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Development of outdoor educational landscapes in forested wetlands of Louisiana's Atchafalaya Basin

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DEVELOPMENT OF OUTDOOR EDUCATIONAL LANDSCAPES IN FORESTED WETLANDS OF LOUISIANA'S ATCHAFALAYA BASIN

A Thesis

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ABSTRACT

Natural landscapes, formed by eons of plant succession, are changing or disappearing as a result of rapid urban development and industrial growth. In addition, the human population explosion pressures are being applied to alter the urban/wildland interface in the United States and throughout the world. Many of Louisiana wetlands are subjected to these pressures and have caused change and loss in forested wetland areas. Most of the Mississippi River Delta consists of wetlands in a state of transition to either open water or degraded hardwood forest due to the effects of several key factors. Being a native of south Louisiana, I have witnessed the changes occurring across south Louisiana and the efforts to restore and preserve valuable wetland areas. As landscape architects we must work with biologists and ecologists to restore, protect, and preserve the delicate balance of wetlands present in today's changing landscapes.

The causes of wetland loss are both natural and anthropogenic. Many wetlands in south Louisiana are being lost due to coastal erosion, particularly in the Barataria-Terrebonne Estuary, due to saltwater intrusion, and in the Atchafalaya Basin due to sediment impoundment. Both areas were dramatically altered around the beginning of the 20th century. Because of the value of the unique landscapes of the Atchafalaya Basin, efforts are being made to keep it "Wet and Wild," to preserve it for generations to come. Part of the efforts to preserve this natural landscape should incorporate ways to inform the public of its value, its biodiversity, its delicate ecosystem, and hydrological requirements. As restoration projects are developed, it is important to educate the stakeholders to the likelihood of sustainability. How can we

facilitate the presence of new and informed constituents for the next 10 years, 30 years, and 50 years?

This thesis focuses on developing recreational landscapes within recreational areas of the Atchafalaya Basin that will serve as outdoor classrooms, or learning landscapes, to the visitor and, particularly, the young naturalist. The young naturalists, through education, will recognize the value of this unique landscape and continue support efforts to preserve it.

CHAPTER 1. LOUISIANA COASTAL ENVIRONMENT

1.1 Value of Louisiana Wetlands

Wetlands are considered one of the most bio-diverse ecosystems. Ducks, fish, snakes, even deer and turkey and many other animals depend upon wetlands sometime during their life. Without these valuable wetlands, these animals would not survive. Also, Louisiana wetlands provide essential habitat to some of the most interesting and charismatic wildlife on earth. It is now widely accepted by both civil engineers and ecologists that wetlands associated with rivers and streams provide an important flood protection function to downstream towns and cities. Riverine wetlands upstream of towns store floodwater and can reduce downstream flood levels. Flooding of areas adjacent to streams and rivers is a natural occurrence that has led to the development of healthy and fascinating ecosystems. Colonization of the US has led to the construction of levees and floodwalls, and the dredging of rivers to contain floodwater. However, the flood of 1993 demonstrated that the long wetland floodplain of the Atchafalaya Basin contributed to reducing flood damage elsewhere along the Mississippi River. Restoration of wetlands helps reduce flood and wind damage. In coastal areas, wetlands provide a buffering effect against tidal surges associated with hurricanes. Louisiana coastal wetlands provide storm protection for ports that carry nearly 500 million tons of waterborne commerce annually. This accounts for 21% of all waterborne commerce in the United States each year (USACE, 2001).

Wetlands also provide water purification, because when wetlands receive floodwater from rivers and streams they remove suspended sediments and pollutants such as phosphorus and nitrogen, (which lead to fish kills) as well as carbon and metal compounds from the water before it flows back into the rivers. Less turbid and polluted water benefit aquatic organisms and improve the aesthetics and function of downstream ecosystems. The recreational and educational value of wetlands is vast. Paddle sports, hiking, hunting, camping, wildlife watching, education and research are just a few of the ways that wetlands benefit society directly. Louisiana has an estimated $944 million value in recreational fishing each year and $220 million in wetland related eco-tourism (Southwick,1997 Coreil, 1997). Additionally, wetlands are being discovered as an educational tool. Many school systems utilize wetland sites to educate students. Vacationers spend millions of dollars escaping the "grind". Visits to, and enjoyment of, wetlands is an important industry in the US, especially here in Louisiana.

1.2 Environmental Background/Study Area

The study of the interactions of people and the environment of Louisiana is relatively young, and as with any new area of science, the progression of time brings new and better understanding. Much of what is known now relates to how the landscape was altered and the obvious effects of those alterations. These interactions have been researched and evaluated by scientists, resulting in various theories that are not in my realm to fully evaluate. However, there are those that are generally accepted.

We know that forested wetlands are an important component of the southern United States coastal ecosystems. They play a critical role in biogeochemical cycles, support fresh and saltwater commercial fisheries, facilitate the most beautiful recreational landscapes, and provide diverse wildlife habitat (Taylor et al. 1990, Mitsch and Grosselink 1993, Walbridge 1995). Cypress-tupelo swamps are generally found along rivers and streams of the Atlantic Coastal Plain from Delaware to Florida, along the Gulf Coast Plain to southeastern Texas, and up the Mississippi River to southern Illinois (U.S.Division of Timber Management Research 1965). Baldcypress was a dominant tree when settlers first arrived in the coastal plain of southern United States (Matoon 1915). Bienville (as quoted by Mancil 1980) said of the vast stands of cypress forest at the time the French settled along the Gulf Coast of Louisiana in the early 18th century, "It is almost impossible to conceive the abundance of the forest. From Manchac to the seashore…there are a hundred square miles of cypress trees which are as thick as the hairs on the head…and it's wonderful."

1.3 Wetland Loss in Louisiana

A series of events occurred in Louisiana at the end of the nineteenth century and the beginning of the twenty century changing the ecology of Louisiana dramatically. Whether these alterations are permanent or reversible is still the subject of great debate and continuing study. Environmentally, the earth is warming, causing sea level rise. The effects of that sea level rise are causing a tremendous loss to coastal marsh as well as inland baldcypress-tupelo

swamps. Understanding these mechanisms is vital to the understanding of how they impact much of south Louisiana.

In the early history of Louisiana, swamps and marshes were considered worthless land areas useless for farming. Furthermore, these areas were considered greatly harmful to the surrounding population. In 1753, Torti named the disease malaria (translated to English "bad air") assuming that the air of the swamp caused malaria (Herms, 1916). This misinformation caused swamps to be perceived as not only useless, but also harmful. This attitude facilitated one of the most devastating clearcutting of forests, over a billion board feet per year (Matoon, 1915), known on the continental United States at a time when virgin forests were being protected by naturalist such as John Muir and Aldo Leopold elsewhere. What seemed to be a renewable resource has proven not to be entirely renewable. Most of what was lost, especially by land erosion, now cannot be replaced in a hundred lifetimes. Baldcypress is in the same family as sequoias and redwoods of the Northwest, and until the turn of the 20th century contained trees 3000 years old and 20 feet or more in diameter. In the Louisiana Historical Quarterly, Rachael Norgress wrote in 1947;

> "The largest stocks are on hundred twenty feet in height, and from twenty-five to forty feet in circumference above the conical base, which at the surface of the earth is always three or four times as large as the continued diameter of the trunk."

In 1931, Lou*isiana Conservation Review*, published an article from the Baton Rouge *State Times,* telling the story of a giant cypress tree felled in Livingston Parish May 1923, in a swamp on the Amite River*:*

> "The story of this tree is remarkable. It came into being hundreds of years before Columbus discovered America. It apparently dates back to the seventh century. It must have been a veteran at the time when Alfred the Great ruled in England. The Indians, perhaps, hid their canoes in its shade. Century after century it has defied the elements and has withstood the axe. Amazing as is the long career of this giant Louisiana tree, far more marvelous is the story it might have told before it was felled to be converted into lumber. If its great branches could have spoken, if the murmuring of its leaves might have been interpreted, what scenes it might have portrayed, what secrets it might have revealed of a past long gone! Yet, mute as it might seem, there is a warning from this fallen giant. Its huge stump with its 1,300 rings seems to proclaim that this cypress tree was one of the last of its kind. It belonged to that forest primeval so fast disappearing. Easier was it to struggle against storm and lighting than against the invasion of the woodsman, and the whir of the sawmill."

Scientific recognition and value of Louisiana swamps appeared in the 1960's and 1970's when biologists, environmentalists, and ecologists recognized the incredible biodiversity of wetlands, and the role they play in the overall environmental health and ecology of our region.

One of the biggest factors affecting forested wetlands is the change in hydrology. Construction of levees as well as straightening of its path has altered inputs from Mississippi River. During the formation of the Mississippi River Delta, the course of the Mississippi River flowed through the Atchafalaya Basin, as well as several other drainage basins. The modern Mississippi River Delta has its beginnings in the late Cretaceous Period and has undergone many major geologic changes since then. One of the defining characteristics of the present shape of the Mississippi River delta system is the vast network of current and abandoned river deltas that have been formed during the natural progression of the Mississippi delta cycle (Coleman et al.,1998).

Figure 1.3 illustrates historical paths of the Mississippi River.

