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PIPELINE CORRIDORS THROUGH WETLANDS — IMPACTS ON PLANT COMMUNITIES: BAYOU GRAND CANE, DE SOTO PARISH, LOUISIANA

TOPICAL REPORT

(August 1991-July 1993)

Prepared by

L.M. Shem, G.D. Van Dyke,* R.E. Zimmerman, and D. Hayes

Center for Environmental Restoration Systems
Energy Systems Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

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GRI Project Manager
Ted Williams
Environment and Safety Research Group

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*Van Dyke is affiliated with the Department of Biology, Trinity Christian College, Palos Heights, Illinois.

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16. Abstract (Limit 200 words)

The goal of the Gas Research Institute Wetland Corridors Program is to document impacts of existing pipelines on the wetlands they traverse. To accomplish this goal, 12 existing wetland crossings were surveyed. These sites varied in elapsed time since pipeline construction, wetland type, pipeline installation techniques, and right-of-way (ROW) management practices. This report presents the results of a survey conducted over the period of August 12-13, 1991, at the Bayou Grand Cane crossing in De Soto Parish, Louisiana, where a pipeline constructed three years prior to the survey crosses the bayou through mature bottomland hardwoods. The site was not seeded or fertilized after construction activities. At the time of sampling, a dense herb stratum (composed of mostly native species) covered the 20-m-wide ROW, except within drainage channels. As a result of the creation of the ROW, new habitat was created, plant diversity increased, and forest habitat became fragmented. The ROW must be maintained at an early stage of succession to allow access to the pipeline; however, impacts to the wetland were minimized by decreasing the width of the ROW to 20 m and recreating the drainage channels across the ROW. The canopy trees on the ROW's edge shaded part of the ROW, which helped to minimize the effects of the ROW.

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Research Summary

Title	Pipeline Corridors through Wetlands — Impacts on Plant Communities: Bayou Grand Cane, De Soto Parish, Louisiana
Contractor	Argonne National Laboratory
Principal Investigators	L.M. Shem, G.D. Van Dyke, R.E. Zimmerman, and D. Hayes
Report Period	August 1991-July 1993
Objective	Document the historical impacts of pipeline rights-of-way (ROWs) on wetlands.
Technical Perspective	The impact of pipeline construction in wetlands is a very sensitive issue and one that is under strict regulatory control. Neither the natural gas industry nor the regulatory community has a documented basis to define the type, value, or environmental consequences of past pipeline activities in wetlands. This is one of a series of reports documenting these impacts. This data report is the result of field studies of a three-year-old pipeline ROW through a forested wetland, a common wetland type in the southeastern United States.
Results	Observable impacts of the ROW on hydrology and vegetation were limited to the ROW itself. Modifications to the topography of the ROW included the creation of five drainage channels across the ROW and a connecting channel along the edge of the ROW in addition to the main bayou channel. At the time of sampling, the ROW was well-drained, with flowing water in the main bayou and only occasional standing water in the other channels. The ROW supported a dense stand of herbaceous vegetation consisting of a greater number of species than was present in the adjacent forest. The species composing the ROW flora have greater fidelity to wetlands than do the species found in the adjacent forest. The dense and diverse vegetative community on the ROW developed in three years without artificial seeding or fertilization. The ROW provided habitat for plant species not found in the adjacent forest because the ROW vegetation lacked competition from shrubs and trees. Maintenance plans are designed to keep the ROW free of large woody plants. The presence of the ROW contributes to species richness in the wetland. Future studies are needed to determine the

direction of future succession of the ROW vegetation and the rate of reinvasion by other species found in the adjacent natural areas (NAs).

Technical Approach

A relatively homogeneous study site was selected within a forested wetland community occupying about 300 meters along the ROW within the floodplain of Bayou Grand Cane. General observations on hydrology and soil cores were recorded, along with plant cover from transect plots within both sides of the ROW and the NAs on either side of the ROW. Plant data were analyzed to determine similarities and differences between the two sides of the ROW and the two adjacent NAs.

Project Implications

This study shows that within three years after installation of the pipeline, the ROW in this wetland community developed a dense stand of mostly native plant species without seeding, liming, or fertilization. Because this site is seasonally flooded and drainage channels have been restored across the ROW, it is unlikely that the hydrology of the site has been changed. The ROW vegetation contributes to the species richness of the wetland and creates habitat diversity; however, it also creates an interruption in the natural plant community. Future impacts will be determined by maintenance practices and the degree to which the forest canopy expands to overhang the ROW.

Ted A. Williams
GRI Project Manager
Environment and Safety Research Group

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Pipeline Corridors through Wetlands — Impacts on Plant Communities: Bayou Grand Cane, De Soto Parish, Louisiana

by

L.M. Shem, G.D. Van Dyke, R.E. Zimmerman, and D. Hayes

1 Introduction

1.1 Background

Pipelines for the distribution of natural gas traverse all types of terrain, including wetlands. Prior to the wetlands regulatory climate of the late 1980s and the early 1990s, the construction of right-of-way (ROW) corridors through wetlands was often welcomed by landowners and local communities; ROW corridors opened up wetlands, thereby providing public access. With the promulgation of more stringent regulations related to development activities (including no-net-loss wetland policies), an assessment of the historical impacts of pipeline ROWs through wetlands is needed to evaluate construction and reclamation methods, assist in future permit application processes, and evaluate future construction costs.

The Gas Research Institute (GRI) Wetland Corridors Program was designed to evaluate impacts of gas-pipeline construction and subsequent maintenance on wetlands. The data gathered through this GRI program provide a better understanding of the type, degree, and duration of impacts of various pipeline-construction techniques. This information will enable the industry to evaluate current construction practices and provide factual input to regulatory bodies.

Careful evaluation of the impacts of pipeline installation on wetlands is necessary because specific impacts may be beneficial to some plant and/or animal species and detrimental to others. Some impacts may appear to be detrimental when, in fact, they improve conditions for certain sensitive species or provide for greater diversity of species and habitat.

The initial questions addressed by the GRI Wetland Corridors Program are as follows:

1. Do ROW construction and/or management practices lead to differences in ROW plant communities with respect to adjacent wetland communities?

2. Does the ROW alter the diversity of the adjacent wetland community? If so, how far do the impacts extend?

3. Does the ROW enhance species diversity of the wetland?

4. Are there ROW construction and management practices that can enhance the positive contributions of ROWs to wetlands and minimize detrimental impacts?

Answers to these broad questions will provide information related to a number of more specific questions. Data on the type of plant communities that develop on ROWs in various wetlands when specific pipeline construction and management practices are utilized and comparison of the ROW plant communities with the plant communities in areas adjacent to the ROW will provide a basis for comparing environmental impacts of previous and current construction and management practices. Valuable data for such comparisons include numbers of plant species present, species that are dominant, percentage of the species that are native to the area, and fidelity of the plants to wetlands. Other measures of the quality of species present are also valuable, but those data are not available at present.

Concern exists as to whether pipeline corridors provide avenues of access for nonnative and invasive plants. Whether such plants become established along pipeline ROWs and from there invade adjacent areas, and the extent to which such invaders modify the plant communities in adjacent areas, are important to determining potential impacts of pipelines on wetlands.

Potential positive impacts are also important to assess. The degree to which ROWs provide habitat for rare or endangered species and other desirable species that are poorly represented in the adjacent areas is important information. Assessments of impacts of pipeline corridors on wetlands should also include the contribution of corridors to both plant and animal species diversity.

Answers to the above questions will assist the industry and regulatory agencies in evaluating current installation and management practices and making modifications that are beneficial to wetland quality enhancement.

1.2 Goal and Objectives

The goal of the GRI Wetland Corridors Program is to document impacts of existing pipelines on the wetlands they transverse. To accomplish this goal, 12 existing wetland crossings were surveyed. The sites evaluated differed in years since pipeline installation (ranging from 8 months to 31 years), wetland type, installation technology used, and management practices. Each wetland survey had the following specific objectives:

- Document vegetative communities existing in the ROW and in adjacent wetland communities;
- Evaluate similarities and differences between the plant communities in the ROW and in the adjacent wetland communities;

- Document qualitative changes to the topography, soils, and hydrology attributable to ROW construction; and

- Identify impacts caused by ROW construction on rare, threatened, endangered, or sensitive species.

These individual wetland objectives were fulfilled by the collection and analysis of field data and the presentation of those data and their analysis in nine individual site reports. An upcoming summary report further synthesizes and interprets the data from all individual sites.

This report is a site report of field studies carried out on August 12 and 13, 1991, at the Bayou Grand Cane wetland crossing, approximately four miles southeast of Logansport, Louisiana.

2 Description of Study Area

2.1 Site Selection and Location

The Bayou Grand Cane study site is located in northwest Louisiana in a palustrine forested wetland (Cowardin et al. 1979). A gas pipeline ROW crosses the bayou through bottomland hardwood. The staff of a local pipeline company assisted the Argonne National Laboratory (ANL) team in selecting this site, which is classified as a "Jurisdictional Wetland" under Section 404 of the Clean Water Act (see Appendix A). The site was selected on the basis of a wetland that extended at least 200 m along the ROW and included at least 50 m of wetland on each side of the ROW center.

The study site, shown in Figure 1, is located approximately 4 mi (6.4 km)* southeast of Logansport, Louisiana, about 1 mi (1.6 km) southeast of the intersection of U.S. Route 84 and State Route 763.

2.2 Soil

Soil at the study site is classified as Guyton (Soil Conservation Service [SCS] 1991a), a silty, loamy, highly acidic, highly erodible bottomland alluvial soil that has low permeability, is frequently flooded, and is found in areas with slopes of less than 1%. It is classified as a hydric soil (SCS 1991b) and is most commonly found in woodlands.

2.3 Hydrology

The Bayou Grand Cane site is in the floodplain of the backwaters of the Sabine River Authority's Toledo Bend Reservoir. The floodplain of Bayou Grand Cane is several hundred meters wide at the pipeline crossing. As a result of the flood control reservoir, these bottomlands are flooded in late winter and early spring each year. During drier seasons, the site is well drained.

The site varies in elevation by less than 3 m (10 ft), except for the depressions at five channels that cross the site. One of the conditions for construction of the pipeline was reconstruction of the five channel crossings (two deeper and three shallower) in addition to the main channel. The locations of all channels are shown in Figure 2.

* Measurements are given in metric units except where they were actually measured in English units; in these cases, metric equivalents are given in parentheses.

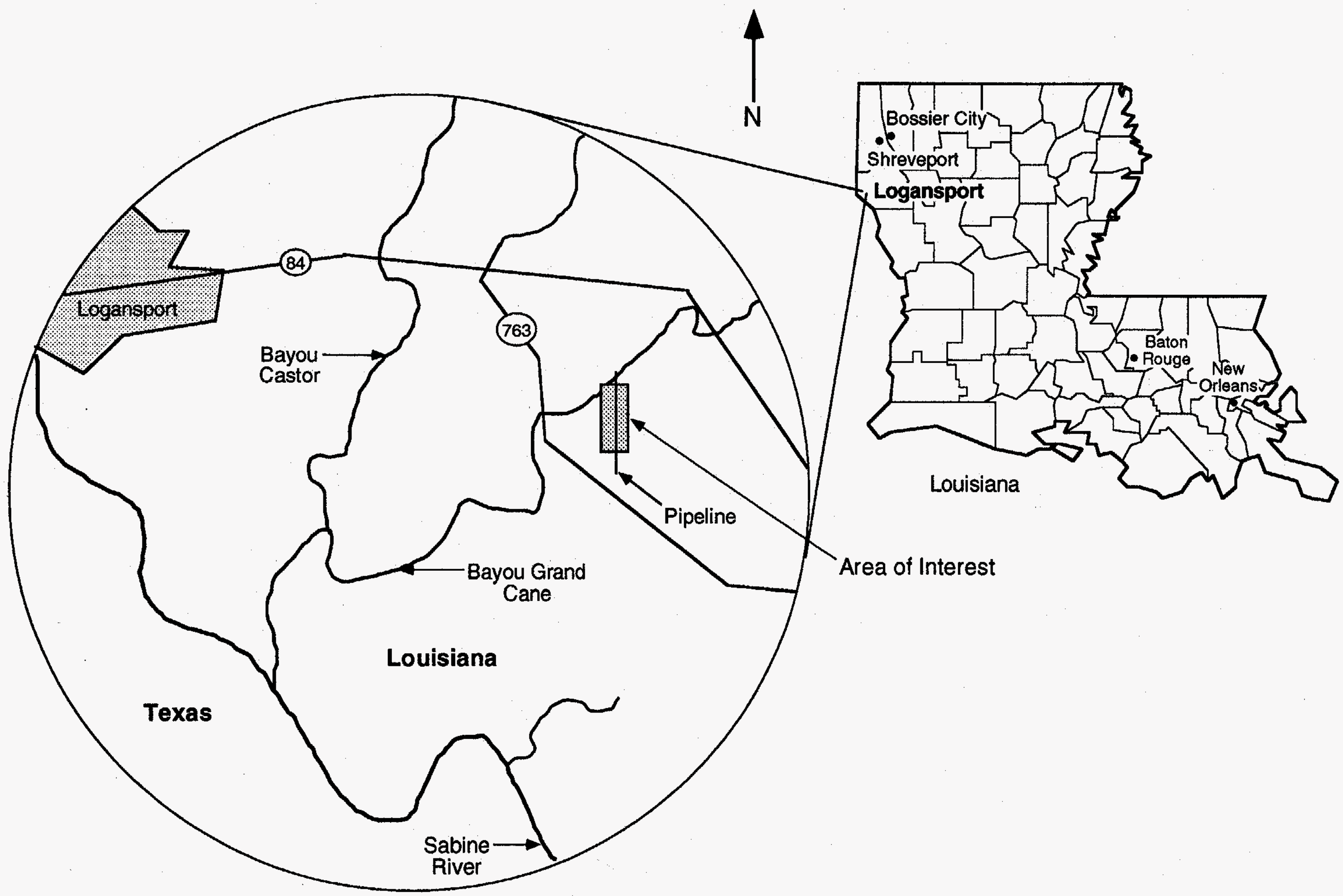

FIGURE 1 Location of the Bayou Grand Cane Study Site in De Soto Parish, Louisiana

