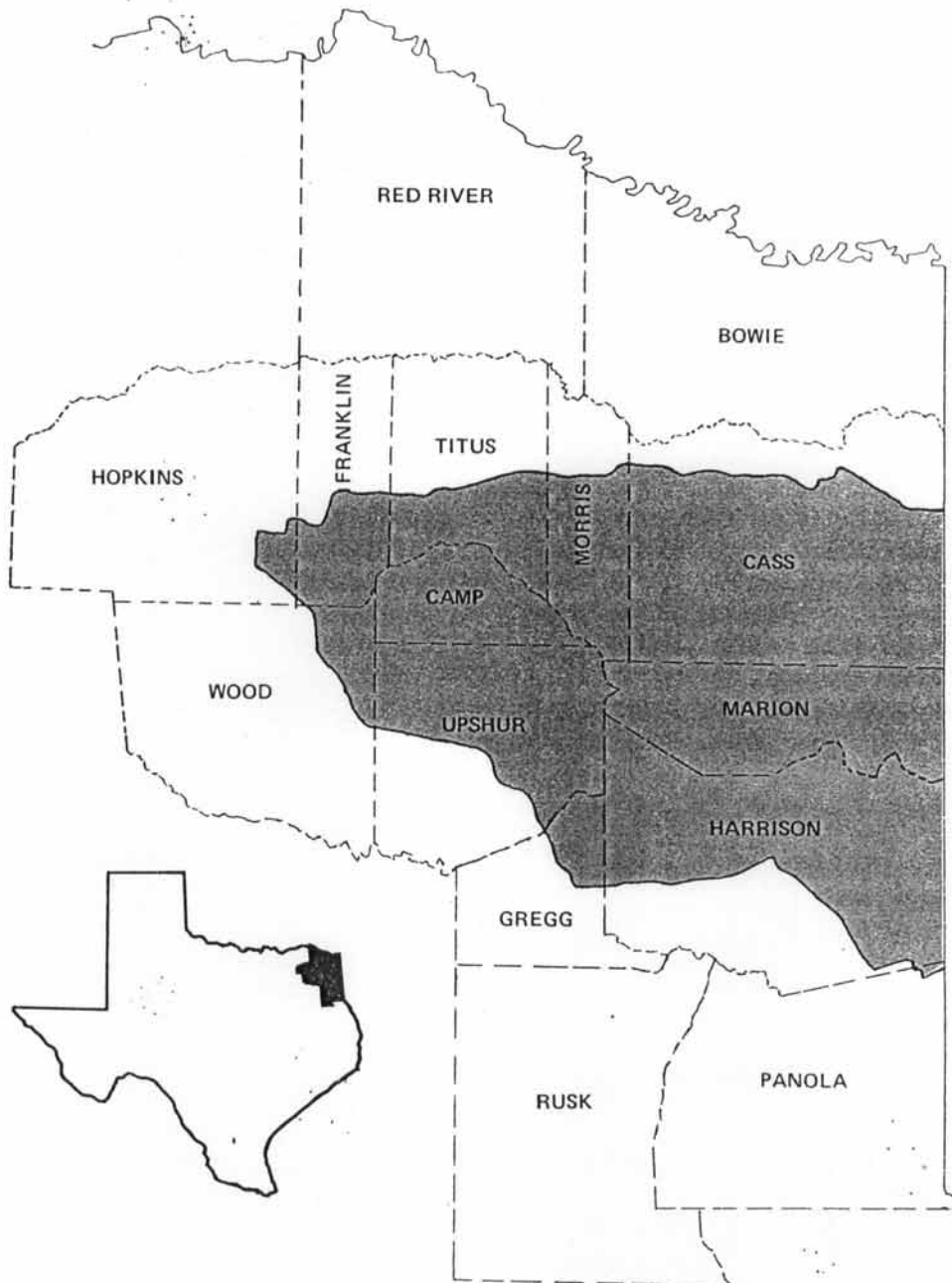


THE BIG CYPRESS WILDLIFE UNIT

A Characterization of Habitat and Wildlife

by
Joseph J. Campo
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Texas Parks and Wildlife Department



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FOREWORD

The chief need of wildlife is a commitment by landowners, organizations and builders to reduce damages to natural habitats by planning. This is true because most of the actual management of wildlife in Texas is accomplished by private landowners through active or passive manipulations of wildlife habitats on their lands. The reasons for conserving undeveloped, open spaces for wildlife are largely unquestioned now -- the existence of a variety of wildlife is indicative of the good health and stability of our total environment. At the same time, wildlife provides hunting recreation and numerous hours of non-consumptive use to the student, artist, hobbyist and nature enthusiasts from all walks of life. An important added benefit is the potential influence of these experiences in natural settings on the development of children.

The degree to which good stewardship is practiced is, of course, left almost entirely to the individual landowner. Thus, the Department's role is largely restricted to performing research, effecting and policing hunting and fishing regulations and recommending practices to the real wildlife manager: the landowner. It is in its advisory capacity that the Parks and Wildlife Department is characterizing selected areas of the State into "wildlife units."

Individual units generally exhibit a commonality with regard to drainage pattern, vegetation, soils, native wildlife, land use and managerial aspects which differ significantly from other surrounding units. Thus, each unit constitutes a land area conducive to its own inventory of plants and animals, storage of information and recommended wildlife habitat management.

Adjoining units may exhibit similar environmental aspects, but always something sets units apart one from another. By relating to localized units the Wildlife Division of the Parks and Wildlife Department begins to intensify its planning efforts from broad geographic regions of the state to areas local governments and private enterprise may identify with as their own. This approach is intended to lead to the attainment of greater harmony between localized human needs and the needs of the indigenous and migratory wildlife resources.

This is one of a series of publications describing the vegetative cover types, land-use and the plant and animal species of wildlife units in Texas. The major emphasis of this document will be to describe the values and interactions of vegetative cover types and land-use on northeast Texas wildlife, and to identify modifications that can be made to benefit wildlife when managing land in this region. References used in compiling information are listed in the bibliography.

THE BIG CYPRESS WILDLIFE UNIT

Physical Setting

Location

The Big Cypress Wildlife Unit (Unit) is located in northeast Texas. The Unit is bounded on the north by the Sulphur River Basin and on the south by the Sabine River Basin. The Unit lies generally in an east-west direction extending about 80 miles from the Texas-Louisiana boundary and varies in width from 40 to 50 miles. The Unit extends westward from the Pineywoods Ecological Region to the Post Oak Savannah Ecological Region. A portion or all of the following counties is included in the Unit: Panola, Harrison, Gregg, Upshur, Wood, Camp, Hopkins, Franklin, Titus, Morris, Cass, and Marion (Fig. 1). The major cities included are Marshall, Gilmer, Pittsburg, Winnsboro, Mount Pleasant, Daingerfield, Linden, Atlanta, and Jefferson. The Unit boundary descriptions are as follows: From FM 249, FM 251, and FM 74 and the TX-LA state line west to Queen City and FM 96 northwest to FM 2791 then southwest to TX 77 then west to U.S. 67 then southwest to Omaha then west to I.H. 30 near Mount Pleasant then west to TX 37 then south to FM 900 then west to FM 3109 then south to FM 3105 then west to FM 269 then south to Pickton and TX 11 then southeast to Winnsboro and FM 852 then southeast to FM 2869 then southeast to TX 154 then easterly to TX 155 then south to TX 300 then southeast to U.S. 80 then east to FM 31 then southeast to FM 451 then easterly to FM 9 then southeast to U.S. 79 then northeast to the TX-LA line. The center of the Unit is located near the intersection of N 32° 52' Latitude and W 94°37' Longitude.

Topography and Physiography

The Unit is within the West Gulf Coastal Plain and includes the entire watershed of the Big Cypress Creek, encompassing 2,855 square miles (1,827,218 acres). The West Gulf Coastal Plain is characterized by local relief and the gentle gulfward slope of the land surface. Local topographic features are irregular, rolling, hilly uplands, flat floodplains and terraces. Elevation ranges from approximately 160 feet above mean sea level to 600 feet. The Unit has a well defined drainage pattern and is dissected by many streams. The stream channels are generally small with wide, heavily timbered floodplains. The major drainages include Frazier Creek, James Bayou, Black Cypress Bayou, Little Cypress Creek, and Big Cypress Creek. The Big Cypress Creek is the major drainage and has its source in southeastern Hopkins County at an elevation of about 550 feet above mean sea level. The Big Cypress Creek flows eastward and southeastward about 100 miles emptying into Caddo Lake at the TX-LA boundary where the elevation of the stream bed is about 168 feet. Its principal tributary, Little Cypress Creek, has its source in northeastern Wood and southwestern Camp counties and flows eastward about 65 miles joining Big Cypress Creek about 12 miles west of the TX-LA boundary. Reservoirs include Caddo Lake and Lake O' The Pines on the east side of the Unit. Lake Bob Sandlin, Lake Cypress Springs, and Lake Monticello are the principal reservoirs on the west side of the Unit. The principal land uses are hay production, cattle grazing, and pine timber production.

