

# Monitoring and Measuring Progress



## Habitat

It is important to monitor overall changes in habitat to know whether critical habitat areas are threatened. Remaining habitat can be monitored either in terms of quality or quantity. Quality monitoring involves measuring specific indicators, such as biodiversity, percent cover, or range quality over time. This kind of monitoring requires a fair amount of scientific rigor to insure that results are comparable over time.

Monitoring the quantity of remaining habitat is comparatively simple. Once a habitat map has been established (as it has for the Armand Bayou watershed), changes in habitat coverage and composition can be monitored. Tools can include aerial photography, satellite imagery, and field surveys.

To be effective, monitoring data should be stored and manipulated in a geographic information system (GIS). The data can be stored geographically (e.g., geo-referenced), and maps of change can easily be generated.

## Water Quality

Water quality monitoring involves the collection of data on many physical, chemical, and biological parameters that indicate the health of the aquatic environment. Water quality measurement is an assessment of the collected data and draws conclusions as to whether water bodies are meeting standards, as set by the Texas Commission on Environmental Quality (TCEQ) and approved by the United States Environmental Protection Agency (EPA). The State of the Watershed, Water Quality section in this plan lists such parameters that were assessed for Armand Bayou.

Water quality in the Armand Bayou Watershed is monitored by various entities, including the TCEQ, City of Houston Health and Human Services Department, and by local citizen monitors through the Texas Watch Program. Each entity has its own set of monitoring stations, which are coordinated by the local Texas Clean Rivers Program partner agency, the Houston-Galveston Area Council. The Clean Rivers Program is a state-fee funded monitoring, assessment, and public outreach program that provides the opportunity to approach water quality issues within a watershed at the local and regional level through coordinated efforts among diverse organizations.

Volunteer monitoring also has a role. The Texas Watch Program is a network of trained volunteers and supportive partners working together to gather information about the natural resources

of Texas and to ensure the information is available to all Texans. Volunteers are trained to collect quality-assured information that can be used to make environmentally sound decisions. The program is administered by Texas State University through a cooperative agreement with the TCEQ and EPA.

The water quality is assessed by the TCEQ on a biennial basis as a part of the state's water quality inventory, or "305(b) report." The biennial assessment also includes a listing of those water bodies that do not meet their assigned uses, known as the "303(d) list." These uses can include aquatic life use, contact recreation use, noncontact recreation use, drinking water supply use, fish consumption use, and oyster waters use.

## Flooding and Stormwater Management

### Flood Level Gauges

The Harris County Flood Control District and the Harris County Office of Emergency Management (HCOEM) maintain a system of rainfall and stream level gauges in Harris County. HCOEM and HCFCD use the gauge information to work with the local office of the National Weather Service to generate flood warnings during potential flooding events. The system presently includes 5 gauges within the Armand Bayou watershed. Real time gauge data can be accessed at [www.hcoem.org](http://www.hcoem.org).

### Flood Damage/Debris Lines Reports

The Harris County Flood Control District, the Permit Office of the Harris County Department of Public Infrastructure, and the various cities within the watershed prepare flood damage and debris line reports after significant flooding events. The reports are generated by physical inspection of flooded areas after floodwaters recede. Personnel from the agencies will drive the flooded areas looking for evidence of flooding, including high water marks on structures and damaged carpet, sheetrock and other items recently removed from the flooded structure. Individual reports are maintained by each of these entities, and are available for review at their offices.

## Public Outreach

Dr. Steven Klineberg, of Rice University's Sociology Department, and his students have conducted annual extensive surveys of the Galveston Bay area about environmental awareness. Such baseline information is crucial to determine true impact.

# Data Gaps

## Habitat

Many data gaps exist in knowledge of the habitat of Armand Bayou. Among the information needs are:

- A better understanding of the phytoplankton community of the Bayou as it relates to sediment/water column nutrient fluxes, and compared to a non-enriched system to elucidate the water quality problem and its likely impact on fisheries.
- A benefit/cost analysis of how to reduce nutrient flow into the Bayou (water quality is a fishery habitat parameter).
- A model of anthropogenic nutrient and pollutant inputs into the Bayou with sinks and outflows also identified, also including modeling of pre-settlement flows into the Bayou as well.
- A comprehensive map of wetland mitigation and other habitat restoration/creation sites and a report on their success.
- A new wetlands inventory map and a map of all ditches and waterways that make up the watershed.
- A wildlife habitat conservation plan that outlines areas of particular value and options for conserving them and connecting them to the core area (ABNC).
- Identification of potential plant and animal reintroductions that could benefit the watershed.
- Economic and ecological benefits of natural habitats.

## Water Quality

The Texas Surface Water Quality Standards were designed to cover a large range of water bodies throughout the state, and represent a minimum for regulatory purposes. They are not an index for determining estuarine health and so may not capture the goals of the Armand Bayou Watershed Partnership. Appropriate standards for various water quality parameters from reference watersheds, including dissolved oxygen, should be collected and utilized in the analysis of the health of the watershed. Currently, TCEQ is collecting such data. In addition to this overarching need, other needs include:

- Automated 24-hour dissolved oxygen sampling to better capture critical dissolved oxygen minima that impact the aquatic life community.
- More frequent sampling of metals and organic compounds in water and sediment.

- Human health risks of contact recreation activities.
- Bacterial source tracking studies to determine sources of, and develop best management practices to reduce, bacteria concentrations.
- Information and analysis of coastal tidal waters (especially flat areas), considering the changes in stream gradients caused by subsidence
- Data on the efficiency of local best management practices for storm water quality improvement are needed. For example, many of the engineering practices related to storm water detention and infiltration may be inappropriate for local topography, soil types, and rainfall regimes.
- In lieu of event mean concentration estimations, primary data on storm water runoff quality.
- Storm water runoff contaminant loading, such as sediment, based upon the primary data and studies on the cumulative impacts of such loading.
- Information on long-term effects of sediment accumulations in detention basins, including data regarding hazardous substances and effects on groundwater.

## Flooding and Stormwater Management

The choice of the most effective methodologies of stormwater management to reduce flooding and the search for the most publicly acceptable options has generated vigorous discussions. As stormwater management authorities search for methods that combine effectiveness with public acceptability, watersheds become a laboratory for determining methods that will optimize habitat and open space while maximizing flood reduction. The issues of channelization vs. detention, choices of construction material, choices of vegetative ground cover, and the use of open space to manage stormwater are constantly being reviewed. As stormwater management evolves beyond concrete and channelization, it will yield data on the effectiveness of new techniques to reduce flooding and preserve habitat.

## Public Outreach

Little to no research has been done to date on outreach in the Armand Bayou watershed and its effectiveness, nor of what people know about the watershed.

# 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.

