VEGETATIVE DELINEATION REPORT

LAKE BOUDREAUX WETLAND (TE-7)

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PURPOSE OF REPORT

The purpose of this report is to document the location and extent of each marsh vegetative zone (fresh/intermediate, brackish, saline, cypress/tupelo swamp) in the management area from 1992 near-vertical color-infrared aerial photography. These data will be used to evaluate the effectiveness of structures and structure management on vegetative communities. This report also depicts the location of selected vegetative data stations used to determine vegetative zone locations. These findings will provide baseline information on the project area's present conditions. After baseline information is collected, vegetative surveys will be conducted every June to August at the same stations to provide spatial and temporal data between flight dates. Five years after completion, the project will be flown again and all data will be used to evaluate the effectiveness of the structures and structure management on vegetative communities. The data collected every flight year will be used to measure changes over time and assess the success or failure of the project.

STUDY AREA

The project area is about 46,000 acres and covers an entire hydrologic sub-basin north of Highway 57 between the Bayou Grand Caillou and Bayou Petit Caillou natural levee ridges (figure 1). Louisiana Highway 56 is part of the east boundary between the junction with Highway 57 and Robinson Canal. The study area center is approximately 12 mi south-southeast of Houma in Terrebonne Parish.

The area interior is owned by several large landowners. Hundreds of small land owners are located along the natural ridge systems of both bayous and much of their properties extend into the wetlands beyond the man-made storm water protection levees. Large pumping stations along internal drainage canals provide forced drainage for residential and commercial property by the wetlands.

The Lake Boudreaux hydrologic basin was formed by natural silt deposition along the Mississippi River distributary channels during the Lafourche Delta building period. In this portion of the Lafourche Delta, land was deposited on the eastern lobe of the Tech Delta (Louisiana Barrier Island Erosion Study 1992). Land has naturally eroded and rebuilt for thousands of years. River management during recent eras has stopped silt-laden water from entering this part of the coastal area. Man-made levees block natural water courses such as Bayou Lafourche, Bayou Terrebonne, Bayou Grand Caillou, and Bayou Petit Caillou. Without periodic input of mineral soil during high river flood conditions, wetlands primarily depend upon plant production for annual organic material accumulation which is the foundation for emergent vegetation.

Changes in hydrology and water quality have direct impacts upon plant community composition, size, and viability. Increased tidal exchange aids in transporting fragile marsh soil particles out of the wetlands and allows saltwater to intrude into areas of lower water and soil salinities. Rapid freshwater runoff becomes yet another problem. Forced drainage stations in most coastal communities have been constructed near an outfall canal to hasten excess water discharge. This practice has facilitated wetland loss that otherwise could have been retained through proper water management programs. The Lake Boudreaux project area is typical of this condition.

The major water features of the study area are Lake Boudreaux, Lake Quitman, and Lake Gero. Bayou Dulac was the major natural drainage outlet for the entire basin before the man-made canals. Bayou Dulac empties into Bayou Grand Caillou near the village of Dulac. Because the Houma Navigation Channel (HNC) is so near where Bayou Dulac enters Bayou Grand Caillou, daily tidal exchange increased after the HNC was built in the late 1960's.

In addition to lakes and natural bayous, two large man-made canals cut through the Bayou Petit Caillou natural terrace system. The Boudreaux Canal enters the southeast quarter of Lake Boudreaux and the Robinson Canal enters the southeast quarter of Lake Quitman. Both of these canals have been in place for an extended period of time and provided access to early oyster industry fishermen and processors (Louisiana Barrier Island Study 1992).

The project area has several producing oil and gas fields in the interior wetlands to which marine access is through Bayou Dulac or Boudreaux Canal. The Highway 56 Bridge over Robinson Canal is not high enough for any vessels other than small boats to pass under. In place at both the Boudreaux Canal and Bayou Dulac highway crossings are movable bridges that allow large drilling rigs and oil field service vessels to navigate.

Historical data for the costal zone indicates that most of the north end of the project area was cypress/tupelo swamp bordered with fresh/intermediate marshes. Cypress timber harvesting in the upper portion of the area was through access canals cut into the swamp from elevated land and natural bayous. Some of these timber access canals have been converted into drainage or oil and gas access canals. At present, large stands of freshwater plants are stressed or have been killed by saltwater intrusion through many of these waterways. Canal enlargement north of Lake Boudreaux has caused most of this loss.