Geology and Soils

The present geologic formations in the Unit are the result of a sequence of events in geologic time. A continuing cycle of advance and retreat of the ancient seas 400 to 70 million years ago resulted in periods of sediment accumulation alternating with periods of erosion. Nonmarine deposition of sediments by streams and other bodies of water complete the depositional sequence. Erosion and deposition by streams in the Quaternary Period largely established the present physiographic boundaries.

Formations of the Eocene Series are the principal outcrops in the Unit. These formations include Carrizo Sand, Wilcox Formation, Mount Selman Formation, and Sparta Sand. The Carrizo Sand and Wilcox Formation together form a primary aquifer. The Mount Selman Formation and Sparta Sand, undifferentiated, and Quaternary Alluvium constitute a secondary aquifer in the Unit. Quaternary Alluvium includes fluvial terrace deposits of the Pliocene Series, which are remnants of old stream floodplains.

The Wilcox Formation consists principally of reddish-brown to light-gray unconsolidated ferruginous crossbedded fine-to-medium sand, interbedded with light to dark-gray clay, lignite, and silt. The Carrizo Sand consists of light brownish-gray to reddish-brown unconsolidated crossbedded, fine-to-medium sand and an interbedded sequence of fine sand, silt, and clay. The Mount Selman Formation and Sparta Sand, undifferentiated, occupy 90 percent of the Unit and consist of light gray to brownish-gray unconsolidated ferruginous crossbedded fine-to-medium sand interbedded with light to dark-gray carbonaceous clay, glauconite, lignite, and ironstone. Iron staining imparts a reddish color to much of the weathered outcrop. The Quaternary Alluvium consists of light-grayish to reddish-brown unconsolidated crossbedded very fine-to-very coarse sand interbedded with dark-colored clay, silt, and gravel.

Well drained and moderately well drained sandy loam and gravelly soils with clayey and loamy subsoils of the uplands in the Unit include Bowie, Kirvin, Cuthbert, Darco, Fuquay, and Sacul Series. Moderately well and poorly drained, moderately to slowly permeable loamy soils with loamy and clayey subsoils of terraces include Kullit, Mollville, Latch, and Wrightville Series. Somewhat poorly drained, moderately and very slowly permeable loamy and clayey soils with loamy and clayey subsoils of bottomlands include Nahatche, Mantachie, and Urbo Series.

Climate

The climate of the Unit is characterized as warm, moist, humid, and subtropical. The Gulf of Mexico plays a dominant role in the climate of the area during the spring and summer months, while modified polar air masses contribute significantly to the fall and winter climate. Daytime temperatures in summer, particularly in August, usually exceed 90°F. Winter temperatures are mild with only about 5 days during the year when the average daily maximum temperature fails to exceed freezing. Precipitation falls mostly as thunderstorms resulting from the interaction of cold fronts from the north with the warm, moist, tropical air moving northward from the Gulf of Mexico. Snowfall averages 2 inches annually, however, some years have no measurable accumulation. Some climate statistics are listed below:

	<u>East</u>	<u>West</u>
Mean annual rainfall (in.)	46	44
Mean annual temperature (°F)	65	65
Mean annual relative humidity (%)	85 (6:00 a.m.)	55 (6:00 p.m.)
Mean length of growing season (days)	242	233
Mean date of first freeze	Nov. 15	Nov. 11
Mean date of last freeze	Mar. 18	Mar. 23

MAJOR COVER TYPES

The major cover types were identified using classified landsat vegetation maps. A total of 7 vegetation-land use types was identified in the Unit (Figure 1). To avoid significant classification errors due to confounding physiognomic characteristics, 1.1% of the Unit was unclassified. Urban areas and sparsely vegetated areas accounted for 0.8% of the Unit. The predominant vegetation type is characterized as pine-hardwood forest. However, recent changes in land use have dissected the once contiguous forest into a patchwork of land use types.

Pine-Hardwood Forest

This major cover type occurs throughout most of the Unit on 873,427 acres (47.8%) and is the predominant vegetation type. Climax vegetation within the Unit is primarily pine-hardwood forest, dependent on the site. However, land-use modifications including timber management have created three vegetation types which can be identified from the pine-hardwood forest.

(1) Pine/Pine-hardwood Forest: This vegetation type is distributed throughout most of the Unit on uplands where predominantly Kirvin-Bowie and Fuquay-Bowie Kirvin soil associations are found. Pine/pine-hardwood forests occur on 348,632 acres (19%) and represent even-aged and uneven-aged pine forests over 30 feet tall with midstory hardwood trees. Timber stand density is high and crown cover ranges from 70 to 100 percent. Included in this type are pine plantations (pine monoculture) and naturally established pine forests (Figure 2).

The occurrence of hardwood tree species is slight where there has been extensive site preparation for planting pines. In this type, pine tree growth is encouraged and the growth of hardwoods is discouraged in timber management. Timber management includes selective harvest of hardwood trees to convert naturally established pine-hardwood forests to homogeneously pure pine forests. Loblolly, and to a lesser extent, shortleaf pine account for at least 85 percent of the dominant and codominant trees occurring in the pine-hardwood forest (Figure 3.).

In the western portion of the Unit, the pine/pine-hardwood forest type includes primarily shortleaf pine-post oak and loblolly pine-post oak. Commonly associated hardwood trees include southern red oak, post oak, sweetgum, winged elm, and red maple. Tree midstory density is usually low and includes hawthorn, flowering dogwood, and white sassafras. Shrubcover vegetation is rarely abundant in this vegetation type and includes American beautyberry, farkleberry, winged sumac, and southern waxmyrtle. Groundcover vegetation is usually sparse and includes Japanese honeysuckle, poison ivy, greenbriar, panicum, blackberry, and dewberry.

