

HARRISON BAYOU
AT CADDO LAKE

A NATURAL AREA SURVEY

Prepared for the Texas Parks and Wildlife Department

DIVISION OF NATURAL RESOURCES AND ENVIRONMENT
THE UNIVERSITY OF TEXAS AT AUSTIN

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letter to Texas Parks and Wildlife
Commission Chairman

from

Don Kennard

Acknowledgements

by

Don Kennard .

Foreword

by

Don Kennard

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HARRISON BAYOU -- AN OVERVIEW

Laurence C. Walker and Thomas Brantley

One of the few truly virgin hardwood stands in the East Texas pine-hardwood forest is the 300 to 400 acres within a 1300-acre tract along Harrison Bayou, not far from its outlet into Caddo Lake in northeast Texas. That stand joins several tracts of bottomland hardwoods and southern bald-cypress (Taxodium distichum) totaling a thousand acres, which was first hi-graded in the early 1900s and probably subsequently partially harvested.

The land had not been subjected to the loggers' axes and cross-cut saws in the early days because of inaccessibility. Old stream channels, now forming small ox-bow lakes, and high water made felling, skidding, and transport difficult. Then, since 1941, when the federal government bought the land for the Longhorn Ordnance Works from T. J. Taylor (the father of Lady Bird Johnson) and other families, national defense security virtually precluded harvesting of the forests. Only since 1969 have the slash and loblolly pine plantations and naturally regenerated pines and hardwoods been cut from the uplands of the Reservation.

Five to seven hundred acres of what is herein referred to as the proposed special management area was logged between 1900 and 1920. A couple hundred more acres were cutover between 1920 and 1941.

^{1/}Appreciation is expressed to personnel of the Department of Defense, Longhorn Army Ammunition Plant, Thiokol Corporation, and Caddo State Park for courtesies extended in the course of this study.

The largest tree on the Reservation is a 19-foot circumference baldcypress measuring 139 feet tall and containing 3400 board feet. Extending far beyond the crowns of neighboring stems, this monarch is a prime candidate for lightning strikes. Indeed, it has been struck in recent years, killing one side, which unfortunately will serve as an entrance for decay fungus. That the tree was not wholly killed is unusual in this wet site where moisture in the tree's inner bark provides an excellent conductor.

Estimates of the age of the large baldcypress range from 300 to 700 years. Ring counts are of little value because of the great size of the stem (felling would be necessary to get a ring count) and because baldcypress may put on several growth rings each year. This occurs as the water level in the soil fluctuates, new early-wood being laid down when the water rises and a pseudo-dormancy occurring when available water is in short supply.

Other specially large trees found in the area are a persimmon (Diospyros virginiana), water elm (Planera aquatica), overcup oak (Quercus lyrata), water locust (Gleditsia aquatica), hawthorn (Crataegus sp.) and two state champions, a water hickory (Carya aquatica), and a flowering dogwood (Cornus florida).

Overflow water--from Caddo Lake (an extension of Big and Little Cypress rivers) and Harrison Bayou--may cover the land for a depth of two feet for long periods in winter. The Lake, eventually emptying into the Red River, drains 2765 square miles; estimates of its size range from 72 to 150 thousand acres.

This site is especially appropriate for setting aside as a special management area, partly because of the tight security of the Defense Department installation in which it lies. Entry requires a personnel check, advance request, and

accompaniment by an authorized employee of the Department or Thiokol Corporation, which operates the facility for the Government. Thiokol's forester is responsible for management of the timberlands and sale of commercial "stumpage."

Cattle grazed the Reservation until 1955; since then they have been excluded.

Hunting within the Ammunition Plant property is permitted by special arrangement for its employees only (because of security). An abundance of deer and squirrels is present. The tracks of mink and the ponds of beaver were observed, the latter raising the level of water in a slough by 2 1/2 feet. Ducks make use of a pond, sloughs, channels, and "backwaters" during migrations.

Ivory-billed woodpeckers have been suspected as being in the area by ornithologists associated with Defenders ^{of} Wildlife, a preservationist group. The evidence may warrant further investigation, but it is inadequate for justifying a claim of their presence.

The site is in the eastern part of the Ammunition Plant, northeast of Karnack, west of Farm Road 9 and Big Lake Camp near the mouth of Harrison Bayou, and on the north edge of Harrison County in East Texas. Elevation ranges from 150 to 180 feet. The highest point in the County is 450 feet.

Archaeology

Evidences of man in the area include the small pieces of Indian pottery which may be rather readily found in the soil on a bluff immediately adjacent to Harrison Bayou. Other Indian mounds, some of which are called "pimple mounds," occur in the Caddo Country and adjacent to the Lake. These probably were built by Indians for the same reason that current-day fishermen build their week-end cottages on stilts. There is some speculation that Indians may have mined clay from the area for making high-quality pottery. This is

an especially appropriate theory for some openings in the forest canopy for which there is no readily apparent explanation.

Indian arrowheads are not uncommon. Apparently the Caddos were good at crafting implements, even though flint had to be brought from the mountains to the north. One collection is reported to have between 12 and 14 thousand points and pieces.

A few logging roads, nearly obliterated, may still be observed along the Bayou. No doubt, fire -- man-caused and naturally occurring from lightning strikes -- has burned over the area, even the wet bottomlands of Harrison Bayou. That pines are found here and there, and in clumps, attests to this; for conifers in the South, in order for the seed to germinate and the seedlings to grow, must have the mineral seedbed exposed and full sunlight at the time of seedfall. Fire, burning the organic matter on the surface of the soil and killing vegetation that would overtop newly germinated seedlings, exposes the mineral soil and controls vegetation that would shade the pine seedlings.

Climate

Rainfall for the year in which this study was made may be one of the driest on record. Ordinarily, about 47 inches is recorded. For the first 7 months of 1977, precipitation was less than 15 inches. Annual tallies are from less than 38 inches to more than 61.

BROAD DESCRIPTION OF THE AREA

Harrison Bayou is located in the West Gulf Coastal Plain, an area characterized by oak-hickory-pine forests and red and yellow podzolic soils.

Climate of this section of the Country is called humid subtropical. The growing season is about 240 days. Average temperature effectiveness is $900\frac{1}{2}$. Annual precipitation is 45 inches, and a few less than 50 days a year have thunderstorms. Critical droughts are frequent. The thunderstorms for the most-part occur while the forest is in full foliage; hence doing minimal damage to the soil by raindrop impact. Rain interception by crowns and trunks may reduce direct precipitation by 25 percent during any one growing season. This intensifies evaporation loss and the seasonal distribution of rainfall so that the region is drier than other climatic indicators might suggest. Lightning strikes do kill trees, though rarely start forest fires in this region.

Harrison Bayou is, of course, a secondary stream. It has never been sociologically significant except to those who lived and worked around it. Thousands of other small stream bottoms just like it threaded inland across the South; and in them people hunted, fished, grazed their hogs and cattle, and cut timber. It is because of a series of unlikely circumstances that the Bayou bottom is in its present state.

The first and most significant is World War II which resulted in the

$\frac{1}{2}$ the difference between 40° F and the average temperature for each growing day, added together.

Government taking over and preserving the Bottom until now. Another is a political connection to Washington of the land area on and adjacent to the bottom, via T. J. Taylor and Lyndon Johnson, which resulted in its being selected as a site for an ordnance plant. Another is the happenstance that some of the valuable hardwood and baldcypress timber was never cut prior to 1940, probably because of its commercial isolation as a merchantable species. If the stand had been located in Louisiana or eastward, it would have likely been harvested in the cut-out-and-get-out days. Being located in Northeast Texas, it was subject to cutting pressure at a later date; enabling its preservation until the Government took it over. As it stands now, the Harrison Bayou Bottom is a relic. It is an example of what thousands of other small stream bottoms were like before they were harvested.

Bottomland Hardwoods

The importance of southern bottomland hardwood types is shown by the statistic that they, along with baldcypress, occupy about 57 million acres and comprise more than half of the hardwood stumpage in the South. Although the belts of hardwoods flanking the countless waterways throughout the South are the principal areas ^{supporting this} growth, the type is also found in swamps, bogs, ponds, and branch heads. Much of this land is inherently productive, capable of growing annually 500 board feet of high-value wood per acre. Another 2/5

cord can be produced from topwood and small trees removed for cultural purposes.

About 70 species of commercial importance typically occur in this kind of alluvial plain, usually in mixed stands. Along river fronts are eastern cottonwood and willows, while further back ^{are} pure stands of sweetgum, water oak, white oak, or ash.

Mixed stands on the ridges -- slight rises of a few inches to a few feet above the surrounding flat -- may be predominantly white, red, and water oaks, hickories, sweetgum, baldcypress, blackgum, and water tupelo. Baldcypress and water tupelo, more typical of poorly drained depressions, are sometimes found on slightly raised sites.

The present forests have resulted from fire, tornado, logging, agriculture, flooding, sedimentation, and erosion, leaving a mixture of species and age classes ranging from seedlings to mature trees. Many kinds intolerant of shade become established in the openings; others develop in the understories of older stands. Generally, seedbeds must be moist, but not flooded and, for many species like the willows and cottonwoods, the mineral soil must be exposed.

Baldcypress is found in swamps where water is too deep for competitive species. It occurs in pure, dense, evenaged stands. Where single stems are found mixed with hardwood forests, a change in the physiography of the site during the life of the stand has probably occurred.

Overburden^{1/2} may include overmature and mature timber, undesirable immature stems, as well as culls and weeds. It usually comprises about half the volume in stands not previously managed. Virgin timber in many of the Coastal Plain bottoms was cut between 1920 and 1950, taking the best

^{1/} See Walker, L. C., and T. Watterston. 1972. Silviculture of Southern Bottomland Hardwoods. Stephen F. Austin State Univ. Sch. For. Bull. 25.

^{2/} The overburdenable or low-lying stands in a bottomland forest.

stems and leaving areas ripe for weed trees and brush invasion. Stands of less than 5,000 board feet (5 MBF), mostly in low-value species and low-grade stems, are therefore common.

East and north from the western limits of southern forest types in Texas, the 520,000-square mile Coastal Plain supports the most extensive and productive forests in the South. Geologically young, the sediments which comprise the region are mainly sands, gravels, clays, and marls, in strata dipping toward the coast. Older sediments are exposed in the interior, the younger ones seaward. Elevations rarely reach 1000 feet, and local relief is everywhere less than 500 feet.^{1/}

Three zones of topography arranged approximately parallel to the coastline extend with little modification from Georgia into Texas. Adjacent to the coast is a series of low and often poorly drained deltaic plains and grassy marshes. Next inland is a narrow zone of depositional terraces, called the "Pine hills." The innermost and most extensive division is a zone of belted topography developed on more steeply dipping beds alternating between fine- and coarse-grained sediments. These strata offer varying resistance to erosion and have produced a surface composed of inward-facing escarpments separated by broad vales or lowlands in typical cuesta topography. The Harrison Bayou area is somewhat transitional between the second and third of these topographic features.

Fires, notably in 1916 and 1925, destroyed much of the bottoms, leaving the forest with a high proportion of low-grade trees, culls, and

^{1/} See Walker, L. E., and G. I. Collier. 1969. Geography of the Forests of the South. Stephen F. Austin State Univ. Sci. For. Bull. 18.

undesirable species. A single fire every 10 years prevents restocking of good trees and destroys the humus so that soils become puddled, drying to rock-like hardness. Regeneration is difficult to obtain where coarse, loose, sandy soils are at the surface or just below a thin veneer of fine material. In those soils, occurring between natural levees, the water table in summer is likely to be too deep to enable delivery of the moisture by capillarity through the sand. Other difficult sites are those with plastic clay, as on the low flats, and the hardpan and silty clay basins of the terraces. There, moisture and aeration are unfavorable and willow oak is generally the principal species present.

Soils and Physiography - Bottomlands, typically hardwood and baldcypress sites, have azonal soils too immature to have well-defined horizons. Forest sites and timber types are closely allied to, and distinguished by, topographic features. First bottoms, major sites of relatively recent origin comprising the present main flood plain, are frequently flooded. The soils there are chiefly waxy clay and fine sandy loams, but may be coarser. Silt is relatively less important, impervious soils here being plastic clays. Terraces, or second bottoms, are older, higher areas which flood only occasionally and on which acidic silt loams and silty clay loams are major textural classes. Low areas may have impervious silty clay.

Ridges, flats, sloughs, and swamps are secondary sites in both first and second bottoms. In second bottoms, sheet erosion has lessened their evidence. Ridges, high land 2 to 15 feet above flats, are the banks of former stream courses. Although rarely inundated, seasonal overflows have deposited coarser materials. Surface drainage is better than in other topographic classes.

Flats, lying between ridges, have poor surface soil drainage and, due to the high proportion of clay, internal drainage is also poor. Following floods or heavy seasonal rains, high flats are drained of free water within a few days after rivers or streams are again within their banks. Free water in low flats requires several weeks to subside. Sloughs are shallow depressions -- usually filled-in stream courses -- in which water collects during wet seasons; while swamps, except during droughts, are inundated for the greater part of every growing season.

INJURIOUS AGENTS

Fire-caused Rot - Virtually all decay in bottomland hardwoods is attributed to fire; and all fire-wounded trees, regardless of species, will contain rot. Fires make wounds into which rots enter and destroy desirable trees, especially in seedling and sapling stages. Undesirable species are frequently the most fire resistant and, hence, a site may be transformed by a single fire. Although injuries as small as one inch in diameter will sometimes admit rot fungi which subsequently destroy butt logs, wounds less than 2 inches in width are generally not important points of infection. Up to 4 years may be required for rot to reach the heartwood but, once there, spread is rapid -- as fast as 2 feet in 10 years. Thus, butt logs are often totally destroyed in the 15 to 20 years required for fire scars to heal. High temperature and humidity encourage spread of decay.

Beavers - Beaver damage in bottoms is an increasing source of butt-log decay. As with fire damage, partial girdling by beavers results in a wound subject to attack by decay-causing fungi. Decay may be as deep as 2 inches after 6 years in ash trees and 8 years in sweetgum. Wounds extending more than one-quarter

of the way around the circumference indicate a strong probability of mortality within 10 years.

Tent Caterpillar - The forest tent caterpillar defoliates tupelos, blackgum, sweetgum, willow oak, overcup oak, and river birch in southern bottomlands. Larvae spin cocoons in early May; moths are in flight two weeks later. By June, defoliated trees may put on new leaves, but this crop will be smaller and less abundant than normal. Fortunately, it is believed fungus, virus, or fly parasites may stop outbreaks, but not before many trees are killed.

Grazing - Grazing of domestic livestock has been detrimental to bottomland hardwood forests. Cattle trample reproduction, browse valuable stems, and compact the soil. The soft floor of many bottomland forests, especially border areas of reeds and swamps where one quickly sinks to the knees in soft, loose organic matter, discourages cattle. Perhaps too, the impalatability of swamp herbs further inhibits grazing, as cattle seem reluctant to graze the swamps except during famine or extremely droughty seasons.

Windthrow - Windthrow is important in sites with pervious soils which, in spite of deep tap roots, afford poor support when saturated. On areas with impervious substrata, wind removes trees with defective root systems and those which lean from a "root-sprung" condition.

The increase in soil moisture following forest cuttings, or other destruction, consequently raises the danger of windfall. The rise of groundwater after trees are removed, converting flats and sloughs to brushy swamps, is particularly devastating where soils are too shallow for establishment of deep tap roots on potential seed trees.

Flooding - Absorption, transpiration, water movement, temperature, chemicals and organic matter in the water, microbes, algae, and the soil physical and

chemical properties all probably affect the tolerance of trees to submergence. These factors, in turn, influence the amount of free oxygen available to plants under saturated soil conditions. It is this oxygen deficiency or carbon dioxide toxicity which detrimentally influences seed germination, seedling survival, and tree growth.

Free oxygen is considered the limiting factor in the germination of bottomland hardwood seeds in flooded sites. Except for siltation, which covers seeds too deeply, flooding bottomlands for up to one month does not appear to reduce germinative capacity. Observations suggest that even if bottomland tree seed were to germinate while immersed in water, eventual establishment of the seedling would be most unlikely unless the immersing waters receded before the seedlings perished from other causes. Consequently, normal flooding is not a major cause of selective regeneration among species until after germination, except possibly in swamps. But, in long-inundated areas, production of great quantities of seeds are essential to offset the hazards of submergence. Sycamore and elm germinate only after flooding subsides; while drainage is necessary for germination of some species.

The amount of light reaching the forest floor also influences germination of bottomland hardwood seeds. Germination is more favorable for river birch, sycamore, and American elm under conditions of full sunlight than under crown canopies. In contrast, less desirable species, able to endure low-light intensity, along with deciduous holly and dogwood, outnumber favorable species in some flooded bottoms where litter is deep and ground vegetation dense. New land, regenerated with cottonwood and subsequently invaded by weed trees, is an exception to this generality.

Reproduction of desirable species is initially adequate on all sites not currently flooded; but it is best where litter is shallow or absent, the ground cover light or absent, and the overstory sparse. Elm may be most abundant of all species where litter is deep or ground cover dense; while hickories and some oaks may be more prolific on heavier soils with high moisture-holding capacity. This, however, could be due to the greater frequency of seed-producing stems of those species on such sites.

