Introduction

This document is Phase I of the Armand Bayou Watershed Plan. It presents the current state of the watershed, the current management programs and practices, and the current tools and strategies available for achieving the mission of the Armand Bayou Watershed Partnership (Watershed Partnership): to protect, preserve, and enhance the ecological integrity of the Armand Bayou watershed while improving the quality of life in our communities.

This Phase I Plan represents the work of members of the Watershed Partnership. They are people who care a lot about the watershed, and come from a broad cross-section of the community. Many are professionals, but all have an interest in watershed management, whether from academia, state and federal agencies, business interests, regional entities, city departments, nonprofit organizations, or citizen residents.

The participants in this process have a vision for the watershed, one that improves the health and sustainability of the natural and built environments. They are concerned about the degradation of water quality in Armand Bayou and its tributaries, about increases in flooding and flood damages, and about the increasing loss of natural habitat. In particular, they are concerned with the lack of coordination among government entities in the watershed. These participants recognize the need for increased education at all levels. They see a need to develop a plan to preserve and restore habitat in the watershed, and to develop the watershed in as sustainable a manner as possible. The Watershed Partnership recognizes that many resources, both regulatory and non-regulatory, are at the disposal of the citizens of the watershed, but that much work will need to be done to coordinate these resources in a way that benefits both people and the environment.

Phase II of the Armand Bayou Watershed Plan will build on the Phase I Plan to address implementation of the Watershed Partnership's goals toward accomplishing its mission and realizing its vision. The Phase II Plan will identify specific objectives and tasks -- incorporating existing management resources, as well as new ones that may be discovered -- in ways that build partnerships, leverage resources, and enhance opportunities for success. Development of the Phase II Plan will involve reaching out further into the watershed community to expand involvement, participation, and stewardship.

Watershed Basics

What is a watershed?

A watershed is the area of land that catches rain and drains into a marsh, bayou, creek, river, lake, or bay. It functions similar to a bowl: Water dropped inside the bowl works its way to the bottom of the basin — draining to a common outlet.

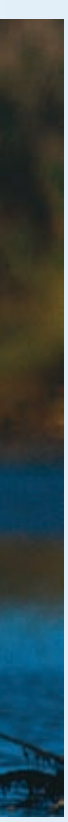
Watersheds

PHOTO © CLIFF MEINHARDT

Why are watersheds important?

Because all watersheds are defined by natural hydrology and ultimately drain to coastal waters, they are good focal points for managing coastal resources. The resource becomes the focal point, and managers are able to gain a more complete understanding of overall conditions in an area and the stressors that affect those conditions.[1] This has been known for some time. John Wesley Powell, who led the first reported expedition down the length of the Colorado River in the mid-1800s, advocated for a "watershed democracy"—for western state boundaries to be established along watershed boundaries.

Everyone lives in a watershed. Even those who don't live near the water live on land that drains to a river, estuary, or lake, and everyone's actions on that land affect water quality and quantity far downstream. Decisions made by homeowners and citizens can affect the quality of the water everyone uses, for drinking, fishing, boating, or swimming. Individual actions—either negatively or positively impacting water quality—may not seem like much, but collectively, they can have a tremendous impact. Watersheds can be large or small. In addition, each watershed can be part of a larger watershed. For example, several subwatersheds are part of the Armand Bayou watershed (Horsepen, Spring Gully, etc), and the Armand Bayou watershed itself is part of the larger Clear Lake and Galveston Bay watersheds.



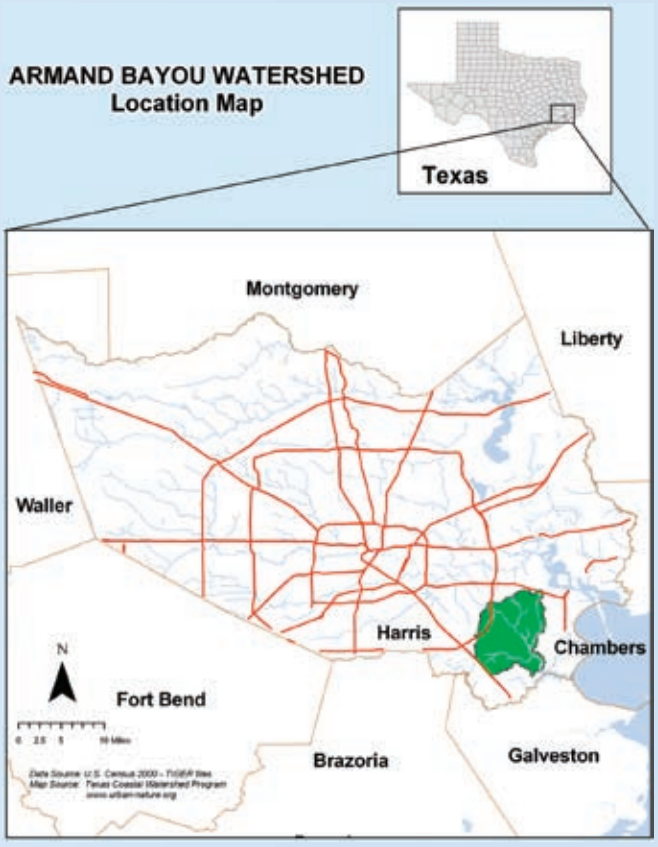
Armand Bayou Watershed Characteristics

Location

The Armand Bayou Watershed is located in southeast Harris County and is entirely in Harris County Precinct Two, situated mostly east of Beltway 8 and south of the La Porte Freeway (State Highway 225). The Gulf Freeway (IH-45) bounds a portion of the basin in the southwest corner. State Highway 146 is roughly two miles east of the basin.