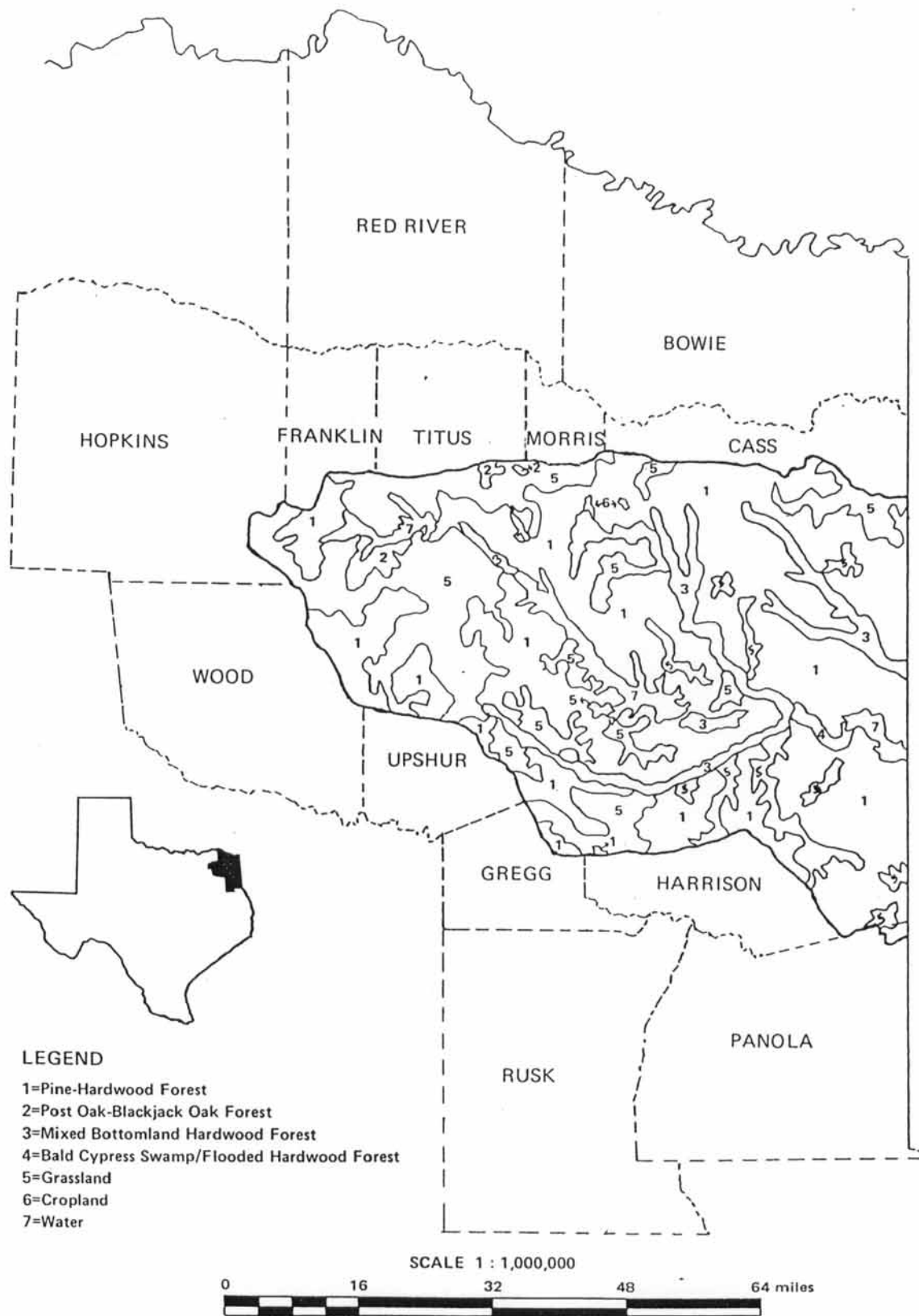


Figure 1. Vegetation Type Map of the Big Cypress Unit, 1973

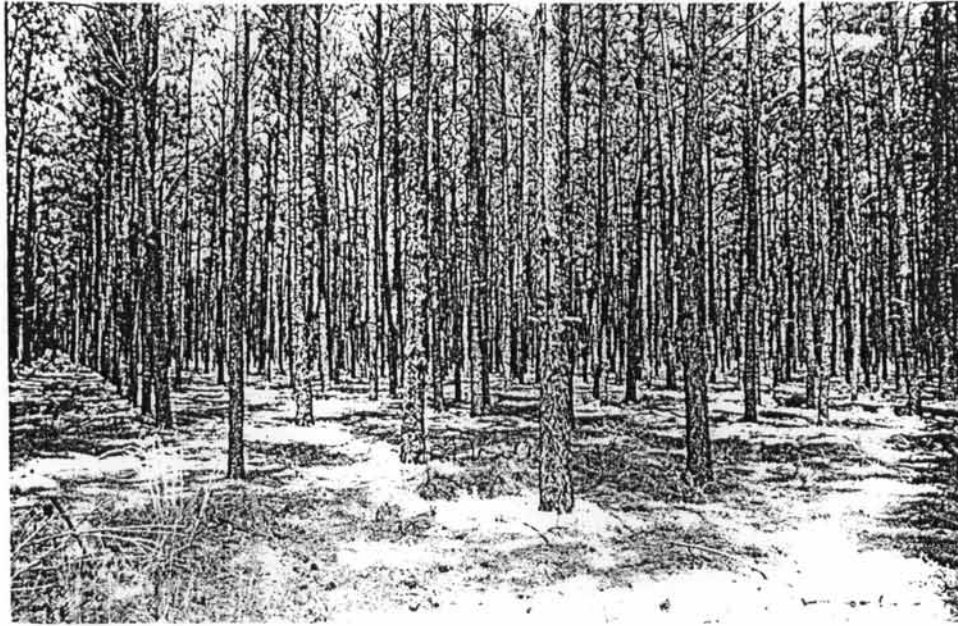


Figure 2. Pine Monoculture Forest in Marion County, July, 1986.

Significant aspects of the pine/pine-hardwood forest type for wildlife include the amount of land devoted to pine timber production, reduction in plant species diversity, and reduction in the number of wildlife species capable of utilizing this type. White-tailed deer are the principal game animals using this habitat type, however, the carrying capacity for deer is generally low. Squirrels, both gray and fox squirrels, can be found in this habitat type. However, pine/pine-hardwood forest do not provide optimum habitat for squirrels. Mourning dove utilize this vegetation type for nesting and roosting cover. Other wildlife species characteristic of this habitat type include common crow, pine warbler, eastern cottontail, nine-banded armadillo, southern copperhead, and white-footed mouse.

(2) Hardwood-Pine Forest: This vegetation type is distributed throughout most of the Unit on uplands and terraces where predominantly Kirvin-Bowie, Fuquay Bowie-Kirvin, and Kullit-Wrightsville soil associations are found. Hardwood-pine forests occur on 347,297 acres (19%) and represent second growth natural forests over 30 feet tall of mixed age classifications. Timber stand density for this type is generally greater than 70 percent crown coverage. This vegetation type exists in the absence of timber management to convert the natural stands to primarily pine forests. Mixed hardwood species account for at least half of the dominant and codominant trees in this type (Figure 4).

Loblolly and shortleaf pine are in association with the hardwood trees. Hardwoods characteristic of this type include southern red oak, cherrybark oak, post oak, sweetgum, black hickory, mockernut hickory, water oak, willow

oak, blackgum, black oak, white oak, shumard oak, sugar hackberry, red maple, and winged elm. The tree midstory will often develop more than one layer beneath the forest canopy and includes American hornbeam, American holly, hawthorn, osage-orange, flowering dogwood, Texas persimmon, American hophornbeam, eastern redbud, Carolina laurelcherry, flatwoods plum, black cherry, and white sassafras. Commonly associated shrubs in this vegetation type include American beautyberry, rusty blackhaw viburnum, possumhaw holly, white fringetree, yaupon holly, southern waxmyrtle, Carolina buckthorn, farkleberry, deerberry, and red buckeye. Groundcover vegetation, mostly vines, includes peppervine, St. Andrews cross, sedge, spanglegrass, flatsedge, tickclover, wooly elephantsfoot, Japanese honeysuckle, panicum, Virginia creeper, Alabama supplejack, greenbriar, poison ivy, grape, yellow jessamine, and bracken fern.



Figure 3. Pine-Hardwood Forest Naturally Established in Marion County, July, 1986.

Significant aspects of the hardwood-pine forest type for wildlife include a high plant species diversity capable of supporting a diverse community of wildlife species and distribution throughout most of the Unit. This forest type provides habitat for cavity-nesting birds and mammals. White-tailed deer densities are highest in association with this forest type. Fox and gray squirrels are abundant in this habitat type. A diverse list of wildlife species utilize this forest type including bobcat, raccoon, Virginia opossum, gray fox, eastern cottontail, Florida wood rat, coyote, eastern flying squirrel, barred owl, redheaded woodpecker, blue jay, common crow, black vulture, nine-banded armadillo, cardinal, brown thrasher, and Texas coral snake.



Figure 4. Hardwood-Pine Forest in Marion County, July, 1986.

(3) Young Pine Forest/Mixed Hardwoods Brush: This vegetation occurs on sites that once supported pine-hardwood forests. Various combinations and age classes of pine and hardwood regrowth, mostly less than 9 feet tall, resulting from the recent harvest of pine or mixed hardwood/pine forests characterize this type (Figure 5).

Young pine forest /mixed hardwoods brush occur on 177,498 acres (9.7%) within the Unit. Depending on the level of timber management following timber harvest, the young pine forest/mixed hardwoods brush type develops into plantations, pine-hardwood forests, or hardwood/pine forests. The pine and hardwood tree species that occur in the young pine forest/mixed hardwoods brush type are those characteristic of the pine-hardwood vegetation type. Shrub and ground vegetation is well developed, however, the number of species and density declines as the overstory canopy closes. The early successional stage of this type produces the greatest diversity of groundcover plant species of all the vegetation types in the Unit. Many species of panicum, paspalum, sedge, and rush occur. Legumes are abundant in this type and include vetch, butterfly pea, partridge pea, common lespedeza, and tickclover. Various species of aster, goldenrod, and sunflower are found in this type.

Significant aspects of the young pine forest/mixed hardwoods brush vegetation type for wildlife include the abundance and variety of plants important to wildlife for food and cover, and increasing edge effect enhancing wildlife habitat. Characteristic wildlife species include white-tailed deer, northern bobwhite, eastern cottontail, coyote, bobcat, hispid cotton rat,

eastern bluebird, America woodcock, yellow-breasted chat, rufous-sided towhee, white-throated sparrow, and racer.

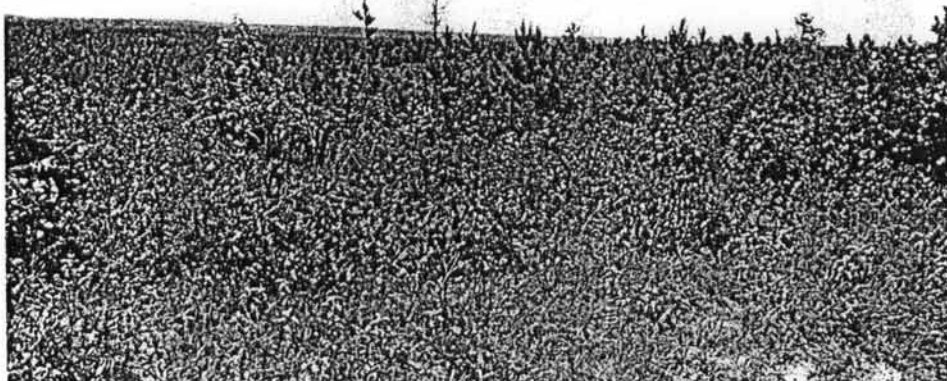


Figure 5. Young Pine Forest Established by Clearcutting and Planting, Marion County, July 1986.

Upland Hardwood Forest

Post Oak-Blackjack Oak Forest: This cover type (79,551 acres, 4.4%) occurs as small scattered woodlands and larger forests increasing in distribution westward across the Unit (Figure 6).

