

wetlands or used the tract only as a hunting area. The white-tailed kite (Elanus leucurus) was nesting on the site.

Endangered/Threatened Species

The USFWS lists 11 threatened or endangered species for the Dickinson Bayou watershed (Walsh Engineering, Inc., 1993). For five of these species, the watershed is historic range only, with no recent confirmed sightings. The threatened arctic peregrine falcon (Falco peregrinus tundrius) is listed as occurring in the bayou watershed during migration only. Four species--the bald eagle (Haliaeetus leucocephalus), American peregrine falcon (Falco peregrinus anatum), prairie dawn (Hymenoxys texana), and Houston toad (Bufo houstonensis)--are listed as endangered. The bald eagle may winter in the area around large bodies of water from December to March. The American peregrine falcon may occur in the watershed during migration.

The TPWD lists 15 species for the watershed, seven species as endangered and eight as threatened (Walsh Engineering, Inc., 1993). The seven endangered species are the black bear (Ursus americanus), Attwater's prairie chicken (Tympanuchus cupido attwateri), bald eagle, loggerhead sea turtle (Caretta caretta), western smooth green snake (Opheodrys vernalis blanchardi), paddlefish (Polyodon spathula), and prairie dawn. Threatened species are the white-faced ibis (Plegadis chihi), American swallow-tailed kite (Elanoides forficatus), wood stork (Mycteria americana), white-tailed hawk (Buteo albicaudatus), Texas horned lizard (Phrynosoma cornutum), timber rattlesnake (Crotalus horridus), alligator snapping turtle (Macrochelys temminckii), and reddish egret (Egretta rufescens). In addition, the TPWD lists two Federal Category 2 species within the watershed, Texas windmill-grass (Chloris texensis) and Houston machaeranthera (Machaeranthera aurea). There have been no confirmed sightings of federal or state listed endangered or threatened species within the watershed recently (Walsh Engineering, Inc., 1993).

Vegetation

Dickinson Bay and Dickinson Bayou are in the Gulf Prairie and Marsh ecological area of Texas (McMahan et al., 1960). The climax vegetation of the Gulf Prairie is largely tall grass prairie or post oak (Quercus stellata) savannah. Much of the area has been invaded by brush, such as mesquite (Prosopis glandulosa), oaks, prickly pear (Opuntia sp.), and several acacias (Gould, 1975). The principal climax grasses are big bluestem (Andropogon gerardii), seacoast bluestem (Schizachyrium scoparium), eastern gammagrass (Tripsacum dactyloides), and switchgrass (Panicum virgatum). The Gulf Marsh generally lies in narrow belts adjacent to the coast. Frequent in moist shoreline sites are gulf cordgrass (Spartina spartinae), marshhay cordgrass (S. patens), coastal saltgrass Distichlis spicata, shoregrass

(Monanthochloe littoralis), bitter panicum (Panicum amarum), and seashore dropseed (Sporobolus virginicus) (Gould, 1975).

Vegetation types found within the bayou watershed and near Dickinson Bay are marsh, forest, and coastal prairie. Most of the native tall grass prairie has been converted to agricultural use or has changed to brushland. Brushland areas are dominated by Chinese tallow (Sapium sebiferum), groundsel bush (Baccharis halimifolia), southern bayberry (Myrica cerifera), and marsh elder (Iva frutescens) (Walsh Engineering, Inc., 1993). Brushland areas are generally located outside of the riparian area of the lower bayou but are adjacent to many of the ditches and upper reaches of the tributaries.

Marsh elder and needle rush (Juncus roemerianus) dominate the brackish marsh within lower Dickinson Bayou from Gum Bayou to Highway 146. Other marsh species are smooth cordgrass (Spartina alterniflora), marshhay cordgrass, spikerush (Eleocharis spp.), bulrush (Scirpus spp.), coastal saltgrass, and groundsel bush. Marshes in the upper bayou contain arrowhead (Sagittaria sp.) and common reed (Phragmites australis).

Walsh Engineering, Inc. (1993) divides the forest vegetation along the bayou into a cedar elm (Ulmus crassifolia) woodland and riparian mixed hardwood. The cedar elm woodland consists mainly of cedar elm and winged elm (U. alata) and is limited to the bayou downstream of Highway 3. The riparian mixed hardwood is found upstream of Highway 3. The riparian woodland area varies from approximately 35 to 498 m in width. Woodland species are willow oak (Quercus phellos), green ash (Fraxinus pennsylvanica), American elm (U. americana), black willow (Salix nigra), and baldcypress (Taxodium distichum).

