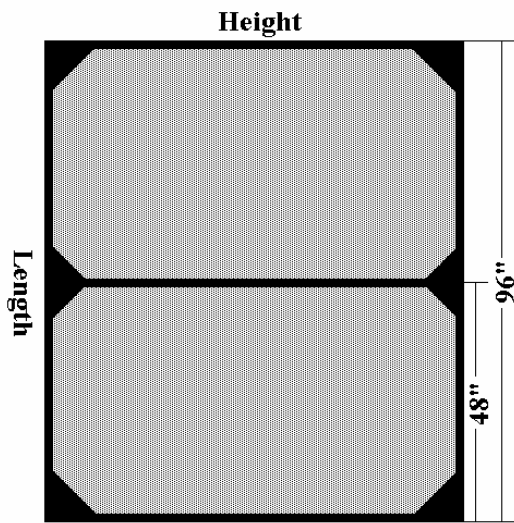
Field Assembly

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

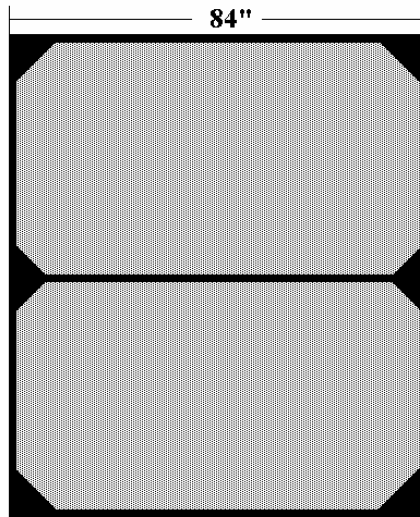
Construction Tips

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

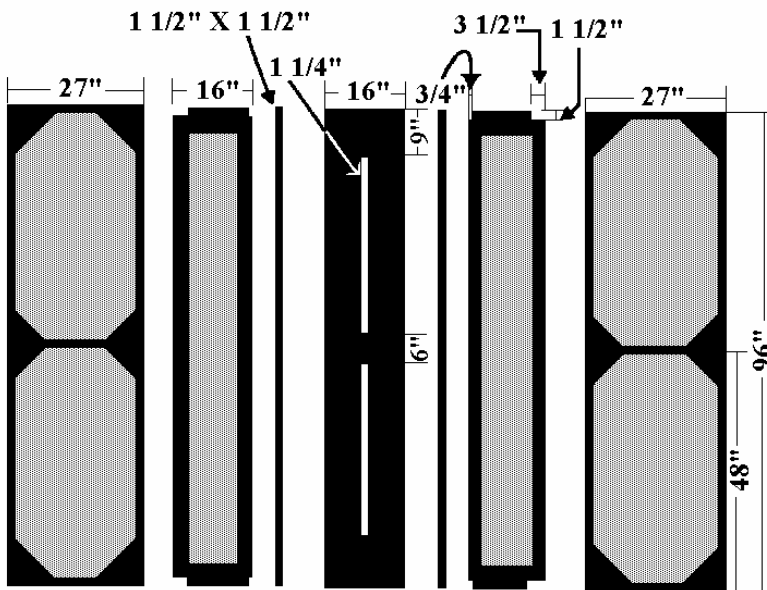




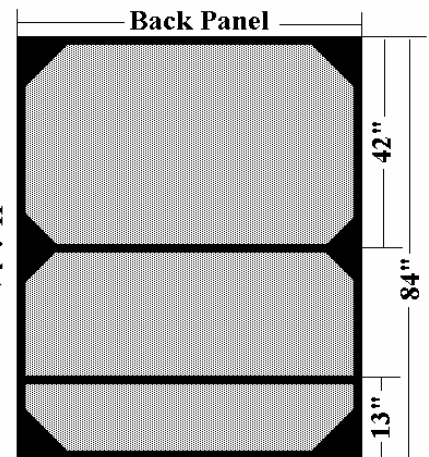
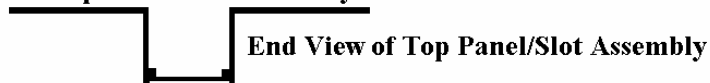
Left Side Panel (same as right panel)



Right Side Panel



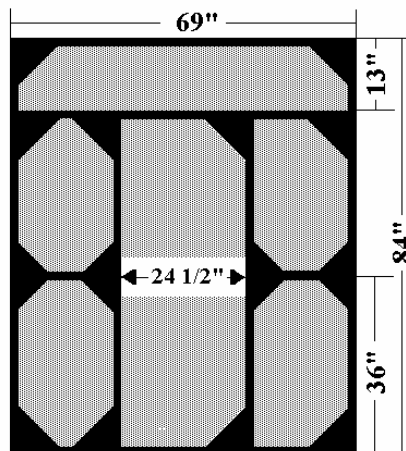
Top Panel/Slot Assembly



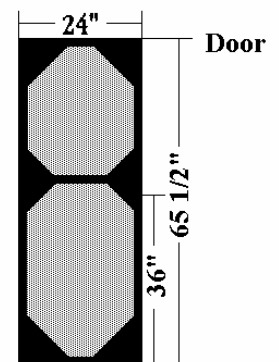
Length

Cowbird Trap Plans

Plans developed by Fort Hood
Environmental Division.



Front Panel



Materials List for 6x8 Portable Metal Cowbird Trap

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

Recommended Tools:

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

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

Sides (Cuts necessary for both sides)

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

Front

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

Door

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

Back

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

Top

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

Wire Mesh covering

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

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

Placement Notes:

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

***ALTERNATE CONSTRUCTION METHODS**

Attaching Wire Mesh (Alternate Method)

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

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

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

Alternate Door Hinges and Latch Construction:

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

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

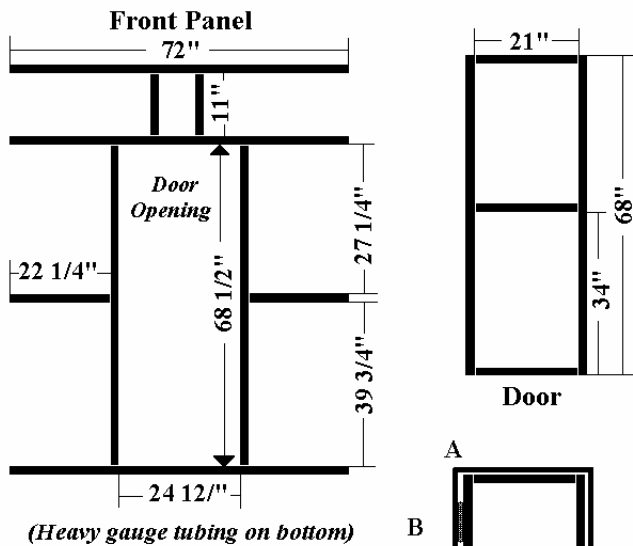
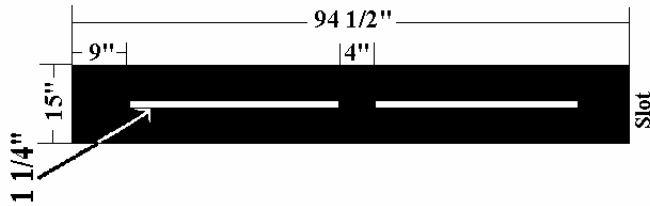
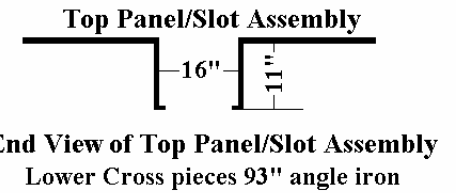
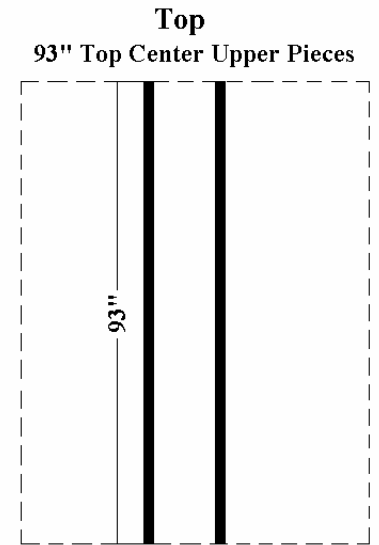
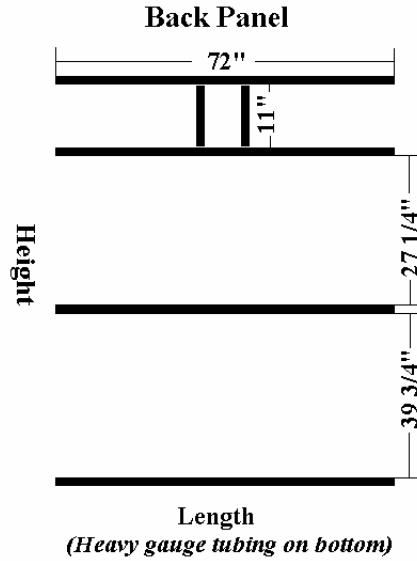
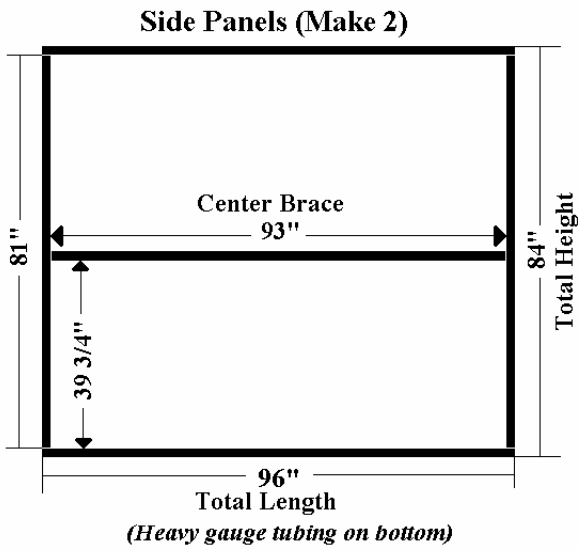
Make the following cuts:

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

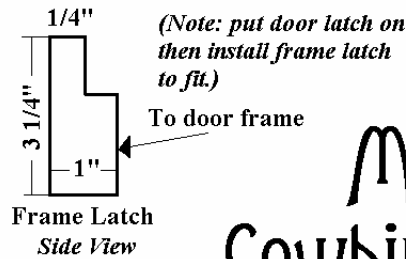
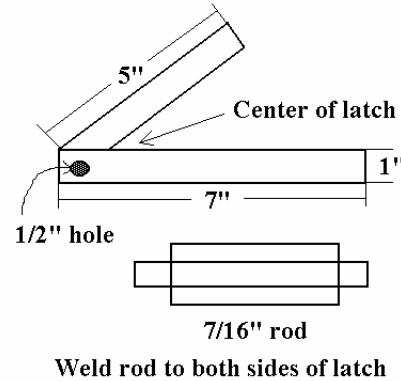
Alternate Trap Entrance Plate:

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

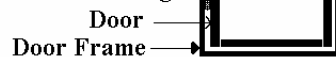




Door Latch Assembly



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



**Metal
Cowbird Trap
Plans**

Resources

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

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

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

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

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

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

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

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

Appendix Q

References

Literature:

Refer to the following Texas Parks and Wildlife Department (TPWD) and Texas Agricultural Extension Service (TCE) bulletins and pamphlets for additional habitat management and specific species management information:

Habitat:

Wildlife Management: Past, Present and Future, A Field Guide to Demonstrations of Wildlife Management Practices and Principles on the Engeling Wildlife Management Area by H. Haucke and J. Hogan Rose, #TPWD-BK-N7100-10L-8/92

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

Management Options in Post Oak Woodlands For Wildlife by D. W. Rideout, TPWD, #PWD LF N7100-237A (10/93)

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

Deer:

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

Determining the Age Of a Deer by C. W. Ramsey, D. W. Steinbach, D. W. Rideout , TAEX #B-1453

The Management of Spike Bucks in a White-tailed Deer Population by B. Armstrong, D. Harmel, B. Young, and F. Harwell, TPWD, #PWD LF N7100-247 (8/94)

Coyote Creek Ranch - A Success Story by D. W. Rideout, TPWD, #PWD LF N&100-241 (10/93)

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

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

Squirrel

Fox Squirrel Management in East Texas by B. G. Alexander, TPWD #PWD BK W7100-028 (10/94)

Quail:

Bobwhite Quail in Texas-Habitat Needs and Management Suggestions by A.S. Jackson, Clyde Holt, and Daniel Lay, TPWD, # PWD Brochure 7000-37 5/84

The 182 page book "Beef, Brush and Bobwhites - Quail Management in Cattle Country" by Fred S. Guthery. Published by the Caesar Kleberg Wildlife Research Institute, Texas A&I University (now Texas A&M at Kingsville), Kingsville, Texas in 1986.

Dove:

Mourning Doves in Texas, Life History, Habitat Needs, and Management Suggestions by R. R. George, TPWD, #PWD-BK-7100-009A-3/88

Turkey:

The Eastern Wild Turkey in Texas by J. J. Campo and J. G. Dickson, TPWD, # PWD-BR-71---137B-2/90

Rio Grande Turkey Habitat Management by G. W. Litton and F. Harwell, TPWD, # PWD RP W7100-263 (10/95)

Feral Hog:

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

Purple Martin:

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

APPENDIX R

The South Texas Brush Country

Bounded on the west by the Rio Grande and Mexico, and on the north by the Balcones Escarpment, the South Texas Brush Country is vast, serene, and unpeopled (Winkler, 1982). Elevations range from sea level to 1,000 feet and rainfall varies from 30 inches in the east to 16 inches in the west. Soils are varied and highly complex. Generally extremely basic to slightly acidic, they range from deep sands to tight clays and clay loams. With average annual temperatures around 73° F, the South Texas Plains boasts the longest growing season in Texas, lasting up to 365 days in some years at Brownsville (Simpson, 1988). This warm region is, however, a land of recurrent droughts, a factor which distinctly marks the landscape. Nearly everything that grows here is drought-tolerant, as rainfall is well below the amount needed for conventional forest trees (Wasowski, 1988). Sporadic rains, however, will trigger wildflowers to bloom unexpectedly at almost any time of year.

The South Texas region owes its diversity to the convergence of the Chihuahuan desert to the west, the Tamaulipan thornscrub and subtropical woodlands along the Rio Grande to the south and the coastal grasslands to the east. Essentially a gently rolling plain, the region is cut by arroyos and streams, and is blanketed with low-growing vegetation--mesquite, granjeno, huisache, catclaw, blackbrush, cenizo and guayacan. Wherever conditions are suitable, there is a dense understory of smaller trees and shrubs such as coyotillo, paloverde, Mexican olive, and various species of cacti. The woody vegetation of the South Texas Plains is so distinctive that the area is also referred to as the "brush country."

The Lower Rio Grande Valley is a highly distinctive subregion of the South Texas Plains. Usually defined as Cameron, Willacy, Hidalgo, and Starr counties, it contains the only subtropical area in Texas. Once supporting majestic groves of Texas palmetto, Montezuma cypress, tall ebony-anaqua woodlands, and jungle-like expanses of Tamaulipan thorny shrubs, today much of it has been bulldozed, plowed or paved. In fact, the once extensive groves of the native Sabal palm which used to flourish here are now reduced to only a few stands near Brownsville. Soils in this subtropical region range from sands to heavy clays. Clays and extremely poor drainage dominate the resaca areas (old meandering paths of the Rio Grande) (Wasowski, 1988).

Despite a history of land use that is the oldest in the state, the Rio Grande Plain harbors many rare species of plants and animals (Texas General Land Office, 1984). It is here that a few wild tropical cats--ocelots and jaguarundis--still take refuge. Other special animals include Ferruginous pygmy-owl, Green Jay, Elf owl, Texas tortoise, Indigo snake and Mexican burrowing toad. There are also a surprising number of plants that occur here and nowhere else, especially among the cactus family, like Albert's black lace cactus, star cactus, and Runyon's cory cactus.

TEXAS WILDSAPES NATIVE PLANT TABLES
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- 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.
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- Ham, H. 1984. South Texas Wildflowers. Kingsville, Texas: The Conner Museum, Texas A&I University.
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- Pope, T., N. Oldenwald, and C. Fryling. 1993. Attracting Birds to Southern Gardens. Dallas: Taylor Publishing Company.
- Richardson, A. 1990. Plants of Southernmost Texas. Brownsville, Texas: University of Texas at Brownsville.
- 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.
- 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 -- South Texas Plains

SPECIES	FAMILY	HABIT/ HEIGHT	FLOWER COLOR	FRUIT	SUN EXPOSURE	HABITAT	SOILS	VEGETATION ZONE										ORNAMENTAL VALUE	WILDLIFE VALUE
								1	2	3	4	5	6	7	8	9	10		
<i>Bumelia lanuginosa</i> Woolly-bucket bumelia	Sapotaceae - Sapodilla Family	40' - 80' Tree, large	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	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.
<i>Carya illinoensis</i> Pecan	Juglandaceae Walnut Family	50' - 60' Tree, large	inconspicuous catkins, m & f, yellowish on same tree. March - May	Nut, Sept. - Oct.	Full sun, Part shade	Prefers rich bottomlands	Sands, loams, or clays. Well-drained, mesic.	X	X	X	X	X	X	X	X			Beautiful shade tree with elegant compound leaves. Prefers deep, rich soils but will grow in thinner soils. Sometimes turns yellow in fall. Deciduous.	Sweet edible nuts valuable for all kinds of wildlife, birds and mammals alike including woodpeckers, jays, sparrows, fox squirrel, gray squirrel, opossum, and raccoons. Good substrate for insectivorous birds. Larval host plant for Gray hairstreak.
<i>Celtis laevigata</i> Sugarberry	Ulmaceae - Elm Family	40' - 60' Tree, large	inconspicuous, small, greenish. May - June	Berry (drupe), orange-red to purplish-black, July-Aug.	Full sun, part shade	Rocky or alluvial soils along streams, in woodlands & thickets.	Sands, loams, and clays. Prefers rich soils, but will tolerate wide range. Well-drained, mesic to xeric; drought tolerant once established.	X	X	X	X	X	X	X	X	X		Fast-growing shade tree adapted to most soils. Very drought tolerant. Yellow autumn color. Deciduous.	Fruit eaten by bluebirds, robins, cardinals, mockingbirds, cedar waxwings, thrashers, & sparrows. Good nest & cover tree, esp. for neotropical migrants. Larval food plant for Question Mark, Mourning Cloak, Pale Emperor, Snout & Hackberry butterflies.
<i>Condalia hookeri</i> Brasil	Rhamnaceae - Buckthorn Family	12' - 30' Tree, large	inconspicuous yellowish flowers. March - April	Drupes, blue-black, sweet & fleshy, Sept. - Oct.	Full sun, part shade	Prefers dryish limestone hills, also locally found on Rio Grande plains	Sands, loams, & clays. Well-drained, mesic-xeric.	X					X	X				Can grow to be large shade tree in South Texas. Usually a small tree with spatulate lime green leaves. Flowers in spring, but fruits sporadically throughout late summer & fall. Has an attractive shape. Persistent to Evergreen.	Continuously bears fruit that is sought after by many kinds of birds: robins, bluebirds, cardinals, towhees, sparrows, mockingbirds, finches, & gamebirds. Thorns make it a good cover & nesting tree. Flowers attract many insects. LHP of Snout butterfly.

<i>Ehretia anacua</i> Anaqua	Boraginaceae Borage Family	25' - 45' Tree, large	Showy white clusters of flowers, fragrant. March - Nov. with the rains	Drupes, orange, April - June	Full sun, part shade, dappled shade	Prefers thickets, forests, palm groves & open woodlands along fence rows & in brushlands.	Sands, loams & clays. Well-drained, mesic.	X					X	X				Attractive rough-leaved tree with fragrant white flowers & bright orange juicy fruit. Very drought tolerant once established. Has a very dense crown. Often planted as an ornamental. Can be sensitive to frost. Good honey tree. Evergreen.	All sorts of insects gather nectar from the fragrant nectar laden flowers. Fruits are eaten by numerous species of birds & small mammals.
<i>Fraxinus berlandieri</i> ana Fresno	Oleaceae - Olive Family	30' - 40' Tree, large	Panicles of m & f greenish purple & green. March - June	Samara, June - Aug.	Full sun, part shade	Grows along wooded streams, in canyons of the Edwards Plateau & Rio Grande Valley	Sands, loams, clays; likes limestone, caliche-like soils. Well-drained, but moist soils.	X					X	X				Spreading, round-topped tree. Fairly fast growing & long-lived. Deciduous.	Good cover and nesting tree. Cardinals, pyrrhuloxias, finches, red-winged blackbirds relish seeds. Foliage browsed by cottontails and white-tailed deer. Larval host plant for Two-tailed tiger swallowtail and Tiger swallow-tail.
<i>Leucaena pulverulenta</i> Great leadtree (Tepaguaje)	Leguminosae - Legume Family	30' -55' Tree, large	Showy, white balls, fragrant. March - July	Legume, strap-shaped with seeds transversely arranged, Sept. - Dec.	Full sun, part shade, dappled shade	Prefers rich soils along streams & resacas in extreme souther Rio Grande Plain	Sands, loams & clays. Moist soils, poor drainage O.K.						X					Small tree with smooth gray bark & rounded crown. Leaves appear light & feathery. Flowers are white and fragrant, shaped like small balls. Tree is often planted as a good yard tree. Very ornamental in appearance. Deciduous.	Myriads of insects are attracted to the fragrant flowers. Several species of birds use this tree as a protective cover & nesting tree.
<i>Parkinsonia aculeata</i> Retama	Leguminosae - Legume Family	9' - 30' Tree, large	Showy yellow flowers, fragrant. April - July	Leguminous, linear orange to brown, with greenish brown seeds, Aug. - Oct.	Full sun, part shade	Prefers low, poorly drained areas, also on a variety of other sites.	Sands, loams & clays. Mesic, poor drainage O.K.	X					X	X			X	A thorny, green-barked shrub with graceful drooping branches and rounded crown. Flowers are a fragrant bright yellow. Leaves are small & delicate, giving tree a light airy appearance. Almost always in bloom. Tolerates salt. Can become weedy. Deciduous.	Flower nectar attracts myriads of insects. Deer occasionally browse the leaves. Pods are also eaten. Seeds are relished by doves, bobwhite quail & other species of birds & small mammals. Good nesting site & cover tree for several bird species.
<i>Pithecellobium ebano</i> Texas ebony	Leguminosae - Legume Family	25' - 30' Tree, large	Showy white spikes, fragrant. May - Oct.	Leguminous pod, brown with red seeds persistent on tree, July - Dec.	Full sun, part shade	Prefers low woods in coastal part of Rio Grande Valley & Plains	Sands, loams & clays, grows in caliche-type soils. Well-drained, mesic.	X					X					A medium-sized tree with a rounded very dense dark crown & dark bark. Zig-zag branches are spiny. Very beautiful tree which is extremely drought-tolerant. Good canopy tree in Valley. Evergreen.	Many species of birds use the tree as a nest site, esp. white-winged doves, due to dense foliage & thorns. Several kinds of insects are attracted to the flowers. Good substrate for insectivorous birds. LHP for Cassius Blue, Coyote & Orange giant skippers.

<i>Quercus fusiformis</i> Plateau liveoak	Fagaceae - Beech Family	30' - 50' Tree, large	inconspicuous m & f catkins, red & greenish. March - June	Acorns, Sept. - Oct.	Full sun, part shade	Prefers calcareous substrate, rocky limestone soils of the Hill Country.	Sands, loams, clays. Prefers limestone & caliche type soils. Will grow on any alkaline to slightly acid soil. Well-drained, mesic-xeric.	X	X	X	X	X	X	X	X			Plateau liveoak is an excellent evergreen shade tree often found growing in mottes. Adapts to a variety of sites, but not extremely wet or dry ones. Evergreen.	Excellent cover & nesting tree. Acorns have high energy value & eaten by almost all forms of wildlife: deer, squirrels, fox, raccoons, gamebirds, woodpeckers, & jays. Fine substrate for insectivorous birds. LHP of 3 hairstreak species and duskywing.
<i>Quercus virginiana</i> Southern live oak	Fagaceae - Beech Family	40' - 60' Tree, large	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.
<i>Sabal texana</i> Sabal palm	Arecaceae - Palm Family	30' - 50' Tree, large	Showy white & fragrant, 7' - 8' stalks. March - April	Berry, dark purple to black with one seed, May - June	Full sun, part shade	Last native remnants on the flatlands of the Lower Rio Grande Valley	Sands, loams & clays. Moist soils, poor drainage O.K.					X						Majestic native palm with dramatic fan-shaped leaves forming a dense rounded crown. Slow-growing, but cold-hardy to Lake Livingstone. Has an enormous root system. There are no thorns on leaves. Very ornamental. Evergreen.	Excellent cover & nesting site for birds. Insects are attracted to the flowers. Many species of South Texas birds forage on the ripe fruit.
<i>Salix nigra</i> Black willow	Salicaceae - Willow family	35' - 80' Tree, large	m & f creamy yellow catkins, on separate trees. April - May	Capsules, light brown, May - June	Full sun, part shade	Prefers alluvial soils along streams	Sand, loams & clays. Hydric-mesic, poor drainage O.K.	X	X	X	X	X	X	X	X	X	X	Occurs throughout Texas where there's standing water. A rapid-grower that is often multitrunked & has irregular crown. Airy, graceful light green leaves & brown-black fissured bark. Not a strong tree, sometimes subject to breakage. Fall color. Deciduous.	Young shoots browsed by white-tailed deer. Catkins eaten by several species of birds. Comose seeds used as nesting material. Larval host plant of Mourning cloak & Viceroy.
<i>Ulmus crassifolia</i> Cedar elm	Ulmaceae - Elm Family	30' - 60' Tree, large	inconspicuous greenish flowers. July.-Sept.	Samara, Aug. - Oct.	Full sun, part shade	Prefers woodlands, ravines & open slopes	Sands, loams & clays. Seasonal 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.

