

Dickinson Bayou Watershed Protection Plan



**February 2009
Dickinson Bayou Watershed Partnership**

*PREPARED IN COOPERATION WITH
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND
U.S. ENVIRONMENTAL PROTECTION AGENCY*

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EXECUTIVE SUMMARY

The Dickinson Watershed Protection Plan (DBWPP) outlines a series of actions aimed at improving the overall health of the watershed and reducing the amount of pollutants entering the Bayou. These actions are based on the vision and goals proposed for the watershed by a broad group of stakeholders representing individual citizens, non-profit and commercial interests, and local, state, and federal government entities. The vision and goals entail leaving an environment and community for future generations that is much improved, or at least no worse than the present.

This plan sets forth specific goals and pollutant reduction targets in short-term (~5 years) and long-term (~20 years) frameworks. There are no intermediate goals (e.g., ~5-10 years) because this plan is intended to be a living document, frequently revisited by the stakeholders.

The Dickinson Bayou Watershed has changed markedly over the years, and not always for the better in terms of watershed health. Water quality in the Bayou has degraded, and what was once native prairie and farmland has been developed into subdivisions and shopping centers. Forecasts of increased growth and development only foretell further changes for the worse. The Partnership does not pretend it is possible to return the watershed to a pristine, pre-development state, but it does intend to insure that the water quality in the Bayou will not degrade much more, if at all.

First and foremost, this plan needs a champion, and preferably several; a champion who lives in the watershed and can dedicate sufficient time to building public support and gathering resources. There is no recipe for producing champions, but without a few homegrown supporters, success of this plan is unlikely. Secondly, dedicated staff is necessary to insure implementation of the plan. A full-time watershed coordinator is recommended, perhaps funded by watershed municipalities as part of their stormwater management programs. A watershed coordinator could provide stormwater education and outreach required of watershed cities under the Texas Pollutant Discharge Elimination System (TPDES) as well as coordination of DBWPP implementation, including the securing of additional outside funding.

For initial implementation phase of the DBWPP, the Partnership proposes modest short-term pollutant reduction targets of 23,394 lbs/yr of total nitrogen (6% reduction), 5,816 lbs/yr of total phosphorous (5% reduction), and 1.9×10^6 billion colonies/yr of bacteria (15% reduction), and 1,000 acres of preserved land¹. A Clean Water Act Section 319 watershed implementation plan grant is already in place², and will be the main driver for accomplishing most of these short term goals. Several on the ground demonstrations of site specific BMPs are funded though this grant with the short-term goal of treating 250 acres with on the ground BMPs. This funding will also help install a demonstration stormwater wetland in the watershed and provide educational workshops for many different groups.

¹ Preserving 1,000 acres will stop an additional 20,252 lbs/yr (4.3%) of total nitrogen, 4,797 lbs/yr (4.6%) of total phosphorus, and 6.2×10^5 billion colonies (4.7%) per year from entering Dickinson Bayou

² Granted to Texas Agrilife Extension through the Texas Coastal Watershed Program.

For the long term, the Partnership envisions much more substantial pollutant reductions and much improved watershed health compared to the present. Under this plan, watershed improvement would be based around three broad categories of actions: installation of stormwater best management practices (BMPs), land preservation, and channeling of a significant fraction of new development into “liveable centers.”

The best stormwater BMP for this area is, in the Partnership’s estimation, the stormwater treatment wetland (STW). Wetlands are a prominent part of our natural environment –they already work well here. Wetlands can easily be engineered into new detention basins or retrofitted into existing basins. If runoff from all existing development in 20 years were routed through STWs, a reduction in 267,968 lbs/yr of total nitrogen (32% reduction), 96,634 lbs/yr of total phosphorus (23% reduction) and 1.6×10^7 billion colonies/yr (46% reduction)³ could be expected. The cost of implementing this goal would be substantial, but it would be a small fraction of total development costs. Not only would STWs provide a substantial pollutant load reduction, they would provide significant habitat for waterfowl and other fauna while beautifying local communities. Consideration should be given to regional management of stormwater detention, which would enable larger and ecologically more significant wetland complexes, as well as better treatment efficiency, versus subdivision-scale detention. A regional approach to wetlands would also put a government agency in charge of maintenance instead of individual businesses or home owners association offering a more unified approach to this issue.

The Plan calls for the preservation of some 4,200 acres of prime natural areas that still exist in the watershed. Preserving these acres in their natural state would result in substantial pollutant reductions over what would take place were that land developed⁴. The preserved natural areas would provide important natural services or infrastructure, such as floodwater detention, that would otherwise cost money. Beyond providing important habitat for native fauna, a large and ecologically intact fragment of Gulf Coast prairie and forest ecosystem would very importantly provide a strong sense of place and heritage for watershed residents, given the role this ecosystem has played in watershed history (see [Appendix B](#)). That sense of place could perhaps contribute more than anything else to a strong sense of ownership and stewardship on the part of watershed residents.