Jones (1986b) described vegetation for the Edgewater Development Tract. Vegetation on the tract consists of switchgrass (Panicum virgatum), marshhay cordgrass, smooth cordgrass, gulf cordgrass, coastal saltgrass, umbrella sedge (Cyperus spp.), spikerush (Eleocharis spp.), marsh elder, bushy bluestem (Andropogon glomeratus), coastal saltgrass, spider lily (Hymenocallis caroliniana), Chinese tallow, and others. Plants within the four acres of jurisdictional wetlands on the tract were mainly umbrella sedge, spider lily, and switchgrass.

Wetlands

White et al. (1992 and 1993) described wetland plant communities and delineated wetlands in the Galveston Bay area, including Dickinson Bay and Bayou. Four locations on Dickinson Bayou and one near the north shoreline of Dickinson Bay were examined for plant communities in 1990 and 1991. A low and high salt marsh (estuarine emergent [Cowardin et al., 1979]) occurred on the shoreline of lower Dickinson Bayou near Dickinson Bay. Plant

species codominant in the low marsh were Spartina alterniflora and Juncus roemerianus. Other species occurring at slightly higher elevations in the salt marsh assemblage were Distichlis spicata, marshhay cordgrass (S. patens), sea ox-eye daisy (Borrichia frutescens), Iva frutescens, Carolina wolfberry (Lycium carolinianum), S. spartinae, Andropogon glomeratus, and Bermudagrass (Cynodon dactylon). Species occurring at three sites further upstream on the bayou were primarily trees (water oak [Quercus nigra], Q. phellos, Ulmus crassifolia, sugar-berry [Celtis laevigata], loblolly pine [Pinus taeda], and sweet gum [Liquidambar styraciflua]) and shrubs (Iva frutescens).

Based on photointerpretation of 1989 color infra-red aerial photography (scale 1:62,500), approximately 802 acres of wetlands were delineated in the Dickinson Bayou watershed (table 3; fig. 5) (White et al., 1993). Most of the wetlands were palustrine scrub-shrub, palustrine emergent, and estuarine emergent (table 3). Palustrine emergent and scrub-shrub wetlands (fresh marshes) totaling approximately 194 and 335 acres, respectively, occurred in relatively small areas both north and south of the bayou. Approximately 194 acres of estuarine emergent marsh (brackish and salt marsh) were in intertidal areas along the bayou shoreline. Most forested areas were upland forested; only a few areas inland of the bayou were palustrine forested wetlands.

In the Dickinson Bay area, there were 308 acres of wetlands in 1989 (table 4; fig. 6) (White et al., 1993). Approximately 87 percent of the wetlands were estuarine emergent.

Trends in wetland distribution

A comparison of wetland distribution in the lower part of the Dickinson Bayou watershed for 1952 and 1989 indicates that there were gains and losses in wetlands over this period, but the overall trend is one of wetland loss (table 3; figs. 5, 7, and 8). Wetland area decreased from approximately 1,749 acres in 1952 to 802 acres in 1989. This loss of 947 acres amounts to 54 percent of the wetland system that existed in 1952. The actual loss in wetlands is possibly somewhat less, because delineations of wetlands in some areas on the 1952 black-and-white aerial photographs included peripheral upland areas, which inflated the 1952 wetland acreages (White et al., 1993).

Estuarine emergent wetlands (salt/brackish marshes) fringing lower Dickinson Bayou decreased from about 391 acres in 1952 to 194 acres in 1989, or 50 percent of the 1950's resource. Most of the emergent wetlands were converted to open water or barren flats (unconsolidated shore) (fig. 8). Palustrine emergent wetlands (fresh marshes) also decreased in area, from 1,336 acres in 1952 to about 220 acres in 1989, or 84 percent of the 1950's

Table 3. Wetland changes in Dickinson Bayou watershed between 1952 and 1989.

Habitat *	Acres 1952	Acres 1989	Percent +/-
PEM	1336.0	219.5	- 84
PSS	8.2	335.3	+ 4089
PFO	13.7	38.5	+ 281
E2EM	390.6	194.2	- 50
ESS	0.0	4.6	+ 460
E1AB	0.0	9.3	+ 930
PAB	0.0	0.4	+ 40
Totals	1748.5	801.8	- 54

* PEM=palustrine emergent; PSS=palustrine scrub-shrub; PFO=palustrine forested; E2EM=estuarine emergent; ESS=estuarine scrub-shrub; E1AB=estuarine aquatic bed; PAB=palustrine aquatic bed

Table 4. Wetland changes in the Dickinson Bay area between 1952 and 1989.

Habitat *	Acres 1952	Acres 1989	Percent +/-
PEM	570.7	0.3	- 99
PFO	0.0	10.2	+ 1020
E2EM	275.5	268.0	- 3
E1AB	119.9	2.4	- 98
ESS	0.0	28.1	+ 2810
Totals	966.1	308.0	- 68

Figure 5.
1989 Wetlands of the Dickinson Bayou Watershed