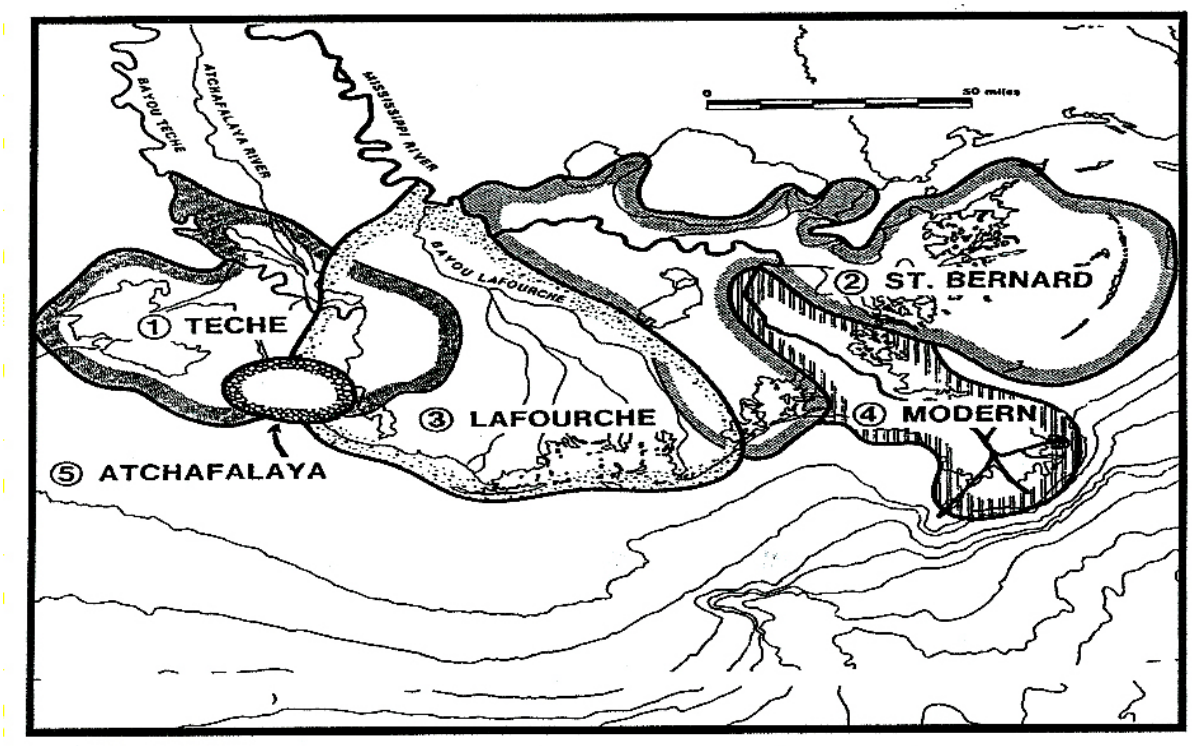

Figure 1.3 Historical Paths of the Mississippi River

The Mississippi River delivers about 240 billion kg of sediment to the Gulf coast per year (Goolsby, 2000). Until the mid 19th century, the Mississippi River flooded its banks yearly, depositing nutrient rich fresh water and sediment through the 'birds foot' system of tributaries to the coastal cypress tupelo swamps and ultimately the coastal marshes. In the mid 19th century farmers and other landowners began levying the Mississippi River in an effort to control flooding and, consequently have altered the hydrology of forested wetlands.

In 1928, the hydrology was further altered by the construction of the Morganza spillway, or what was to become the first Louisiana Mississippi River diversion, which distributes 30% of the River water and sediment into the Atchafalaya Basin. As a result of this alteration, increased sediment to the basin has contributed to rapid land succession. Much of what was once cypress-tupelo is becoming bottomland hardwood forest, thus further reducing the cypress-tupelo forests once covering south Louisiana.

Further alteration in hydrology in Louisiana occurred because of dredging of canals in the early twentieth century, for the cypress logging process, oil exploration and evacuation, and as a means of draining wetlands for the purposes of agriculture. It is estimated that several hundred square miles of wetlands were lost between 1900 and 1940 (Turner 1997). As an indirect result of the canals, cypress swamps continue to be lost due to saltwater intrusion caused by the opening of these waterways to waters from the Gulf of Mexico.

The lack of natural regeneration of baldcypress-tupelogum swamp in southeast Louisiana has been attributed to nutria herbivory, increase flooding

depth, saltwater intrusion, decreased throughput from nearby rivers, and competition with exotic wetland vegetation (Coast 2050). It has been projected that by the year 2050, nearly half (93,883 ha) of all of the existing swamp in Louisiana could be lost despite current restoration and management programs (CWPPRA 1993, Coast 2050 1998). This report was presented in 1998 titled Coast 2050 by a team of biologists, wetland ecologists, and environmentalists, to Congress explaining the condition of the Louisiana Coast and it's rapid erosion. Louisiana has lost 1,900 square miles of land since 1930 (Barras et al. 1994, Barras et al. 2003, Dunbar et al. 1992).

At the present time Louisiana has 30% of the total coastal marsh and accounts for 90% of the coastal marsh loss in the lower 48 states(Dahl 2000, Field et al. 1991). Between 1990 and 2000 wetland loss was approximately 24 square miles per year, which is equivalent to one football field lost every 38 minutes. The loss over the next 50 years with current restoration efforts is expected to be 500 square miles (Barras et al. 2003).

Thanks to the efforts of countless organizations, agencies, and individuals like professor Charles Fryling, Jr. and Dr. Richard Goyer of Louisiana State University, and countless others who have dedicated a great deal of their life to understanding and striving to restore and preserve, many of our valuable wetlands. Through the effort of informed concerned citizens, Louisiana wetlands have gained public attention, throughout the United States and the world. As a direct result of these combined efforts congress was lobbied to pass legislation to assist Louisiana wetlands. Public law 101-646, Title III, or Coastal Wetlands

Planning, Protection, and Restoration Act was passed by congress in 1990, also know as the Breaux Act, was sponsored by Senator John Breaux of Louisiana (Coast 2050, 1998).

The Breaux Act since 1990 has generated about 50 million dollars per year to Louisiana. A large portion of those funds has been dedicated to grants for studying and researching the problem of coastal wetland loss. Additionally these funds have facilitated many projects such as diversions and crevasses intended to deliver fresh water and nutrients to areas in greatest need, rebuild barrio islands and marshes, and planting various types of vegetation. So far, 125 projects have been approved for construction, of which 61 have been completed.

Early in her term as governor of Louisiana, Kathleen Blanco requested an additional $1.15 billion needed for a “meaningful, effective coastal restoration program.” On June 23, 2004 the Senate approved $375 million, short of what is needed (http:breaux.senate.gov/~breaux/releases/2003/2004803557.html).

CHAPTER 2. CULTURE OF SOUTH LOUISIANA

2.1 Pre-Columbian South Louisiana

To develop educational landscapes that assist in shaping public knowledge and support, it is important to examine the historical culture of the citizenry inhabiting the area. The Delta of the Mississippi River and the adjoining Atchafalaya Basin was once the homeland of the Chitimacha. According to tribal tradition, the boundary of the Chitimacha homeland was defined by four sacred trees(Baldcypress): the first was at Maringouin, Louisiana: the second southeast of New Orleans; another at the mouth of the Mississippi River; and the last great cypress located in the present-day Cypremort Point (Kniffen 1987) The Chitimacha lived in structures made from mud, moss, and palmetto found in great quantity throughout Louisiana forested wetlands. The mud and moss walls (waddle and daub construction) made homes cool in summer and warm in winter. A small central fire provided heat for cooking and smoke, which helped repel mosquitoes. The thick palmetto thatch roof kept out even the heaviest rains (McIntire 1958). The main mode of transportation was by dugout canoe made of cypress, cottonwood, or elm.

The majority of the Chitimacha diet was corn, introduced into the southeast United States from Mesoamerica sometime around 300 B.C. Blessed with several hundred feet of rich topsoil and a 320-day growing season, the Chitimacha had little trouble raising enough for their needs and unlike some of their neighbors, rarely went hungry. Beans, pumpkins, melons and several varieties of squash were also part of the bounty. The women supplemented this

by gathering wild fruits, vegetables, and nuts, while the men provided meat from hunting (deer, buffalo, turkey, alligator) and fishing (McIntire 1958).

By 1675 the native populations of the southeastern United States had fallen, due to European disease, to 25 percent of what their population had been in 1500. The Chitimacha were protected somewhat by their isolated location and, thus, the Chitimacha fared better than most of the other tribes of north American, and only lost about 50 percent of their population to disease. This was all to change with the arrival of the French to south Louisiana. Iberville made his way up the present-day Bayou Lafourche, and met and signed treaties with three bands of Chitimacha, who in turn honored their guests with a feast of alligator. A true Frenchman in his culinary tastes, Iberville found it "quite tasty" (Hoover 1975).

The French began settling south Louisiana in the early seventeenth century, and, as a rule, were never successful in enticing many of their women to immigrate to Louisiana. The few women that did come were usually unwilling to accept the difficult life of a fur trapper or farmer in the Delta. Their solution was to raid Chitimacha camps capturing women and children, these were known as "love raids." This practice continued well into the seventeenth century (Hoover 1975).

2.2 The Arrival of the Acadians

Longfellow's poem *Evangeline* has romanticized the exile from Nova Scotia and arrival of the Acadians to South Louisiana. Many of the families who left Nova Scotia wandered for 10 or more years before finding their way to South

Louisiana. By 1780 the Attakapas area was settled by over 3000 Acadians who began to intermarry with the native people and converting them to Christianity (Hoover 1975). The descendants of those native people of south Louisiana has formed the base to the gumbo of peoples who make up the culture of south Louisiana known as Cajuns. The first settlers found this new terrain tough, and quickly adapted to many native ways of living, which included diet, shelter, and medicine or herbal treatment for disease which is still practiced in some rural areas today. Those settlers included, not only the French and Acadians but also, Spanish, German, Italian, Irish, English, Chinese, Philippine, African, Mexican, South American, West Indian, each adapting some of the existing culture in their own way to this land, to form a very unique culture (Holmes1990, Bernard 2003). The name Cajun came from the Acadians who fled to south Louisiana in the mid 18th century, who were identified as Acadian. (In French, the 'd' sounded softer like a 'j'.) Most of south Louisiana was isolated from the rest of America, excluding New Orleans which has its own particular dialect, that has been compared to a Brooklyn accent, probably resulting from years of maritime trade originating from the eastern coast of the United States. South of the area now identified by Interstate 10, including the area within and along the Atchafalaya Basin, the culture and dialect is Acadiana.

In the preface of Walter C. Holmes book, *Flore Louisiane; An Ethno-Botanical Study of French-Speaking Louisiana,* the author describes the isolation factor contributing to Cajun culture.

> "It is hard to imagine the transition in one lifetime from speaking French, using horse and buggy, pirogue, and depending on native plants and wildlife, to a world of computers, space flight, and atomic energy. The isolation of Louisiana French speakers from mainstream America before the World war II is well summed-up by one of my aunts, Lillie Keating: 'The Great Depression came and went; we never even knew there was one."

In fact the social image of people from south Louisiana was developed around a New York Times article in 1856 describing them as "lazy vagabonds, doing but little work". New York Times during the Civil War that they were, "most ignorant and wretched people….unable to speak the English language, or convey an intelligent idea in the national language" (Bernard 2003). During World War I under President Warren G. Harding focus was placed on ethnic cultures other than Anglo-saxon. German-Americans, Spanish-Americans, Italian Americans, and Native-Americans were criminally prosecuted for speaking their native languages. Children were beaten, locked in closets, their mouths washed with soap, or their heads shaved for speaking their native languages. My mother told me of beatings for speaking French at school. As in many Cajun households the Cajun French language was lost in the "Baby Boom Generation."

However, in the late 1960's CODOFIL (Council for the Development of French in Louisiana) was founded in an effort to preserve the French language in Louisiana as well as to promote Cajun pride. Louisiana received assistance from France and Quebec through CODOFIL, and these ties are still in place today.

Figure 2.2 is a map of Acadiana.