Lastly, liveable centers (also known as town centers) are emerging as an important regional development alternative. Development in walkable liveable centers is much more compact than, and therefore consumes much less land than, traditional development. In addition, walkable communities provide a much higher quality of life for many people. If 50% of new development were channeled into mostly small lot (\leq about 3,000 sq ft) and townhome patterns, we could expect at least 20% reduction in what pollutant loads otherwise would have been. The

³ Reductions based upon projected 2029 loadings assuming full build out of the watershed at medium density, see Section 23 for full calculations

⁴ If 4,200 acres were developed at medium density, they would contribute an additional 80,000 lbs/yr of total nitrogen⁴, 20,000 lbs/yr of total phosphate, and some 2.4 billion colonies/year of bacteria.

impending creation of a commuter rail line along Hwy 3 will be a real opportunity for compact transit-oriented development, if appropriate planning takes place now.

This watershed plan is a list of potentially isolated actions. The fundamental principle of watershed management, however, is that everything is connected. This holds true for this plan as well. There is a synergy to be obtained by integrating as many actions as possible. Stormwater wetlands, for example, provide by water quality *and* habitat; liveable centers improve quality of life *and* result in pollutant loading reductions. This *watershed* plan seeks to integrate a diverse set of activities, and to find *watershed* wide benefits.

SUMMARY OF MILESTONES

Strategy	Milestone	Expected Completion Date	Cost
<u>Organizational Continuity</u>			
	Seek grant funding for coordinator & solicit funding from municipalities within the watershed	2009	No cost
	Hire watershed coordinator	2009	\$70,000-100,000 annually
	Establish a 501(c)3 non- profit group	2010	\$20,000 annually
<u>Education and Outreach</u>			
	Development of 3 key themes	2009	Cost listed under watershed coordinator
	Five watershed workshops held, and 10% of households/businesses reached	2014	Cost listed under specific strategies (i.e. habitat, stormwater management, etc.)
	Four outreach events attended by Watershed Partnership representatives	2010	Cost listed under specific strategies (i.e. habitat, stormwater management, etc.)
	Ten watershed specific publications produced	2010	Cost listed under specific strategies (i.e. habitat, stormwater management, etc.)
	Twelve demonstration sites (WaterSmart landscapes, rain gardens, construction site BMPs, LID BMPs)	2010	Cost listed under stormwater BMPs
	Implementation of full blown multimedia outreach campaign	Spring 2014	\$2.5 million over 5 years

Strategy	Milestone	Expected Completion Date	Cost
<u>Habitat Conservation</u>			
	Hold 2 public workshops on preserving land through conservation easements	2010	\$50,000 (also includes a landowner assistance program)
	Develop a watershed wide mitigation plan	2014	\$30,000
	Develop a watershed wide habitat conservation plan	2014	\$100,000
	Preserve 1,000 total acres of habitat in the watershed	2014	
	Preserve 2,500 total acres of habitat in the watershed	2019	
	Preserve 4,200 total acres of habitat in the watershed	2029	
<u>Onsite Wastewater Facilities</u>			
	On-site Sewage Facility (OSSF) Feasibility study	2010	\$75,000
	OSSF Soil Evaluation Workshop	2009	\$5,000
	Advanced Retrofit Workshop	dependent on feasibility study	\$10,000
<u>Permitted Wastewater</u>			
	Complete conversion of clay sewer pipes	2016	\$17 million
<u>Stormwater Management</u>			
	Creation of LID Technical Committee	2010	No cost

Strategy	Milestone	Expected Completion Date	Cost
	List of the best BMP's for Dickinson	2010	No cost
	Self guided tour map of demonstration sites in the watershed	2011	\$5,000
	Adoption of a watershed stormwater ordinance by all communities within the watershed	2012	No cost
	Three construction site compost demonstration sites	2014	\$1.1 million
	Three post construction site demonstration BMPs completed at highly visible sites (selected from technical committee list)	2010	
	100 LID BMP's installed at private homes	2014	
	50 LID BMP's installed at business, municipal offices, court houses, etc.	2014	
	Creation of (or retrofit) LID neighborhood	2014	
	10,000 acres treated by storm water BMPs	2029	
<u>Stormwater Wetlands</u>			
	Develop a retrofit manual/guidebook for landowners	Fall 2009	\$10,000
	Complete 5 stormwater wetland treatment systems within the watershed	2014	\$500,000
	All currently developed areas treated by stormwater wetlands	2029	