In the southern end of the study area, Highway 57 maintenance between Dulac and Highway 56 has caused marsh impoundment. Natural subsidence is evidenced by large stands of dead live oak trees (*Quercus virginiana*) east of Lake Quitman. Saltwater intrusion may have caused many of these trees to die and standing water around the base of the remaining live trees will soon cause them to die as well. Large sections of emergent marsh have converted into open water throughout the basin and the largest land loss is in the south end where impounding is the most evident. Hydrologic restoration of the entire basin may best be accomplished by addressing the three major water openings and providing some relief from impounding by installing openings through Highway 57 near Bayou Sale.

Trappers have periodically burned accumulated plant material in this coastal area. This marsh management technique encourages regeneration of plant communities attractive to muskrat, nutria, and waterfowl. Marsh plant communities with high wildlife habitat quality are also excellent detritus material producers for fisheries food chain organisms.

As marshes deteriorate, use of wildlife and fisheries resources plateaus for a short time before a marked decline occurs. As the habitat base is lost, all uses decrease and many traditional species no longer inhabit the area. Wetland management efforts must be designed to prevent this sequence of deterioration from progressing to land loss. Many acres of the Lake Boudreaux watershed have converted into deep water habitat that will be impossible to revert into emergent marsh under existing technology.

METHODS

Vegetative zones were delineated using 1:12,000-scale color-infrared photographs. Vegetative zones were ground-truthed on August 12, 1992 by locating species composition, water levels, salinities, landmarks, and other pertinent information. The area was then mapped with project boundaries, vegetative zones, and vegetative stations in place (figure 2). The percent area of each habitat type and open water was calculated using GIS software (Infocad ver.). Details of the methodology can be found in Appendix B.

RESULTS

Color-infrared photographs were taken on April 22, 1992 and the site was visited on August 12, 1992. During the initial visit, the area was ground-truthed and attempts were made to determine the line of demarcation between the marsh vegetative zones. Field investigations confirmed the vegetative type lines compiled by Chabreck and Linscombe in their 1988 Louisiana Coastal Marsh Vegetative Type Map.

A small section of saline marsh exists in the southeastern end of the project area north of Highway 57. This area is under stress from impounding and unless relief is provided soon, much of the area will convert into open water. The marsh is supporting a stand of smooth cordgrass (*Spartina alternaflora*). The major portion of the study area; however, is composed of brackish marsh and surrounds Lake Boudreaux, Lake Quitman, and Lake Gero. The dominate vegetation in the brackish marsh area is marshhay cordgrass (*Spartina patens*).

A band of intermediate marsh is along the western edge of the project area covering a section north of a pipeline canal which crosses the area in an east-west direction. The plant communities in the intermediate zone are under stress from saltwater encroachment. Several sites are developing large open water areas and have dead stands of waxmyrtle (*Myrica cerifera*). The dominate vegetation was bullwhip (*Scirpus californicus*), waterhyssop (*Bacopa monnieri*), and dwarf spikerush (*Eleocharis parvula*). Small stands of marshhay cordgrass are established along the canal banks and on elevated sites in the marsh interior.

A stand of cypress/tupelo-gum swamp is along the northern edge of the study area. Timber has been harvested from this forest and few trees of commercial value remain. Baldcypress (*Taxodium distichum*), tupelo-gum (*Nyssa aquatica*), red maple (*Acer rubrum*), black willow (*Salix nigra*), and green ash (*Fraxinus pennsylvanica*) are the dominate trees in this forest. Understory species are waxmyrtle and buttonbush (*Cephalanthus occidentalis*).

Hurricane Andrew crossed the central coastal section of Louisiana on August 24–25, 1992. The Lake Boudreaux area was in the northeast quadrant of the tropical storm and residential and other man-made structures near the study area were extensively damaged by wind and water. Very high tides and salinity spikes were recorded. Louisiana Department of Natural Resource (DNR) staff made several follow-up visits to the vegetative station during environmental monitoring trips. Freshwater plant species were killed by saltwater driven into the northern portion of the area and all emergent plant stands exhibit signs of damage from storm wind and water currents. Accumulated plant material was washed out of the wetlands and deposited along elevated levees and along the cypress swamp fringe. Final assessment of impacts to the plant communities will not be evident until after one or more growing seasons. Aerial photography may show physical impacts.