Armand Bayou and its tributaries drain 59.1 square miles (37,822 acres), including portions of the cities of Houston, Pasadena, Deer Park, La Porte, and Taylor Lake Village. The City of Houston and the City of Pasadena compreise the greatest amount of land in the watershed, with 14,079 acres and 12,129 acres, respectively. The upper and lower portions of the watershed have developed residentially. The central portion is industrial to the east and undeveloped agricultural land to the west, with some oil and gas production. The majority of the watershed is already developed, and the balance is developing

[1] EPA "Why Watersheds" brochure (http://www.epa.gov/owow/watershed/why.html)



Location of Armand Bayou Watershed

The Armand Bayou Watershed includes portions of five cities — Houston, Pasadena, Deer Park, La Port and Taylor Lake Village.

ALL DRAWINGS BY RICARDO LOPEZ

Did you know that the widely recognized headwaters of the main stem of Armand Bayou are not the naturally occurring headwaters?

at a rapid pace, with urbanization projected to continue at this pace for the next several years.

The Armand Bayou Watershed is a major tributary system of the Clear Creek Watershed, consisting of natural and manmade channels. The basin is slightly less than one-third the size of the Clear Creek Watershed and has a roughly rectangular shape with an average north-south length of eight miles and width of seven miles.

The headwaters of the Armand Bayou main stem begin just west of Beltway 8 near Spencer Highway and flow in a southeasterly direction for 13.8 miles through Mud Lake (also known as Lake Pasadena) to the confluence with Clear Lake. The major western tributary of Armand Bayou is Horsepen Bayou, and the major eastern tributaries are Big Island Slough, Willow Springs Bayou, and Spring Gully.

In the late 1920s, a channel was constructed to drain a large rural subdivision called Golden Acres, which is located north of Beltway 8 and Spencer Highway. The two-mile channel connected to the northernmost meander of naturally occurring Armand Bayou at a point near Spencer Highway and Space Center Boulevard. Significant portions of the natural headwaters, upstream of that connection, were later re-routed or incorporated into underground drainage systems through developing land.

Topography

The high point in the basin is near the western boundary where the ground is generally 35 feet above mean sea level (MSL), with a few mounds 40 feet msl or slightly higher. In the middle of the watershed, where the major tributaries join the Armand Bayou main stem, the ground elevations are generally 15-20 feet above mean sea level (MSL). Downstream of Bay Area Boulevard, ground elevations are between 10 and 20 feet above mean sea level, averaging 15 feet. Land surrounding the outfall of Armand Bayou into Clear Lake is less than 5 feet above mean sea level. Average overland slope across the basin is 1.0 foot per mile.

At the headwaters of Armand Bayou, the elevation of the flowline (bottom of the channel) is roughly 25 feet above mean sea level (MSL). In the middle of the watershed, the flowline is roughly at sea level. This computes to a fall in the main stem of roughly 6 feet per mile in this reach. Beyond this point Armand's flowline is very irregular, fluctuating between mean sea level and 8 feet below sea level. The tidal limit for the

Table 1. Armand Bayou Major Tributaries

Stream	HCFCD Unit No.	Drainage Area (sq. mi.)	Stream Miles
Big Island Slough	B106-00-00	8.8	7.6
Willow Springs Bayou	B112-00-00	7.1	4.9
Spring Gully	B109-00-00	3.3	1.4
Horsepen Bayou	B104-00-00	19.3	6.5

waters of Armand Bayou is approximately 300 yards downstream of Genoa-Red Bluff Road.

Geology and Soils

The land in the watershed was laid down by the Brazos River some 30,000 or so years ago. The Armand Bayou Watershed is now separate from the Brazos River, which lies fifty miles to the west. Galveston Bay was formed by rising sea levels at the end of the last Ice Age, or about 12,000 to 18,000 years ago, which drowned the confluence of the San Jacinto and Trinity rivers. The physical features we recognize today have been in place since that time.

The Armand Bayou watershed is dominated by moderately or very clayey soils. These soils have a very high shrink-swell potential and are the main reason that so very many houses in this watershed need foundation repair. The clayey soils of the watershed are well suited for pastures, or for cropland if drainage is in place. The low permeability of these soils along with the flat topography resulted in the abundance of natural wetlands observed in this watershed.

Examples of curious features called "mima" (or "prairie" or "pimple") mounds and "prairie potholes" (or "pocks" or "pockmark" depressions) remain within the watershed. These features, present throughout the area and widely noted on older maps, provide interesting micro-variations in topography and habitat. The "mima" mounds are circular to elliptical mounds up to 150 feet in diameter and two to four feet in height from the general ground level. Likewise, the "pocks" are circular to irregular, undrained depressions scattered on the ground surface. The origins of these features are widely debated, but are generally recognized to have their origin in the scars and channels formed by the ancient Brazos River, subsequently modified by wind and biotic forces. They have been largely obliterated by urbanization and cultivation. Many mima mounds were "mined" for their soils for Galveston gardens after the 1900 storm.