Strategy	Milestone	Expected Completion Date	Cost
<u>Urban Growth</u>			
	Ordinance changes to allow compact growth in select areas	2010	No cost
	At least 3 growth related workshops	2014	Cost listed under Watershed Coordinator
	Channel 50% of new growth into Liveable Centers	2029	No additional cost
<u>Parks and Recreation</u>			
	Additional 50 acres of park space open to the public, portion of which will be pocket parks	2013	Land acquisition costs listed under habitat conservation
	Installation of at least 5 educational signs throughout the watershed	2011	\$7,500
	25% of parks managed organically (using WaterSmart Landscaping principles)	2014	No additional cost
	Hold 2 classes on boating safety and community stewardship	2010	No cost
	Additional 110 acres of park space open to the public	2019	Land acquisition costs listed under habitat conservation
	100% of parks managed organically (using WaterSmart Landscaping principles)	2019	No additional cost
<u>Water Quality Monitoring</u>			
	Clean Rivers Program surface water quality monitoring	2014	\$22,000
	Installation of new continuous water quality monitoring station with flow meter	2014	\$10,000 - \$20,000 per year

FORWARD

Imagine an endless sea of thick, flowering prairie grasses, full of color and variety, disturbed only by segments of cloistered forests. Picture buffalo, wild mustangs, deer and a whole host of wildlife, roaming freely among the towering trees and grasses of this coastal lowland. Concealed between banks of majestic post oaks and aromatic cedars, discover a beautiful bayou, providing sustenance and life to all its inhabitants. Flowing modestly with tidal change, Dickinson Bayou resonates with an unassuming purpose when tasked with accepting storm-water from miles and miles of surrounding land. A vision captured only in the colorful past of this aged waterway, the Dickinson Bayou watershed has only small remnants of its once prevalent inhabitants and natural topography.

The watershed encompasses approximately 100 square miles of property that utilizes tributaries, drainage ditches and storm drains to move run-off into Dickinson Bayou. With the enormous influx of large commercial and housing developments, non-porous surfaces are rapidly changing the landscape within this watershed and having a negative effect on Dickinson Bayou and its populace. There is no question that the current appearance of this watershed is threatening the quality of water in Dickinson Bayou and Galveston Bay, and land use issues need to be addressed at the State and local level to prevent further degradation of Dickinson Bayou. The Dickinson Bayou watershed is a place for people to live and work, but it is also a place to connect with the natural heritage of this region.

The Dickinson Bayou Watershed Plan presents the current state of the watershed, identifies concerns, provides recommendations on how to improve the watershed, devises an implementation schedule of those recommendations, and specifies who has the technical and financial framework for implementation to occur. All of these elements are important in achieving the mission of the Dickinson Bayou Watershed Partnership which is “to protect, preserve and restore the quality of the Dickinson Bayou watershed and its communities.”

Julie Masters

Mayor, City of Dickinson

1. Introduction

The Dickinson Bayou Watershed

The Dickinson Bayou watershed lies between Houston and Galveston, Texas and encompasses a total area of 105 square miles (Figure 1). The watershed falls within Galveston and Brazoria Counties and includes portions of Alvin, Dickinson, Friendswood, Kemah, League City, Manvel, San Leon, Santa Fe and Texas City (Figure 2). The total population of the watershed is approximately 75,000⁵. Ethnically, the population is primarily white with significant Hispanic and African American populations and a small Asian population. The Dickinson Bayou watershed is about 50% developed, but there are still significant natural and agricultural areas.

Dickinson Bayou is a 22.7 mile long, slow moving coastal stream that drains into Dickinson Bay, a sub bay of the Galveston Bay system. The lower reaches of the bayou from 2.5 miles downstream of FM 517 to Dickinson Bay are tidally influenced, while the portion from the head waters to 2.5 miles downstream of FM 517 is not. (Figure 3) Dickinson Bayou has ten main tributaries: Oak Creek, Algoa Bayou and Hickory Bayou in the portion above tidal influence and Gum Bayou, Bensons Bayou, Giesler Bayou, Bordens Gully, Cedar Creek, Hulen Park Bayou and Arcadia Bayou in the tidal portion. The main channel of Dickinson Bayou has a significant deep section where the bottom of the channel dips below the level of the channel at the outlet to Dickinson Bay. This deep section effects the mixing of water in the bayou and flow to the Bay.

The climate in the Dickinson Bayou watershed is characterized by long hot, humid summers frequently cooled by sea breezes. Winters are warm and occasionally interrupted by incursions of cool air from the north. Rain occurs throughout the year, and precipitation generally averages 48 inches annually⁶. Snowfall is rare.

The Dickinson Bayou watershed is relatively flat with elevations ranging from zero to 60 feet above mean sea level. The westernmost portions of the watershed are generally higher and the land generally slopes downward toward Galveston Bay. Much of the tidal section of the watershed is below 30 feet (Figure 4). The soils throughout the watershed are moderately to very poorly drained loams, clays and clayey loams (Figure 5).