This type is located on rolling hills to gently sloping, well-drained, sandy soils on uplands. Post oak is dominant, mostly greater than 30 feet tall, with more than 70 percent crown cover. In the eastern portion of the Unit, loblolly pine and shortleaf pine are associated with the post oak-blackjack oak forest type. Post oak-blackjack oak parks occur scattered throughout the Unit and are characterized as woody plants at least nine feet tall and growing as small clusters, or as randomly scattered trees within continuous grass or forbs. Homogeneous stands of post oak-blackjack oak occur in the western portion of the Unit as the ecological area shifts from the Pineywoods to Post Oak Savannah. Shrub species include yaupon, American beautyberry, farkleberry, hawthorn, winged sumac, and rusty blackhaw viburnum. Groundcover vegetation, mostly vines, includes greenbriar, Alabama supplejack, grape, spanglegrass, and bluestem.

Significant aspects of the post oak-blackjack oak forest type for wildlife include hardwood mast production as a valuable source of wildlife food and woodland cover particularly in the western portion of the Unit where woodland

habitat is limited. Characteristic species include whitetail deer, fox squirrels, Virginia opossum, raccoon, blue jay, coyote and eastern coachwhip.

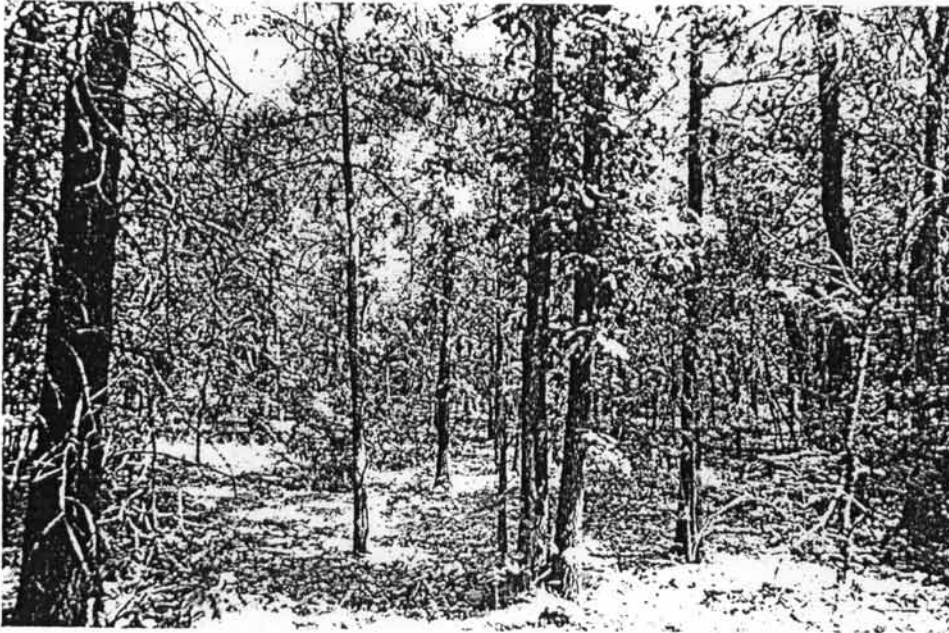


Figure 6. Post Oak-Blackjack Oak Forest in Marion County, July, 1986.

Bottomland Hardwood Forest

This major cover type occupies 318,806 acres (17.4%) within the Unit on alluvial soils along drainages and floodplains. Loamy and clayey soils that support this forest type include Nahatche, Mantachie, and Urbo series. This forest type is distributed throughout the Unit and includes some unique and sensitive areas. Two cover types are recognized for the bottomland hardwood forest.

(1) Mixed Hardwood Bottomland Forest: This vegetation type occurs on 308,840 acres (16.9%) within the Unit and is restricted to riparian areas (Figure 7).

Timber stand density for this type is greater than 70 percent crown coverage and dominant-codominant trees are greater than 30 feet tall. The mixed bottomland hardwood forest type contains natural areas with old growth, virgin hardwoods that provide unique habitat. State champion trees have been identified in this habitat type. Bottomland hardwoods along the major creeks and tributaries range from narrow bands to more than one mile wide. Water oak and willow oak are dominant. Associated tree species include cherrybark oak, southern red oak, white oak, red maple, blackgum, bitter pecan, sweetgum, sugar hackberry, river birch, winged elm, overcup oak, and bald cypress. The tree midstory includes American hornbeam, American hophornbeam, basswood, American holly, flowering dogwood, water elm, sweetbay magnolia, and hawthorn. Shrubcover vegetation includes possumhaw holly, two-winged

silverbell, baccharis, arrow-wood viburnum, sweetleaf, swamp-privet, deerberry, southern witchhazel, and southern waxmyrtle. Groundcover vegetation includes sedge, spanglegrass, flatsedge, barnyard grass, cross-vine, greenbriar, Japanese honeysuckle, muscadine, Alabama supplejack, false-nettle, ruellia, cardinal-flower, and dwarf palmetto.



Figure 7. Mixed Hardwood Bottomland Forest in Harrison County, July, 1986.

Significant aspects of the mixed bottomland forest type for wildlife include hardwood mast production from a great variety of species, rich diversity of plant species and associated wildlife species, and protection of riparian areas from erosion. Characteristic wildlife species include white-tailed deer, bobcat, gray squirrel, eastern flying squirrel, raccoon, swamp rabbit, mink, red-shouldered hawk, barred owl, pileated woodpecker, Virginia opossum, Carolina chickadee, common grackle, tufted titmouse, and cotton mouse.

(2) Bald Cypress Swamp/Flooded Hardwood Forest: This vegetation type occurs on 9,957 acres and represents less than one percent (0.5%) of the Unit. This habitat type is found almost exclusively on Caddo Lake and the surrounding floodplain. The bald cypress swamp cover type is characterized as trees with varying heights, canopy cover greater than 10 percent, and within frequently or constantly inundated sites (Figure 8).

The flooded hardwood forest type is located within frequently inundated sites, the trees are greater than 30 feet tall with greater than 70 percent crown coverage, and typically associated with bald cypress swamp (Figure 9). Associated tree species include bald cypress, swamp tupelo, water tupelo, overcup oak, sweetgum, water oak, and willow oak. The tree midstory includes Carolina ash, water elm, bitter pecan, and American hornbeam. Shrubcover

vegetation includes common buttonbush, swamp-privet, and possumhaw holly. Groundcover vegetation includes sedges, rushes, climbing hempweed, lizard's tail, smartweed, camphorweed, heliotrope, and spider-lilly. Emergent and submergent vegetation includes American lotus, alligatorweed, arrowhead, parrotfeather, bladderwort, fanwort, pondweed, and ducksmeat.



Figure 8. Bald Cypress Swamp in Caddo Lake State Park, Harrison County, July, 1986.

Significant aspects of the bald cypress swamp/flooded hardwood forest type for wildlife include most unique habitat type within the Unit, high productivity of plants and animals, and valuable wetlands for waterfowl. Characteristic wildlife species include beaver, nutria, muskrat, mink, raccoon, American alligator, bullfrog, cottonmouth, alligator-snapping turtle, wood duck, prothonotary warbler, great egret, great blue heron, black-crowned night heron, great horned owl, and belted kingfisher.

Grassland

Grasses: This major cover type occurs on 448,782 acres (24.6%) throughout the Unit (Figure 10.). Grasses, forbs, and grasslike plants are dominant. Crown coverage of woody vegetation in this cover type is generally 10 percent or less. Improved pastures and native grasses for cattle grazing and hay production are included in this cover type. Management practices include weed control using herbicides, mowing pastures to improve production, fertilization in early spring with a blended fertilizer, and top dressing the hayfields with ammonium nitrate after each cutting. Most pastureland within the Unit is characterized by low productive capacity due to inherent soil characteristics and years of cropland abuse. Coastal bermuda grass, common bermuda grass, bahia, and dallis grass are characteristic species for improved pastureland. Cool-season grasses that are planted for winter cover crop include elbon rye,

oats, ryegrass, and wheat. Legumes that are planted include arrowleaf clover, crimson clover, and smooth vetch. Weed species include sandspur, wooly croton, dogfennel, buttercup, and common persimmon.



Figure 9. Flooded Hardwood Forest in Caddo Lake State Park, Harrison County, July, 1986.

Significant aspects of the grassland cover type for wildlife include providing habitat for non-woodland wildlife and plant species, and reduction of woodland habitat as a result of conversion to grassland. Characteristic wildlife species include northern bobwhite, eastern meadowlark, red-tailed hawk, savannah sparrow, scissor-tailed flycatcher, eastern cottontail, striped skunk, fulvous harvest mouse, hispid cotton rat, coyote, and plains pocket gopher.

