

san jacinto river basin | trinity-san jacinto coastal basin | san jacinto-brazos coastal basin | brazos-colorado coastal basin



# how's the water?

2003

BASIN HIGHLIGHTS REPORT

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# how's the water?

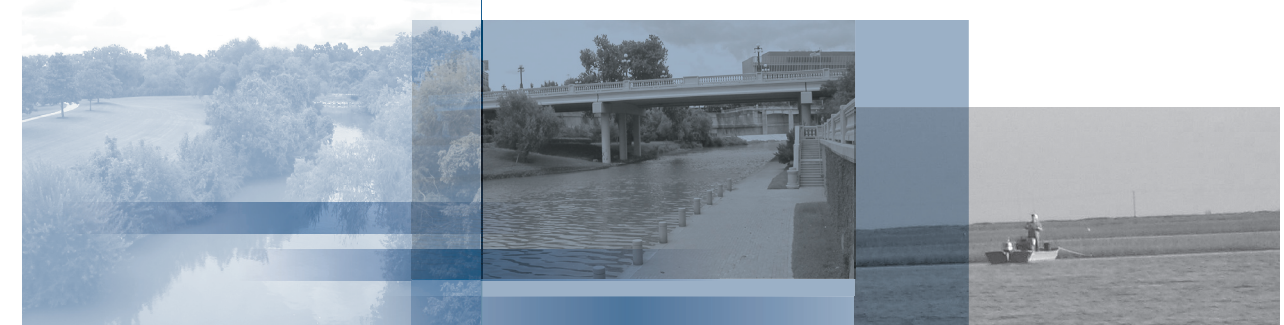


This Report is dedicated to the memory of our friend and colleague Karen Brettschneider

The H-GAC Clean Rivers Program has lost a dear member of its family, Karen Brettschneider, Senior Environmental Planner and Clean Rivers Program Data Manager, passed away on July 26, 2003, after a courageous battle with cancer.

Karen was an inspiration to us all. Her laugh was loud and distinct. Everyone knew when Karen was in the room. Throughout her illness, her outlook on life or her dedication to her work never changed. She felt a real calling to put her energies into working to protect the environment and to help animals. She hit the ground running when she came to H-GAC and she never slowed down.

We are all better people for having known Karen. Her coworkers at H-GAC feel lucky to have had the chance to work alongside her over the past 4 years. We will miss her, both professionally and personally, but the work she did and the memories she left will long remain.



## How's the Water?

More and more people are learning the answer to that question through the efforts of Houston-Galveston Area Council's (H-GAC) Clean Rivers Program. The region has an immense network of bayous, creeks, lakes, and estuarine systems containing quality aquatic habitat and providing recreational opportunities such as boating, canoeing, fishing, and swimming. Many water bodies run through highly urbanized landscapes, producing challenges that require the cooperation of many stakeholders, to produce sound watershed management.

H-GAC coordinates regional monitoring activities with five local agencies and maintains a regional water quality database for four river basins, the San Jacinto River Basin, the Trinity-San Jacinto Coastal Basin, the San Jacinto-Brazos Coastal Basin, and the San Bernard River in the Brazos-Colorado Coastal Basin. As part of the Clean Rivers Program, H-GAC also performs data analysis on watersheds within these basins, funds special studies, and participates in public outreach activities. This report provides an update of that analysis covering the past year, and includes information on current special studies and activities throughout the region.





## Water Quality in 2002, the Year in Review

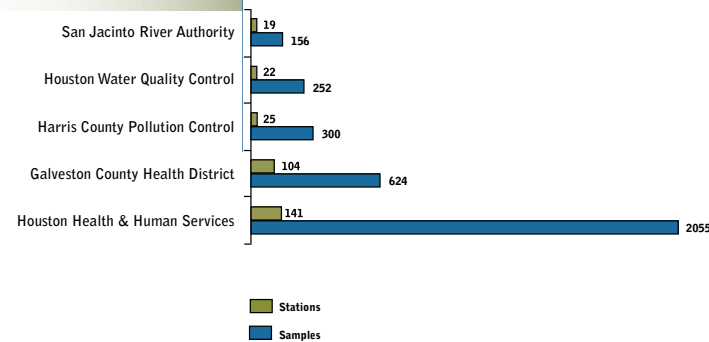
While the overall state of water quality in the region has not changed much over the past year, there have been additional data collection efforts that are helping water quality managers to better understand water quality issues in many of H-GAC's Clean Rivers watersheds. Special studies on water bodies not meeting Texas State Surface Water Quality Standards have confirmed, or in some cases refuted, state listings of impaired water bodies.

Last year 25 additional monitoring sites were added in the Cypress Creek, Spring Creek, Greens Bayou, Halls Bayou, Moses Bayou, Clear Creek, and West Bay watersheds. Many of these sites are in the headwater areas, where the landscape is less developed and where little or no monitoring has been done before. In addition, monitoring in the side bays of Upper Galveston Bay was reinstated. Volunteer monitoring also increased significantly during 2002.

