Executive Summary

Introduction

Phase I of the Armand Bayou Watershed Plan 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.** 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 Armand Bayou watershed is located in southeast Harris County, mostly east of Beltway 8 and south of Highway 225, draining approximately 59 square miles to Clear Creek. As with most of southeast Texas, the watershed is relatively flat, with land sloping at about one foot per mile, has mostly clayey soils, and receives an average rainfall of 48 inches per year. The habitat in the watershed was once dominated by tall-grass prairie, punctuated by forest corridors along stream channels and flatwood forest across much of the lower part of the watershed.

The watershed has experienced vast changes over the years, especially from agriculture, drainage channels, residential and commercial development, and groundwater withdrawals. Still, examples remain of some of the original topography and vegetation that existed prior to settlement. One notable example of the native prairie and woodlands may be found at the Armand Bayou Nature Center. Some of the original topography of mima mounds and prairie pothole depressions also remain in the lower part of the watershed. The Armand Bayou watershed is a place for people to live and work, but it's also a place to connect with the natural heritage of this region.

The Armand Bayou Watershed Partnership

The Armand Bayou Watershed Partnership (Watershed Partnership) came together because of a shared interest in preserving and enhancing the natural integrity of the watershed through the coordinated management of natural resources. The Watershed Partnership is composed of stakeholders from state and federal agencies, nonprofit organizations, civic groups, academic institutions, local governments, business and industry groups, and utilities.

The vision of the Watershed Partnership includes restoring the ecological function of the bayou and maintaining the natural integrity of the natural resources in the watershed. The vision also includes a watershed populace that is aware of the natural values of this watershed, and that makes choices accordingly. Implementation of this vision will involve improving education and stewardship, working to enhance water quality and protect habitat, and supporting a coordinated decision making process for activities that affect the watershed.

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. From this first phase plan, the Group 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, as part of an iterative process.

State of the Watershed

Habitat

In spite of heavy impacts by development over the years, the Armand Bayou watershed retains some very unique and valuable natural areas (i.e., habitat. Lower Armand Bayou is one of very few unchannelized stream segments in the Houston metropolitan area. People throughout the region consider the habitat in this watershed to be one of the most important amenities in the Houston-Galveston area.

Just over half the watershed is in undeveloped or "open" space (about 21,000 land acres and about 1,000 acres of open water). Of that amount, about 14,000 acres could be considered as "significant" (i.e. relatively undisturbed) wildlife habitat, composed of coastal flatwoods, prairie pothole complexes and other prairies, tidal marshes, and the aquatic habitats associated with Armand Bayou and Mud Lake. After the permanent alterations caused by development, invasive plant and animal species are perhaps the next most significant threat to native habitat in this watershed.

Water hyacinth within the bayou and Chinese tallow on the prairies are the two most dominant invasive plants. Channeled applesnails and nutria are among the most problematic animal invasive species. A few significant areas are permanently protected within the watershed, most notably the 2,500 acres associated with the Armand Bayou Nature Center and the 300-acre Armand Bayou Coastal Preserve. Other important opportunities for additional protection may be found within the watershed.

Water Quality

The tidal and above tidal portions of Armand Bayou are currently listed on the state's list of impaired water bodies because of low dissolved oxygen levels that seasonally occur in the Bayou. Seven major fish kills have occurred in the Armand Bayou watershed since 1971; most located in the tributaries. Four were attributed to low dissolved oxygen.

Detrimentally high values of chlorophyll-a, an indicator of algal populations that are a proximate cause of the low dissolved oxygen, has been found in the summer in Armand Bayou and some of its tributaries. The high chlorophyll-a would seem to suggest high nutrient loadings (from lawn and garden fertilizers and wastewater treatment plants) into the Bayou and its tributaries, but none of the water quality studies to date have found elevated levels of nutrients.

Additional problems include high fecal coliform bacteria counts (an indicator of human or animal waste in the water) and relatively high turbidity (or low water clarity). Most local residents note the very deep green color that characterizes Armand Bayou and its major tributaries most summers.

In spite of some real water quality problems, Armand Bayou is not totally degraded. In fact, studies indicate that Armand Bayou has a diverse fish population that is indicative of "good" water quality. But additional development within the watershed threatens to degrade water quality in the Bayou and its tributaries further.

Flooding

The Armand Bayou watershed is prone to flooding because the topography of the area is extremely flat with a slope of less than one foot per mile, and the watershed has an abundance of relatively impermeable clayey soils. Although flooding is a naturally occurring event in the watershed, impacts from flooding have increased because of development and concomitant increases in stormwater runoff into the bayous, and because some construction has occurred within the floodplains. Many of the most impacted residences within the floodplain have, however, been bought out.