⁵ Houston-Galveston Area Council 2008. Population and Employment Forecasts. GIS dataset Format (1 mile grid).

⁶ Galveston County Parks Department. Dickinson Bayou Watershed brochure.

<http://www.dickinsonbayou.org/watersheds/info/documents/DickinsonBrochure.pdf>

Figure 1. Location of the Dickinson Bayou Watershed

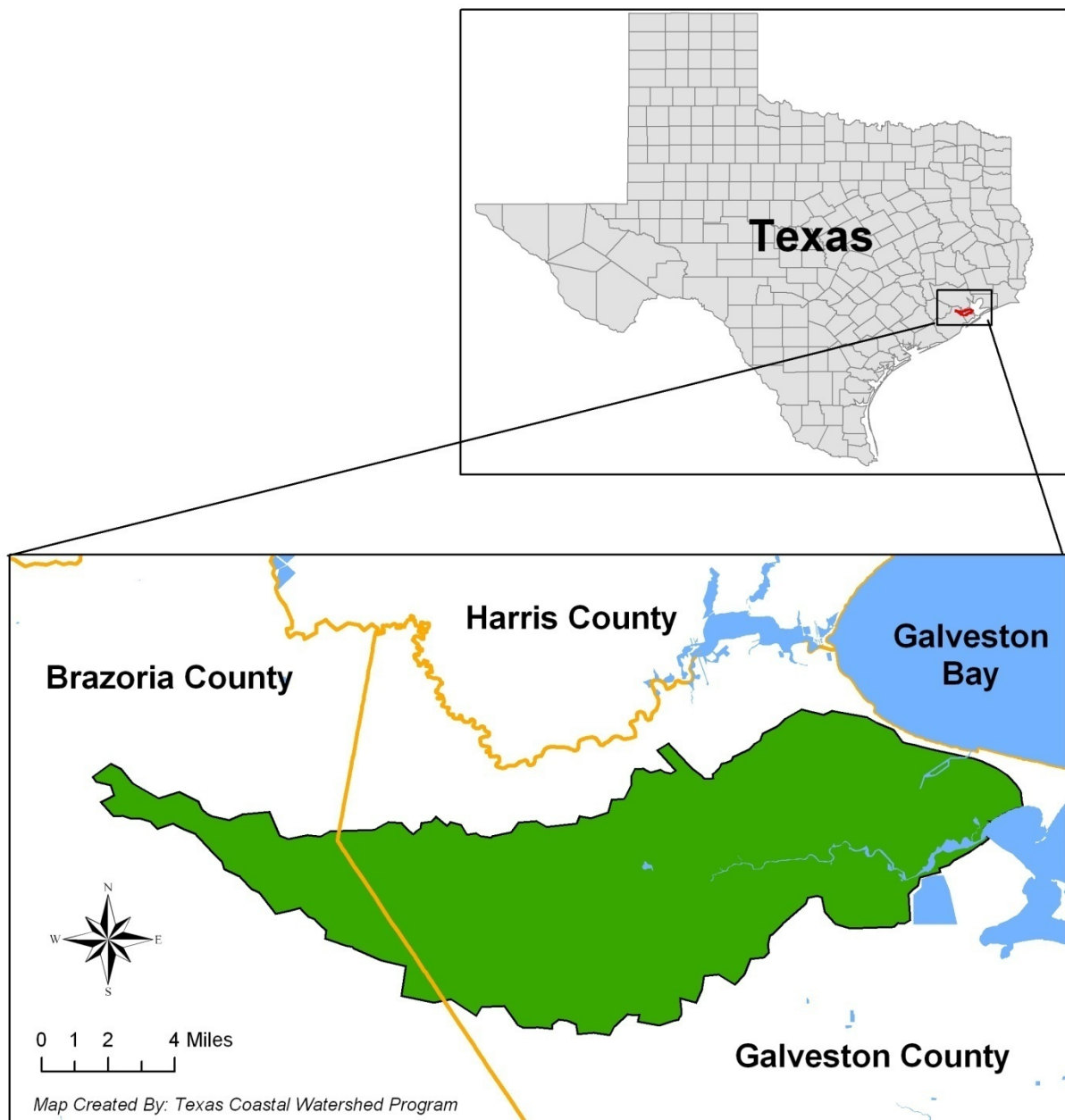