Rainfall and Historical Storms

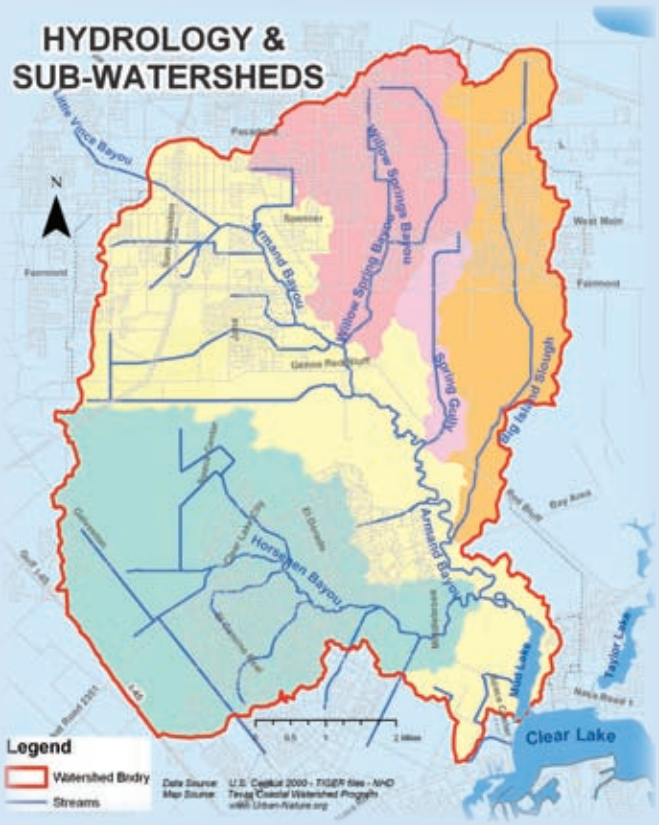
The average annual rainfall within Harris County is approximately 48 inches. Below are rainfall amounts produced by major storms since 1989.

Table 2. Armand Bayou Watershed Selected Historical Storms, 24-Hour Period*

Date	Rainfall Amount(inches)	Comments
06/26/89	10.16	Two-percent (50-year) storm
08/01/89	8.66	Hurricane Chantal
10/17/94	5.75	
10/18/94	5.67	
09/10/98	2.52	Tropical Storm Francis
09/11/98	9.13	Tropical Storm Francis
06/05/01	6.89	Tropical Storm Allison
06/09/01	11.10	Tropical Storm Allison

*HCFCD Gage Number 220, Genoa-Red Bluff Road.

Armand Bayou soils



The streams and bayous that comprise the Armand Bayou watershed.

Habitat

The Armand Bayou watershed lies within the Gulf Coastal Prairies and Marshes eco-region. Prior to settlement in the 19th century, the watershed was largely a tall-grass prairie, characterized by species such as big bluestem and Indian grass. This landscape was maintained by a combination of burning (likely managed by indigenous populations) and low frequency, high intensity grazing by native buffalo as well as Spanish horses and cattle. The prairie was punctuated by forest corridors along the stream channels and by extensive patches of coastal flatwood forests in the lower part of the watershed. Some large and significant tracts of the prairie and woodlands remain in the watershed, most notably at the Armand Bayou Nature Center. Coastal and riparian woodlands are found along Armand Bayou and its tributaries.

Human History and Impacts

Settlement brought vast changes to the watershed, both in terms of vegetation and hydrology. Withdrawal of sub-surface water, for example, has resulted in considerable subsidence in modern times. Most of the land in the watershed has subsided 6-7 feet since about 1900. Switching to surface water has slowed or stopped the subsidence. However, many areas have been affected – marshes drowned and flooding risk increased.

Drainage has always been an issue in the Armand Bayou watershed. Prior to settlement, only the main stem of Armand Bayou and its principal tributaries existed. Drainage in the rest of the watershed was not integrated into these watercourses. Runoff was consequently very slow and wetlands were everywhere. "Improving drainage" has been a constant activity from the very first settlers to our day, and is one of the most significant impacts on this watershed. Human habitation would be extremely difficult in this area without artificial drainage.

Middle Bayou was renamed Armand Bayou in 1974 after Armand Yramategui, the curator of the Burke Baker Planetarium. Yramategui was a grassroots conservationist and political activist who helped bring public awareness to environmental issues in Texas in the 1960s.[2] He was the inspiration for the efforts that resulted in the creation of Armand Bayou Nature Center, preserving 2,119 acres of habitat in the Armand Bayou watershed.[3] Harris County purchased the land and provides a long-term (99-year), rolling lease to the Nature Center.