Ponded areas exposed to sunlight after rain, causing the temperature to rise, increases respiration and the activity of micro-organisms, resulting in oxygen deficiency and carbon dioxide toxicity. Root growth of a number of species stops when free oxygen reaches 0.5 percent in the gas around roots, but top growth may continue, accompanied by possibly toxic accumulations of iron. While the rate of transfer of solutes from root to shoot is independent of aerobic mechanisms of roots, flooding might stop downward movement of carbohydrates and auxins. Thus, the accumulation of plant foods and hormones at the water-line may account for adventitious rooting of flooded trees.

Baldecypress^{1/}

Baldecypress, an ecologic pioneer, becomes established when water is low in one or more extremely dry seasons following periods of sufficient moisture for soaking the soil for one to three months. A saturated, but not inundated, seedbed is essential for seed germination. Natural reproduction may come in after drainage of open cypress flats or wet ponds where herbaceous and shrubby undergrowth are absent.

Little is known of the proper management of baldecypress stands because few such forests remain to arouse experimental interest. And for those that do, access for man and machinery is limited. The species is usually in

^{1/} See Walker, L. C. 1967. Silviculture of Minor Southern Conifers. Stephen F. Austin State Univ. Sch. For. Bull. 15.

pure evenaged stands.

Seeds, produced about every third year, are sticky and, hence, not eaten by birds and rodents. Ripened by October or November, seeds are scattered neither by wind nor animals, but by water alone; and they are often washed from the site of initial deposition. Germination, in the spring, is usually poor except in seedbeds of sphagnum moss and soft wet muck. In spite of frequent good seed crops, obtained with 4 to 8 seed trees per acre between 10 and 18 inches diameter, breast high,^{1/} other conditions often prevent regeneration more than once in 30 years. Where a pine seed source is present, pines may take over openings, and, if drainage is sufficient, replace cypress.

While baldcypress may sprout, the shoots are usually unsatisfactory. The sapwood of stump sprouts quickly rots: basal sprouts are more lasting. Shoots seldom occur on trees more than 90 years old or on stumps injured in logging. Sprouts grow faster than seedlings--as much as 6 to 10 inches dbh in 12 years--and, hence, compete effectively where their vigor is satisfactory. Upon heavy cutting, baldcypress sites are frequently captured by sweetgum, Nuttall oak, willow oak, red maple, and water tupelo.

Other old stands of baldcypress occur: a 650-year-old stand of baldcypress in the Bay Lake area of North Carolina is one of the few remaining virgin forests of the type. Trees over a thousand years of age, 130 feet tall, and 10 feet in diameter were common twenty years ago. Another virgin stand--of pondcypress--is more than 250 years old. A second-growth stand in north Mississippi had a volume of 52 MBM per acre fifteen years ago, the average crop trees being 18 inches dbh and 112 feet tall at 85 years of age.

Buttresses - In areas drained below the usual low water level, buttresses actually terminate at a level below which water almost never

^{1/} diameter 4-1/2 feet above the ground, abbreviated dbh.

recedes. From that level to the ground surface, trunks are narrow, possibly because (1) normal unbuttressed trunks have no excess water, but do have an abundance of air, or (2) the section of the trunk under water is saturated, but without adequate air, the buttresses being a response to water plus air, concomitant with rising and lowering water levels. Only slight swelling occurs in swamps not subject to high floods.

Knees - It has been concluded that, because little gas exchange occurs between roots and knees, these ^{latter} structures are not essential for root aeration. Knees reduced oxygen content in closed air-tight containers surrounding the protuberances, but most of the oxygen absorbed was used by the large amount of cambial tissue in ^{the} knees. This is particularly evident since knee growth is more rapid than root growth and, therefore, more demanding of oxygen. Furthermore, trees grow in deep water and in the absence of knees; and removal of the organs seems to have no effect upon growth and survival.

Knees are considered important for basal support in organic soils described as "trembling earth." Windfirmness is indicative of efficient anchorage. Evidence is (1) the general absence of knees in swamp soils superficially dry during most of the year, (2) the presence of knees where surface water is excessive for long periods, (3) the rise of knees to the approximate height of the average flood level, and (4) the interwoven network of, and the anchorage afforded by, a deep root mass beneath the knees.

Destructive Agents

Insects - Baldcypress is notably free of insects. The most serious pest

See Walker, L. C. 1967. Silviculture of Minor Southern Conifers. Stephen F. Austin State Univ. Sch. For. Bull. 15.

is a leaf-chewing beetle (Systema marginalis), causing foliage to discolor in mid-summer. Damage is done by small (1/8- to 5/16-inch long), flattened, dull yellowish-tan adults. The insects do not remain on trees more than three days. Leaves are not consumed, but turn red within a few days after attack, and heavy feeding is evidenced by linear-shaped gougings that seldom pierce both leaf surfaces. After foliage turns color, leaves shrink to the degree that feeding holes are difficult to see unless leaves are soaked in water overnight. Defoliation reduces growth and vigor, enabling secondary pests to further weaken and kill trees.

Disease - Baldcypress stands are relatively free of rots and other fungi infections. Pecky cypress results from infection of Fomes geotropus -- the scientific species name derived from the downward curvature of the rarely found dried bracts. The fungus probably enters through basal fire wounds. Damage, characterized by cavities which eventually occur throughout the heartwood of a tree, is especially serious on overmature stems. These pockets, generally several inches long, fill with brown powder which may be antiseptic and, thereby, arrest further disease activity. Fungus growth ceases when trees are felled. Old trees may require decades to die.

Rodents - Swamp rabbits may be a serious problem in baldcypress plantations. In a Louisiana swamp, 75 percent of the seedlings were clipped above ground, making a smooth-angle cut. Damage occurs only on non-flooded sites. Clipped stems generally re-sprout, but the short shoots are killed when inundated.

Nutria, introduced from South America in the 1930's, uproot seedlings, eat bark from tap roots, and, in some cases, consume whole roots. Damage occurs in the spring, on flooded sites first and then on adjacent non-flooded areas for a distance of 15 to 20 feet from the water's edge. In contrast

to swamp rabbit injury, the cut is rough and at an angle of about 40 degrees. As seedlings are carried back to the water to be eaten, sections of debarked roots and seedling tops are found strewn upon the surface of the pond.

Flooding - Floods overtopping seedlings during their first year for more than three weeks, except in winter, kill them. While it is detrimental to submerge plant tips after trees are in leaf for briefer periods, death may not result. Sometimes stems re-leaf in late summer after being inundated for several months during the growing season. Warm water and deep deposits of silt and clay sediments, along with oxygen deficiency, attribute to poor survival of submerged seedlings.

Soils of the Proposed Special Management Area

The soils of Harrison Bayou proposed special management area fall into one of 12 groups according to Woodland suitability, as currently classified by the Soil Conservation Service and shown on the map. The last survey of Harrison County, made in 1912^{1/}, classified the lower-elevation alluvial lands as Sanders silt loam and fine sandy loam, Kalmia fine sand and fine sandy loam, and Trinity clay. The Sanders was described as brown to nearly black surface soil and mottled brown, yellow, and gray subsoil. Its silt loam type is especially prominent on Harrison Bayou. Clay of the series is sticky when wet and granular when dry. The Kalmia is a dark-brown surface soil with mottled brown, yellow and gray subsoil. Trinity soil is black to dark-brown surface soil and mottled yellow and gray clay subsoil. The first two are "reworked" material from nearby uplands; the Trinity is reworked and washed in from Cretaceous prairies to the west. It is stiff clay 6 to 10

^{1/} Van Duyne, C., and W. C. Byers. 1915. Soil Survey of Harrison County, Texas. In Field Operations of the Bureau of Soils, 1912. Gov. Print. Off.

inches deep, sticky when wet and cracking when dry.

Notably, Kalmia fsl is described as forming a well-defined terrace several feet above the first bottom, with water usually standing between the mounds. That type may be a colluvial formation at its edge where joining upland, sedimentary-lain soils. It is typically of loose and porous structure, the fine sandy loam forming a narrow strip along the banks of streams and the fine sand specifically noted "along the second bottom of Harrison Bayou."

Genesis of soil types within the series is complicated by weathering and erosion, for texture depends on the degree to which the finer particles have been eroded or leached to lower horizons subsequent to weathering. The unconsolidated sands and clays underlying the alluvium and on the uplands adjacent to Caddo Lake are classified as Sabine Formation of the Eocene Age.

Description of Six Cover Types

Some distinctly different forest cover types^{1/} occur in the Harrison Bayou proposed special management area. Six are described here. The soil textures are usually variants of those described for the site in the 1912 Survey^{2/} (for which no map was included.)

I. Cherrybark oak--overcup oak--baldecypress-sweetgum

The cherrybark oak (Quercus falcata var. pagodaefolia^{3/}), overcup oak (Quercus lyrata), southern baldecypress (Taxodium distichum), sweetgum (Liquidambar styraciflua) forest cover type extends over about 50 acres in the flat

^{1/}a category of forest defined by its vegetative composition.

^{2/}Van Duyne and Byers, op. cit.

^{3/}Q. falcata var. leucophylla occurs on the same sites and is difficult to distinguish from the pagodaefolia variety. For both, Caddo Lake is the western edge of the range.

stream bottom of the area studied. Cherrybark oak (a variety of southern red oak) has "more massive, better formed trees than the southern red oak, and often reach heights of 100 to 130 feet and diameters of 3 to 5 feet, which classes them among the largest of the southern oaks."^{1/} Because of the high quality of the wood, these trees are among the most valuable of the region.

The soil of the type-site has a clay loam surface which overlies a clay zone, beginning at a depth of 6 inches. At 18 inches, the soil is tight, almost impenetrable with a spade. Mottling, indicative of poorly drained sites, extends from a depth of 12 inches downward. These lands are moist, even after extensive drought, as in the current year.

Quality of the site is indicated by the Site Index^{2/}: about 100 for sweetgum and cherrybark oak. (Site-species productivity relationships for bald-cypress and overcup oak for this area are non-existent or not reliable.) This is about the equivalent of loblolly pine (Pinus taeda) for the same situation.

Growth of sweetgum is typically about 26 rings^{3/} per inch, regularly, for a radius of 9 inches (the length of the increment borer^{4/} used). Thus a 20-inch dbh tree would be more than 250 years of age. Hence, even with high-quality sites -- in terms of height growth, diameter growth is slow in contrast to that in second-growth managed bottomland hardwood stands. This may be due to the effect of close spacing in these natural stands.

Stems of the species named are from 0 to 40 inches dbh, the average being about 16 inches. Heights of 95 feet are common, such trees having 2-1/2

^{1/} Harlow, W. M., and E. S. Harrar. 1941. Textbook of Dendrology. McGraw-Hill.

^{2/} average total height of the dominant and codominant trees at age 50.

^{3/} layers of wood produced during one growing period (usually a year), observed in cross-section.

^{4/} auger-like instrument to extract radial cylinders of wood for examination.

merchantable^{1/} 16-foot logs. Basal area^{2/} is 110 square feet per acre, and volumes (gross) are 4.5 MBM, and net 3.5 MBM. Thus, there is much dote, or rot, in these old stems.

Some may not consider baldcypress as typically an integral component of this forest cover type. It may occur in the type as isolated trees or small groups when the microsite conditions permit seed germination and stem development. Here the species is limited to the stream channels and sloughs; it is not found throughout the stand.

Other species common to the type are osage-orange (Maclura pomifera) and deciduous holly (Ilex decidua).

II. Pine-Hardwood

The principal components of the pine-hardwood type on the upper slopes and bluffs above, and adjacent to, the Harrison Bayou bottom are loblolly pine (Pinus taeda) and sweetgum, oaks (Quercus spp.) and hickories (Carya spp.) The Indian artifact area, (not now a mound and perhaps never having been one), referred to earlier, is located in an area characterized by this type.

Here the surface soil texture is sandy loam, grading to a loam subsoil. A faint plow sole occurs, due--at least in part--to the frequent cultivation of the flat, rock-free, moist but well-drained site. Mottling, indicative of this soil-water relationship, begins at a depth of 20 inches.

The plateau is as little as a chain from the Bayou in some areas; elsewhere it is more than 300 feet. Its elevation averages about 30 feet above the alluvial plain through which the Bayou cuts.

Site index for the pines is about 90, growth rates range from 2 rings per inch to as low as 5 rings per inch, and volume per acre of

^{1/} including use for cross-ties, a common product of the area sawn from these species.

^{2/} total area, in square feet, of the cross-sections of the trees, at dbh,

all species of merchantable size is about 4 MBM. Stems in such stands have dbh of up to 15 inches, heights of 80 feet, and ages of 33 years.

A plantation on this soil had a basal area of 140 square feet per acre. Now 18-years-old, it contained about 30 cords per acre of merchantable wood for pulp production.

III. Open flats

The open flats, of which there are some three in the Harrison Bayou natural area, have a mysterious genesis. Perhaps they were where Indians scraped the surface soil horizon for its high-quality clay to be used in pottery; perhaps they relate to past fires (but not likely, for they may be slightly [6 inches] lower in elevation than surrounding alluvial wet lands).

In one of these, a dense stand of green ash (Fraxinus pennsylvanica var. lanceolata), now 5 to 7 years old and up to 30 feet tall, has as many as 10,000 stems per acre. Where some light penetrates the canopy, grass occurs, as it does on the edges of the opening in a 50-foot periphery between the ash stand and ^{trees of the} cherry bark oak--overcup oak--baldcypress--sweetgum type.

The soil, if chemically analyzed, may reveal the reason for the openings. Loblolly pine at the edge lacks the vigor of stems found within the principal bottomland type. The pH is 6.5. Often, during droughts, an alkaline-appearing crust forms on the surface. The survey made in 1912 described these "salt licks," fringed by salt-loving grass, as not uncommon in the County.

The soil has a crumb structure throughout the clay surface soil to a tight claypan at 12 inches. It is also mottled to this depth. At the periphery, there is some sand in the surface soil to a depth of 2 inches and mottling takes place to a depth of at least 15 inches.

In contrast, within the hardwood stand, just a few feet from the peripheral area soil pit, mottling does not occur until the 4-inch depth is reached. There it is 10 inches to a hardpan. The surface is sandy clay loam with a rich admixture of organic matter. Loblolly pines here have twice the growth as those few found in the peripheral zone. So favorable is this site that the pines are enduring well under the shade of a canopy in their second year. Here, a 28-inch dbh tree is less than 50 years old.

IV. Overcup oak

A moist flat astride Harrison Bayou is principally characterized by overcup oak. Blue beech (Ostrya virginiana) and Shumard oak (Q. shumardii) are important components. Baldcypress trees occur in abundance at the Bayou edge, with many knees protruding from the water. They do not occur away from the stream.

Site index for Shumard oak is probably^a more than 80, although reliable tabular data are lacking.

Current growth rate is slow and steady; 20 rings to an inch of radius. Dbh measurements extend to 30 inches. The ages of some trees are thus calculated as exceeding 400 years. Heights of 100 feet are not uncommon. Basal area per acre is about 60, the stands being without much understory so that one may see five chains or more through the forest. Gross volumes are up to 4 MBM per acre.

The soil surface in this type is presently (during a drought season) 4 feet above the water in the Bayou, the bank of the stream being 5 to 6 feet high. Usually, one might suggest, the water level of the Bayou is within two feet of the land surface.

Soil characteristics are directly related to the water that overflows the land. The surface layer is clay loam to clay at a depth of 15 inches. A hard pan occurs at 18 inches. Crumb to clod structure is found to that depth. No mottling is found in the top 8 inches. Organic matter content is high in the top 2 inches, forming an A₁ horizon. The A₂ extends to 6 inches with a very slight change in texture to the B horizon.

V. Cherrybark oak--Sweetgum

The flats of cherrybark oak and sweetgum grade into Type I (described in this report) as the amount of overcup oak increases. Generally, however, baldcypress is absent in this site, probably because flooding is only for brief periods, a day or less, in these flat lands. Here the baldcypress is not even found alive along stream channels. Dead standing stems, called snags, however, indicate its earlier presence. Perhaps the water table has fallen significantly in the past few decades.

Quality of these species and the form in which they are found here makes them among the choicest hardwoods for furniture and other specialty uses. Growth is moderate, about 11 rings per inch in radius for cherrybark oak, so that 18-inch stems are centurians. Basal area per acre approximates 120 square feet. With no allowance for rot or defective trees, volumes are up to 10 MBM per acre; with sound timber, probable scale is 4 to 5 MBM.

One overcup oak measured 54-1/2 inches dbh and 120 feet tall. This is the third largest known tree of this species in Texas.

The soil underlying this stand has a good mixture of organic matter in the thin A₁ horizon. Below this, it is almost pure clay to a depth of 2 inches, under which it is sandy clay to 10 inches and clay to 24 inches. Mottling occurs throughout the profile to at least a depth of 24 inches; more gray color, indicating greater reduction of iron oxides coating the soil particles, occurs from 10 inches down.

VI. Water elm--swamp privet--overcup oak--baldecypress

Water elm (Planera aquatica) and swamp privet (Forestiera acuminata), along with water locust (Gleditsia aquatica), are important components in this stand. As the Lake shore is neared, the amount of swamp privet increases. In this stand is one of the largest water locusts in the country, measuring 45 inches circumference, about 65 to 70 feet in height, and with a crown diameter of 37 feet.