<i>Bumelia celastrina</i> Coma (Saffron plum)	Sapotaceae - Sapodilla Family	15' - 25' Tree, small	Small green & white flowers, fragrant. May - Nov.	Berries, blue-black, April - June	Full sun, part shade	Prefers open brushy flats or gently rolling slopes, or along resacas, gravelly hills, thickets & salt marshes in South Texas.	Sands, sandy loams or clays. Prefers alkaline soils. Xeric, well-drained.	X				X						Spiny small tree with simple leaves, greenish-white flowers & fleshy blue-black fruits. Can also be a shrub. Persistent to Evergreen.	Flowers attract several kinds of insects, while fleshy fruits are eaten by many species of birds. In South Texas, the chachalacas love them. Raccoons & coyotes also relish them. Provides excellent cover & is a great nesting tree for many bird species.
<i>Cercidium texanum</i> Texas paloverde	Leguminosae Legume Family	15' - 25' Tree, small	Showy, bright yellow flower clusters. March - April, also after rains to Sept.	Leguminous pod, dark brown with 1-4 seeds. Aug. - Dec.	Full sun, part shade	Prefers open or brushy areas, flats & gently rolling slopes	Sands, sandy loams, loams & clays. Like alkaline soils. Xeric, well-drained.	X				X						Fairly small, green-barked, spiny ornamental tree with asymmetrical yellow flowers. Well adapted to arid environments. It will shed its leaves during drought conditions. Puts down deep taproot to soak up water. Deciduous.	Flower nectar attracts myriads of bees, butterflies & other insects. White-tailed deer occasionally browse the leaves. Seeds are eaten by several species of birds & small mammals. This makes an excellent nesting tree for birds.
<i>Diospyros texana</i> Texas persimmon	Ebenaceae - Ebony Family	15' - 40' Tree, small	Small greenish white flowers, fragrant. March	Fruit, small, round black & fleshy with lots of seeds, June - July	Full, part shade	Prefers limestone hills, shinnery oak dunes, breaks & rocky canyons, mesquite groves, areas along water courses.	Sands, loams & clays. Xeric, well-drained.	X	X	X	X	X	X				X	Very attractive tree with smooth gnarled bark. Quite drought-resistant once established. Deciduous.	Fragrant whitish flowers attract insects of many kinds. Ripe fruits eaten by several species of game & song birds. Mammals, especially javalina, relish the fruit. Leaves browsed by white-tailed deer. Larval host plant for Gray hairstreak & Henry's elfin.
<i>Esenbeckia berlandieri</i> v. <i>runyonii</i> Jopoy	Rutaceae - Citrus Family	10' - 15' Tree, small	Showy white to greenish white flowers, in clusters, fragrant. March - April, again Sept - Oct.	Capsule, deeply lobed & woody, April - June, again in fall	Part shade, dappled shade	Prefers banks of resacas & streams in extreme South Texas, Cameron Co.	Sands, loams & clays, alkaline soils preferred. Well-drained, mesic.					X						Considered one of the rarest trees in Texas, this small attractive plant has dark glossy evergreen trifoliate leaves and is very ornamental. Has whitish bark with a rounded top look. Can be found in cultivation in Hidalgo and Cameron counties. Evergreen.	Jopoy makes an excellent protective cover & nesting tree. Many kinds of insects are attracted to the fragrant flowers.
<i>Eysenhardtia texana</i> Texas kidneywood	Leguminosae - Legume Family	6' - 15' Tree, small	Showy racemes of white flowers, fragrant. April - Nov., esp. after rains	Pods, small & linear, July - Sept.	Full sun, part shade	Prefers chaparral & brushy areas on calcareous soils	Sands, loams & clays. Xeric, well-drained.	X				X	X				X	Irregularly-shaped spineless shrub with aromatic compound leaves giving the shrub an airy appearance. Flowers can be profuse. Quick-growing & very drought tolerant. Deciduous.	Sweet-scented flowers attract myriads of insects: bees, butterflies, diurnal moths. Leaves are heavily browsed by deer. Seeds occasionally consumed by birds. Larval host plant for the Dogface butterfly.

<i>Guaiacum angustifolia</i> Guayacan	Zygophyllaceae Caltrop Family	10' - 20' Tree, small	Showy purple flowers with yellow anthers. March - April, off & one to Sept., depending on rains	Capsules, brown with 1-3 orange seeds, Aug.- Sept.	Full sun, part shade	Prefers brushy areas & open flats. Can be found on well-drained sites on the Coastal Bend.	Sands, loams & clays. Likes limestone soils. Xeric, well-drained.	X					X	X			X	Highly attractive & unusual small tree with compact branches, tiny compound leaves & purple flower clusters. Tree has a very distinctive and eye-catching habit. Often grows in clumps with branches appearing thick, black & stubby. Evergreen.	The purple & yellow flowers attract several kinds of insects. Excellent honey plant. Good nest tree. Leaves are highly nutritious browse for white-tailed deer. Arils eaten by several species of birds & small mammals. LHP of Gray & Lyside hairstreaks.
<i>Morus rubra</i> Red mulberry	Moraceae Fig Family	35' - 40' Tree, small	inconspicuous m & f greenish flowers. March - June	Mulberry (syncarp of aggregated red-black drupelets), April - Aug.	Full sun, part shade, dappled shade	Prefers rich soils along streams, creek bottoms & moist woodlands	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X	X	X	X	Handsome understory tree with polymorphic leaves, reddish black fruit and broad spreading crown. Deciduous.	Red mulberries are the prime source of spring fruit for neotropical migrant birds. 21 species devour them as soon as they ripen as do squirrels, raccoons, opossums & skunks. Larval host plant for Mourning Cloak.
<i>Pithecellobium pallens</i> Tenaza (Ape's earring)	Leguminosae - Legume Family	4' - 18' Tree, small	Showy cream-colored spikes, fragrant. May - August, also after rains	Legume, reddish brown with blackish seeds, July - Oct.	Full sun, part shade	Prefers alluvial soils of stream bottoms or the edges of water holes in Coastal Prairies & South Texas marshes.	Loams & clay loams. Well-drained, yet moist.	X				X						Spiny small tree with loosely spaced, airy compound leaves. When in bloom, the entire tree is covered in fragrant clusters of white globe-shaped flowers. Fairly fast growing but not overly drought tolerant. Deciduous.	Bees, butterflies & myriads of other insects are attracted to the fragrant flowers.
<i>Prosopis glandulosa</i> Honey mesquite	Leguminosae - Legume Family	20' - 30' Tree, small	Showy creamy yellow elongated spike-like racemes. May - Sept.	Legumes in loose clusters, August - Sept.	Full sun, part shade	Tolerates wide range of situations, open fields, edges of woodlands, etc.	Sands, loams & clays. Xeric, well-drained.	X	X	X	X	X	X	X	X	X	X	Attractive tree with crooked, drooping branches, feathery leaves & rounded crown. Fast growing & often shrubby, forming thickets. Fixes nitrogen in the soil. Deciduous.	Good nectar plant for bees & other insects. Many species of wildlife like quail, bobwhite, doves depend on it for food & shelter from the sun. Squirrels, coyotes, skunks, rabbits & deer eat pods. LHP for Long-tailed skipper & Reickert's blue.
<i>Zanthoxylum fagara</i> Colima	Rutaceae Citrus Family	10' - 30' Tree, small	Small yellow-green flowers. Jan. - June	Follicle, rusty brown with one seed, Sept. - Dec.	Full sun, part shade	Prefers brushy areas or flats near coast	Sands, loams or clays. Xeric, well-drained.	X				X						Aromatic, very prickly small tree with compound leaves & small yellow-green flowers. Red berries can be very striking & decorative when plant is heavy with fruit. Evergreen.	Leaves are an important source of browse for white-tailed deer. Flowers attract several kinds of insects. Several species of passerine birds use it as a nesting & cover site. Berries are also eaten by birds.

<i>Ziziphus obtusifolia</i> Lotebush	Rutaceae - Citrus Family	6' - 10' Tree, small	inconspicuous greenish yellow flowers. March - April	Drupe, black & fleshy, July - Sept.	Full sun, part shade	Prefers upland brushy areas & stream banks	Sands, loams & clays. Well- drained, mesic- xeric.	X					X	X			X	Rounded stout thorny shrub or small tree with grayish green leaves and black fleshy fruits. Becomes leafless during drought. Tolerates a variety of soil types. Deciduous.	Leaves are occasionally browsed by white-tailed deer. Flowers, though small, are very attractive to nectar-loving insects. Fruits are eaten by a number of small mammals and birds. Because of protective thorns, this is a good cover & nesting tree.
<i>Acacia berlandieri</i> Guajillo	Leguminosae Legume Family	9' - 15' Ornament al small tree	Showy creamy- white globose flowers, fragrant. Feb. - April, also Nov. to March in Valley	Legume, large, curved with 5-10 seeds, April - June	Full sun, part shade	Prefers limestone & caliche cuestas on dry brushy hillsides.	Sands, loams & clays, gravelly limestone & caliche-type soils. Xeric, well-drained.						X	X			X	Spreading small ornamental tree or shrub with gray to whitish branches & delicate fern-like leaves. When in bloom, tree is covered with deliciously fragrant creamy-white puffs of flowers. Spines are small. Deciduous to Persistent.	Fragrant flowers attract myriads of nectar-loving insects. Leaves & branches browsed by white-tailed deer. This makes an excellent honey plant. Also serves well as a good protective cover & nesting site for the birds.
<i>Acacia farnesiana</i> Huisache	Leguminosae Legume Family	15' - 30' Ornament al small tree	Showy, yellow round heads, fragrant. Feb. - March	Legume, brownish- black, August - Sept.	Full sun	Prefers open areas, fields, pastures & fence rows	Sands, loams & clays. Moderately well-drained. Seasonal poor drainage O.K.	X	X	X			X	X			X	Medium-sized tree to shrub; densely branched & armed with long paired, straight spines. Rapid growth rate. Profusely flowering in early spring. In southern Texas starts flowering in late Dec. Very fragrant. Fairly drought tolerant. Deciduous.	Provides quick shade in spring. Good cover & nesting tree esp. for White-winged doves. Good nurse tree to other plants. Small mammals eat the pods. Excellent pollen & nectar source for bees & other insects. Larval host plant for Marine Blue.
<i>Acacia rigidula</i> Black- brush acacia	Leguminosae Legume Family	10' - 15' Ornament al small tree	Showy creamy- white racemes, fragrant. April - May	Leguminou s pod, reddish brown, with dark green seeds, August - Sept.	Full sun, part shade	Prefers open or brushy areas, roadsides & pastures	Sands, loams & clays. Xeric, well- drained.	X					X	X			X	Attractive, stiff thorny shrub that is gorgeous when in bloom. Relatively slow-growing, but worth the wait. Longer lived than many other acacias. Can form thickets. If you prune the trunks, it will become a graceful tree. Good erosion control. Deciduous.	Flowers attract myriads of bees, butterflies, diurnal moths & other insects in the spring. Excellent honey plant. Seeds are eaten by bobwhite quail. Leaves & beans are browsed by white-tailed deer.

<i>Acacia wrightii</i> Wright acacia	Leguminosae Legume Family	20' - 30' Ornamental small tree	Showy creamy-yellow flowers in fuzzy cylindrical spikes. March - May, and after rains	Legume, broad, light brownish green with dark brown seeds, May - August	Full sun, part shade	Prefers chaparral & woodlands along creeks & canyons	Sands, loams & clays, likes limestone, caliche-type soils. Xeric, well-drained.	X	X	X	X	Spiny shrub or small tree with wide spreading branches & irregular crown. Attractive light yellow bottlebrush-like flowers. Delicate foliage gives light shade, allowing other wildflowers to grow underneath. Fairly cold hardy for an acacia. Evergreen.	Pollen produced by flowers an important food source for bees. Makes an excellent honey tree. Good protective cover & nesting site for birds. Larval host plant for the Marine blue butterfly.
<i>Pithecellobium pallens</i> Tenaza	Leguminosae - Legume Family	10' - 15' Ornamental small tree	Showy, creamy white flower balls. May - August, or after rains.	Legume, reddish brown, July - Nov.	Full sun, part shade	Prefers chaparral on alluvial soils of stream bottoms or at water's edge. Mostly in South Texas. Found north to San Patricio County on Gulf Coast.	Loams or clays. Well-drained, mesic.	X			X	Small highly decorative spiny tree with bipinnately compound delicate leaves. Mound of globular flowers engulf shrub. Good for the southern most portion of the Coastal Bend. Evergreen.	Flowers attract hordes of nectar-loving insects. Excellent honey tree. Good protective cover and nesting tree.
<i>Caesalpinia mexicana</i> Mexican poinciana	Leguminosae - Legume Family	10' - 20' Ornamental small tree	Showy bright yellow racemes of flowers, fragrant. Feb. - Sept., and after rains	Legume, greenish brown, May - Nov.	Full sun, part shade	Prefers chaparral & woodlands along creeks & canyons	Sands, loams & clays, likes limestone, caliche-like soils. Xeric, well-drained.	X			X	An introduced ornamental that becomes established along fence rows, blooming off & on throughout the year. Bright yellow showy flowers are stunning. This can be a highly attractive accent plant for any yard. Persistent to Evergreen.	Fragrant flowers are a special favorite of the carpenter & bumble bees. Other insects are also attracted to the nectar. Birds use the shrub as a nesting site.
<i>Chilopsis linearis</i> Desert willow	Bignoniaceae Catalpa Family	10' - 15' Ornamental small tree	Showy pink-magenta trumpet shaped flowers. May - Sept.	Capsule with winged seeds, Aug. - Nov.	Full sun, part shade	Prefers dry washes & gravelly creek beds, arroyos & water courses.	Sands, loams & clays. Well-drained, mesic-xeric.	X	X		X	Fast-growing, lightly ornamental tree with attractive willow-like leaves & showy tubular flowers. Can be quite winter hardy. Is a phreatophyte which will extend its roots deep down to the water table. Does not like overwatering in cultivation. Deciduous.	Both insects & hummingbirds are attracted to the flowers. orioles & tanagers will also feed on the flowers. Various species of birds forage on the winged seeds.
<i>Cordia boissieri</i> Texas wild olive	Boraginaceae Borage Family	12' - 24' Ornamental small tree or shrub	Showy white crinkly 2"-flowers with yellow spot in throat. Dec.	Drupe, fleshy egg-shaped, white turning to purple. Sept. - Nov.	Full sun, part shade	Occurs along roadsides, in pastures & on flat lands in poor, dry soil; also on hillsides of the Lower Rio Grande Valley.	Sands, loams & clays; likes caliche-type soils. Xeric, well-drained.	X				An ornamental small tree with a narrow rounded crown & short trunk that creates deep shade underneath. This showy plant blooms all year. Quite cold sensitive, but fast-growing. Once established, it is very drought tolerant. Persistent to Evergreen.	Trumpet-shaped crinkly flowers attract several kinds of insects. The fruits are devoured by several species of birds & small mammals.

<i>Citharexylum berlandieri</i> Berlandier fiddlewood	Verbenaceae Vervain Family	5' - 20' Ornamental small tree or shrub	Pretty white flowers, fragrant. Feb. - August	Drupes, yellow to red with two seeds. April - Oct.	Full sun, part shade	Occurs in thickets on flats & brushy habitats in Cameron & Willacy counties in extreme south Texas	Clay or clay loam soils. Xeric, well-drained.	X										A crooked shrub to small gnarled tree with small fragrant white flowers borne on racemes. Yellow to red berries are very stunning when plant is in fruit. Persistent.	Many small insects are attracted to the fragrant flowers for their nectar. Several species of South Texas fruit-eating birds relish the ripe berries.
<i>Mimosa wherryiana</i> Wherry mimosa	Leguminosae Legume Family	2' - 7' Ornamental small tree or shrub	Showy creamy yellow globes, fragrant. May - Sept.	Legume, small with sharp slender prickles on margin & dark brown seeds, July - Nov.	Full sun, part shade	Prefers caliche & gravelly hills in Starr & Zapata counties in the Lower Rio Grande Valley	Sands, loams, clays & caliche-like soils. Xeric, well-drained.	X										Absolutely beautiful, rare, ornamental shrub or tree with slender zig-zag twigs & blackish gray bark. Very sensitive to the cold. When in bloom, the flowers are very fragrant and eye-catching. Foliage is feathery & thorns are no vicious. Deciduous.	Wherry mimosa is an excellent honey plant. Bees, flies, moths & butterflies are highly attracted to the flowers. This plant provides good protective cover & a nesting site for birds.
<i>Schaefferia cuneifolia</i> Desert yaupon	Celastraceae Staff tree Family	3' - 6' Ornamental small tree or shrub	Small greenish flowers. Feb. - Sept.	Red to orange showy berries (drupes), July - Nov.	Full sun, part shade	Prefers rocky hillsides, chaparral or xeric sites near coast	Sands, loams, clays. Xeric, well-drained.	X					X				X	Densely-branched, rigid ornamental shrub with beautiful red berries on female plant. Twigs are somewhat spiny. Evergreen.	Leaves are frequently browsed by white-tailed deer & fruits are a favorite of several species of birds & small mammals. Quail, wrens, coyotes & woodrats are especially fond of them. Birds use tree as nesting & cover site.
<i>Ungradiaspeciosa</i> Mexican buckeye	Sapindaceae - Soapberry Family	15' - 30' Ornamental tree or large shrub	Showy clusters of pink-magenta flowers, before leaves come out. Fragrant. March - May	Capsules (tripartite leathery "buckeyes") brown-black, Oct. - Nov.	Full sun, part shade	Prefers rocky areas in canyons, slopes & ridges & along fencerows.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X				X	Showy, small, shrubby often multi-trunked ornamental with irregular shape. Spectacular pink blossoms in spring. Good understory tree, prefers at least half a day in sun. Has pretty yellow fall color also. Deciduous.	Splashy pink flowers are a good nectar source for bees, butterflies, diurnal moths. Good honey plant. Sweet seeds eaten by a few species of birds and mammals, though poisonous to humans. Larval host plant for Henry's Elfin.

<i>Juniperus ashei</i> Ashe juniper	Cupressaceae Cypress Family	10' - 30' Conifer	inconspicuous. Feb.	Cones, flesh & berry-like, August - Sept.	Full sun, part shade	Prefers rocky soils in canyons, ravines, arroyos, rimrock & breaks; on eroded slopes & flats.	Sands, loams & clays. Xeric, well-drained.	X	X	X	X							Multi- or single-trunked thick evergreen tree with wonderfully shaggy bark. Leaves scale-like, dark green & aromatic. Female plant with large blue fruits. Dominant plant of the hill country. Almost evergreen, but sheds all its leaves in spring.	Bark strips used as nest material by the Golden-cheeked warbler. Blue fruits a winter-time favorite of wildlife: bluebirds, robins, cedar waxwings, cardinals, finches & mammals. Good substrate for insectivorous birds. LHP of Olive & Juniper hairstreak.
<i>Taxodium mucronatum</i> Montezuma bald cypress	Taxodiaceae Bald Cypress Family	45' - 90' Conifer	inconspicuous 5'-long drooping clusters of cones. F cones at branch tips. Feb. - March	Cones, wrinkled, rounded, 1-inch in diameter. Sept. - Oct.	Full sun, part shade	Occurs on moist soils along swamps, river bottoms & resacas in extreme south Texas.	Sands, loams & clays. Hydric-mesic, seasonal poor drainage O.K.				X							Large majestic conifer with feathery, deciduous, needle-like leaves, straight trunk & enlarged base. 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. Good foraging substrate for insectivorous birds. Seed cones eaten by many different kinds of wildlife. Small rodents & other small mammals relish them.
<i>Abutilon hypoleucum</i> Rio Grande abutilon	Malvaceae - Mallow Family	3' - 4' Shrub	Showy yellow to orange flowers. Dec.	Capsules, white & hairy turning dark brown with 3 - 9 heart-shaped seeds, Sept.	Part shade, dappled shade	Prefers woodlands & floodplains of the Rio Grande Valley	Sands & loams. Well-drained, yet moist.				X							A large, thornless, softly rounded tropical shrub which blooms in the afternoon year-round. Attractive heart-shaped, lime-green leaves with velvety texture. Evergreen.	Myriads of insects are attracted to the copious pollen on the flowers. Leaves & stems are used as the larval host plant of the Laviana skipper.
<i>Aloysia gratissima</i> Beebrush	Leguminosae Legume Family	4' - 14' Shrub	Showy spikes of white flowers with yellow throats, very fragrant. March - Nov., esp. after rains	Drupes, small with two outlets, Aug. - Dec.	Full sun, part shade, dappled shade	Prefers rocky, gravelly limestone soils in chaparrals, thickets & arroyos. Found almost throughout Texas but may have been introduced in eastern portion of the state.	Sands, loams, or clays. Moist soils, seasonal poor drainage O.K.	X	X	X	X	X	X				X	Thicket-forming, much branched, slender aromatic shrub. This fragrant ornamental blooms profusely & is easily transplanted. Bountiful honey plant, hence its common name. Good screen or hedge plant, but flowers poisonous to horses & mules. Persistent.	Insects of all sorts are highly attractive to the fragrant white blossoms. Several species of birds are very fond of the fruit. The shrub makes a good cover & nesting site for small birds.

<i>Amyris texana</i> Texas torchwood	Rutaceae Citrus Family	3' - 7' Shrub	Panicles of greenish-white flowers, fragrant. Feb - June, also Sept. - Nov. depending on rains	Drupes, purple-black with one seed, June - Dec.	Full sun, part shade	Prefers brushy areas, locally abundant in chaparral	Sands, loams & clays. Well-drained, mesic-xeric.	X				X						Much-branched aromatic rounded shrub with trifoliolate leaves. Flowers are highly fragrant. The plant is winter-hardy to Houston. Evergreen.	Fragrant flowers attract many kinds of insects. White-tailed deer occasionally browse the leaves. Several species of birds are very fond of the fruit.	
<i>Atriplex canescens</i> Fourwing saltbush	Chenopodiaceae Goosefoot Family	3' - 8' Shrub	Pretty spikes of m & f flowers on separate trees. April - Oct.	Showy four-winged bracted yellowish fruit, August - Sept.	Full sun, part shade	Prefers grassy uplands to sandy deserts or salt or alkali flats.	Sands, loams & clays. Grows in limestone, caliche-type soils; tolerates saline soils. Xeric, well-drained.					X					X	X	An evergreen shrub with diffused branches, variable in shape. Female plants are more showy with their fall showy, yellow four-winged fruit covering the tree. This tree tolerates saline soils well and is quite drought tolerant. Evergreen.	This shrub is a valuable, palatable & nutritious food for wildlife. Fruit is eaten by scaled quail, porcupine, rock-squirrels, jack rabbits. Pollen from the flowers is sought after by bees & other many other kinds of insects.
<i>Berberis trifoliolata</i> Agarita	Berberidaceae Barberry Family	3' - 8' Shrub	Showy yellow flowers. Feb. - March	Berries, red, May - July	Full sun, part shade	Prefers rocky slopes & flats of pastures, thickets & open woods	Sands, loams or clays. Xeric, well-drained.	X				X	X	X	X	X	X	Well-know striking evergreen shrub with the spiny blue-green trifoliolate leaves. This plant makes a good hedge. Flowers bloom very early in the spring. Evergreen.	Early blooming golden yellow flowers offer very early nectar for all kinds of insects. Excellent cover & nesting place due to spiny leaves. Deer rarely browse this plant unless they are hungry. Birds & mammals of several species gorge on the ripe fruit.	
<i>Buddleja sessiliflora</i> Tepozan	Buddleiaceae Buddleya Family	3' - 7' Shrub	Pretty greenish-yellow flowers borne in glomerules, fragrant. April - July	Capsules, small, June - Sept.	Full sun, part shade	Prefers sandbars & banks along resacas & in palm groves. Found only in Lower Rio Grande Valley.	Sand, sandy loams, clays. Prefers sand. Moist.					X						Attractive unarmed shrub with stems & young leaves covered with dense white pubescence (short fuzzy hairs). Leaves are entire with fine teeth on edges. Evergreen.	Several kinds of insects, especially butterflies, sip nectar from the nectar-laden flowers. White-tailed deer will browse on the leaves. For attracting butterflies, this plant is fantastic.	
<i>Calliandra conferta</i> Fairy duster	Leguminosae Legume Family	1/2' - 3' Shrub	Showy reddish-purple globes with long stamens. March - May	Legumes, small gray to black in color, June - Aug.	Full sun, part shade	Prefers caliche & limestone hills & cuestas in Brush Country, also dry gravelly slopes & mesas.	Sands, loams & clays; likes limestone & caliche-type soils. Xeric, well-drained.					X	X				X	Low, densely-branched shrub with mimosa-like leaves & unusual reddish-purple flowers. Persistent.	Flowers attract several kinds of insects, especially bees & butterflies. Hummingbirds are also attracted to these flowers, gleaning small insects along with the nectar. Good cover & nesting site. Foliage browsed by deer. Seeds eaten by quail.	