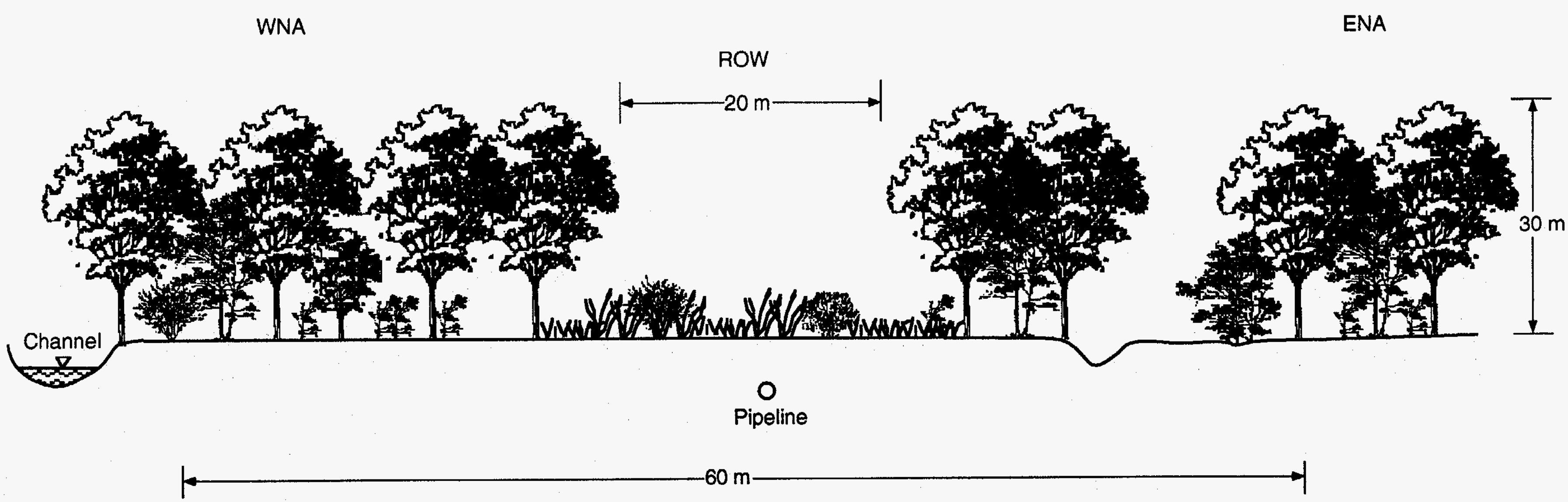

FIGURE 2 Generalized Cross-Section of the Study Site Showing the ROW, Pipeline Location, and Vegetation Types

2.4 Climate

The Logansport area has long, hot, humid summers and short, mild winters. Annual precipitation averages 49 in. (124.5 cm), and average temperatures range from 47°F (8°C) in the winter to 79°F (26°C) in the summer. The lowest recorded temperature is 5°F (-15°C); the highest is 108°F (42°C). Precipitation is even throughout most of the year, and prolonged droughts are rare. From April to September, rainfall averages 25 in. (63.5 cm).

2.5 History and Management Practices

Area History. The area surrounding the study site contains numerous natural-gas wells. The study site is part of the reservoir capacity for the Sabine River Authority and is periodically flooded. A total of 8,000 ft (2,438 m) of pipeline traverses the wetland at the study site. The vegetation consists primarily of bottomland hardwood trees, although bald cypress and loblolly pines are also present.

Pipeline Construction. Construction of the pipeline through the study site was completed in April 1989. Conventional trench and backfill techniques were used for pipeline construction. The 4-in. (10.2 m)-diameter pipeline is a collection line that transports natural gas approximately 8,000 ft (2,438 m) from a wellhead to a nearby condensate removal/compressing station.

Postconstruction and Maintenance. No seed or fertilizer was applied to the portion of the ROW within the wetland crossing; the surrounding natural and disturbed areas provided the seeds for revegetation of the study site. However, the portion of the ROW immediately to the south of the study site (in the upland area just beyond the wetland) was seeded by a hunting club to provide food for wildlife. Information about the species used for seeding was not available. Management practices consist of routine maintenance performed on the ROW to maintain access to the pipeline. Maintenance of the ROW at this site consists of "brush whacking" by hand and machine during late summer on a three-year cycle.

3 Approach and Methods

3.1 General Approach

The primary objectives listed in the Introduction (Section 1.2) provided the general guidelines for this study. To allow comparison of results across sites, methodologies for site reconnaissance, vegetation data collection, and data analysis used at this site were similar to those used at the other sites. However, sampling methodology at this site was adapted to include large plots designed to provide data on the forest canopy.

3.2 Habitat Description

The pipeline and ROW extend in a south-to-north direction through the study area, as shown in Figure 1. The natural vegetation off the ROW consists of a dense canopy of nearly mature native bottomland hardwoods, bald cypress and loblolly pine trees, an intermittent understory, and a relatively sparse herb stratum. Vegetation on the 20-m-wide ROW consists of a dense stand of herbaceous species with scattered woody seedlings. Sampling was performed in both habitats: the ROW and the NAs adjacent to the ROW that were undisturbed by pipeline activity. These two habitats were subdivided, based on their relationship to the center of the ROW, into east ROW, west ROW, east natural area (ENA), and west natural area (WNA) (Figure 2).

3.3 Sampling Design for Vegetational Studies

Transects. Five transects were established perpendicular to and crossing the ROW at 30-m intervals (see Figure 3). Each transect extended 30 m east and 30 m west from the center of the ROW. Herbaceous vegetation on the ROW was sampled in two 2-m × 5-m plots along each transect. The two plots consisted of rectangles 2 m wide along each transect. The plots extended 5 m in either direction from the center of the ROW. Similar 2-m × 5-m plots were used to sample the herb stratum within the bottomland hardwoods. Each plot began 20 m from the center of the ROW and extended to 25 m from the center of the ROW. Shrubs, saplings, and trees were sampled in the NAs by using 10-m × 15-m plots that began 15 m from the center of the ROW and extended to 30 m from the center of the ROW. The transects extended through the middle of the plots. Figure 4 shows plot locations along one transect.

Sampling Procedures. ANL collected data on vegetation from each of the measured plots. Specimens of each plant species found in or near the plots were collected as voucher specimens. Visual estimates of areal coverage were recorded for each species by stratum in each plot, and the individual diameters at breast height (dbh) of trees were measured and recorded by species. These measurements were later converted to basal areas.

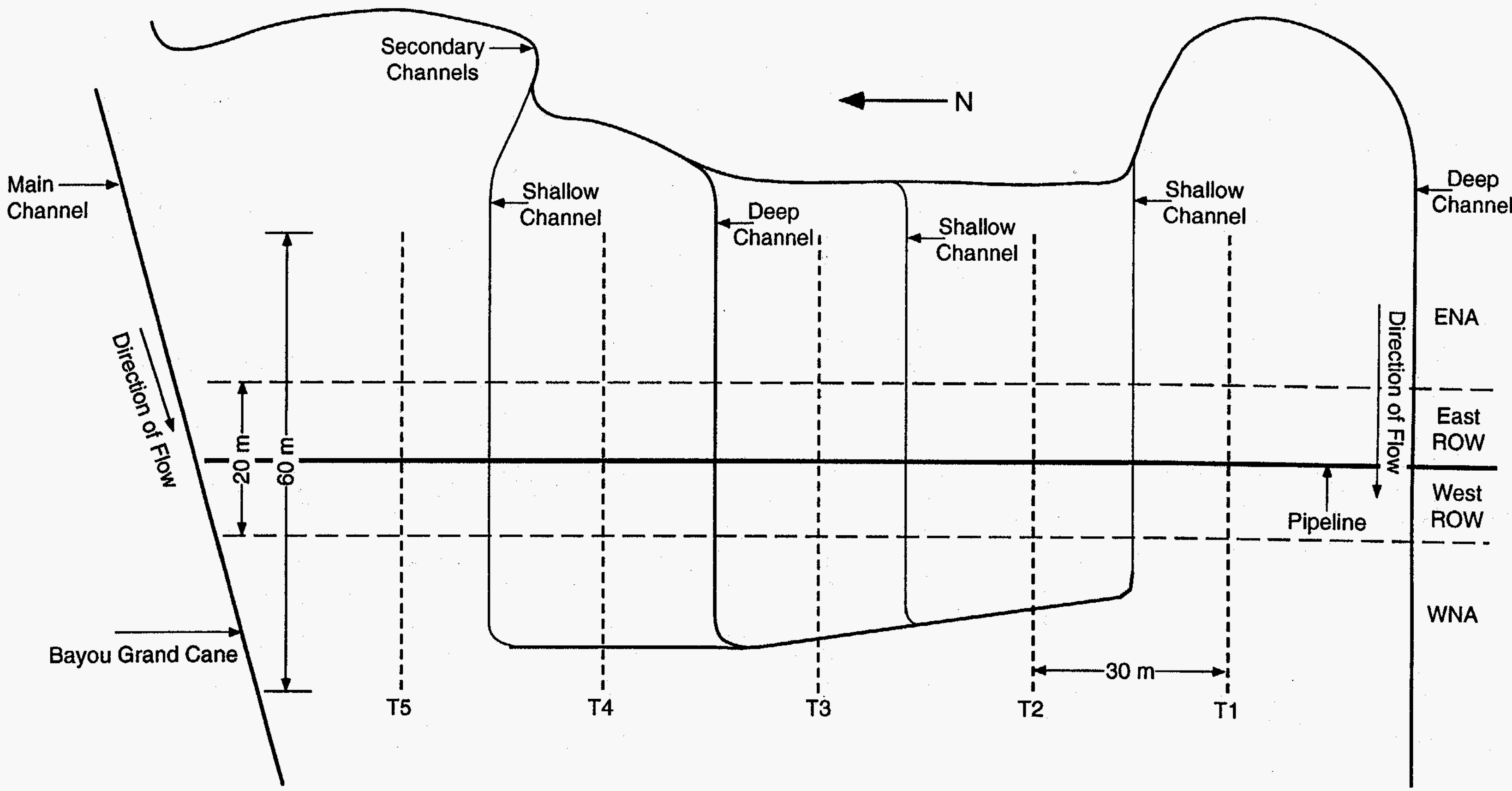

FIGURE 3 Plan View of the Study Site Showing Transect Length and Spacing

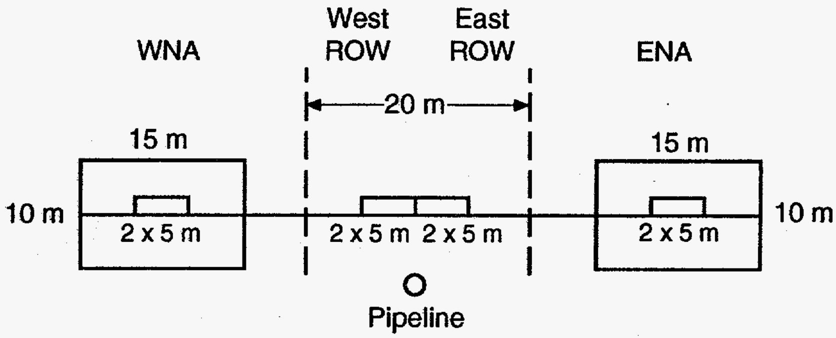

FIGURE 4 Location and Dimensions of Sampling Plots along One Transect

The definitions of the vegetative strata (herbs, shrubs, saplings, and trees) used in this report were taken from the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (better known as the 1989 Federal Manual) (Federal Interagency Committee for Wetland Delineation [FICWD] 1989). The herbs were defined as herbaceous plants, including graminoids, forbs, ferns, herbaceous vines, and woody species under 3 ft (0.91 m) in height. Shrubs included multistemmed, bushy shrubs and small trees and saplings between 3 and 20 ft (0.91 and 6.1 m) high. Saplings were defined as having a dbh of 0.4 to 4.9 in. (1.0 to 12.4 cm) and a height exceeding 20 ft (6.1 m). Trees were defined as having a dbh of greater than or equal to 5.0 in. (12.7 cm) and a height exceeding 20 ft (6.1 m). One plant species could occur in any or all strata. Coverage estimates were also made for surface water and bryophytes in each plot.

3.4 Data Analysis

Analyses of vegetative data collected from sampling plots for all 17 sites studied as part of the GRI Wetland Corridors Program were consistent. Analyses focused on comparing the plant communities on the ROW with those in the NAs and determining hydrophytic characteristics of the plant communities in each area. Particular attention was given to dominant species because they are used in several wetland delineation methods. Although the number of species dominant, species richness, and the variety of plant life-forms present are all aspects of community diversity, no diversity indices were calculated. Diversity indices that use coverage values as measures of species importance were considered, but they were judged inappropriate because of differences in the number of strata in the ROW and NAs for the sites included in the Wetland Corridors Program and because coverage values are not additive across strata.

Species Richness, Wetland Indicator Categories, and Species Characteristics. The total number of species present (species richness) was determined for each side of the ROW, for the total ROW, for each NA, and for the NAs combined. Wetland indicator categories (Reed 1988) were identified for each species in the study plots. These categories are defined in Appendix B, Section B.1. The number of species in each category was determined for each area by stratum and for all strata combined. Because one plant species could occur in any or all strata, when data from different strata were combined, each species was considered only once, independent of the number of strata in which it occurred. Species characteristics, including life-forms and origins, were also determined from Reed (1988). Symbols for life-forms and species origins are given in Appendix B, Section B.2.