The soil has a rich organic layer in the 2-inch A_1 horizon, though the litter layer is, by early August, almost entirely gone due to the rapid oxidation caused by the hot, moist environment. There is 4 inches of reddish-blue mottling. From 6 to 10 inches, the clay is a bright yellow (suggesting hydration of the iron coatings on the silt and clay particles), permeated with various shades of red, and some blue. At 18 inches, the soil is almost solid blue-gray, without mottling, indicating the iron reduction that is associated with waterlogging.

This soil is the most "gumbo-like" of the locale. [You stick with it and it will stick with you!] Drainage is poor. The many baldecypress trees are directly related to the water that often, and for long periods, stands on the land.

Dbh of the baldecypress trees is up to 15 inches above the butt swell. For hardwoods, it is up to 22 inches. Basal area is about 150 square feet per acre, most of which is contributed by baldecypress.

The baldecypress show 15 to 20 rings per inch in trees of 14-inch diameter. Thus, allowing for false rings, they are more than a hundred years old. Heights are about 75 feet. Hardwoods are faster-growing (8 rings per inch) suggesting the typical tree of 13-inch dbh to be between 50 and 60 years old. For the

broadleaf stems, heights are typically about 70 feet.

These poorly formed, fairly dense stands of baldcypress are often called pond cypress, a colloquialism; they are not the variety ascendens, found elsewhere in cutover southern swamps and bottomlands.

HISTORY OF HARRISON COUNTY^{1/}

Harrison County, formed in 1842, covers about 872 square miles or about 558 M acres. It is drained by the Sabine and Red river tributaries, among which the Big and Little Cypress rivers, ^{that} spread to form Caddo Lake, averaging 10 feet deep, are most important. Significance of the Lake was early recognized as a transportation route especially for cotton.

To that end, in 1872, the Government cleared the log debris of the lower "raft" that dammed the river in order to make a waterway to Jefferson. So alarmed were people around the lake by the sudden lowering of the water level by as much as 15 feet^{2/} that the Government shortly thereafter built a 1/4-mile dam to maintain a stable pool.

The raft on the Red River was a natural obstruction, timbers falling into the river, as a result of the caving in of forested banks, lodging with one another. Eventually the raft so grew, backing up water for 160 miles, that an additional 5 miles of lake in one year was added on the river and its tributaries. So sturdy was the raft that horses were ridden safely across it.

^{1/} See Bailey, O. D. Caddo Lake Region, unpub. undated ms. Stephen F. Austin State University Library, and

McClung, M. M. 1974. Caddo Lake--Mysterious Swampland. Southwest Printers and Publishers. Texarkana.

^{2/} This is difficult to comprehend, for timber over 200 years old would have had to have been generated in deep water--an unlikely happening--and the species under that circumstance would have been different.

While the natural dam of organic debris is usually given as the origin of the South's largest natural lake, Indian legend and others think it was caused by an earthquake, notably the tremor of 1811. This late an occurrence as the cause of the damming of Caddo is unlikely, for the bottomland, hydric vegetation in the region predates that event.

Tales have it that Captain Shreve later blew up, in 1873, the remnant raft and Government dam to assure his port would be the terminus on the Red River for inland shipping. No longer would steamers and sternwheelers, fueled by wood and illuminated by pine knots, ply to Jefferson through the cypress trails, like Government Ditch, of Caddo Lake. Until that time, black oarsmen pulled, in one noted case like ancient galley slaves, an imitation of a Roman barge while its owner rode majestically at the prow.

Star Ditch, still there to be navigated, was the man-cut route through one part of the Lake. On beyond, the illiterate blacks, who knew well their playing cards, would unload supplies at docks along the way according to symbols. Marshall, for instance, was the King of Diamonds. Horses and housewares all the way from New Orleans, via the Red River, would be oft-loaded by code cards attached to the animals or goods.

But even before Captain Shreve and the Government engineers, Caddo Lake was important politically and militarily. It was the most western part of the Confederacy, the Lake itself called the "lifeline." Supplies and people moved cautiously through it.

By 1912, 30 to 35 percent of the County had been cleared of timber, lumber output was decreasing, and the mill(s) (?) was now supplied with stumpage from Panola County to the south. Basket manufacturing was singled out, indicating perhaps its primary importance as a use of wood. An account

of that year^{1/} said that "very few merchantable trees (are found) in uplands but some of the bottomlands have a valuable growth of hardwoods. Native grasses are abundant where the forests are not too dense." Farmland prices then ranged from \$5 to \$25 an acre, prices attained because of the mild growing season of 8 months and well-distributed precipitation, averaging 47 inches per year. Even then, however, the boll weevil was forcing farmers to diversify.

At first the Caddo country was navigated by pirogues, solid wooden canoes whittled and burned from baldcypress logs by able artisans. These vessels, skimming the surface of the water, could carry heavy loads through the shallows, where hidden brush and snags would otherwise impede movement.

The Lake appears peaceful in its baldcypress and water lilly serenity; but its people have not always been so. The Caddos were kindly. These civilized Indians of small stature, resisting encroachment by less-tolerant white and black men, were paid \$80,000 by the U.S. Government to move out of U.S. Territory. They wandered to Kansas and Colorado until 1902, when federal allotments were made for each tribal member to enable settling in Oklahoma.

Less submissive were many Indians who followed into the "heart of the Texas Badlands," a locale of dispute and a hide-out for the Regulators and Moderators. Both Louisiana and Texas had reasonable right to claim the land; both obliged the other and, hence, Neutral Ground was charted on the pioneers' maps. And those other rascals of 1840-1844 intrusion and control were finally disbanded in this and surrounding counties by Sam Houston, himself, in

Van Duyne and Byers, op. cit.

the course of delivering a tearful speech with an emotional appeal for peace and sense. Near the north shore of the Lake, too, Robert Potter, a Texas independence and statehood politician, was murdered. It was "near the shore," for the pursued warrior was slain while running through the water to escape his assassins. Squatters, law-breakers in hiding, and moonshiners, too, have contributed their share to the mysteries of Caddo Lake.

Oil-well drilling began early, in 1911, on the Lake; hundreds of claims have been worked since then. Lead, it is written, was once mined hereabouts, and used in the manufacture of bullets. Pearls were hunted in the mudbanks. Today's economic enterprises continue to include oil, iron, tourism, fish, and hunting for game in this "sportsmen's paradise."

PHOTOS IN BLACK-AND-WHITE
OF LONGHORN AAP SPECIAL MANAGEMENT AREA

1. A stand of overcup and shumard oaks, with some stems 30 inches dbh, typify virgin timber of the area. Note the absence of lower-story vegetation.
2. Windthrown trees are not uncommon among the blackgum and other stands of the bottoms, perhaps 300 to 400 years old.
3. This complex virgin forest grades abruptly from baldcypress to a mixture of oaks and sweetgum with even slight changes in moisture.
4. The duck pond near the north end of the special management area serves as a resting place for migratory fowl.
5. A typical view of Harrison Bayou in summer leaf and low water. The bottom often overflows in winter.
6. Harrison Bayou runs through a dark wood on its way to Caddo Lake. Here baldcypress are in the water and a number of species line the shore.
7. Unusually large Hercules club (Zanthoxylum clava-herculis) or toothache tree, used by Indians as a pain reliever, in Harrison Bayou.
8. Largest tree on the property, a baldcypress measuring 139 feet in height and ____ inches in diameter, has been struck by lightning but yet lives.

PHOTOS IN COLOR
OF LONGHORN AAP SPECIAL MANAGEMENT AREA

1. Cones of the baldcypress often appear as Christmas ornaments when the deciduous conifer is in summer leaf.
2. Oak-hickory climax forest cover type occurs on the higher, dryer periphery of the Harrison Bayou Special Management Area.
3. A multi-stemmed baldcypress adjacent to Harrison Bayou in a "wetter-than-average" site. Senator Donald Kennard serves as the scale.
4. At the northwestern extremity of the Longhorn Army Ammunition Plant, where Harrison Bayou empties into Caddo Lake, are scenes of water lilies and cypress.
5. Water lilies in the duck pond of the Special Management Area in the Harrison Bayou virgin bottomlands.

6. Giant-size water locust (Gleditsia aquatica) known for its dagger-like spines.
7. Harrison Bayou flows through the forest of baldcypress on its way to Caddo Lake.
8. Expanses of water lilies and water hyacinths cover Caddo Lake not far from the mouth of Harrison Bayou.
9. An especially large southern baldcypress stem near the Special Management Area of the Longhorn Army Ammunition Plant. This, the largest tree on the property, has been struck by lightning, yet lives.
10. A relatively pure stand of overcup oak (Quercus lyrata). Note the absence of understory vegetation.
11. A shallow inlet of Caddo Lake, north of Harrison Bayou Bay, where a boat trail weaves its way.



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2. Windthrown trees are not uncommon among the blackgum and other stands of the bottoms, perhaps 500 to 400 years old.



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4. The duck pond near the north end of the special management area serves as a resting place for migratory fowl.



5. A typical view of Harrison Bayou in summer leaf and low water. The bottom often overflows in winter.



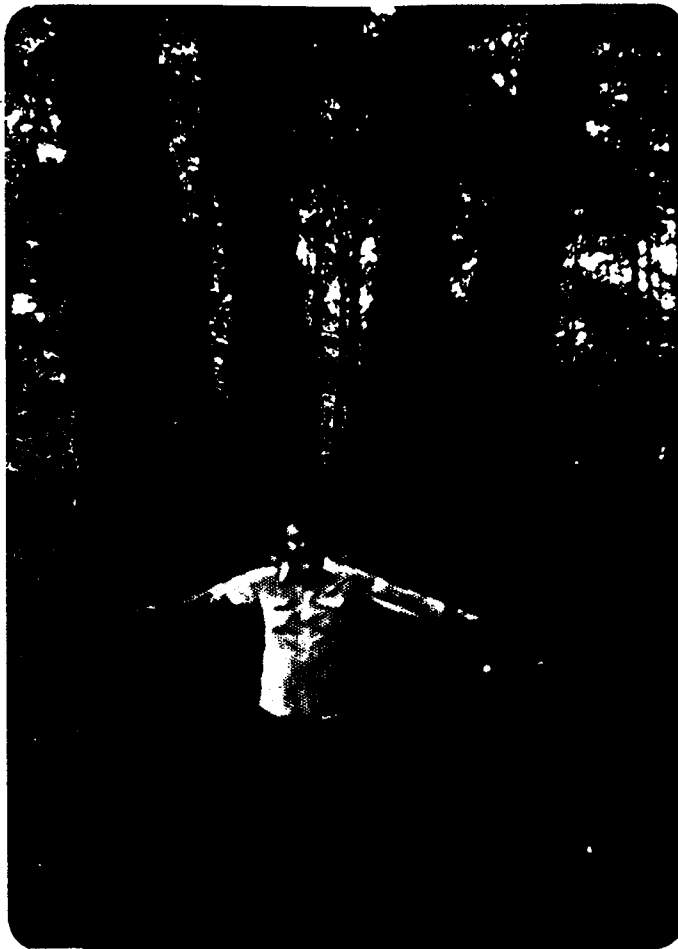
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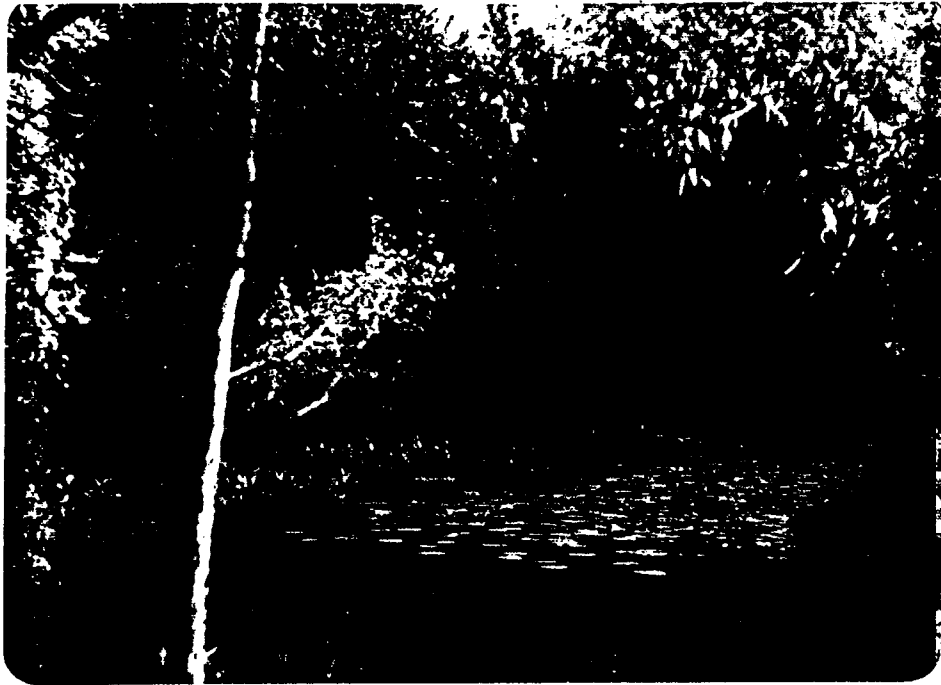
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11. A shallow inlet of Caddo Lake, north of Harrison Bayou Bay, where a boat trail weaves its way.

Vegetative Survey

by

Elray S. Nixon

and

Ray R. Hicks, Jr.

The forest of the Harrison Bayou tract can be generally classified as southern bottomland hardwoods. Within this tract are several communities which are designated by certain overstory species. Based on the dominant overstory, fourteen communities are delineated (^{Map}Figure 3). Changes in species from community to community are mostly due to the depth of the water table since water is the most prominent environmental factor of the site. Moisture conditions, in turn, are primarily affected by slight changes in elevation. The physiographic subunits such as sloughs, bottoms, and natural levees all resulted from natural developments of Harrison Bayou and/or Caddo Lake and represent different moisture conditions, thus different species aggregations.

Certain species are more sensitive to changes in soil drainage than others and are therefore better "indicator plants". Among the woody species, an abundance of baldcypress (Taxodium distichum), waterlocust (Gleditsia aquatica), planertree (Planera aquatica), swamp privet (Forestiera acuminata), and common buttonbush (Cephalanthus occidentalis) generally indicates a wet site condition. On the other hand, species such as loblolly pine (Pinus taeda) and post oak (Quercus stellata) indicate fair to good soil drainage. Correspondingly, herbaceous species such as burhead (Echinodorus cordifolius), duckweed (Lemna spp.), and marsh seedbox (Ludwigia palustris) indicate wet

sites while Bermuda grass (Cynodon dactylon), common selfheal (Prunella vulgaris), and Atlantic pigeon wings (Clitoria mariana) indicate better drainage. The species lists (Tables 1 and 2) can be used in conjunction with the designated dominant species from ^{Map} Figure 3 to determine where the wetter and drier areas are located.

The most generally abundant arborescent woody plants over the entire tract are oaks, particularly overcup oak (Quercus lyrata) and willow oak (Q. phellos). Other common species are red maple (Acer rubrum), common persimmon (Diospyros virginiana), and winged elm (Ulmus alata). Herbaceous plants which are generally most abundant during the summer include various grass species (Graminae), several composites (Compositae), and a few sedges (Carex spp.).

No woody plants were found which are considered rare or endangered. Two rare herbaceous species were tentatively identified. Carex typhina is listed by Correll and Johnston (1970) as being exclusive to Harrison and Shelby counties, Texas. A sample which best suited the description of the rare species Panicum tenerum was found in area M. Another species, Carex hyalinolepis was tentatively identified which supposedly is only found on blackland soils. This species was also found in one of the openings, designated on the map as area M.

These unique, somewhat open areas are perhaps the most interesting sites on the entire tract. Here soil factors other than drainage seemed to cause the curious exclusion of large woody plants. Growth of pines on the borders of the areas was obviously retarded. Presence of a very tight clay soil was typical. The occurrence of Carex typhina may be a clue that the heavy clay is indeed one of the unique soil modifiers creating the unusual vegetative communities in the openings. Blackland soils are noted for having

a large proportion of high shrink-swell clays. Chemical analyses of the soils in the openings may reveal other unique features.

The following checklists (Tables 1 and 2) include plants identified and collected during our visit to the tract. Areas within which the various species were found are also listed. Vines (1960) was used as a source for common and scientific names of woody plants while Correll and Johnston (1970) was used for the herbaceous plants.

Literature Cited

- Correll, D. S., and M. C. Johnston. 1970. Manual of Vascular Plants of Texas. Texas Research Found., Renner, TX.
- Vines, R. H. 1960. Trees, Shrubs and Woody Vines of the Southwest. Univ. of Texas Press. Austin, TX.

Table 1. Woody plants observed on the Harrison Bayou at Caddo Lake tract.