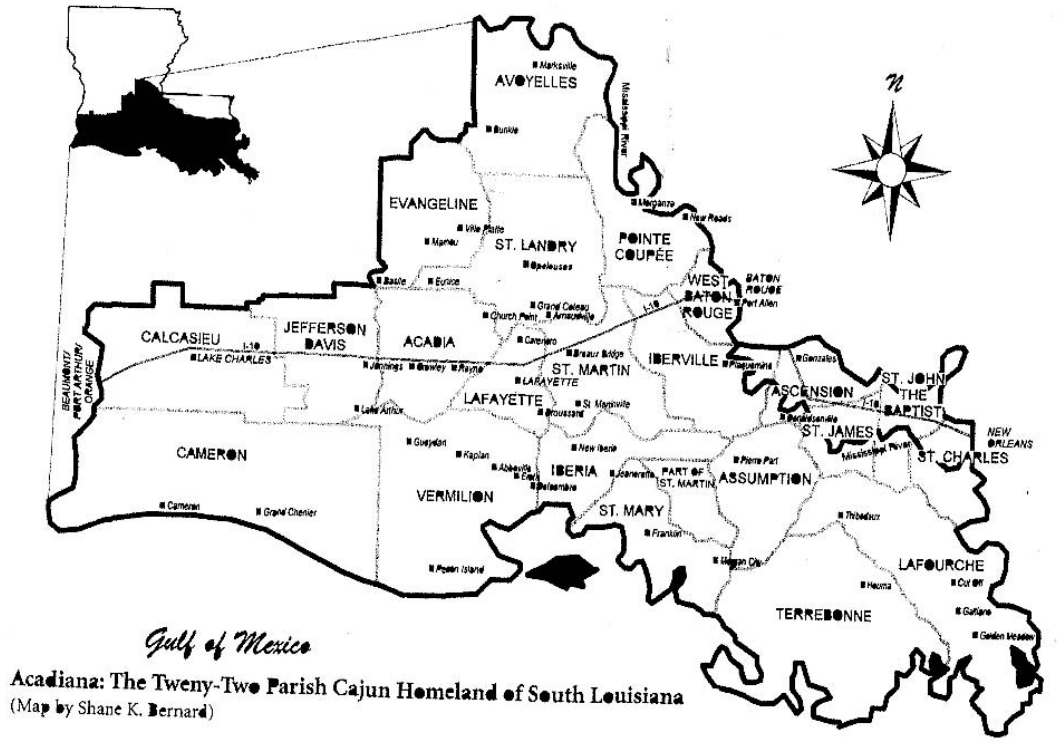

Figure 2.2 Map of Acadiana

2.3 Today's Cajuns

Dr. Holmes sums up the embarrassment associated with being Cajun and the advent of the 'Cajun Renaissance' and his efforts to preserve its ethno botany:

> "In truth, my rejection of the French plant names told to me by my Cajun relatives was a manifestation of the embarrassment at the time to be of French descent and to speak with a Cajun accent….Within the last two decades, an immense effort has been made to retain the French language and culture in Louisiana…..Today those of French descent are now openly proud of being Cajun….Coupled with this 'Cajun Renaissance' has been the creation of numerous folk festivals designed to preserve the heritage of all ethnic groups in Louisiana….While many of the old traditions can be

retained through these festivals and renewed interest in cajun music and cuisine, much more of the culture is quickly fading, such as ethno botany. Possibly, one day there may be an Acadian Gardens, a place where the plants of importance to the French of Louisiana may be grown and displayed for all to see."

This statement is not at all surprising since the same isolation that formed the unique culture of Cajun life is the same element that bound its people to the land. For hundreds of years people of the Mississippi Delta lived and worked as the native Americans once lived, by growing and capturing their food and building their homes of cypress. The fertile Mississippi Delta provided an abundance of wood for building, corn, fruits, and vegetables as well as fish, crawfish, seafood, deer, alligator, turtle, and the list goes on and on. There was no need for anything required for day to day living that the land did not provide. However modern Cajun life has changed, with fast food, SUV's, cellular phones, computer technology and other modern conveniences. However, there are still a great many families in south Louisiana who spend weekends at their favorite wooded watery get-away, or as they would put it, "at the camp," hunting, fishing, boating, or just simply relaxing with family and friends.

In a collaborative effort financed in part by CWPPRA, DNR and LSU Agricultural Center's Louisiana Cooperative Extension Service, published a report identifying the value of Louisiana's wetlands under Cultural Values it stated:

"The people who inhabit coastal Louisiana are known worldwide for their unique wetland-linked lifestyle and cuisine, the result of a melting pot of

international settlers. The rich fish and wildlife resources along Louisiana's coast has molded its people and their communities. (Coreil 1997)."

This tie to the land is passed from generation to generation, with a renewed pride and now an urgent sense of preservation. A need exists, to ensure that the general public be more informed of the basics and subtle nuances of the interactions in their environment and the land they enjoy, further supporting the preservation efforts of wetlands of South Louisiana.

CHAPTER 3. ENVIRONMENTAL LEARNING AND OUTDOOR CLASSROOMS

3.1 Project Learning Tree

In 1970, thirteen western states founded Western Regional Environmental Education Council (WREEC) to bring together state-level resource management professionals and education administrators to work on environmental education programs of regional and ultimately nation importance. Rudolph J.H. Schafer, founder of WREEC and others provided the framework and model for Project Learning Tree (PLT 1997). Since its inception in 1973 Project Learning Tree has emerged as one of the nation's leading and most widely used environmental education programs for elementary and secondary schools. Co-sponsored by the American Forest Foundation and the Council for Environmental Education, PLT has reached more 20 million students in the United States, Japan, Brazil, Finland, Sweden, Canada, Chile, and Mexico.

In 1995, Louisiana Department of Agriculture and Forestry published *Louisiana Guidelines and Features for Outdoor Classrooms,* describing methods of organization, curriculum, cost, and maintenance of outdoor classrooms intended for applications on or adjacent to public schools in Louisiana. Some of the featured activities that could be applied to the Atchafalaya Basin sites include:

1) Native Plant Identification. Planning a native plant arboretum for identifying native plants and trees. This type of space functions as a living example of the diversity in vegetation found in Louisiana.

2) Bird Watching. Bird blind or bird observation area is constructed for observing birds near a feeder or around a pond or marsh.
3) Animal Tracking Plots. Identifying animals by their tracks using an area cleared of grass filled with clay or fine sand. Animals such as birds, mice, squirrels, rabbits, opossum, raccoon, alligator, and deer can be identified by the tracks they leave behind.
4) Archaeological Dig Site. This is an area where students can learn the techniques used in archaeological digs, while unearthing "planted" artifacts. Such an activity can be tied into historical studies and soils investigations.
5) Berry Producing Shrubs. For quick growth, beautiful color, wildlife food and cover, and an understanding of flower, fruit and seed processes.
6) Butterfly Garden. Colorful surroundings attract colorful visitors to outdoor classrooms.
7) Fence Row. An old woody fence row is one of the best outdoor learning areas you can find. Often a fence row is an undisturbed area. Students can study the types of vegetation and animals they find near the fence. It is a demonstration of how seeds can be transported from one place to another.
8) Native American Theme Area. Indian corn, sweet corn, gourds and wildflowers can be cultivated. A firepit and even a small Indian hut can be constructed on the site. Arrows, and other tools could be fashioned and used by students.

9) Marsh and Swamp. Wetland plant identification is important plants such as tupelogum, baldcypress, red maple, roughleaf dogwood, buttonbush, elderberry, palmetto, irises, spider lilies, redbay, cattails, pickerel weed, marsh mallow, bulrushes, sedges, reeds and other aquatic plants.

10) Nature's "Swap Shop." A small area can be established where students are encouraged to donate interesting items of nature (galls, bones, feathers, rocks, etc.). In turn, they may take home any items that capture their interest. Ideally, each student making a withdrawal will also make a donation so that the supply is always there. This reinforces the need to replenish what is taken from nature.

11) Nesting Boxes. Artificial nesting boxes can be built by students and placed in various locations of the outdoor classroom.

12) Soil Studies. "Dirt" is what you sweep off the floor or wash from your hands. "Soil" is a precious natural resource. Soil can be observed by layers, and types or by observing the types of vegetation growing there.

These are but a few established environmental learning activities. The goal of each activity is to teach children about their environment. Since its inception Louisiana Project Learning Tree has trained over 19,000 teachers in Louisiana. PLT has participating schools in every parish in Louisiana. Full descriptions of many appropriate PLT activities are available through PLT in each state through out the United States upon request.

3.2 Project WILD

Project WILD is an interdisciplinary conservation and environmental education program emphasizing wildlife. The goal of Project WILD is to assist students of any age in developing awareness, knowledge, skills and commitment to result in informed decisions, responsible behavior and constructive actions concerning wildlife and the environment (Project WILD, 2000). Since Project WILD was first introduced in 1983, more than 650,000 educators in the United States have participated in Project WILD workshops. These educators in turn have provided instruction using Project WILD to more than 38 million young people in the United States.

Outdoor activities that could be used in the Atchafalaya Basin included in Project WILD are:

1. Grasshopper Gravity. Students collect, observe, and describe live grasshoppers or crickets.
2. Bearly Growing. Introduction of the black bear by having children compare similarities and differences between the growth of black bears and humans.
3. How Many Bears Can Live in This Forest? Students define habitat-limiting factors and describe how limiting factors affect animal populations.
4. My Kingdom for a Shelter. Students find different types of animal shelter. The major purpose of this activity is for students to recognize the importance of suitable shelter to wildlife.

5. Spider Web Geometry. Students find different types of spiders and the various types of webs they construct.
6. Oh Deer! Students are introduced to deer in nature. This activity illustrates good habitat is key to wildlife survival.
7. Wild Words. Students are introduced to naturalists and analyze journals of the naturalist. Students then visit a wooded area and create journals and then compare their entries to journals of naturals they have studied.
8. Habitracks. Students identify the basic components of habitat such as food, water, shelter and space in a suitable arrangement. A specific animal in the forest is identified, with its requirement for food, water, space and shelter. A map of the area shows where each might be found the students than draw tracks or the marks left by the animal to each need.
9. Rainfall and the Forest. Students correlate rainfall data with vegetative communities and then correlate vegetative communities with animal life. This activity is useful for understanding distributions of plant and animal communities in many different areas.
10. Time Lapse. Students will look at successional changes in an ecosystem and the factors that affect these changes. Students will compare physical changes produced by resident organisms, such as shading trees or larger plants; geological processes such as filling in a

lake with sediment; and biogenic changes such as the introduction of a predator/consumer, invasive exotic plants or animals or a disease.

Full descriptions of many appropriate Project WILD activities are available in each state throughout the United States.