Monitoring agencies have revised their sampling efforts to be more efficient, while expanding their list of parameters sampled. Three new city and county agencies have expressed interest in participating in the program. Two of these groups are in areas that have not received much monitoring attention in the past.

water quality

Number of Stations and Sampling Events



## Special Studies

Projects in several rural watersheds, including Peach Creek, Caney Creek, Lake Creek, and the San Bernard River, for which little historical data exists, have provided baseline water quality, biological, and habitat data to allow for a better evaluation of the condition of these watersheds.

H-GAC has also initiated "small watershed analyses" on several tributaries that feed major bayous in the region. This effort is intended to identify sources of contamination and to conduct runoff analysis in some of the more severely contaminated areas. The project also aims to develop a methodology that can be easily replicated in other small watersheds. Results from these analyses will be used in future projects as a basis for recommending structural and/or non-structural "best management practices" (BMPs), remediation, and focusing public education efforts.



Another important step towards gaining a better understanding of the quality of the region's water has been the investigation into flow at many of the monitoring stations covered under H-GAC's Clean Rivers Program Regional Quality Assurance Project Plan (QAPP). Because the amount of flow in a water channel often dictates water quality results, this complementary information to routine data collection efforts is an important asset.

The addition of current land cover classification throughout the region has also been an important asset gained in 2002. This project entailed the development of a low-cost method that can be reproduced periodically for categorizing general land cover throughout the CRP basins. These Geographic Information System (GIS) data files generated through this initiative supply a wealth of information that can be used in watershed analysis, as well as for other regional planning purposes.

Maintaining healthy aquatic ecosystems is vital to the quality of life for the region's population and its economic development and sustainability. The data collection efforts, in conjunction with public outreach activities supported by the Clean Rivers Program are leading the way in better assessment and understanding of the region's water resources.

## Texas City Ship Channel

A special study was conducted on the Texas City Ship Channel to determine whether the water body should be listed on the Clean Water Act, Section 303(d) list of water bodies not meeting surface water quality standards for dissolved oxygen. The original listing was based on limited readings collected from one site, which indicated low dissolved oxygen (DO) concentrations. The segment has also been identified as having a number of concerns related to elevated nutrients such as nitrogen, phosphorus, and ammonia.

Using buoys, four data sondes were deployed within the ship channel at two locations to gather 24-hour DO data. One sonde was suspended at the surface and a second sonde several feet lower for 48 hours. Measurements of DO were recorded every fifteen minutes and 24-hour averages were calculated. The study was conducted from April 2001 through November 2002.

Twenty-four hour average DO measurements ranged from 4.0 to 13.5 milligrams per liter (mg/l). The lowest one-time measurement was 3.1 mg/l, collected during August 2002. However, the 24-hour average for that location on that date was 5.2 mg/L. All DO measurements, both one-time and 24-hour averages, collected during the entire study showed no impairment for dissolved oxygen.

Monthly nitrogen and phosphorus data were also collected to examine the nutrient concern. Results of this monitoring revealed the ammonia screening level was exceeded more than 25% of the time at the two sampling locations and one site exceeded the screening level for total phosphorus in more than 33% of the samples analyzed.

Based upon the findings of this study, Galveston County Health District was able to recommend that the Texas Commission on Environmental Quality reexamine the listing of the Texas City Ship Channel for dissolved oxygen. However, nutrients, especially ammonia, appear to be an ongoing concern that should be addressed.



# small watershed

## Small Watershed Analysis

Many of Houston's urban waterways experience elevated bacteria loads that prevent safe contact recreation. However, a better understanding of the sources of the bacteria problem has begun to emerge. H-GAC's 2001 Urban Bacteria study revealed that concentrations of bacteria are often higher in the tributaries of waterways like Buffalo and White Oak Bayous than they are in the main stem of those bayous. Many of the tributaries with high bacteria counts also contain high concentrations of ammonia. In an effort to further pinpoint the sources of these pollutants, H-GAC has selected the following small tributaries for more intensive study:



### Brickhouse Gully

a highly urbanized tributary of White Oak Bayou

### Garner's Bayou

a mixed use tributary of Greens Bayou

### Turkey Creek

a tributary of Buffalo Bayou that flows through both undeveloped (park) and highly developed land

### Mason Creek

a highly residential tributary of Buffalo Bayou

By studying these smaller watersheds with varying land use types, H-GAC hopes to identify correlations between land uses and sources of bacteria and ammonia. This study will also establish methods of small watershed analysis that can be easily replicated in other similar watersheds in the region. Knowing more about the relationship of land use and bacteria to ammonia loadings will be critical to the development of effective strategies for reducing these pollutants. Reasonable recommendations for bacteria and ammonia reduction will be assessed for integration into a 319 NPS grant for implementation. Preliminary work has begun on this project and conclusions and recommendations should be available in the Summer of 2003.