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>	<u>Area</u> ^{d/}
ACERACEAE	<u>Acer rubrum</u>	red maple	B,C,E,G,H,I,J,K,L,N
ANACARDIACEAE	<u>Toxicodendron radicans</u>	poison-ivy	B,C,E,G,H,I,J,K,L,N
ANNONACEAE	<u>Asimina triloba</u>	paw-paw	K
APOCYNACEAE	<u>Trachelospermum difforme</u>	climbing star-jassimine	K
AQUIFOLIACEAE	<u>Ilex decidua</u> <u>I. vomitoria</u>	deciduous holly yaupon	B,C,G,H,I,J,K,M,N E,L
BETULACEAE	<u>Carpinus caroliniana</u>	American hornbeam	K
BIGNONIACEAE	<u>Bignonia capreolata</u> <u>B. radicans</u>	crossvine trumpet-creeper	B,C,E,G,H,I,J,K,L,N B,C,E,G,J,L,N
CAPRIFOLIACEAE	<u>Lonicera japonica</u> <u>Sambucus canadensis</u> <u>Viburnum rufidulum</u>	Japanese honeysuckle American elder rusty blackhaw	B,C,G,J,N E,H,I,L B,C,G,J,N
COMPOSITAE	<u>Baccharis halimifolia</u>	sea myrtle	B,C,G,J,H,I,M,N
CORNACEAE	<u>Cornus florida</u>	flowering dogwood	E,L
EBENACEAE	<u>Diospyros virginiana</u>	common persimmon	A,B,C,E,G,H,I,J,K,L,N
ERICACEAE	<u>Vaccinium arboreum</u>	tree sparkleberry	E,L
FAGACEAE	<u>Quercus alba</u> <u>Q. falcata</u> <u>Q. falcata</u> var. <u>pagodaefolia</u> <u>Q. lyrata</u> <u>Q. michauxii</u> <u>Q. nigra</u> <u>Q. phellos</u> <u>Q. shumardii</u> <u>Q. stellata</u>	white oak southern red oak cherrybark oak overcup oak swamp chestnut oak water oak willow oak Shumard oak post oak	E,K,L E,H,I,K,L E,H,I,L,M A,B,C,E,G,H,I,J,K,L,M K B,C,E,G,J,K,L,N A,B,C,E,G,H,I,J,K,L,M E,K,L E,L
HAMAMELIDACEAE	<u>Liquidambar styraciflua</u>	sweetgum	B,C,E,G,H,I,J,K,L,N
HIPPOCASTANACEAE	<u>Aesculus pavia</u>	red buckeye	E,L
HYPERICACEAE	<u>Ascyrum hypericoides</u>	St. Andrew's cross	B,C,E,G,H,I,J,K,L,N

Reference Map Figure 3

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>	<u>Area</u>
JUGLANDACEAE	<u>Carya aquatica</u>	water hickory	A,B,C,G,J,K,H,I
	<u>C. cordiformis</u>	bitternut hickory	K
	<u>C. leiodermis</u>	swamp hickory	K
	<u>C. tomentosa</u>	mockernut hickory	K
LEGUMINOSAE	<u>Cercis canadensis</u>	eastern redbud	E,K,L
	<u>Gleditsia aquatica</u>	waterlocust	A,B,C,G,J,K,N
	<u>G. triacanthos</u>	honeylocust	H,I
	<u>Wysteria macrostachya</u>	Kentucky wysteria	B,C,G,J,N
MENISPERMACEAE	<u>Cocculus carolinus</u>	Carolina moonseed	A,H,I,K
MORACEAE	<u>Maclura pomifera</u>	Osage orange	M
	<u>Morus rubra</u>	red mulberry	B,C,E,G,H,I,J,K,L,N
MYRICACEAE	<u>Myrica cerifera</u>	southern wax-myrtle	H,I
NYSSACEAE	<u>Nyssa sylvatica</u>	blackgum	B,C,G,H,I,J,K,N
OLEACEAE	<u>Forestiera acuminata</u>	swamp privet	A,H,I,K
	<u>Fraxinus americana</u>	white ash	B,C,E,G,J,L,M,N
	<u>F. pennsylvanica</u>	green ash	A,B,C,G,H,I,J,K,N
PALMAE	<u>Sabal minor</u>	bush palmetto	K
PINACEAE	<u>Juniperus virginiana</u>	eastern redcedar	E,L
	<u>Pinus taeda</u>	loblolly pine	B,C,E,G,J,L,M,N
POLYGONACEAE	<u>Brunnichia cirrhosa</u>	ear-drop vine	A,B,C,G,H,I,J,K,N
RHAMNACEAE	<u>Berchemia scandens</u>	Alabama supple-jack	B,C,E,G,H,I,J,K,L,N
ROSACEAE	<u>Crataegus marshallii</u>	parsley hawthorn	E,K,L
	<u>C. opaca</u>	May hawthorn	A,H,I
	<u>C. spathulata</u>	pasture haw	E,K,L
	<u>C. spp.</u>	hawthorn	B,C,E,G,J,L,N
	<u>Prunus serotina</u>	black cherry	E,L
	<u>P. mexicana</u>	Mexican plum	B,C,E,G,J,K,L,N
RUBIACEAE	<u>Cephalanthus occidentalis</u>	common buttonbush	A,B,C,G,J,K,N
SALICACEAE	<u>Salix nigra</u>	black willow	A
SAPOTACEAE	<u>Bumelia lanuginosa</u>	gum bumelia	B,C,E,G,J,K,L,N
SAXIFRAGACEAE	<u>Itea virginica</u>	sweetspire	B,C,G,J,K,N

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>	<u>Area</u>
SMILACACEAE	<u>Smilax bona-nox</u>	cat briar	B,C,E,G,H,I,J,K,L,N
	<u>S. laurifolia</u>	laural greenbriar	E,L
	<u>S. rotundifolia</u>	common greenbriar	B,C,E,G,H,I,J,K,L,N
STYRACACEAE	<u>Styrax americanum</u>	American snowbell	H,I,K
TAXODIACEAE	<u>Taxodium distichum</u>	baldcypress	B,C,E,G,H,I,J,K,L,N
TILIACEAE	<u>Tilia caroliniana</u>	Carolina basswood	K
ULMACEAE	<u>Celtis laevigata</u>	sugarberry	B,C,E,G,H,I,J,K,L,N
	<u>Planera aquatica</u>	planertree	B,C,G,J,K,N
	<u>Ulmus alata</u>	winged elm	A,B,C,E,G,H,I,J,L,M,
	<u>U. americana</u>	American elm	B,C,G,H,I,J,K,N
	<u>U. crassifolia</u>	cedar elm	B,C,G,J,K,N
VERBENACEAE	<u>Callicarpa americana</u>	American beautyberry	E,L
VITACEAE	<u>Ampelopsis arborea</u>	pepper-vine	B,C,G,H,I,J,K,N
	<u>Parthenocissus</u>		
	<u>quinquefolia</u>	Virginia creeper	B,C,E,G,H,I,J,K,L,N
	<u>Vitis cinerea</u>	sweet grape	A
	<u>V. palmata</u>	cat grape	E,L
	<u>V. rotundifolia</u>	muscadine	B,C,E,G,H,I,J,L,N
<u>V. spp.</u>	grape	E,L	

Table 2. Herbaceous plants observed on the Harrison Bayou at Caddo Lake tract.

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>	<u>Area</u> ^{//}
ACANTHACEAE	<u>Justicia lanceolata</u>	lance-leaved water willow	A,B,C,G,H,I,J,K,N
	<u>Ruellia</u> spp.	ruellia	B,C,E,G,J,L,N
ALISMACEAE	<u>Echinodorus cordifolius</u>	burhead	A
ARACEAE	<u>Arisaema</u> spp.	Jack-in-the-Pulpit	H,I,K
ARISTOLOCHIACEAE	<u>Aristolochia serpentaria</u>	Virginia dutchmanspipe	B,C,G,J,K,N
ASCLEPIADACEAE	<u>Asclepias perennis</u>	shore milkweed	A
BORAGINACEAE	<u>Heliotropium curassavicum</u>	salt heliotrope	M
	<u>Heliotropium indicum</u>	India heliotrope	A
COMMELINACEAE	<u>Commelina erecta</u>	erect dayflower	H,I,K
COMPOSITAE	<u>Aster</u> spp.	aster	B,C,G,H,I,J,K,N
	<u>Boltonia diffusa</u>	smallhead boltonia	M
	<u>Cirsium</u> spp.	thistle	B,C,G,H,I,J,M,N
	<u>Elephantopus carolinianus</u>	leafy elephant foot	B,C,E,G,H,I,J,K,L,N
	<u>Eupatorium coelestinum</u>	mistflower	B,C,G,H,I,J,N
	<u>Eupatorium serotinum</u>	late eupatorium	B,C,G,J,K,N
	<u>Mikania scandens</u>	climbing mikania	H,I,M
	<u>Pluchea purpurascens</u>	purple pluchea	M
	<u>Pyrrhopappus carolinianus</u>	Carolina false dandelion	M
	CYPERACEAE	<u>Carex crus-corvi</u>	crowfoot sedge
<u>Carex frankii</u>		Franks sedge	H,I,M
<u>Carex hyalinolepis</u>		thinscale sedge	M
<u>Carex intumescens</u>		bladder sedge	B,C,G,J,K,N
<u>Carex typhina</u>		sedge	B,C,G,H,I,J,K,N
<u>Cyperus strigosus</u>		false nutgrass	M
DIOSCOREACEAE		<u>Dioscorea villosa</u>	Atlantic yam
GRAMINEAE	<u>Arundinaria gigantea</u>	giant cane	K
	<u>Chasmanthium latifolium</u>	broadleaf uniola	B,C,E,G,H,I,J,K,L,N
	<u>Chasmanthium laxum</u>	spike uniola	B,C,E,G,H,I,J,K,L,N
	<u>Chasmanthium sessiliflorum</u>	longleaf uniola	E,L
	<u>Cynodon dactylon</u>	Bermuda grass	M
	<u>Elymus virginicus</u>	Virginia wildrye	B,C,G,H,I,J,K,M,N
	<u>Leersia lenticularis</u>	catchfly grass	B,C,G,H,I,J,K,N
	<u>Leersia virginica</u>	whitegrass	H,I,K
	<u>Panicum anceps</u>	beaked panicum	B,C,G,J,M,N
	<u>Panicum</u> spp.	panic grass	B,C,E,G,H,I,J,K,L,N
	<u>Panicum tenerum</u>	panic grass	M
	<u>Paspalum floridanum</u>	Florida paspalum	M

GRAMINEAE (Cont.)	<u>Paspalum laeve</u>	field paspalum	M
	<u>Setaria geniculata</u>	knotroot bristle grass	M
HYPERICACEAE	<u>Hypericum drummondii</u>	Drummond St. Johnswort	M
	<u>Hypericum tubulosum</u>	turf St. Johnswort	H,I
JUNCACEAE	<u>Juncus coriaceus</u>	leathery rush	B,C,G,H,I,J,K,N
	<u>Juncus validus</u>	rush	M
LABIATHAE	<u>Prunella vulgaris</u>	common selfheal	M
	<u>Stachys tenuifolia</u>	slenderleaf betony	H,I
LEGUMINOSAE	<u>Clitoria mariana</u>	Atlantic pigeon wings	E,L
	<u>Desmodium sessilifolium</u>	sessile leaf tick clover	H,I,M
	<u>Lespedeza repens</u>	creeping lespedeza	B,C,G,J,N
	<u>Mimosa strigillosa</u>	herbaceous mimosa	M
LEMNACEAE	<u>Lemna</u> spp.	duckweed	A
MALVACEAE	<u>Hibiscus lasiocarpus</u>	wolly rosemallow	A,M
ONAGRACEAE	<u>Ludwigia palustris</u>	marsh seedbox	H,I
OPHIOGLOSSACEAE	<u>Botrychium dissectum</u>	cutleaved grapefern	B,C,G,H,I,J,N
PASSIFLORACEAE	<u>Passiflora lutea</u>	yellow passionflower	E,H,I,L
PHYTOLACCACEAE	<u>Phytolacca americana</u>	common pokeberry	A,H,I
POLYGONACEAE	<u>Persicaria hydropiperoides</u>	swamp smartweed	H,I,K,M
	<u>Persicaria punctata</u>	dotted smartweed	H,I
	<u>Persicaria</u> spp.	smartweed	K
	<u>Polygonum</u> spp.	knotweed	M
POLYPODIACEAE	<u>Asplenium platyneuron</u>	ebony spleenwort	H,I
	<u>Onoclea sensibilis</u>	sensitive fern	H,I
	<u>Polypodium polypodioides</u>	resurrection fern	B,C,G,J,N
ROSACEAE	<u>Rubus</u> spp.	blackberry	B,C,G,H,I,J,K,N
	<u>Rubus trivialis</u>	southern dewberry	B,C,G,H,I,J,K,N
RUBIACEAE	<u>Diodia virginiana</u>	Virginia buttonweed	M
	<u>Mitchella repens</u>	partridge berry	K
	<u>Spermacoce glabra</u>	smooth buttonplant	A
SAURURACEAE	<u>Saururus cernuus</u>	common lizards tail	A,B,C,G,H,I,J,K,N
UMBELLIFERAE	<u>Eryngium prostratum</u>	creeping eryngo	A
	<u>Hydrocotyle verticillata</u>	whorled pennywort	A
	<u>Sanicula canadensis</u>	Canada sanicle	B,C,E,G,H,I,J,L,N
URTICACEAE	<u>Boehmeria cylindrica</u>	smallspike falsenettle	A,B,C,G,H,I,J,K,N

VERBENACEAE	<u>Phyla lanceolata</u>	wedgeleaf frogfruit	M
VIOLACEAE	<u>Viola</u> spp.	violet	B,C,G,J,N
VITACEAE	<u>Vitis cinerea</u>	sweet grape	A
Miscellaneous		sphagnum	M

GEOLOGIC ENVIRONMENT OF THE HARRISON

BAYOU AREA AT CADDO LAKE

HERSHEL L. JONES

The geological investigation was conducted as part of the interdisciplinary study of the Harrison Bayou Natural Area at Caddo Lake. The area of investigation is situated south of Caddo Lake, approximately 15 miles northeast of Marshall, Harrison County, Texas.

Geologic units of the Wilcox Group (Paleocene-lower Eocene) constitute the major rocks present, but Quaternary alluvial flood-plain deposits of Recent age are incised into these deposits along Harrison Bayou, which flows northeastward across the property.

GEOLOGIC SETTING

The study area lies within the Coastal Plain physiographic province, a gently undulating plain bordering the Gulf of Mexico which is normally characterized by beds dipping slightly Gulfward. Beds of the Wilcox Group, covered locally by flat-lying Recent alluvial flood-plain deposits, dip gently to the north-northwest, however. This is because they constitute a part of the northwest flank of the structurally high Sabine Platform. The uplift is a domal structure situated in Northwest Louisiana and adjacent parts of East Texas. West-southwest of the area, the dip of the Wilcox beds flattens out as the axis of the East Texas Embayment is approached. Its axis strikes generally in a north-south direction, the deepest part occurring southwest of the survey area near Tyler.

No major surface displacements of the sedimentary strata took place in the area of study.

GEOLOGY OF THE SURVEY AREA

Geomorphology

The Natural Area is the site of the Longhorn Ordnance Works, immediately south of Caddo Lake. Local surface elevations are less than 300 feet above sea level and the relief is approximately 50 feet or less. The property is drained by Harrison Bayou which flows northeastward across the central portion of the project area.

Stratigraphy

The site of ^{the} investigation is in the outcrop area of the Wilcox Group (Paleocene-lower Eocene). Local erosion by Harrison Bayou, which flows northeastward across the area, has scoured the Wilcox; and subsequent deposition by the bayou has partially filled this erosional valley with Quaternary alluvial flood-plain deposits of Recent age. A condensed petrographic description of the formations is given in Table 1. The formations are listed according to the order of their increasing age.

Table 1: Petrography of Geological Formations in the Survey Area.

<u>Name</u>	<u>Petrography</u>
Quaternary Alluvium	Flood plain deposits of clay, silt and sand.
Tertiary Wilcox Group	Clay, also lignite, silt, quartz sand: gray, weathers gray, reddish brown, buff. Laminated to massive, locally cross-bedded concretions. Silty, sandy, glauconitic, carbonaceous, ferruginous calcareous.

Sedimentary units of the outcropping Wilcox Group consist predominately of interbedded sand, silt, and clay with local concentrations of organic material. These deposits are predominately deltaic and fluvial in nature. The units dip northwestward because they constitute a part of the western flank of the structurally high Sabine Platform.

The Quaternary alluvial floodplain deposits consist mostly of flat-lying sands, silts, and clays laid down by flood waters of Harrison Bayou.

Commercial Deposits of Oil and Gas, Rocks and Minerals

Longwood Gas and Oil Field is situated approximately 2 miles southeast and Caddo Oil Field some 3 miles east-northeast of the area of investigation; but no wells have been drilled in the Natural Area.

The survey area contains no known economically important deposits of rocks and minerals.

Ground Water

The Wilcox Group is the most important ground-water-bearing unit in the Harrison Bayou area. It outcrops at the surface and characteristically consists of interlayered sand, silt, and clay. It has very variable coefficients of transmissibility, resulting from the variable composition of the strata. However, due to its considerable thickness, a coefficient of transmissibility of 20,000

gallons per day per foot can be assumed as an average figure; the coefficient of permeability^{is} slightly less than 350 gallons per day per square foot (Peckham et al.: 1963). The coefficients indicate that groundwater can move freely through the strata.