<i>Callicarpa americana</i> American beauty-berry	Verbenaceae - Vervain Family	3' - 9' Shrub	Small clusters of white or pink flowers at nodes. May - July	Berries, magenta, in clusters at nodes, Aug. - Nov.	Part shade, dappled shade.	Prefers moist soils of canyons and bottomlands, woods & thickets.	Sands, loams & clays. Likes rich soils. Well-drained, mesic.	X	X	X	X	X	X				Open, much branched shrub with showy magenta berries. Has mounding form. Likes to be watered during dry periods. Deciduous.	Fruits are favored by several species of birds, i.e., bobwhite, mockingbirds, cardinals, thrashers, robins, finches & towhees. Raccoons, opossum & gray fox also relish berries.
<i>Capsicum annuum</i> Chile pequin	Solanaceae - Nightshade Family	1' - 2' Shrub	Small white perfect flowers with yellow anthers. March - Nov., sometimes year-round	Chili peppers, small & red, April - Dec.	Dappled shade, full shade	Prefers ledges along rivers, thickets & groves along arroyos	Sands, loams & clays likes limestone soils. Well-drained, mesic.	X	X	X	X	X	X				Perky little shrub with electric red hot chili pepper berries. A pleasant airy understory shrub. Prefers moist soils. People use fruit as a very hot flavoring for foods. Deciduous.	Birds of several species are highly fond of the peppers. Plants are dispersed by birds.
<i>Castela texana</i> Goat-bush	Simarubaceae - Quassia Family	3' - 10' Shrub	Showy red to orange axillary flowers. March - May	Drupes, bright red with one seed, June - Aug.	Full sun, part shade	Prefers gravelly hills, chaparral thickets, gulf shores & mesquite prairies	Sands, loams & clays. Xeric, well-drained.	X				X	X			X	Densely-branched spinose shrub with shiny green leaves, red-orange flowers & flashy red fruit. It has a very bitter bark. Persistent to Evergreen.	Several kinds of insects are attracted to the flowers. White-tailed deer browse leaves & fruit. Several species of game & song birds also eat the fruits. It is frequently used as a nesting site by birds due to its protective thorns & dense branches.
<i>Celtis pallida</i> Granjeno	Ulmaceae - Elm Family	10' - 18' Shrub	inconspicuous greenish white flowers. Feb. - May	Drupes, yellow to orange, rounded, May - July	Full sun, part shade	Prefers mesas, foothills & thickets & brushlands	Sands, loams & clays. Xeric, well-drained.	X				X	X			X	Spiny, spreading, densely-branched shrub with deep green leaves having slightly scalloped edges. Very drought tolerant. Evergreen.	Flowers attract myriads of insects: bees, butterflies & diurnal moths. Fruits relished by all kind of critters: wrens, cardinals, pyrrhuloxias, mockingbirds, quail, raccoons, coyotes, rabbits. Leaves & stems browsed by deer. LHP of Snout butterflies.
<i>Erythrina herbacea</i> Coralbean	Leguminosae - Legume Family	3' - 6' Shrubby perennial (Shrub in South TX)	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 shrub 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. Persistent.	Elegant tubular flowers have copious nectar & are highly attractive to the Ruby-throated hummingbird. Seeds, though highly appealing visually, are poisonous and not eaten by wildlife.

<i>Eupatorium odoratum</i> Fragrant boneset	Asteraceae - Sunflower Family	2' - 6' Shrub	Showy flower heads, lilac to purple. Aug. - Oct.	Achenes, Sept. - Dec.	Part shade, dappled shade, shade	Prefers rocky clay soils along coast & in valley	Sands, loams or clays. Mesic, poor drainage O.K.	X						X					Subshrubby plant with erect or reclining branches. Can be used as a ground cover. Lilac flowers are very showy. Deciduous to Persistent.	Lilac flowers provide abundant nectar to butterflies, bees & other insects when a lot of other plants are not in bloom. Leaves are frequently browsed by white-tailed deer. Ripe achenes are eaten by sparrows & finches.
<i>Lantana horrida</i> Lantana	Verbenaceae Vervain Family	3' - 6' Shrub	Showy yellow & orange heads made up of tiny florets. May to December (first frost)	Berries, green then dark blue-black, Sept. - Nov.	Full sun, part shade	Occurs in fields, thickets, swamps, rich sandy woods, scrub & gravelly hills.	Sands, loams & clays. Well-drained, xeric to mesic.	X	X	X	X	X	X	X					This showy shrub is planted has a long, profuse blooming season. Though not a native of Texas, it is planted almost throughout the state. It loves the hot weather. It's good to prune it back to the ground each winter. Deciduous.	Colorful, long-blooming flowers attract both butterflies and hummingbirds throughout the season. Northern cardinals and other species of birds eat the ripe fruit. Fairly deer resistant. Larval host plant of the Painted Lady.
<i>Leucophyllum frutescens</i> Cenizo	Scrophulariaceae Figwort Family	4' - 8' Shrub	Showy lavender to light purple flowers, almost bell-shaped. May - Oct.	Capsules, Sept. - Dec.	Full sun, a little shade O.K.	Prefers rocky limestone hills, bluffs, ravines, arroyos & brushlands	Sands, loams & clays, likes limestone soils. Xeric, well-drained.							X	X			X	Drought-hardy shrub with pretty gray leaves & long-blooming magenta to lavender flowers. The silvery-gray leaves lend a highly ornamental flair to this shrub. Evergreen.	The showy lavender flowers attract several kinds of insects. This dense shrub offers good cover and safe nesting site for birds. The leaves are not readily browsed by white-tailed deer. Larval host plant of the Theona Checkerspot.
<i>Lippia alba</i> Bushy lippia	Verbenaceae - Vervain Family	5' - 7' Shrub	Showy purple to violet flowers, sometimes pink & white. March - Oct.	Dry drupes with 2 nutlets, May - Nov.	Full sun, part shade	Prefers woods, river banks & resacas in southern Rio Grande Valley, Cameron & Hildago counties. Also on lower coast plains.	Sands, silts, loams & clays. Moist soils.	X						X					Much-branched aromatic shrub with opposite leaves & purple-violet flowers. This is a very ornamental plant & is widely cultivated. Deciduous to Persistent.	Both butterflies & hummingbirds are attracted to these flowers. The ripe seeds eaten by a number of bird species.
<i>Lippia graveolens</i> Redbrush lippia	Verbenaceae - Vervain Family	5' - 7' Shrub	Showy yellowish white flowers with yellow centers. March - Dec.	Drupes, small 7 dry with 2 nutlets, May - Dec.	Full sun	Prefers dry, rocky hills, valleys, arroyos, chaparral & open desert scrub.	Sands, loams, gravelly clays; likes limestone caliche-like soils. Xeric, well-drained.							X				X	Slender, aromatic pubescent shrub with yellowish-white flowers & opposite leaves. Very drought tolerant, once established. Persistent.	Redbrush lippia is an excellent honey shrub. Myriads of insects are attracted to the nectar-laden flowers, especially bees & butterflies. Seeds are eaten by a number of species of birds.

<i>Lycium berlandieri</i> Wolfberry	Solanaceae - Nightshade Family	5' - 7' Shrub	Showy blue to lavender flowers. Feb. - Oct.	Berries, bright red & many seeded, April - Dec.	Full sun, part shade	Prefers gravelly, rocky hills, limestone & alkali flats, arroyos & scrubland.	Sands, loams or clays. Xeric, well- drained.	X					X			X	Spiny, sparingly-branched shrub with semi-succulent leaves. Shrub is very attractive when in bloom & in fruit. Persistent to Evergreen.	Flowers attract many insects while the leaves are browsed by white-tailed deer. Several species of birds & small mammals eat the fruit including chachalacas in South Texas. Raccoon also love the fruit.
<i>Lycium carolinianum</i> Carolina wolfberry	Solanaceae - Nightshade Family	3' - 6' Shrub	Showy purple, egg-plant shaped flowers. April - Oct.	Red tomato- shaped fruit, 1/4- 1/2" in diameter, June - Nov.	Full sun, part shade	Occurs near ponds, ditches, marshes, on clay flats, salt flats or in gravelly soils on chaparral- covered hills in the Rio Grande Plains & on lower coastal marshes.	Sands, loams, clays of gravelly texture. Moist soils, poor drainage O.K.	X					X				Medium-sized spiny erect to somewhat trailing shrub with thick fleshy grayish leaves & purple flowers. Attractive red fruit. Can be used as ground cover. Highly salt tolerant. Evergreen with summer watering.	Flowers attract several kinds of insects. Red fruits are not only attractive to the eye they are relished by several species of birds, including Whooping cranes. White- tailed deer browse on the succulent leaves.
<i>Malpighia glabra</i> Barbados cherry	Malpighiaceae Malpighia Family	5' - 9' Shrub	White to pale pink flowers. March - Dec.	Drupes, red & fleshy, May - Dec.	Full sun, part shade, dappled shade	Prefers thickets, brushlands & palm groves	Sands, loams & clays. Well- drained, mesic.	X					X				Erect shrub with many slender stems from the base. Leaves are simple & opposite, while flowers are pink, though sometimes white. Fruit is an attractive red color. This is a highly ornamental shrub. Evergreen.	Flowers attract an abundance of insects of all varieties. Several species of birds & small mammals eat the fruit. Raccoons & coyotes are especially fond of them. White-tailed deer browse the leaves. LHP of Cassius Blue & White Patch.
<i>Malvaviscus drummondii</i> Turk's cap	Malvaceae - Mallow Family	4' - 9' Shrubby perennial, shrub in South TX	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. Deciduous.	Attractive red flowers are very popular with hummingbirds. Butterflies, diurnal moths & other insects are also attracted to the flowers. The bland fruit is eaten by several species of birds & small mammals.
<i>Pavonia lasiopetala</i> Rose pavonia	Malvaceae - Mallow Family	2' - 5' Shrub	Showy pink flowers. May - Dec., sometimes all year	Capsules, July - Dec.	Full sun, part shade, dappled shade	Prefers rocky woods on Edwards Plateau & Rio Grande Plains	Sands, loams & clays, likes limestone soils. Well- drained, mesic-xeric.						X	X			Very attractive flowering perennial shrub. Leaves are scalloped & velvety to the touch. Numerous flowers open every morning & close in the afternoon. Requires little care beyond occasional watering & pruning. Perennial.	Lush pink flowers attract many species of butterflies & moths. Leaves are browsed by white-tailed deer.

<i>Phaulotha mnus spinescens</i> Snake-eyes	Phytolaccaceae Pokeweed Family	6' - 10' Shrub	inconspicuous m & f flowers, solitary or in racemes, on separate trees. Aug. - Sept.	Drupe, one-seeded, transparent looking like snake eyes, Sept. - Nov.	Part shade, dappled shade, shade	Prefers clayey soils in thickets & palm groves in southern-most Lower Rio Grande Valley.	Sandy loams clays. Moist soils, poor drainage O.K.	X									Erect shrub with dense spiny branches & very unusual fruits that look like snake eyes. This species grows only in the southern-most tip of the state. Persistent to Evergreen.	Snake-eyes is an excellent protective cover & nesting site for small birds. Fruits are eaten by several species of fruit-loving birds & small mammals. Deer occasionally browse the leaves. Warblers, long-billed thrashers are especially fond of the fruit
<i>Salvia greggii</i> Autumn sage	Lamiaceae - Mint Family	2' - 4' Shrub	Showy magenta red flowers, also comes in white, pink or coral. April - Dec.	Nutlets, June - Dec.	Full sun, part shade	Prefers rocky soils in central, south & west Texas.	Sands, loams & clays. Likes limestone soils, esp. Well-drained, mesic-xeric.	X	X	X				X			Aromatic showy shrub which blooms prolifically spring, summer & fall. Adaptable to other areas of the state where not native. Good as ground cover or hedge. Really needs good drainage. Persistent (almost Evergreen).	Abundant flowers provide copious nectar which is attractive to bees & especially hummingbirds. Ruby-throats can't seem to get enough. Provides food over the long hot summer for them when other plants have waned.
<i>Sophora tomentosa</i> Yellow sophora	Leguminosae Legume Family	6' - 9' Shrub	Showy, elongate racemes of yellow flowers. March - Oct.	Leguminous pods, necklace-like & densely pubescent, July - Nov.	Full sun, part shade	Prefers sandy beaches & flatlands from Valley to Coastal Prairies	Sands & loams. Tolerates saline soils. Well-drained, mesic-xeric.	X					X				Small rounded shrub with densely pubescent foliage, splashy yellow flowers & unusually furry seed pods shaped like a necklace. Wonderful long-blooming accent plant. Leaves are a beautiful silvery green & feel like velvet. Seeds poisonous. Evergreen.	Flowers attract a number of insects including butterflies, moths & bees. Foliage is not browsed by deer.
<i>Xylosma flexuosa</i> Brush holly	Frankeniaceae Frankenia Family	6' - 10' Shrub	Small white m & f flowers. Dec.	Berries, small & red with eight seeds, Dec.	Part shade, dappled shade	Prefers chaparral & brushy areas, also palm groves	Sands, loams & clays. Mesic, poor drainage O.K.	X					X				Slender, evergreen, thorny shrub or small tree with small white flowers & yellow & red berries. Highly ornamental shrub which blooms throughout the year. Evergreen.	Flowers full of nectar attracting an abundance of insects of many varieties. Fruits provide excellent food to birds & small mammals almost throughout the year.
<i>Batis maritima</i> Seaside saltwort	Bataceae - Saltwort Family	1' - 2' Seaside shrub	Small white m & f flowers, separate on same plant. June - Aug.	Fruit a fleshy yellow aggregate, Aug. - Oct.	Full sun	Prefers sandy beaches, mud flats & saline marshes	Sands, sandy loams & clays. Mesic, poor drainage O.K.	X					X				Low, pale green shrub with creeping stems, thick succulent leaves & white flowers & fleshy yellow fruits. This species is highly salt tolerant & also tolerates seasonal poor drainage. Evergreen.	Fruits are eaten by several species of birds & small mammals. Colonial water birds will often establish a nesting site where this plant grows abundantly.
<i>Borrchia frutescens</i> Ox-eye daisy	Asteraceae Sunflower Family	1' - 4' Seaside shrub	Showy yellow composite flowers. Dec.	Achenes, Dec.	Full sun	Prefers salt marshes, sandy shores, sea beaches & saline prairies	Sands, loams & clays. Mesic, poor drainage O.K.	X					X				Small, fleshy, pale green shrub with attractive bright yellow flowers. Plants tolerate salt & poor drainage conditions well. Evergreen.	Bees & butterflies are attracted to the flowers. Seed eating birds dine on the ripe achenes. Plants are also used for cover by small birds & mammals, especially rails.

<i>Avicennia germinans</i> Black mangrove	Verbenaceae - Vervain Family	3' - 4' Seaside shrub	Showy creamy white flowers. July - Aug.	Capsule with one seed. Sept. - Oct.	Full sun	Prefers sandy or clay tidal flats & lagoons	Sands, loams & clays. Mesic, poor drainage O.K.	X				X					Shrub or small tree with leathery green leaves & attractive creamy white flowers. Highly tolerant of saline conditions as well as extremely poor drainage. Soils can even be permanently wet. Excellent erosion control plant. Evergreen.	Flowers attract a wide variety of insects, while the seeds are eaten by some species of birds & small mammals, esp. rodents. Provides ample cover & nesting substrate along lower coastal areas for many species of colonial waterbirds.
<i>Agave americana</i> Century plant	Agavaceae - Agave Family	Leaves 2'-3', flower stalk 8'-9'. Succulent	Showy yellow flowers on tall bloom stalk, flowers only once. June - July	Capsules, brown & many seeded. Flowers only once in its lifetime.	Full sun	Common on naturally occurring islands in Laguna Madre, escaped elsewhere.	Sands, loams & clays. Xeric, well-drained.	X				X				X	Medium to large leaf-succulent with basal rosette of large attractive gray-green leaves. This is a naturalized plant that has escaped from cultivation. It is also widely cultivated for the beauty & shape of its spine-tipped leaves. Evergreen.	Plants live many years, bloom only once, then die (sending off pups on the side). Insects & hummingbirds are attracted to the flowers. Many birds & small mammals eat the ripe seeds.
<i>Agave scabra</i> Rough agave	Agavaceae - Agave Family	Leaves 1'-2', flower stalk 4'. Succulent	Showy yellow flowers on tall bloom stalk. April - June	Capsule, brown, many-seeded. Flowers only once in its lifetime.	Full sun	Occurs on sandy & calcareous soils in extreme southwest Rio Grande Plains in Starr, Webb & Zapata counties.	Sands & clays, likes calcareous soils. Xeric, well-drained.					X					Medium to large stemless plant with an open basal rosette of large grayish leaves with a rough surface. Evergreen.	Many species of insects are attracted to flower pollen & nectar. Hummingbirds also sip nectar from flowers. Many birds & small mammals dine on the ripe seeds.
<i>Hechtia glomerata</i> Guapilla	Bromeliaceae - Pineapple Family	1/3' - 1/2' Succulent	Showy creamy white m & f flowers on separate plants. May - Aug	Capsule, brown, many-seeded, July - Aug.	Full sun	Occurs on gravelly sites, sandstone formations & saline clays in Starr Co.	Sands, sandy loams & clays. Xeric, well-drained.					X					Sharply serrate linear basal rosette leaves with the habit of a yucca or agave, but in the pineapple family. Often forms dense colonies. Evergreen.	Flowers attract myriads of insects of all varieties. Spiny plant provides excellent for small mammals. Seeds eaten by small mammals & birds.
<i>Manfreda variegata</i> Huaco	Agavaceae - Agave Family	Leaves 2' - 4' Flower stalk 4' - 12'. Succulent	Showy yellow to coral orange flowers, spicy fragrance. April - July	Capsules, July - Oct.	Full sun, part shade	Prefers prairies & chaparrals	Sands, loams & clays, acid or calcareous. Well-drained, mesic-xeric.	X				X					Green succulent rosette leaves with purplish-brown spots -- very eye-catching. Makes an excellent accent plant for any garden. Spicy perfumed flowers are especially fragrant in the evening. Evergreen.	Fragrant flowers emit their perfume in the evening thus attracting many moths as pollinators. Finches, sparrows & other seed eating birds eat the ripe seeds as do several species of small rodents & other small mammals.

<i>Yucca constricta</i> Buckley yucca	Agavaceae - Agave Family	2' leaves 3'- 6' flower stalk. Succulent	Showy panicles of creamy- white flowers. April - June	Capsules. Sept. - Oct.	Full sun, part shade	Prefers brushy woods & grasslands.	Sands, loams & clays; likes limestone soils. Xeric, well- drained.	X	X			X		X	X	Very striking accent plant, lovely when in bloom. This plant is the most flower-like of all the yuccas. Leaves are dark green with white edges. Older leaves get threads. Tips are armed with healthy spines. Evergreen.	Elegant waxy flowers emit their fragrance at night attracting moths which pollinate them. Flowers are edible and popular with white-tailed deer. Larval host plant to Yucca giant skipper.
<i>Yucca treculeana</i> Spanish dagger	Agavaceae - Agave Family	5' - 15' Succulent	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.
<i>Aristolochia marshii</i> Marsh's pipevine	Aristolochiaceae Pipevine Family	Climber. Vine	Bizarre reddish- purple pipe- shaped flowers. Feb. - June	Capsules, May - Aug.	Part shade, dappled shade	Prefers alluvial soils along rivers & resacas in the Rio Grande Valley	Sands, silts & clays. Mesic, poor drainage O.K.					X				Herbaceous twining vine with slender stems & triangular lobed leaves & unusual pipe-shaped flowers. Persistent, but dies back.	This unusual vine is the larval host plant for the Polydamus swallowtail.
<i>Chiococca alba</i> David's milkberry	Rubiaceae - Madder Family	Climber over shrubs. Vine-like shrub	White to yellowish flowers, borne in racemes. Feb. - Sept.	Drupes, white, globose, very showy, May - Nov.	Part shade, dappled shade	Prefers loamy soils in thickets, brushy areas & palm groves in Cameron County.	Sandy loams, loams & loamy clays. Moist, poor drainage O.K.					X				An attractive scandent, unarmed smooth stemmed shrub that acts like a vine. It has simple opposite leaves and white flowers. Fruits are white rounded & very eye-catching. This plant makes a very nice ground cover. Persistent.	Flowers attract several kinds of insects. Several species of birds thrive on the fruit. The shrub is a good place to hide from predators for small birds.
<i>Clematis drummondii</i> Old man's beard	Ranunculaceae Buttercup Family	Climber. Vine	Creamy white to palest yellow flowers. March - Sept.	Achenes, slender & plumose, Aug. - Oct.	Full sun, part shade	Prefers dryish soils, dry washes & rocky canyons, roadsides, fencerows & thickets.	Sands, loams & clays, likes limestone soils. Xeric, well-drained, drought tolerant.	X	X	X	X	X	X	X	X	A vigorous climber that will drape other trees & shrubs. Especially beautiful in late summer & fall when the feathery achenes are backlit by the sun, they glisten. This can be a very ornamental vine. Deciduous.	Old man's beard serves as an excellent protective cover & nesting site. Achenes are eaten by many species of birds. Larval host plant of the Fatal metalmark butterfly.
<i>Cocculus diversifolius</i> Correhuela	Menespermac eae Moonseed Family	Climber. Vine	White m & f flowers, borne in racemes. Feb. - Sept.	Drupes, blue-black, May - Nov.	Part shade, dappled shade	Prefers brushy areas on a variety of soil types in the Lower Rio Grande Valley.	Sands, loams & clays, likes caliche-type soils. Well- drained, mesic.					X				An attractive woody climbing, twining vine with simple, variably-shaped leaves, white flowers & blue-black fruit. Twines on fences & other plants. Persistent.	Several kinds of insects are attracted to the flowers. While the fruit will make people sick, birds will eat them when they are ripe. White-tailed deer browse the leaves occasionally.

<i>Lonicera sempervirens</i> Coral honeysuckle	Caprifoliaceae Honeysuckle Family	Climber to 40'. Vine	Showy orange red tubular flowers in clusters. March - Dec.	Berries, red, April - Jan.	Full sun, part shade	Prefers moist fertile soils of East Texas, woods & thickets	Sands, loams & clays. Mesic-hydric soils; 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. Though not native of South Texas, it will grow well in more mesic areas. Persistent.	Ruby-throated and Black-chinned hummers are attracted to this vine spring, summer and fall, esp. during migration. Orioles also sip nectar, as do butterflies. Fruit-eating birds relish the succulent red berries in the fall. LHP of Spring Azure.
<i>Rubus trivialis</i> Southern dewberry	Rosaceae - Rose Family	Climber. Vine-like plant	Showy white flowers with five petals. Feb. - April	Dewberries May - June	Full sun, part shade, dappled shade	Prefers low grounds, swampy areas at low elevations.	Sands, loams & clays. Mesic, tolerates poor drainage.	X	X	X	X	X	X	X	X					A weedy, trailing plant rooting at tips of canes & branches. Though this is not an overly attractive plant it has great wildlife value.	Flowers attract myriads of insects, while dewberries are great favorites of innumerable species of small birds & mammals. It also provides excellent cover for them as well.
<i>Serjania brachycarpa</i> Serjania	Sapindaceae - Soapberry Family	Climber. Vine	Small yellow flowers in panicles; m & f flowers on separate plants. Feb. - Nov.	Samaras bearing seeds, March - Dec.	Full sun, part shade, dappled shade	Frequently found on loamy soils near the Rio Grande flood plain	Sands, loams & clays. Mesic-hydric, poor drainage O.K.					X							Slender, somewhat hairy scandent vine with woody base, no thorns & compound leaves. Forms a dense mantle that can cover shrubs & small trees. Persistent.	This dense vine provides excellent protective cover for small birds. Insects are attracted to the flowers. Several species of birds dine on the ripe seeds.	
<i>Bothriochloa barbinoensis</i> Cane bluestem	Poaceae Grass Family	2' - 4' Grass	Flowering spikelets greenish gray to silvery. May - Oct.	Seeds, Aug. - Nov.	Full sun, a little shade O.K.	Prefers open grassy areas throughout western 2/3rds of state.	Loose limey soils. Xeric, well-drained.	X				X	X	X	X	X	X		A very attractive coarse perennial bunch grass with lovely seed heads. Silvery seed heads catch the rays of the sun making the plant appear to glisten. Warm-season perennial.	Cane bluestem is a good forage grass for wildlife especially before stems become mature & fibrous. Sparrows & other granivorous birds forage on ripe seeds. Grass parts used as nesting & denning material.	
<i>Bothriochloa saccaroidea</i> s. v. <i>longipaniculata</i> Longspike silver bluestem	Poaceae Grass Family	2' - 4' Grass	Flowering spikelets green to silver. May - Oct.	Seeds. Sets seed shortly after flowering.	Full sun, part shade	Prefers dryish open areas, woodland edges, along roadsides	Sands, sandy loams, loams & clays. Xeric-mesic.	X	X	X	X	X							This grass becomes increasingly beautiful as its seed head ripens and catches the sun light, glowing silvery. This bunchgrass has a conspicuous basal cluster of leaves & stems. Warm-season perennial.	This bunch grass is a fairly good forage grass for white-tailed deer. Parts of the grass are used as nesting & denning material by birds & small mammals. Many species of seed-eating birds eat the ripe seeds.	