Dominant Species. The definition of and methodology for the determination of dominant species in this study were taken from the 1989 Federal Manual (FICWD 1989). In the manual, dominance refers "strictly to the spatial extent of a species that is directly discernible or measurable in the field," as opposed to number of individuals present. Using this definition, dominant species were identified by plant stratum, rather than by total community. For each area, the dominant species were determined for each stratum by ranking each species in a plant stratum in descending order relative to total areal coverage of all plants in that stratum. The highest ranking species, which make up 50% of the total areal coverage or half of the total relative percent coverage (RPC), are the dominant species for that stratum. Any remaining species with 20% or more RPC are also considered dominant.

Community Similarity Indices. Sørensen's coefficient of community index (CC_S) was used to measure similarity between vegetative communities (Brower, Zar, and von Ende 1990). This index uses the following formula:

$$CC_S = 2c/(a+b) \tag{1}$$

where

a = the number of species in community A,

b = the number of species in community B, and

c = the number of species in common between communities A and B.

A CC_S value of 1.00 indicates 100% similarity in species composition between communities A and B. A value of 0.00 represents no species in common. Community similarity indices that use coverage values as measures of species importance were considered, but they were judged inappropriate because of differences in the strata present in the plant communities on the ROW compared to those in the NAs and because of the nonadditive characteristic of coverage data.

Comparisons were made between the combined ROWs and combined NAs, the two portions of the ROW, each portion of the ROW and its adjacent NA, and the two NAs.

Prevalence Index Values. Prevalence index values (PIVs) were calculated according to methods outlined in the Federal Manual (FICWD 1989), substituting RPC data from quadrat coverage estimates for relative frequencies from intercept data. This substitution is logical because both relative frequency and RPC are estimates of relative coverage (Bonham 1989). The PIV is an average wetland indicator value ranging from 1.0 to 5.0 and weighted by the RPC. Because areal coverage was determined by stratum, the PIVs were calculated for each area by stratum only. The average RPCs for each species in the five plots in each area were used in calculating the PIV for the area. The equation for calculating a PIV is presented in Appendix B, Section B.3.

Average Wetland Values. Average wetland values (AWVs) (Zimmerman et al. 1991) were calculated for the species in each of the five areas. This index is an average of the wetland indicator values for all plants present. It differs from the PIV in that it is not weighted by RPC; rather, all plants present are represented equally, regardless of their frequency of occurrence. Because areal coverage is not considered, the calculation of an index value is not restricted to one vegetative stratum. An overall site AWV was determined, as well as values for each stratum. See Appendix B, Section B.4, for the equation.

4 Results

4.1 General Ecology

Topography throughout the wetland area is generally level. The site is located in a flat basin that varies in width along both sides of the Bayou Grand Cane. The area is periodically flooded during high water levels in the reservoir operated by the Sabine River Authority. Where the ROW crosses the wetland, the basin extends southward from the bayou approximately 300 m. In addition to the main channel, the five smaller channels of varying depths (5-10 ft [1.5-3 m] deep) that crossed the ROW were restored after pipeline construction. Several of the channels had steeply sloping, almost vertical sides. At the time of sampling, only pockets of standing water were present in the channels. No signs of flow direction within the channels or erosion along the steep banks were apparent. Flow directions in the area are dependent on rising and falling water levels in the reservoir. Soil samples collected from the sample plots using a hand auger were consistent with the description for Guyton silty loam described by SCS (1991b). The ROW vegetation consisted of a dense herb stratum, except in the channels, where little or no vegetation was observed.

4.2 Plant Community

Names of plant species, individual plot coverage estimates (by species), and a summary of coverages for each species in each area are provided in Appendix C, Tables C.1, C.2, and C.3. Figure 4 shows a generalized cross-section of the vegetation types in the study site. The WNA within the study site was slightly lower in elevation than the ROW and was dominated by bottomland hardwoods with scattered loblolly pine. Sums of the estimated areal coverages of all species in the shrub and sapling understory strata were only 39% and 18%, respectively. The herb stratum was also incomplete; the sum of the areal coverage of all species was only 37%. The ENA contained a greater diversity of habitat, including several drainage channels and a small knoll in the third transect. Sums of the areal coverages of all species were 33% for the shrub stratum, 10% for the sapling stratum, and 48% for the herb stratum. Vegetation was also more diverse and included bald cypress trees near the channels. The sum of the areal coverages of all species on the ROW was 192%, indicating a dense stand, with plants of different species overlapping.

Plant Species, Life-Forms, and Species Origins. One hundred thirty-two taxa of vascular plants were collected from the study site (Appendix C, Table C.1). Of these, 123 were identified to species; regional wetland indicators (Reed 1988) were determined for 122 of the 123 species. One plant, winged sumac (*Rhus copullinum*) was identified to species, but has not yet been assigned a regional indicator (Reed 1988). Four taxa were identified to genus only, and five grasses/sedges could not be identified to the genus level. On the basis of vegetative differences, all of the unknowns were assumed to be separate species. Wetland indicators could not be assigned to plants identified only to genus or classified as unknowns. Of the 132 species, 15 were found outside the sampling plots and excluded from further data analysis. Percent areal coverage, species diversity, species dominance, and wetland indicator values for the different transects and habitats were determined on the basis of the 117 taxa that occurred within the sampling plots.

Of the 107 identifiable vascular plant species occurring in the sampling plots, four are listed as introduced species (Reed 1988). Chinese privet (*Ligustrum sinense*), a shrub, was a minor component in one plot of the ENA. Upright yellow woodsorrell (*Oxalis europaea)* occurred in one plot on the east side of the ROW, and bahia grass (*Paspalum notatum*) occurred in one plot on the west side of the ROW. Shrubby camphor-weed (*Pluchea odorata*), which occurred in only one plot in each NA (east and west), was the primary dominant species in both the east and west sides of the ROW, with over 26% relative coverage.

Species Richness and Wetland Indicator Categories. Table 1 shows the number of plant species found in the NAs and in the ROW by wetland indicator categories and vegetative strata. Because a plant species can occur in one or more strata, when data from all four strata were combined, each species was considered only once, regardless of the number of strata in which it occurred.

Table 1 gives the total numbers of species found in the NAs and in the ROW (columns 3 and 4), the number of species common to both habitats (column 5), and the number of species unique to each habitat (columns 6 and 7). The herb stratum contained a total of 101 species. The ROW had higher diversity, with a total of 75 species versus 45 in the NAs. Of the total species, 19% were common to both habitats, 56% were unique to the ROW, and 26% were unique to the NAs. Of the plant species in the ROW, 59% were either obligate wetland (OBL) (27%) or facultative wetland (FACW) (32%), 17% were facultative (FAC), and 13% were either facultative upland (FACU) (12%) or upland (UPL) (1%). The remaining 11% of the plants in the ROW were not identified to species and were therefore not classified. In the NAs, 44% of the plants were either OBL (11%) or FACW (33%), 33% were FAC, and 15% were either FACU (13%) or UPL (2%); the remaining 7% of plants in the NAs were not identified to species.

Shrubs, saplings, and trees occurred only in the NAs. Twenty-five species of shrubs were found on the study site: 28% were either OBL (8%) or FACW (20%), 48% were FAC, and 20% were either FACU (16%) or UPL (4%). One species (4%) was an introduced, uncategorized species. Eleven species occurred in the sapling stratum: 27% were FACW, 64% were FAC, and a single species (9%) was UPL. The tree stratum included eleven species: 36% were OBL (18%) or FACW (18%), 45% were FAC, and one species (9%) was an upland species. Only four of the tree species were also found in the sapling stratum.

Greater diversity was observed in the herb stratum of the ROW (75 species) than in all of the strata in the NAs combined (63 species). Of the species in the herb stratum, 18% were found in both the ROW and NAs, 46% were unique to the ROW, and 36% were unique to the NAs. Of the 107 taxa identified to species from all strata combined, 56% were either OBL (21%) or FACW (35%), 28% were FAC, and 16% were either FACU (13%) or UPL (3%).

TABLE 1 Number of Plant Species by Wetland Indicator Category Found in the Study Plots in the NAs and the ROW (by individual stratum and combined strata)

		Number of Species					
Stratum	Wetland Indicator Category[a]	Occurring in NAs	Occurring in ROW	Common to Both Areas	Unique to NAs	Unique to ROW	Total
Herb	OBL	5	20	5	0	15	20
	FACW	15	24	4	11	20	35
	FAC	15	13	4	11	9	24
	FACU	6	9	4	2	5	11
	UPL	1	1	0	1	1	2
	Unid[b]	3	8	2	1	6	9
	Total	45	75	19	26	56	101
Shrub	OBL	2	0	0	2	0	2
	FACW	5	0	0	5	0	5
	FAC	12	0	0	12	0	12
	FACU	4	0	0	4	0	4
	UPL	1	0	0	1	0	1
	Unid	1	0	0	1	0	1
	Total	25	0	0	25	0	25
Sapling	OBL	0	0	0	0	0	0
	FACW	3	0	0	3	0	3
	FAC	7	0	0	7	0	7
	FACU	0	0	0	0	0	0
	UPL	1	0	0	1	0	1
	Unid	0	0	0	0	0	0
	Total	11	0	0	11	0	11
Tree	OBL	2	0	0	2	0	2
	FACW	2	0	0	2	0	2
	FAC	5	0	0	5	0	5
	FACU	1	0	0	1	0	1
	UPL	1	0	0	1	0	1
	Unid	0	0	0	0	0	0
	Total	11	0	0	11	0	11
Combined	OBL	8	20	5	3	15	23
	FACW	17	24	4	13	20	37
	FAC	22	13	5	17	8	30
	FACU	10	9	5	5	4	14
	UPL	2	1	0	2	1	3
	Unid	4	8	2	2	6	10
	Total	63	75	21	42	54	117

[a] OBL = obligate wetland species; FACW = facultative wetland species; FAC = facultative species; FACU = facultative upland species; UPL = obligate upland species. See Appendix B for more detailed information on wetland indicators.

[b] Includes plants not identified to species and species not assigned a wetland indicator value.

Table 2, presented in the same format as Table 1, compares the sample plots from the two sides of the ROW. Because no shrubs, saplings, or trees were present in the ROW, the combined-strata data are the same as the herb stratum data and therefore are not listed separately. The total number of species, including unidentified species, for the east and west sides of the ROW were similar: 64 and 61, respectively. Of the 75 species in the ROW, 67% were common to both sides of the ROW, while 19% were unique to the east side, and 15% were unique to the west side. However, the number of unique species in each of the wetland indicator categories was very similar in each side of the ROW.

Table 3 uses the same format as Tables 1 and 2 to compare species from the ENA with those from the WNA. A total of 63 species was found in the NAs, many in more than one stratum. Forty-five species were found in the herb stratum: 35 in the ENA and 27 in the WNA. Thirty-eight percent of the species in the herb stratum were found in both areas, 40% were unique to the ENA, and 22% were unique to the WNA. The shrub stratum included 25 species: 18 in the ENA and 12 in the WNA. For the shrub stratum, 20% of the species were found in both NAs, 52% were unique to the ENA, and 28% were unique to the WNA. Eleven species were present in the sapling stratum: 36% were unique to the ENA, 45% were unique to the WNA, and only 18% of the species were common to both areas. Eleven species were also present in the tree stratum: 45% of the species were common to both areas, 27% were unique to the ENA, and 27% were unique to the WNA.

Figure 5 shows the total number of species in all strata combined in each wetland indicator category for all of the study plots in the NAs and the ROW. Figure 5 shows that the greater total number of species in the ROW is accounted for by a greater number of OBL and FACW species in the ROW than in the NAs, a phenomenon that more than compensates for the greater number of FAC species in the NAs. These relationships, which are based on percentage of species in each wetland category, are also illustrated in Figure 6.

Dominance. The dominant species in each habitat were determined for individual vegetative strata by using a modification of the method outlined in the 1989 Federal Manual (FICWD 1989), as described in Section 3.4. For the NAs at this site, four strata were observed: (1) herb, (2) shrub, (3) sapling, and (4) tree. Section 3.3 provides definitions for each stratum. Table 4 lists the dominant species averaged, by stratum, over the study plots for each habitat. In the ROW, only an herb stratum was present.

In the herb stratum, four species were dominant in the 10 plots in the NAs, and four different species were dominant in the 10 plots in the ROW. The NAs were dominated by one OBL species, one FACW species, and two taxa that were identified only to genus and thus not categorized. The ROW dominants included one OBL, two FACW, and one FACU species. When the NAs were considered separately, five dominants occurred; the additional species was a FAC species. When the two sides of the ROW were considered separately, five dominants also occurred, and the additional species was classified as a FACW species.

TABLE 2 Number of Plant Species by Wetland Indicator Category Found in the Study Plots in the East and West Sides of the ROW (by individual stratum and combined strata)

		Number of Species					
Stratum	Wetland Indicator Category	Occurring in East Side of ROW	Occurring in West Side of ROW	Common to Both Sides of ROW	Unique to East Side of ROW	Unique to West Side of ROW	Total
Herb and Combined[a]	OBL	17	17	14	3	3	20
	FACW	21	19	16	5	3	24
	FAC	11	10	8	3	2	13
	FACU	7	9	7	0	2	9
	UPL	1	0	0	1	0	1
	Unid[b]	7	6	5	2	1	8
	Total	64	61	50	14	11	75

[a] No shrubs, saplings, or trees occurred in the ROW; therefore, the herb stratum and the combined strata were the same.

[b] Plants not identified to species and species not assigned a wetland indicator value.

Shrub and sapling strata were present only in the NAs and were dominated in all areas by a single species, American hornbeam (*Carpinus caroliniana*), a native tree classified as a FACW species.

Three dominant tree species were present in the combined NAs: one OBL and two FAC species. The ENA contained three dominants (one OBL, one FAC, and one UPL), with a combined relative basal area of 60%. The WNA contained two dominants (both FAC), with a combined relative basal area of 53%. One species in each separate NA did not qualify as a dominant species when the areas were combined.