The alluvium in the bayou floodplain is a potential source of groundwater. It is not a major water-bearing unit, however, due to its very variable permeability resulting from the discontinuous extent of the lithological units; e.g., sands, silts, and clays. Groundwater currently moves toward Caddo Lake to the north.

1 VERTEBRATE SURVEY OF HARRISON BAYOU
2 JAMES C. KROLL, Ph.D.
3 INTRODUCTION

4 During August 1977, I conducted a vertebrate survey and habitat
5 analysis of the proposed Harrison Bayou Natural Area.

6 The Harrison Bayou Area represents perhaps the best example of
7 bottomland hardwood habitat in Texas. Ecological and educational value
8 of the area is such that it should be given high priority for preserva-
9 tion and management. Since fourteen cover types (cf. L.C. Walker) exist
10 within the confines of the Longhorn Ordnance Works, there is
11 habitat and species diversity; concomitant vertebrate diversity is impres-
12 sive.

13 METHODS

14 Habitat components of Harrison Bayou were analyzed using the point-
15 quarter system of Cottam and Curtis (1956)^{1/}. One hundred sample points
16 were randomly positioned within the cover types. At each sample point,
17 the following data were collected: basal areas ($m^2 ha^{-1}$)^{2/} of pine, hard-
18 wood, and pine-hardwood; plant species in each quadrant; distances from
19 point centers; plant height (m); diameter (cm) breast height (dbh); and
20 percent crown closure. In addition, twenty circular plots (10 m in
21 diameter) were placed in each type. Total number of den trees and po-
22 tential den trees were recorded. Analyses of habitat data were accom-
23 plished using a statistical program package (Kroll unpubl.) developed at
24 the Stephen F. Austin State University Computer Center.

25 Birds were censused by cruising the area at sunrise; identification
26 was by sight and call. Reptiles, amphibians, and mammals were censused
27 by observation and signs. A review of published records of
specimens for the area was also conducted. Further, I have collected

^{1/}This method involves the use of measurements (4) from an established point. Using the average distance by species, the researcher can calculate such parameters as importance values, frequencies, and dominance.

1 specimens and observed wildlife in the Caddo Lake region extensively
 2 during the last ten years. Personal records of species are included in
 3 this report.

4 QUALITY OF HABITAT

5 Although some of the area was cut-over, or selectively
 6 cut, much of the habitat remains intact and representative of the
 7 bottomland hardwood type. The most important tree species of the
 8 area is Overcup Oak (importance value=7.2629), followed by Hercules-
 9 Club(5.4472), Water Elm (4.5393), Parsley Hawthorn (4.5393), Black
 10 Hickory (4.5393) and Baldypress (4.5393). A list of
 11 woody plant species is presented in Table 1, along with density
 12 (stems ha⁻¹), dominance, frequency, and importance values. Woody-
 13 plant species diversity index was 3.32. Average basal area of pine
 14 was 0.67 m² ha⁻¹, while total hardwood basal area was 17.1 m² ha⁻¹.
 15 Overstory closure averaged 69.0%.

16 In order to determine the forage production of the area, small
 17 woody, grass, and forbaceous vegetation within 0.25 m-square sampling
 18 areas were recorded. Analyses of these data indicate that forage
 19 standing-crop (stems ha⁻¹) at the end of the growing season is
 20 14.2 X 10⁵ for woody, 11.3 X 10⁵ for grass, and 10.6 X 10⁴ for
 21 forbaceous vegetation. Ground litter cover averaged 86.4%.

22 Den and nest trees and potential den sites were censused
 23 in bottomland and upland hardwood areas. I observed more nest cavities
 24 per hectare than ⁱⁿ any area previously examined. Average density (ha⁻¹)
 25 of actual den/nest sites was 12.2 for bottomland areas and 1.9
 26 for upland hardwoods: potential den/nest trees were 60.0 and 11.3,
 27 respectively. Average height of den/nest trees was 13.3 m for all the

Table 1. Point-quarter analysis of habitat data from Harrison Bayou Area.

SPECIES	TOTAL		DENSITY	DOMINANCE	DOMINANCE FREQ.	Q.
	INP.	OCCUR.				
OVERCUP OAK	8	8				4.0593
CLUB	6	6				4.0593
THORN						4.0593
Y						4.0593
B D	4	4				4.0593
WETLAND						4.0593
OP						4.0593
LA						4.0593
SOUTHERN						4.0593

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	1.98	1.8157
	1.68	1.8157
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RATTAN	1.68	1.8157
T	1.68	1.8157
HOPHORN BEAM	1.68	1.8157
ST. ANDREW'S CROSS	1.68	1.8157
PERSIMMON	1.68	1.8157
GUM BUNELIA	1.68	1.8157
WALSLEY	1.58	1.8157
	1.68	1.8157
VILLA SP.	1.68	1.8157
	1.68	1.8157
S	1.68	1.8157
	1.68	1.8157
	1.68	1.8157
	1.68	1.8157
MUSCADINE	1.68	1.8157
SPARKLEBERRY	1.68	1.8157

1 study areas; average diameter was 26.2 cm. Using data available from
 2 the U.S. Forest Service (1971), expected hard-mast production for the
 3 area should be approximately 33 kg ha⁻¹. Such productivity plus
 4 availability of numerous nest/den sites is probably responsible
 5 for the high density of cavity-utilizing species discussed below.

6 FISH

7 There are two basic aquatic habitats present on the Harrison
 8 Bayou area; viz., creeks and back-water sloughs of Caddo Lake.
 9 Caddo Lake, a popular fishing lake for Texas and Louisiana sports-
 10 men, also supplies water to some metropolitan areas. Fishes most
 11 commonly sought after by sportfishermen include Largemouth Bass
 12 (Micropterus salmoides), Crappie (Pomoxis annularis and P.
 13 nigromaculatus), Channel Catfish (Ictalurus punctatus), Flathead
 14 Catfish (Pylodictis olivaris) and numerous species of Sunfish
 15 (Lepomis sp.). Commercially important species include Channel and
 16 Flathead Catfishes. Freshwater Drum (Aplodnotus grunniens),
 17 River Carpsucker (Cyprinus carpio), Buffalo (Ictiobus sp.), and
 18 Gizzard Shad (Dorosoma cepedianum) (Table 2).

19
 20 Most notable game fish of the Lake proper, although few
 21 fishermen seek it, is the Chain Pickerel (Esox niger);
 22 these fishes attain reasonable size and provide the sportsman with
 23 a good fight.

24 The sloughs and creeks of Harrison Bayou contain several species
 25 of interesting and ecologically important species. Most notable of
 26 the fishes and fish-like vertebrates include Lampreys (Ichthyomyzon
 27 sp.), Bowfin (Amia calva), American Eel (Anguilla rostrata), Golden

TABLE 2. Fishes and fishlike vertebrates observed and/or reported from Harrison Bayou Area.

Higher Taxon	Scientific-Common Name
CLASS PETROMYZONES	
Order Petromyzoniformes	
Family Petromyzonidae....	<u>Ichthyomyzon castaneus</u> Chestnut Lamprey
	<u>I. gagei</u> Southern Brook Lamprey
CLASS OSTEICHTHYS	
Order Acipenseriformes	
Family Polyodontidae....	<u>Polyodon spathula</u> Paddlefish
Order Amiiformes	
Family Amiidae.....	<u>Amia calva</u> Bowfin
Order Lepisosteiformes	
Family Lepisosteidae....	<u>Lepisosteus oculatus</u> Spotted Gar
	<u>L. osseus</u> Longnose Gar
	<u>L. spatula</u> Alligator Gar
Order Clupeiformes	
Family Clupeidae.....	<u>Alosa chrysochloris</u> Shipjack Herring
	<u>Dorosoma petenense</u> Threadfin Shad
	<u>D. cepedianum</u> Gizzard Shad
Family Esocidae.....	<u>Esox americanus</u> Redfin Pickerel

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E. niger
Chain Pickerel

E. lucius
Northern Pike

Order Cypriniformes

Family Cyprinidae.....Notemigonus chrysoleucas
Golden Shiner

Opsopoeodus emiliae
Fugnose minnow

Hybopsis aestivalis
Speckled Chub

Notropis roseipinnis
Cherryfin Shiner

N. cornutus
Common Shiner

N. ortenburgeri
Kiamichi Shiner

N. venustus
Blacktail Shiner

N. signipinnis
Flagfin Shiner

N. chalybaeus
Ironcolor Shiner

N. texanus
Weed Shiner

N. longirostris
Longnose Shiner

N. atrocaudis
Blackspot Shiner

N. volucellus
Mimic Shiner

N. buchanani
Ghost Shiner

N. sabiniae
Sabine Shiner

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Pimephales promelas
Fathead minnow

Campostoma anomalum
Stoneroller

Family Catostomidae.....Cycleptus elongatus
Blue sucker

Ictiobus cyprinellus
Bigmouth Buffalo

I. niger
Black Buffalo

I. bubalus
Smallmouth Buffalo

Carpiodes carpio
River Carpsucker

Moxostoma congestum
Gray Redhorse

Minytrema melanops
Spotted Sucker

Erimyzon tenuis
Sharpfin Chubsucker

E. sucetta
Lake Chubsucker

E. oblongus
Creek Chubsucker

Hypentelium nigricans
Northern Hog Sucker

Family Ictaluridae.....Ictalurus punctatus
Channel Catfish

I. furcatus
Blue Catfish

I. natalis
Yellow Bullhead

I. melas
Black Bullhead

Noturus gyrinus
Tadpole Madtom

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N. nocturnus
Freckled Madtom

Pylodictis olivaris
Flathead Catfish

Order Anguilliformes

Family Anguillidae.....Anguilla rostrata
American Eel

Order Cyprinodontiformes

Family Cyprinodontidae....Fundulus grandis
Gulf Killifish

F. similis
Longnose Killifish

F. pulvereus
Bayou Killifish

F. chrysotus
Golden Topminnow

F. notti
Starhead Topminnow

F. notatus
Blackstripe Topminnow

F. olivaceous
Blackspotted Topminnow

Cyprinodon variegatus
Sheepshead Pupfish

Family Poeciliidae.....Poecilia latipinna
Sailfin Molly

Gambusia affinis
Nosquitofish

Order Percopsiformes

Family Aphredoderidae.....Aphredoderus savanus
Pirate Perch

Order Mugiliformes

Family Atherinidae.....Labidesthes sicculus
Brook Silverside

1	Order Perciformes
2	Family Serranidae..... <u>Roccus saxatilis</u>
3	Striped Bass
4	<u>R. chrysops</u>
5	White Bass
6	<u>R. mississippiensis</u>
7	Yellow Bass
8	Family Centrarchidae..... <u>Micropterus salmoides</u>
9	Largemouth Bass
10	<u>M. punctulatus</u>
11	Spotted Bass
12	<u>Chaenobryttus gulosus</u>
13	Warmouth
14	<u>Lepomis syanellus</u>
15	Green Sunfish
16	<u>L. symmetricus</u>
17	Bantam Sunfish
18	<u>L. gibbosus</u>
19	Pumpkinseed
20	<u>L. microlophus</u>
21	Redear Sunfish
22	<u>L. auritus</u>
23	Redbreast Sunfish
24	<u>L. marginatus</u>
25	Dollar Sunfish
26	<u>L. megalotis</u>
27	Longear Sunfish
	<u>L. humilis</u>
	Orange-Spotted Sunfish
	<u>L. macrochirus</u>
	Bluegill
	<u>Ambloplites rupestris</u>
	Rockbass
	<u>Pomoxis nigromaculatus</u>
	Black Crappie

1		<u>P. annularis</u>
		White Crappie
2		
		<u>Centrarchus macropterus</u>
3		Flier
4	Family Elasmomidae.....	<u>Elassoma zonatum</u>
		Banded Pygmy Sunfish
5		
	Family Percidae.....	<u>Stizostedion vitreum</u>
6		Walleye
7		
		<u>Percina sciera</u>
8		Dusky Darter
9		
		<u>P. caprodes</u>
10		Logperch
11		
		<u>Ammocrypta vivax</u>
12		Scaly Sand Darter
13		
		<u>Etheostoma histrio</u>
14		Harkquin Darter
15		
		<u>E. artesia</u>
16		Eastern Redfin Darter
17		
		<u>E. asprtgene</u>
18		Mud Darter
19		
		<u>E. parvipinn</u>
20		Goldstripe Darter
21		
		<u>E. spectabile</u>
22		Orange-throat Darter
23		
		<u>E. gracile</u>
24		Slough Darter
25		
		<u>E. proeliare</u>
26		Cypress Darter
27		
	Family Sciaenidae.....	<u>Aplodinotus grunniens</u>
		Freshwater Drum

1 Topminnow (Pundulus chrysotus), Flier (Centrarchus macropterus),
 2 Banded Pygmy Sunfish (Elassoma zonatum), Logperch (Percina caprodes),
 3 and Cypress Darter (Etheostoma proeliare). The Paddlefish (Polydon
 4 spatula), long-sought by commercial fishermen, may or may not
 5 occur in the area. Another fish of particular interest to visitors
 6 is the Pirate Perch (Aphredoderus sayanus) which has
 7 the doubtful distinction of having its anus near its mouth. In
 8 young fish, the anus is in the normal abdominal position, then
 9 migrating anteriorly as the fish matures. The reason for this
 10 adaptation is unknown.

11 Numerous Gars (Lepisosteus sp.) occur in the sloughs and creeks.
 12 These fishes are unique because they breathe by rising to the
 13 surface and "burping" in surface air. This is accomplished by
 14 dropping the gular region. Actually, the swim bladder is ^amodified
 15 breathing organ.

16 AMPHIBIANS AND REPTILES

17 Harrison Bayou lies in the Austroriparian Biotic Province of
 18 Texas (Blair 1950). A total of 29+ species of snakes, 10 lizards, 2
 19 land turtles, 12 aquatic turtles, 17 anurans and 18 urodeles are
 20 reported for the general geographic area. Table 3 presents species
 21 observed on or reported from the Caddo Lake area; habitat quality
 22 ratings (0-10) are also presented for each species by general habitat
 23 type (viz., pure pine, pine-hardwood, bottomland hardwood, and upland
 24 hardwood). A habitat rating of 0 indicates the area is not suited
 25 for a particular species, while 10 suggests ideal habitat. No rating
 26 indicates habitat requirements for the species are not known.

27 Indicator species for the pure pine type are small-mouthed

TABLE 3. Herpetofauna of Harrison Bayou Area¹.

Taxon	Scientific-Common Name	Habitat Rating ²
Order Trachystomata	CLASS AMPHIBIA (v)	
Family Sirenidae.....	<u>Siren intermedia nettingi</u> Western Siren	5,7,9,7
Order Caudata		
Family Amphiumidae...	<u>Amphiuma means tridactylum</u> Three-toed Amphiuma	5,7,9,7
Family Proteidae.....	<u>Necturus beveri beveri</u> Waterdog	3,4,9,4
Family Salamandridae.	<u>Notophthalmus viridescens</u> <u>louisianensis</u> Central Newt	5,6,9,7
Family Ambystomidae..	<u>Ambystoma texanum</u> Narrow-mouthed Salamander	7,8,9,8
	<u>A. maculatum</u> Spotted Salamander	6,7,9,8
	<u>A. opacum</u> Marbled Salamander	5,7,9,8
	<u>A. tigrinum</u> Eastern Tiger Salamander	6,8,8,8
	<u>A. talpoideum</u> Mole Salamander	3,9,7,6
Family Plethodontidae		
	<u>Desmognathus auriculatus</u> Southern Dusky Salamander	3,5,9,7
	<u>Eurycea quadridigitata</u>	3,5,9,7
Order Anura		
Family Bufonidae....	<u>Scaphiopus holbrooki</u> Eastern Spadefoot	6,5,3,6
Family Hylidae.....	<u>Acris crepitans</u> Cricket Frog	7,9,9,9
	<u>Hyla cinera</u> Green Treefrog	5,7,9,8

1	<u>H. crucifer</u>	
2	Spring Peeper	5,7,9,8
3	<u>H. versicolor</u> X <u>H.</u>	
4	<u>chrysozelis</u>	
5	Gray Treefrog	6,7,9,8
6	<u>Pseudacris triseriata</u>	
7	Upland Chorus Frog	6,7,8,8
8	Family Microhylidae.. <u>Gastrophryne carolinensis</u>	
9	Eastern Narrow-mouthed Toad	6,7,9,8
10	Family Ranidae..... <u>Rana catesbeiana</u>	
11	Bullfrog	7,7,9,8
12	<u>R. clamitans</u>	
13	Green Frog	7,8,9,9
14	<u>R. palustris</u>	
15	Pickereel Frog	7,8,8,8
16	<u>R. pipiens</u>	
17	Leopard Frog	7,8,8,8

CLASS REPTILIA (46)

Order Testudinata

18	Family Chelonidae.... <u>Chelydra serpentina</u>	
19	Common Snapping Turtle	4,5,9,5
20	Family Kinosternidae. <u>Kinosternon subrubrum</u>	
21	<u>hippocrepis</u>	
22	Mississippi Mud Turtle	5,5,9,6
23	<u>Sternothaerus carinatus</u>	
24	Razor-backed Musk Turtle	5,6,9,6
25	<u>S. odoratus</u>	
26	Stinkpot	5,6,9,6
27	Family Emydidae..... <u>Chrysemys concinna</u>	
28	River Cooter	6,6,9,7
29	<u>C. floridana</u>	
30	Cooter	6,6,9,7
31	<u>C. scripta</u>	
32	Pond Slider	6,6,8,7

TABLE 3. Herpetofauna of Harrison Bayou Area¹.