3.3 Project WILD Aquatic

Project WILD Aquatic has developed to introduce young people to aquatic wildlife or any wild animals that depend upon aquatic environments for survival. The aquatic environment may be fresh water such as rivers, lakes, ponds, and streams or salt water such as oceans, estuaries, and saltwater such as oceans, estuaries, and salt-water marshes (Project WILD Aquatic, 2001). The animals may live directly in the water such as fish and whales. The animals may live in water some of the time and out of water some of the time, such as some frogs and toads. Some aquatic animals may find food, water shelter, and space both in and out of water such as beavers and sea lions. Other animals, such as pelicans, osprey, and water striders (insects) are examples of wildlife that live in association with aquatic environments. Funding for the development of these materials has been provided with support from money provided through the Wollop-Breaux Amendment to the Sport Fish Restoration Act. This legislation provides support for aquatic resources education to increase public understanding of, and responsibility toward, the nation's water resources and aquatic life forms.

Outdoor activities that could be used in the Atchafalaya Basin included in Project WILD Aquatic are:

1. Are You Me. Students look at various you stages of aquatic animals and match them with corresponding adult stages. There are some remarkable similarities and differences between some aquatic animals in different life stages. Different eggs of many animals take very different forms such as pelican, alligator, and turtles.
2. Fishy Who's Who. Students recognize and identify the major species of freshwater or saltwater fish that live in their area; discribe various values of fish species in some aquatic communities; and locate places where fish species occur.
3. Migration Headache. Students portray migrating water birds traveling between nesting habitats and wintering grounds. This activity identifies limiting factors affecting habitats and populations of migrating water birds; predict the effects of such limiting factors; describe the effects of habitat loss and degradation on populations of migrating water birds; and make inferences about the importance of suitable habitat for migrating birds.
4. Where Does Water Run? Students measure and calculate the area of a study site; calculate the volume and weight of water falling on the study site; determine specific and annual rainfall and runoff; and trace the course of water to aquatic habitats.
5. Water Canaries. Students investigate a stream or pond using sampling techniques. Students can identify several aquatic organisms and assess the relative environmental quality of a stream or pond

using indicators of pH, water temperature, and the presence of a diversity of organisms.

6. Water Plant Art. Students create artwork showing habitats using drawings and pressed aquatic plants. Students will learn to identify aquatic plants as an important component of aquatic habitats and as a necessity for aquatic wildlife.
7. Marsh Munchers. Students identify components of a food web in a marsh; and identify their interconnectedness in the food web. This activity imitates the activity of plant and animals becoming detritus eaten by crabs, crawfish, shrimp, clams, oysters, and minnows which then become food for predators birds, raccoon, blue heron, large fish, alligators, turtles, and people, who die and become detritus.
8. Wetland Metaphors. In this activity a variety of everyday objects can be used to represent the natural functions of wetlands. For example; a wetland acts as a sponge by absorbing excess water caused by runoff; a pillow a wetland is a resting place for migratory birds; a cradle protects and feeds young wildlife; and a filter wetlands filter small impurities from water.
9. Micro Odyssey. The student will collecting river or pond water and learn to identify forms of microscopic life that live in water and describe how various aquatic organisms are interrelated.

10. Edge of Home. Students learn to identify the characteristic of ecotones, or transitional zones, between two wildlife habitats by visiting places where habitats overlap.
11. Watershed. Students learn characteristics of watersheds; discuss the role of watersheds in providing wildlife habitat; and give examples of watershed conservation. Students measure the area of a local watershed, calculate the amount of water it receives each year, and discuss the varied roles the watershed plays in human and wildlife habitat.
12. Dragonfly Pond. Students create a collage of human land-use activities around an image of a pond. Students learn to evaluate the effects of different kinds of land use on wetland habitats and to evaluate lifestyle changes to minimize damaging effects on wetlands.

Full descriptions of outdoor learning activities in Project Wild Aquatic are available in each state throughout the United States.

3.4 Learning Through Birding

Birds, in literal terms, are a prime example of the beauty found in nature, in wetland rookeries a study in habitat, interesting structural nesting diversity, and living breathing masters of aerodynamics. Organizations such as The National Audubon Society, Partners in Flight, and Royal Society for the Protection of Birds advocate the value of introducing birding or bird watching for young children (Everett 1997). According to a recent 2 year survey done by Bill

Fontenot, there are approximately 300 resident and migratory birds in and near the Atchafalaya Basin.

An introduction to birding for young children recommended by Partners in Flight includes an approved list of children's books. Reading levels range from age 5 years to 18 years, titles included are: *Across the Stream, Bird Watching for Kids, Feathered Travelers, Fifty Favorite Birds Coloring Book, The Moon of the Winter Bird,* and others listed in Appendix *4.*

Numerous activities were found in publications of *Science Activities* which introduce children to birds and bird watching such as:

1. Observing Flat Birds and Other Fun Birding Activities for K-12 Students. Discusses the use of flat birds, which are life sized color images of specific birds, as a teaching aid for K-12. Uses flat birds to teach use of field guides for birding in the classroom followed by an outdoor birding experience. (Mathews and Connors 2002)
2. Keeping Warm. Science activity designed to determine the role of feathers and how they keep a bird warm. (Shaw 1999)

3.5 Effectiveness of Environmental Based Learning

Over the past 30 years, the core field of environmental education has developed into one of the most effective paradigms of learning available today. Environmental education goes beyond providing students with simple information about environmental issues. As defined in the National Project for Excellence in Environmental Educaiton (www.naaee.org/npeee):

> "Environmental education is a process that aims to develop an environmentally literate citizenry that can compete in our global economy; has the skills, knowledge, and inclinations to make well-informed choices; and exercises the rights and responsibilities of members of a community."

Professionally-executed environmental education is a comprehensive process for helping people understand the environment, their place in it, and related issues (Archie and McCrea, 1998). The main goal of environmental education is for people of all ages to know enough about environmental science and related social issues to make sound and well-reasoned environmental decisions.

The term "environment-based education is used into focus attention on the numerous benefits that arise from using the environment more broadly as a learning tool. While environmental education focuses on building a base of environmental knowledge and skill to be applied to environmental stewardship, environment-based education uses a popular subject matter to improve students' learning skills and create a wider learning context for students, teachers, and community. Environment-based education emphasizes interdisciplinary integration of subject mater, problem and issue based learning. A similar term, "environment as an integrating context" is used by the State Education and Environment Roundtable (SEER) to discribe this approach (www.seer.org). In recent years, environmental education has become more comprehensive and oriented to active learning, problem solving, decision making, and understanding complexities of interactions in the living and nonliving world (Stapp and Coxx, 1974; Hungerford et al, 1996).

Bryant and Hungerford(1979) analyzed the effects of environmental instruction on two classes of kindergartners . Bryant simultaneously taught two classes a one week introductory unit on basic environmental concepts. For three weeks thereafter, the experimental group received activity-oriented instruction on pollution and solid waste. The conventional curriculum taught to the control group did not not involve environmental issues. The treatments were then reversed. Each child participated in an interview consisting of four knowledge and opinion questions asked before and after the treatment. The evaluators reported a significant change and suggested that kindergarten children are capable of forming concepts concerning environmental subjects. The concept of outdoor classrooms is rapidly growing throughout the world there are many projects and organizations involved in refining and developing outdoor classrooms and environmental based learning. Post-implementation evaluations of environmental education projects are reporting success in raising not only environmental awareness but improved reading and math skills for in children from kindergarten and beyond.

Figure 3.5 Outdoor Classroom

CHAPTER 4. DEVELOPING EDUCATIONAL VENUES IN THE ATCHAFALAYA BASIN

4.1 Identifying Potential Sites

Keeping in mind the environmental issues of the Atchafalaya Basin, the recreational value, cultural richness and guidelines of environmental based learning, I set out to find sites on the basin that would be most beneficial in helping us achieve the following goals. These goals are to: 1- develop informative recreational settings; 2- provide interactive outdoor educational venues showcasing the existing landscape of the Atchafalaya Basin; and 3- to encourage re-establishment cypress-tupelo, as well as other native vegetation in the Basin. Critical to achieving these goals are key components such as: the site being considered by state or local agencies for ecotourism/ recreational development; its close proximity to water; its easily accessibility by car; and if its state or federally owned land.

Finding the right location to implement the educational venues requires contacting people within forestry as well as DNR (the Atchafalaya Basin Project). Early in June of 2003 Dr. Rich Goyer, who has conducted forest research in the area for the last 30 years at L.S.U, and I drove along the levees bordering the Atchafalaya Basin. Toni DeBosier, working with Louisiana Department of Forestry and DNR, lead us to several areas under development for recreation and tourism.

I began the fact finding with the recently opened Butte-Larose Visitor Center on I-10. The visitor center offers a beautiful introduction to life in south Louisiana. Areas adjacent to the visitors center are being planned for a

children's fishing pier and an associated trail system (See "Wetland Discovery Trail in appendix 4). Traveling south on LA 3177, one encounters Frenchman's Wilderness at .9 miles a camping area, "Lazy Cajun Cabins and Grill" at 2.0 miles, Douchet Grocery at 5.8 miles, Anna's Store at 6.0 miles, and the start of Herman Dupius Road which turns west to Uncle Dick Davis Park at 7.2 miles, there is a fishing area and floating bridge at Herman Dupius Road and Henderson Road at 9.8 miles, Angelle's Marina at 12.6 miles, Turtle's Bar and Boat Launch at 13.3 miles, McGee's Marina at 14.0 miles, and ends at the intersection of Henderson and the levee at 17.6 miles from the Visitor Center.

4.2 Areas Selected for Development

Over the next 6 weeks I visited the area several times with Dana Brown, chair of my committee and associate professor of Landscape Architecture, and biologist Dr. Rebecca Effler. Several sites were identified as areas that could be developed, not only as recreational areas, but also as informative or educational landscapes. Selections were made using the criteria mentioned earlier.

The first site selected is located in Henderson at the junction of Louisiana highway 352 and the Henderson Levee Road. The site is immediately to the south after crossing the Bayou Amy Bridge, and has access over the levee to the Basin. This area will be referred to as Henderson Intersection.

Henderson intersection was chosen because of the obvious interest of the mayor of Henderson in having something established in this area that will represent life in the Basin. It is near Pat's Restaurant, a very popular restaurant and dance hall which features local Cajun music.