Community Similarity Index. To provide a summary comparison of species found in each of the areas of the study site on the basis of plot data, we calculated a CC_S index (the coefficient is defined in Section 3.4). These values are listed in Table 5. When data from all strata were combined, each species was considered only once, regardless of the number of strata in which it occurred.

When the species occurring in the 10 plots of the ROW were compared with the species occurring in the 10 plots of the NAs, the CC_S was 0.32 when only the herb stratum was considered. The CC_S was only 0.30 when the herb stratum on the ROW was compared with the

TABLE 3 Number of Plant Species by Wetland Indicator Category Found in the Study Plots in the East and West NAs (by individual stratum and combined strata)

		Number of Species					
Stratum	Wetland Indicator Category	Occurring in ENA	Occurring in WNA	Common to Both NAs	Unique to ENA	Unique to WNA	Total
Herb	OBL	5	1	1	4	0	5
	FACW	14	7	6	8	1	15
	FAC	9	12	6	3	6	15
	FACU	4	4	2	2	2	6
	UPL	1	0	0	1	0	1
	Unid[a]	2	3	2	0	1	3
	Total	35	27	17	18	10	45
Shrub	OBL	2	0	0	2	0	2
	FACW	3	3	1	2	2	5
	FAC	9	6	2	6	3	12
	FACU	2	3	1	1	2	4
	UPL	1	0	0	1	0	1
	Unid	1	0	0	1	0	1
	Total	18	12	5	13	7	25
Sapling	OBL	0	0	0	0	0	0
	FACW	1	2	0	1	2	3
	FAC	5	4	2	3	2	7
	FACU	0	0	0	0	0	0
	UPL	0	1	0	0	1	1
	Unid	0	0	0	0	0	0
	Total	6	7	2	4	5	11
Tree	OBL	2	0	0	2	0	2
	FACW	1	2	1	0	1	2
	FAC	4	5	4	0	1	5
	FACU	0	1	0	0	1	1
	UPL	1	0	0	1	0	1
	Unid	0	0	0	0	0	0
	Total	8	8	5	3	3	11
Combined	OBL	8	1	1	6	0	8
	FACW	15	9	7	8	2	17
	FAC	17	17	12	5	5	22
	FACU	6	7	3	3	4	10
	UPL	2	1	1	1	0	2
	Unid	3	3	2	1	1	4
	Total	51	39	27	24	12	63

[a] Includes plants not identified to species and species not assigned a wetland indicator value.

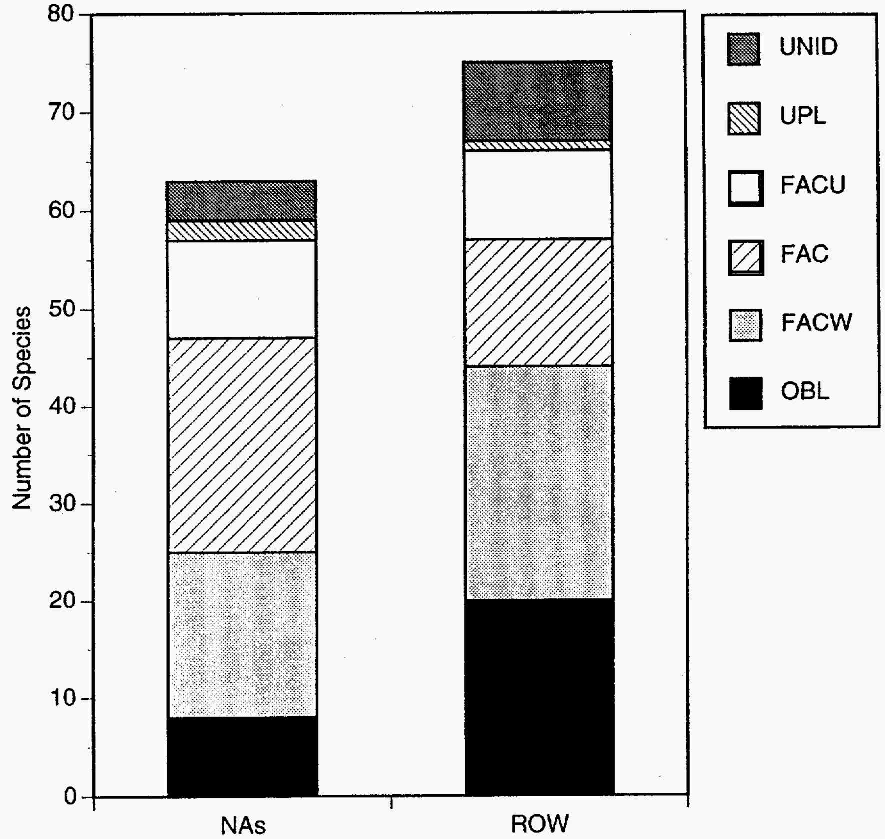

FIGURE 5 Number of Species in Each Wetland Indicator Category by Habitat

combined strata for the NAs. Comparison of the shrub, sapling, and tree strata of the NAs with the ROW is inappropriate because these strata were not present on the ROW. Comparison of the plots from the east and west sides of the ROW yields a high CC_S (0.80). Comparison of the plots from the ENA and WNA resulted in values ranging from 0.31 for the sapling stratum to 0.63 for the tree stratum. The value for the combined strata was 0.60.

Prevalence Index Values and Average Wetland Values. Table 6 presents the PIVs and AWVs for the NAs and the ROW. For both indices, a value of less than 3.00 indicates wetland vegetation. Generally, the values presented in Table 6 are below 3.00, which confirms the delineation of the area as a wetland. In two strata (shrub and sapling in the NAs), one species, *Carpinus caroliniana* (a FAC species), was dominant. As a result, both the PIV and the AWV for dominant species in these strata is 3.00; however, the value for all species combined is slightly below 3.00.

PIVs could not be calculated for the herb stratum of the NAs because this value is weighted by the dominant species; in this case, the two most dominant taxa could not be identified to species. Therefore, no wetland indicator category could be assigned. Similarly, the AWV could not be calculated for the dominant species of this stratum of the NAs because these two unidentified species made up half the number of dominant species.

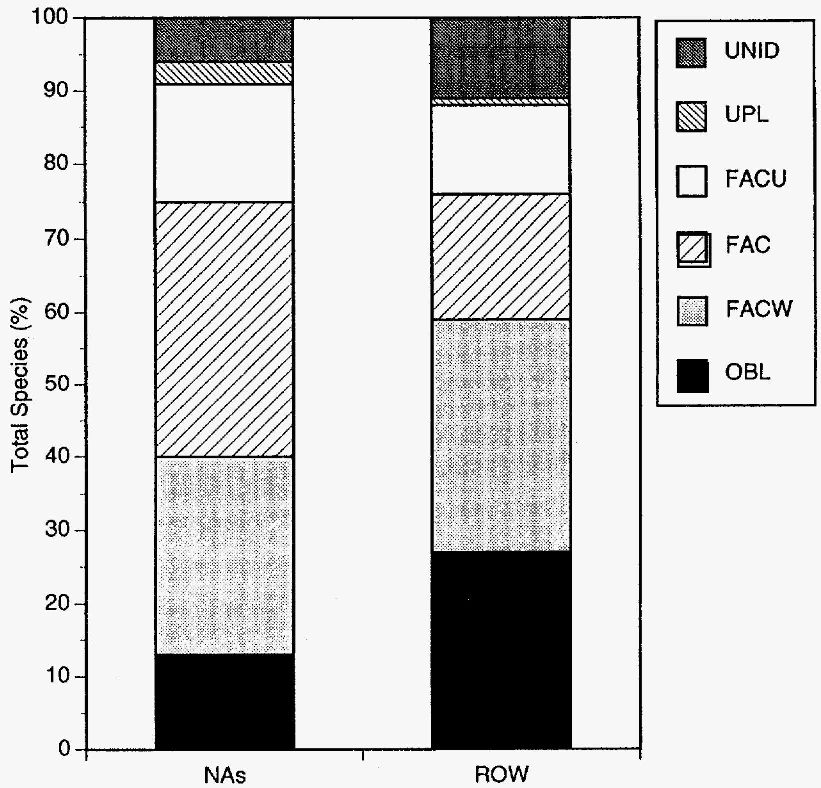

FIGURE 6 Percentage of Species in Each Wetland Indicator Category by Habitat

PIVs could not be calculated for combined strata because coverage data were used in the calculations, and coverage values for strata are not additive. AWVs were calculated for both individual and combined strata. A comparison of the PIVs and AWVs for each area and each stratum (whether all species were considered or just the dominant species) shows that the two values are similar. There are two schools of thought as to which wetland indicator, the PIV (weighted by species coverage) or the AWV (an unweighted value), better represents the condition of the wetland. In this case, the two methods yielded similar results. In giving equal weight to all species present, the AWV is influenced more by rare or occasional species. If dominant species have broad ecological ranges, they may indicate less about the habitat than do the species with narrow ecological ranges that may be present in lesser amounts. When all species of this site are considered equally (in the AWV), the wetland value is generally lower than when the value is weighted by dominance (PIV). This phenomenon can be explained by the fact that some of the subordinant species are more specific to wetlands than are dominant species as a whole.

TABLE 4 Dominant Species by Vegetative Stratum for Each Habitat

Stratum	Habitat	Scientific Name	Common Name	Wetland Indicator Category	Relative Percent Coverage[a]	Total Relative Percent Coverage
Herb	NAs	*Rubus* sp.			19.5	
		Carex sp.			18.5	
		Boehmeria cylindirca	Small-spike false nettle	FACW	6.5	
		Triadenum tubulosum	Large marsh St. John's wort	OBL	6.0	50.5
	ROW	*Pluchea odorata*	Shrubby camphor-weed	FACW	26.1	
		Dichanthelium aciculare	Needle-leaf witchgrass	FACU	15	
		Carex tribuloides	Blunt broom sedge	FACW	6.1	
		Mikania scandens	Climbing hempweed	OBL	5.7	52.9
Shrub	NAs	*Carpinus caroliniana*	American hornbeam	FAC	67.2	67.2
Sapling	NAs	*Carpinus caroliniana*	American hornbeam	FAC	63.1	63.1
Tree	NAs	*Liquidambar stryaciflua*	Sweet gum	FAC	19.7	
		Taxodium disticum	Bald cypress	OBL	16.1	
		Pinus taeda	Loblolly pine	FAC	14.2	50.0

[a] Basal areas, rather than an estimate of areal coverage, were used for trees.

TABLE 5 Coefficient of Community Values: Comparison of Similarity of Species Found in Study Plots

	Comparison		
Stratum	NAs to ROW	East Side of ROW to West Side of ROW	ENA to WNA
Herb	0.32	0.80	0.56
Shrub	0.00	0.00	0.32
Sapling	0.00	0.00	0.31
Tree	0.00	0.00	0.63
Combined	0.30	0.80	0.60

TABLE 6 Prevalence Index and Average Wetland Values for All Species and Dominant Species Found in the NAs and ROW (by individual stratum and combined strata)

Stratum	Habitat	Species	Prevalence Index Value	Average Wetland Value
Herb	NAs	All	NC[a]	2.60
		Dominant only	NC	NC
	ROW	All	2.27	2.21
		Dominant only	2.57	2.50
Shrub	NAs	All	2.98	2.84
		Dominant only	3.00	3.00
	ROW[b]		None	None
Sapling	NAs	All	2.94	2.91
		Dominant only	3.00	3.00
	ROW		None	None
Tree	NAs	All	2.70	2.73
		Dominant only	2.36	2.33
	ROW		None	None
Combined	NAs	All	NL[c]	2.68
	ROW	All	NL	2.21

[a] NC = not calculated; dominant species were not identified to species.

[b] No shrubs, saplings, or trees were present on the ROW.

[c] NL = values could not be calculated for combined strata because areal coverage (which is not additive) is used in the calculation.

5 Discussion

In the area of the study site the ROW was dissected by several prominent and shallow drainage channels. During much of the year, the area is sufficiently drained so that the soil surfaces become relatively dry. Evidence of periodic flooding and high water tables included bald cypress knees, water lines on trees, and sediment deposits adjacent to channels at various locations. All vegetative strata are composed predominantly of wetland species; both the herb and tree strata are dominated by wetland species.

Only drainage within the boundaries of the ROW was modified by ROW construction; drainage in NAs off the ROW was not altered. Because drainage channels were restored across the ROW after pipeline construction, overall drainage and periodic reservoir flooding should not be affected by the presence of the ROW.

The NAs on either side of the ROW consist of relatively mature forests with dense canopies and less dense sapling and shrub strata. The herb stratum in the forest is poorly developed, at least partially because of intense shading by a dense canopy; sustained periods of flooding may, to some extent, inhibit the growth of the herb stratum. These conclusions are supported by several findings. For example, the sum of individual species coverages for the herb stratum in the ENA was 48% compared with 37% in the WNA. The ENA was dissected by more channels and therefore had a less dense canopy. The ENA also contained a small knoll in one transect. Moreover, the species in the herb strata of the ENA and the WNA had a CC_S that indicated only about a 50% similarity. No rare or endangered species were found in the NAs or in the ROW.

Vegetation on the ROW was very different from that in the NAs. Only an herb stratum was present on the ROW, and only 21 of the 75 species found on the ROW were also present in the NAs. Four of the species found in both the NAs and the ROW were seedlings of woody species: American hornbean, poison ivy, bald cypress, and water oak. Thus, 54 of the 71 herbaceous species found on the ROW were unique to the ROW. Three of the dominant species on the ROW (shrubby camphor-weed, climbing hempweed [*Mikania scandens*], and needle-leaf witchgrass [*Dichanthelium aciculare*]) also occurred in the NAs but each with less than 1% coverage (Table C.2, Appendix C). The other ROW dominant, blunt broom sedge (*Carex tribuloides*), did not occur in the NAs.

The shrubby camphor-weed, with an average areal coverage of 51% on the ROW, is an opportunistic perennial with a wide geographical distribution and broad ecological tolerances (Godfrey and Wooten 1981). This plant variety is an introduced species in the site area. The other dominant species, climbing hempweed (a perennial vine with an areal coverage of 11%), has similar traits. Needle-leaf witchgrass, a perennial native grass with an areal coverage of 27%, is also a rather aggressive invader.