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CLASS AMPHIBIA		
Order Trachystomata		
Family Sirenidae.....	<u>Siren intermedia nettingi</u> Western Siren	5,7,9,7
Order Caudata		
Family Amphiumidae...	<u>Amphiuma means tridactylum</u> Three-toed Amphiuma	5,7,9,7
Family Proteidae.....	<u>Necturus beveri beveri</u> Waterdog	3,4,9,4
Family Salamandridae.	<u>Notophthalmus viridescens</u> <u>louisianensis</u> Central Newt	5,6,9,7
Family Ambystomidae..	<u>Ambystoma texanum</u> Narrow-mouthed Salamander	7,8,9,8
	<u>A. maculatum</u> Spotted Salamander	6,7,9,8
	<u>A. opacum</u> Marbled Salamander	5,7,9,8
	<u>A. tigrinum</u> Eastern Tiger Salamander	6,8,8,8
	<u>A. talpoideum</u> Mole Salamander	3,9,7,6
Family Plethodontidae		
	<u>Desmognathus auriculatus</u> Southern Dusky Salamander	3,5,9,7
	<u>Eurycea quadridigitata</u>	3,5,9,7
Order Anura		
Family Bufonidae....	<u>Scaphiopus holbrooki</u> Eastern Spadefoot	6,5,3,6
Family Hylidae.....	<u>Acris crepitans</u> Cricket Frog	7,9,9,9
	<u>Hyla cinera</u> Green Treefrog	5,7,9,8

1	<u>Deirochelys reticularia</u>	
	Chicken Turtle	6,6,8,7
2		
3	<u>Graptemys pseudogeographica</u>	
	False Map Turtle	5,6,9,7
4	<u>Terrapene carolina</u>	
	Eastern Box Turtle	7,9,8,9
5		
6	<u>T. ornata</u>	
	Western Box Turtle	8,9,8,9
7	Family Trionychidae.. <u>Trionyx muticus</u>	
	Smooth Softshell	4,4,6,4
8		
9	<u>T. spiniferus</u>	
	Spiny Softshell	4,4,6,4
10	Order Crocodilia	
11	Family Crocodylidae.. <u>Alligator mississippiensis</u>	
	American Alligator	1,3,9,3
12		
13	Order Squamata	
14	Family Iguanidae..... <u>Anolis carolinensis</u>	
	Green Anole	6,8,8,8
15	<u>Sceloporus undulatus</u>	
	Eastern Fence Lizard	7,7,6,7
16		
17	Family Scincidae..... <u>Eumeces anthracinus</u>	
	Coal Skink	5,6,8,7
18	<u>E. fasciatus</u>	
	Five-lined Skink	5,7,7,7
19		
20	<u>E. laticeps</u>	
	Broad-headed Skink	5,7,7,7
21	<u>E. septentrionalis</u>	
	Prairie Skink	7,6,4,5
22		
23	<u>Lygosoma laterale</u>	
	Ground Skink	8,9,9,9
24	Family Teiidae..... <u>Cnemidophorus sexlineatus</u>	
	Six-lined Racerunner	5,2,2,2
25		
26	Family Anguidae..... <u>Ophisaurus attenuatus</u>	
	Slender Glass Lizard	5,2,2,2
27		

1	Family Colubridae... <u>Coluber constrictor</u> Racer	6,7,6,7
2		
3	<u>Diadophis punctatus</u> Ringneck Snake	7,7,3,6
4		
5	<u>Elaphe obsoleta</u> Common Rat Snake	6,9,8,8
6		
7	<u>Farancia abacura</u> Mud Snake	1,4,9,5
8		
9	<u>Heterodon platyrhinos</u> Eastern Hognose Snake	6,8,6,8
10		
11	<u>Lanpropeltis calligaster</u> Prairie King Snake	8,8,4,6
12		
13	<u>L. getulus</u> Common Kingsnake	8,4,5,6
14		
15	<u>L. triangulum</u> Milk Snake	7,8,6,8
16		
17	<u>Masticophis flagellum</u> Coachwhip	7,9,6,7
18		
19	<u>Natrix cyclopion</u> Green Water Snake	4,5,9,5
20		
21	<u>N. erythrogaster</u> Plain-bellied Water Snake	4,5,9,5
22		
23	<u>N. fasciata</u> Broad-banded Water Snake	4,6,9,6
24		
25	<u>N. rhombifera</u> Diamond-backed Water Snake	5,7,9,7
26		
27	<u>N. rigida</u> Glossy Water Snake	4,5,9,5
28		
29	<u>Opheodrys aestivus</u> Rough Green Snake	6,8,8,8
30		
31	<u>Storeria dekayi</u> Brown Snake	6,8,9,9
32		
33	<u>Tantilla gracilis</u> Flat-headed Snake	5,4,2,4
34		

1	<u>Thamnophis proximus</u>	
	Western Ribbon Snake	5,7,8,8
2		
3	<u>Virginia striatula</u>	
	Rough Earth Snake	6,7,8,8
4	Family Crotalidae.... <u>Agkistrodon contortrix</u>	
	Copperhead	7,8,7,8
5		
6	<u>A. piscivorus</u>	
	Cottonmouth	4,6,10,7
7		
8	<u>Sistrurus miliarius</u>	
	Pygmy Rattlesnake	7,9,5,9
9	Family Elapidae..... <u>Micrurus fulvius</u>	
	Coral Snake	8,8,5,8

11 ¹Classification after Raun and Gehlbach (1972).
 12 ²The four habitat rating figures represent pure pine, pine-
 13 hardwood, bottomland hardwood, and upland har^dwood, respectively.

14
15
16
17
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22
23
24
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27

1 salamander (Ambystoma texanum), Eastern Spadefoot (Scaphiopus
 2 holbrooki), Cricket Frog (Acris crepitans), Western Chorus Frog
 3 (Pseudacris triseriata), Leopard Frog (Rana pipiens), Eastern and
 4 Western Box Turtles (Terrapene carolina and T. ornata), Green Anole
 5 (Anolis carolinensis), Eastern Fence Lizard (Sceloporus undulatus),
 6 Prairie Skink (Eumeces septentrionalis), Ground Skink (Lygosoma
 7 laterale), Six-lined Racerunner (Cnemidophorus sexlineatus), Slender
 8 Glass Lizard (Ophisaurus attenuatus), Racer (Coluber constrictor),
 9 Prairie Kingsnake (Lampropeltis calligaster), Milk Snake (L.
 10 triangulum), Copperhead (Agkistrodon contortrix), Pygmy Rattlesnake
 11 (Sistrurus miliarius), and Coral Snake (Micrurus fulvius).

12 Species found commonly in the pine-hardwood type include
 13 Western Siren (Siren intermedia nettingi), Three-toed Amphiuma
 14 (Amphiuma means tridactylum), Central Newt (Notophthalmus viridescens
 15 louisensis), Small-mouthed Salamander*, Spotted Salamander (A.
 16 maculatum), Marbled Salamander (A. opacum), Eastern Tiger Salamander
 17 (A. tigrinum), Mole Salamander (A. talpoideum), Cricket Frog, Green
 18 Treefrog (Hyla cinerea), Spring Peeper (H. crucifer), Gray Treefrog
 19 (H. versicolor X H. chrysocelis), Western Chorus Frog, Woodhouse's
 20 Toad (Bufo woodhousei), Eastern Narrow-mouthed Toad (Gastrophryne
 21 carolinensis), Bullfrog (Rana catesbeiana), Green Frog (R. clamitans),
 22 Pickerel Frog (R. palustris), Leopard Frog, Eastern and Western Box
 23 Turtles, Green Anole, Eastern Fence Lizard, Five-lined Skink (Eumeces
 24 fasciatus), Broad-headed Skink (E. laticeps), Ground Skink, Racer,
 25 Ringneck Snake (Diadophis punctatus), Common Rat Snake (Elaphe obsoleta),
 26 Eastern Hognose Snake (Heterodon platyrhinos), Prairie Kingsnake,
 27 Common Kingsnake (L. getulus), Milk Snake, Coachwhip, Diamond-backed

1 Watersnake (Natrix rhombifera), Rough Green Snake (Opheodrys
 2 aestivus), Brown Snake (Storeria dekayi), Western Ribbon Snake
 3 (Thamnophis proximus), Earth Snake (Virginia striatula), Copperhead,
 4 Pygmy Rattlesnake, and Coral Snake.

5 The Bottomland Hardwood type is, as noted earlier, the most
 6 important component of Harrison Bayou. Several stenooecious species
 7 occur in this type. In addition to most of the species listed for
 8 the two previous types, conspicuous ones include Western Siren,
 9 Three-toed Amphiuma, Central Newt, Small-mouthed Salamander, Spotted
 10 salamander, Marbled Salamander, Southern Dusky Salamander (Desmognathus
 11 auriculatus), Dwarf Salamander (Eurycea quadridigitata), Cricket Frog,
 12 Green Treefrog, Gray Treefrog, Woodhouse's Toad, Mississippi Mud
 13 Turtle (Kinosternon subrubrum hippocrepsis), Razor-backed Turtle
 14 (Sternothaerus carinatus), Stinkpot (S. odoratus), River Cooter
 15 (Chrysemys concinna), Cooter (C. floridana), False Map Turtle
 16 (Graptemys pseudogeographica), American Alligator (Alligator
 17 mississippiensis), Ground Skink, Mud Snake (Farancia abocura),
 18 Green Watersnake (N. cyclopion), Plain-bellied Watersnake (N.
 19 erythrogaster), Broad-banded Watersnake (N. fasciatus), Diamond-backed
 20 Watersnake, Brown Snake, and Cottonmouth (A. piscivorus). The three
 21 most notable species are alligator, mud snake, and cottonmouth. The
 22 alligator has been on the endangered species list for some
 23 time; but, recently, political pressures in Louisiana have resulted
 24 in this species being hunted in that State. The mud snake is interesting
 25 because it apparently eats only siren; virtually nothing is known
 26 about its reproduction. The cottonmouth is perhaps the most-feared
 27 poisonous snake in the South; these reptiles are indeed dangerous and

1 can inflict a lethal bite.

2 The Upland Hardwood type involves only a small portion of the
3 area. Species there are those observed in the bottomlands;
4 however, some species are less common due to fewer water sources.
5 Salamanders and aquatic reptiles occur in small numbers. Woodhouse's
6 Toad and Box Turtles were most commonly encountered. A large Common
7 Kingsnake was collected, along with a Western
8 Ribbon Snake and a Racer, in this type.

9 MAMMALS

10 Harrison Bayou is particularly interesting in regard to small
11 mammals such as Fox and Gray squirrels (Sciurus niger and S.
12 carolinensis), Swamp Rabbits (Sylvilagus aquaticus), several species
13 of bats, Florida Woodrat (Neotoma floridana), and the mustelids.
14 The tremendous density of den/nest sites available to arboreal species
15 has produced one of the highest densities of gray squirrels I have
16 ever observed. Day-nest counts suggest an average density of 8.1
17 squirrels per acre (0.4 ha). Species common to each habitat type
18 will be discussed in detail.

19 The Pure Pine component of the area is typical of pine
20 forests of East Texas in mammal species composition. The only unique
21 feature is that the area is protected from outside disturbance due
22 to the military nature of the facility. Hunting is allowed for the
23 employees of the Longhorn Ordnance Works, but the general public is
24 excluded. As a result, it appears that game populations in this type
25 are relatively high. (especially deer,) Information obtained
26 from ^{Ordnance} personnel suggests that bucks harvested from the area are
27 older than those commonly observed outside the Reservation.

P

1 Fox Squirrel populations in this type are, as expected,
 2 rather low due to ^{the presence of} a few mast-producing species. Mammals commonly (Table 4)
 3 encountered and suited to this type include O'possum (Didelphis
 4 marsupialis), Nine-banded Armadillo (Dasypus novemcinctus), Eastern
 5 Cottontail (Sylvilagus floridanus), Plains Pocket Gopher (Geomys
 6 bursarius), Plains Pocket Mouse (Perognathus hispidus), Cotton Rat
 7 (Sigmodon hispidus), Pine Vole (Pitymys pinetorum), Coyote (Canis
 8 latrans), Striped Skunk (Mephitis mephitis), and White-tailed Deer
 9 (Odocoileus virginianus). Most of these are so-called "weed"
 10 species commonly associated with ^{site} disturbance.

P

11 The Plains Pocket Gopher, Plains Pocket Mouse, and Cotton Rat are
 12 usually found in grassland (early clearcut stages) habitats. The
 13 Pine Vole is not commonly found. This habitat may also
 14 be used on a seasonal basis by other animals usually associated with
 15 hardwoods. For example, during the early fall, Gray Squirrel may
 16 inhabit the area to feed on pine seeds, while deer
 17 use young pole-sized stands for winter cover.

18 The Pine-Hardwood type is an excellent example of an ecologic
 19 successional stage. It usually occurs at the interface between
 20 the pure pine and pure hardwood types. Its transitional nature
 21 creates high species diversity; many edge species are found in, or
 22 frequent, this type. Commonly occurring species are O'possum, Eastern
 23 Mole (Scalopus aquaticus), Nine-banded Armadillo, Cottontail, Fox
 24 Squirrel, Golden Mouse (Ochrotomys nuttalli), Cotton Rat, Pine Vole,
 25 Coyote, Red Fox (Vulpes fulva), Striped Skunk, Bobcat (Lynx rufus),
 26 Feral Pig (Sus scrofa), and White-tailed Deer. ^P This type provides
 27 particularly good habitat for the Fox Squirrel and Bobcat.

Table 4. Mammals of Harrison Bayou Area¹.

Taxon	Scientific-Common Name	Habitat Rating ²
Order Marsupialia		
Family Didelphidae....	<u>Didelphis marsupialis</u> O'possum	6,8,6,8
Order Chiroptera		
Family Vespertilionidae		
	<u>Myotis lucifugus</u> Little Brown Bat	Unknown
	<u>M. austroriparius</u> Florida Brown Bat	5,7,8,8
	<u>Pipistrellus subflavus</u> Eastern Pipistrelle	5,7,8,8
	<u>Eptesicus fuscus</u> Big Brown Bat	5,7,8,8
	<u>Nycticeius humeralis</u> Evening Bat	5,7,8,8
	<u>Lasiurus borealis</u> Red Bat	6,7,8,8
	<u>L. seminolus</u> Seminoe Bat	6,7,8,8
	<u>L. cinereus</u> Hoary Bat	6,7,8,8
	<u>L. intermedius</u> Northern Yellow Bat	Unknown
	<u>Plecotus rafinesquii</u> Eastern Big-eared Bat	6,7,8,8
	<u>Tadarida brasiliensis</u> Mexican Free-tailed Bat	6,7,8,8
Order Insectivora		
Family Soricidae.....	<u>Blarina brevicauda</u> Short-tailed Shrew	6,7,6,7
	<u>Cryptotis parva</u> Least Shrew	6,7,6,7

1	Family Talpidae.....	<u>Scalopus aquaticus</u> Eastern Mole	7,8,5,7
2	Order Edentata		
3	Family Dasypodidae...	<u>Dasyopus novemcinctus</u> Nine-banded Armadillo	8,9,9,9
4	Order Lagomorpha		
5	Family Leporidae.....	<u>Sylvilagus floridanus</u> Eastern Cottontail	7,8,5,7
6		<u>S. aquaticus</u> Swamp Rabbit	5,6,9,7
7	Order Rodentata		
8	Family Sciuridae.....	<u>Sciurus niger</u> Fox Squirrel	7,9,5,8
9		<u>S. carolinensis</u> Eastern Gray Squirrel	5,7,9,9
10			
11	Family Geomyidae.....	<u>Geomys bursarius</u> Plains Pocket Gopher	8,4,4,4
12			
13	Family Heteromyidae..	<u>Perognathus hispidus</u> Plains Pocket Mouse	8,4,4,4
14	Family Castoridae....	<u>Castor canadensis</u> Beaver	5,5,9,7
15			
16	Family Criceidae....	<u>Oryzomys palustris</u> Rice Rat	4,5,6,5
17		<u>Reithrodontomys fulvescens</u> Fulvous Harvest Mouse	6,5,4,5
18		<u>R. humulis</u> Eastern Harvest Mouse	6,5,4,6
19			
20		<u>Peromyscus leucopus</u> Wood Mouse	5,6,8,7
21		<u>P. gossypinus</u> Cotton Mouse	5,6,9,7
22			
23		<u>Ochrotomys nuttalli</u> Golden Mouse	6,8,9,8
24			
25		<u>Sigmodon hispidus</u> Cotton Rat	8,8,5,6
26		<u>Neotoma floridana</u> Florida Woodrat	5,7,9,8
27			

1	<u>Microtus ochrogaster</u>	
2	Prairie Vole	6,5,4,4
3	<u>Pitymys pinetorum</u>	
4	Pine Vole	7,8,5,5
5	Family Capromyidae... <u>Myocaster coypus</u>	
6	Nutria	5,5,8,6
7	Family Muridae..... <u>Rattus rattus</u>	
8	Roof Rat	2,2,2,2
9	<u>R. norvegicus</u>	
10	Norway Rat	2,2,2,2
11	<u>Mus musculus</u>	
12	House Mouse	2,2,2,2
13	Order Carnivora	
14	Family Canidae..... <u>Canis latrans</u>	
15	Coyote	8,8,7,8
16	<u>Vulpes fulva</u>	
17	Red Fox	7,8,5,7
18	<u>Urocyon cinereoargenteus</u>	
19	Gray Fox	5,7,9,8
20	Family Procyonidae... <u>Procyon lotor</u>	
21	Raccoon	6,7,9,8
22	Family Mustelidae... <u>Mustela frenata</u>	
23	Long-tailed Weasel	4,5,5,5
24	<u>M. vison</u>	
25	Mink	4,6,8,6
26	<u>Mephitis mephitis</u>	
27	Striped Skunk	7,8,7,8
28	<u>Spilogale putorius</u>	
29	Spotted Skunk	4,5,4,4
30	<u>Lutra canadensis</u>	
31	River Otter	4,5,8,5
32	Family Felidae..... <u>Lynx rufus</u>	
33	Bobcat	5,8,9,8
34	Family Suidae..... <u>Sus scrofa</u>	
35	Feral Pig	6,8,9,8

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Family Cervidae.....Odocoileus virginianus
White-tailed Deer

7,8,8,8

¹Phylogenetic relationships after Davis (1966).