Figure 4.2a. Henderson Intersection

Figure 4.2c. Henderson Intersection Inside the basin

Figure 4.2b. Henderson Intersection Crossing Bayou Amy

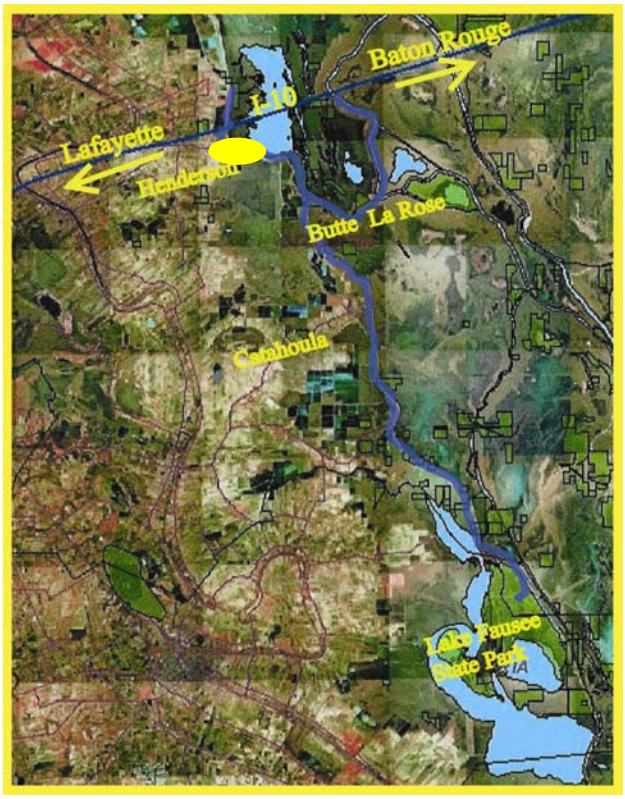

Figure 4.2d Location of Henderson Intersection

Local interest in the project is very important, and on many occasions, financing is limited and the quality of the experience improves with volunteer operation and maintenance. Pat's Restaurant provides built-in local flavor, and entertainment. This site has easy access from I-10, and can function as a first impression to the Atchafalaya Basin when approaching from La Highway 352. The area just beyond the levee has a boat launch for access into the Basin by water.

4.3 Proposal for Henderson Intersection

Henderson Intersection area can be broken down into two areas; 1) the area in the batture of Bayou Amy and Henderson Levee Road and 2) the area inside the levee adjacent to the boat launch. Area one would serve as a complement to the visitor center on a smaller, more rustic scale, managed and maintained by the town of Henderson. There would be a small one or two room Acadian-style structure that could be salvaged from an area nearby. This structure preferably would be made of old cypress wood. The information center could be decorated with cultural effects from the early twentieth century. Free, as well as purchased, informative materials would come from DNR or be recommended by DNR, and provided at this site. Inside the information center one could find examples of the dress of early twentieth century Acadia including hats such as garsolet (bonnet), which could be provided by local organizations for sale. The landscape surrounding the information center would be planned to simulate the typical house garden of that period. For example, a small garden plot would grow fruits and vegetables commonly found in winter gardens and summer gardens in south Louisiana. There also would be an example of medicinal herbs found in the house garden. Each of the planted areas would provide identification

markers, which would identify plants first in Cajun French, second by Latin name, and third by English common name. The area would have parking of compacted gravel or limestone. There would be a pavilion approximately 30' X 30' near the waters edge adjacent to the parking area to allow for small groups to gather. This area would provide a pleasant meeting place for joggers, cyclists, and for seasonal outdoor demonstrations.

Behind the information center a forestry trail would begin beyond the garden area and continue as far down the batture as could be acquired, donated to the town, or collaborated with the owners. Examples of Louisiana native trees could be planted with markers to provide identification in French, Latin, and English. This trail would continue south directing the traveler up and down from the batture to the levee at points which would provide optimal views. Figure 4.3a illustrates the cypress pavilion seen below. Figure 4.3b on page 34 illustrates a conceptual plan for the development of Henderson Intersection Area 1.

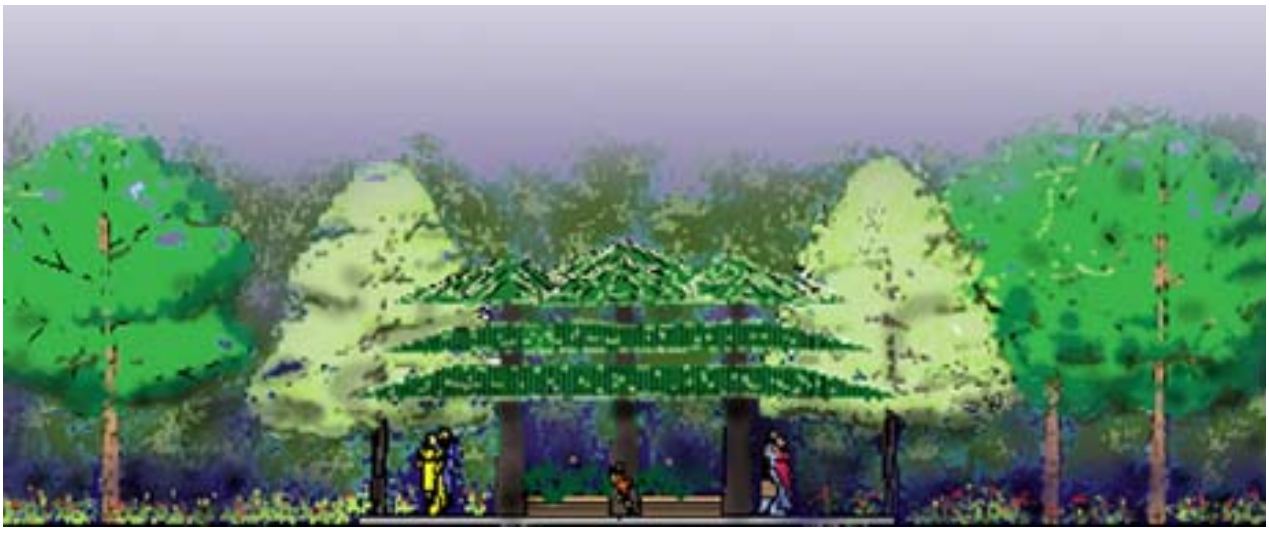

Figure 4.3a Cypress Pavilion

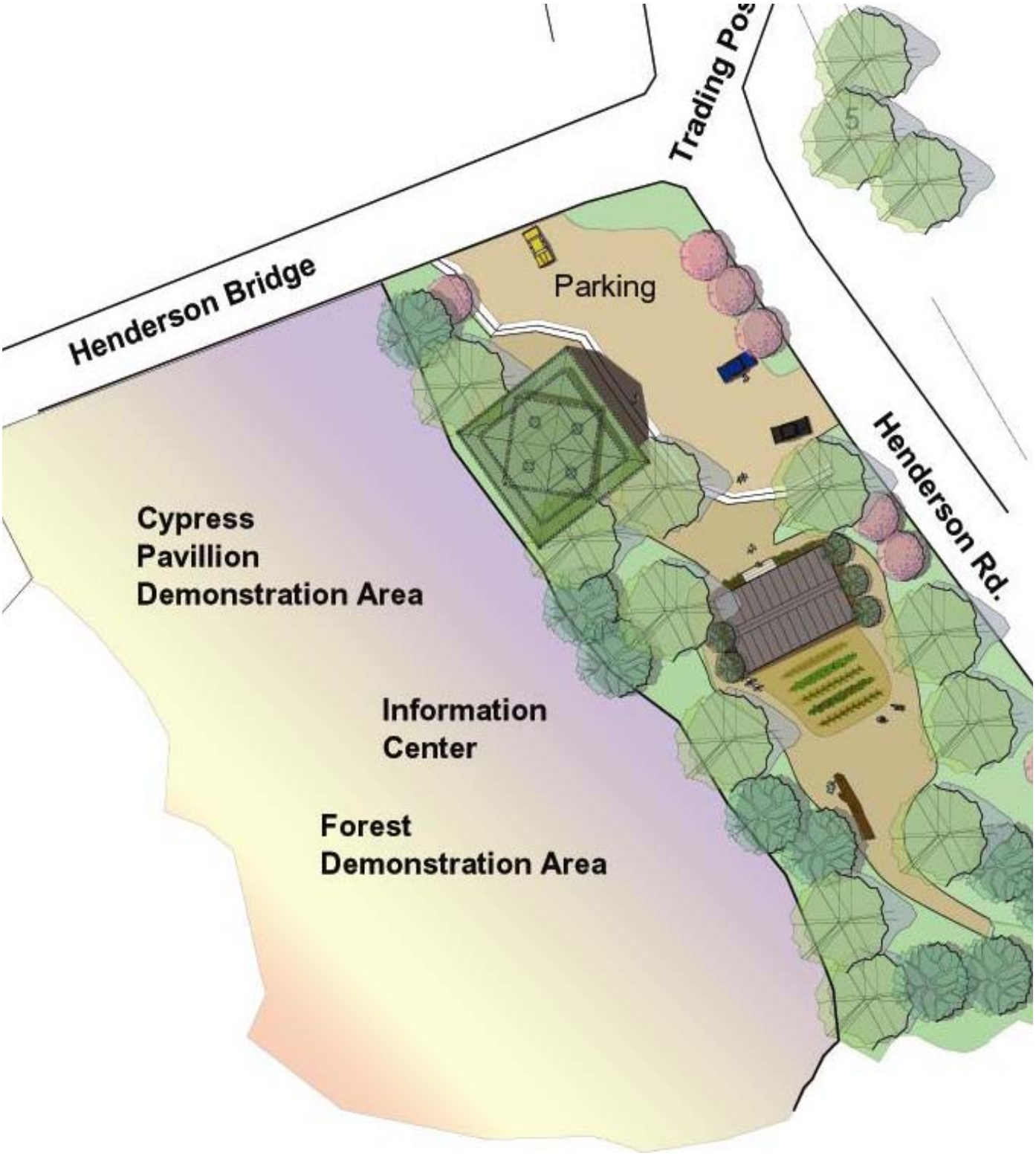

Figure 4.3b Conceptual Plan for Henderson Intersection Area 1

Area 2 of the Henderson Intersection Site, located beyond the levee, would represent the native American village, this area would a small group of palmetto huts at different stages of construction. Also, there would be a demonstration area for dugout canoes with examples of the process of building a dugout canoes. Maps will be available to the Chitimacha Museum in Charenton, Louisiana located farther south near the Atchafalaya Basin. A building could function as a trading post. The trading post would have examples of fishing apparatus as well as trapping materials and hides available for viewing. The trading post could have ledgers acquired from local people detailing people who lived, fished, and trapped in that area of the basin. This information could be found through examination of census data from the late nineteenth and early twentieth century, as well as, occasional oral history interviews with local elderly. This area could function as a part of a larger canoe trail or end to a canoe trail from Indian Bayou north of Henderson. Figure 4.2a illustrates a trading post and figure 4.2b on page 36 illustrates the conceptual plan for Henderson intersection area 2 .