Figure 2. Cities in the Dickinson Bayou Watershed

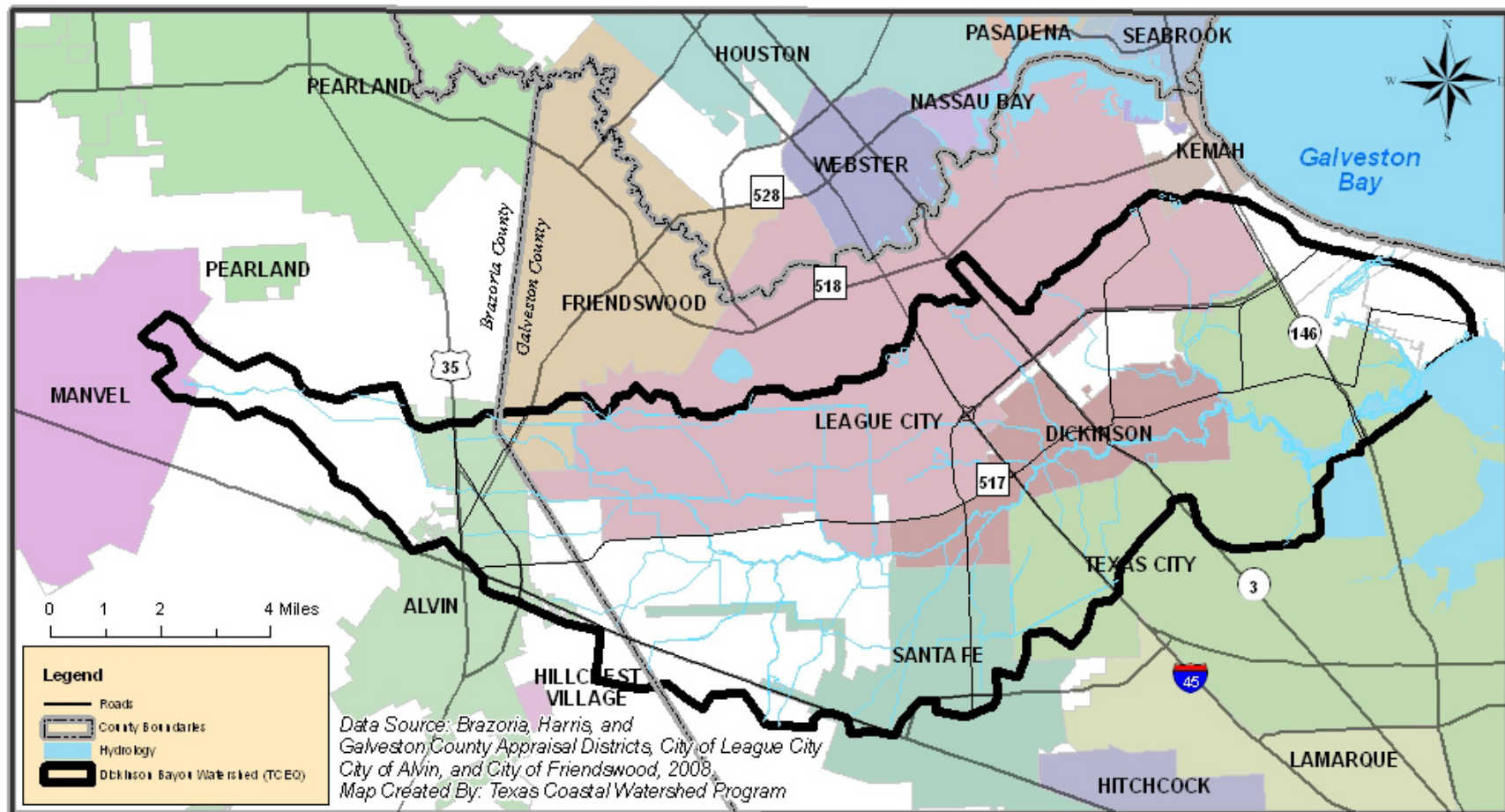


Figure 3. The tidal boundary of Dickinson Bayou

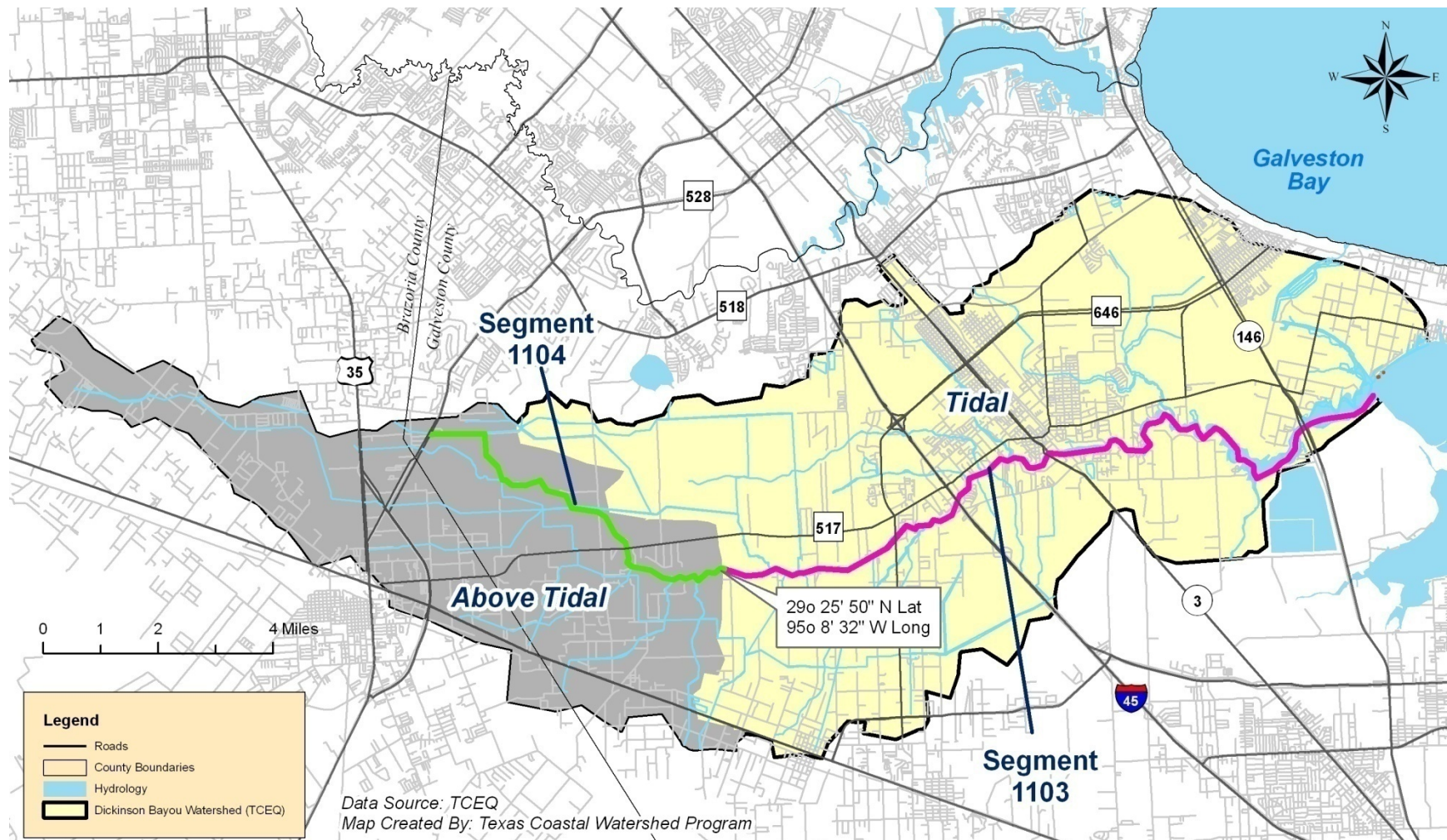


Figure 4. Dickinson Bayou Watershed Elevation