Vegetative Station Data

Eleven vegetative stations were established throughout the project area (figure 2). They were located in transitional areas between the different vegetative zones and in areas of special significance such as the stressed waxmyrtle stands. Salinities and water levels were taken during the initial ground-truthing effort and repeated at or near the stations in follow-up investigations. Photographs were taken at each station and the photo direction identified. Species composition and the dominate vegetative species were noted at each station and recorded by percentage estimation.

Station 1 is along the Bayou Butler west bank about ¼ mi from the northwest corner of Lake Boudreaux. Salinity was 3 parts per thousand (ppt) and marsh vegetation was 50% marshhay cordgrass and 50% three-cornered grass (*Scirpus olneyi*). Vegetation along the bayou bank included many common wetland plants such as roseau cane (*Phragmites communis*), hogcane (*Spartina cynosuroides*), cutgrass (*Zizaniopsis miliaceae*), marshhay cordgrass, smooth cordgrass, three-cornered grass, camphorweed (*Pluchea camphorata*), waterhyssop, deerpea (*Vigna luteola*), morningglory (*Ipomoea sagittata*), belle dame (*Acnida cuspidata*), lesser ragweed (*Ambrosia artemisiifolia*), dogfennel (*Eupatorium capillifolium*), eastern baccharis (*Baccharis halimifolia*), marshelder (*Iva frutescens*), black willow, and tallowtree (*Sapium sebiferum*). Aquatic vegetation in the bayou was Eurasian watermilfoil (*Myriophyllum spicatum*), southern naiad (*Najas quadalupensis*), coontail (*Ceratophyllum demersum*), widgeongrass (*Ruppia maritima*), duckweed (*Lemna minor*), and common salvinia (*Salvinia rotundifolia*). Dwarf spikerush (*Eleocharis parvula*) was common along the edge of all waterways and ponds (figure 3).

Station 2 is along a small canal running east-northeast out of Butler Bayou. To the right of the canal, three-cornered grass was 80% and marshhay cordgrass 20%. Northwest of the station, marshhay cordgrass was 90%, three-cornered grass 5%, and baccharis 5%. Smooth cordgrass was growing along the edge of the small bayou and canal system and may have been planted during former restoration efforts in the area. Aquatic plants were coontail, widgeongrass, Eurasian watermilfoil, and duckweed. Small clumps of water hyacinth (*Eichornia crassipes*) were noted in the canal system. This marsh appears very healthy and may be in a transition from an intermediate marsh to a brackish marsh (figures 4 & 5).

Station 3 is at a large pond area on the west side of the Bayou Chauvin canal system. Salinity was 2 ppt and vegetation was marshhay cordgrass (90%), three-cornered grass (5%), and a 5% combination of bulltongue (*Sagittaria lancifolia*), cattail (*Typha spp.*), wild millet (*Echinochloa walteri*), sawgrass (*Claidum jamaicense*), marshmallow (*Hibiscus lasiocarpos*), and belle dame. Small clumps of alligatorweed (*Alternanthera philoxeroides*), sedge (*Carex spp.*), pennywort (*Hydrocotyle umbellata*), cutgrass, and smooth cordgrass were located along the edge of the canal and spoilbank (figures 6, 7, 8, & 9).

Station 4 is at a Fina-LaTerre property line near an oil and gas well site. Water salinity at this station was 1 ppt. A large stand of dead cypress trees is located north of this station. Bulltongue was 90% and alligatorweed and sensitive jointvetch (*Aeschynomene indica*) were 5% of the plant community. Belle dame, wild millet, coffeeweed (*Sesbania macrocarpa*), and goldenrod

(*Solidago sempervirens*) were common in the marsh and along the levee system at this station. Water hyacinth mats were more common in the waterways and common salvinia had formed dense mats in the pond area and may be a pest plant because of its poor quality as a wildlife food plant (figures 10, 11, & 12).