Farming

The first settlers to the watershed located on the land that bordered Armand Bayou. The area was covered by a riparian forest, accessible only by boat. The sloughs and gullies that crisscrossed the prairies made wagon travel difficult. The farms were mainly small produce farms or family subsistence farms. From the beginning, settlers modified the landscape by providing drainage for their agricultural fields. Large agricultural enterprises did not begin until the railroads began promoting the land in the 1890s. Between 1890 and 1930, farming spread across the watershed. Italian and Japanese immigrants, who came into the area from the period beginning in the 1890s to about 1910, brought about the most agricultural change. Prairies from Red Bluff to Genoa and extending to Ellington Field became rice and sugarcane fields.[4]

After the 1900 Storm, Clara Barton, founder of the American Red Cross, headed the relief efforts and had over a million strawberry plants brought in by train to supply the prairie farmers with a crop that would provide them with quick financial returns.[5] The prairies of Pasadena and La Porte became strawberry fields. Strawberries became an even bigger business in Pasadena when Texaco founder, Joseph S. Cullinan, used the land he purchased

PHOTO BY JACK LEWIS, TEXAS DEPARTMENT OF TRANSPORTATION

[2] Emmott, Sarah, 1985, Who was Armand? Along The Bayou, June/July 1995

[3] Emmott, Sarah, 1985, Who was Armand? Along The Bayou, June/July 1995

as a strawberry farm. For the next sixty years, much of the wet coastal prairies were plowed and hilled for strawberry fields in Pasadena.[6]

Evidence of man-made channels servicing Pasadena and Houston appear on the 1943 edition of the U.S. Geological survey (USGS) quadrangle maps. The early settlers, probably farmers, likely built these channels to help drain the land for cultivation.

Ranching

When the first settlers arrived in the watershed, they found herds of wild cattle and horses, descendants of the Spanish cattle and domesticated cattle that strayed from settlers.[7] Until the late 1890s, cattle comprised the majority of the animals in the riparian and prairie areas of the Armand Bayou watershed.

William Vince received title to a league of land (4,428 acres) on the south side of Buffalo Bayou as one of Stephen F. Austin's first 300 settlers. Today this land is part of the City of Pasadena.

The cowboys on the Allen Ranch of the mid-1800s are credited with naming Horsepen Bayou. One of the sharp meander curves with high banks provided a location to drive the wild horses to trap and pen them. In 1925, James Marion West began buying up property in the Armand Bayou watershed. Within ten years the West Ranch encompassed 30,000 acres.[8] Today, the lands of the West Ranch have become:

- Residential development of Clear Lake City (15,000 acres)
- Bayport Industrial District (10,500 acres)
- Bayport Channel (725 acres)
- Johnson Space Center (1,620 acres)
- West Mansion and surrounding lands (100 acres)
- Armand Bayou Nature Center (2,119 acres)
- Remainder includes oil and gas fields that are also used for cattle grazing

During the 1930s, ranchers were forced to fence their pastures and gather the herds of wild horses from the prairies. Fencing would contribute to the alteration of the watershed's prairies. Underneath the wires, fencerows of shrubs and trees invaded the grasslands, seeded by the myriads of perching birds that lived or migrated through the area. The fragmentation of the prairie by fences reduced the efficacy of one of the most important factors responsible for the character of the prairie: fires set by the native populations to burn large expanses of prairie. The reduction in fire changed the composition of the prairie.

The native tall grass prairie grasses had unfortunately been almost eradicated by overgrazing by the 1890s. During this same period, many exotic plants that have since proved to be invasive were introduced, including grasses, trees, shrubs, vines, and aquatic plants. The Chinese tallow was sold and planted as a popular shade tree by nurseries prior to the 1920s, and has proven to be a major invader of the prairies. Another exotic, water hyacinth, reportedly filled Clear Lake in the late 1920s and 1930s. Saltwater flooding into the lake during a small hurricane of the 1930s killed it. Cyclical changes in salinity continue to limit the range of hyacinth.

PHOTO © CLIFF MEINHARDT

Wildlife, Hunting and Trapping

The watershed was a favored habitat for both large and small mammals. The riparian corridor gave shelter to both predator and prey. Black bear, puma, bobcats, wolves, and coyotes are found in the historical records. Small groups of bison were sighted from Buffalo Bayou to Clear Lake during the 1830s. Deer were plentiful until the turn of the 20th century. During the 1920s Jim West stocked his land with deer and made a portion of his land a game preserve.[9] Local trappers harvested alligators, bobcat, raccoons, beavers, muskrat, otters, fox, skunks, and other small animals for hides. Wild game that was hunted for food, or for trotline bait, included: deer, swamp rabbits, cotton-tailed rabbits, jackrabbits,

[4] C. David Pomeroy, Jr. Pasadena The Early Years, 1993, Pomerosa Press: Pasadena

[5] Barton, Clara, 1900, Report

[6] C. David Pomeroy, Jr. Pasadena The Early Years, 1993, Pomerosa Press: Pasadena

[7] C. David Pomeroy, Jr. Pasadena The Early Years, 1993, Pomerosa Press: Pasadena

[8] Alecya Gallaway, A Lumberman's Empire: The West Ranch, Sept. 1995, Bay Watcher Magazine, Vol. 2, No. 30

ducks, squirrel, and alligators. Wild animals run by dogs for sport were wolves, coyotes, bobcat, fox, raccoon, and rabbits.[10]