²Habitat ratings are for pure pine, pine-hardwood, bottomland
hardwood, and upland hardwood types, respectively.

1 though common in the Caddo Lake area, Since the population status
 2 of the Bobcat, is currently controversial,
 3 the Harrison Bayou Area would provide a refuge if, and when,
 4 "endangered status" is conferred. The primary foods of these cats are
 5 rabbits and deer. They are probably responsible for the majority
 6 of white-tail^{ed} fawn mortality in East Texas. White-tail^{ed} deer are well-
 7 suited to the mixed pine-hardwood type, as both quality browse and
 8 hardwood mast are available. The deer herd on the area is apparently
 9 at a high level at this time.

10 The pine-hardwood type represents prime Fox Squirrel
 11 habitat. Approximately two day-nests per acre (0.4 ha) were observed
 12 in these stands. According to P. D. Goodrum (pers. comm.), this means
 13 there are approximately four squirrels to the acre. If the
 14 squirrels continue to be hunted, up to 80% of the population could
 15 be harvested each year without endangering it.

16 The Bottomland Hardwood type is the most important section of the
 17 proposed natural area. It contains several subtypes (cf. L. C. Walker),
 18 creating high species diversity in plants and animals and concomitant
 19 stability in the ecosystem. As noted above, Gray Squirrel density
 20 is at a high level. In addition, other hole-utilizing
 21 species abound. Most abundant mammals include O'possum, several
 22 species of bats (Table 4), Nine-banded Armadillo, Swamp Rabbit
 23 (S. aquaticus), Eastern Flying Squirrel (Glaucomys volans), Beaver
 24 (Castor canadensis), Wood Mouse (Peromyscus leucopus), Cotton Mouse
 25 (P. gossypinus), Golden Mouse, Florida Woodrat, Nutria (Myocaster
 26 coypus), Gray Fox (Urocyon cinereoargenteus), Raccoon (Procyon lotor),
 27 Mink (Mustela vison), River Otter (Lutra canadensis), Bobcat,

1 and Feral Pig. There are at least three Beaver colonies on the area.
 2 Although these animals appear to be making a comeback in the South,
 3 Harrison Bayou represents a protected area for study. The Beaver is
 4 currently considered a pest by foresters and their pelts are once
 5 again in high demand. Another furbearer, the Mink, is also abundant in
 6 the area. Since pesticides are little used, due to lack of
 7 crop agriculture, the Mink should remain at reasonable population
 8 levels, provided trapping pressures do not increase substantially.

9 It is uncertain as to the current status of the River
 10 Otter in East Texas. In general, however, it appears to be increasing
 11 in numbers due to reservoir construction. River Otters, frequenting
 12 creeks and sloughs of Harrison Bayou, are often found in or
 13 around the Beaver-created ponds. These animals feed extensively on
 14 Crayfish and fishes. Fishermen usually regard them as a pest.

15 The feral pig is, and has been, an ever-present pest in southern
 16 forests. Brought to the area by early settlers, the pig has flourished
 17 to the detriment of some tree and animal species. These creatures
 18 destroy longleaf pine seedlings and compete with
 19 deer and small rodents for hard mast. However, the feral pig could
 20 provide excellent sport hunting; this would
 21 help to control these prolific animals.

BIRDS

22
 23 The mania for reservoir construction in the
 24 state of Texas during the last several years has resulted in
 25 destruction of countless acreages of bottomland habitat. Perhaps
 26 most affected by these activities have been the bottomland birds.
 27 Many species are currently on the Audubon "Blue List" as potentially

1 threatened. In addition, logging practices and conversion of hardwood
2 stands to pine have contributed to this problem. Two endangered species
3 could inhabit the area; Red-cockaded and Ivory-billed
4 woodpeckers. It was reported that the Ivory-bill^d had been
5 sighted in the Harrison Bayou by reputable bird-watchers; however,
6 a thorough search of the area revealed no signs
7 of its presence. Although I was told that Ivory-bill^d sign
8 had been seen in the Bayou, I noted that trees which had been
9 stripped of bark in the Ivory-bill^d fashion were, on closer examination,
10 actually the work of Pileated Woodpeckers.

11 I observed a pair of these birds excavating large areas of bark in
12 a white oak near the Bayou. No den holes were observed which
13 could have accomodated an Ivory-billed Woodpecker.

14 A complete list of birds observed or reported for Harrison Bayou
15 is presented in Table 5. A discussion of commonly occurring species,
16 by habitat type, follows.

17 The Pure Pine type contains the lowest avian species diversity
18 of the area. Commonly occuring ones include Turkey Vulture,
19 Black Vulture, Red-tailed Hawk, American Kestrel, Bobwhite, Ground
20 Dove, Mourning Dove, Roadrunner, Common Nighthawk, Ruby-throated
21 Hummingbird, Red-headed Woodpecker, Hairy Woodpecker, Downy Woodpecker,
22 Red-cockaded Woodpecker, Eastern Kingbird, Great-crested Flycatcher,
23 Barn Swallow, Blue Jay, Common Crow, Carolina Chickadee, Tufted
24 Titmouse, White-breasted Nuthatch, Brown-headed Nuthatch, Carolina
25 Wren, Mockingbird, Eastern Bluebird, Cedar Waxwing, White-eyed Vireo,
26 Yellow-throated Vireo, Yellow-breasted Chat, Cardinal, Painted Bunting,
27 and numerous species of sparrows.

Table 5. Birds of the Harrison Bayou Area¹.

3	Taxon	Scientific-Common Name	Habitat Rating ²
4	Order Gaviiformes		
5	Family Gaviidae....	<u>Gavia immer</u> Common Loon	-, -, 5, -
6		<u>G. stellata</u> Red-throated Loon	-, -, 3, -
7	Order Podicipediformes		
8	Family Podicipedidae		
9		<u>Podiceps auritus</u> Horned Grebe	4, 4, 6, 4
10		<u>P. nigricollis</u> Eared Grebe	4, 4, 6, 4
12		<u>Aechmophorus occidentalis</u> Western Grebe	4, 4, 5, 4
13		<u>Podilymbus podiceps</u> Pied-billed Grebe	4, 4, 6, 4
15	Order Pelecaniformes		
16	Family Pelecanidae.	<u>Pelecanus erythrorhynchos</u> White Pelican	4, 4, 5, 4
17	Family Phalacrocoracidae		
18		<u>Phalacrocorax auritus</u> Double-crested Cormorant	4, 4, 5, 4
19		<u>P. olivaceus</u> Olivaceous Cormorant	4, 4, 5, 4
21	Family Anhingidae..	<u>Anhinga anhinga</u> Anhinga	5, 5, 7, 5
23	Order Ardeiformes		
24	Family Ardeidae....	<u>Ardea herodias</u> Great Blue Heron	5, 5, 8, 6
25		<u>Butorides virescens</u> Green Heron	6, 7, 9, 7
26			
27			

1	<u>Florida caerulea</u> Little Blue Heron	5,6,9,7
2	<u>Bubuleus ibis</u> Cattle Egret	5,6,7,6
3	<u>Casmerodius albus</u> Great Egret	5,5,8,6
4	<u>Egretta thula</u> Snowy Egret	5,6,8,7
5	<u>Hydranassa tricolor</u> Louisiana Heron	5,6,9,7
6	<u>Nycticorax nycticorax</u> Black-crowned Night Heron	5,6,9,7
7	<u>Nyctanassa violacea</u> Yellow-crowned Night Heron	5,6,9,6
8	<u>Ixobrychus exilis</u> Least Bittern	5,5,6,5
9	<u>Botaurus lentiginosus</u> American Bittern	5,5,6,5
10	Family Ciconiidae.. <u>Mycteria americana</u> Wood Ibis	5,6,9,7
11	Family Plataleidae.. <u>Plegadis chihi</u> White-faced Ibis	5,6,9,7
12	<u>Eudocimus albus</u> White Ibis	5,6,9,7
13	<u>Ajaia ajaja</u> Roseate Spoonbill	4,4,5,4
14	Order Anseriformes	
15	Family Anatidae.... <u>Branta canadensis</u> Canada Goose	3,3,5,3
16	<u>Anser albifrons</u> White-fronted Goose	3,3,5,3
17	<u>Chen caerulescens</u> Snow Goose	3,3,5,3
18	<u>Anas platyrhynchos</u> Mallard	3,3,8,6
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1	<u>A. rubripes</u> Black Duck	3,3,7,5
2		
3	<u>A. fulvigula</u> Mottled Duck	3,3,5,3
4	<u>A. strepera</u> Gadwall	5,6,7,6
5		
6	<u>A. acuta</u> Pintail	4,4,5,4
7	<u>A. crecca</u> Green-winged Teal	4,5,6,5
8		
9	<u>A. discors</u> Blue-winged Teal	5,5,6,5
10	<u>A. cyanoptera</u> Cinnamon Teal	3,3,4,3
11		
12	<u>A. americana</u> American Widgeon	5,6,7,6
13	<u>A. clypeata</u> Northern Shoveler	4,4,5,4
14		
15	<u>Aix sponsa</u> Wood Duck	4,6,9,8
16	<u>Aythya americana</u> Redhead	4,4,5,4
17		
18	<u>A. collaris</u> Ring-necked Duck	5,6,8,6
19	<u>A. valisineria</u> Canvasback	4,4,5,4
20		
21	<u>A. marila</u> Greater Scaup	-, -, 5, -
22	<u>A. affinis</u> Lesser Scaup	-, -, 5, -
23		
24	<u>Bucephala clangula</u> Common Goldeneye	4,4,6,5
25	<u>Oxyura jamicensis</u> Ruddy Duck	4,4,6,5
26		
27		

1	<u>Mergus serrator</u>	
2	Red-breasted Merganser	3,3,4,3
3	Order Accipitriformes	
4	Family Vulturidae.. <u>Cathartes aura</u>	
5	Turkey Vulture	7,7,7,7
6	<u>Coragyps atratus</u>	
7	Black Vulture	7,6,6,6
8	Family Accipitridae	
9	<u>Ictinia mississippiensis</u>	
10	Mississippi Kite	5,5,6,5
11	<u>Accipiter striatus</u>	
12	Sharp-shinned Hawk	6,7,8,7
13	<u>A. cooperii</u>	
14	Cooper's Hawk	6,7,8,7
15	<u>Buteo jamaicensis</u>	
16	Red-tailed Hawk	7,7,7,7
17	<u>B. lineatus</u>	
18	Red-shouldered Hawk	6,8,9,8
19	<u>B. platypterus</u>	
20	Broad-winged Hawk	6,8,9,8
21	<u>B. swainsoni</u>	
22	Swainson's Hawk	3,2,2,2
23	<u>B. lagopus</u>	
24	Rough-legged Hawk	3,2,2,2
25	<u>Aquila chrysaetos</u>	
26	Golden Eagle	?
27	<u>Haliaeetus leucocephalus</u>	
28	Bald Eagle	4,4,8,5
29	<u>Circus cyaneus</u>	
30	Marsh Hawk	5,5,7,6
31	Family Pandionidae.. <u>Pandion haliaetus</u>	
32	Osprey	3,3,8,6
33	Family Falconidae.. <u>Falco peregrinus</u>	
34	Peregrine Falcon	2,2,1,1

1	<u>F. columbarius</u>	
2	Pigeon Hawk	2,2,1,1
3	<u>F. sparverius</u>	
4	American Kestrel	8,8,5,6
5	Order Galliformes	
6	Family Phasianidae. <u>Colinus virginianus</u>	
7	Bobwhite	9,7,4,4
8	Family Meleagridae. <u>Meleagris gallopavo</u>	
9	Turkey	6,7,9,9
10	Order Ralliformes	
11	Family Gruidae..... <u>Grus canadensis</u>	
12	Sandhill Crane	1,-,-,-
13	Family Rallidae.... <u>Rallus elegans</u>	
14	King Rail	2,2,2,2
15	<u>R. limicola</u>	
16	Virginia Rail	2,2,4,2
17	<u>Porzana carolina</u>	
18	Sora	2,2,5,2
19	<u>Coturnicops noveboracensis</u>	
20	Yellow Rail	2,-,-,-
21	<u>Porphyryla martinica</u>	
22	Purple Gallinule	3,3,7,3
23	<u>Gallinula chloropus</u>	
24	Common Gallinule	4,4,7,4
25	<u>Fulica americana</u>	
26	American Coot	4,4,8,4
27	Order Charadriiformes	
28	Family Charadriidae	
29	<u>Charadrius semipalmatus</u>	
30	Semipalmated Plover	
31	<u>C. melodus</u>	
32	Piping Plover	
33	<u>C. wilsonia</u>	
34	Wilson's Plover	

1	<u>Pluvialis dominica</u>	
	American Golden Plover	
2	<u>P. squatarola</u>	
3	Black-bellied Plover	
4	<u>Arenaria interpres</u>	
	Ruddy Turnstone	
5	Family Scolopacidae	
6	<u>Philohela minor</u>	
7	American Woodcock	6,8,9,8
8	<u>Capella gallinago</u>	
	Common Snipe	5,7,7,6
9	<u>Numenius americanus</u>	
10	Long-billed Curlew	3,4,6,4
11	Order Columbiformes	
12	Family Columbidae... <u>Zenaida macroura</u>	
	Mourning Dove	7,5,3,3
13	<u>Columbigallina passerina</u>	
14	Ground Dove	8,3,3,3
15	Order Cuculiformes	
16	Family Cuculidae... <u>Coccyzus americanus</u>	
	Yellow-billed Cuckoo	5,8,8,8
17	<u>C. erythrophthalmus</u>	
18	Black-billed Cuckoo	
19	<u>Geococcyx californianus</u>	
	Roadrunner	7,8,8,8
20	Order Strigiformes	
21	Family Tytonidae... <u>Tyto alba</u>	
22	Barn Owl	5,7,8,8
23	Family Strigidae... <u>Otus asio</u>	
	Screech Owl	6,8,9,9
24	<u>Bubo virginianus</u>	
25	Great Horned Owl	6,8,9,9
26	<u>Strix varia</u>	
27	Barred Owl	6,8,9,9

1	Order Caprimulgiformes	
2	Family Caprimulgidae..	<u>Caprimulgus carolinensis</u>
3		Chuck-will's-widow 6,7,7,7
4		<u>C. vociferus</u>
5		Whip-poor-will 6,7,7,7
6		<u>Chordeiles minor</u>
7		Common Nighthawk 7,8,8,8
8	Order Apodiformes	
9	Family Apodidae.....	<u>Chaetura pelagica</u>
10		Chimney Swift 5,7,8,8
11	Family Trochilidae....	<u>Archilochus colubris</u>
12		Ruby-throated Hummingbird 7,7,7,7
13	Order Caraciformes	
14	Family Caracidae.....	<u>Megaceryle alcyon</u>
15		Belted Kingfisher 3,4,8,4
16	Order Piciformes	
17	Family Picidae.....	<u>Colaptes auratus</u>
18		Common Flicker 5,8,9,9
19		<u>Dryocopus pileatus</u>
20		Pileated Woodpecker 6,8,10,9
21		<u>Centurus carolinus</u>
22		Red-bellied Woodpecker 6,8,9,9
23		<u>Melanerpes erythrocephalus</u>
24		Red-headed Woodpecker 7,8,9,9
25		<u>Sphyrapicus varius</u>
26		Yellow-bellied Sapsucker 5,7,9,9
27		<u>Dendrocopos villosus</u>
28		Hairy Woodpecker 7,8,9,9
29		<u>D. pubescens</u>
30		Downy Woodpecker 7,8,9,9
31		<u>D. borealis</u>
32		Red-cockaded Woodpecker 9,6,-,-
33		<u>Campephilus principalis</u>
34		Ivory-billed Woodpecker -,-,9,-