Station 5 is on the north side of an east-west mineral canal where a large stand of waxmyrtle is showing extensive stress and an estimated 60% of the trees are dead. Water salinity was 2 ppt. The pond next to the waxmyrtle stand was covered with waterhyssop, and clumps of bullwhip (*Scirpus californicus*) are in the interior of this section (figures 13 &14).

Station 6 is along a canal running to the south near a stub canal with a plug. A large stand of bullwhip is in back of the pond by the canal and composes 100% of this site. Water salinity at this station was 2 ppt and waxmyrtle was on large floats with waterhyssop on the surface under the trees. A mixture of duckweed, wild millet, deerpea, coffeeweed, camphorweed, and marshelder was growing on the front of the float along the edge of the bullwhip (figures 15, 16, & 17).

Station 7 is located on the east side of the canal which runs to the south. Water salinity at this station was 3 ppt. The marsh in this area is very broken and is converting into a brackish marsh from an intermediate marsh. Plants were 90% marshhay cordgrass with a 5% combination of three-cornered grass, saltmarsh loosestrife (*Lythrum lineare*), seashore paspalum (*Paspalum vaginatum*), smartweed (*Polygonum spp.*), and alligatorweed. Yellow pond-lily (*Nuphar luteum*) and coontail were growing in the canal system (figures 18 & 19).

Station 8 is across the canal from station 6 in a marsh that is changing to a more brackish plant composition. Water salinity was 2 ppt. Large spikerush (*Eleocharis spp.*) was the dominate plant (60%) with bulltongue (15%) and cattail (25%). Waterhyssop was located throughout most of the marsh interior. Small stands of saltmarsh bulrush (*Scirpus maritimus*) were located along parts of the canal system (figures 20 & 21).

Station 9a (east) is on the east side of New Canal at the power line crossing. Salinity was 4 ppt and marshhay cordgrass was 60% and three-cornered grass 40%. There was a mixture of saltmarsh bulrush and roseau cane in the plant community and dwarf spikerush was common on exposed soil sites. Aquatic vegetation was coontail, southern naiad, and Eurasian watermilfoil (figures 22, 23, & 24).

Station 9b (west) is on the west side of New Canal at the power line. Salinity was 4 ppt and marsh vegetation was 80% marshhay cordgrass and 20% three-cornered grass. Smartweed was growing along the backside of the levee system. The large pond was providing good waterfowl habitat and Eurasian watermilfoil and southern naiad made up the aquatic plant stand (figures 25 & 26).

Station 10 is near the end of a mineral canal and along the edge of a large pond area southwest of Lake Boudreaux near Lake Gero. Water salinity at this station was 2.5 ppt. Marsh vegetation was 70% marshhay cordgrass and 30% three-cornered grass. A mixture of bulltongue, camphorweed, and deerpea was noted in this marsh. This marsh looks healthy and appears to have been burned within the past year. Eurasian watermilfoil and duckweed were the aquatic vegetation (figures 27, 28, & 29).

Station 11 is located along the north edge of a large pond area east of some oil and gas producing facilities. Salinity was 1 ppt and the vegetation was 90% marshhay cordgrass, 5% three-cornered grass, and a 5% mixture of black rush (*Juncus roemerianus*), marshelder, baccharis, camphorweed, and belle dame (figures 30, 31, & 32).

Vegetative Area Calculations

This project area (58,526.68 acres) is basically made up of three different vegetative zones, fresh/intermediate marsh, brackish marsh, and cypress/tupelo swamp. The cypress/ tupelo swamp is located mostly in the northern portion of the project with some patches along the back levees of Little Petit Calliou Bayou and Grand Calliou Bayou. This cypress swamp zone is split into live swamp, covering 4,913 acres (8.4%) and dead swamp, covering 722 acres (1.23%). The next vegetative zone south of the cypress swamp is the fresh/intermediate zone covering 9,720 acres or 16.61% of the project area. This project area also contains 9,825 acres (16.79%) of none wetland. The remainder of the project is covered by brackish marsh, 33,344 acres (56.97%).