<i>Bouteloua curtipendula</i> Sideoats grama	Poaceae Grass Family	2' - 6' Grass	Spikelets, yellowish, arranged down along stem. May - Oct.	Seeds, June - Nov.	Full sun, part shade, dappled shade	Tolerates a variety of open places throughout state. Does well in disturbed areas. Not as common in eastern forests.	Sands, loams & clays, both limestone & igneous soils. Well-drained, mesic-xeric.	X	X	X	X	X	X	X	X	X	X	Our state grass is a strong perennial and works well as a garden accent. Competes well with short grasses but not tall-grass prairie grasses. Great choice for wildflower meadow garden. Warm-season perennial bunch grass. Dormant in winter.	Provides good grazing for wildlife and an abundance of bird seed for seed-eating birds of several varieties. Food available spring, summer & fall. Grass parts used as nesting & denning material. Larval host plant for Dotted skipper & green skipper.
<i>Bouteloua repens</i> Slender grama	Poaceae Grass Family	1/2' - 2' Grass	Flowering spikelets greenish to yellowish. April - Dec.	Seeds, May - Dec.	Full sun	Prefers open or brushy pastures & road rights-of-way, often found along streams & banks.	Sands, loams & clays. Well-drained, mesic-xeric.						X					Tufted perennial grass with slender stems & perky seed heads. Good grass to mix with South Texas wildflowers. Perennial.	Ripe seeds are eaten by several species of birds. Various parts of grass are used as nesting & denning material. Provides forage to a fair extent to grazers.
<i>Bouteloua rigidiseta</i> Texas grama	Poaceae Grass Family	1/2' - 1 1/2' Grass	Flowering spikelets, perky & star-shaped, turns from green to silvery gold. April - Nov.	Seeds, May - Nov.	Full sun	Prefers grasslands, grassy woods openings, road rights-of way & moist slopes	Sands, loams & clays. Well-drained, mesic-xeric.	X	X	X	X	X	X	X				Short, highly attractive tufted perennial grass with slender weak stems & very eye-catching flowering spikelets. When backlit, they catch the rays of the sun & glisten like little shooting stars. Warm-season perennial.	A number of small birds will eat the ripe seeds. Perhaps not ever enough of it to provide much forage for the larger grazers.
<i>Buchloe dactyloides</i> Buffalograss	Poaceae Grass Family	3" - 12" Grass	Flowering spikelets yellowish green. June - Nov. or whenever not dormant	Seeds. Sets seed shortly after flowering.	Full sun	Prefers open areas in many kinds of soils, short-grass prairies of Central & North Central Texas	Sands, loams & clays. Xeric, well-drained.	X	X	X	X	X	X	X	X	X	X	This is a wonderful turf grass. It takes a little longer to establish in caliche soils. Once established, it is very drought tolerant. It turns a soft golden brown when it goes dormant. Perennial turf grass.	Buffalograss provides fine nesting & denning materials, especially for lining bird's nests. Seeds of male flowers are eaten by small granivorous birds. Is the larval host plant of the Green skipper.
<i>Chasmantium latifolium</i> Inland sea-oats	Poaceae Grass Family	2' - 4' Grass	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 streambanks.	Sands, loams & clays. Mesic, seasonal poor drainage O.K.	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, esp. when turned to whitish gold in the fall. Great garden accent plant. 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.

<i>Digitaria californica</i> California cottontop	Poaceae Grass Family	1' - 3' Grass	Flowering spikelets greenish to whitish silver. July - Nov.	Seeds. Sets seed shortly after flowering.	Full sun, part shade	Grows on wide variety of soil types in open grassy areas.	Sands, loams & clays. Well-drained, mesic-xeric.	X	X	X	X	X	X	X	X	An attractive tufted, leafy perennial grass with very pretty seed heads. This pretty grass can be a wonderful accent to the garden. Warm-season perennial.	California cottontop provides good forage for wildlife. Many birds & small mammals eat the ripe seeds. Grass parts are used as nesting & denning material.
<i>Elyonurus tripsacoides</i> Pan American balsamscale	Poaceae Grass Family	1' - 3' Grass	Flowering spikelets greenish turning yellowish. May - Nov.	Seeds. Sets seed shortly after flowering.	Full sun	Prefers coastal grasslands & woods openings	Sands & sandy loams. Well-drained, mesic-xeric.	X			X					When the flower head appears, this is a very attractive grass. Warm-season, tufted perennial.	When found in abundance, this tufted perennial grass can provide good forage for wildlife. Ripe seeds eaten by a few species of birds. Grass parts used as nesting & denning material.
<i>Eragrostis intermedia</i> Plains lovegrass	Poaceae Grass Family	1 1/2' - 3' Grass	Flowering spikelets grayish-green turning reddish purple. June - Nov.	Seeds. Sets seed shortly after flowering.	Full sun	Prefers sandy, clayey, rocky ground in open areas, also grows well in disturbed areas.	Sands & clays. Xeric, well-drained.	X	X	X	X	X	X		X	This beautiful bunch grass has very elegant, delicate seed heads suffused with a reddish purple color when ripe. Grows well with other grasses & wildflowers in a prairie association or small pocket prairie. Warm-season, tufted perennial.	Plains lovegrass provides fair grazing for wildlife. Small seed eating birds forage on the ripe seeds. Grass parts are used for denning & nesting material.
<i>Eragrostis palmeri</i> Rio Grande lovegrass	Poaceae Grass Family	1' - 2 1/2' Grass	Flowering spikelets grayish-green turning purplish. Sept.- Nov.	Seeds. Sets seed shortly after flowering.	Full sun, part shade	Prefers open grassy areas in far south Texas.	Sands, loams & clays. Well-drained, mesic-xeric.	X								Attractive tufted perennial grass that grows only in the Rio Grande Valley. This species has a very pretty seed head. Warm-season, tufted perennial.	Rio Grande lovegrass provides fair forage for wildlife. Some seed-eating birds dine on the ripe seeds. Grass parts are used as nesting & denning material.
<i>Heteropogon contortus</i> Tanglehead	Poaceae Grass Family	3" - 2 1/2' Grass	Flowering spikelets yellowish tan, turning brownish. March - Dec.	Seeds. Sets seed shortly after flowering.	Full sun	Prefers grasslands of lower Texas Gulf Coast, also mountains of West Texas.	Sands & sandy loams. Well-drained, mesic-xeric.	X				X	X		X	Tanglehead is a caespitose grass with curly sharp awns, making it an interesting looking grass. Warm-season perennial.	While not excellent forage for wildlife, grass parts are used as nesting & denning material. A few birds will eat the ripe seeds.
<i>Hilaria berlanderi</i> Curly-mesquite	Poaceae Grass Family	4" - 6" Grass	Flowering spikelets greenish gray to silvery in fall. July - Nov.	Seeds, Aug. - Nov.	Full sun, a little shade O.K.	Prefers rocky slopes, dry hillsides & grassy or brushy plains.	Thin limestone soils, clays & caliche type soils. Also sands & loams. Xeric, well-drained.	X	X	X	X	X	X	X	X	Curly-mesquite looks a bit like Buffalograss & can be used as a lawn grass, but it can be somewhat lumpy. It makes a better ground cover. Warm-season perennial.	Seed heads are eaten by various granivorous birds. Grass parts are used as nesting & denning material by a variety of small wildlife species.

<i>Panicum virgatum</i> Switchgrass	Poaceae Grass Family	3' - 6' Grass	Flowering spikelets green turning rich gold. Aug. - Sept.	Seeds. Oct. - Nov.	Full sun, part shade	Prefers seasonally moist, open areas throughout Texas.	Sands, loams & clays. Moist soils, 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.
<i>Pappophorum bicolor</i> Pink pappasgrass	Poaceae Grass Family	1/2' - 2 1/2' Grass	Flowering spikelets yellowish-pink turning to fluffy pinkish rose. April - Nov.	Seeds, April - Nov.	Full sun, part shade	Prefers grassy plains, moist road rights-of-way & open valleys	Sands, loams & clays. Mesic.	X				X	X	X		X		This is one of the truly beautiful grasses with its pink fluffy seed head that catches the sunlight. Perennial.	Though it's not a good forage grass, it makes up for it in its beauty. A few birds eat the ripe seeds. Grass parts used for nesting & denning material.
<i>Schizachyrium scoparium v. littoralis</i> Little Bluestem	Poaceae Grass Family	2' - 5' Grass	Flowering spikelets blue-green to silvery gold. Aug. - Dec.	Seeds, Sept. - Dec.	Full sun, part shade	Prefers woods openings, rocky slopes of pastures & rangeland, along forest borders and prairies throughout Texas.	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X	X	X	X	X	Wide-ranging bunchgrass, dominant of the tallgrass prairie. Tolerant of 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. Dormant in winter.	Provides fairly good grazing for wildlife. Good cover grass, grass parts provide denning & nesting material for birds & mammals. Larval host plant for Dusted skipper, Delaware skipper, Dixie skipper, Cross-line skipper & Cobweb skipper.
<i>Setaria macrostachya</i> Plains bristlegrasses	Poaceae Grass Family	2' - 4' Grass	Flowering spikelets greenish to yellow. May - Nov.	Seeds, June - Nov.	Full sun, part shade	Prefers open grassy areas in southern portion of the state	Sands, loams & clays. Well-drained, mesic-xeric.	X				X						Tufted perennial grass with stiffly erect stems & densely flowered flowerheads. Perennial.	Attractive seed heads provide lots of ripe seeds for granivorous sparrows, finches & buntings. Grass parts used as nesting & denning material. Provides fair grazing for wildlife.
<i>Setaria texana</i> Texas bristlegrasses	Poaceae Grass Family	1 1/2' - 3' Grass	Flowering spikelets greenish to greenish yellow. May.	Seeds, June	Full sun, part shade	Prefers open grassy areas in South Texas & southern part of Edwards Plateau.	Sands, loams & clays. Well-drained, mesic-xeric.	X	X									Tufted perennial with erect stem & smaller flower head than plains bristlegrass. Leaves are dark green, spikelets are lime-green. Perennial.	Texas bristlegrass provides only fair forage for grazing wildlife, but sparrows, finches & buntings forage on the ripe seeds.

<i>Trichloris pluriflora</i> Showy chloris (Multi-flowered false-rhodesgrasses)	Poaceae Grass Family	2' - 3' Grass	Flowering spikelets tawny turning silvery white. July - Sept.	Seeds, Aug. - Oct.	Full sun	Prefers low areas	Silts or clays. Mesic, seasonal poor drainage O.K.	X				X						Highly ornamental grass with a very showy flower head. Especially striking when backlit by the sun. Makes an excellent accent plant for any garden. Warm-season perennial.	Provides cover for small animals. Ripe seeds eaten by granivorous birds & small rodents. Grass parts used as nesting & denning material.
<i>Tridens albescens</i> White tridens	Poaceae Grass Family	1 1/2' - 3' Grass	Flowering spikelets greenish turning silvery white. March - Nov.	Seeds, April - Nov.	Full sun, part shade	Prefers clayey soils along ditches, in swales & areas that get abundance of drainage water.	Clay loams & clays. Mesic.	X	X	X	X	X	X	X	X	X	X	Tufted perennial grass with attractive whitish seed heads with purplish tips. This pretty grass is good mixed in with other grasses & wildflowers. Perennial.	White tridens provides fair grazing for wildlife. Seed-eating birds forage on the ripe seeds. Grass parts used as nesting & denning material.
<i>Paspalum monostachyum</i> Gulfdune paspalum	Poaceae Grass Family	1' - 2 1/2' Seaside grass	Flowering spikelets greenish to straw then brown. May - Nov.	Seeds, June - Nov.	Full sun	Frequently on coastal dune formations, backshore dunes & dune ridges.	Sands, loose. Xeric, well-drained.	X				X						This seaside paspale grass with smooth leaves & densely-flowered single branch prefers the backshore dunes & ridges. It tolerates salt air, loose soils & high winds. Perennial, stout.	This grass provides protective cover & forage for small seaside creatures.
<i>Spartina spartinae</i> Gulf cordgrass	Poaceae Grass Family	4' - 7' Seaside grass	Flowering spikelets greenish to straw-colored then tan. June - Sept.	Seeds, July - Nov.	Full sun	Prefers marshy areas, also coastal flats & brackish marshlands.	Sands, silts, muds. Hydric, tolerates wet soils.	X	X			X	X					This stout perennial with densely clumped stems has a stout spike-like flower head. It will form extensive meadows along coastal flats & other lowland areas. Can grow in soils that are submerged in salt water periodically. Perennial, stout.	This distinctive grass provides excellent food & cover for all sorts of marine & seashore critter, especially rails, shorebirds & beach rodents.
<i>Abronia ameliae</i> Heart's delight	Nyctaginaceae Four o'clock Family	8" - 24" Wildflower	Showy deep pink flowers in 3" heads, very fragrant. March - June	Anthocarp with seeds. March - June	Full sun, part shade	Grows in sandy areas in live oak woods, along roadsides from the Rio Grande Plains north to the Panhandle	Sands, deep. Xeric, well-drained.	X				X						Highly ornamental wildflower that does well in a garden or planned landscape. Perennial.	Heart's delight is highly attractive to butterflies and especially moths. Insects are attracted by the highly fragrant perfume.
<i>Anthericum chandleri</i> Lila de los llanos	Liliaceae Lily Family	1' - 3' Wildflower	Pretty pale orange flowers. May - Nov.	Capsule with seeds, July - Dec.	Full sun, part shade, dappled shade	Grows in prairies and chaparral in the Lower Rio Grande Valley & along the southern coast.	Sands, loams & clays. Well-drained.	X				X						Anthericum sports yellow to pale orange flowers on slender elegant stems. Plant does well in slightly shady conditions & can bloom for a long period of time. Perennial.	Flowers attract an assortment of insects.

<i>Englemannia pinnatifida</i> Engelmann daisy	Asteraceae Sunflower Family	1' - 3' Wildflower	Showy yellow daisy-like flowers. Feb. - Nov.	Achenes, April - Dec.	Full sun, part shade, dappled shade	Grows in open fields, meadows, along roadsides throughout much of the state.	Sands, loams & clays; neutral to calcareous soils. Well-drained, mesic-xeric.	X	X	X	X	X	X	X	X	X	X	X	Lemon-yellow flowers blanket the fields & roadsides especially in the spring. With a little extra water in your garden, these flowers will prolong bloom-time through the summer. Perennial.	Engelmann daisy attracts a multitude of bees, butterflies & other insects which forage on the nectar. Seed-eating birds such as sparrows, buntings & finches dine on the ripe achenes in the fall.
<i>Gutierrezia sarothrae</i> Texas snakeweed	Asteraceae Sunflower Family	1' - 3' Wildflower	Showy tiny yellow flowers. Sept. - Nov.	Achenes, Oct. - Dec.	Full sun, part shade	Grows in open areas, prairies, fields, meadows on poor, dry soils; also along roadsides.	Sands, loams & clays, limestone-based & caliche type soils. Xeric, well-drained.							X	X	X	X		This golden bushy plant does very well in poor dry soils & requires very little water. Looks great in a rock garden. Fields are covered in the fall with solid balls of rich golden yellow which last until it freezes. Perennial.	Many small insects, including syrphid flies, small bees & butterflies are attracted by the nectar. These clumps provide great cover for small animals. Seed-eating birds such as finches & sparrows eat the ripe achenes.
<i>Hibiscus cardiophyllus</i> Heartleaf hibiscus	Malvaceae Mallow Family	3' - 8' Wildflower	Showy red flowers. Dec.	Capsule, multivalved, with seeds, Dec.	Full sun, part shade, dappled shade	Grows in chaparral & brush country, also in canyons in Corpus Christi, south to Rio Grande Plains west to Val Verde County.	Sands, loams, clays & caliche-type soils. Xeric, well-drained.	X					X	X				Highly ornamental hibiscus that is quite drought-tolerant. If you plant it on clay, it must be well-drained. The color of the flower varies from deep red to rose to orangy-red. Not cold-hardy. Perennial.	Pollen attracts many kinds of bees, beetles & other small insects.	
<i>Salvia coccinea</i> Scarlet sage	Lamiaceae Mint Family	2' - 4' Wildflower	Showy red tubular flowers. May - Dec.	Calyx with nutlets, June - Dec.	Full sun, part shade, dappled shade	Prefers sandy soils in thickets, chaparral, on edges of open woods from East to South Texas.	Sands, loams, clays & caliche-type soils. Mesic, seasonal poor drainage O.K.	X	X	X	X	X	X	X				Scarlet sage can thrive in any part of the state. It is not very cold-hardy, however. Oddly, it looks better if planted in dry, shady areas with poor soil. In rich soils with lots of water it gets very tall, coarse & slightly unattractive. Perennial.	Scarlet sage is another excellent hummingbird plant & will draw in the hummingbirds of your area, including any migrants passing through in spring & fall. Bees & other insects are also attracted to the nectar, despite the red flower color.	
<i>Tephrosia lindheimeri</i> Hoary pea	Leguminosae Legume Family	9" - 10" Wildflower	Showy magenta flowers in 4"- inch clusters. April - Oct.	Leguminous pod with seeds, June - Nov.	Full sun, part shade	Grows in open areas, prairies, plains, brushlands & chaparral.	Sands & loams. Xeric, well-drained.	X					X	X				Lindheimer tephrosia makes an excellent showy ground cover. It will also climb a trellis. Once established it's an easy plant to care for. The gray-green leaves are especially attractive. Perennial.	Insects such as bees & small butterflies are attracted to the flowers. The ripe seeds are eaten by several species of birds & small mammals. The plant's leaves are poisonous to livestock however.	

<i>Argemone sanguinea</i> Red prickly poppy	Papaveraceae Poppy Family	1' - 3' Wildflower	Showy pinkish red flowers. Dec.	Capsules, Dec.	Full sun, part shade	Grows in open areas, meadows, fields, along roadsides, waste places in South Texas	Sands, loams & clays; a variety of soils. Well-drained.	X												Colorful poppy with big gorgeous deep red to pinkish lavender flowers. Plants like a little extra water & don't appreciate competition. Does well on disturbed soils. Annual.	Poppies attract bees, beetles, bugs & other small insects that forage on the pollen.
<i>Castilleja indivisa</i> Indian paintbrush	Scrophulariaceae Figwort Family	6" - 12" Wildflower	Showy orange to red bracts. March - May	Capsules with seeds, May - July	Full sun, a little shade O.K.	Prefers fields, meadows, prairies & roadside areas in Eastern portion of the state including the Coastal plains	Sands, loams & clays. Well-drained, mesic.	X	X	X	X	X	X							Indian paintbrush is an excellent choice for a pocket prairie or meadow garden. Grows very well when planted with native grasses. Looks great when interspersed among masses of bluebonnets & showy evening primrose. Annual.	Insects of several varieties are attracted to the small flowers. Hummingbirds will also feed from them, attracted to the red-orange bracts that surround them. Larval host plant of the Buckeye.
<i>Gaillardia amblyodora</i> Red gaillardia	Asteraceae Sunflower Family	1' Wildflower	Showy red daisy-like flowers. March - Nov.	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				This is a marvelously easy wildflower to grow & it comes in various coloration patterns from mainly yellow to mostly reddish. Blooms most of the season from spring to late fall & provides lots of color to a wildflower meadow. Annual.	Indian blanket attracts bees, butterflies & several other varieties of small insects who forage on the nectar. Ripe seed heads are favorites with many species of seed-eating passerines like the Painted Bunting.
<i>Nemophila phacelioides</i> Baby blue-eyes	Hydrophyllaceae Waterleaf Family	10" - 28" Wildflower	Showy lavender & white flowers. March - May	Fruiting calyx with seeds, May - July	Full sun, part shade, dappled shade	Grows in sandy soils & open woodlands in east & southeast Texas	Sands & sandy loams. Well-drained, mesic.	X	X	X		X	X							Baby blue-eyes forms a beautiful carpet of lavender blue. Can be upright to straggling with attractive blade lobed or divided leaves irregularly toothed. Annual.	Bees & butterflies are attracted to the flowers & forage on the nectar.
<i>Phacelia patuliflora</i> Purple phacelia	Hydrophyllaceae Waterleaf Family	10" - 12" Wildflower	Showy purple & white flowers. Feb. - 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.
<i>Phlox glabriflora</i> Rio Grande phlox	Polemoniaceae Phlox Family	9" - 10" Wildflower	Showy deep pink flowers with white centers. May - June	Capsules with seeds, July - Aug.	Full sun, part shade	Grows in open sandy areas in the Coastal Bend area & Lower Rio Grande Valley	Sands, deep. Xeric, well-drained.	X				X								These gorgeous vivid flowers form lush mounds for a little over one month's time in late spring. The species needs deep sands with excellent drainage. Provides incredible splashes of color for your garden. Annual.	Insects of a wide variety are attracted to the flowers.

Food Plots for White-tailed Deer

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Abstract: Food plots may increase the value of hunting leases, make deer more visible for viewing opportunities, and improve the diet quality of deer. However, planting food plots is not a replacement for poor habitat management. Maintaining deer densities within the carrying capacity of the habitat, sound livestock grazing management, and maintaining quality habitat should be the first priorities of any management program. Perennials do not require planting every year, but they produce less forage than annuals. All food plots should be fenced from livestock and warm-season annual food plots should be protected from deer until they are established. To improve diet quality, a ranch should have one cool-season and one warm-season food plot per square mile. Plot size depends on the density of deer. The size and number of plots that can be established may be limited by lack of farmable soils. Rectangular-shaped plots are preferred to long, narrow plots. Food plots are the most productive if all woody plants inside the plots are removed. When planting legumes, care should be taken to inoculate them properly. In semiarid habitats, skip row planting may increase plant survival and reduce seed costs.

INTRODUCTION

Reasons for Planting Food Plots

Planting food plots is one of the most widely used wildlife habitat improvement techniques. The major reasons for planting deer food plots include: (1) using plots as a lease marketing strategy, (2) increasing viewing and photographing opportunities, and (3) increasing the nutritional quality and quantity of available forage.

Presence of food plots often represents the landowner's commitment to deer management, which can aid the landowner in marketing lease property to prospective hunters. Billy Higganbotham, Texas A&M Wildlife Extension Specialist, estimated that for each 1% of the land base planted in food plots, the value of a hunting lease could be increased from \$0.80 to \$1.20 per acre.

A second reason to plant food plots is to make deer more visible for viewing or photography. Many landowners, managers, and hunters derive satisfaction from observing deer. Increased visibility also may benefit landowners involved in ecotourism, which is a growing industry. Additionally, high visibility of deer feeding in food plots can aid managers in monitoring the body condition of deer, progress in antler growth, and other biological factors.

The third objective of planting food plots is to increase the quality and amount of forage available to deer. Researchers in Mississippi found that main-

taining 0.5% of an area in year-round agronomic food plots increased body mass, number of antler points, beam circumferences, and beam lengths of white-tailed deer. In Louisiana, yearling male white-tailed deer exhibited a 19% increase in live weights following establishment of cool-season food plots.

Much interest exists among landowners in improving antler size of white-tailed deer. Genetic improvement of deer has received considerable popular interest, but nutrition is more important in free-ranging deer. Good nutrition is essential to produce large-bodied and large-antlered deer. Improving genetics through culling of "inferior" animals or introducing superior "breed bucks" will have little impact on free-ranging white-tailed deer populations on a practical time scale. Even if genetic improvement did impact free-ranging deer, habitat that provides high levels of nutrition is needed for deer to express their genetic potential.

Unfortunately, nature does not consistently supply an optimally nutritious diet to deer. Nutritional quality and availability of forbs (broad-leaved weeds) and browse (shrub leaves and twigs) fluctuate seasonally, limiting availability of natural foods at certain times of the year.

Deer prefer forbs over browse and generally consume little grass except when it is young, green, and succulent. During rainy winters and springs, forbs often are abundant, resulting in deer that are on a high nutritional plane. Most forbs grow best

during cooler periods and their abundance declines by May or June. Availability of forbs is limited during summer. Thus, late summer is often a period of nutritional stress for deer in the southeastern United States. Rains generally occur in late September and October in Texas. These rains stimulate plant growth and improve the nutritional quality of deer diets during the fall. As with other times of the year, rainfall in September and October is sometimes lacking, resulting in poor forage conditions.

Although winter forbs are abundant if rainfall is adequate, dry winters result in a lack of green, nutritious forbs. Such winters may result in nutritional stress for deer, particularly if a hard freeze occurs. Franz Vogt found that red deer stags had to be in a good nutritional state at least one month before antler growth began to grow antlers of maximum size. If this is true for white-tailed deer in south Texas, then February to May could be a particularly critical time to have high-quality forage available since the period of maximum antler growth for bucks is mid-June through mid-August.

An abundance of forbs and preferred browse species is critical to maintain deer on a high nutritional plane. Both forbs and browse decline in nutritional quality during summer, particularly when rainfall is low. When forbs are lacking, browse becomes the mainstay of deer diets. Researchers at Texas A&M University-Kingsville and the Caesar Kleberg Wildlife Research Institute discovered that the energy content of natural deer foods drops below levels required for maintenance during July and August. In addition, protein levels drop below the optimum for body growth. This deficiency can cause weight loss or reduced weight gain and may result in reduced antler growth. Fawns are born during summer in south Texas and if the high nutrient demands of lactating does are not met, fawn survival will be reduced. Detrimental impacts on deer are accentuated if poor forage conditions are prolonged by drought or if the habitat has been overgrazed by livestock or wildlife.

Role of Food Plots in Deer Management

Food plots should be just a part of an overall management program in which the top priority is maintaining high quality native habitat. Proper management is accomplished by maintaining deer densities within the carrying capacity of the habitat, avoiding overgrazing by livestock, and application of habitat improvement practices such as prescribed burning. For trophy deer management, sex ratios should be maintained near 1:1 and only mature bucks

(5 1/2+ years old) should be harvested. The effect of food plots or any form of supplemental feeding on nutritional status, productivity, and quality of a deer herd will be reduced if one or more of the aforementioned management priorities are ignored. Only when these priorities are accomplished should consideration be given to establishing food plots. Food plots and supplemental feeding are not substitutes for proper population and habitat management.