Major efforts at providing stormwater "detention" are occurring throughout the watershed. Detention basins hold back runoff water from paved surfaces and release it slowly to avoid flooding.

Public Education and Outreach

One of the main challenges facing the Armand Bayou watershed is how to create a sense of place and community among the residents of the watershed, and an understanding of how watersheds work, so that residents become more effective stewards of the watershed. Several agencies and institutions have educational and outreach programs that impact residents in the watershed, but much more remains to be done.

Institutional Framework

Aside from some limited protection of wetlands by the federal Clean Water Act, very few laws exist that directly protect and regulate usage of natural areas. However, a few unique pieces of legislation have direct local implications, including laws requiring coordinated coastal zone management, regulation of groundwater withdrawals, and consideration of freshwater inflows to bays and estuaries in statewide surface water management.

Several federal, state, and local agencies oversee state resource protection laws, including the Environmental Protection Agency, U.S. Fish and Wildlife Service, Texas Commission on Environmental Quality, Texas General Land Office, Texas Parks and Wildlife, and various groundwater districts. Additionally, numerous local non-profit organizations participate in coordinated natural resource management efforts.

Tools and Strategies

Improving the ecological integrity of the watershed begins with natural open areas or habitat. Although preservation can be an expensive endeavor, various tools are available to conserve natural areas. Restoration and management can bring back disturbed habitats to their pre-settlement ecology, as may be seen at the Armand Bayou Nature Center. A number of nongovernmental organizations and government agencies offer expertise, services, and funding for preservation and restoration of open space.

Impacts to water quality come from a variety of sources, and the tools for water quality improvements are equally varied: preservation of open space, low impact development, wastewater treatment options, stormwater options, and reduced use of toxic products at homes and businesses.

Tools to reduce flood damages are generally either "structural," such as channelization or detention basins, or "non-structural," such as buy-outs or on-site garden or swale features. Strategies for reducing flooding impacts involve stepping back to identify larger scale approaches. These may include ordinances, flooding analysis for prevention, and watershed-wide detention planning.

Almost every organization involved in water, watershed, or water quality work in the Armand Bayou area deals at least tangentially with public education and outreach. However, the efforts are somewhat of a "shotgun" approach, scattered and unorganized, and lacking in a unified education and outreach strategy. Nationally, however, several examples of well-organized outreach programs may be found, as well as organizations dedicated to supporting such efforts.

Monitoring and Measuring Progress

In order to protect watershed health, it is important to monitor the state of habitat and water quality. To account for human interactions with the watershed in regards to flooding, it is also critical to monitor flooding regimes and the pattern of flood damages to the built environment. Finally, to gauge the efficacy of

any watershed plan education and outreach effort, it is necessary to know the level of public environmental awareness.

Information Needed

If the Armand Bayou watershed is to be appropriately cared for and better understood, then the information collected in this plan should be as complete and comprehensive as possible. Better information results in more informed decision-making. Although this plan contains vast amounts of information collected from many sources, it is acknowledged that much is lacking. For example, very little documented information exists about how water moves from prairie pothole wetlands to the bayou. This information could help scientists develop effective plans for restoring existing wetland complexes to their full functionality.

Additionally, while this plan describes the current state of the watershed, it is acknowledged that circumstances, physical conditions, and the availability of information, etc., will change after production of the plan. An example of this circumstance is the FEMA floodplain maps, which have recently been revised to more accurately show the topography of the watershed and the floodplain as a result of the LIDAR study conducted by the Tropical Storm Allison Recovery Project team.

Undertaking additional scientific studies of various types is often a function of the amount of funding available, but the additional information would surely produce a more effective watershed system. Watershed function can only be better understood when data gathering efforts are systematic and comprehensive.

Next Steps

This Phase I Armand Bayou Watershed Plan presents the current state of the watershed, the current management programs and practices, and the current tools and strategies used throughout the watershed. The Phase II Armand Bayou Watershed Plan will build on the Phase I plan to develop a more complete plan that will begin to implement the mission and vision of the Watershed Partnership. The Phase II Plan will identify specific objectives and tasks in ways that build partnerships, coordinate actions, 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.

The Steering Committee and Watershed Partnership recently adopted formal procedures for their structure and operation to be used throughout the Phase II Plan development process. It will begin with the publication, release, and distribution of Phase I Plan, Executive Summary, and informational brochures. Considerable public outreach will be conducted to promote public awareness and education about the Armand Bayou watershed. The existing subcommittees will continue to operate and others may be added as needed. It is anticipated that the already strong and broad participation will strengthen as the Phase I Plan is publicized and Phase II plans begin to develop. Target dates for milestones and completion of the Phase II Plan will be generated as part of the plan development process.

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