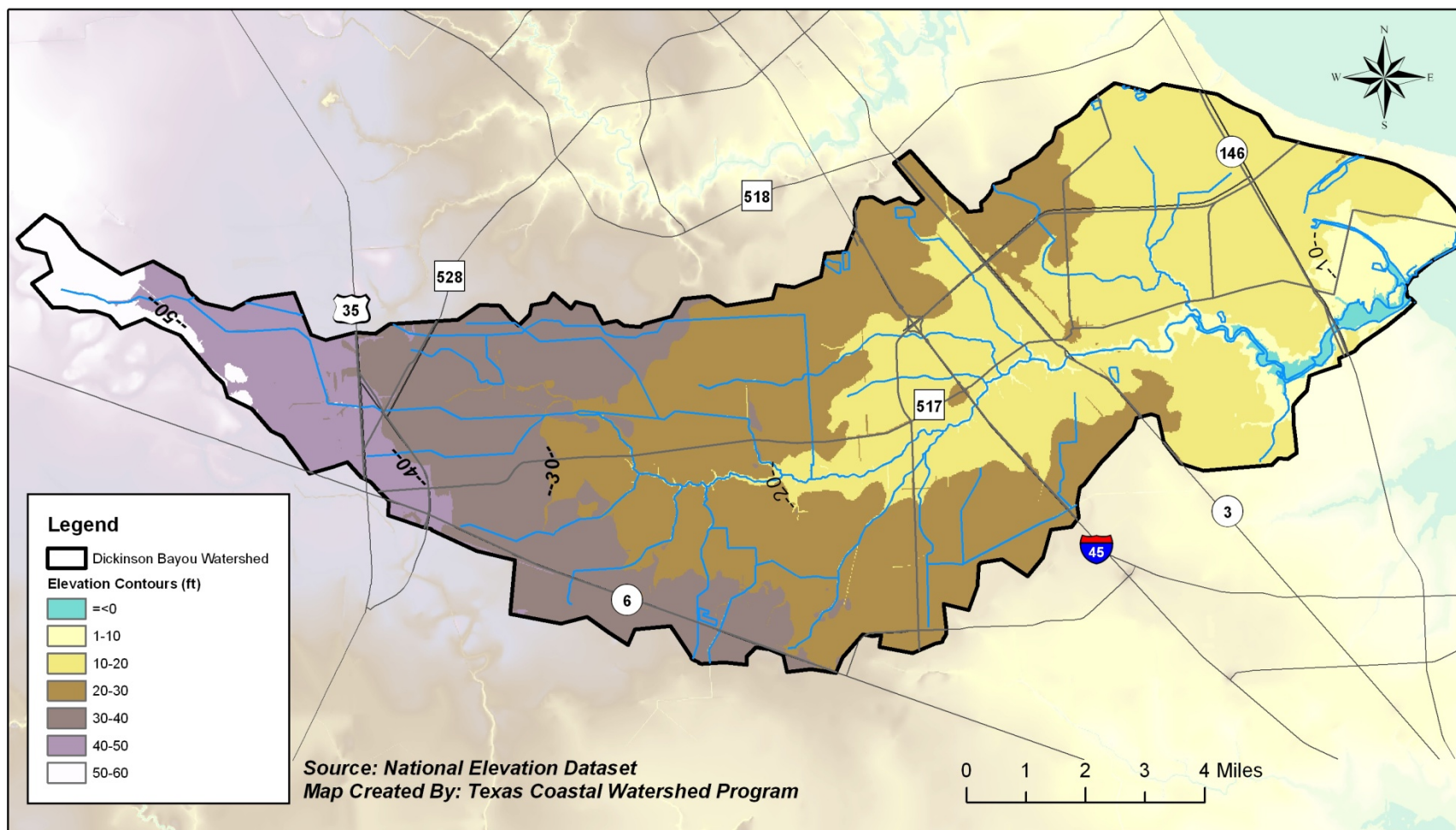


Figure 5. Dickinson Bayou Watershed Soils

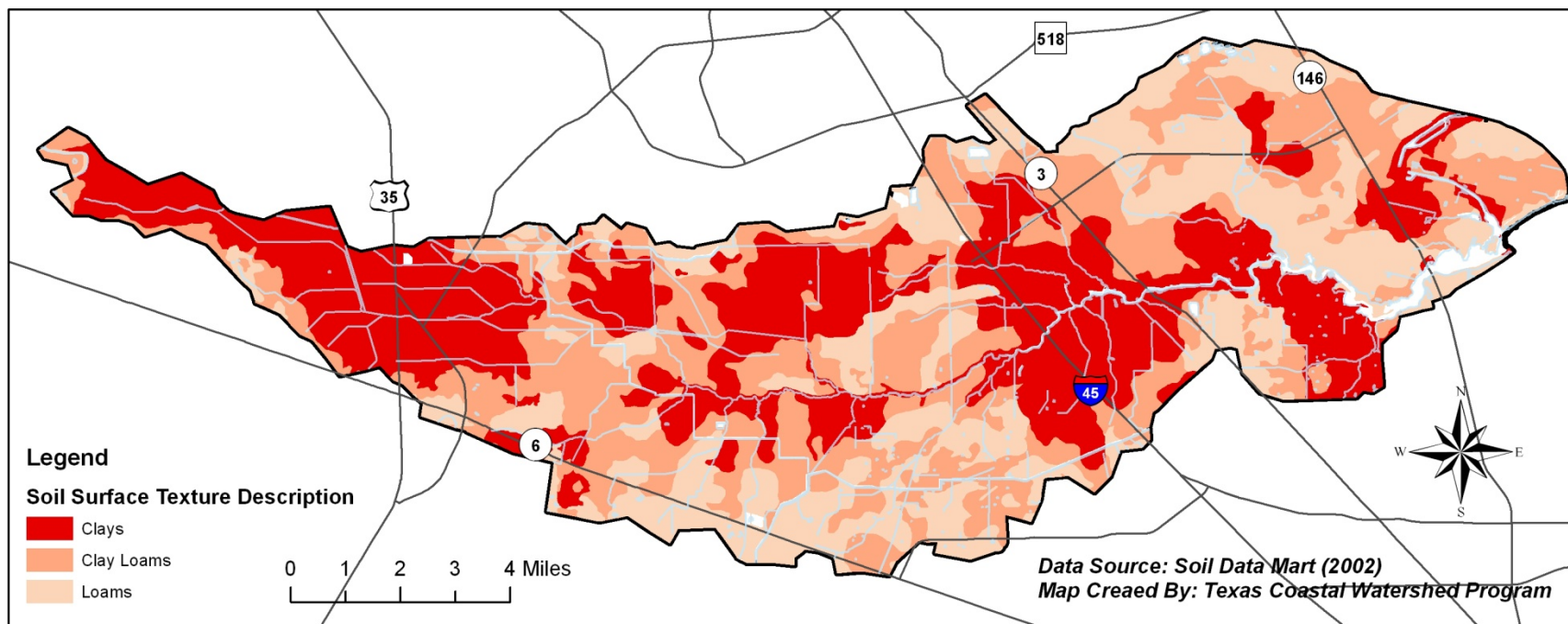
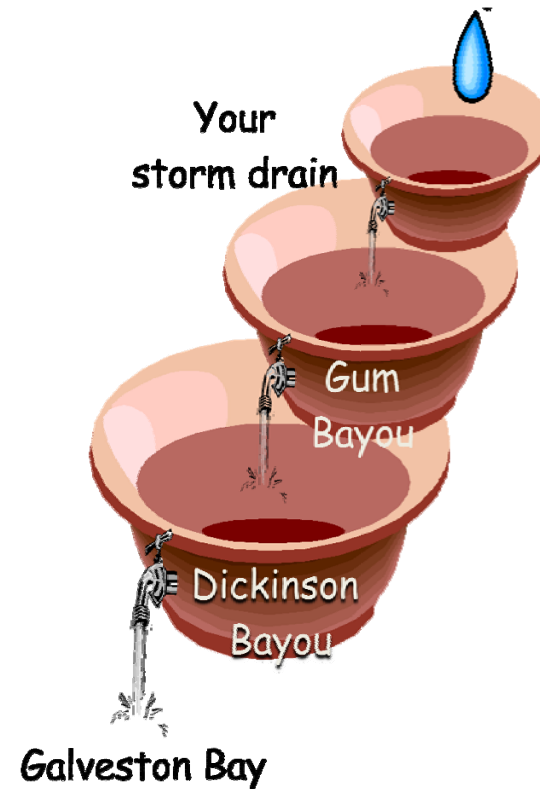