Fishing

Early fishing reports from the 1920s and early 1930s indicate Clear Lake as a near fresh water habitat some of the time, and fish caught there were mostly fresh water catfish, bass, perch, bream, and alligator gar. Blue crabs and bait shrimp were caught in the marshes just inside the channel to Taylor Lake. Before the 1940s, the small shrimp in Clear Lake were only used as bait and were caught with seines and cast nets. By the 1950s, markets had opened up for small shrimp, and Clear Lake was considered a major shrimp nursery grounds. During the 1950s tarpon were caught in Clear Lake all the way to Clear Creek at Webster. Rangia cuneata and Rangia flexuosa clams were the major molluscan species in the lake.[11] Men who regularly fished the area thought the salinity in the lake increased during the late 1940s after the straight channel was cut to the bay.[12]

Recreational Use

Armand Bayou is rich with recreational opportunities. Some of the most important recreational activities that the bayou offers include canoeing, kayaking and rowing. Paddlers find a waterway that has been protected from most of the influences that urban development has brought to other Houston area waterways. The bayou remains one of the last unchannelized bayous in Harris County. Most of the mid and lower length of the bayou is lined with a coastal flatwood forest. This convergence of the forest and bayou habitats offers paddlers the possibility of viewing numerous forms of wildlife. Perhaps most significant to paddlers is the restriction against gasoline motors: The use of gasoline-powered motors is prohibited north of Mud Lake. This restriction creates a paddling atmosphere that is calm and quiet. Many paddlers enjoy fishing as they float through the preserve. The bayou offers a great diversity of sport fish species to pursue including channel catfish, blue catfish, largemouth bass, bluegill, grass carp, redfish, speckled trout, and flounder. The relative calm of the preserve, the abundance of wildlife, and the close proximity of the preserve to town make Armand Bayou one of the most popular recreational destinations in the Houston area.

Houston Canoe Club members have been paddling and conducting trips on Armand Bayou since at least 1964, including, in early years, a Cruise with the Blind. An estimated 50-100 club members participate in organized trips each year. With the canoe put-in site at Bay Area Park, originally a muddy place, club members obtained permission to build a boat pier in the mid 1970s. Materials were donated, and club members spent two days pounding posts and installing the structure. The County is investigating improvements to the area, which had fallen into disrepair.

Located along both shorelines of the southern portion of the bayou lies the Armand Bayou Nature Center (Nature Center). Created in 1976, the Nature Center has a two-fold mission statement of providing environmental educational opportunities

Table 3. Armand Bayou Watershed Land Surface Subsidence

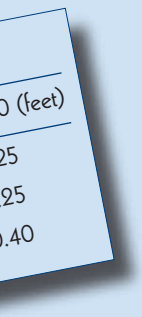
Region	1906-1978 (feet)	1978-1987 (feet)	1987-200
Upper	8.5	0.25	0.2
Middle	7.0	0.25	0.
Lower	5.0	0.50	0

[9] Dallas Coons, ABNC oral history, 1977

[10] Dallas Coons, ABNC oral history, 1977; also Louis Muecke, ABNC oral history; also Don Dick, 1998, Dick family interviews, Alecya Gallaway collection

[11] Buzz Larrabee, Shrimping history interviews, Alecya Gallaway Collection; also NMFS reports, 1958-1962; also Tony Muecke, ABNC oral histories.

[12] Dallas Coons, ABNC oral history, 1977; and Galveston District Army dredging records in Clear Lake, 1948.



to the public and preserving the land under its care for this and future generations. Recreational activities offered at the center include guided forest and prairie hikes, guided canoe tours, birding walks, and star parties. Additionally, the Nature Center provides guided tours of the bayou from the electric pontoon boat, the Bayou Ranger. The Bayou Ranger provides a relaxing venue to observe numerous inhabitants of the preserve including white tailed deer, river otter, American alligator, and more than 220 species of birds.

The Galveston Bay Foundation conducted educational canoe trips on Armand Bayou for adults and families from 1993 to 2002, and for youth from 1997 to 2002. More recently, the Artist Boat has offered eco-art adventures on the Bayou, combining science and art education.

The Houston Canoe Club began coordinating annual spring volunteer clean-ups of Armand Bayou in the 1980s. Later, Nature Center became involved, and this site became part of the regional Trash Bash effort in the mid 1990s. Typically, 200-300 people participate each year, half in boats on the water, and half on land. Corporate and education sponsors are active in the event. An estimated 50-100 club members participate in organized trips each year on Armand Bayou, and many other individuals paddle on private trips. Several area outfitters and canoe/kayak instructors use the bayou for teaching purposes, with students often returning to paddle with their new skills.

Timber

The riparian corridor along the bayou supplied all of the heating, cooking and building materials for the early settlers. Many of the early settlers were boat builders. They bought milled cypress wood cut from the San Jacinto and Trinity rivers to build the exteriors of their boats, but depended on the "water woods" like mulberry and overcup oak to build the boats ribs. Masts were made from pine, and live oak, and cedar was used on the interiors.[13] Spanish moss was harvested for stuffing bed mattresses and was cured and made into horse blankets by some of the early settlers.