Figure 4.3c Kern's Trading Post

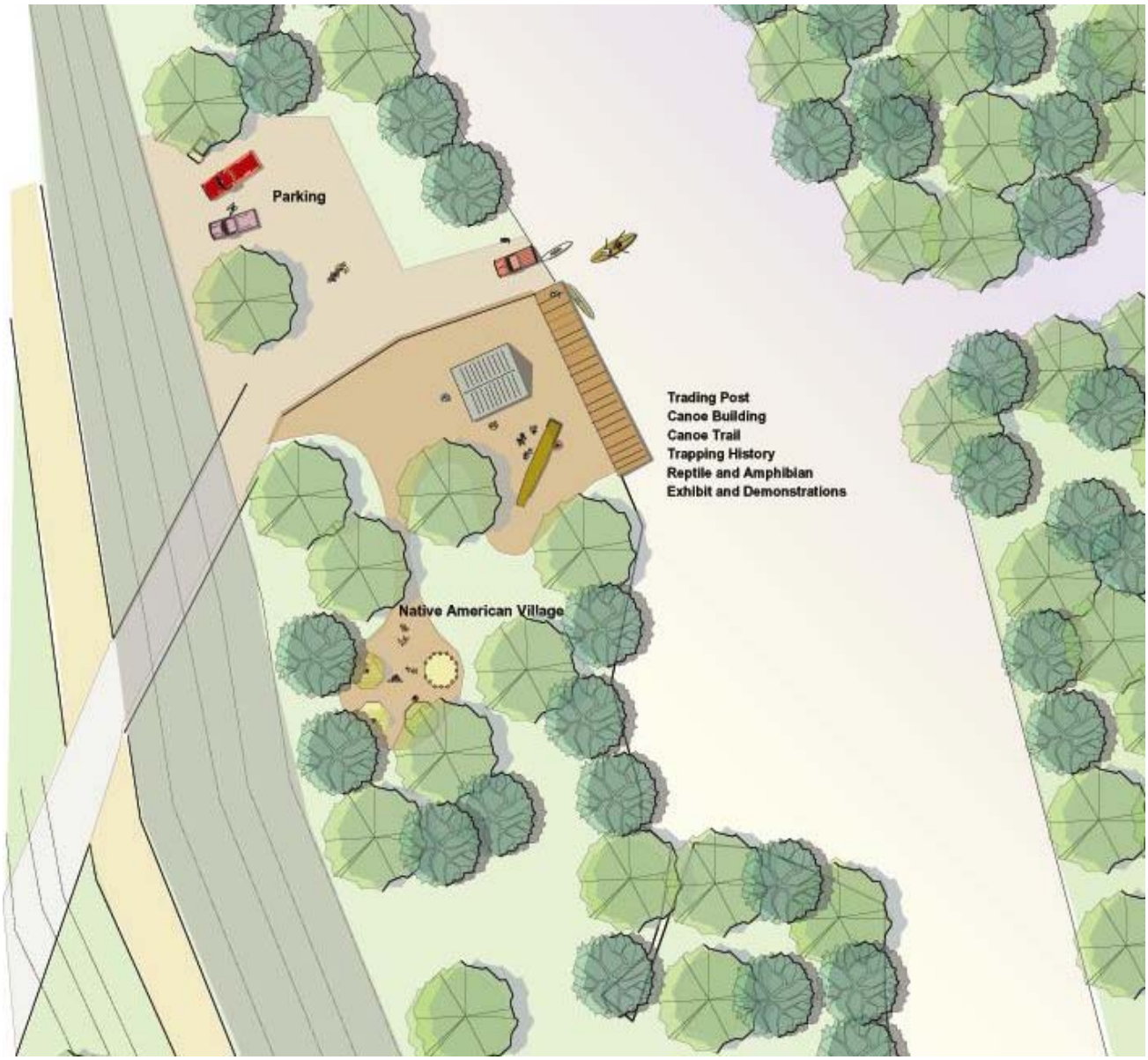

Figure 4.3d Conceptual Plan for Henderson Intersection Area 2.

4.4 Butte La Rose Fishing Area

Traveling south on Henderson Levee Road there are numerous marinas Turtle's Bar and Boat Launch 4 miles from Henderson, and Magee's Marina 5 miles from Henderson. At 7.8 miles from Henderson or 9.8 miles from the visitor center we selected another site, which is used frequently for bank fishing, and is referred to as Butte La Rose Fishing Area. This site is located at the intersection of Henderson Road and Herman Dupius Road, where a pontoon bridge joins a small community of Butte-Larose inside the Basin to LA 1377. This area is frequented by local fishermen wanting to fish inside the bountiful Basin without a boat. Figure 4.4a is a photograph of the area as it looks today, bare of shrubs or trees and used by many people.

Figure 4.4a. Butte La Rose Fishing Area

Figure 4.4b. Butte La Rose Fishing Location

4.5 Proposal for Butte La Rose Fishing Area

The Butte La Rose Fishing Area is ideal for development of a pleasant, shaded community fishing area. The Butte La Rose fishing area is a node and has an excellent example of the floating or pontoon bridge implemented through out south Louisiana during the 1930's and 1940's. There is adequate diversity in the fish caught in this area such as large mouth bass, blue gill perch, and many more. It is easily accessible by car or boat, and planting baldcypress and tupelo on the water's edge would make the soil bank more secure because of the fibrous roots systems of the trees. This area would benefit from a 6 to 12 inch layer of coarse sand or fine gravel along the waters edge, facilitating a less muddy access to the water's edge. The Butte La Rose Fishing Area could function as a demonstration of fish diversity as well as a hydrology demonstration area. A kiosk would provide fish and hydrology information to visitors. A group of picnic tables would provide a meeting area for school groups or just for a fisherman's picnic. Figure 4.5a is a photograph of the bridge and fisherman and Figure 4.5b on page 39 illustrates a conceptual plan for the Butte La Rose Fishing Area.

Figure 4.5a Fisherman and Floating Bridge

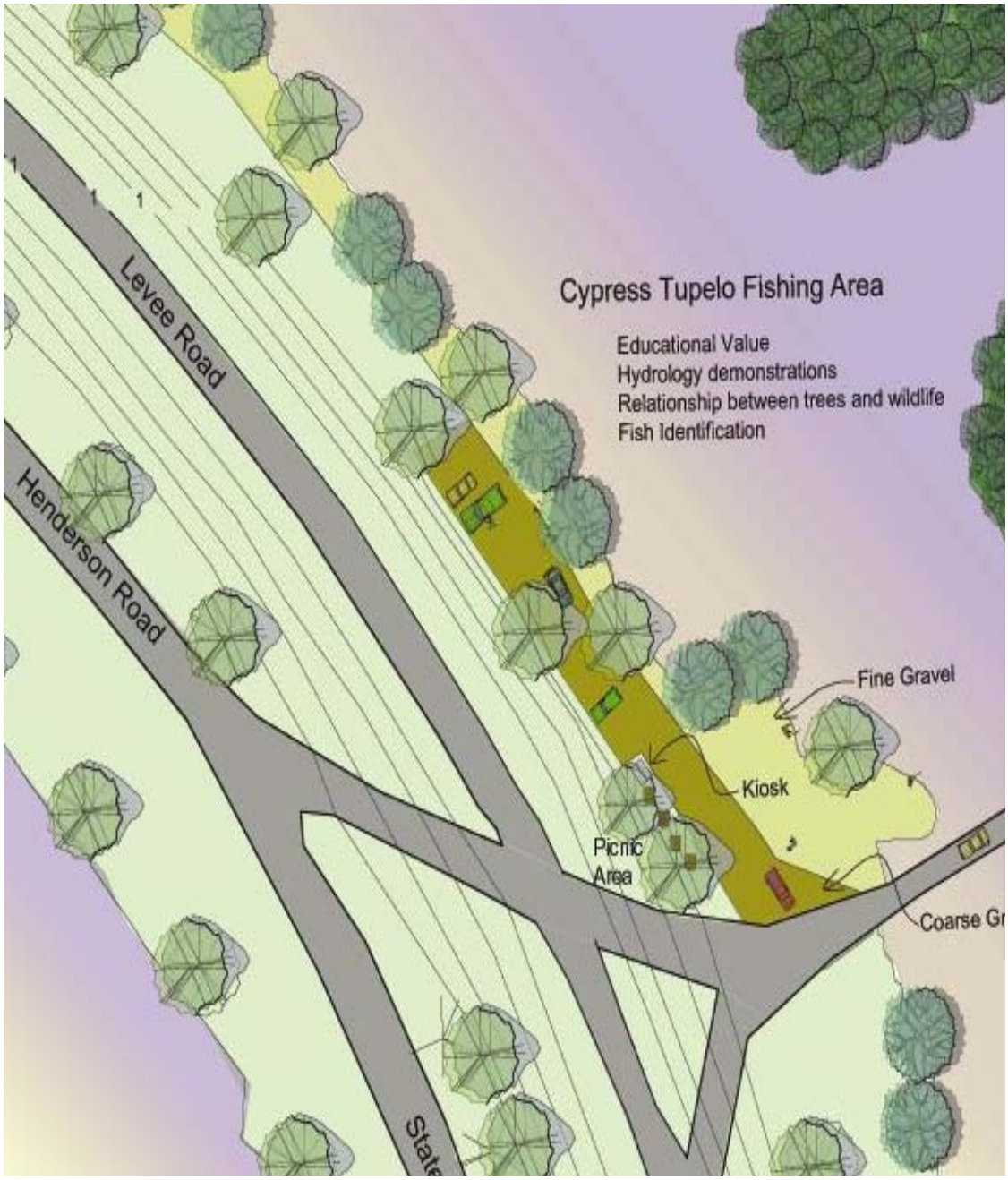

Figure 4.5b Conceptual Plan for Butte La Rose Fishing Area

4.6 Uncle Dick Davis Park

The next area under development is Uncle Dick Davis Park 7.2 miles from the visitor center, and on Herman Dupius Road located in the middle of a small vacation home community (Figure 4.6b). In south Louisiana, weekend homes or recreational homes are customarily known as ‘camps,’ which can vary from four walls and an outhouse to a multilevel mansion. Uncle Dick Davis Park has a boat launch, which is used by recreational boaters, and provides RV facilites (water and rest rooms), and several beautiful poplar trees shade the park.