Figure 6. What is a watershed?

What is a watershed? A watershed is an area of land where precipitation drains into a single bayou, creek, river, lake, or bay. Watersheds include both natural elements such as prairies, marshes, and streams, and man-made elements such as homes, parks, schools and shopping centers.

Watersheds can be large or small. In addition, each watershed can be part of a larger watershed. For example, several sub-watersheds are part of the Dickinson Bayou watershed (Benson Bayou, Gum Bayou, etc), and the Dickinson Bayou watershed itself is part of the larger West Galveston Bay watershed.

Why are watersheds important? Everyone lives in a watershed. Even those who do not live near the water live on land that drains to a bayou, 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.



2. The Dickinson Bayou Watershed Partnership

The Dickinson Bayou Watershed Partnership (Watershed Partnership) formally came together in 2004 through a shared interest in preserving and enhancing the natural integrity of the watershed through the coordinated management of natural resources. The Watershed Partnership comprises stakeholders from state and federal agencies, nonprofit organizations, civic groups, academic institutions, local governments, business and industry groups, utility companies and citizens. The Dickinson Bayou Watershed Partnership worked as a group to establish their mission, vision, and goals. This was a consensus based process with the objective of maintaining and restoring the health of the Dickinson Bayou watershed.

The **Advisory Committee** is the main directive body of the Watershed Partnership and is made up of a cross section of stakeholders representing all areas mentioned above. The Advisory Committee meets to discuss issues that arise and votes to bring the most important points forward to the entire Watershed Partnership (Figure 7). All decisions are voted on, with no recommendations going forward that do not have full consensus of the Advisory Committee.

In addition to the Advisory Committee, there are six **Workgroups**: Land Use, Habitat, Education and Outreach, Flooding and Stormwater Management, Water Quality, and Recreation (Figure 7). These groups are open to any stakeholder and their members work to find realistic solutions to problems in the watershed. These work groups have all contributed to the writing of this watershed protection plan.

The Watershed Partnership is lead by a **chairperson** or two **co-chairs** elected by the partnership and by a watershed coordinator. The partnership meets at least twice each year for updates on advisory committee and workgroup happenings. All issues put forth by the Advisory committee are voted on at Watershed Partnership meetings and must be passed by a simple majority. All citizens of the watershed are invited and encouraged to attend these meetings.

The vision of the Watershed Partnership is a fully ecologically functioning bayou and a watershed that maintains the integrity of its natural resources. 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.

This watershed plan establishes the **baseline conditions** and an **initial vision** for the watershed. The plan also **establishes priorities**, creates a detailed **plan of management options**, and **a plan to implement** improvement projects. The Watershed Partnership will evaluate the progress of this process and repeat various stages as necessary, as part of an iterative process.

Figure 7. Organizational Structure of the Dickinson Bayou Watershed Partnership