Ground Water Withdrawal and Subsidence

Prior to the 1920s producing wells could be dug by hand to the shallow, 15- to 20-foot, water sands. Deep wells or artesian wells were dug at Pasadena, Genoa, La Porte, and Seabrook and as irrigation wells for the rice fields.[14]

Like other areas in Harris County, the Armand Bayou watershed has experienced a gradual lowering of the ground's elevation, over the past several decades, primarily due to withdrawals of groundwater for industrial and municipal use. Maps prepared for the Harris-Galveston Coastal Subsidence District show that the local cone of subsidence (the central point of most

[13]Porter family interviews, Alecya Gallaway collection; also Louis Muecke, ABNC oral histories.

[14]Harris County Ground water records

subsidence) from 1906 to 1978 was located slightly northwest of the watershed's northern boundary. Historical rates of subsidence are shown in Table 3.

The rate of subsidence was about one foot every nine years in the upper and middle regions of the watershed until the subsidence plan kicked in around 1978. After implementation of the plan began, the rates dropped to 0.25 feet in both the upper and middle regions for the next nine years. Since 1987, the rates in the upper and middle regions dropped to 0.17 feet every nine years. In the lower basin, the subsidence rate up to 1978 was not as severe as in the upper regions, and the reduction in subsidence since then has been less pronounced, though still declining.

Because the upper part of the watershed experienced more subsidence than the lower, the slope (gradient) of the stream has flattened, thus increasing the potential for flooding.

Oil, Gas, and Other Industrial Use

The Clear Lake oil and gas field and pipelines occupy part of the watershed and are part of the vast oil and gas production facilities of the lower Galveston Bay watershed. Included are platforms for producing oil and condensate, and natural gas, plus the pipelines for their transport. Additionally, the petrochemical industry is a major presence in the Armand Bayou watershed, through the facilities in the Bayport Industrial District. The petrochemical industry in the entire Galveston Bay watershed comprises nearly fifty percent of the chemical production in the nation, a major economic engine for the region.

Impacts on the environment from oil and gas production have included the results of the unintentional discharge of petroleum and of the formerly common practice of discharge of produced water (water associated with the oil and gas in the subsurface formations) into streams near production facilities. In 1998, the USEPA developed and implemented regulations that prohibited the discharge of these produced waters, which contained hydrocarbons and a salt chemistry that is different from the natural streams and bay. Both the hydrocarbons and the salts had deleterious effects on marine life.

The petrochemical industry also has impacts on the Armand Bayou watershed through the discharge of stormwater from plant facilities. The process wastewater from these facilities is treated and discharged in adjacent watersheds.

Residential and Commercial Development

Development began first in the upper part of the watershed. Pasadena, Deer Park, and La Porte were all founded around the turn of the last century, although real development from these cities did not reach into the watershed until the 1940s and 50s. Development in the lower part of the watershed did not begin until the 1960s with the advent of NASA. In addition to destroying natural habitat, development radically alters the natural hydrology of the land. Buildings and pavement ("impervious" surfaces) keep rainwater from infiltrating into the soil and replace natural vegetation and wetlands, resulting in very rapid, and often polluted, runoff.