Three of the four introduced species identified in study plots occurred on the ROW. Two were exclusively found on the ROW but were rare. One of these, shrubby camphor-weed (as mentioned above), was the most dominant species on the ROW. This finding further suggests the opportunity the ROW creates for such a species to take hold. However, this species was found very rarely in the NA, which suggests it is not a threat to the wetland community.

The dense vegetation and the fact that 60 of the 67 taxa identified to species on the ROW are perennials demonstrates a considerable stabilization within the three years since pipeline installation. Some shifts in composition are likely in the future, but if scheduled maintenance is completed, the species will be limited to herbs and smaller shrubby plants. Although the relatively narrow (20-m-wide) ROW is shaded by adjacent forest trees early and late in the day, there is apparently sufficient sunlight to support sun-adapted species. We cannot predict the extent to which the canopy will close in over the ROW and alter its vegetation over time; however, some changes are likely to occur. It is also impossible to predict the extent to which ROW species will invade the adjacent forest. As long as the forest remains intact, extensive invasion seems unlikely because of the area's dense canopy.

6 Summary and Conclusions

6.1 Summary

As stated in Section 1, the primary goal of the GRI Wetland Corridors Program is to identify and evaluate the impacts of pipeline construction and ROW maintenance on the wetlands they traverse. To accomplish this goal, pipelines crossing various wetlands throughout the eastern United States were surveyed. The objectives for each study site were to document the vegetative communities on the ROW and on adjacent NAs that were not disturbed by pipeline construction; evaluate the similarities and differences between the plant communities on the ROW and those in the adjacent NAs; document changes to the topography, soils, and hydrology attributable to ROW construction; and identify the impacts caused by ROW construction on rare, threatened, endangered, or sensitive species.

This study involved collecting and analyzing data at the Bayou Grand Cane Wetland Crossing in De Soto Parish, Louisiana. No rare, threatened, endangered, or sensitive species were found during the survey of this site. After the pipeline was constructed, an attempt was made to restore the topography and hydrology of the site to its preconstruction state by creating five channels (in addition to the main bayou) across the ROW. These efforts appeared to have been successful based on observations at the time of sampling; no erosion had occurred, except on channel banks, and pockets of standing water were observed in the deeper channels. Additional observations made during times of flooding could better verify the adequacy of drainage.

The ROW at this site supports a much different flora than that in adjacent NAs; however, 59% of the species are wetland species, and the ROW has become stabilized with predominantly perennial vegetation within three years of pipeline installation. The sum of the average percent areal coverage for all plants on the ROW was 192%, which represents a dense stand of vegetation averaging 3 ft in height. This stand regenerated in three years without supplemental fertilization or seeding. At present, there is little evidence of any impacts on the vegetation in the adjacent NAs. Forest canopies and understories are intact, except within the ROW.

6.2 Conclusions

The two major impacts to the wetland as a whole by the pipeline ROW construction and maintenance are (1) creation of a new habitat, increasing the diversity of plants and, potentially, of wildlife, and (2) fragmentation of the present forest. These impacts could be viewed as both detrimental and beneficial, depending on which portion or what size of ecosystem is studied. In one way, the ROW is disrupting the continuity of the forested wetland, possibly creating barriers or competition to the native species of plants or animals. However, the ROW is relatively narrow (20 m), and the canopy overhang further narrows the ROW, thereby reducing its effects as a barrier to most species. The ROW is also creating a habitat for early successional and opportunistic plants to take hold in what is now a relatively mature forest. The increased diversity of the vegetation also provides an opportunity for an increase in wildlife diversity and considerable forage for grazing species.

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Appendix A:

Definition of Jurisdictional Wetlands

Appendix A: Definition of Jurisdictional Wetlands

Wetland identification and delineation necessary to implement Section 404 of the Clean Water Act and the "Swampbuster" (Subtitle B) provision of the Food Security Act of 1985 involves four agencies: the U.S. Army Corps of Engineers (COE), the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS), and the Soil Conservation Service (SCS). On January 10, 1989, these agencies, which had operated with slightly different definitions of wetland, adopted a uniform definition based on hydrology, vegetation, and soils.

The joint agreement stipulates that to be classified as a Jurisdictional Wetland, an area must have hydrotrophytic vegetation, hydric soils, and a wetland hydrology. All three criteria are mandatory; without any one criterion, the area is not a Jurisdictional Wetland. A schematic diagram of this delineation process is shown in Figure A.1. See the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* for a more detailed discussion of the various terms and criteria (FICWD 1989).

Problems uncovered during field trials of the 1989 Federal Manual and disagreement among the four agencies on revisions in 1991 resulted in the EPA and the COE reverting to use of the 1987 *COE Wetlands Delineation Manual*, which also defines wetlands on the basis of vegetation, hydric soils, and hydrology, but with slightly different definitions of these parameters. In January 1994, the four agencies entered into a joint Memorandum of Agreement, "Concerning the Delineation of Wetlands for Purposes of Section 404 of the Clean Water Act and Subtitle B of the Food Security Act," which, in broad terms, stipulates that the EPA and the COE will accept SCS procedures for delineating wetlands (SCS 1988) on agricultural lands and that SCS will use the 1987 *COE Wetlands Delineation Manual* (COE 1987) for areas that are not agricultural lands.

The individual reports on the pipeline crossings through wetlands that are part of the GRI Wetland Corridors Program use the definition and criteria of the 1989 Federal Manual that were in effect during 1990 and 1991, the first two years of these studies. The use of the rigorous criteria of the 1989 manual should provide sufficient information for application to other procedures in the evolving field regulatory procedures for delineation and preservation of jurisdictional wetlands.

References

COE: see U.S. Army Corps of Engineers.

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FICWD: see Federal Interagency Committee for Wetland Delineation.

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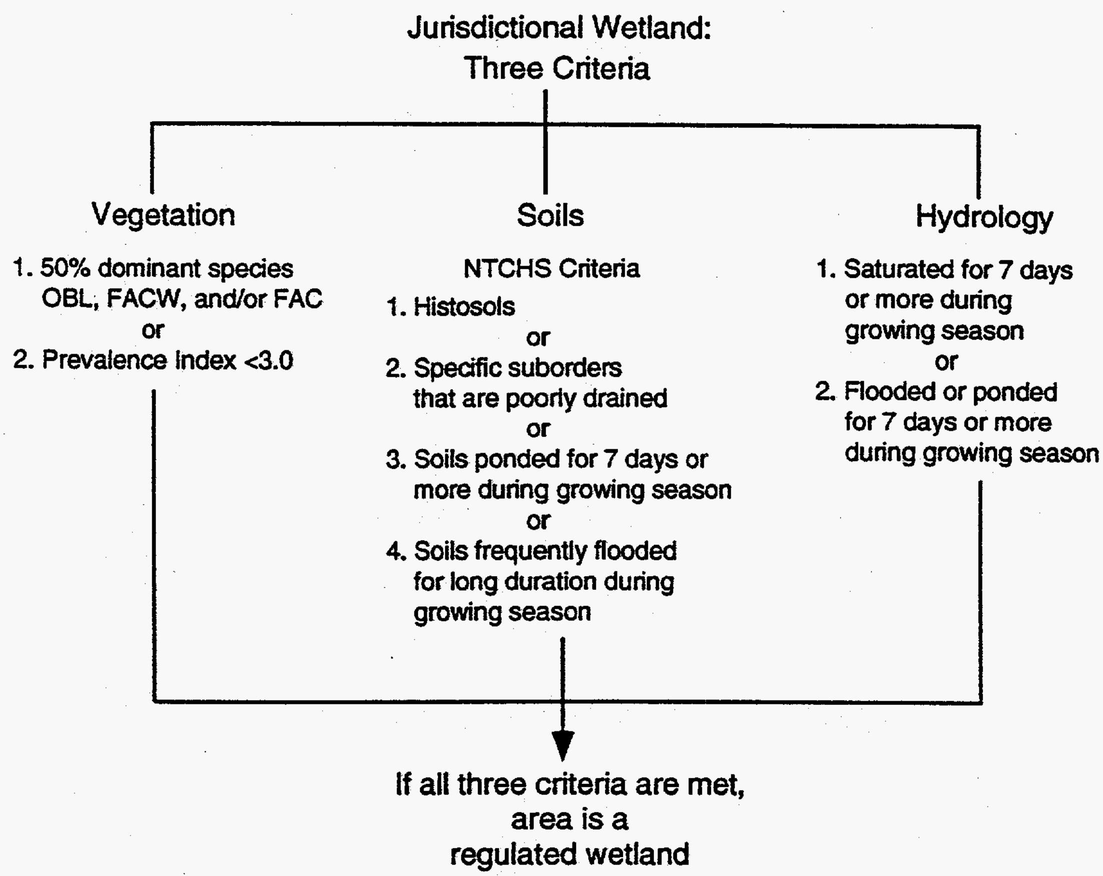

FIGURE A.1 Schematic Diagram of the Wetland Delineation Process (Source: FICWD 1989)

Appendix B:

Data Analysis — Definitions and Equations

Appendix B: Data Analysis — Definitions and Equations

B.1 Wetland Indicator Categories

Wetland indicator categories used in this report to classify the types of plant species were taken from Reed (1988). The five basic categories, commonly called the "wetland indicator status," are based on frequency of occurrence in wetlands. They are defined as follows:

Category	Value	Definition
Obligate wetland (OBL)	1.0	Plants that almost always occur in wetlands under natural conditions (estimated probability >99%)
Facultative wetland (FACW)	2.0	Plants that usually occur in wetlands (estimated probability 67-99%) but occasionally are found in nonwetlands
Facultative (FAC)	3.0	Plants that are equally likely to occur in wetlands or nonwetlands (estimated probability 34-66%)
Facultative upland (FACU)	4.0	Plants that usually occur in nonwetlands (estimated probability 67-99%) but occasionally are found in wetlands (estimated probability 1-33%)
Obligate upland (UPL)	5.0	Plants that almost always occur in nonwetlands under natural conditions (estimated probability >99%)

B.2 Life-Form and Origin

The life-form and origin symbols are used for describing plant characteristics. The following symbols are used:

Symbol	Life-Form or Origin
A	Annual
B	Biennial
E	Emergent
F	Forb
F3	Fern
G	Grass
GL	Grasslike
H2	Horsetail
I	Introduced
N	Native
P	Perennial
S	Shrub
T	Tree
V	Herbaceous vine
WV	Woody vine

Symbols are combined to describe the life-form and origin; for example, ANG means annual native grass and PIEF means perennial introduced emergent forb. For further description refer to the report by Reed (1988).

B.3 Prevalence Index Value

The prevalence index value (PIV) was determined by using the method outlined in the 1989 Federal Manual (FICWD 1989). The PIV, modified for this report to use relative percent areal coverage instead of relative frequencies as described in the 1989 Federal Manual, is defined as

$$PIV = \frac{RPC_o + 2RPC_{fw} + 3RPC_f + 4RPC_{fu} + 5RPC_u}{100} \qquad (B.1)$$

where

RPC_o = Relative percent coverage (RPC) of obligate wetland species,

RPC_{fw} = RPC of facultative wetland species,

RPC_f = RPC of facultative species,

RPC_{fu} = RPC of facultative upland species, and

RPC_u = RPC of upland species.

B.4 Average Wetland Value

The average wetland value (AWV), defined in Zimmerman et al. (1991), differs from the PIV in that it is not coverage data or frequency of occurrence that is used in determining the AWV, but rather the total number of species present. Thus, all species present are represented equally in the AWV. The AWV is defined as

$$AWV = \frac{N_o + 2N_{fw} + 3N_f + 4N_{fu} + 5N_u}{N_o + N_{fw} + N_f + N_{fu} + N_u} \qquad (B.2)$$

where

N_o = number of obligate wetland species,

N_{fw} = number of facultative wetland species,

N_f = number of facultative species,

N_{fu} = number of facultative upland species, and

N_u = number of upland species.

B.5 References

Federal Interagency Committee for Wetland Delineation, 1989, *Federal Manual for Identifying and Delineating Jurisdictional Wetlands,* U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Department of Agriculture, Cooperative Technical Publication, Washington, D.C.