Cropland

Crops. This major cover type occurs on 36,780 acres (2.0%) within the Unit (Figure 11). Cultivated row crops or cover crops used for the purpose

of producing food and/or fiber for either man or domestic animals characterizes this cover type. Wheat, soybeans, grain sorghum, corn, sweet potatoes, peanuts, vegetables, peaches, watermelon, and pecans are cultivated. Much of the cropland is cultivated on a rotation with grazing. The decline in the acreage devoted to cultivated row crops and the transition of cropland to pastureland and timberland is continuing. Utilization of herbicides for grass and weed control has reduced the plant species diversity in this cover type. Plants associated with the cropland cover type typically include pigweed, wooly croton, ragweed, horseweed, foxtail and Johnson grass.



Figure 10. Grassland Cover Type, Bahia Grass, in Harrison County, July, 1986.

Significant aspects of the cropland cover type for wildlife include providing a food source for wildlife, potential for wildlife depredation, and increasing diversity of habitat types. Characteristic wildlife species include white-tailed deer, Virginia opossum, striped skunk, mourning dove, cattle egret, red-winged blackbird, red-shouldered hawk, eastern cottontail, and house mouse.

Water

This major type occurs on 34,072 acres (1.9%) within the Unit and includes primarily reservoirs constructed by impounding Big Cypress Creek and its tributaries. There are eight major reservoirs in the Unit: Cypress Springs, Bob Sandlin, Lake O' the Pines, Monticello, Welsh, Ellison Creek, Johnson Creek, and Caddo. Lake O' the Pines is the largest body of water in the Unit and was first put into operation in 1959. Lake O' the Pines is the only reservoir in the Unit which has flood-control storage as a project purpose. No other reservoirs provide additional flood-control storage. Caddo Lake is the only natural impoundment in the Unit, being formed many centuries ago.

The lake was augmented by a dam on Big Cypress Bayou in Louisiana that was originally constructed in 1914. Lake Cypress Springs was impounded in 1970, Lake Monticello was impounded in 1972, and Lake Bob Sandlin was impounded in 1977. The reservoirs primarily provide water for industrial and municipal use. Recreation is also one of the uses of the reservoirs. The Unit has existing and projected surface water in excess of water requirements through the year 2030. Shoreline vegetation includes black willow and common buttonbush. Aquatic vegetation includes marshpurslane, pondweed, and coontail.



Figure 11. Cropland Cover Type, Grain Sorghum, in Morris County, July, 1986.

Significant aspects of the water cover type for wildlife include valuable wetland habitat, loss of bottomland hardwoods through inundation, and impact of water fluctuations on wetland habitat. Characteristic wildlife species include pied-billed grebe, double-crested cormorant, ring-necked duck and American coot.

WILDLIFE

White-tailed Deer. The white-tailed deer is the most numerous big game animal in Texas and in the United States. Many factors contributed to the near extinction of deer in Texas by the end of the 19th century. The Texas Parks and Wildlife Department began restocking deer throughout the state in 1938. Since then, more than 28,000 deer have been trapped and transplanted to other areas. A total of 540 white-tailed deer was restocked into the Unit between the years 1949 and 1968. The estimated deer population for the Unit, based on current deer population surveys, is 98,000 white-tailed deer.

There are 4 subspecies of white-tailed deer in Texas of which the Texas whitetail is the most numerous. The Kansas whitetail occupies the eastern portion of the deer range in Texas. The range of the Carmen Mountains whitetail is limited to the Carmen Mountains on both sides of the Rio Grande. The range of the Avery Island whitetail stretches along the Gulf Coast. The deer that inhabit the Unit are largely an intergradation of Texas whitetails and Kansas whitetails.

White-tailed deer can be found throughout the Unit in a wide variety of habitat types. Deer density ranges from 10 to 100 deer per 1,000 acres. The carrying capacity for deer throughout the Unit is estimated to be 40 deer per 1,000 acres of deer range. Deer are too numerous over much of the Unit and lacking in numbers on other parts primarily because of loss of suitable habitat. The home range for individual deer in the Unit is approximately 600 to 1,000 acres and varies according to the suitability of the habitat for deer. The hardwood-pine forest type and the mixed hardwood bottomland forest type provide the best habitats for deer in the Unit.

Squirrel. The squirrel is the most numerous and most important small game animal in the Unit. The range of the gray squirrel is almost entirely in the eastern portion of the state, however, the fox squirrel inhabits almost all of the timbered areas in Texas. The gray squirrel is named for its color, however, true albinos are found near Caddo Lake. The gray squirrel, sometimes called cat squirrel, is abundant wherever suitable habitat is found. However, the highest populations of gray squirrels are found in the mixed hardwood bottomland forest type. Individual gray squirrels usually live out their lives in a home territory of about two acres. Fox squirrels also can be found throughout the Unit where suitable habitat exists. The fox squirrel, sometimes called red squirrel, shows considerable variation with some almost totally black and others pure white. The highest populations of fox squirrels are associated with the hardwood-pine forest type and post oak-blackjack oak forest type. The home territory for a fox squirrel is normally less than five acres.

Many factors influence the abundance of squirrels. Availability of food is the most important factor influencing squirrel populations. Squirrel populations fluctuate periodically, however, populations normally range from one squirrel per two acres to two squirrels per acre. The quality of the habitat, amount and availability of food and cover, will determine whether the squirrel population is near the lower or upper end of the density range.

Mourning Dove. The mourning dove is one of the most abundant birds in the United States. Throughout its range, the mourning dove offers more recreation in terms of hunter harvest than any other resident or migratory game bird. However, dove hunting in the Unit is of minor importance because of low populations of doves in the area. Doves nest throughout the Unit, however, the greatest proportion of doves are migratory from their breeding areas in the north. The early successional stage of the young pine forest/mixed hardwoods brush type and cropland cover type provide the best dove habitat in the Unit.

Northern Bobwhite. The bobwhite quail was very abundant in the Unit when small diverse farms with brushy fence rows and cultivated fields interspersed with woodland pastureland provided the early successional stages of plant

development of which quail are associated. The land use practices of the past resulted in excellent food and cover for quail. Pine timber and expansive pastureland have replaced most of the farmland in the Unit. These habitat types do not provide the weed seeds and cover necessary to support quail in large numbers. Thus quail are of minor importance as a game bird in the Unit. Where suitable habitat exists or the habitat is managed to provide suitable food and cover for quail, the native broodstock of quail is sufficient to reestablish the population. Quail population density in the Unit varies from one to 25 quail per 100 acres depending on the level of management.

Waterfowl. The number of waterfowl in the Unit is transient depending on the chronology of migration and the availability of suitable waterfowl habitat. The wood duck is a common resident and nests in the Unit, however, the majority of wood ducks and other duck species are migratory from northern nesting areas. Wintering waterfowl in the Unit depend on the major creeks, flooded bottomland hardwood forests, and reservoirs to provide suitable habitat. Waterfowl foods, primarily acorns, along the major creeks and flooded bottomland hardwood forests are not produced consistently from year to year and are available only when sufficient water provides waterfowl habitat. In reservoirs, aquatic vegetation is the primary food source for waterfowl. However, the water level in reservoirs is generally drawn down in the winter months below suitable waterfowl food and cover. The primary waterfowl species that use the wetlands in the Unit include wood duck, mallard, ring-necked duck, lesser scaup, and green-winged teal.

Furbearers. There are 20 fur animals legally classified as fur-bearing animals in Texas. Although coyotes and bobcats are not classified as fur-bearing animals, they are important fur species. Thirteen species of fur-bearing animals along with coyotes and bobcats are found in the Unit. The raccoon is the most economically important furbearer in Texas and in the Unit. Other furbearers regularly harvested in the Unit include Virginia opossum, gray fox, bobcat, and coyote. These species occur throughout the Unit on all of the vegetated cover types.

Nongame Wildlife. All types of wildlife contribute to some form of outdoor recreation, be it hunting or non-hunting. Non-consumptive use, bird watching or nature study, is generally associated with nongame wildlife. However, game species offer non-consumptive use as well. Two state parks are located within the Unit. Caddo State Park, near Caddo Lake, and Daingerfield State Park, in Morris County, provide opportunities to experience nature and hundreds of bird, mammal, fish, reptile, and amphibian species.

Endangered Species. Six wildlife species are listed by the Texas Parks and Wildlife Department as endangered species that occur or may occur in the Unit. No plant species are presently listed as endangered in the Unit.

Bald Eagle - Two subspecies may occur in the Unit. The northern bald eagle subspecies nests in Alaska and Canada and may migrate into the Unit for the winter. The southern bald eagle subspecies may nest in the Unit and fledge young between April and June. No active bald eagle nests are known to occur in the Unit at this time.

Red-Cockaded Woodpecker - This rare species may occur where old growth pine timber (more than 60 years old) with an open understory is found. Occurrence of the red-cockaded woodpecker in Harrison and Marion counties has been recently confirmed. Suitable habitat is lacking.

Arctic Peregrine Falcon - This species may occur during migration through the Unit. No confirmed occurrence of this species has been reported.

Interior Least Tern - The occurrence of this species is unconfirmed, however, it may occur because part of the Unit is at the periphery of the known distribution of the species.