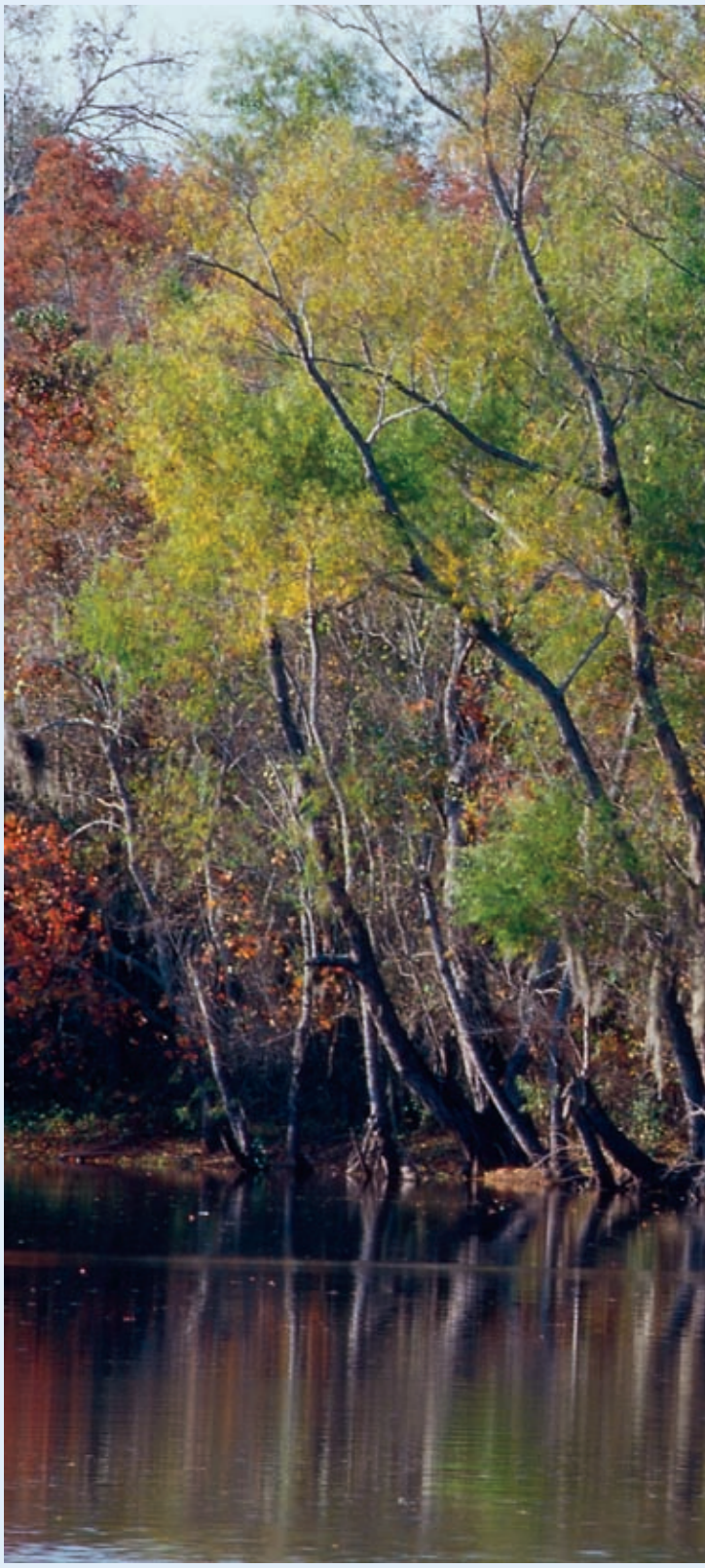
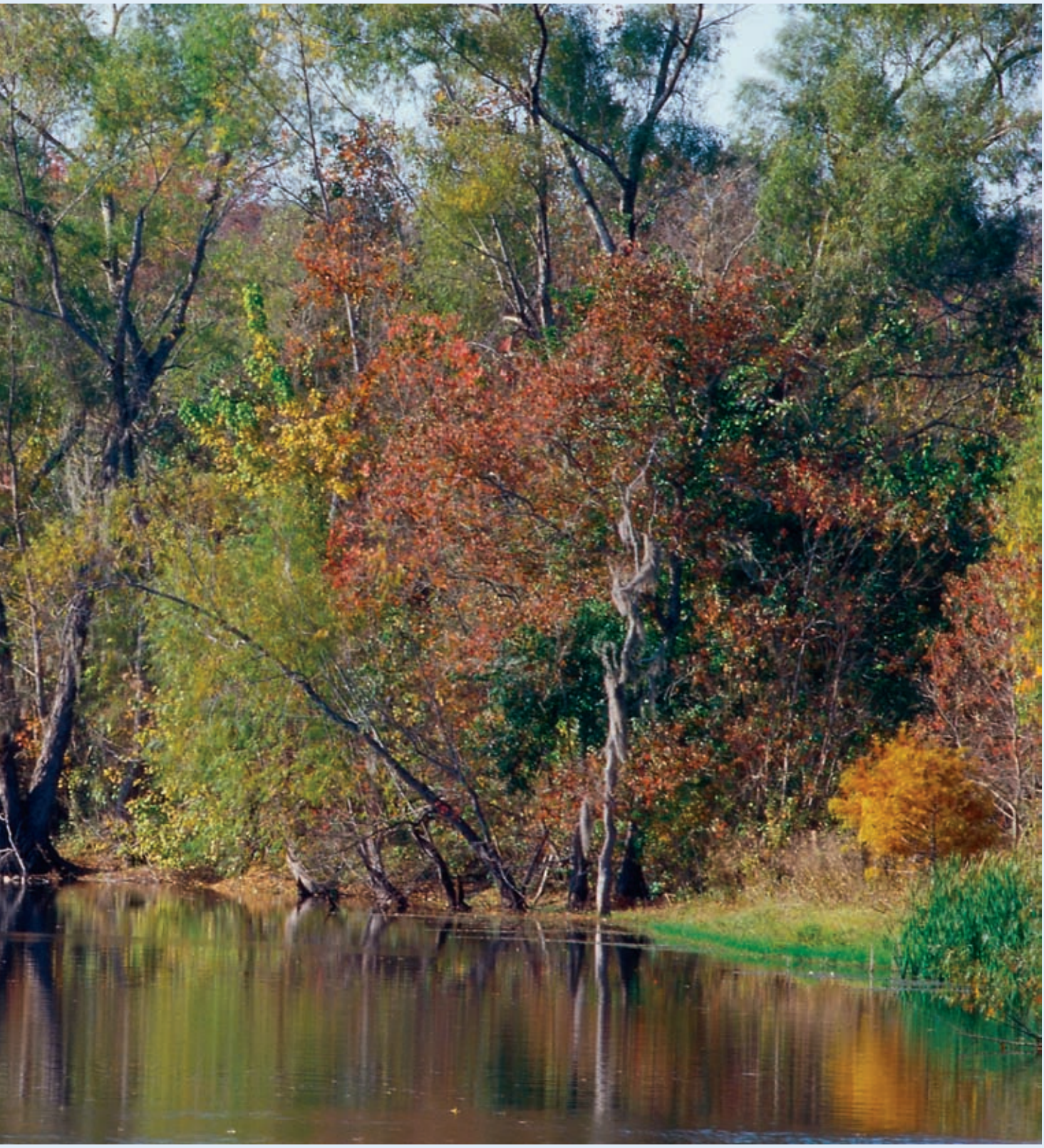


PHOTO © CLIFF MEINHARDT



Technical advisors are drawn from member organizations, other stakeholders in the watershed, and other agencies with expertise/interest in the watershed.