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Appendix C:

Plant Species List, Areal Coverage Data, and Species Distribution

Appendix C:

Plant Species List, Areal Coverage Data, and Species Distribution

TABLE C.1 Plant Species List for the Bayou Grand Cane Study Site

Field No.	Scientific Name and Authority	Common Names	Region 2 Wetland Indicator Category[a]	Life-Form/ Origin[b]
32	*Acalypha virginica* L.	Three-seeded mercury	FACU-	ANF
109	*Acer rubrum* L.	Red maple	FAC	NT
61	*Aesculus pavia* L.	Red buckeye	FAC	NST
103	*Ampelopsis arborea* (L.) Koehne	Pepper-vine	FAC+	NWV
141	*Aristolochia sepentaria* L.	Virginia snakeroot	FACU	PNF
65	*Arundinacea gigantea* Walter ex Muhl.	Giant cane	FACW	PNG
90	*Ascyrum hypericoides* L.	St. Andrew's cross	FAC	NS
150	*Asimina triloba* (L.) Dunal	Common pawpaw	FAC	NT
28	*Aster dumosus* L.	Bush aster	FAC	PNF
71	*Aster lateriflorus* (L.) Britton	Calico aster	FAC	PNF
91	*Baccharus halimifolia* L.	Eastern false-willow	FAC	NS
46	*Berchemia scandens* K. Koch	Alabama supple-jack	FACW	NWV
54	*Bidens frondosa* L.	Devil's beggar-ticks	FACW	ANF
53	*Bignonia capreolata* L.	Crossvine	FAC	NWV
81	*Boehmeria cylindirca* (L.) Swartz	Small-spike false nettle	FACW+	PNF
144	*Botrychium biternatum* (Savigny) Under.	Sparse-lobe grapefern	FAC	PNF3
4	*Brunnichia cirrhosa* Gaertn.	Redvine	FACW	PNF
125	*Carex glaucescens* Ell.	Southern waxy sedge	OBL	PNEGL
51	*Carex* sp.			
7	*Carex tribuloides* Wahl.	Blunt broom sedge	FACW+	PNGL
116	*Carpinus caroliniana* Walter	American hornbeam	FAC	NT
72	*Carya cordiformis* K. Koch	Bitter-nut hickory	FAC	NT
44	*Carya tomentosa* Nutt.	Mockernut	UPL	NT
147	*Celtis laevigata* Willd.	Sugar-berry	FACW	NT
21	*Cephalanthus occidentalis* L.	Common buttonbush	OBL	NT
10	*Chasmanthium latifolium* Michx.	Indian sea-oats	FAC-	PNG
66	*Chasmanthium laxum* (L.) H. Yates	Slender spikegrass	FACW-	PNG
124	*Cocculus carolinus* (L.) Dc.	Carolina coral-beads	FAC	NWV
15	*Conoclinium coelestinum* (L.) Dc.	Mistflower	FAC	PNF
85	*Conyza canadensis* (L.) Cronq.	Canada horseweed	FACU	ANF
70	*Crataegus viridis* L.	Green hawthorn	FACW	NT
16	*Cyperus pseudovegetus* Steud.	Marsh flatsedge	FACW	PNEGL
6	*Cyperus virens* Michx.	Green flatsedge	FACW	PNEGL
11	*Dichanthelium aciculare* Gould & Clark	Needle-leaf witchgrass	FACU	PNG
13	*Dichanthelium sphaerocarpon* Gould	Round-seed panic grass	FACU	PNG
2	*Diodia virginiana* L.	Virginia button-weed	FACW	APNEF
131	*Diospyros virginiana* L.	Common persimmon	FAC	NT

TABLE C.1 (Cont.)

Field No.	Scientific Name and Authority	Common Names	Region 2 Wetland Indicator Category[a]	Life-Form/ Origin[b]
151	*Elephantopus carolinianus* Raeusch	Carolina elephant-foot	FAC	PNF
152	*Elephantopus tomentosus* L.	Hairy elephant-foot		PNF
92	*Eryngium prostatum* Nutt. Ex Dc.	Creeping coyote-thistle	FACW	PNF
88	*Eupatorium capillifolium* (Lam.) Small	Small dog-fennel thorough-wort	FACU	PNF
12	*Eupatorium serotinum* Michx.	Late-flowering thorough-wort	FAC	PNF
107	*Fagus grandifolia* Ehrh.	American beech	FACU	NT
130	*Forestiera acuminata* (Michx.) Poir.	Swamp privet	OBL	NST
60	*Fraxinus pennsylvanica* Marshall	Green ash	FACW	NT
78	*Gratiola virginiana* L.	Round-fruit hedgehyssop	OBL	ABNEF
79	*Hydrocotyle verticillata* Thunb.	Worled penny-wort	OBL	PNF
9	*Hydrolea uniflora* Raf.	One-flower false-fiddle-leaf	OBL	PNF
20	*Hypericum mutilum* L.	Slender St. John's-wort	FACW	PNF
68	*Ilex decidua* Walter	Deciduous holly	FACW-	NT
48	*Ilex opaca* Soland. In Ait.	American holly	FAC-	NTS
55	*Ilex vomitoria* Soland. In Ait.	Yaupon	FAC	NST
43	*Ipomea trichocarpha* Elliot	Small-flower pink morning glory	FACU	PNVF
75	*Juncus diffusissimus* Buckley	Slim-pod rush	FACW	PNGL
110	*Juncus effusus* L.	Soft rush	FACW+	PNEGL
87	*Juncus validus* Coville	Round-head rush	FACW+	PNGL
126	*Justica americana* (L.) Vahl	Common water-willow	OBL	PNF
42	*Leersia virginica* Willd.	Whitegrass	FACW	PNG
93	*Ligustrum sinense* Loureiro	Chinese privet	FAC	IS
27	*Lindernia anagallidea* (Michx.) Pennell	False-pimpernel	FACW+	ANF
94	*Liquidambar stryaciflua* L.	Sweet gum	FAC+	NT
111	*Lobelia cardinalis* L.	Cardinal flower	FACW+	PNF
17	*Ludwigia alternifolia* L.	Bushy seedbox	OBL	PNEF
136	*Ludwigia decurrens* Walter	Primrose willow	OBL	NEF
14	*Ludwigia grandulosa* Walter	Cylindric-fruit seedbox	OBL	PNEF
19	*Ludwigia palustris* (L.) Elliot	Marsh seedbox	OBL	PNEF
26	*Ludwigia peploides* (H.B.K.) Raven	Floating seedbox	OBL	PNE/F
120	*Lycopus rubellus* Moench	Taper-leaf bugleweed	OBL	PNEF
36	*Lysimachia radicans* Hook.	Trailing loosestrife	OBL	PNF
123	*Melothria pendula* L.	Creeping cucumber	FACW-	PNV
4	*Mikania scandens* (L.) Willd.	Climbing hempweed	FACW+	PNV
8	*Mimulus alatus* Ait.	Sharp-wing monkey-flower	OBL	PNF
52	*Mitchella repens* L.	Partridge-berry	FACU+	PNF
129	*Morus rubra* L.	Red mulberry	FAC	NT
59	*Nyssa sylvatica* Marshall	Swamp tupelo	OBL	NT
108	*Ostrya virginiana* (Mill.) K. Koch	Eastern hop-hornbeam	FACU-	NT
33	*Oxalis eurpaea* Jordan	Upright yellow woodsorrel	UPL	PIF
154	*Panicum anceps* Michx.	Beaked panic grass	FAC-	PNG
112	*Panicum dichotomiflorum* Michx.	Fall panic grass	FACW	ANG

TABLE C.1 (Cont.)

Field No.	Scientific Name and Authority	Common Names	Region 2 Wetland Indicator Category[a]	Life-Form/ Origin[b]
5	*Panicum regidulum* Bosc Ex Nees	Red-top panic grass	FACW	PNG
145	*Parthenocissus quinquefolia* (L.) Planch.	Virginia creeper	FAC	NWV
89	*Paspalum notatum* Fluegge	Bahia grass	FACU+	PIG
86	*Penstemon laxiflorus* Pennell	Muskogee beardtongue	FAC-	PNF
18	*Penthorum sedoides* L.	Ditch-stonecrop	OBL	PNF
133	*Phanopyrum gymnocarpon* (Elliot) Nash	Savannah panic grass	OBL	PNG
3	*Phyla lanceolata* (Michx.) Greene	Lance-leaf frog-fruit	FACW+	PNF
139	*Phyllanthus caroliniensis* Walter	Carolina leaf-flower	FAC+	ANF
40	*Physalis pubescens* L.	Low hairy ground-cherry	UPL	ANF
146	*Pinus taeda* L.	Loblolly pine	FAC	NT
1	*Pluchea odorata* (L.) Cass.	Shrubby camphor-weed	FACW	PIS
23	*Polygonum hydropiperoides* Michx.	Swamp smartweed	OBL	PNEF
155	*Polygonum virginianum* L.	Virginia knotweed	FAC	APNF
29	*Polypremum procumbens* L.	Juniper-leaf	FACU-	APNF
106	*Quercus falcata* (pagoda) Michx.	Cherry-bark oak	FAC+	NT
148	*Quercus lyrata* Walter	Overcup oak	OBL	NT
104	*Quercus nigra* L.	Water oak	FAC	NT
56	*Quercus phellos* L.	Willow oak	FACW-	NT
156	*Rhamnus caroliniana* Walt.	Carolina buckthorn	FACU	NST
25	*Rhexia mariana* L.	Maryland meadow-beauty	FACW+	PNF
63	*Rhus copallinum* L.	Winged sumac	NI	NST
121	*Rhynchospora inexpansa* (Michx.) Vahl	Nodding beakrush	FACW	PNGL
77	*Rhyncospora* sp.			
22	*Rotala ramosior* (L.) Koehne	Toothcup	OBL	ANF
69	*Rubus* sp.			
82	*Salix nigra* Marshall	Black willow	OBL	NT
134	*Sambucus canadensis* L.	American elder	FACW-	NS
157	*Scirpus cyperinus* (L.) Kunth	Wool-grass	OBL	PNEGL
49	*Smilax glauca* Walter	Cat greenbrier	FAC	NSWV
67	*Smilax rotundifolia* L.	Common greenbrier	FAC	NWV
83	*Solidago canadensis* L.	Canada golden-rod	FACU	PNF
158	*Solidago salicina* Elliott	Willow golden-rod	OBL	PNF
24	*Stachys tenuifolia* Willd.	Smooth hedgenettle	FACW-	PNF
30	*Styrax americana* Lam.	American snowbell	FACW	NST
62	*Styrax grandifolia* Ait.	Big-leaf snowbell	FACU-	NT
64	*Symplocos tinctoria* (L.) L'Her.	Horse-sugar	FAC	NTS
127	*Taxodium disticum* (L.) L. Rich	Bald cypress	OBL	NET
47	*Toxicodendron radicans* (L.) Kuntze	Poison ivy	FAC	NWVS
80	*Triadenum tubulosum* (Walter) Gleason	Large marsh St. John's wort	OBL	PNEF
58	*Ulmus alata* Michx.	Winged elm	FACU+	NT
142	*Ulmus americana* L.	American elm	FACW	NT
37	Unidentifiable grass No. 1			
114	Unidentifiable grass No. 2			
122	Unidentifiable grass No. 3			
113	Unidentifiable grass No. 4			

TABLE C.1 (Cont.)

Field No.	Scientific Name and Authority	Common Names	Region 2 Wetland Indicator Category[a]	Life-Form/ Origin[b]
34	Unidentified *Cyperus or Rhincosporum*			
160	*Vaccinium elliottii* Chapm.	Elliott blueberry	FAC+	NS
159	*Veronia missurica* Raf.	Missouri ironweed	FAC+	PNF
35	*Viola* sp.			
115	*Vitis riparia* Michx.	River-bank grape	FACW	NWV
50	*Vitis rotundifolia* Michx.	Muscadine grape	FAC	NWV
39	*Wisteria macrostachya* (Torr. & Gray)	Kentucky wisteria	FACW	NWV
38	*Xanthium strumarium* L.	Rough cockle-bur	FAC	ANF

[a] Wetland indicator categories are assigned to plants in the United States on a regional basis. Louisiana is located in Region 2. A "+" following an indicator reveals a frequency toward the high end of the category (more frequently found in wetlands), while a "-" indicates a frequency toward the low end (less frequently found in wetlands).

[b] Plant characteristics and life-forms assigned to each species are indicated in this column. Appendix B, Section B.2 provides definitions of the life-forms and origins, with the exception of /, which signifies a floating species.

TABLE C.2 Coverage Estimates by Stratum for Species in the Bayou Grand Cane Study Site

Field No.	Scientific Name	Areal Coverage (%)[a] ENA T1	ENA T2	ENA T3	ENA T4	ENA T5	East ROW T1	East ROW T2	East ROW T3	East ROW T4	East ROW T5	West ROW T1	West ROW T2	West ROW T3	West ROW T4	West ROW T5	WNA T1	WNA T2	WNA T3	WNA T4	WNA T5
Ground Stratum																					
	Bryophytes	—	—	1	2	—	7	10	5	2	2	8	10	10	1	1	25	5	15	0.5	-
Herb Stratum																					
32	*Acalypha virginica*	0.5	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-
103	*Ampelopsis arborea*	-	-	20	1	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-
141	*Aristolochia sepentaria*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-
65	*Arundinacea gigantea*	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	*Ascyrum hypericoides*	-	-	-	-	-	-	-	-	-	2	-	1	1	-	-	-	-	-	-	-
28	*Aster dumosus*	-	-	-	-	-	2	5	10	4	5	-	3	2	5	1	-	-	-	-	-
71	*Aster lateriflorus*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
91	*Baccharus halimifolia*	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-
46	*Berchemia scandens*	-	0.5	-	2	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	0.5
54	*Bidens frondosa*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-
53	*Bignonia capreolata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.5	0.5	0.5	2
81	*Boehmeria cylindirca*	-	-	1	25	0.5	-	1	2	1	2	-	-	-	1	3	-	-	-	-	-
144	*Botrychium biternatum*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
45	*Brunnichia cirrhosa*	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	*Carex glaucescens*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
51	*Carex* sp.	-	0.5	3	0.5	-	-	-	-	-	-	-	-	-	-	-	50	15	3	-	5
7	*Carex tribuloides*	-	-	-	-	-	3	5	25	30	20	3	1	6	20	5	-	-	-	-	-
116	*Carpinus caroliniana*	0.5	0.5	-	-	0.5	-	-	1	-	1	-	-	10	-	-	-	10	0.5	-	-
21	*Cephalanthus occidentalis*	0.5	-	-	-	-	2	-	1	-	-	1	1	-	-	-	-	-	-	-	-
10	*Chasmanthium latifolium*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
66	*Chasmanthium laxum*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
124	*Cocculus carolinus*	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	*Conoclinium coelestinum*	-	-	-	-	-	10	-	-	-	-	-	3	-	1	1	-	-	-	-	-
70	*Crataegus viridis*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	*Cyperus pseudovegetus*	-	-	-	-	-	2	2	10	-	3	15	15	2	-	-	-	-	-	-	-
6	*Cyperus virens*	-	-	-	-	-	7	1		-	1	3	1	1	1	1	-	-	-	-	-
11	*Dichanthelium aciculare*	-	2	0.5	-	-	50	30	20	10	15	50	50	50	10	5	2	0.5	-	-	-
13	*Dichanthelium sphaerocarpon*	-	0.5	-	-	-	40	1	3	1	2	2	10	10	-	-	0.5	0.5	-	-	-
2	*Diodia virginiana*	-	-	-	-	-	2	7	1	2	1	20	-	1	3	1	-	-	-	-	-
92	*Eryngium prostatum*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
88	*Eupatorium capillifolium*	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-
12	*Eupatorium serotinum*	-	-	-	-	-	10	-	2	1	2	2	1	1	1	3	-	-	-	-	-
78	*Gratiola virginiana*	-	-	-	-	-	-	1	2	-	1	-	1	1	-	-	-	-	-	-	-
79	*Hydrocotyle verticillata*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-
9	*Hydrolea uniflora*	-	-	-	-	-	2	-	3	-	1	1	1	-	1	-	-	-	-	-	-
20	*Hypericum mutilum*	-	-	-	-	-	1	1	-	-	-	1	3	1	-	-	-	-	-	-	-
68	*Ilex decidua*	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
48	*Ilex opaca*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.5	-	-	-
43	*Ipomea trichocarpha*	0.5	0.5	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-

TABLE C.2 (Cont.)