Shovelnose Sturgeon - This fish species may occur in Caddo Lake and the Big Cypress Creek. The Unit is at the western periphery of the known distribution of the species.

Paddlefish - This fish species inhabits open waters of large, silty rivers and oxbow and flood-plain lakes. The occurrences of the paddlefish in Harrison, Marion, and Cass counties have been recently confirmed. The Unit is at the western periphery of the known distribution of the species, which is primarily the Mississippi Valley.

Threatened and/or Protected Nongame Species. Presently 14 wildlife species are listed by the Texas Parks and Wildlife Department as threatened and/or protected nongame species that occur or may occur in the Unit. No plant species are presently listed as threatened and/or protected in the Unit.

Osprey - The occurrence of this species throughout most of the Unit has been recently confirmed. The osprey may be observed during spring and fall during migration but does not breed or spend the winter in the Unit. This species is uncommon along lakes, rivers or creeks, and bald cypress swamps.

White-faced Ibis - This species may occur during spring and fall migration. Occurrence of the white-faced ibis in the Unit is unconfirmed.

Wood Stork - The occurrence of this species along Caddo Lake and the bald cypress swamp has been recently confirmed.

American Swallow-tailed Kite - This species may occur during the summer before continuing its migration south of the United States. It may be observed along bald cypress swamps and rivers or creeks with adjacent bottomland hardwood forests. Occurrence in Harrison County has been recently confirmed.

Southeastern Myotis - This bat species may occur throughout the Unit. It seeks out roosts in man-made structures near water, over which it forages.

Rafinesque's Big-eared Bat - This species may occur throughout the Unit. Its natural roosting places include hollow trees, crevices behind tree bark, and under dry leaves. It is also found in barns and other structures.

River Darter - This fish species may occur in the main creeks. The occurrences in Cass, Marion, and Harrison counties have been recently confirmed.

Western Sand Darter - This fish species may occur in the main creeks. The occurrence has not been recently confirmed.

Blue Sucker - This fish species may occur in the main creeks and reservoirs. The occurrence has not been recently confirmed.

Bluehead Shiner - This fish species may occur in the main creeks. The occurrence has not been recently confirmed.

Texas Horned Lizard - This species may occur throughout the Unit, however, occurrence in only Harrison County has been recently confirmed.

Louisiana Milk Snake - This species may occur throughout the Unit in widely different habitats. Occurrence in Harrison County has been recently confirmed.

Louisiana Pine Snake - This species may occur throughout the Unit on forested areas. Occurrence is unconfirmed.

Mole Salamander - This amphibian species, which tends to burrow, may occur throughout the Unit near moist woodlands. Occurrence in Harrison County has been recently confirmed.

WILDLIFE RELATED ISSUES

Land Use. Prior to the advent of Anglo-American colonists, the Unit was home to a variety of Indian tribes. The most notable Indians were the Caddo Indians (Caddoes). The Caddoes occupied the Unit for at least 1,000 years before white man appeared. French explorers in 1541 and Spanish explorers in 1542 first encountered the Caddoes. The Caddoes, a group of closely allied tribes, lived in northeast Texas and adjacent to Arkansas, Louisiana, and Oklahoma. Cass County was nearly the geographical center of the large Indian nation, sometimes called Caddoan. The Caddoes were agriculturists. Animals supplied only a small part of their food supply. The principal crops were corn, several varieties of beans, squash, sunflower seed, peaches, pumpkins, and tobacco. The Caddoes hunted deer, ducks, turkeys, other birds, rabbits, mice and snakes. Bison hunting was prevalent in the 16th century, with the introduction of horses. Fish were used extensively and were caught on trotlines similar to those used today.

The early explorers were surprised to find that the Caddoes maintained well populated and economically self-sufficient villages surrounded by cultivated fields. The Caddoes cultivated fields and hunted animals in proportion to the number and needs of their population. The Caddo Indians numbered about 15,000. In the 1820's, Anglo-American colonists began to immigrate to east Texas. The first settlers arrived in the Unit about 1830. The beginning of Anglo-American settlement in east Texas marked the decline of the Caddo Indians. In 1835 the Caddo Indians ceded all their land to the U.S. Government and finally moved out of east Texas in 1855.

Farming, timber, and mining were the land uses that the settlers developed in the Unit. Steamboats provided the first major means of exporting goods

produced in the Unit. During the 1840's, Jefferson became the head of navigation through the Big Cypress Creek and Caddo Lake, down the Red River and into the Mississippi River. During the 1870's, the Texas and Pacific Railroad was developed in the Unit and replaced the steamboat as the major form of shipping. Most of the early settlers were cotton planters from the southern states. The early settlers began to clear the virgin pine and hardwood forests for cropland. Small fields were created with only a hand ax and back-breaking labor. Slave labor accelerated the clearing of the land. Large plantations were established, especially along the Big Cypress Creek. Cotton and corn were the dominant crops grown. Farming provided nearly all of the food requirements of the early settlers. About 40,000 people occupied the Unit at the end of the 1800's. The abandonment of cropland began in the early 1900's. The decline in the availability of labor, outmigration of people to urban areas, development of alternate sources of income, and other factors contributed to the decline in cropland.

The timber industry peaked in the 1890's and most of the large virgin timber was harvested. There were no plans for reforestation following harvest of the virgin forests. Clearings were maintained primarily for cropland until the soil nutrients were depleted. Abandoned cropland was grazed by cattle or allowed to revert back to forest land. Mechanization in the mid 1900's allowed timber management practices to include clearcutting and regeneration of the forest.

Vast reserves of iron ore in the east-central portion of the Unit were mined intermittently since the 1850's. Iron ore was used to make farm implements, cook stoves, and hollow wares. Clay was mined extensively for pottery and bricks during the 1860's. Currently iron ore is strip-mined for the production of pig iron and steel. Oil was discovered in the Unit about 1910 and greatly altered the life style of the people and land use practices in the Unit. Oil and natural gas are produced from many fields throughout the Unit and represent two of the most significant natural resources available. About 100,000 people occupied the Unit in 1940.

The major land uses today are for timber production and for forage/beef cattle production. Timber provides the major source of agricultural income in the eastern half of the Unit and forage/beef cattle provide the major agricultural income in the western half. The population in the Unit is expected to double by 2030 to 235,000 people and land use will consequently intensify.

Effects of Land Use and Management Practices on Wildlife

Maintaining suitable wildlife habitats is prerequisite to sustaining wildlife populations in the Unit. Basic elements of wildlife habitat are food, water, and cover distributed throughout the area (range) that a wildlife species occupies. The size of the area depends on the quantity and quality of available resources, especially food supply. The amount and availability of water in the Unit is not limiting for most wildlife species. The structure of wildlife habitat providing cover for escape from predators, shelter, and reproduction limits which wildlife species may exist in a particular area. Generally if any one of the basic elements is lacking over an extensive area, the suitability of the habitat for wildlife is reduced. Land uses with the most significant impacts on wildlife are discussed below.

The grassland cover type represents the greatest loss of wildlife habitat in the Unit. Grass monoculture in vast pasturelands has limited the food availability and cover for most wildlife species. The clearing of woodlands for pasturelands has eliminated habitat for many woodland wildlife species, including gray and fox squirrels that require woodland cover. Overgrazing grasslands has reduced plant species diversity and food and cover for wildlife species. Harvesting hay in pastureland during the nesting period, April through July, destroys most of the reproduction from birds, especially northern bobwhite. Primarily non-game wildlife species benefit from the grassland cover type. Management of grassland cover types to benefit wildlife species includes (1) maintaining native pasture grasses and forbs; (2) maintaining woodland cover along drainages and wet areas within pastureland; (3) conservative stocking of cattle to avoid overgrazing; (4) deferring harvest of hay during the nesting period or providing alternate areas suitable for nesting by birds and for other uses by wildlife; and (5) planting forages specifically for utilization by wildlife species.

The pine-hardwood forest type has the greatest potential for improvement of the habitat for wildlife. Pine-hardwood forests occur on almost half (48%) of the Unit and forest management decisions influence the habitat for wildlife. Management of forest land is less intensive and sometimes lacking on small private land than on larger industrial forest land. To maximize production of wood fiber, natural pine-hardwood and hardwood-pine forests are being converted to even-aged pine plantations and harvest rotations are being shortened. Natural forests contain diverse plant communities and provide habitat diversity necessary to support abundant and diverse wildlife communities. The conversion of natural stands to pine plantations reduces or eliminates habitat diversity. The need for habitat diversity is reflected in the variety of foods eaten by wildlife species.