DISCUSSION

The project area has been subjected to extensive hydrologic changes for most of this century. Man-made canals through the Petit Caillou natural levee system provided navigation access and allowed for water interchange between the interior marsh and the bayou. Recent canal expansion to accommodate oil and gas exploration and for pipeline transportation has further altered the hydrology. Construction of the Houma Navigation Channel provided more frequent tidal exchange with interior marsh areas through Bayou Dulac. In addition to water level impacts from increased tidal exchange, the interior marsh had a marked salinity increase after channel construction. Natural subsidence has contributed to a cumulative water level increase in this hydrologic sub-basin. As plant communities die out because of stress from impounding or saltwater intrusion, land loss increases and large open water areas develop. Tidal action increases as open water areas grow because more freedom is possible and marsh soil is rapidly transported out. The result is deep ponds and lakes in formerly vegetated marsh. Restoring deeper ponds and lakes to vegetated marsh may not be practical or possible unless water can be drawn off the surface so seedlings can establish. Reducing tidal exchange and rapid rainfall runoff would prolong the area's natural resource productivity.

REFERENCES

Chabreck, R. H., G. Linscombe 1988. Louisiana Coastal Marsh Vegetative Type Map 1988.

Williams, S. J., S. Penland, A. H. Sallenger, Jr. 1992. Louisiana Barrier Island Erosion Study.

APPENDIX A

(Vegetative station photos)

Figure 3

Figure 4

Figure 5

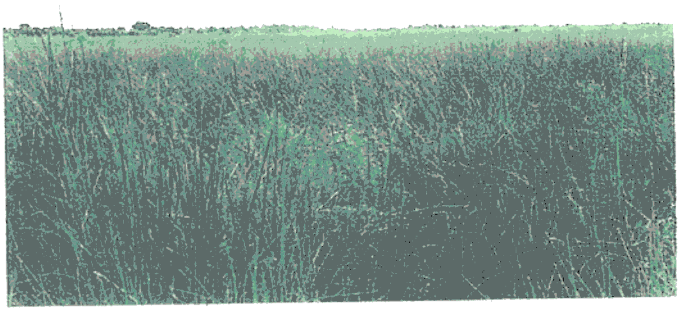

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

APPENDIX B

(Delineation methodology)

FORMAT FOR AERIAL PHOTOGRAPHY DELINEATIONS

Steps for defining marsh zones from photography:

A) Obtain color infra-red photography of the project site.

B) Depending on project size do one of the following:
   1) Create a mosaic of the project area in order to view complete project at one time.
   2) Use individual prints.

C) Lay a sheet of clear mylar plastic paper over the photos and attach it to the prints.

D) Using a 0.25mm pen, outline the project area then outline the areas inside the project that differ in color, texture, height, and/or shape.

E) Label open water areas and permanent land marks to be used in year to year comparisons on zone location changes.

F) If historical vegetative data is available for the project area label delineated areas, on mylar, according to this field data with a black permanent marker.

G) Schedule ground truthing of delineated areas.

H) Create a plan of action for field trip following these guidelines:
   1) Locate permanent stations in each delineated zone and possibly on transition lines.
   2) Have 2 to 5 stations per zone depending on the size and possible species makeup of the zone.
   3) Establish a possible pattern for investigating each station by numbering them.

I) Visit project site to perform ground truthing of delineated vegetative zones using the following method:
   1) Using an airboat investigate all stations marked
   2) At each station collect the following data:
      a) identify the vegetation in the area, including aquatics, and estimate percent cover by species
      b) associate identified vegetation in area to the colors, patterns, and textures shown on the photos
      c) label zones, on mylar, according to the vegetation identified with a permanent marker
      d) take photographs of area
      e) take salinity and water temperature readings
      f) make field notes of water levels, water clarity, vegetative condition, land marks, and wildlife and fisheries encountered

Steps performed in office after ground truthing:

A) Digitize the boundary of each vegetative zone, in infocad with digital 1990 Landsat data as a backdrop and using prints delineated in the field as a guide.

B) Locate and label all vegetative stations in the project area.

C) Assign shade patterns to respective vegetative zone type (i.e. cypress/tupelo, fresh/intermediate, brackish, saline)

D) Perform percentage and acreage calculations of the four marsh types

E) Formulate a report including
   1) general condition of project area
   2) acreage and percentages calculated
   3) location of stations with the vegetation and photos corresponding to each one
   4) history of project area
   5) methods used to evaluate the project
   6) figure showing the coded vegetative zone within the project area