Field No.	Scientific Name	Areal Coverage (%)[a] ENA T1	ENA T2	ENA T3	ENA T4	ENA T5	East ROW T1	East ROW T2	East ROW T3	East ROW T4	East ROW T5	West ROW T1	West ROW T2	West ROW T3	West ROW T4	West ROW T5	WNA T1	WNA T2	WNA T3	WNA T4	WNA T5
Herb Stratum (Cont.)																					
75	*Juncus diffusissimus*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
110	*Juncus effusus*	-	-	-	-	-	-	-	1	1	-	-	-	1	1	-	-	-	-	-	-
87	*Juncus validus*	-	-	-	-	-	-	-	3	-	1	-	1	1	-	-	-	-	-	-	-
42	*Leersia virginica*	2	-	-	-	0.5	-	-	-	-	2	-	-	-	-	50	-	-	0.5	-	-
27	*Lindernia anagallidea*	-	-	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-
94	*Liquidambar stryaciflua*	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-
111	*Lobelia cardinalis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
17	*Ludwigia alternifolia*	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136	*Ludwigia decurrens*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
14	*Ludwigia grandulosa*	0.5	-	-	-	-	10	15	40	10	1	1	5	2	1	1	-	-	-	-	-
19	*Ludwigia palustris*	-	-	-	-	-	10	1	1	1	-	1	1	-	-	-	-	-	-	-	-
2	*Ludwigia peploides*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	*Lycopus rubellus*	-	-	-	-	-	-	-	-	12	2	-	-	1	1	1	-	-	-	-	-
36	*Lysimachia radicans*	0.5	1	0.5	-	-	1	1	-	20	1	-	-	-	30	2	0.5	10	-	-	-
123	*Melothria pendula*	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	*Mikania scandens*	-	-	0.5	-	-	10	3	10	3	10	15	10	10	30	10	-	1	-	-	-
8	*Mimulus alatus*	-	-	-	-	-	5	8	8	10	15	1	2	1	15	25	-	-	-	-	-
52	*Mitchella repens*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
33	*Oxalis eurpaea*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	*Panicum dichotomiflorum*	-	-	-	-	-	-	-	2	3	9	-	-	1	1	-	-	-	-	-	-
5	*Panicum regidulum*	-	-	-	-	-	20	5	1	-	5	15	25	2	-	1	-	-	-	-	-
145	*Parthenocissus quinquefolia*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	*Paspalum notatum*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
18	*Penthorum sedoides*	-	-	-	-	-	1	4	2	2	5	2	1	-	10	5	-	-	-	-	-
133	*Phanopyrum gymnocarpon*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
3	*Phyla lanceolata*	-	-	-	-	-	10	2	1	1	1	8	-	-	10	1	-	-	-	-	-
139	*Phyllanthus caroliniensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
40	*Physalis pubescens*	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	*Pluchea odorata*	-	-	0.5	-	-	40	50	25	60	80	10	60	50	50	80	-	7	-	-	-
23	*Polygonum hydropiperoides*	-	-	-	-	-	2	-	10	2	5	3	-	1	5	3	-	-	-	-	-
29	*Polypremum procumbens*	-	-	-	-	-	1	1	2	-	-	-	-	1	-	-	-	-	-	-	-
106	*Quercus falcata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
104	*Quercus nigra*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-
56	*Quercus phellos*	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	0.5	0.5	0.5
25	*Rhexia mariana*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
121	*Rhynchospora inexpansa*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
77	*Rhynchospora* sp.	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
22	*Rotala ramosior*	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-
69	*Rubus* sp.	-	-	80	-	-	-	-	-	4	-	-	-	1	-	-	-	0.5	-	-	-
82	*Salix nigra*	-	-	-	-	-	-	3	4	1	2	-	1	1	1	1	-	-	-	-	-
134	*Sambucus canadensis*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
49	*Smilax glauca*	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	1	0.5	2	-	-

TABLE C.2 (Cont.)

Field No.	Scientific Name	ENA T1	ENA T2	ENA T3	ENA T4	ENA T5	East ROW T1	East ROW T2	East ROW T3	East ROW T4	East ROW T5	West ROW T1	West ROW T2	West ROW T3	West ROW T4	West ROW T5	WNA T1	WNA T2	WNA T3	WNA T4	WNA T5
		Areal Coverage (%)[a]																			
Herb Stratum (Cont.)																					
67	*Smilax rotundifolia*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.5	0.5	0.5
83	*Solidago canadensis*	-	-	-	-	-	-	1	1	-	1	-	2	15	-	-	-	-	-	-	-
24	*Stachys tenuifolia*	-	-	-	-	-	10	-	-	-	1	-	-	-	-	-	-	-	-	-	-
30	*Styrax americana*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	*Symplocos tinctoria*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-
127	*Taxodium disticum*	0.5	-	20	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-
47	*Toxicodendron radicans*	-	5	0.5	-	-	-	-	-	-	1	-	-	-	-	-	10	0.5	5	-	1
80	*Triadenum tubulosum*	-	-	-	25	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
58	*Ulmus alata*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
142	*Ulmus americana*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	Unidentifiable grass No. 1	-	-	-	-	-	-	5	-	-	-	1	1	-	-	-	-	-	-	-	-
114	Unidentifiable grass No. 2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
122	Unidentifiable grass No. 3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
113	Unidentifiable grass No. 4	-	-	-	-	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-	-
34	Unidentified *Cyperus* or *Rhincosporum*	-	-	-	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-
35	*Viola* sp.	-	-	-	-	-	1	-	1	-	1	-	1	-	1	1	0.5	0.5	0.5	0.5	-
115	*Vitis riparia*	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-
50	*Vitis rotundifolia*	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-
39	*Wisteria macrostachya*	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	*Xanthium strumarium*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Shrub Stratum																					
61	*Aesculus pavia*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	*Berchemia scandens*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	6	4	1
116	*Carpinus caroliniana*	20	35	50	10	4	-	-	-	-	-	-	-	-	-	-	30	40	5	10	40
44	*Carya tomentosa*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	*Diospyros virginiana*	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	*Fagus grandifolia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
130	*Forestiera acuminata*	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	*Fraxinus pennsylvanica*	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	*Ilex decidua*	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	5
48	*Ilex opaca*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	*Ilex vomitoria*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
93	*Ligustrum sinense*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	*Liquidambar stryaciflua*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	*Morus rubra*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
59	*Nyssa sylvatica*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
108	*Ostrya virginiana*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
104	*Quercus nigra*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
56	*Quercus phellos*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C.2 (Cont.)

Field No.	Scientific Name	ENA T1	ENA T2	ENA T3	ENA T4	ENA T5	East ROW T1	East ROW T2	East ROW T3	East ROW T4	East ROW T5	West ROW T1	West ROW T2	West ROW T3	West ROW T4	West ROW T5	WNA T1	WNA T2	WNA T3	WNA T4	WNA T5
		Areal Coverage (%)[a]																			
Shrub Stratum (Cont.)																					
63	*Rhus copallinum*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	*Styrax grandifolia*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	*Symplocos tinctoria*	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	*Toxicodendron radicans*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	6	1
58	*Ulmus alata*	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
142	*Ulmus americana*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
5	*Vitis rotundifolia*	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	8	-	-	3
Sapling Stratum																					
61	*Aesculus pavia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
46	*Berchemia scandens*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-
116	*Carpinus caroliniana*	20	4	10	3	2	-	-	-	-	-	-	-	-	-	-	25	3	4	10	8
44	*Carya tomentosa*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-
48	*Ilex opaca*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	*Liquidambar stryaciflua*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	*Morus rubra*	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	*Quercus nigra*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
56	*Quercus phellos*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
64	*Symplocos tinctoria*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-
142	*Ulmus americana*	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tree Stratum																					
116	*Carpinus caroliniana*	340	108	173	-	1314	-	-	-	-	-	-	-	-	-	-	676	582	-	-	314
44	*Carya tomentosa*	973	2165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
147	*Celtis laevigata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	158
94	*Liquidambar stryaciflua*	-	106	1789	-	-	-	-	-	-	-	-	-	-	-	-	-	-	826	2944	697
146	*Pinus taeda*	2463	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2124	-	-
106	*Quercus falcata* (pagoda)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2781	-	219
148	*Quercus lyrata*	-	1650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	*Quercus nigra*	-	-	80	-	-	-	-	-	-	-	-	-	-	-	-	1075	-	387	423	-
127	*Taxodium disticum*	-	-	-	3660	1534	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	*Ulmus alata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211	-	-	-	-
142	*Ulmus americana*	-	-	-	-	1676	-	-	-	-	-	-	-	-	-	-	-	434	-	156	214

[a] Each value represents the value given to a species in a single plot of Transect 1 (T1) through Transect 5 (T5). Values are percent areal coverages for the herb, shrub, and sapling strata. Values are total basal area for all trees of that species in the plot.

TABLE C.3 Areal Coverage Estimates and Frequencies by Stratum for Species in the Bayou Grand Cane Study Site

		Average Percent Coverage/ Absolute Frequency[a]			
Field No.	Scientific Name and Authority	ENA	East ROW	West ROW	WNA
Ground Stratum					
	Bryophytes	0.6/ 2	5.2/ 5	5.8/ 5	9.1/ 4
Herb Stratum					
	<u>Plants found in both NAs and both portions of ROW</u>				
116	*Carpinus caroliniana* Walter	0.3/ 3	0.2/ 2	2/ 1	2.1/ 2
11	*Dichanthelium aciculare*	0.5/ 2	25/ 5	33/ 5	0.5/ 2
13	*Dichanthelium sphaerocarpon*	0.1/ 1	9.3/ 5	4.4/ 3	0.2/ 2
42	*Leersia virginica*	0.5/ 2	0.4/ 1	10/ 1	0.1/ 1
36	*Lysimachia radicans*	0.4/ 3	4.4/ 4	6.4/ 2	2.1/ 2
4	*Mikania scandens*	0.1/ 1	7.2/ 5	15/ 5	0.2/ 1
1	*Pluchea odorata*	0.1/ 1	51/ 5	50/ 5	1.4/ 1
69	*Rubus* sp.	16/ 1	0.8/ 1	0.1/ 1	0.1/ 1
	<u>Plant found in both NAs and east portion of ROW only</u>				
47	*Toxicodendron radicans*	1.1/ 2	0.1/ 1	0/ 0	3.3/ 4
	<u>Plants found in both NAs only</u>				
71	*Aster lateriflorus*	0.1/ 1	0/ 0	0/ 0	0.6/ 1
46	*Berchemia scandens*	0.5/ 2	0/ 0	0/ 0	0.2/ 2
51	*Carex* sp.	0.8/ 3	0/ 0	0/ 0	14.6/ 4
68	*Ilex decidua*	1.6/ 1	0/ 0	0/ 0	0.4/ 1
56	*Quercus phellos*	0.1/ 1	0/ 0	0/ 0	0.4/ 4
49	*Smilax glauca*	2/ 1	0/ 0	0/ 0	0.7/ 3
67	*Smilax rotundifolia*	0.1/ 1	0/ 0	0/ 0	0.4/ 4
50	*Vitis rotundifolia*	0.1/ 1	0/ 0	0/ 0	0.1/ 1
	<u>Plants found in ENA and both portions of ROW</u>				
32	*Acalypha virginica*	0.1/ 1	0.1/ 1	0.2/ 2	0/ 0
103	*Ampelopsis arboream*	4.2/ 2	0.1/ 1	0.1/ 1	0/ 0
81	*Boehmeria cylindirca*	5.3/ 3	1/ 4	0.8/ 2	0/ 0
21	*Cephalanthus occidentalis*	0.1/ 1	0.5/ 2	0.2/ 2	0/ 0
43	*Ipomea trichocarpha*	0.2/ 2	0.1/ 1	0.1/ 1	0/ 0
14	*Ludwigia grandulosa*	0.1/ 1	15.1/ 5	1.9/ 5	0/ 0
127	*Taxodium disticum*	4.1/ 2	0.4/ 2	0.1/ 1	0/ 0
	<u>Plants found in ENA and west portion of ROW</u>				
80	*Triadenum tubulosum*	5/ 1	0/ 0	0.1/ 1	0/ 0

TABLE C.3 (Cont.)