Many people who promote supplemental feeding (pelleted feeds and food plots) advocate it as a tool to increase deer densities beyond the carrying capacity of the habitat. Maintaining high deer densities at levels that threaten to degrade the habitat is dangerous, particularly in semiarid areas. Native forages comprise a significant portion of deer diets regardless of how much supplement is provided. High deer densities may be maintained in years with normal or above-average rainfall, but sooner or later a drought will occur. Too many deer in a drought-stressed habitat will result in degraded habitat, reducing the ability of the habitat to produce quality bucks in the future. So, keep supplemental feeding as just that—a supplement, not the main course.

BASICS OF GROWING FOOD PLOTS

What to Plant

Cool-season food plots planted with mixtures of grasses that include oats, wheat, and triticale and legumes such as hairy vetch, Austrian winter peas, alfalfa, and hubam clover provide nutritious forage from November through April or May (Table 1). Planting wheat alone had little impact on white-tailed



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Food plots should be used as part of a comprehensive deer management plan.

Table 1. Planting recommendations for selected cool-season annual deer forages.

Characteristics	Forage Species and Varieties						
	White Sweet-Clover	Yellow Sweet-Clover	Arrowleaf Clover	Austrian Winter-peas	Oats	Hairy Vetch	Wheat
Seeding Rate (lbs./acre)	3 - 5 in semi-arid areas; otherwise 10 - 15	3 - 5 in semi-arid areas; otherwise 10 - 15	5 - 10 with drill; 10 - 12 broadcast	25 - 35	50 - 100	20 - 30	50 - 60 (<40" rainfall) 70 - 120 (east TX)
Planting Depth (in.)	1/4 - 1/2	1/2 - 1	1/4	1 - 1 1/2	1/2 - 1	1/2 - 1	1/2 - 1
Planting Dates	Fall	Fall	Fall	Fall	Fall	Fall	Fall
Soil Texture Adaptation	Wide range	Wide range	Well drained sandy and clay soils	Wide range	Wide range except deep sands	Wide range; sandier soil best	Wide range
Soil pH	Slightly acid to moderately alkaline	Slightly acid to moderately alkaline	Slightly acid to slightly alkaline	Neutral to slightly alkaline	Depends on variety	Slightly acid to moderately alkaline	Depends on variety
Drought Tolerance	High	High	Low	Moderate	Moderate	Moderate	Moderate to high
Cold Tolerance	High	High	Moderate	High	Depends on variety	High	Depends on variety
Salinity Tolerance	Not adapted	Not adapted	Not adapted	Not adapted	Not adapted	Not adapted	Not adapted
Rainfall Adaptation (inches)	12+; optimum 17+	10+; optimum 16+	Optimum 35+	20+	Depends on variety	20+	Depends on variety
Establishment Ease	High with scarified seeds	High with scarified seeds	Moderate	High	High	High	High

deer diet quality during February in a recent study conducted by one of my students. Planting mixtures that include nutritious legumes is recommended. Warm-season food plots should provide forage from early spring until late fall and supplement natural vegetation during July-August when natural forages are lacking in quantity and quality. Plants adapted to hot, dry conditions, and intensive farming are essential for producing forage during summer in semiarid areas (Table 2).

Moisture management techniques used in dryland farming such as deep tillage and weed control are necessary for producing food plots in semiarid areas. For warm-season crops such as lablab or cowpeas, plots should be deep tilled in late summer to store rainfall during September and October. Light cultivation or herbicides should be used following rainfall events during the winter to maintain a weed-free seedbed. Weeds should be eliminated since they use the stored soil moisture that will be needed in the spring to support growth of food plot forages.

Use of pre-emergence (pre-planting) herbicides and periodic cultivation between planted rows until the crop is too large to cultivate will maximize the survival and production of food plot forages.

Perennial Versus Annual Food Plots

Seeds of several perennial native plant species including Maximilian sunflower, Engelmann daisy, bush sunflower, and Illinois bundleflower are commercially available for planting (Table 3). Perennial food plots appeal to wildlife managers since they provide permanent vegetative cover and do not have to be replanted every year. Steve Nelle, from the Natural Resources Conservation Service, reported that in central Texas (20 to 25 inch rainfall zone) various mixtures of these plant species can produce 3,000 pounds of forage per acre. Nelle also noted that establishment of perennial food plots is expensive (ranging up to \$100 per acre just for seed) and the plots are management-intensive, which further increases costs.

Generally, perennial food plots produce less forage for deer than annual food plots. One factor is soil compaction that results from concentrations of deer in perennial plots; during rainfall events, the compacted soil facilitates runoff, which results in decreased water infiltration and less water for plants. Also, many commercially-available perennials such as bush sunflower have very small seeds that require planting at shallow depths. Consequently, these plants often are difficult to establish in semiarid areas because soil moisture is seldom adequate to support seed germination or seedling growth at shallow planting depths.

Fencing Food Plots

All food plots, whether warm-season or cool-season, should be fenced to prevent livestock from grazing them. Additionally, warm-season annual plots should be fenced from deer. Emerging seedlings of lablab and many other warm-season species are easily killed by grazing deer. Resistance to grazing greatly increases once the plants are about four or five weeks old. It makes little sense to spend money planting a food plot only to have it grazed

out before the plants are large enough to provide an appreciable amount of forage.

There are two ways to avoid the problem of "graze out." One is to plant very large food plots (greater than 50 acres). The second is to surround the food plot with a fence that can be manipulated to allow deer access to the plots once the plants are large enough to withstand grazing. A number of conventional and electric fence designs have been developed to temporarily exclude deer from plots.

Number and Size of Food Plots

Based on research that my students and I conducted in south Texas, I recommend establishing at least one warm-season and one cool-season food plot per square mile, as soils permit. A lablab field that produces 3,000 pounds of forage per acre will support 2.5 adult white-tailed deer per acre for six months. This calculation is based on an average consumption of 5.5 pounds of dry matter per day with lablab averaging 60% of the dry matter consumed. Also, it assumes 50% use of the forage because the leaves are the most nutritious and palatable portion of the plant. If we assume that warm-season food

Table 2. Planting recommendations for selected warm-season annual deer forages.

Characteristics	Forage Species and Varieties			
	Lablab	Cowpeas	Soybeans	Milo
Seeding Rate	12 - 15 (<20" rainfall)	12 - 30 (<20" rainfall)	12 - 15 (<20" rainfall)	2 - 4 (<20" rainfall)
Rows (lbs./acre)	20 - 30 (20 - 40" rainfall) 20 - 35 (east TX)	20 - 60 (20 - 40" rainfall) 60 - 90 (east TX)	15 - 40 (20 - 40" rainfall) 60 - 75 (east TX)	4 - 7 (20 - 40" rainfall) 8 - 10 (east TX)
Seeding Rate Broadcast (lbs./acre)	30 - 70 (only in areas with >30" rainfall)	80 - 150 (only in areas with >35" rainfall)	60 - 150 (only in areas with >40" rainfall)	16 - 20 (only in areas with >30" rainfall)
Planting Depth (inches)	1 - 4	1 - 3	1 1/2 - 2	3/4 - 1 1/2
Planting Dates	After danger of 1st frost until June	After danger of 1st frost until June	After danger of 1st frost until May	February in south TX, later northward
Soil Texture Adaptation	Wide range	Wide range	Wide range	Wide range if soil is well drained
Soil pH	5 - 7.5	Slightly acid (4) to slightly alkaline	5 - 7.5	4.5 - 8.5
Drought Tolerance	High	High	Low	High
Cold Tolerance	Low	Low	Low	Moderate
Salinity Tolerance	Not adapted	Not adapted	Not adapted	Not adapted
Rainfall Adaptation (inches)	16+ with 30+ optimal; 98 is maximum	30 - 43 is optimal	25 - 30	17 - 25 is optimal
Establishment Ease	High	High	High	High



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Row crop planters such as the John Deere™ Flex Planter ensure proper seed placement, proper seed spacing within rows, and enable planting in evenly-spaced rows.

plots will support 2.5 white-tailed deer per acre for six months, then acres of food plot needed can be determined if the density of deer per square mile is known. For a warm-season food plot with a density of 35 adult deer per square mile:

$$\begin{aligned} \text{acres needed} &= \text{No. deer per square mile} \div 2.5 \text{ deer per acre} \\ &= 35 \text{ deer per square mile} \div 2.5 \text{ deer per acre} \\ &= 14 \text{ acres per square mile} \end{aligned}$$

Thus, for a density of 35 adult deer per square mile, warm-season food plots within each square mile should be at least 14 acres.

Selecting Proper Soils

Clearly, the most fertile and productive soils produce the highest yielding food plots. However, these soils usually support the best native habitat. When possible, food plots should be established on sites where the native habitat has previously been degraded. Converting good quality native habitat into food plots is not a wise management decision.

Typically, ranches are in areas where soils are not conducive to producing agricultural crops. Soils often are too saline, rocky, or sandy for cultivation. To find which soil types are capable of producing crops and where these soils are located on your ranch or lease, contact your local USDA Natural Resources Conservation Service Office. For most counties, the Natural Resources Conservation Service has published soil surveys that contain information on the suitability of particular soils for growing crops and the value of the soils for wildlife habitat.

Shape of Food Plots

Biologists often recommend planting long, narrow food plots to maximize “edge effect.” A cotton field growing beside a mesquite pasture will clearly illustrate why this idea does not work in drier areas. Cotton plants nearest to the mesquites are small and stunted in comparison with plants in the middle of the field. This is because the mesquites compete with the cotton plants for soil water. Food plots in a long, narrow plot bordered on either side by brush is analogous to trying to produce a cotton crop by planting only the edge of the field next to a mesquite pasture. The result will be a sparse stand of stunted plants in years that rainfall is average or below average. For best results, food plots should be square-shaped. If rectangular plots are used, they should be as wide as possible.

Food Plots and Cover

Scattered clusters of brush often are left in food plots to provide security cover. Deer tend to bed in the brush clumps and feed around them. Although brush clumps are intuitively a good idea, they reduce forage production for many yards around the clump for reasons previously discussed about water competition. Furthermore, the brush clumps make it more difficult to maneuver a tractor around in the food plot when planting and cultivating. Both of these problems counterbalance the additional security provided by the brush. Deer will forage in the middle of rectangular 15-acre food plots whether or not brush clumps are present once forage at the edges of plots has been grazed out.

Inoculating Legumes

One of the values of growing legumes is that they form a relationship with certain bacteria which live in association with the plant roots. These bacteria take nitrogen from the air and release it in a form that plants can use. The inoculant that is sold with legumes such as lablab, soybeans, cowpeas, and clovers contains nitrogen “fixing” bacteria and ground up peat moss. The peat moss containing the bacteria is mixed with the seeds before planting. Once the seedling emerges, the bacteria form growths on plant roots called nodules. Presence of these nodules indicates that the bacteria are alive and producing nitrogen.

Inoculant should be stored in a refrigerator because the bacteria can die when exposed to excessively warm temperatures or when the peat moss dries out. Fertilizing the soil before or after planting with nitrogen may reduce nodulation. Thus,

when planting legumes, fertilizers low in nitrogen and high in phosphorus should be used.

Mixing inoculant with seeds to ensure proper seed coverage is essential. To aid in making the inoculant stick to the seeds, many people use commercial tackifiers or liquids such as soda pop, pet milk, or other sticky substances. Inoculation may not be needed in plots where the same plant species have been planted for several years with inoculated seeds because the soil contains sufficient bacteria from the previous plantings.

SKIP ROW PLANTING FOR DRY AREAS

Effects on Plant Survival

Cotton farmers in semiarid areas often leave unplanted rows between pairs of planted rows to increase availability of moisture to the crop. My students and I conducted a study in an area that

averages 18 inches of annual rainfall to determine if “skip-row” planting would increase survival of lablab plants during the late summer.

The amount of lablab produced was similar among planting designs during May through July. However, in August many of the plants in plots where every row was planted died, whereas few plants died in plots where skip row planting was used. Consequently, more food was available during August in skip row plots. The magnitude of the difference between plots depended on rainfall. For example, in August 1994 (an average rainfall year), skip-two-row plots had 32% more forage than plots with every row planted. In 1995, with rainfall 13% below the long-term average, plots planted with two skip rows between pairs of planted rows contained 13 times more forage during August than plots with every row planted. Another advantage of skipping two rows between pairs of planted rows is that seed costs are reduced by 50%.

Table 3. Planting recommendations for selected perennial deer forage species and varieties.

Characteristics	Forage Species and Varieties				
	Siratro	Maximilian Sunflower	Engelmann Daisy	Awnless Bush Sunflower	Illinois Bundleflower
Seeding Rate Rows (lbs./acre)	2 - 4	3 - 4	3	1/2 - 3/4	1 1/2 - 2
Seeding Rate Broadcast (lbs./acre)	8 - 10	1 - 2	3	1/10 - 1/5	3 - 4
Planting Depth (in.)	1/2 - 1	1/8 - 1/2	1/8 - 3/4	1/8 - 1/2	1/2 - 3/4
Planting Dates: South Texas	Spring	Spring	Fall or early winter	Late winter - early spring	Spring
North, East, and Central Texas	Spring - early summer	Spring	Fall or early winter	Late winter - spring	Spring
Soil Texture Adaptation	Deep sand to light clay	Sandy to clay	Wide range	Loam, sandy loam, or clay loam	Wide range
Soil pH	4.5 - 8.0	Neutral to alkaline	Neutral to alkaline	Neutral to calcareous	Wide range
Drought Tolerance	High	High	Moderate	Moderate	Moderate
Cold Tolerance	Survives to 17°F	High	High	High	High
Salinity Tolerance	Moderate	Not adapted	Not adapted	Not adapted	Not adapted
Rainfall Adaptation (in.)	18 - 70	18+	18+	18+	20 - 22+
Ease of Establishment	High in well-prepared bed	High (CRP land)	Low	Low	Moderate
Season of Growth	Warm	Warm	Cool	Warm	Warm



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In semiarid habitats, planting food plots with unplanted (skip) rows between pairs of planted rows increases plant survival during August and lowers seed costs.

Effects on Deer Feeding Behavior

Deer appear to feed only along the edges of lablab food plots when planted with 3-foot row spacing. My graduate student, Jeff Bonner, tested the idea that by leaving unplanted rows between pairs of planted rows, deer would feed into the middle of plots. We envisioned that the unplanted rows would serve as travel lanes into the plots. In some plots, every row in 3-foot rows was planted; in some plots, a row between pairs of planted rows was skipped; and, in some plots two rows were skipped between pairs of planted rows.

Observations revealed that deer ate mainly along the edges of the food plots until the forage at the plot edge had been consumed, regardless of whether the plot was planted in skip rows or not. Once most of the forage was eaten at the edges, deer began feeding further into the plots until forage in that portion of the plot was consumed. Thus, our results indicated that deer will feed in the middle of the plots when forage in other parts of the plot is depleted.

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APPENDIX T



Learn About Whitetails

by Robert L. Cook

Updated and revised by Horace G. Gore, 1989

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Exploration and settlement of the American frontier would have been extremely difficult without the white-tailed deer. Early colonists and explorers utilized the meat and skins of these animals extensively, and deer hides later served as a medium of exchange between trappers, frontier scouts, Indians and traders.

Deer were even more important to the American Indians prior to settlement of the nation, providing clothing and food. Deer were also an important factor in the folklore and religion of native tribesmen.

Indiscriminate slaughter by commercial meat and hide hunters and ignorance of the deer's habitat requirements almost caused its extermination near the end of the 19th century. It was reported, for example, that an early Texas trader operating in Indian country at Trading House Creek (near present site of Waco) shipped approximately 75,000 deer skins from 1844 through 1853.

Public concern for survival of the species brought about a series of protective measures by the Texas Legislature near the turn of the century. A five-month closed season during

which deer could not be hunted was enacted in 1881. The bag limit was established at six bucks per season in 1903 and was reduced to three bucks per season in 1907.

The first hunting licenses were sold in Texas in 1909. In 1919, six game wardens were hired to patrol the entire state.

Additional interest and protection by landowners, sportsmen and law enforcement personnel helped deer populations increase steadily during the 1930s and 1940s. Statewide trapping and restocking programs established deer herds in previously uninhabited areas. Sales of hunting licenses increased dramatically—382,249 in 1955, 571,058 in 1964 and over one million in 1972.

The white-tailed deer is now the most numerous big game animal in Texas and in the United States. Aesthetically and emotionally, the whitetail holds a place of distinction in the hearts and minds of many Texans.

Research and management projects concerning the whitetail and its habitat requirements are conducted by wildlife biologists of the Texas Parks and Wildlife Department, federal agencies, many universities and several private research establishments in Texas.

Research activities by the wildlife biologists of the Texas Parks and Wildlife Department are 75 percent funded from federal excise taxes on firearms and ammunition. Deer are of primary importance on several of the 119 wildlife management areas (900,000 acres) operated by this department. Research activities also are conducted on National Wildlife Refuges, National Forests and Department of Defense lands. The Texas Parks and Wildlife Department game warden field force now numbers some 460 officers. These highly skilled and trained officers provide law enforcement services essential to continued survival of the whitetail.

The whitetail is one of the most researched, observed, sought after, cussed and discussed of all wildlife species in Texas. Few of us, however, are aware of the basic principles which rule this majestic animal's life. Following are some of the most frequently asked questions about white-tailed deer in Texas.

How many kinds of deer are there in Texas?

The Texas white-tailed deer, *Odocoileus virginianus texana*, occurs almost statewide. There were several subspecies of whitetail in the state years ago. However, due to expanding-overlapping ranges and restocking efforts in recent times, the subtle differences between subspecies have been lost except for the isolated population of Carmen Mountain white-tailed deer, *Odocoileus virginianus carminus*, in the Big Bend National Park area. Although found almost statewide in brushy or wooded areas, the heaviest deer populations are located in the central one-third of the state. The mule deer, *Odocoileus hemionus*, is a different species which occurs primarily west of the Pecos River and in parts of the High Plains of the Texas Panhandle.

How many deer are there in Texas?

Texas has more white-tailed deer than any other state. Population estimates in recent years range from three to four million. Current census data indicate that there are more than

four million whitetails in Texas. Population estimates vary from year to year, depending upon reproduction, survival and losses due to malnutrition and disease.

How many white-tailed deer are legally harvested by sportsmen in Texas each year?

An estimated 500,000 whitetails are harvested by sportsmen in Texas annually—more than any other state.

Isn't that too many?

No. Current harvest rates account for only about ten percent of the herd annually. Research indicates that about 20 percent of most populations should be removed annually by sportsmen. Biologically sound harvest rates and habitat management programs are necessary in Texas to prevent waste due to overpopulation, to achieve maximum utilization of this valuable natural resource and to insure the whitetail's continued survival. For example, since the initiation of the program in 1953, more than two million antlerless or doe deer have been harvested from the established deer herds in the state.

How are deer counted?

Several methods of estimating deer numbers are used in Texas:

1. The walking deer cruise line. During the fall months, wildlife biologists walk census lines which have been placed in representative deer habitat and count the deer observed. This method is used extensively in Texas, and there are several hundred such deer census lines in the state.

2. Counts from fixed-winged aircraft. This method is used in areas of the South Texas brush country. Observers count deer seen on strips of deer habitat of known width and length.

3. Track count method. Counting deer tracks on selected sites during late summer is a method frequently used in heavily wooded areas of East Texas.

4. Spotlight counts. Counting deer at night with the use of spotlights along pasture roads or lightly traveled public roads is a method biologists have recently put into use. It is an excellent census method in areas with low deer populations. **Caution:** Biologists always notify all landowners along their spotlight census routes. They drive vehicles clearly marked "Texas Parks and Wildlife Department" and "Deer Census." Any other spotlighters should be reported to the local game warden.

5. Several other deer census methods are used by Parks and Wildlife Department personnel. Counts from helicopters and late evening counts from vehicles are good deer census techniques.

What do deer eat?

Deer eat mostly browse (leaves, twigs, young shoots of woody plants and vines) and forbs (weeds and other broad-leaved flowering plants). They eat some grass, but only when



Each summer the whitetail grows a new set of antlers. When the breeding season begins, the velvet (above) is shed and the antlers become hard and polished.

it is green and succulent. Sheep, goats and foreign big game species compete directly with the whitetail for preferred deer foods. Deer food shortages usually occur during late summer and winter months. Adequate forage is usually available during spring and fall seasons. A variety of foods and habitat types is essential to good deer production and survival.

The following plants are examples of some good native deer foods in Texas which are readily taken by deer when and where they are available.

Browse: oak leaves and acorns, yaupon, greenbriar, prickly pear and fruit, hackberry, mulberry, rattan or supplejack, sumac, mesquite beans and dried leaves, hawthorns, poison oak, American beautyberry, wild cherry and plum, wild grape, honeysuckle, dogwood, elm, blackberry and dewberry, gum elastic (chittum), acacias (catclaw), ephedra, walnut, guayacan, wild chinaberry, kidneywood, Brasil and other condalias.

Grasses: rescue grass, Texas wintergrass, Ozarkgrass, fall witchgrass, panic grasses, sedges and rushes.

Forbs: bundle flower, euphorbia(s), whorled nodviolet, bayflower, oxalis, wooleywhite, tickclovers, filaree, clover, verbena, arrowleaf sida, wild lettuce, wild onions, old man's beard, wildbean, snoutbean, lespedezas, spiderwort, vetches (milkveitch, etc.) lamb's quarters, plantain, groundcherry, pigweed or carelessweed and partridge peas.

How long do deer live?

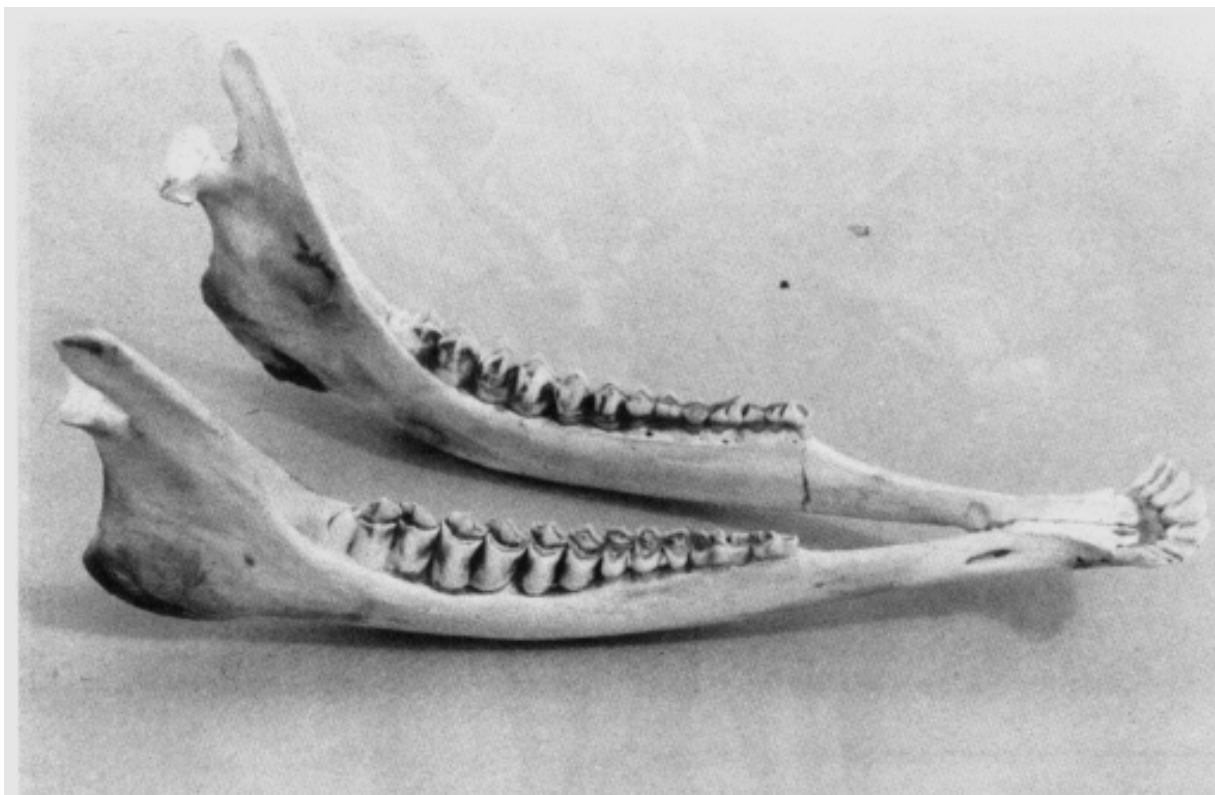
Deer in controlled situations have been known to live 15 to 20 years. It is unusual, however, for a deer in the wild to live more than 10 years, because its teeth usually wear out during the eighth or ninth year.

How can the age of a deer be determined? Is the number of antler points one method?

Deer age is determined by tooth replacement and tooth wear of the premolars and molars (back teeth) of the lower jaw. Unlike sheep, deer cannot be aged by their front teeth, and age cannot be determined by antler characteristics.

Does a buck deer keep the same set of antlers each year?

No. A buck grows a new set of antlers (not horns) each summer. The size of the antlers depends primarily upon the quality and quantity of food the buck eats and his age. The more nutritious the food and the more there is of it during the antler-growing season, the better his antlers will be. With favorable conditions, antler size and spread will increase with deer age. After the sixth year, however, antlers usually decline in size due to the deer's inability to properly chew and digest food.



By noting tooth replacement and tooth wear of the premolars and molars of the lower jaw, biologists determined that this deer was 1½ years old.