The physical boundaries that govern the Watershed Partnership are those of the watershed. The programmatic boundaries are those that envelop water issues – quality, flooding/stormwater management, and habitat – and community involvement issues – outreach, education, and stewardship. The Watershed Partnership does not directly consider enforcement issues.

As a collaborative effort, the Watershed Partnership relies on the insights, expertise, and input of the broad spectrum of the Armand Bayou watershed community. Anyone sharing the mission and vision of the Watershed Partnership is welcome and heartily encouraged to participate.

Mission, Vision, and Goals

Mission

To protect, preserve and enhance the ecological integrity of the Armand Bayou watershed while improving the quality of life in our communities.

Vision

1. The ecological function of Armand Bayou is restored.
2. The watershed's valuable natural resources – its physical and biological integrity – are maintained.

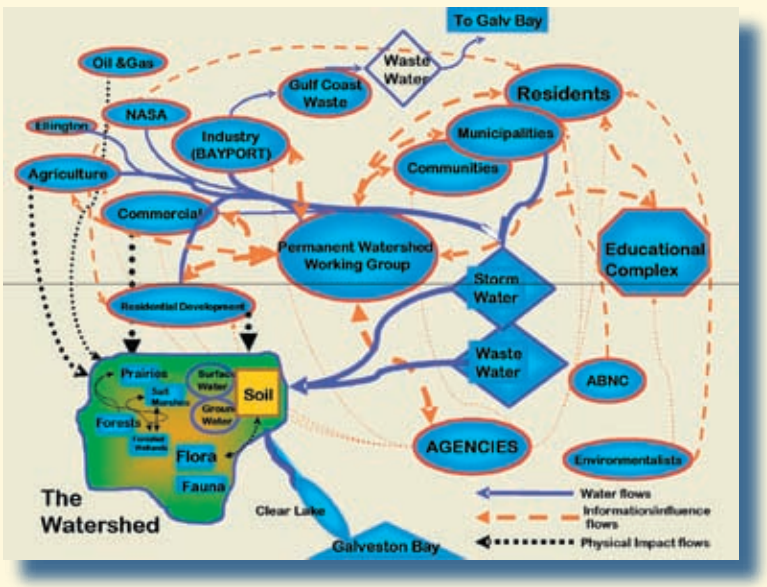


Figure 3. Armand Bayou Dynamic Interactions Diagram developed by the Armand Bayou Watershed Partnership captures a portion of the complexity of the interactions of the watershed.

3. All who live and/or work in the watershed are aware of the values of the Bayou to the community and its relationship to the ecology of Clear Lake and Galveston Bay, and understand their role in maintaining its health.
4. Residents and business interests make choices, individually and collectively, that enhance the watershed's health and minimize negative impacts.

Goals

1. Improve awareness and understanding of Armand Bayou and its values to the community.
2. Increase stewardship of Armand Bayou and its tributaries.
3. Enhance water quality to minimize fish kills and maintain aquatic diversity in Armand Bayou and its tributaries.
4. Reduce erosion and runoff pollution through measures both in the watershed and along stream banks.
5. Avoid harmful changes in the salinity regime of Armand Bayou.
6. Reduce the impact of flooding on homes and businesses, using the watershed's natural ability to absorb floodwaters wherever possible.
7. Protect and restore valuable habitat areas through the watershed.
8. Protect the riparian and adjacent habitats along the lower reaches of Armand Bayou.
9. Support coordinated decision-making for protection, restoration, and enhancement of Armand Bayou and its watershed.
10. Develop and implement a monitoring strategy to evaluate the effectiveness of watershed protection and restoration methods.

The Watershed Approach

Groups from across the nation have formed—sometimes prodded by governmental legislation, sometimes spontaneously—to protect and improve their watersheds. Their goals and methods vary widely, but all recognize people's impact upon their watersheds and that coordinated efforts are needed to better utilize the limited resources, both human and monetary. Hence, the "watershed approach" developed.

The watershed approach is "a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow."[16] Its guiding principles are that (1) the people who are most affected be involved in the process, (2) the effort be geographically based, i.e., within the watershed, and (3) sound management, based on strong science and data, in an iterative decision making process to improve the watershed.

Following this process, the Watershed Partnership has opted to create a Watershed Action Plan in multiple phases. The first phase establishes the baseline conditions and an initial vision for the watershed. While extensive information on the Armand Bayou watershed prior to major settlement does not exist, substantial data on the watershed's current conditions and recent history have been collected. This plan also lists the mission, vision, and goals of the Watershed Partnership. From this first phase plan, the Watershed Partnership will work to establish priorities, create a detailed plan of management options, and implement improvement projects. Group members will evaluate the progress and repeat various stages as necessary—again, this is an iterative process.

[16] EPA Watershed Approach brochure (http://www.epa.gov/owow/watershed/

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