Size, age, and shape of individual stands within a forest influence the habitat diversity. Small (less than 100 acres), irregularly-shaped stands are more valuable for wildlife than large square stands. Generally the greater the number of individual stands within a forest, the greater the diversity between the stands. Irregular shapes provide more edge per area than square blocks. Some wildlife species are tolerant of a wide range of stand ages; however, most woodland wildlife species are dependent on a narrow range of stand ages. Young pine stands, less than 7 years old, generally contain a diverse plant species composition and support an abundance of wildlife species. Pine canopy closure at about 7 years old, increases understory shading. Growth of understory vegetation is virtually precluded in pine stands that are not thinned to maintain understory vegetation production when the overstory canopy closes and understory shading increases. Mast production from hardwoods in pine stands, older than 25 years, provides prime foods for many wildlife species. The juxtaposition of small, irregularly-shaped stands of different ages provides an "edge effect" that enhances habitat diversity and diversity of wildlife species in the forest.

Timber harvest and regeneration alters the structure of the habitat for wildlife and consequently the wildlife species that occupy the forest. The extent of the habitat alteration depends on the method of harvest. The selection method of regeneration is best for most wildlife species because an uneven-aged stand is maintained and habitat diversity is interspersed

throughout the stand. Clearcutting alters the habitat and wildlife more drastically than other methods. Wildlife species associated with early successional stages benefit from clearcutting until the tree crowns close. Clearcutting large blocks to produce contiguous even-aged stands reduces the value of the habitat for most wildlife species. Clearcutting is detrimental to wildlife species associated with mature stands. The effect of shelterwood and seed-tree methods of regeneration on wildlife habitat and wildlife species is intermediate with the selection and clearcutting methods of regeneration. The retention of hardwood trees along drainageways during harvest operations enhances the habitat for wildlife. Similarly maintaining hardwoods interspersed throughout the stand benefits wildlife species.

Site preparation for planting or regenerating pine following timber harvest to produce even-aged stands includes non-mechanical and mechanical treatments. Prescribed or controlled burning to prepare the seedbed causes less disturbances to the site than mechanical methods. Maintenance of established stands with controlled burning enhances wildlife habitat for most species by improving the quantity and quality of understory vegetation. However, burning to completely eliminate hardwoods negatively impacts wildlife habitat. Mechanical methods of site preparation severely limit or eliminate competing vegetation through the destruction of above ground vegetation and root systems. The risk of harm to the soil, primarily through erosion, is increased with mechanical site preparation. Intensive site preparation decreases habitat diversity and is detrimental to the quality of wildlife habitat. Natural regeneration with moderate site preparation is more desirable for maintaining wildlife habitat than intensive site preparation for planting.

Management of pine-hardwood cover types to benefit wildlife species includes (1) maintaining natural stands that have a high habitat diversity; (2) designing timber stands to provide the greatest edge per area; (3) retaining hardwoods along drainageways to provide habitat diversity; (4) selectively harvesting timber to produce uneven-aged stands; (5) controlled burning and thinning pine plantations to maintain understory vegetation production; and (6) moderate site preparation for pine regeneration to avoid severe loss of habitat diversity.

Water development in the Unit is expected to increase and will drastically reduce the available wildlife habitat. Presently eight major reservoirs exist in the Unit. Water use is expected to double current use by the year 2030; however, a surplus will be available for additional municipal and manufacturing demands in the Unit and for export to adjacent river basins. Proposed development of additional reservoirs include Little Cypress Reservoir and Black Cypress Reservoir. The proposed Little Cypress Reservoir will inundate most of the Little Cypress Creek bottomland in Harrison and Upshur counties. The proposed Black Cypress Reservoir will inundate most of the Black Cypress Creek bottomland in Marion and Cass counties. Potential projects include expansion of Caddo Lake and Lake O' the Pines. Prime wildlife habitat will be lost as a result of future surface water development in the Unit. Compensation will need to be accomplished through the acquisition and intensive management of habitat similar to that which is lost. Mitigation lands will be managed by the Texas Parks and Wildlife Department for use by the general public.

Sensitive and Unique Habitats. Within each vegetative cover type, areas of special importance to wildlife exist. Wetlands, riparian areas, and bottomland hardwoods are particularly sensitive and unique habitats. Significant detrimental impacts to these areas could potentially jeopardize the ability of a wildlife species and plant species to exist on the areas or cause the depletion of a wildlife population.

Caddo Lake is the best example of a sensitive and unique habitat in the Unit. The Lake is one of the largest natural lakes in the South. Caddo Lake and the associated bald cypress swamp/flooded hardwood forest is one of the most floristically diverse areas in Texas. Wildlife populations are highly productive and diverse. The area is dependent on an adequate flow of water through Big Cypress Creek and periodic flooding. The area is threatened by development for housing and increasing the elevation of the lake.

Natural marshes along the major drainages range in size from two acres to 30 acres. The openings and edge provided in bottomland hardwood forest by these natural wetlands produce valuable habitat for waterfowl and other wildlife.

Stands of bald cypress and flooded hardwoods occur in narrow bands along the major creeks (riparian areas). Bottomland hardwood forests are restricted to the flood plains of the creeks and streams. Natural areas with old-growth hardwoods and state champion trees have been identified in bottomland hardwood forests. By nature of the location and shape, bottomland hardwoods are extremely valuable to wildlife and highly susceptible to loss. Flood control and reservoir construction have had the greatest detrimental impacts on bottomland hardwood forests.

Wildlife species that depend on these sensitive and unique areas include American alligator, wood duck, and many other wildlife species that require these areas for nesting, feeding, and maintaining their populations.

The Texas Parks and Wildlife Department initiated the Technical Guidance Program in 1973 and was designed to give direct assistance to landowners, land managers, and sportsmen in preserving habitat and enhancing wildlife resources on their property, including recommendations for the proper harvest of game species. The primary thrust of the program is to ultimately protect, preserve, enhance, conserve, and restore wildlife habitat in Texas for the benefit of wildlife resources in the future. Technical guidance biologists are available upon request. Interested persons should contact the Director, Wildlife Division Technical Guidance Program, 4200 Smith School Road, Austin, Texas 78744.

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Shelterwood Method - A method of regeneration in which mature timber is removed in a series of cuttings which extend over a fraction of the rotation. Evenaged reproduction under the partial shelter of seed trees is encouraged.

Soil Series - Soils that are similar in composition, thickness, and arrangement.

Stand - A contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition to be a distinguishable unit.

Terrace - An old alluvial plain bordering a river or lake that is at a higher elevation than the floodplain.

Watershed - The entire region drained by a waterway or that drains into a waterway.

APPENDIX I
LIST OF PLANTS MENTIONED

Alligatorweed	<u>Alternanthera philoxeroides</u>
Arrowhead	<u>Sagittaria</u> spp.
Ash, Carolina	<u>Fraxinus caroliniana</u>
Aster	<u>Aster</u> spp.
Baccharis	<u>Baccharis halimifolia</u>
Bald Cypress	<u>Taxodium distichum</u>
Basswood	<u>Tilia caroliniana</u>
Beautyberry, American	<u>Callicarpa americana</u>
Bermudagrass, coastal	<u>Cynodon</u> sp.
Bermudagrass, common	<u>C. dactylon</u>
Birch, river	<u>Betula nigra</u>
Black cherry	<u>Prunus serotina</u>
Blackberry	<u>Rubus argutus</u>
Blackgum	<u>Nyssa sylvatica</u>
Bladderwort	<u>Utricularia</u> spp.
Bluestem	<u>Andropogon</u> spp.
Bracken Fern	<u>Pteridium aquilinum</u>
Buckeye, red	<u>Aesculus pavia</u>
Buckthorn, Carolina	<u>Rhamnus caroliniana</u>
Buttercup	<u>Ranunculus</u> spp.
Buttonbush, common	<u>Cephalanthus occidentalis</u>
Camphorweed	<u>Pluchea camphorata</u>
Cardinal-flower	<u>Lobelia cardinalis</u>
Clover, arrowleaf	<u>Trifolium</u> sp.
Clover, crimson	<u>T. incarnatum</u>
Coontail	<u>Ceratophyllum demersum</u>
Croton, wooly	<u>Croton capitatus</u>
Creeper, Virginia	<u>Parthenocissus quinquefolia</u>
Deerberry	<u>Vaccinium stamineum</u>
Dewberry	<u>Rubus trivialis</u>
Dogwood, flowering	<u>Cornus florida</u>
Dogfennel	<u>Eupatorium capillifolium</u>
Ducksmeat, common	<u>Spirodela polyrhiza</u>
Elephantsfoot, wooly	<u>Elephantopus tomentosus</u>
Elm, winged	<u>Ulmus alata</u>
False-nettle	<u>Boehmeria cylindrica</u>
Fanwort	<u>Cabomba caroliniana</u>
Farkleberry	<u>Vaccinium arboreum</u>
Flatsedge	<u>Cyperus</u> spp.
Foxtail	<u>Setaria</u> spp.
Fringetree, white	<u>Chionanthus virginicus</u>
Grape	<u>Vitis</u> spp.
Grape, muscadine	<u>V. rotundifolia</u>
Grass, bahia	<u>Paspalum notatum</u>
Grass, dallis	<u>P. dilatatum</u>