What happens to the antlers each year?

Buck deer shed their antlers following the mating season each year. Antler shedding is triggered by the cessation of production of a hormone which also terminates the breeding season. Most bucks in Texas shed their antlers during late January and February. Shed antlers quickly deteriorate or are eaten by rodents and other animals for their calcium content. New antlers start growing and become noticeable "in velvet" during May and June. Good nutrition during this period is critical for good antler growth.

Shouldn't spike bucks be protected since they are young and will be the breeding bucks of the future?

Not necessarily. Most spike bucks are young deer, but if range conditions are poor, there may be spikes of any age. If a herd contains many spikes, the deer probably did not have sufficient quality forage during antler-growing season (May-August). It would serve no logical purpose to protect the spike buck. Research conducted on the Kerr Wildlife Area has shown that all young spike bucks do not develop into the same quality of buck as do most yearling bucks with forked antlers. Some young spikes will produce very good antlers later in life, but the chances for massive antlers is not as good as with forked antlered yearlings. Spikes should be harvested based on the intensity of management desired by each landowner or group of hunters. Spikes should never be protected from hunting. The idea that the removal of spikes is a cure-all for antler development has little merit.

When is the breeding season?

The breeding season for white-tailed deer in Texas ranges through the fall and winter months from about the first of September through mid-January. The peak breeding activity occurs in mid-November in Central Texas and late December in South Texas.

What is a good buck-doe ratio?

The buck-doe ratio in most of Texas is about one buck per three to five does (adult deer) which is satisfactory for good production and hunting. This ratio is not a major problem in Texas deer herd management at this time. An adequate harvest of antlerless deer would help maintain a good ratio of both sexes. It is recommended that game managers and landowners strive for a ratio of 2.5 does per buck.

Won't the deer become smaller due to inbreeding if we don't bring some new blood lines?

No. The deer of Texas are direct descendants of isolated deer herds of many years ago. Inbreeding may occur in the wild, but it apparently is no problem. New blood lines are quickly absorbed into established genetic pools and no improvement in quality is noticed. Inferior quality or small deer result from poor range conditions or insufficient preferred forage and will not be improved by bringing in new bucks.

Does the Texas Parks and Wildlife Department restock deer?

Yes, but only in approved areas judged as potentially good deer habitat which presently have few or no deer. The deer trapping and restocking program was initiated in 1938 by the Game, Fish and Oyster Commission, predecessor of the Texas Parks and Wildlife Department. Since that time, more than 30,000 deer have been released in 160 Texas counties.

How many fawns will a doe have?

Normally, a doe deer in Texas will have her first fawn, which is usually a single, when she is two years old. Thereafter, if food conditions are adequate, the doe should normally have twin fawns almost every year until her sixth or seventh year, when the reproductive rate will begin to decline. Triplet fawns are uncommon, but do occur. Quadruplets have been reported.

The gestation period for deer is seven months.

According to reproductive studies, "old barren does," or does that have never produced fawns, are uncommon and are no problem to deer herd management. The key to maximum production is an adequate supply of nutritious natural food.

Are more female fawns born than male fawns?

No. Male and female fawns are born in approximately equal numbers.

What are the most serious threats to deer herds in Texas?

1. Habitat destruction such as land clearing, root plowing, improved grass pastures, subdivisions, new lakes, expanding cities, etc.
2. Poor range or inadequate food supplies due to overgrazing by domestic livestock and overpopulations of deer, resulting in large-scale deer die-offs.
3. Disease and parasites.
4. Illegal hunting.

What are some of the most important limiting factors affecting white-tailed deer?

Rainfall is an important limiting factor. Extended periods of severe drought during the late summer and fall are especially harmful to fawns, yearlings and very old deer. Coyotes are a limiting factor in South Texas and in portions of Southeast-Central Texas. However, natural predators, such as coyotes, bobcats or eagles presently pose no serious threats to established deer herds of Texas. Efforts to control these predators are usually expensive and ineffective with regard to white-tailed deer.

What about hunting?

Legal hunting can be a limiting factor but is not currently a threat to deer populations. In fact, regulated hunting is the best way to crop the deer herd annually, much like a farmer-rancher would crop his herds of domestic livestock. Properly controlled and regulated, hunting is the most reasonable and humane method of maintaining and utilizing the extensive deer populations of Texas.

Will deer move great distances?

Not normally. A deer chased by dogs may run several miles, but will often circle and end up close to home. During the breeding season, some bucks will trail female deer out of their normal home range but will later return. Movement studies and radio-tracking research in Texas indicated that most deer spend their lives within about 1.5 miles of their birthplace.

What can I do to help the deer, increase deer numbers or improve the quality of deer?

1. Learn about the habitat requirements of deer. Become familiar with preferred deer foods in your area or the area where you vacation or hunt. Support practices which create good wildlife habitat and prevent destruction of existing habitat.
2. Landowners and operators should make every effort to provide adequate habitat and forage for deer and other wildlife. Competition by domestic sheep and goats should be reduced in some cases. Both sexes of deer should be reasonably, but adequately, harvested each year from well-established herds.
3. Sportsmen should obey state laws and those rules established by landowners. Sportsmen should not abuse the land on which they hunt, trespass where they do not have permission, take "sound shots" or misuse a firearm.
4. Everyone should cooperate with law enforcement officers responsible for protection of our wildlife. Violations should be reported immediately to the nearest game warden of the Parks and Wildlife Department, or to Operation Game Thief at 1-800-792-GAME.
5. Landowners and hunters can provide a significant service to the game management programs of Texas by completely and accurately providing harvest data. Whether it is solicited by mail questionnaire or in person by biologists in the field, at check stations or cold storage facilities, valid harvest information is vital to the formulation of effective hunting regulations. These regulations will allow the maximum harvest of surplus animals without endangering the broodstock necessary to replenish those populations.

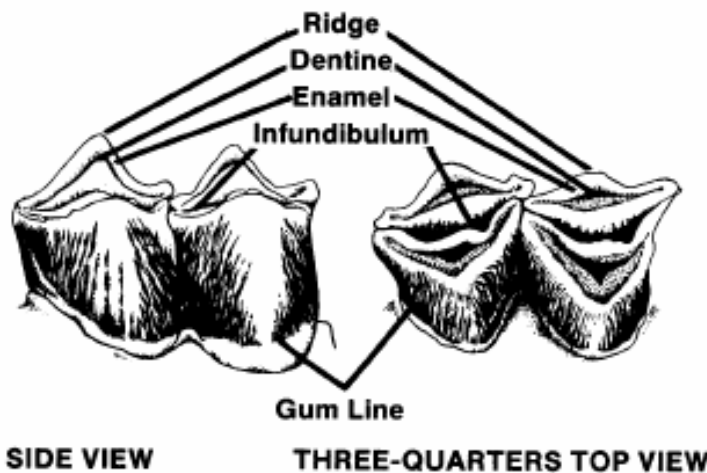
Would it help to feed the deer some supplemental feed?

If deer take large quantities of supplemental feed (corn, etc.), there probably is a shortage of their natural preferred foods. The best solution to the problem is to improve availability of natural foods. Obviously, this cannot be achieved quickly and will result only from proper range management practices (grazing moderately, rotation grazing systems, etc.). If artificial feeding is necessary, deer should be supplied high-quality (14 to 16 percent protein) 3/16" pellets instead of corn, which is about eight percent protein. Marked improvement in body size and antler development should not be expected from artificial or supplemental feeding.

Researchers in Texas and other states have worked many years to obtain answers to some of the many questions concerning the white-tailed deer, its requirements and management. Continued research will reveal additional necessary information about this and other wildlife species. The well-being and continued survival of the whitetail in Texas, however, is dependent primarily upon the interest and concern of sportsmen, landowners and the conservation-minded public of our state.

How To Age Deer

GENERAL ANATOMY OF LOWER MOLAR



Age of a deer is determined by tooth replacement and wear on molars and premolars of the lower jaw. As a deer grows older, certain portions of its teeth are worn enough to show definite differences from the teeth of other age classes.

A deer has only six jaw teeth, although they appear to have many more. The teeth are broken into two distinct categories: the premolars, which are numbered 1, 2, and 3, and the molars, which are numbered 4, 5, and 6.

Deer are aged in fractions because they are born around July and are killed during the hunting season.

1½ year old: (*long yearling*): The long yearling deer is the most easily recognized of all age classes. The first three jaw teeth are milk teeth, which will be replaced around two years of age. These are worn smooth as a long yearling, while the last three teeth remain sharp. The number 3 tooth has three cusps in the milk tooth stage, but only two cusps appear on the replaced tooth. Fawns in their first season will show little evidence of wear on their milk teeth.

2½ year old: The first three jaw teeth have been replaced by permanent teeth and all molars are sharp. The dentine of the first molar (tooth 4) is not as wide as the enamel which surrounds it.

3½ year old: The dentine in the first molar (tooth 4) is now as wide or wider than the enamel which surrounds it, and this is not true of the second molar or tooth 5.

4½ year old: The dentine of the first and second molars (teeth 4 and 5) is as wide or wider on both teeth, but not in tooth 6.

5½ year old: The dentine of all molars (teeth 4, 5, and 6) is now as wide or wider than the enamel surrounding it.

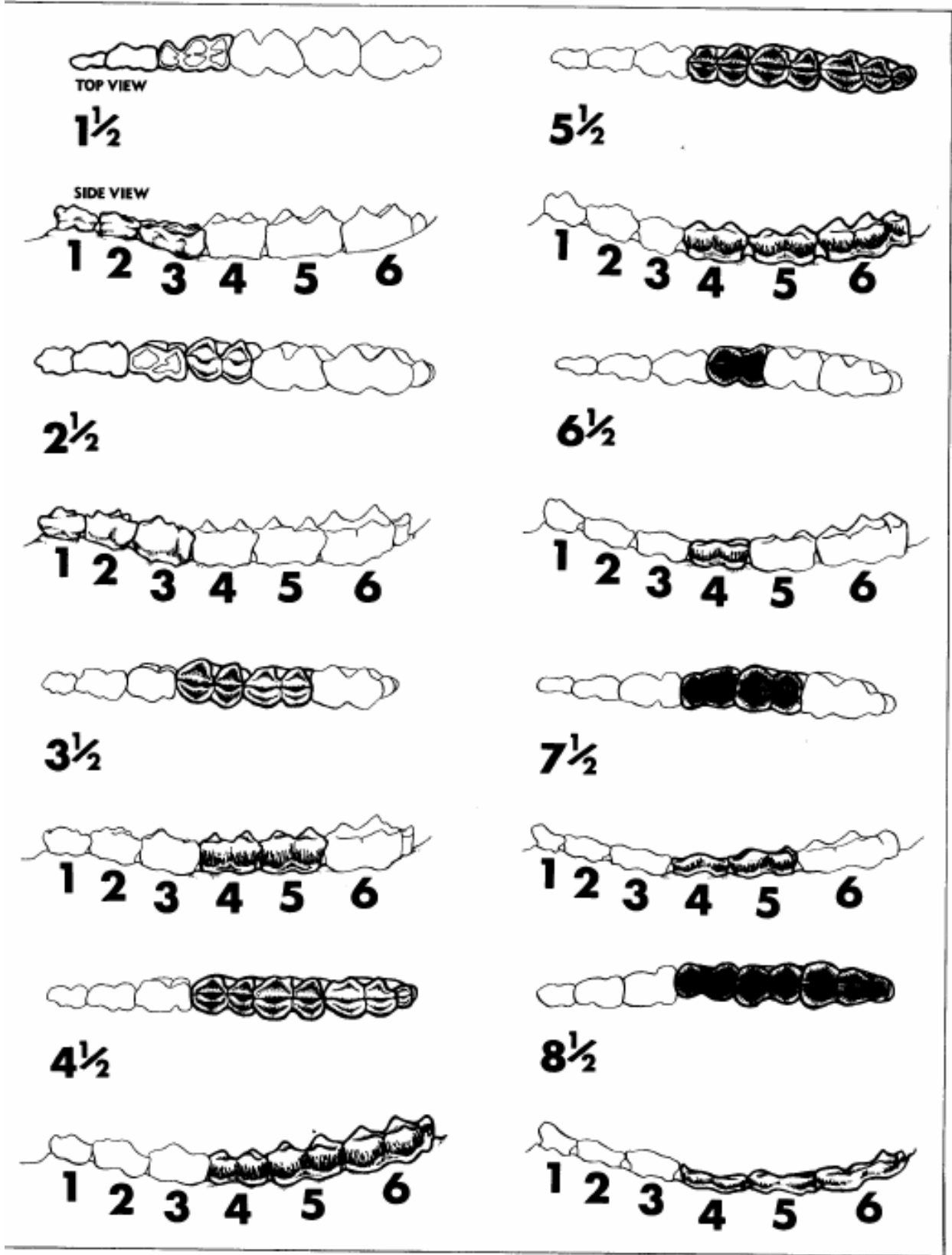
6½ year old: The first molar (tooth 4) is worn smooth, but teeth 5 and 6 are not smooth.

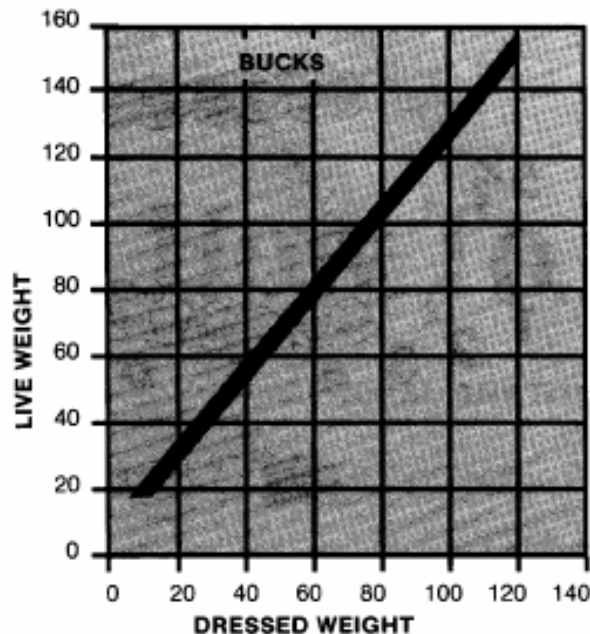
7½ year old: The first and second molars (teeth 4 and 5) are worn smooth, or tooth 5 may still have a small ridge left.

8½ year old: All molar teeth are worn smooth (teeth 4, 5, and 6), but tooth 6 may still have a small ridge left.

Older than 8½ year old: Unable to determine, because characteristic formations have all been worn smooth.

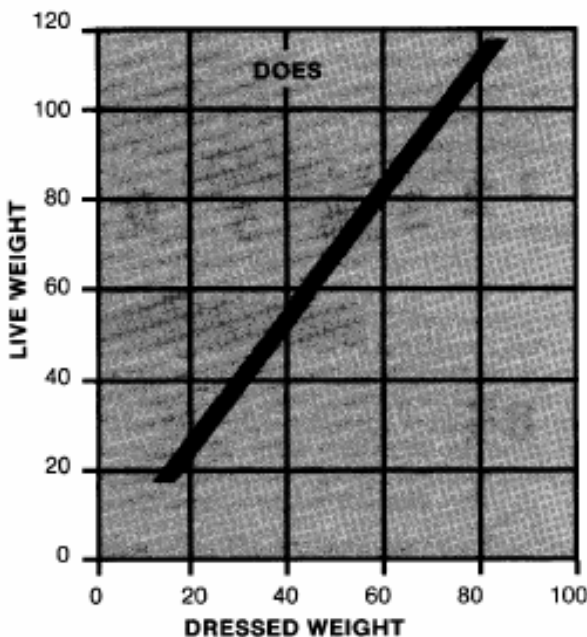
The primary factor governing antler formation is food supply. As deer grow older and their teeth wear flatter, food becomes harder and harder to chew. Body condition will drop and, simultaneously, so will antler development.





Find dressed weight of buck in figures at bottom of chart and trace line up to diagonal. From intersection, trace line to scale at left and read live weight. Reverse this procedure to determine dressed weight of live animal.

Does are lighter than bucks so a different chart must be used. As above, find dressed weight of doe in scale at bottom, trace up to diagonal, then from intersection trace line to left and read estimated live weight.



The Way to Weigh

by Charles Ramsey
and
Melvin J. Anderegg

A PICKUP with two hunters drove up to the deer check station on the Kerr Wildlife Management Area. Both hunters climbed out, and walked around to the back of the truck and began unloading a couple of deer.

The first deer, a small doe, was tossed upon the table in the check station. Area personnel field dressed the deer and recorded descriptive measurements and weights. Then the doe was loaded back into the truck.

The second deer, a large buck, was lifted onto the table and the process of measuring and recording was repeated. Since the buck was already field dressed, only a dressed weight was taken—106 pounds field dressed. How big was that deer on the hoof?

This question has been repeated so many times at the check station that two graphs were prepared to help with the answer. These graphs represent the weights taken from approximately 200 deer in good body condition killed on the Kerr Wildlife Management Area. Since these deer were typical of the Edwards Plateau, the graphs will be applicable for deer taken within the Hill country. Although not as accurate, they are also good guides for deer taken from other areas of the state.

Dressed weight means "field dressed" with head, hide, and feet left on the carcass.

Visit the outdoors each month through the full-color pages of *Texas Parks & Wildlife* magazine.

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PWD-BK-7100-7-12/89

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.



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 _____ 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.

<input type="checkbox"/> Habitat control	<input type="checkbox"/> Provide supplemental supplies of water
<input type="checkbox"/> Erosion control	<input type="checkbox"/> Provide supplemental supplies of food
<input type="checkbox"/> Predator control	<input type="checkbox"/> Provide shelters
<input type="checkbox"/> Making census counts to determine population.	

Part VI. White tail Deer and Mule Deer Population Management

Is hunting to be a part of this wildlife management plan? Yes No
If YES, type of hunting: Lease hunting Family/guests only Both
List deer harvest for past three seasons:
Year: _____ Bucks: _____ Does: _____
Year: _____ Bucks: _____ Does: _____
Year: _____ Bucks: _____ Does: _____
Population Management Goals:
Target Density for Pre-season Deer Population (fall density) _____
Target Sex Ratio (does/buck): _____
Target Production (fawns/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
<input type="checkbox"/> <i>Grazing management.</i> Check grazing system being utilized. <input type="checkbox"/> 1 herd/3pasture <input type="checkbox"/> 1 herd/4 pasture <input type="checkbox"/> 1 herd/multiple pasture <input type="checkbox"/> High intensity/low frequency (HILF) <input type="checkbox"/> Short duration system <input type="checkbox"/> Other type of grazing system (describe) _____ <i>Additional Information:</i> _____
<input type="checkbox"/> <i>Prescribed Burning</i> Acres to be burned: _____ Planned burn date: _____ <i>Additional Information:</i> _____
<input type="checkbox"/> <i>Range Enhancement (Range Reseeding)</i> Acres to be seeded: _____ Date to be seeded: _____ Seeding Method: <input type="checkbox"/> Broadcast <input type="checkbox"/> Drilled <input type="checkbox"/> Native Hay Seeding mixture to be used: Fertilized: <input type="checkbox"/> Yes <input type="checkbox"/> No Weed control needed for establishment? <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Additional Information:</i> _____
<input type="checkbox"/> <i>Brush Management.</i> Acres to be treated: _____ Check method of brush management: <input type="checkbox"/> Mechanical <input type="checkbox"/> grubber <input type="checkbox"/> chain <input type="checkbox"/> roller chopper/aerator <input type="checkbox"/> rhome disc <input type="checkbox"/> brush hog (shredder) <input type="checkbox"/> dozer <input type="checkbox"/> hand-cutting (chainsaw) <input type="checkbox"/> hydraulic shears <input type="checkbox"/> other (describe): _____ <input type="checkbox"/> Chemical Kind: _____ Rate: _____ <input type="checkbox"/> Brush management design: <input type="checkbox"/> block <input type="checkbox"/> mosaic <input type="checkbox"/> strips: width: _____ Length: _____ <i>Additional Information:</i> _____
<input type="checkbox"/> <i>Fence Modification</i> Target species: <input type="checkbox"/> pronghorn antelope <input type="checkbox"/> bighorn sheep Technique: <input type="checkbox"/> fold up bottom of net-wire Gap width: _____ <input type="checkbox"/> replace sections of net-wire with barbed wire. Gap width: _____ Miles of fencing that will be modified: _____ <input type="checkbox"/> replace entire net-wire fence with barbed wire. Miles replaced: _____ <i>Additional Information:</i> _____

Riparian management and enhancement

Fencing of riparian area

Complete fencing Partial fencing

Deferment from livestock grazing

Complete deferment partial deferment Season deferred : _____

Establish vegetation

Trees (list species) _____

Shrubs (list species) _____

Herbaceous species (list) _____

Additional Information: _____

Wetland enhancement

Provide seasonal water Provide permanent water Moist soil management

Other (describe) _____

Additional Information: _____

Habitat Protection for species of concern

Fencing Firebreaks Prescribed burning Control of nest parasites

Habitat manipulation (thinning, etc.) Native/exotic ungulate control

Other (describe) _____

Additional Information: _____

Prescribed Control of Native, Exotic and Feral Species

Prescribed control of vegetation

Prescribed control of animal species

Species being controlled: _____

Method of control: _____

Additional Information: _____

Wildlife Restoration

Habitat restoration

Wildlife restoration

Target species: _____

Method of restoration: _____

Additional Information: _____

2. EROSION CONTROL

Pond construction and repair

Surface area (acres): _____ Number of cubic yards of soil displaced: _____

Length of dam (feet): _____ Planned date of construction: _____

Additional Information: _____

Gully shaping

Total acres to be treated: _____ Acres treated annually: _____

Seeding mix used for reestablishment of vegetation: _____

Planned date of construction: _____

Additional Information: _____

Streamside, pond, and wetland revegetation. Techniques used:

Native hay bales Fencing Filter strips Seeding upland buffer

Rip-rap, etc. stream crossings Other: _____

Planned date of construction: _____

Additional Information: _____

Herbaceous and/or woody plant establishment on critical areas (erodible)

Establish windbreak Establish shrub mottes Improve plant diversity

Improve wildlife habitat Conservation/no-till practices Manage CRP cover

Additional Information: _____

Dike/Levee Construction/Management

Reshaping/repairing erosion damage Revegetating/stabilize levee areas

Install water control structure Fencing

Additional Information: _____

Establish water diversion

Type: Channel Ridge

Slope: level graded Length (feet) _____

Vegetated: No YES

If YES: Native: _____ Crop: _____

Additional Information: _____

3. PREDATOR CONTROL

- Imported red fire ants (verify prior to application that product is labeled for pasture use)
- Control of cowbirds Grackle/starling/house sparrow control
- Method of control: Trapping Shooting Baiting Scare tactics _____
- Coyotes Feral hogs Raccoon Skunk Bobcat Mountain lion
- Rat snakes Feral cats/dogs
- Method of control: Trapping Shooting M-44 (licensed applicators)
- Poison collars (1080 certified, licensed, applicator) Other _____
- Additional Information:* _____

4. SUPPLEMENTAL WATER

- Marsh/Wetland Restoration or Development*
- Greentree reservoirs Shallow roost pond development Seasonally flooded crops
- Artificially created wetlands Marsh restoration/development/protection
- Prairie pothole restoration/development/protection Moist soil management units
- Planned date of construction: _____
- Additional Information:* _____

- Well/trough/windmill overflow/other wildlife watering facilities*
- Drill new well Depth: _____ Gallons per minute: _____
- Windmill Pump Pipeline: Size _____ Length: _____
- Modification(s) of existing water source
- Fencing Overflow Trough modification Pipeline
- Distance between water sources (waterers): _____
- Type of wildlife watering facility
- | | |
|---|--|
| <input type="checkbox"/> PVC pipe facility # _____ | <input type="checkbox"/> Drum with faucet or float # _____ |
| <input type="checkbox"/> Small game guzzler # _____ | <input type="checkbox"/> Windmill supply pipe dripper # _____ |
| <input type="checkbox"/> Plastic container # _____ | <input type="checkbox"/> In-ground bowl trough # _____ |
| <input type="checkbox"/> Big game guzzler # _____ | <input type="checkbox"/> Inverted umbrella guzzler # _____ |
| <input type="checkbox"/> Flying saucer guzzler # _____ | <input type="checkbox"/> Ranch Specialties guzzler # _____ |
| <input type="checkbox"/> Other: _____ | |
- Additional Information:* _____

- Spring development and/or enhancement*
- Fencing Water diversion/pipeline Brush removal Spring clean out
- Other: _____
- Additional Information:* _____

5. PROVIDING SUPPLEMENTAL FOOD

Grazing management Prescribed burning Range enhancement

Food plots Size: _____ Fenced: Yes No

Irrigated: Yes No

Plantings: Cool season annual crops: _____

Warm season annual crops: _____

Annual mix of native plants: _____

perennial mix of native plants: _____

Additional Information: _____

Feeders and mineral supplementation

Purpose: Supplementation Harvesting of wildlife

Targeted wildlife species: _____

Feed type: _____ Mineral type: _____

Feeder type: _____ Number of feeders: _____

Method of mineral dispensing: _____

Number of mineral locations: _____

Year round: Yes No If not, state when: _____

Additional Information: _____

Managing tame pasture, old fields and croplands

Overseeding cool and/or warm season legumes and/or small grains

Periodic disturbance (Discing/Mowing/Shredding) Conservation/no-till

Additional Information: _____

Transition management of tame grass monocultures

Overseed 25% of tame grass pastures with locally adapted legumes

Species planted: Clover Peas Vetch Other: _____

Additional Information: _____

6. PROVIDING SUPPLEMENTAL SHELTER

Nest boxes Target Species: _____

Cavity type. # _____ Bat boxes. # _____ Raptor pole. # _____

Additional Information: _____

Brush piles and slash retention

Type: Slash Brush piles Number per acre: _____

Additional Information: _____

Fence line management Length: _____ Initial establishment: Yes No

Plant type established: Trees Shrubs Forbs Grasses

Additional Information: _____

Hay meadow, pasture and cropland management for wildlife Acres treated: _____

Shelter establishment: Roadside management Terrace/wind breaks Field borders

shelterbelts Conservation Reserve Program lands management

Type of vegetation: Annual Perennial

Species and percent of mixture _____

Deferred mowing Period of deferment: _____

Mowing Acres mowed annually: _____

No till/minimum till

Additional Information: _____

Half-cutting trees or shrubs

Acreage to be treated annually: _____ Number of half-cuts annually: _____

Additional Information: _____

Woody plant/shrub establishment

Pattern: Block Mosaic Strips: Width: _____

Acreage or length established annually: _____ Spacing: _____

Shrub/tree species used: _____

Additional Information: _____

Natural cavity/snag development

Species of snag _____ Size of snags: _____ Number/acre _____

Additional Information: _____

7. CENSUS

Spotlight counts Targeted species: _____
Length of route: _____ Visibility of route _____
Dates (3 required) A. _____ B. _____ C. _____
Additional Information: _____

Standardized incidental observations Targeted species: _____
Observations from: Feeders Food plots Blinds Vehicle Other _____
Dates: _____
Additional Information: _____

Stand counts of deer (5 one hour counts per stand required). Number of stands: _____
Dates: _____
Additional Information: _____

Aerial Counts Species counted: _____
Type of survey: Helicopter Fixed-wing
Percent of area surveyed: Total 50% Other: _____
Additional Information: _____

Track counts: Predators Furbearers Deer Other: _____
Additional Information: _____

Daylight deer herd/wildlife composition counts
Species: Deer Turkey Dove Quail Other _____
Additional Information: _____

Harvest data collection/record keeping: Deer Game birds
 Age Weight Sex Antler data Harvest date
Additional Information: _____

Browse utilization surveys (thirty 12 foot circular plots required)
Additional Information: _____

Census of endangered, threatened, or protected wildlife. Species: _____
Method and dates: _____
Additional Information: _____

Census and monitoring of nongame wildlife species. Species: _____
 Method and dates: _____
Additional Information: _____

Miscellaneous Counts: Species being counted: _____

Remote detection (i.e. cameras) Hahn (walking) line Roost counts

Booming ground counts Time/area counts Songbird transects and counts

Quail call and covey counts Point counts Small mammal traps

Drift fences and pitfall traps Bat departures Dove call counts

Chachalaca counts Turkey hen/poult counts Waterfowl/water bird counts

Alligator nest/census counts Other: _____

Additional Information: _____

IX. Additional Supporting Information. (Optional)

Attach any other supporting information, such as maps or photographs that you believe to be relevant to this wildlife management plan.