Field No.	Scientific Name and Authority	Average Percent Coverage/ Absolute Frequency[a] ENA	East ROW	West ROW	WNA
	Plants found in ENA only				
65	*Arundinacea gigantea*	0.6/ 1	0/ 0	0/ 0	0/ 0
45	*Brunnichia cirrhosa*	0.1/ 1	0/ 0	0/ 0	0/ 0
66	*Chasmanthium laxum*	0.2/ 1	0/ 0	0/ 0	0/ 0
124	*Cocculus carolinus*	0.1/ 1	0/ 0	0/ 0	0/ 0
70	*Crataegus viridis*	0.1/ 1	0/ 0	0/ 0	0/ 0
123	*Melothria pendula*	0.8/ 1	0/ 0	0/ 0	0/ 0
145	*Parthenocissus quinquefolia*	0.2/ 1	0/ 0	0/ 0	0/ 0
40	*Physalis pubescens*	0.1/ 1	0/ 0	0/ 0	0/ 0
142	*Ulmus americana*	0.1/ 1	0/ 0	0/ 0	0/ 0
39	*Wisteria macrostachya*	2/ 1	0/ 0	0/ 0	0/ 0
	Plant found in WNA and both portions of ROW				
35	*Viola* sp.	0/ 0	0.3/ 3	0.3/ 3	0.4/ 4
	Plant found in WNA and east portion of ROW				
104	*Quercus nigra*	0/ 0	0.1/ 1	0/ 0	0.2/ 1
	Plants found in WNA only				
141	*Aristolochia sepentaria*	0/ 0	0/ 0	0/ 0	0.1/ 1
54	*Bidens frondosa*	0/ 0	0/ 0	0/ 0	0.1/ 1
53	*Bignonia capreolata*	0/ 0	0/ 0	0/ 0	0.8/ 5
144	*Botrychium biternatum*	0/ 0	0/ 0	0/ 0	0.1/ 1
48	*Ilex opaca*	0/ 0	0/ 0	0/ 0	0.2/ 2
52	*Mitchella repens*	0/ 0	0/ 0	0/ 0	0.6/ 1
106	*Quercus falcata*	0/ 0	0/ 0	0/ 0	0.1/ 1
64	*Symplocos tinctoria*	0/ 0	0/ 0	0/ 0	3/ 1
	Plants found in both portions of ROW				
90	*Ascyrum hypericoides*	0/ 0	0.4/ 1	0.2/ 2	0/ 0
28	*Aster dumosus*	0/ 0	5.2/ 5	2.1/ 4	0/ 0
91	*Baccharus halimifolia*	0/ 0	0.1/ 1	0.3/ 2	0/ 0
7	*Carex tribuloides*	0/ 0	16.6/ 5	7/ 5	0/ 0
15	*Conoclinium coelestinum*	0/ 0	2/ 1	0.8/ 3	0/ 0
16	*Cyperus pseudovegetus*	0/ 0	3.4/ 4	6.4/ 3	0/ 0
6	*Cyperus virens*	0/ 0	1.8/ 4	1/ 5	0/ 0
2	*Diodia virginiana*	0/ 0	2.6/ 5	4.8/ 4	0/ 0
88	*Eupatorium capillifolium*	0/ 0	0.1/ 1	0.2/ 2	0/ 0
12	*Eupatorium serotinum*	0/ 0	3/ 4	1.5/ 5	0/ 0
78	*Gratiola virginiana*	0/ 0	0.7/ 3	0.2/ 2	0/ 0
79	*Hydrocotyle verticillata*	0/ 0	0.1/ 1	0.2/ 1	0/ 0
9	*Hydrolea uniflora*	0/ 0	1.1/ 3	0.4/ 3	0/ 0

TABLE C.3 (Cont.)

Field No.	Scientific Name and Authority	Average Percent Coverage/ Absolute Frequency[a] ENA	East ROW	West ROW	WNA
20	*Hypericum mutilum*	0/ 0	0.3/ 2	0.8/ 3	0/ 0
110	*Juncus effusus*	0/ 0	0.3/ 2	0.4/ 2	0/ 0
87	*Juncus validus*	0/ 0	0.8/ 2	0.4/ 2	0/ 0
27	*Lindernia anagallidea*	0/ 0	0.2/ 2	0.1/ 1	0/ 0
94	*Liquidambar stryaciflua*	0/ 0	0.1/ 1	0.3/ 2	0/ 0
19	*Ludwigia palustris*	0/ 0	2.3/ 4	0.3/ 2	0/ 0
120	*Lycopus rubellus*	0/ 0	2.8/ 2	0.4/ 3	0/ 0
8	*Mimulus alatus*	0/ 0	9.2/ 5	8.7/ 5	0/ 0
112	*Panicum dichotomiflorum*	0/ 0	2.8/ 3	0.4/ 2	0/ 0
5	*Panicum regidulum*	0/ 0	6.2/ 4	8.6/ 4	0/ 0
18	*Penthorum sedoides*	0/ 0	2.7/ 5	3.5/ 4	0/ 0
3	*Phyla Lanceolata*	0/ 0	2.7/ 5	3.7/ 3	0/ 0
23	*Polygonum hydropiperoides*	0/ 0	3.8/ 4	2.4/ 4	0/ 0
29	*Polypremum procumbens*	0/ 0	0.7/ 3	0.2/ 1	0/ 0
22	*Rotala ramosior*	0/ 0	0.1/ 1	0.2/ 2	0/ 0
82	*Salix nigra*	0/ 0	1.9/ 4	0.5/ 4	0/ 0
83	*Solidago canadensis*	0/ 0	0.4/ 3	3.4/ 2	0/ 0
115	*Vitis riparia*	0/ 0	0.4/ 1	0.2/ 1	0/ 0
34	Unidentified *Cyperus* or *Rhincosporum*	0/ 0	0.1/ 1	0.3/ 2	0/ 0
37	Unidentifiable grass No. 1	0/ 0	1/ 1	0.2/ 2	0/ 0
113	Unidentifiable grass No. 4	0/ 0	0.6/ 1	0.4/ 1	0/ 0
	Plants found only on east portion of ROW				
10	*Chasmanthium latifolium Michx.*	0/ 0	0.1/ 1	0/ 0	0/ 0
75	*Juncus diffusissimus*	0/ 0	0.1/ 1	0/ 0	0/ 0
17	*Ludwigia alternifolia*	0/ 0	0.6/ 1	0/ 0	0/ 0
26	*Ludwigia peploides*	0/ 0	0.1/ 1	0/ 0	0/ 0
33	*Oxalis europaea*	0/ 0	0.1/ 1	0/ 0	0/ 0
133	*Phanopyrum gymnocarpon*	0/ 0	0.2/ 1	0/ 0	0/ 0
25	*Rhexia mariana*	0/ 0	0.1/ 1	0/ 0	0/ 0
77	*Rhynchospora sp.*	0/ 0	0.1/ 1	0/ 0	0/ 0
134	*Sambucus canadensis*	0/ 0	0.1/ 1	0/ 0	0/ 0
24	*Stachys tenuifolia*	0/ 0	2.2/ 2	0/ 0	0/ 0
30	*Styrax americana*	0/ 0	0.1/ 1	0/ 0	0/ 0
114	Unidentifiable grass No. 2	0/ 0	0.4/ 1	0/ 0	0/ 0
	Plants found only on west portion of ROW				
125	*Carex glaucescens*	0/ 0	0/ 0	0.1/ 1	0/ 0
92	*Eryngium prostatum*	0/ 0	0/ 0	0.1/ 1	0/ 0
111	*Lobelia cardinalis*	0/ 0	0/ 0	0.1/ 1	0/ 0
136	*Ludwigia decurrens*	0/ 0	0/ 0	0.1/ 1	0/ 0
89	*Paspalum notatum*	0/ 0	0/ 0	0.2/ 1	0/ 0
139	*Phyllanthus caroliniensis*	0/ 0	0/ 0	0.1/ 1	0/ 0
121	*Rhynchospora inexpansa*	0/ 0	0/ 0	0.2/ 1	0/ 0

TABLE C.3 (Cont.)

Field No.	Scientific Name and Authority	Average Percent Coverage/ Absolute Frequency[a] ENA	East ROW	West ROW	WNA
58	*Ulmus alata*	0/ 0	0/ 0	0.1/ 1	0/ 0
38	*Xanthium strumarium*	0/ 0	0/ 0	0.1/ 1	0/ 0
122	Unidentifiable grass No. 3	0/ 0	0/ 0	0.4/ 1	0/ 0
Shrub Stratum (five 10 × 15-m plots)					
	Shrubs found in both NAs				
116	*Carpinus caroliniana*	23.8/ 5	0/ 0	0/ 0	25/ 5
68	*Ilex decidua*	0.4/ 1	0/ 0	0/ 0	2.4/ 2
47	*Toxicodendron radicans*	0.4/ 1	0/ 0	0/ 0	2.8/ 4
58	*Ulmus alata*	5/ 1	0/ 0	0/ 0	0.2/ 1
50	*Vitis rotundifolia*	0.6/ 0	0/ 0	0/ 0	2.2/ 2
	Shrubs found in ENA only				
61	*Aesculus pavia*	0.1/ 1	0/ 0	0/ 0	0/ 0
44	*Carya tomentosa*	0.2/ 1	0/ 0	0/ 0	0/ 0
131	*Diospyros virginiana*	0.1/ 1	0/ 0	0/ 0	0/ 0
130	*Forestiera acuminata*	0.1/ 1	0/ 0	0/ 0	0/ 0
60	*Fraxinus pennsylvanica*	0.6/ 1	0/ 0	0/ 0	0/ 0
48	*Ilex opaca*	0.4/ 1	0/ 0	0/ 0	0/ 0
93	*Ligustrum sinense*	0.1/ 1	0/ 0	0/ 0	0/ 0
94	*Liquidambar stryaciflua*	0.2/ 1	0/ 0	0/ 0	0/ 0
59	*Nyssa sylvatica*	0.2/ 1	0/ 0	0/ 0	0/ 0
56	*Quercus phellos*	0.1/ 1	0/ 0	0/ 0	0/ 0
63	*Rhus copallinum*	0.1/ 1	0/ 0	0/ 0	0/ 0
62	*Styrax grandifolia*	0.4/ 1	0/ 0	0/ 0	0/ 0
64	*Symplocos tinctoria*	0.1/ 1	0/ 0	0/ 0	0/ 0
	Shrubs found in WNA only				
46	*Berchemia scandens*	0/ 0	0/ 0	0/ 0	4.2/ 4
107	*Fagus grandifolia*	0/ 0	0/ 0	0/ 0	0.4/ 1
55	*Ilex vomitoria*	0/ 0	0/ 0	0/ 0	0.4/ 1
129	*Morus rubra*	0/ 0	0/ 0	0/ 0	0.2/ 1
108	*Ostrya virginiana*	0/ 0	0/ 0	0/ 0	0.6/ 1
104	*Quercus nigra*	0/ 0	0/ 0	0/ 0	0.4/ 1
142	*Ulmus americana*	0/ 0	0/ 0	0/ 0	0.1/ 1
Sapling Stratum (five 10 × 15-m plots)					
	Saplings found in both NAs				
116	*Carpinus caroliniana*	7.8/ 5	0/ 0	0/ 0	10/ 5
104	*Quercus nigra*	0.4/ 1	0/ 0	0/ 0	1.2/ 1

TABLE C.3 (Cont.)

Field No.	Scientific Name and Authority	Average Percent Coverage/ Absolute Frequency[a] ENA	East ROW	West ROW	WNA
	<u>Saplings found in ENA only</u>				
48	*Ilex opaca*	0.4/ 1	0/ 0	0/ 0	0/ 0
94	*Liquidambar stryaciflua*	0.4/ 1	0/ 0	0/ 0	0/ 0
129	*Morus rubra*	0.6/ 1	0/ 0	0/ 0	0/ 0
142	*Ulmus americana*	0.8/ 1	0/ 0	0/ 0	0/ 0
	<u>Saplings found in WNA only</u>				
61	*Aesculus pavia*	0/ 0	0/ 0	0/ 0	0.6/ 1
46	*Berchemia scandens*	0/ 0	0/ 0	0/ 0	2/ 1
44	*Carya tomentosa*	0/ 0	0/ 0	0/ 0	0.8/ 1
56	*Quercus phellos*	0/ 0	0/ 0	0/ 0	0.2/ 1
64	*Symplocos tinctoria*	0/ 0	0/ 0	0/ 0	3/ 1
Trees Over 12.7 cm in Diameter (average basal areas in cm^2/absolute frequency for 10 × 15-m plots)					
	<u>Trees found in both NAs</u>				
116	*Carpinus caroliniana*	387/ 4	0/ 0	0/ 0	314/ 3
94	*Liquidambar stryaciflua*	379/ 2	0/ 0	0/ 0	893/ 3
146	*Pinus taeda*	493/ 1	0/ 0	0/ 0	425/ 1
104	*Quercus nigra*	16/ 1	0/ 0	0/ 0	377/ 3
142	*Ulmus americana*	335/ 1	0/ 0	0/ 0	161/ 3
	<u>Trees found in ENA only</u>				
44	*Carya tomentosa*	628/ 2	0/ 0	0/ 0	0/ 0
148	*Quercus lyrata*	330/ 1	0/ 0	0/ 0	0/ 0
127	*Taxodium disticum*	1039/ 0	0/ 0	0/ 0	0/ 0
	<u>Trees found in WNA only</u>				
147	*Celtis laevigata*	0/ 0	0/ 0	0/ 0	31.6/ 1
106	*Quercus falcata (pagoda)*	0/ 0	0/ 0	0/ 0	600/ 2
58	*Ulmus alata*	0/ 0	0/ 0	0/ 0	42.2/ 1

[a] Frequencies based on five plots.

TABLE C.4 Species Found Outside of Sampling Plots in the Bayou Grand Cane Study Site

Field No.	Plant Species	Location
109	*Acer rubrum*	Seedlings in ENA
150	*Asimina triloba*	Shrub found in ENA
72	*Carya cordiformis*	Seedlings in ENA
85	*Conyza canadensis*	Herb found on ROW
151	*Elephantopus carolinianus*	Herb found on ROW
152	*Elephantopus tomentosus*	Herb found on ROW
126	*Justica americana*	Herb in ENA
154	*Panicum anceps*	Grass found on ROW
86	*Penstemon laxiflorus*	Herb found on ROW
155	*Polygonum virginianum*	Herb found on ROW
156	*Rhamnus caroliniana*	Shrub found in ENA
157	*Scirpus cyperinus*	Sedge found on ROW
158	*Solidago salicina*	Herb found on ROW
160	*Vaccinium elliottii*	Seedlings in ENA
159	*Veronia missurica*	Herb found on ROW