Grass, Johnson	<u>Sorghum halepense</u>
Grass, rye	<u>Lolium</u> spp.
Greenbriar	<u>Smilax</u> spp.
Goldenrod	<u>Solidago</u> spp.
Hackberry, sugar	<u>Celtis laevigata</u>
Hawthorn	<u>Crataegus</u> spp.
Heliotrope	<u>Heliotropium indicum</u>
Hempweed, climbing	<u>Mikania scandens</u>
Hickory, black	<u>Carya texana</u>
Hickory, mockernut	<u>C. tomentosa</u>
Holly, American	<u>Ilex opaca</u>
Holly, possumhaw	<u>I. decidua</u>
Holly, yaupon	<u>I. vomitoria</u>
Honeysuckle, Japanese	<u>Lonicera japonica</u>
Hophornbeam, American	<u>Ostrya virginiana</u>
Hornbeam, American	<u>Carpinus caroliniana</u>
Horseweed	<u>Erigeron canadensis</u>
Ivy, poison	<u>Toxicodendron radicans</u>
Jessamine, yellow	<u>Gelsemium sempervirens</u>
Laurelcherry, Carolina	<u>Prunus caroliniana</u>
Lespedeza	<u>Lespedeza</u> spp.
Lizard's tail	<u>Saururus cernuus</u>
Lotus, American	<u>Nelumbo lutea</u>
Magnolia, sweetbay	<u>Magnolia virginiana</u>
Maple, red	<u>Acer rubrum</u>
Marshpurslane	<u>Ludwigia palustris</u>
Oak, blackjack	<u>Quercus marilandica</u>
Oak, black	<u>Q. velutina</u>
Oak, cherrybark	<u>Q. pagodaefolia</u>
Oak, overcup	<u>Q. lyrata</u>
Oak, post	<u>Q. stellata</u>
Oak, shumard	<u>Q. shumardii</u>
Oak, southern red	<u>Q. falcata</u>
Oak, water	<u>Q. nigra</u>
Oak, white	<u>Q. alba</u>
Oak, willow	<u>Q. phellos</u>
Osage-orange	<u>Maclura pomifera</u>
Palmetto, dwarf	<u>Sabal minor</u>
Panicum	<u>Panicum</u> spp.
Parrotfeather	<u>Myriophyllum brasiliense</u>
Paspalum	<u>Paspalum</u> spp.
Pea, butterfly	<u>Centrosema virginianum</u>
Pea, partridge	<u>Cassia fasciculata</u>
Pecan, bitter	<u>Carya aquatica</u>
Pecan, sweet	<u>C. illinoensis</u>
Persimmon, common	<u>Diospyros virginiana</u>
Persimmon, Texas	<u>D. texana</u>

Pigweed
Pine, loblolly
Pine, shortleaf
Plum, flatwoods
Pondweed
Privet, swamp

Ragweed
Redbud, eastern
Ruellia
Rush

Sandspur
Sassafras
Sedge
Silverbell, two-winged
Smartweed
Soybean
Spanglegrass
Spider-lilly
St. Andrew's Cross
Sumac, winged
Sunflower
Supplejack, Alabama
Sweetgum
Sweetleaf

Tickclover
Tupelo, water
Tupelo, swamp

Vetch
Vetch, smooth
Viburnum, arrow-wood
Viburnum, rusty blackhaw

Water elm
Waxmyrtle, southern
Wheat
Witchhazel, southern

Amaranthus spp.
Pinus taeda
P. echinata
Prunus umbellata
Potamogeton spp.
Forestiera acuminata

Ambrosia artemisiifolia
Cercis canadensis
Ruellia caroliniensis
Juncus spp.

Cenchrus longispinus
Sassafras albidum
Carex spp.
Halesia diptera
Polygonum spp.
Glycine max
Chasmanthium spp.
Hymenocallis caroliniana
Ascyrum hypericoides
Rhus copallina
Helianthus spp.
Berchemia scandens
Liquidambar styraciflua
Symplocos tinctoria

Desmodium spp.
Nyssa aquatica
N. sylvatica var. biflora

Vicia spp.
V. dasycarpa
Viburnum dentatum
V. rufidulum

Planera aquatica
Myrica cerifera
Triticum aestivum
Hamamelis virginiana

APPENDIX II
LIST OF ANIMALS MENTIONED

Mammals

Armadillo, nine-banded	<u>Dasyus novemcinctus</u>
Bat, Rafinesque's big-eared	<u>Plecotus rafinesquii</u>
Bat, Southeastern myotis	<u>Myotis austroriparius</u>
Beaver	<u>Castor canadensis</u>
Bobcat	<u>Lynx rufus</u>
Cottontail, eastern	<u>Sylvilagus floridanus</u>
Coyote	<u>Canis latrans</u>
Deer, white-tailed	<u>Odocoileus virginianus</u>
Fox, gray	<u>Urocyon cinereoargenteus</u>
Gopher, plains pocket	<u>Geomys bursarius</u>
Mink	<u>Mustela vison</u>
Mouse, cotton	<u>Peromyscus gossypinus</u>
Mouse, fulvous harvest	<u>Reithrodontomys fulvescens</u>
Mouse, house	<u>Mus musculus</u>
Mouse, white-footed	<u>Peromyscus leucopus</u>
Muskrat	<u>Ondatra zibethicus</u>
Nutria	<u>Myocastor coypus</u>
Opossum, Virginia	<u>Didelphis virginiana</u>
Rabbit, swamp	<u>Sylvilagus aquaticus</u>
Raccoon	<u>Procyon lotor</u>
Rat, Florida wood	<u>Neotoma floridana</u>
Rat, hispid cotton	<u>Sigmodon hispidus</u>
Skunk, striped	<u>Mephitis mephitis</u>
Squirrel, eastern flying	<u>Glaucomys volans</u>
Squirrel, fox	<u>Sciurus niger</u>
Squirrel, gray	<u>S. carolinensis</u>

Birds

Blackbird, red-winged	<u>Agelaius phoeniceus</u>
Bluebird, eastern	<u>Sialia sialis</u>
Bluejay	<u>Cyanocitta cristata</u>
Bobwhite, northern	<u>Colinus virginianus</u>
Cardinal	<u>Cardinalis cardinalis</u>
Chat, yellow-breasted	<u>Icteria virens</u>
Chickadee, Carolina	<u>Parus carolinensis</u>
Coot, American	<u>Fulica americana</u>
Cormorant, double-crested	<u>Phalacrocorax auritus</u>
Crow, common	<u>Corvus brachyrhynchos</u>
Dove, mourning	<u>Zenaidura macroura</u>
Duck, ring-necked	<u>Aythya collaris</u>
Duck, wood	<u>Aix sponsa</u>
Eagle, northern bald	<u>Haliaeetus leucocephalus alascanus</u>
Eagle, southern bald	<u>H. l. leucocephalus</u>
Egret, cattle	<u>Bubulcus ibis</u>
Egret, great	<u>Casmerodius albus</u>
Falcon, Arctic peregrine	<u>Falco peregrinus tundrius</u>

Flycatcher, scissor-tailed
Grackle, common
Grebe, pied-billed
Hawk, red-shouldered
Hawk, red-tailed
Heron, black-crowned night
Ibis, white-faced
Kingfisher, belted
Kite, American swallow-tailed
Meadowlark, eastern
Osprey
Owl, barred
Owl, great horned
Sparrow, savannah
Sparrow, white-throated
Stork, wood
Tern, interior least
Thrasher, brown
Titmouse, tufted
Vulture, black
Warbler, pine
Warbler, prothonotary
Woodcock, American
Woodpecker, red-headed
Woodpecker, pileated
Woodpecker, red-cockaded

Muscivora forfic
Quiscalus quiscula
Podilymbus podiceps
Buteo lineatus
B. jamaicensis
Nycticorax nycticorax
Plegadis chichi
Ceryle alcyon
Elanoides forficatus
Sturnella magna
Pandion haliaetus
Strix varia
Bubo virginianus
Passerculus sandwichensis
Zonotrichia albicollis
Mycteria americana
Sterna antillarum athalassos
Toxostoma rufum
Parus bicolor
Coragyps atratus
Dendroica pinus
Protonotaria citrea
Scolopax minor
Melanerpes erythrocephalus
Drycopus pileatus
Picoides borealis

Reptiles

Alligator, American
Coachwhip, eastern
Copperhead, southern
Cottonmouth
Lizard, Texas horned
Racer
Snake, Louisiana milk
Snake, Louisiana pine
Snake, Texas coral
Turtle, Alligator-snapping

Alligator mississippiensis
Masticophis flagellum flagellum
Agkistrodon contortrix
A. piscivorus
Phrynosoma cornutum
Coluber constrictor
Lampropeltis triangulum amaura
Pituophis melanoleucus ruthveni
Micrurus fulvius tenere
Macroclmys temmincki

Amphibians

Bullfrog
Salamander, mole

Rana catesbeiana
Ambystoma talpodeum

Fish

Darter, river
Darter, western sand
Paddlefish
Shiner, bluehead

Percina shumardi
Ammocrypta clara
Polyodon spathula
Notropis hubbsi



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