I certify that the above information provided by me in this application is to the best of my knowledge and belief, true and complete.

 Landowner Signature

 Date

This area for use only if the wildlife management plan was prepared for the above landowner for a fee by a wildlife professional or consultant. *

Signature of person preparing wildlife management plan.	Date
Company	Phone Number
*Signature by TPWD not required for this plan to be lid.	

Texas Parks and Wildlife does not maintain the information collected through this form. This completed form is only provided to the County Tax Appraiser. Please inquire with your County Central Appraisal District on any local laws concerning any information collected through this form.



1-D-1 Open Space Agricultural Valuation Wildlife Management Annual Report for the Year(s) _____

Submit this plan to your County Tax Appraiser, not to Texas Parks and Wildlife

Part I. Owner Information

Account Number: _____

Owner's Name: _____
Current mailing address: _____
City, town, post office, state and zip code: _____
Phone number: _____
Tract Name: _____ Majority County: _____
Additional Counties (if any): _____

Part II. Qualifying Wildlife Management Activities

Check the wildlife management practices implemented on the property during the year being reported. A minimum of three practices is required.

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

Part III. Wildlife Management Association Membership

Are you a member of a wildlife property association? Yes No

Name of wildlife property co-op/association, if YES is checked. _____

Part IV. Wildlife Management Activities

Check the activities you have implemented during the year to support each of the wildlife management activities listed in Part II.

1. HABITAT CONTROL

- Grazing management.* Check grazing system being utilized.
- 1 herd/3pasture 1 herd/4 pasture 1 herd/multiple pasture
 High intensity/low frequency (HILF) Short duration system
 Other type of grazing system (describe) _____

Additional Information: _____

- Prescribed Burning*

Acres to be burned: _____ Planned burn date: _____

Additional Information: _____

- Range Enhancement (Range Reseeding)*

Acres to be seeded: _____ Date to be seeded: _____
Seeding Method: Broadcast Drilled Native Hay
Seeding mixture to be used:
Fertilized: Yes No
Weed control needed for establishment? Yes No

Additional Information: _____

- Brush Management.* Acres to be treated: _____ Check method of brush management:

Mechanical
 grubber chain roller chopper/aerator rhome disc
 brush hog (shredder) dozer hand-cutting (chainsaw)
 hydraulic shears other (describe): _____
 Chemical Kind: _____ Rate: _____
 Brush management design:
 block mosaic strips: width: _____ Length: _____

Additional Information: _____

- Fence Modification*

Target species: pronghorn antelope bighorn sheep
Technique: fold up bottom of net-wire Gap width: _____
 replace sections of net-wire with barbed wire. Gap width: _____
Miles of fencing that will be modified: _____
 replace entire net-wire fence with barbed wire. Miles replaced: _____

Additional Information: _____

Riparian management and enhancement

Fencing of riparian area

Complete fencing Partial fencing

Deferment from livestock grazing

Complete deferment partial deferment Season deferred : _____

Establish vegetation

Trees (list species) _____

Shrubs (list species) _____

Herbaceous species (list) _____

Additional Information: _____

Wetland enhancement

Provide seasonal water Provide permanent water Moist soil management

Other (describe) _____

Additional Information: _____

Habitat Protection for species of concern

Fencing Firebreaks Prescribed burning Control of nest parasites

Habitat manipulation (thinning, etc.) Native/exotic ungulate control

Other (describe) _____

Additional Information: _____

Prescribed Control of Native, Exotic and Feral Species

Prescribed control of vegetation

Prescribed control of animal species

Species being controlled: _____

Method of control: _____

Additional Information: _____

Wildlife Restoration

Habitat restoration

Wildlife restoration

Target species: _____

Method of restoration: _____

Additional Information: _____

2. EROSION CONTROL

Pond construction and repair

Surface area (acres): _____ Number of cubic yards of soil displaced: _____

Length of dam (feet): _____ Planned date of construction: _____

Additional Information: _____

Gully shaping

Total acres to be treated: _____ Acres treated annually: _____

Seeding mix used for reestablishment of vegetation: _____

Planned date of construction: _____

Additional Information: _____

Streamside, pond, and wetland revegetation. Techniques used:

Native hay bales Fencing Filter strips Seeding upland buffer

Rip-rap, etc. stream crossings Other: _____

Planned date of construction: _____

Additional Information: _____

Herbaceous and/or woody plant establishment on critical areas (erodible)

Establish windbreak Establish shrub mottes Improve plant diversity

Improve wildlife habitat Conservation/no-till practices Manage CRP cover

Additional Information: _____

Dike/Levee Construction/Management

Reshaping/repairing erosion damage Revegetating/stabilize levee areas

Install water control structure Fencing

Additional Information: _____

Establish water diversion

Type: Channel Ridge

Slope: level graded Length (feet) _____

Vegetated: No YES

If YES: Native: _____ Crop: _____

Additional Information: _____

3. PREDATOR CONTROL

- Imported red fire ants (verify prior to application that product is labeled for pasture use)
 - Control of cowbirds Grackle/starling/house sparrow control
 Method of control: Trapping Shooting Baiting Scare tactics _____
 - Coyotes Feral hogs Raccoon Skunk Bobcat Mountain lion
 - Rat snakes Feral cats/dogs
 Method of control: Trapping Shooting M-44 (licensed applicators)
 Poison collars (1080 certified, licensed, applicator) Other _____
- Additional Information:* _____

4. SUPPLEMENTAL WATER

- Marsh/Wetland Restoration or Development*
 Greentree reservoirs Shallow roost pond development Seasonally flooded crops
 Artificially created wetlands Marsh restoration/development/protection
 Prairie pothole restoration/development/protection Moist soil management units
 Planned date of construction: _____
- Additional Information:* _____

- Well/trough/windmill overflow/other wildlife watering facilities*
 Drill new well Depth: _____ Gallons per minute: _____
 Windmill Pump Pipeline: Size _____ Length: _____
 - Modification(s) of existing water source
 Fencing Overflow Trough modification Pipeline
 Distance between water sources (waterers): _____
- Type of wildlife watering facility
- | | |
|---|--|
| <input type="checkbox"/> PVC pipe facility # _____ | <input type="checkbox"/> Drum with faucet or float # _____ |
| <input type="checkbox"/> Small game guzzler # _____ | <input type="checkbox"/> Windmill supply pipe dripper # _____ |
| <input type="checkbox"/> Plastic container # _____ | <input type="checkbox"/> In-ground bowl trough # _____ |
| <input type="checkbox"/> Big game guzzler # _____ | <input type="checkbox"/> Inverted umbrella guzzler # _____ |
| <input type="checkbox"/> Flying saucer guzzler # _____ | <input type="checkbox"/> Ranch Specialties guzzler # _____ |
| <input type="checkbox"/> Other: _____ | |
- Additional Information:* _____

- Spring development and/or enhancement*
 Fencing Water diversion/pipeline Brush removal Spring clean out
 Other: _____
- Additional Information:* _____

5. PROVIDING SUPPLEMENTAL FOOD

Grazing management Prescribed burning Range enhancement

Food plots Size: _____ Fenced: Yes No

Irrigated: Yes No

Plantings: Cool season annual crops: _____

Warm season annual crops: _____

Annual mix of native plants: _____

perennial mix of native plants: _____

Additional Information: _____

Feeders and mineral supplementation

Purpose: Supplementation Harvesting of wildlife

Targeted wildlife species: _____

Feed type: _____ Mineral type: _____

Feeder type: _____ Number of feeders: _____

Method of mineral dispensing: _____

Number of mineral locations: _____

Year round: Yes No If not, state when: _____

Additional Information: _____

Managing tame pasture, old fields and croplands

Overseeding cool and/or warm season legumes and/or small grains

Periodic disturbance (Discing/Mowing/Shredding) Conservation/no-till

Additional Information: _____

Transition management of tame grass monocultures

Overseed 25% of tame grass pastures with locally adapted legumes

Species planted: Clover Peas Vetch Other: _____

Additional Information: _____

6. PROVIDING SUPPLEMENTAL SHELTER

Nest boxes Target Species: _____

Cavity type. # _____ Bat boxes. # _____ Raptor pole. # _____

Additional Information: _____

Brush piles and slash retention

Type: Slash Brush piles Number per acre: _____

Additional Information: _____

Fence line management Length: _____ Initial establishment: Yes No

Plant type established: Trees Shrubs Forbs Grasses

Additional Information: _____

Hay meadow, pasture and cropland management for wildlife Acres treated: _____

Shelter establishment: Roadside management Terrace/wind breaks Field borders

shelterbelts Conservation Reserve Program lands management

Type of vegetation: Annual Perennial

Species and percent of mixture _____

Deferred mowing Period of deferment: _____

Mowing Acres mowed annually: _____

No till/minimum till

Additional Information: _____

Half-cutting trees or shrubs

Acres to be treated annually: _____ Number of half-cuts annually: _____

Additional Information: _____

Woody plant/shrub establishment

Pattern: Block Mosaic Strips: Width: _____

Acres 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.

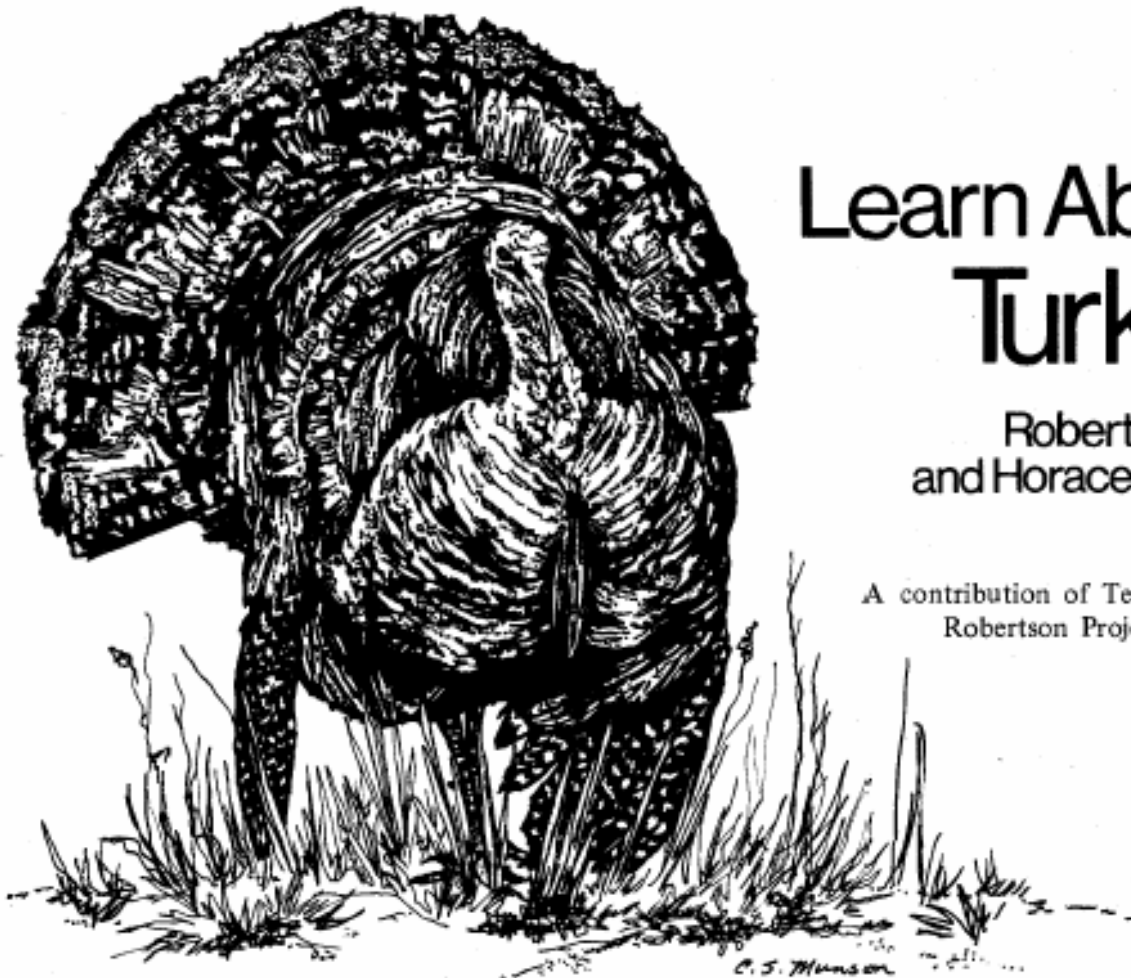
I certify that the above information provided by me is to the best of my knowledge and belief true and complete.

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



Learn About Turkey

Robert L. Cook
and Horace G. Gore

A contribution of Texas Pittman-
Robertson Project FW-14-C.

Turkey were almost exterminated in Texas by late in the 19th century. However, the first step was taken to protect these game birds in 1897 when trapping was outlawed for five months of the year. In 1903, a bag limit of 25 turkey per day throughout a five-month season was initiated. These liberal restrictions failed to help the turkey in most of its range, since there were few game wardens to enforce the laws.

In 1919, the legislature created a bag limit of three bearded gobblers per season. Increased protection by conservation-minded landowners and additional game wardens in the 1920s helped turkey populations to begin a steady increase. Also, since that time, the Texas Parks and Wildlife Department has trapped over 10,000 turkey and restocked them to suitable habitat throughout the state in an effort to restore the wild turkey to its historic range.

There are presently two varieties of wild turkey common to Texas. The Eastern turkey, *Meleagris gallopavo silvestris*, is found in the forests and dense thickets of East Texas and is rarely seen because of its wariness and scarcity. The Rio Grande turkey, *Meleagris gallopavo intermedia*, is found in most of South, Central and North Texas. The Merriam's turkey, *Melagris gallopavo merriami*, once roamed the mountains of West Texas, but were extirpated by 1907.

Attempts to restock this turkey have not been successful.

In general, the Eastern turkey is darker and larger than the more common Rio Grande variety. A mature Rio Grande gobbler averages 16 to 18 pounds, while the Eastern bird averages 19 to 21 pounds.

Biologists of the Parks and Wildlife Department are trying to save Texas' Eastern turkey and restore it to its former range. The few remaining birds are carefully protected by game wardens and landowners, and efforts to restock suitable areas with wild-trapped birds are made each year. Efforts are also being made to develop a hybrid turkey which could be satisfactorily established in portions of East Texas.

Following are some of the most often asked questions about wild turkey in Texas.

How long do wild turkey live?

Turkey live an average of two to three years; however, upon reaching maturity their life expectancy increases substantially. Most mortality occurs in poults (young-of-the-year) and yearlings. A few birds have been known to live as long as 10 years.

Where did the wild turkey come from?

Wild turkey are native to America and probably evolved from pheasantlike ancestors. American Indians ate turkey and

used the feathers to adorn themselves and their weapons. Cortez, the Spanish explorer, found the Aztecs and other Indians in Mexico in possession of domesticated wild turkey in 1519. The explorer Vasco de Gama introduced the wild turkey into Europe.

What do turkey eat?

Turkey are primarily vegetarians, although they eat many insects, snails and other invertebrates. Major food items during the spring and summer are green grasses and forbs (weeds), buds, flowers, seeds and insects. In the fall and winter, turkey take fruits, most such as pecans and acorns and green forage such as Texas winter grass, oats or wheat, depending upon availability.

How many eggs does a hen usually lay?

Ten or 11 eggs make up the average clutch laid by each hen, and it takes her about two weeks to lay them. Most eggs are fertile and will hatch upon completion of the 28-day incubation period if not destroyed or unduly disturbed.

Do most of the eggs hatch or does something happen to them before the incubation period is complete?

Overall nesting success in turkey is similar to that of most ground-nesting birds. About one-third of all eggs laid will eventually hatch. Weather is the main factor limiting Rio Grande turkey nesting success. If there is insufficient ground moisture, the eggs will get too hot and dry during incubation and the embryo will die. Studies indicate that almost one-half of all turkey nests are destroyed by predators. If weather conditions are good, however, a reasonably good turkey hatch can be expected in spite of predators and other limiting factors.

How long do the hen and young stay on the nest?

The hen and newly hatched poults stay on the nest about one full day. Poults begin to roost in trees at about two weeks of age, but can fly well for short distances at 10 days. During this critical period, predators account for many poult losses. Although a hen may have hatched nine or 10 poults, only two or three may be left at the summer's end.

Can a bearded turkey hen raise young?

Yes. They (about 15 percent of all Rio Grande hens in Texas have visible beards) are as productive as hens without beards. Beards appear on older hens and increase in size and thickness with age.

Why are some wild turkey gray or even white?

Gray or white turkey in the wild are usually genetic color aberrancies compared to the well known "black sheep." They are not domestic turkey gone wild or descendants of domestic turkey. White or gray turkey are often wilder than turkey of normal coloration.

What is the most important limiting factor on Rio Grande turkey?

Weather, especially dry weather in Texas. Droughts lasting several months may cause reductions of up to 50 percent in wild turkey flocks. During dry weather, turkey are weakened by poor forage conditions and are more susceptible to disease, parasites and predators. Most turkey eggs will not hatch in hot, dry weather and the few poults that do hatch must soon have moisture to survive. Sufficient rainfall during the late spring and early summer months is essential to good turkey production and survival.

Wouldn't a good predator control program increase turkey numbers?

Not necessarily. Wild turkey have survived and reproduced for thousands of years in spite of the presence of every known predator in North America. With good weather and range conditions, turkey have little trouble contending with pressure from predators. In addition, it is expensive and difficult to effectively reduce predator populations.

Why do we hunt turkey?

Turkey provide thousands of hours of recreation for sportsmen as well as a delicious addition to the menu. Legal hunting pressure has never been a limiting factor on turkey in Texas since less than 10 percent of the entire population is harvested by hunters annually. Turkey can withstand an annual harvest of at least 20 percent of the population. If these birds are not taken by sportsmen during the hunting season, they will eventually die and be wasted.

Shouldn't we protect hens?

To properly harvest turkey and maintain sex ratios, it is absolutely necessary to harvest both hens and gobblers. Ranchers wouldn't sell only the male offspring from their livestock herds. The same principle applies to turkey since surpluses occur in both sexes. Continual harvest of one sex will create an imbalance in the sex ratio. In addition, turkey hens are difficult to distinguish from young gobblers, and the average hunter finds it almost impossible to distinguish a bearded hen from a gobbler. As in the case with most game birds (waterfowl, quail, dove), it is practical to allow and encourage the harvest of both sexes. A reasonable either-sex harvest will not hinder turkey production.

Why hunt gobblers in the spring mating season?

Although the spring gobbler season is relatively new to most Texans, it is traditional in most southern states and is probably the most practical of all hunting seasons, since it is held after the hens have been bred and are laying or incubating eggs. Hunting game animals during their breeding season is a common and established principle to big game hunters. Because of his gobbling and strutting activities, the male turkey is easier to distinguish this time of year. Hunters can also use calls to lure gobblers within range.

Hens need to be bred only once each spring to fertilize their entire clutch of eggs and each dominant gobbler usually mates with about ten hens. Since sexes are born in equal numbers, it is easy to see how a surplus of gobblers can occur under this arrangement. After the hens are bred and no longer need the gobbler for mating, most of the gobblers could be harvested. Bag limit during the spring season in Texas is one gobbler per hunter; therefore, there is no danger of reducing the productivity of the flocks by harvesting gobblers each spring.

Should I try to restock turkey on my place?

Restocking is one of the most important factors in our turkey management program in Texas, but restocking efforts should not be made in areas that are no longer suitable for the birds. Extensive land clearing practices have eliminated thousands of acres of good turkey habitat, and continuous overgrazing by domestic livestock has rendered additional thousands of acres worthless to the wild turkey. Successful restocking attempts have been made by the Texas Parks and Wildlife Department with turkey trapped from the wild. The

trapped birds are immediately released into approved restocking areas and carefully protected for at least five years following their release. Wild turkey have the ability to survive and reproduce when relocated under such conditions. In most cases, releases of pen-raised or semidomesticated turkey into the wild have been unsuccessful and quite expensive. Releasing pen-raised birds into the wild may also invite serious disease and parasite problems unless done under carefully regulated conditions such as programs carried out by the Parks and Wildlife Department.

There are several factors which should be considered before turkeys are restocked in an area. First, why aren't turkeys there now? Is there sufficient vegetation to provide cover and food? Good turkey range should have ample numbers of mature trees as well as brush and shrubs to provide food (pecans, acorns, berries, seeds) as well as cover and roosting areas. Assuming the range provides all the natural essentials, the area must also be protected from illegal hunting such as roost shooting at night. *No one should be allowed to hunt, camp or otherwise disturb turkey within one-quarter mile of a roost site.* Finally, turkey require a large annual range, often moving eight to 10 miles from winter roost sites to summer nesting areas. Food, cover and protection must, therefore, be provided over an area of several thousand acres. If an area can provide all these essentials and is within the required rainfall belt, then serious consideration might be given the possibility of restocking turkey.

Do turkey need supplemental feed?

Supplemental feeding of any wild animal is recommended only during extended periods of stress such as prolonged drought or severe winter weather. However, in order to sustain wildlife during these critical periods, the animals must know where the supplemental feed is located and be accustomed to taking it. Therefore, feed should be provided well in advance of any anticipated critical periods. Often supplemental feed is provided just before and during hunting seasons in order to "bait" turkey to a specific site to be harvested by eager hunters. It is essential that such a feeding program be continued into January and February if turkey are going to benefit from it. Turkey prefer natural food and will not take significant quantities of artificial feed unless they really need it. In most cases, it is preferable to improve or extend the turkey's natural habitat and food supply.

Although extended periods of severe weather may justify supplemental feeding in some instances, feeding programs are expensive. Feeding areas should be kept clean and the grain must not become contaminated by the birds' droppings. For this reason, feeders should be moved short distances from time to time. The feeding area should be near trees and thick brush to provide immediate escape cover from predators.

Food plots are preferable to feeding stations for turkey and other wildlife. These plots need not be large in size; two to 10 acres will provide large quantities of forage for turkey and other wildlife if it is not grazed by domestic livestock. Turkey readily eat oats, wheat, clover, vetch or rye.