Figure 4.6a Uncle Dick Davis Park

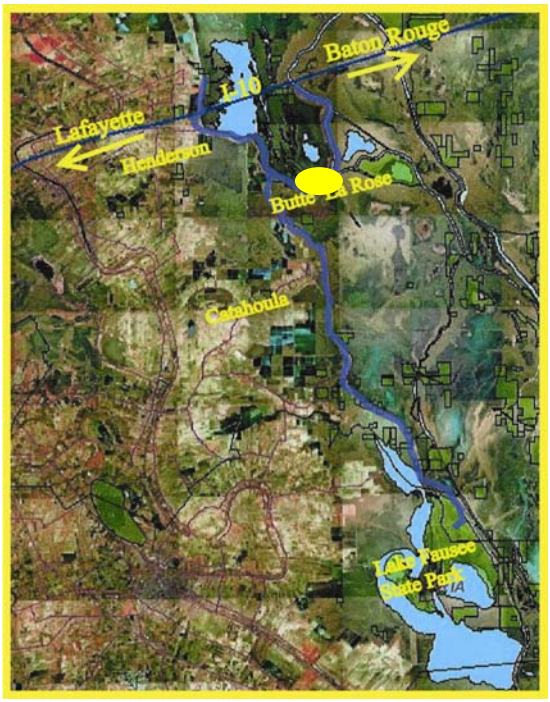

Figure 4.6b Location of Davis Park

4.7 Proposal for Uncle Dick Davis Park

Uncle Dick Davis Park is a very beautiful area surrounded by lush green foliage. The educational value of this area could be insect collection butterfly

observation, and aquatic vegetation. A small, simple, almost transparent pavilion not obscuring the surrounding beauty of the landscape could provide shelter from rain and provide a meeting or resting place for visitors. In the conceptual plan the hundreds of dragonflies seen on the site inspired the dragonfly pavilion. The pavilion has three supports on each side and transparent fiberglass roofing material. A boat dock built along the edge of the park over the water would assist boaters when docking, launching, and retrieving boats and canoes. There is a five-foot elevation between the water line and the edge of the park this area could be planed and planted to attract butterflies and humming birds. This entire slope would display vibrant color and activity. Figure 4.7a illustrates the butterfly pavilion and Figure 4.7b on page 42 illustrates a conceptual plan for Dick Davis Park.

Figure 4.7a Butterfly Pavilion

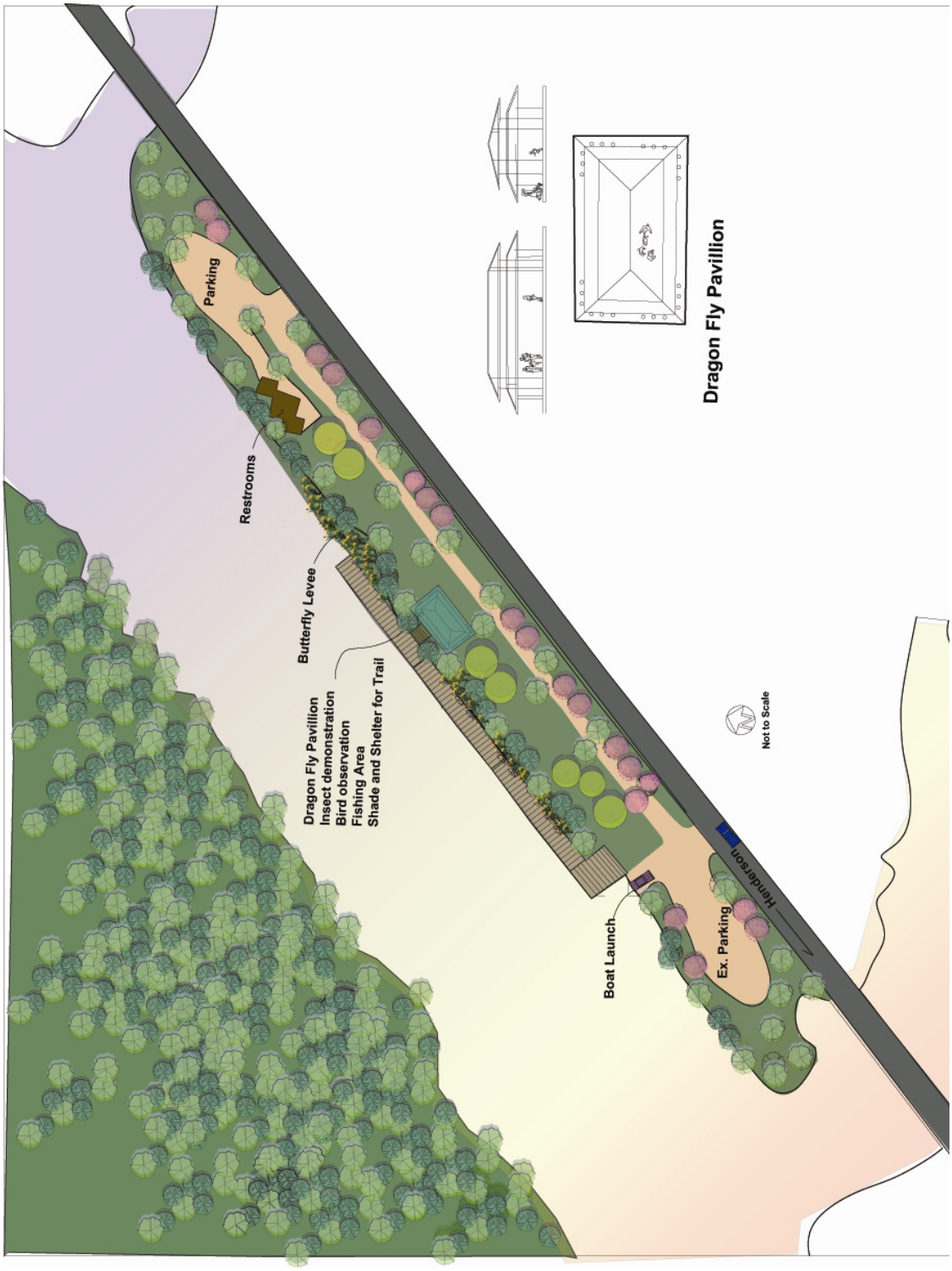

Figure 4.7b Conceptual Plan for Dick Davis Park

4.8 Birding

The Atchafalaya Basin is temporary and year round home to approximately 300 bird species. On any given day of the year a visitor is likely to see at least 5 different species in any given location in the Basin. Organizations such as the National Audubon Society, Partners in Flight, and the Royal Society for the Protection of Birds advocate the educational value of introducing birding or bird watching to young children. The educational opportunity found in birding, in literal terms, are a prime example of the beauty found in nature, in wetland rookeries a study in habitat, interesting structural nesting diversity, and living breathing masters or aerodynamics. With the assistance of ornithologist Bill Fontenot, who conducted a 2-year survey of the Atchafalaya Basin, several sites in the Atchafalaya Basin were identified population density and frequency distribution applied to GIS mapping I located two densely populated birding areas. Two sites were identified south of Henderson for potential birding towers. Other considerations for location were multi modal accessibility, state owned land, and close proximity to other recreational sites.

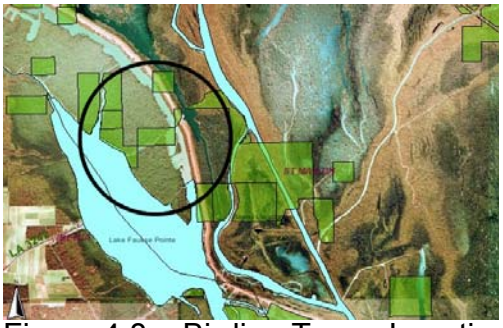

Figure 4.8a Birding Tower Location St. Martin Parish

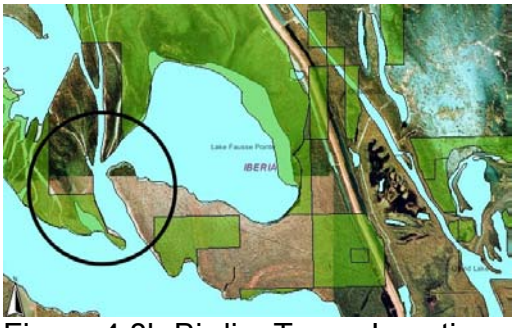

Figure 4.8b BirdingTower Location Lake Fausee State Park

Figure 4.8a is an aerial photograph of an area just north of Lake Fausse Point State Park and is heavily populated by nesting birds. Figure 4.8b is immediately adjacent and south of Lake Fausse Point State Park. This area was selected as one of the sites for construction of the birding tower, and will become part of the Lake Fausse Point State Park. Figure 4.8c illustrates the general locations of the selected areas.

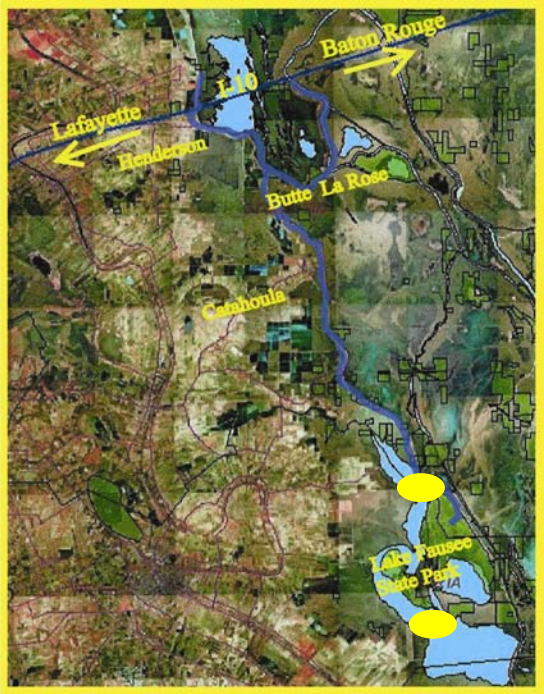

Figure 4.8c General location of birding towers.

Figure 4.8d is a sketch of a proposed bird observation tower which gradually inclines and levels to meet handicap requirements. This type of tower would also be accessible to boaters by water. The gradual incline through the trees would also allow birders to observe birds into the tree canopy as well as above the trees and out over the water.

Figure 4.8d Birding Tower

4.9 Graffiti Wall

At a highway intersection south of Henderson on the levee road that leads to the state park a concrete wall has graffiti.

Figure 4.9a Graffiti Wall

Figure 4.9b Location of Graffiti Wall

Figure 4.9a is a photograph of the graffiti wall near Catahoula. Figure 4.9b illustrates the general location. This wall could be a mural to teach history, culture, and environmental and agricultural topics by sponsoring yearly competitions to design and paint the murals by area high school students. I chose high school students because more than likely this is the age group of the artists of this particular work. A mural would make this wall more attractive to visitors and serve as an excellent educational opportunity to the students painting the concrete wall.