1	Order Passeriformes	
2	Family Tyrannidae.....	<u>Tyrannus tyrannus</u>
		Eastern Kingbird
		8,8,5,5
3		<u>T. verticalis</u>
4		Western Kingbird
5		<u>Muscivora forficata</u>
		Scissor-tailed Flycatcher
		7,-,-,-
6		<u>Myiarchus crinitus</u>
7		Great-crested Flycatcher
		8,9,7,7
8		<u>Sayornis phoebe</u>
		Eastern Phoebe
		7,8,8,8
9		<u>Epidonax flaviventris</u>
10		Yellow-bellied Flycatcher
		7,7,6,6
11		<u>E. virescens</u>
		Acadian Flycatcher
		7,8,8,8
12		<u>E. alnorum</u>
13		Alder Flycatcher
		7,8,8,8
14		<u>E. minimus</u>
		Least Flycatcher
		7,7,6,6
15		<u>Contopus virens</u>
16		Eastern Wood Pewee
		7,7,6,6
17		<u>Nutallornis borealis</u>
		Olive-sided Flycatcher
		7,7,8,8
18	Family Alaudidae.....	<u>Eremophila alpestris</u>
19		Horned Lark
20	Family Hirundinidae...	<u>Iridoprocne bicolor</u>
		Tree Swallow
		5,6,8,8
21		<u>Stelgidopteryx pyrrhonota</u>
22		Rough-winged Swallow
		5,6,8,8
23		<u>Hirundo rustica</u>
		Barn Swallow
		8,7,5,5
24		<u>Petrochelidon pyrrhonota</u>
25		Cliff Swallow
		8,7,5,5
26		<u>Progne subis</u>
		Purple Martin
		7,5,4,4
27		

1	Family Corvidae.....	<u>Cyanocitta cristata</u> Blue Jay	8,9,9,9
2		<u>Corvus brachychos</u>	
3		Common Crow	8,9,9,9
4	Family Paridae.....	<u>Parus carolinensis</u> Carolina Chickadee	8,9,9,9
5		<u>Paris bicolor</u>	
6		Tufted Titmouse	8,9,9,9
7	Family Sittidae.....	<u>Sitta carolinensis</u> White-breasted Nuthatch	8,9,9,9
8		<u>S. canadensis</u>	
9		Red-breasted Nuthatch	
10		<u>S. pusilla</u>	
11		Brown-headed Nuthatch	8,9,7,7
12	Family Certhiidae.....	<u>Certhia familiaris</u> Brown Creeper	8,9,9,9
13	Family Troglodytidae..	<u>Troglodytes aedon</u> House Wren	8,8,7,7
14		<u>T. troglodytes</u>	
15		Winter Wren	
16		<u>Thryomanes beweckii</u>	
17		Bewick's Wren	
18		<u>T. ludovicianus</u> Carolina Wren	8,9,9,9
19	Family Mimidae.....	<u>Mimus polyglottos</u> Mockingbird	8,6,5,5
20		<u>Sumetella carolinensis</u>	
21		Catbird	7,8,8,8
22		<u>Taxostoma rufum</u>	
23		Brown Thrasher	7,8,8,8
24	Family Turdidae.....	<u>Turdus migratorius</u> American Robin	7,6,5,5
25		<u>Hylocichla mustelina</u>	
26		Wood Thrush	7,8,8,8
27		<u>Catharus guttata</u> Hermit Thrush	7,8,9,9

1	<u>C. ustulata</u> Swainson's Thrush	7,8,9,9
2		
3	<u>C. minima</u> Gray-cheeked Thrush	7,8,9,9
4	<u>C. fuscescens</u> Veery	7,8,9,9
5		
6	<u>Sialia sialis</u> Eastern Bluebird	8,8,7,7
7	Family Sylviidae..... <u>Polioptila caerulea</u> Blue-gray Gnatcatcher	7,8,8,8
8		
9	<u>Regulus strapa</u> Golden-crowned Kinglet	7,8,8,8
10	<u>R. calendula</u> Ruby-crowned Kinglet	7,8,8,8
11	Family Bombycillidae.. <u>Bombycilla cedrorum</u> Cedar Waxwing	8,8,5,5
12		
13	Family Laniidae..... <u>Lanius ludovicianus</u> Loggerhead Shrike	7,7,5,5
14		
15	Family Sturnidae..... <u>Sturnus vulgaris</u> Starling	7,6,5,5
16	Family Vireonidae..... <u>Vireo griseus</u> White-eyed Vireo	8,9,7,8
17		
18	<u>V. bellii</u> Bell's Vireo	
19	<u>V. flavifrons</u> Yellow-throated Vireo	8,9,7,8
20		
21	<u>V. solitarius</u> Solitary Vireo	7,8,8,8
22	<u>V. olivaceus</u> Red-eyed Vireo	6,7,9,9
23		
24	<u>V. philadelphicus</u> Philadelphia Vireo	
25	<u>V. gilvus</u> Warbling Vireo	7,8,8,8
26		
27		

1	Family Parulidae.....	<u>Mniotilta varia</u> Black-and-white Warbler	7,9,5,5
2			
3		<u>Protonotaria citrea</u> Prothonotary Warbler	6,8,9,9
4			
5		<u>Limnothypis swainsonii</u> Swainson's Warbler	5,6,9,9
6			
7		<u>Helmitheros vermivorus</u> Worm-eating Warbler	5,6,9,9
8			
9		<u>V. pinus</u> Blue-winged Warbler	
10			
11		<u>V. peregrina</u> Tennessee Warbler	5,6,9,9
12			
13		<u>V. celata</u> Orange-crowned Warbler	5,6,9,9
14			
15		<u>V. ruficapilla</u> Nashville Warbler	5,6,9,9
16			
17		<u>Parula americana</u> Northern Parula	5,6,9,9
18			
19		<u>Dendroica petechia</u> Yellow Warbler	5,6,9,9
20			
21		<u>D. magnolia</u> Yellow-rumped Warbler	5,6,9,9
22			
23		<u>D. virens</u> Black-throated Green Warbler	7,8,5,5
24			
25		<u>D. cerula</u> Cerulean Warbler	5,6,9,9
26			
27		<u>D. fusca</u> Blackburnian Warbler	5,6,9,9
		<u>D. dominica</u> Yellow-throated Warbler	5,6,9,9
		<u>D. pensylvanica</u> Chestnut-sided Warbler	6,7,9,9

1	<u>D. castanea</u>	
2	Bay-breasted Warbler	5,6,9,9
3	<u>D. striata</u>	
4	Blackpoll Warbler	5,6,9,9
5	<u>D. pinus</u>	
6	Pine Warbler	7,8,5,5
7	<u>D. discolor</u>	
8	Prairie Warbler	7,8,5,5
9	<u>Seiurus aurocapillus</u>	
10	Ovenbird	5,6,9,9
11	<u>S. noveboracensis</u>	
12	Northern Waterthrush	5,6,9,9
13	<u>S. motacilla</u>	
14	Louisiana Waterthrush	5,6,9,9
15	<u>Opornis formosus</u>	
16	Kentucky Warbler	5,6,9,9
17	<u>O. philadelphia</u>	
18	Mourning Warbler	5,6,9,9
19	<u>Geothlypis trichas</u>	
20	Common Yellowthroat	4,5,9,9
21	<u>Icteria virens</u>	
22	Yellow-breasted Chat	8,8,5,5
23	<u>Wilsonia citrina</u>	
24	Hooded Warbler	5,6,9,9
25	<u>W. pusilla</u>	
26	Wilson's Warbler	5,6,9,9
27	<u>Setophaga ruticilla</u>	
28	American Redstart	2,3,9,9
29	Family Icteridae..... <u>Sturnella magna</u>	
30	Eastern Meadowlark	7,5,3,3
31	<u>Agelaius phoeniceus</u>	
32	Red-winged Blackbird	5,6,7,7
33	<u>Icterus spurius</u>	
34	Orchard Oriole	5,6,8,8
35	<u>I. galbula</u>	
36	Northern Oriole	5,6,8,8

1	<u>Euphagus carolinus</u> Rusty Blackbird	4,5,9,9
2		
3	<u>E. cyanocephalus</u> Brewer's Blackbird	5,5,3,3
4	<u>Cassidix major</u> Boat-tailed Grackle	
5		
6	<u>C. mexicana</u> Great-tailed Grackle	
7	<u>Quiscalus quiscula</u> Common Grackle	6,6,4,4
8		
9	<u>Molothrus ater</u> Brown-headed Cowbird	6,7,4,4
10	Family Tangridae..... <u>Piranga olivacea</u> Scarlet Tanager	6,7,8,8
11		
12	<u>P. rubra</u> Summer Tanager	6,7,8,8
13	<u>Cardinalis cardinalis</u> Cardinal	8,9,8,8
14	Family Fringillidae... <u>Pheucticus ludovicianus</u> - Rose-breasted Grosbeak	5,6,8,8
15		
16	<u>Guiraca caerulea</u> Blue Grosbeak	5,6,8,8
17		
18	<u>Passerina cyanea</u> Indigo Bunting	7,8,8,8
19	<u>P. ciris</u> Painted Bunting	8,7,7,7
20		
21	<u>Spiza americana</u> Dickcissel	6,4,2,2
22	<u>Carpodacus purpureus</u> Purple Finch	6,7,7,7
23		
24	<u>Spinus tristis</u> American Goldfinch	6,5,3,3
25	<u>Pipilo erythrophthalmus</u> Rufous-sided Towhee	6,7,6,6
26		
27		

1	<u>Passerculus sandwichensis</u> Savannah Sparrow	7,5,3,3
2		
3	<u>Pooecetes gramineus</u> Vesper Sparrow	7,5,3,3
4		
5	<u>Chondestes grammacus</u> Lark Sparrow	6,5,3,3
6		
7	<u>Aimophila aestivalis</u> Bachmann's Sparrow	7,6,3,6
8		
9	<u>Junco hyemalis</u> Dark-eyed Junco	7,6,3,6
10		
11	<u>Spizella passerina</u> Chipping Sparrow	7,6,3,5
12		
13	<u>Spizella pusilla</u> Field Sparrow	7,6,3,4
14		
15	<u>Zonotrichia querula</u> Harris Sparrow	
16		
17	<u>Z. albicollis</u> White-throated Sparrow	7,6,4,6
18		
19	<u>Passerella iliacea</u> Fox Sparrow	7,6,4,6
20		
21	<u>Melospiza lincolni</u> Lincoln's Sparrow	7,6,4,6
22		
23	<u>M. georgiana</u> Swamp Sparrow	7,6,4,6
24		
25	<u>M. melodia</u> Song Sparrow	7,6,4,6
26		
27		

¹Classification scheme after that of the American Ornithologists Union.

²Habitat ratings are for pure pine, pine-hardwood, bottomland hardwood, and upland hardwood types, respectively.

1 Most of the above species are found at early stages of ecologic
2 succession during pine regeneration. Warblers are often seen
3 feeding in pine crowns during fall and spring migrations. Most
4 notable of these are Black-throated Green Warbler, Black-and-
5 white Warbler, Pine Warbler, Prairie Warbler, and Yellow Warbler.

6 The Bobwhite is another "weed" species that thrives after
7 disturbance by site preparation. These birds occur in high
8 population densities until stands are about seven years of age,
9 at which time ^{timber-} stand density is such that the birds' cover requirements
10 are no longer met. The American Woodcock also occurs commonly in
11 clearcuts and young plantations. Clearcut ^{areas} are used by both
12 sexes for roosts and by males for roding grounds. Population
13 densities as high as one bird per acre have been observed south
14 of the Harrison Bayou Area.

15 The Pine-Hardwood type provides good bird-watching
16 opportunities for. Broad-winged Hawk, Red-shouldered Hawk,
17 American Kestrel, American Woodcock, Yellow-billed Cuckoo, Roadrunner,
18 Screech Owl, Great-horned Owl, Barred Owl, Common Nighthawk, Common
19 Flicker, Pileated Woodpecker, Red-bellied Woodpecker, Red-headed
20 Woodpecker, Hairy Woodpecker, Great-crested Flycatcher, Eastern Phoebe,
21 Acadian Flycatcher, Alder Flycatcher, Blue Jay, Common Crow, Carolina
22 Chickadee, Tufted Titmouse, White-breasted Nuthatch, Brown Creeper,
23 Brown-headed Nuthatch, House Wren, Carolina Wren, Catbird, Brown
24 Thrasher, Wood Thrush, Hermit Thrush, Swainson's Thrush, Gray-cheeked
25 Thrush, Veery, Eastern Bluebird, Blue-gray Gnatcatcher, Golden and
26 Ruby-crowned Kinglets, Cedar Waxwing, White-eyed Vireo, Yellow-throated
27 Vireo, Solitary Vireo, Warbling Vireo, Black-and-white Warbler,

1 Prothonotary Warbler, Black-throated Green Warbler, Pine Warbler,
2 Yellow-breasted Chat, Cardinal, and Indigo Bunting.
3 Green Heron, Little Blue Heron, Black-crowned Night Heron, and
4 Yellow-crowned Night Heron may also frequent wet areas within this
5 type.

6 The Bottomland Hardwood type, as noted,
7 is the most important component of the proposed natural area. In
8 addition to the species listed for the pine-hardwoods, indicator
9 species include Little Blue Heron, Louisiana Heron, Black and Yellow-
10 crowned Night Heron, Wood Ibis, White-faced Ibis, White Ibis, Mallard,
11 Wood Duck, Sharp-shinned Hawk, Cooper's Hawk, Red-shouldered Hawk,
12 Broad-winged Hawk, Bald Eagle, Osprey, Turkey, American Coot,
13 American Woodcock, Screech Owl, Great Horned Owl, Barred Owl, Common
14 Flicker, Pileated Woodpecker, Red-bellied Woodpecker, Red-headed
15 Woodpecker (in winter), Yellow-bellied Sapsucker, Downy and Hairy
16 woodpeckers, Ivory-billed Woodpecker?, Olive-sided Flycatcher, Tree and
17 Rough-winged Swallows, Hermit Thrush, Red-eyed Vireo, Prothonotary
18 Warbler, Swainson's Warbler, Worm-eating Warbler, Tennessee Warbler,
19 Orange-crowned Warbler, Nashville Warbler, Northern Parula, Yellow
20 Warbler, Yellow-rumped Warbler, Cerulean Warbler, Blackburnian
21 Warbler, Yellow-throated Warbler, Chestnut-sided Warbler, Bay-breasted
22 Warbler, Blackpoll Warbler, Ovenbird, Northern Waterthrush, Louisiana
23 Waterthrush, Kentucky Warbler, Mourning Warbler, Common Yellow Throat,
24 Hooded Warbler, Wilson's Warbler, American Redstart, Orchard and
25 Northern Orioles, and Rusty Blackbird.

26 The American Bald Eagle and Osprey were not included in the
27 discussion of rare and endangered species because

1 their current population in the Caddo Lake area
is unknown.

2 There are instances of eagle sightings, as well as Osprey, but
3 breeding flocks are not known to be there..

4 The Bottomland Hardwood area provides some excellent Wild
5 Turkey habitat. Size of area included in hardwood, both bottomland
6 and upland, is just sufficient to support a reasonable population
7 of ^{these} birds.

8 The Upland Hardwood area contains a similar avifauna to the
9 Bottomland Hardwood type. Aquatic species are, of course, less
10 abundant here. Screech and Barred owls appear to make
11 particular use of this area, as several birds were heard calling
12 from upland perches. This also probably ^{is} due to the fact that
13 several clearings and openings are situated near the upland hardwood
14 area. Capromulgids, too, seem numerous.

15 SUMMARY AND RECOMMENDATIONS

16 The Harrison Bayou Natural Area probably represents the best
17 example of bottomland hardwood in Texas. Much of the
18 area appears to be virgin. ^{both} Species diversity, [^] plant and
19 animal, is impressive. There is an excellent opportunity for
20 teaching and research on the area, provided access is permitted.

21
22 Since some fourteen habitat, or cover, types exist on the area,
23 ^{field-class instruction on forest}
24 cover types and communities, ^{is conveniently afforded.} In addition, the pine-to-hardwood
25 transition areas present an opportunity to teach such concepts as
26 edge-effect and community gradients. In one or two days of
27 field instruction, a teacher could demonstrate most relationships of

1 forest-cover types in East Texas without leaving this geographical area.

2 Research potential for Harrison Bayou is notable *because of* the
3 opportunity to study changes in animal and plant species composition with *biome*
4 succession and by cover type. *Examples:* The beaver population is at a level which
5 would allow demographic dynamics studies. *And* as the area has a high density
6 of hole-nesting and hole-using birds and mammals, population
7 dynamics of these could be studied under undisturbed conditions, *thus*
8 *providing* baseline data for future disturbance analyses.

9
10 LITERATURE CITED

- 11 Blair, W. F. 1950. The biotic provinces of Texas. *Tex. J. Sci.* 2:93-117.
12 Davis, W. B. 1966. The Mammals of Texas. *Tex. Parks and Wildl. Dept.*
13 *Bull.* 41.
14 Raun, G. R., and F. R. Gehlbach. 1971. Amphibians and Reptiles in Texas.
15 *Dallas Museum of Nat. Hist. Bull.* 2.
16 U. S. F. S. 1971. *Wildlife Management Handbook: Southern Region.*
17 U.S.D.A. For. Serv. FSH 2609.23.