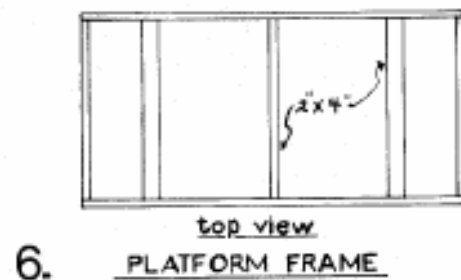
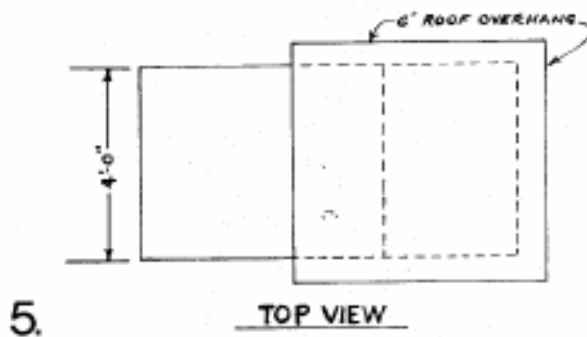
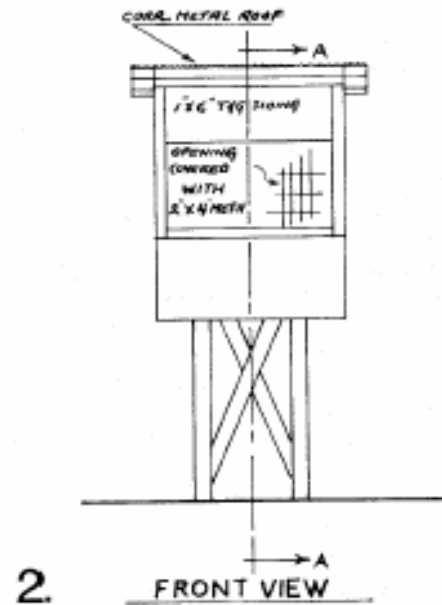
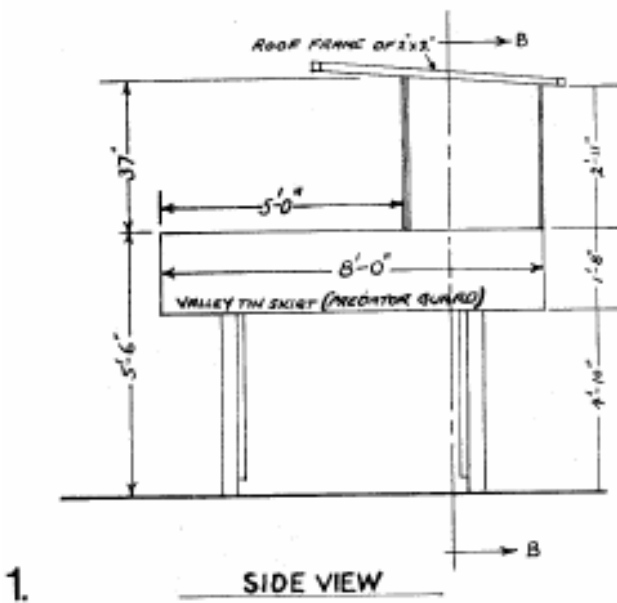
Biologists in Texas and other states have worked years to obtain answers to some of the many questions which arise concerning the restoration and management of the wild turkey. Our society continues to demand more fields for food

crops; more livestock to provide meat and other products; more lakes for recreational activities; and more land for homes, schools, factories and roads. These demands may spell eventual doom for the wild turkey unless large tracts of land are preserved as wildlife habitat. Continuing research will hopefully provide the management techniques which will ensure the survival of the wild turkey in Texas.

For those landowners and sportsmen who may be interested in feeding turkeys on their land or leases, we have included diagrammatical sketches of two feeders which have proven successful in many areas of Texas. October through March is the critical time for keeping feed available to turkey. Best feeds are milo or corn chops. Landowners who wish to feed both deer and turkey from the same feeder should consider using an elevated barrel-type automatic feeder and a mixture of whole corn and milo.

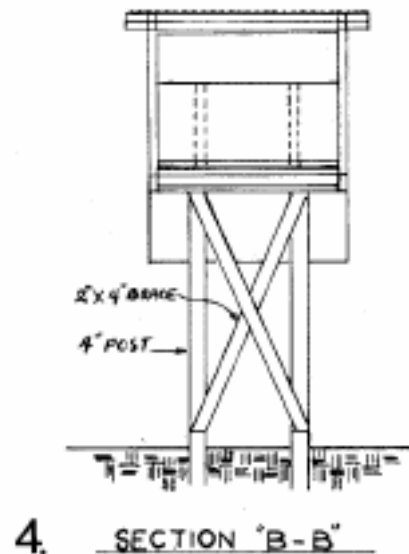
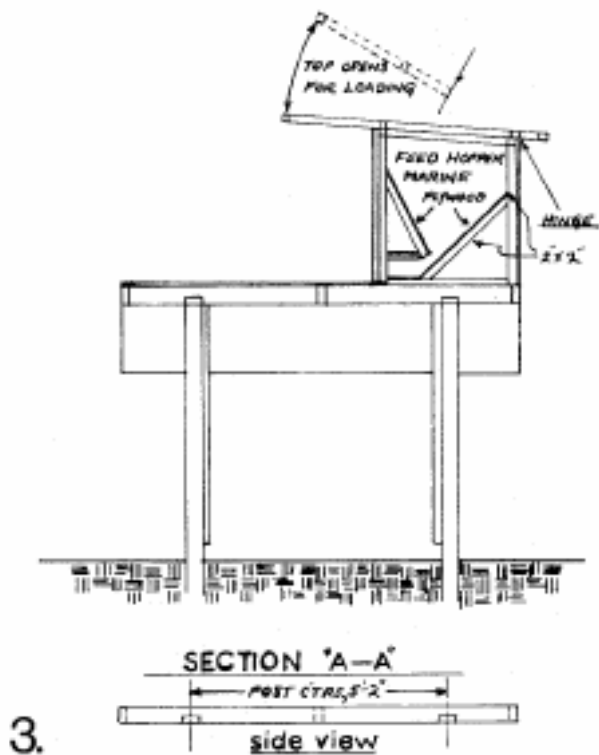


Turkey Feeder 500 pound capacity



General Notes

1. Platform Covering & Exterior of Hopper of 1" x 6" T&G
2. "Weldwire" Mesh Used Over Feed Opening
3. Top of Hopper Secured By Hook & Eye at Each Side.
4. T&G Siding on Hopper Installed With Tongue Edge Up.
5. Posts Set in From Edge Of Platform To Deny Access to Predators.



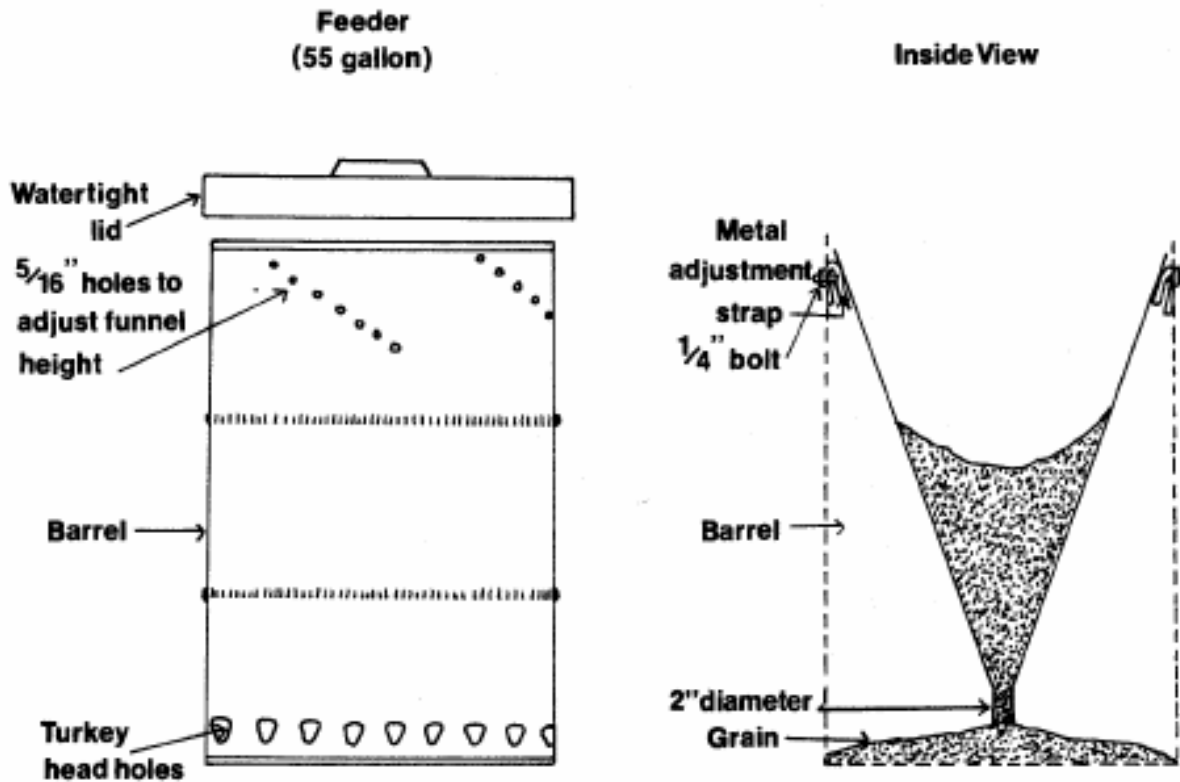
This type of feeder is being used on several wildlife management areas and on private ranches. The inset legs and valley tin around the platform practically eliminates the tremendous waste that usually accompanies the use of turkey feeders by ever-hungry raccoons.

Care should be taken not to place the feeder directly under a tree or the raccoons will soon learn to climb the tree and drop down on the feeder. While it takes a little longer for turkeys to learn to utilize this type of feeder, the savings are well worthwhile. Turkey will normally accept this feeder more readily if a few pounds of grain such as milo are scattered on the ground around the feeder at weekly intervals until turkey locate the feed in the hopper.

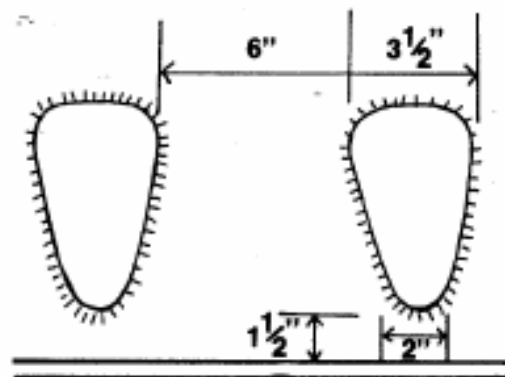
The materials to build this feeder cost approximately \$50.00 and if the wood is treated it will last for many years.

REPRINT FROM FLORIDA WILDLIFE MAGAZINE, AUGUST, 1964

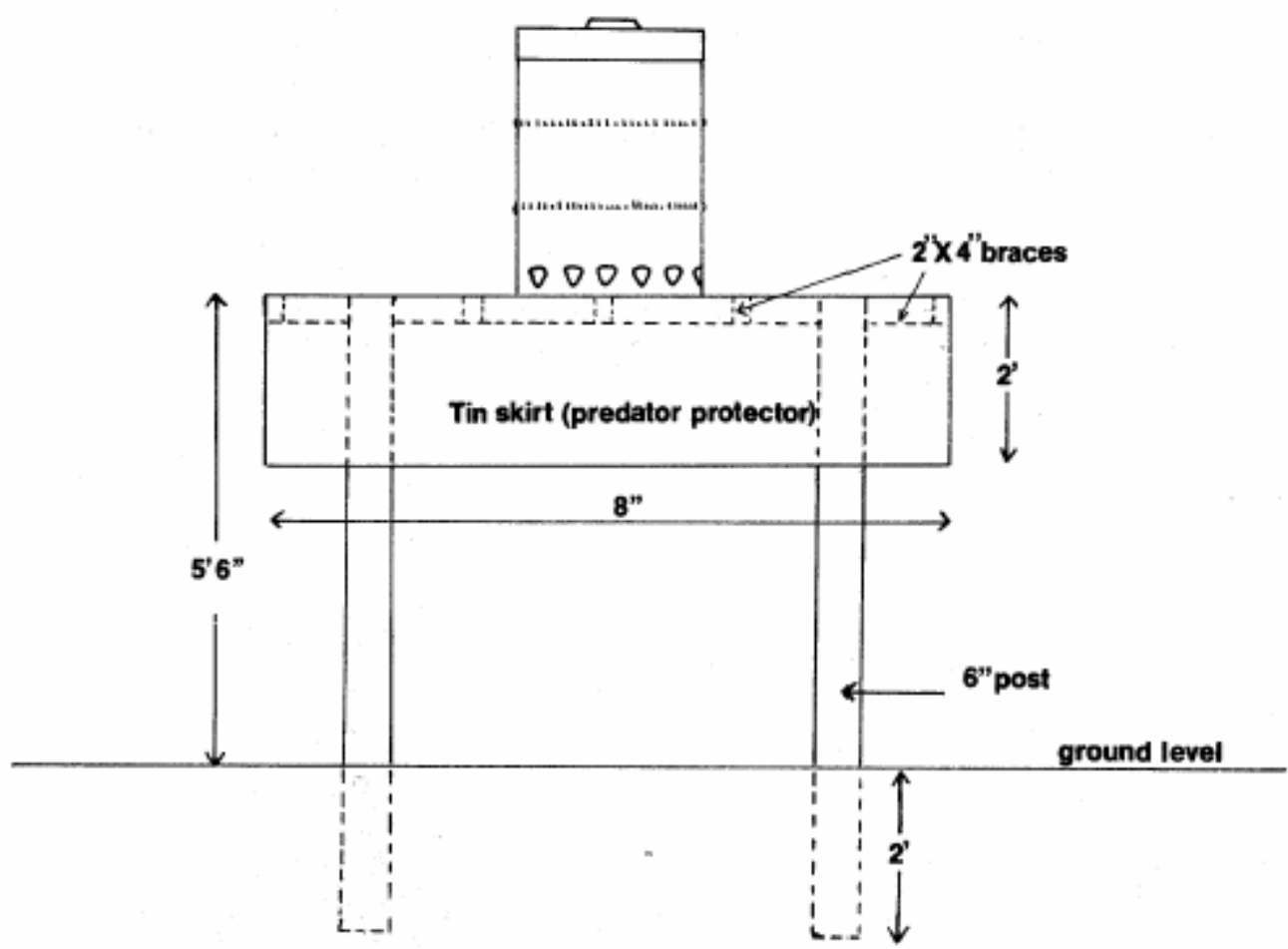
TURKEY FEEDER



Turkey Head Holes



TURKEY FEEDER PLATFORM



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Appendix W

Pesticides and Brush Control Texas Department of Agriculture

Pesticide Registration and Safety

The U.S. Environmental Protection Agency (EPA) and the Texas Department of Agriculture (TDA) register all pesticides used for brush control in the state of Texas. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Food Quality Protection Act (FQPA), and Federal Food, Drug and Cosmetic Act (FFDCA) all regulate the use of pesticides in Texas to some degree. However, FIFRA and Texas pesticide laws and regulations are primarily involved in the registration process of brush control herbicides.



To be eligible for registration and use in Texas, pesticide products must first undergo a rigorous testing protocol required by EPA and then be registered federally. The testing protocol is extensive and must address issues such as efficacy and toxicity to non-target species. The vast majority of pesticide products that are registered in Texas are subject to over 140 scientific or toxicological tests in order to receive and maintain EPA product label approval, and subsequent Texas registration. Automatic approval does not occur for use of a pesticide in Texas if it is approved by EPA. Pesticides must meet state use and registration regulations in addition to strict EPA standards. The exact number of tests that must be performed for a pesticide to be allowed in Texas varies with its end-use, but it is extensive whatever the case. EPA evaluates a plethora of scientific studies before registering a product and uses a series of safety factors to determine the appropriate use patterns considering worst-case exposure scenarios.

Native Texas wildlife, especially threatened and endangered species, are given further consideration when performing risk assessments for the special use of pesticides in many brush control projects. Various classes of species are specifically targeted for detailed assessment, namely the chemical effects on amphibians and reptiles, birds, fish and invertebrates. The environmental fate of most compounds used in brush control is also carefully reviewed in order to protect water supplies. Factors such as degradative processes, absorption and mobility, field dissipation, as well as local ground and surface water concerns are considered in risk assessments, especially during special use considerations such as a FIFRA Section 24(c) allowances as discussed below.

Toxicity Category	Herbicide / Substance	Oral LD ₅₀	Equivalent Human Dose
I Severe Danger	Botulinus	0.00001	1 teaspoon or less
	TCDD (a dioxin)	0.1	
	Parathion	13	
	Strychnine	30	
	Nicotin	50	
II Moderate	Caffeine	200	1 teaspoon to 1 ounce
	2,4-D	375	
III Slight (caution)	Formaldehyde	800	1 ounce to 1 pint
	Aspirin, Vitamin	1700	
	Bleach	2000	
	Table	3750	
	Diuron	3750	
	Glyphosat	4320	
IV Very Slight	Imazapy	>5000	More than 1 pint
	Diesel	7380	
	Kerosen		
	Sugar		

Table 1: The equivalent human dose is that physical amount of the compound that would contain the oral lethal dose 50 (LD₅₀) amount.

In reality and for all practical purposes of assessment, the amount of pesticide that a sensitive species must be exposed to and cause a harmful effect is very unlikely to be seen with any use of a pesticide product (Table 1). Even when these species may encounter these registered pesticides in a natural setting, most of these chemicals have relatively low toxicity or similar toxicity to that of many household or natural materials (Table 2).

Table 2: Overall toxicity rating based on the LD₅₀ and the dermal response rating are from 1 to 5, with 5 being the least severe

COMMON NAME	TRADE NAME	ORAL LD50 mg/Kg	TOXICITY RATING	DERMAL RESPONSE RATING
nicotine	for comparison	50-60	2	-
paraquat	Surefire	120	3	3
caffeine	for comparison	200	3	-
diquat	Diquat	230	3	4
2,4-D	various brands	600	4	4
tebuthiuron	Spike	644	4	4
MSMA	various brands	1,800	4	4
Aspirin	for comparison	1,240	4	-
hexazinone	Velpar	1,690	4	4
dicamba	Banvel	2,900	4	4
prometon	Pramitol	2,980	4	-
atrazine	various brands	3,080	4	5
pendimethalin	Pendulum	3,277	4	4
Table salt	for comparison	3,320	4	-
diuron	Direx, Karmex	3,400	4	4
bromacil / diuron	Krovar	4,260	4	5
glyphosate	Roundup	4,320	4	5
sulfometuron methyl	Oust	>5000	5	4
imazapyr	Arsenal	>5000	5	4
imazapic	Plateau	>5000	5	5
prodiamine	Endurance	>5,000	5	4
simazine	Princep	5,000	5	4
bromacil	Hyvar	5,200	5	4
chlorsulfuron	Telar	5,545	5	5
picloram	Tordon	8,200	5	4
oryzalin	Surflan	10,000	5	4
norflurazon	Predict	>10,000	5	4
fosamine	Krenite	24,000		4

FIFRA Section 24(c) Special Registration

A FIFRA Section 24(c) is designed to expand a currently registered product label in the state of Texas for a documented special local need (SLN). A SLN means an existing or imminent pest problem within Texas for which TDA, based upon satisfactory supporting information, has determined that an appropriate federally registered pesticide product is not sufficiently available.

Documentation of need for the 24(c) registration in the form of letters from producers, grower organizations, experiment station personnel, and/or extension service personnel, must be provided to EPA. Research and/or test data, or summaries supporting efficacy and safety must be submitted. In addition, data documenting expected residue levels (when appropriate, mainly when food or feed crops are involved) must also be supplied with the application packet to EPA. Prior to issuing a Section 24(c), EPA and TDA determine that use of the product for which registration is sought will not cause unreasonable adverse effects



on man or the environment when used in accordance with labeling directions or widespread and commonly recognized practices. Endangered and threatened species are especially considered when evaluating special uses of pesticides. The U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department and TDA are in regular contact concerning the well being of all native Texas species.

The Texas Department of Agriculture obtained a FIFRA Section 24(c) Special Local Need registration to use *Arsenal*[®] (active ingredient imazapyr) to control saltcedar to conserve water and protect native habitats.

In fact, in several cases, saltcedar is being controlled with *Arsenal*[®] to enhance wildlife habitat. The Canadian Municipal Water District is planning to control salt cedar beginning in September 2004 along the Canadian River. This effort is being made to stop the spread of salt cedar, which is estimated to consume almost 70,000 acre feet of water each year in the river basin, and to enhance habitat for the Arkansas River Shiner. In addition, U.S. Fish & Wildlife Service and Panhandle Water Conservation District officials have proposed a joint project to finance the control of salt cedars along the Canadian River to enhance habitat for the Arkansas River shiner.

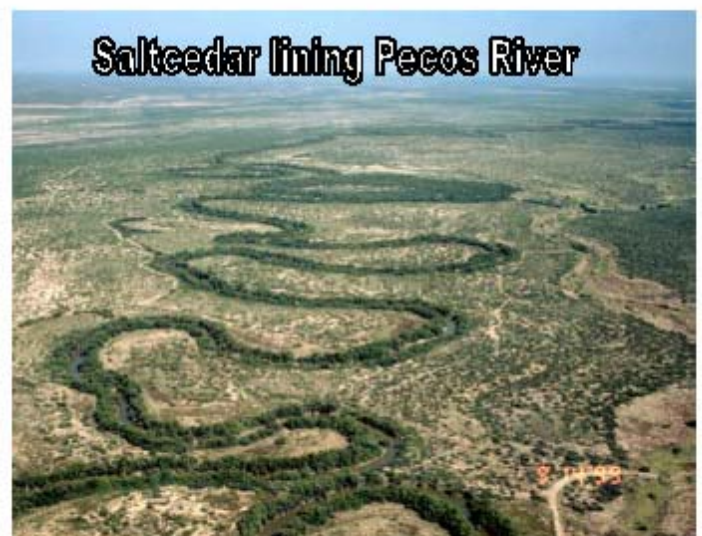
In another instance, the U.S. Fish & Wildlife Service and Fort Worth Zoo requested that TDA change the restriction on the use of *Arsenal*[®] in Salt Creek in Culberson County to enhance habitat for the endangered Pecos Gambusia. Additionally, the Colorado River Municipal Water District has worked with U.S. Fish & Wildlife and the Texas Parks and Wildlife Department to use *Arsenal*[®] along the Colorado River to preserve habitat for the endangered Concho water snake and the endangered Texas poppy-mallow. The Concho water snake is not affected by *Arsenal*[®] because this chemical generally only affects plant species. The Texas poppy-mallow is not affected by the saltcedar spraying because its habitat is not near saltcedar due to different soil preferences between the two plant species. Additionally, GIS mapping is done before helicopter spraying of *Arsenal*[®] to pinpoint Texas poppy-mallow habitat.

Saltcedar (*Tamarisk*) Control in Texas

Saltcedar (*Tamarix spp.*) was introduced into the southwestern United States in the early 1800s from Eurasia as an ornamental shrub that aided in erosion control. A mature saltcedar may consume up to 200 gallons of water per day and is a problem for most of the western United States. Saltcedar trees occur in almost all of the water bodies of west Texas including the Pecos, Brazos, Canadian, Colorado, Rio Grande and Red rivers, and their tributaries.

Saltcedar has the ability to change its physical environment giving it a competitive advantage over native trees and shrubs. This occurs through increased surface soil salinity, lowered soil water potential and increased fire frequency. This invasive increases surface soil salinity by absorbing salts from deeper soil layers and groundwater and transporting these salts to their leaves, subsequently releasing the salts back into the surrounding soils through accumulation of leaf litter. The high tolerance for salt that saltcedar possesses allows for a competitive advantage. Increased soil salinity inhibits germination and growth of most other plant species.

The Texas Department of Agriculture is leading the Texas Riparian Invasive Plant (TXRIP) Taskforce in its endeavors to combat the spread of invasive riparian plants, especially saltcedar. This Taskforce is composed of almost every major state and federal agency with a mandate on this issue. TXRIP joins the US



Tamarisk Coalition, the US Department of Interior, and the US Department of Agriculture in addressing this serious national problem. All scientifically tested methods for saltcedar control are assayed for use in control programs, including biological, chemical, and mechanical options.

Recent applications of federally approved herbicides, including *Arsenal*[®], has proven to be a very effective and safe tool to control saltcedar in selected segments of Texas waterways. This has spurred an interest in using this means of control in other infested water systems.



Appendix X

Minimum Requirements for Supplemental Shelter for South Texas

NEW: Summary guidance for supplemental shelter intensity levels. The following documents are intended for guidance only, and represent what would be the desired number of supplemental shelters for various species that a landowner should strive for. Because each individual property is different and effective use of supplemental shelter for wildlife enhancement will vary based on individual site characteristics, these numbers should be used as guidance only. Additional information is available from your local biologist or on the TPWD web site at www.tpwd.state.tx.us/wildscapes. Be sure to study the general guidelines for agricultural tax valuation based on wildlife management. See Wildlife Management Activities And Practices: Comprehensive Wildlife Management Planning Guidelines for your region. It's the book to which this is an appendix.

Species:	Shelter Type:	Minimum no. per area of suitable habitat:
Bats	Bat House	1 per 10 acres
Purple Martin	Martin House	1 site per 10 acres, 8 cavities per site
Ferruginous Pigmy Owl, Barn Owl, Eastern Screech Owl, Elf Owl	Nest Box	1 per 10 acres
Wood Duck, Black-bellied Whistling Duck	Nest Box	1 per 8 acres
Golden Fronted Woodpecker, Ladder-backed Woodpecker, Green Parakeet, Red-crowned Parrot	Nest Box	1 per 10 acres
Great Crested Flycatcher, Brown Crested Flycatcher, Ash Throated Flycatcher, Eastern Bluebird, Carolina Chickadee, Black Crested Titmouse, Bewick's Wren, Carolina Wren	Nest Box	1 per 5 acres