4.10 Lake Fausse Point State Park

Lake Fausse Point State Park is the southern most point of the study area and is adjacent to the Atchafalaya Basin. The park is an excellent educational opportunity, offering overnight facilities including 50 campsites and 18 cabins. Day us facilities include 3 nature trails, a canoe trail, boat launch, picnic areas, pavilions, a playground, and a meeting room. Groups and educators can meet and stay here while learning the latest techniques in environmental based education in and around the basin. Figure 4.10b illustrates the location of Lake Fausse State Park.

Figure 4.10a Lake Fausse Point State Park

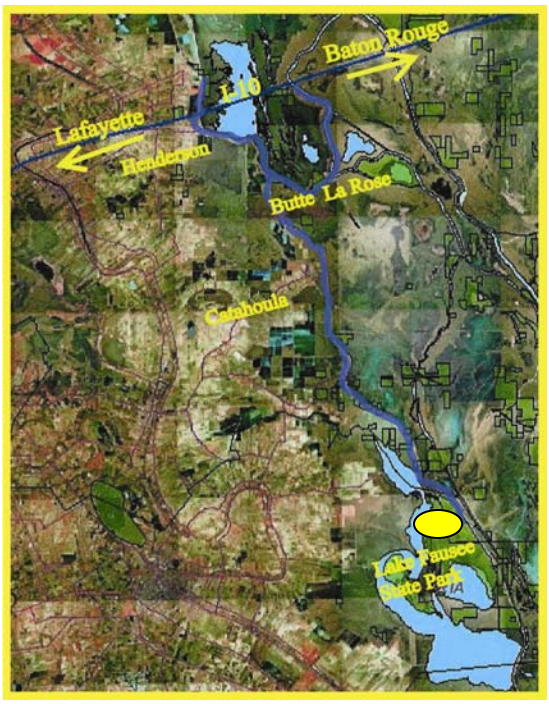

Figure 4.10b Location of Lake Fausse Point State Park

4.11 Tying It All Together

Many of the stores, campgrounds, and marinas are particularly interesting and rich with in cultural expression, providing visitors a very good example of Cajun life. It would be wise to implement ordinances or zoning laws in order to preserve and maintain the present functions of the area. There are many educational opportunities available at the points indicated in Figure 4.11a in the study area.

Areas in yellow and gold are existing or in planning stages. Areas in red are local marinas, stores and restaurants. These sites could be tied together with a bicycle, equestrian, canoe, or hiking trail of 17.6 miles from the Butte La

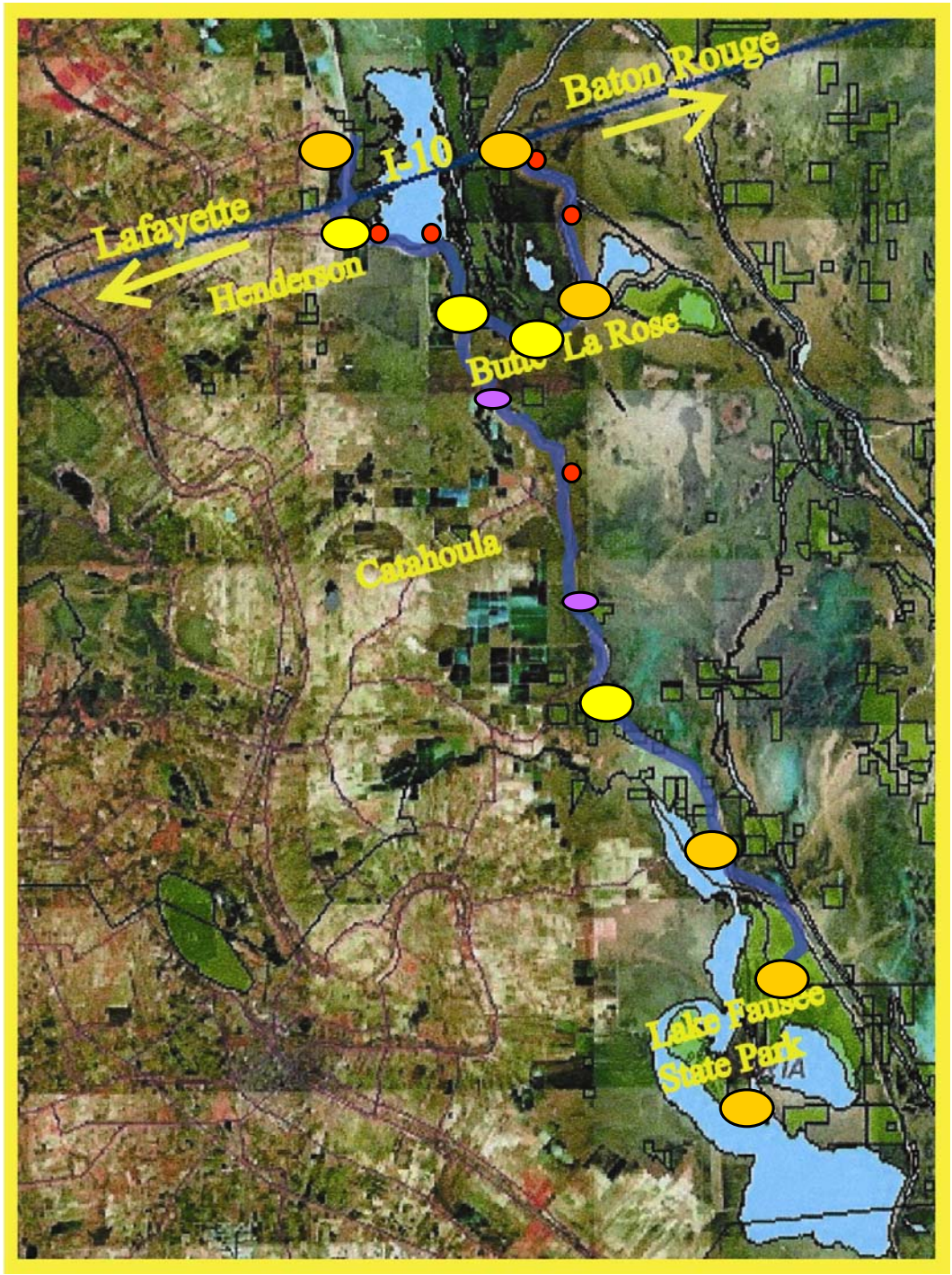

Figure 4.11a Tying it All Together

This trail would use the levee top road on Henderson Road and LA 1377 as well as Herman Dupius Road. Widening Herman Dupius Road from Doucet Grocery to the bridge at Butte La Rose Fishing Area to incorporate a bicycle path along the existing road. Although Herman Dupius Road is paved and is accessible to bicycles, it would be much safer to have a separate bicycle lane of at least a 10 foot width. The levee trail section would bring the trail up and down the levee to the bature area by providing rest areas designed similarly to the docks used in Lake Fausse Point State Park shown in Figure 4.11b. These small rest areas that would provide open views of the adjacent landscape, such as open water views or known bird rookeries along the trail.

Figure 4.11b Lake Fausse Point State Park Boat Dock and Seating Design.

With collaborative efforts between Louisiana Dept. of Natural Rescourses at the Butte La Rose Visitor Center, the town of Henderson, the Army Corps of Engineers, and Lake Fausse Pointe State Park this site has the potential for developing into a very unique, multi modal trail system that could be expanded north and/or south through the basin.

4.12 Presentation of These Concepts to Department of Natural Resources

August, 2003, Dr. Goyer, Dana Brown and myself met with Sandra Thompson, (Executive Director of the Atchafalaya Basin Program) Tommy Warder, and Ed Cripps, (members of her staff) to present the concept and to offer examples, using the three sites in the Basin designed to function as recreational and educational landscapes. The presentation was well received, and as a result I was asked to research and assist in developing an interpretive trail located between the Visitor Center and the future Children's Fishing Pier which will include outdoor classrooms and a birding tower. Yet another project with very exciting prospects. It will be the "Wetland Discovery Trail".

CHAPTER 5. SUMMARY

What can be learned in the Atchafalaya Basin? The Atchafalaya Basin is one of the most bio-diverse wetlands in North America. Within a few square miles a visitor could view change in terrain caused by land succession from riverine sediment. Forested wetlands within the Basin range from cypress-tupelo swamp to bottomland hardwood forest, frequently occurring within a few hundred feet. The Basin is rich in bio-diversity, and in a recent study by Bill Fontenot author of Birds of the Gulf Coast, 304 different bird species were identified within the Atchafalaya Basin. Additionally there are approximately 30 different species of mammals in the basin including black bear, white tail deer, beaver, nutria, otter, and others.

Today there are only remnants or relic virgin cypress trees scattered in isolated spots throughout Louisiana, such as Cat Island near St. Francisville, Tangipahoa River near Lake Ponchatrain, and Lake Verret. Some areas are protected by state and private organizations such as The Nature Conservancy, and agencies like Department of Natural Resources. Yet despite efforts to conserve cypress tupelo forests, private landowners continue to clearcut cypress in a manner not conducive to regeneration. Cypress is being cut and lifted away from the site with all leaves and branches. Leaving the leaves and branches on the site would provide additional nitrogen providing components to the soil enhancing the chance of new germination on the site.

If it is true that the people of South Louisiana are so tied to the land to be passed from generation to generation, with a renewed pride and now an urgent

sense of preservation. A need exists, to ensure that the general public be more informed of the basics and subtle nuances of the interactions in their environment and the land they enjoy, further supporting the preservation efforts of wetlands of South Louisiana.

Interpretive sites and trails need to be more effective for the individual visitors, furthermore, recreational areas should have a means to relate information about the ecology of the landscape that is being utilized by not only visitors but also for residents of the area. Certainly utilizing the teaching protocols of PLT, and other environmental based learning tools to guide us to a more effective interpretive trail. Recent anthropological studies by J. Henrich of Emory University showed that environmental learning is greatly enhanced when combined with biased cultural transmission. Environmental learning is enhanced of produces an 'S' curve in behavioral change when introduced by an older peer. For instance elementary-school aged students are more likely to experience behavioral change when it is introduced by a high school student, (older peer), when compared to an adult guide. Adults would more likely get more from a retired person. Trail guides would be most effective lead by young adults such as high school seniors or college students or retired professionals. There is a growing awareness of the environment and ecological issues throughout the world. Many groups and organizations are sponsoring environmental schools in different locations. There are many groups involved in teaching children about their environment those organizations and groups are also teaching adults in various outdoor activites. Furthermore the popularity of ecotourism is growing at

a tremendous rate it is a challenge for every landscape architect to begin looking at all recreational projects with an eye for its environmental educational opportunities not only for function but the true sustainability of the land in which he or she works. When implemented in the planning phase providing areas for classrooms as well as other teaching activities can become part of a routine formula for the design of public outdoor landscapes.

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