## H-GAC Receiving Waters Assessment (RWA) Summary and Status Update

Several small tributaries that feed the Houston Ship Channel (Segment 1006) and the Buffalo Bayou/Houston Ship Channel (Segment 1007) have been placed on the state's list of water bodies not meeting standards for their designate use, which is "high aquatic life". These water bodies were given this designation because they exhibit continuous flow year-round. However, several of these tributaries flow constantly

due to wastewater treatment plant discharges. H-GAC is conducting Receiving Water Assessments (RWA) to determine if any of these "subsegments" should receive a "intermediate" or "limited" aquatic life use designation due to the source of their flow. The tributaries selected for analysis are:

### Water Body Locations

Water Body ID	Water Body
1006 F	Big Gulch Above Tidal
1006 I	Unnamed Nontidal Tributary of Halls Bayou
1006 J	Unnamed Nontidal Tributary of Halls Bayou
1007 H	Pine Gully Above Tidal
1007 I	Plum Creek Above Tidal
1007 K	Country Club Bayou Above Tidal
1007 N	Unnamed Nontidal Tributary of Sims Bayou
1007 O	Unnamed Nontidal Tributary of Buffalo Bayou
1007 P	Brays Bayou Above Tidal
1007 Q	Sims Bayou Above Tidal
1007 R	Hunting Bayou Above Tidal

The Project Team for this study characterized the segments to determine if the default high aquatic life use classification was appropriate. There were two potential outcomes of the assessment. The first was that the subsegments do have the potential for high aquatic use, but do not meet the Texas Surface Water Quality Standards. This scenario required a separate evaluation for potential causes of an aquatic life use impairment. The second scenario was that the subsegments,

which have a default of a high use, but would be better classified as limited or intermediate. In this case, these subsegments were evaluated to determine the appropriate classification. This effort could result in the segments eventually being removed from the list of water bodies not meeting standards, saving thousands of dollars in TMDL study.

The historical data used to list these eleven tributaries, or "sub-segments," were analyzed along with new data collected during the project to present a concise, coherent picture of each water body. Site visits to each stream were conducted to assess the "in-channel" aspects of habitat type, substrate quality, and the presence of shade cover for fish and aquatic insects. Hydraulic measurements were also collected at the study sites included physical stream dimensions (width, depth), and flow. In addition, physical and water quality data measurements (DO, Temperature, pH, etc.) were made hourly for 24 hours during the assessment to determine which sites may meet the criteria for High Aquatic Life Use or merit additional evaluation. Biological samples (fish and aquatic insects) were also collected. Project results and conclusions should be available by Summer 2003.

### Illicit Connections Manual for Municipal Entities Available

H-GAC has contracted with the Galveston County Health District over the last several years to locate illicit connections in the Clear Creek watershed. Illicit connections are waste water lines that connect to storm sewers instead of sanitary sewers where the waste water would receive treatment. The

study resulted in dozens of illicit connections being located and repaired. As a result of this project, a manual to guide municipal officials in detecting, tracking, and eliminating these discharges from storm sewer systems has been produced. The manual outlines methods for mapping storm sewer connections, initial dry weather survey procedures, various methods of illicit connection investigative techniques, sampling methods, and documentation and reporting procedures. Alternative ideas are presented for use by agencies with budget, personnel, and time constraints. It is a great addition to any public works department's toolbox.

### Flow Studies

Analyzing the chemical constituents found in the water tells one part of the water quality story. However, it is important to put such measurements in the context of stream flow, which has not been extensively measured in the H-GAC region. For example, higher concentrations of pollutants in a given measurement may not be a major concern if they occurred during under very low flow conditions. The purpose of this study is to determine the most accurate, reliable and cost-effective method for determining the stream flow for the region's water bodies. Thus far, monitoring locations that have existing flow gauges have been identified. A methodology is being evaluated for interpolating flow conditions at monitoring sites that are located between these gauges. For sites where interpolation is not an option, other methods of manually collecting flow information are being investigated, such as correlating flow with a measurement of stage height of the water. Study results should be available by late summer 2003.

## Habitat Update

Ever wonder what the waterways on H-GAC's Water Quality Monitoring maps really look like? Why are the data for dissolved oxygen at one station different from that at another? How do the characteristics of a water body change as it flows downstream?

In an effort to better understand the environmental quality and dynamics of the region's watersheds, H-GAC initiated a project to collect habitat data to properly characterize each monitoring site covered under the regional Quality Assurance Project Plan.

# habitats



Local monitoring partners were asked to take photographs of each of their monitoring stations. For comparison, two photographs were taken for each site, one during the summer when leaves are on the trees, and the other during the winter when trees have dropped their leaves. The partners also completed a datasheet outlining physical and hydrologic characteristics, vegetative characteristics, aquatic life present, and human influences at each station.

This information has been entered into databases, by basin, to complement the water quality data collected at the site. Users may look at the photographs and field characteristics of a site to help them interpret monitored data and trends. This information has also been integrated into Geographic Information System (GIS) files, which allow for custom mapping queries and regional geographic analysis.

H-GAC believes that the integration of quantitative water quality data and qualitative information will allow environmental agencies and the public as a whole to better understand the relationship of a watershed's physical setting and its water quality parameters. For more information, please contact Todd Running at [todd.running@h-gac.com](mailto:todd.running@h-gac.com).

## 2002 Land Cover Classification

H-GAC Staff recently completed a classification of the Region's Landscape into nine land cover classes. The land cover classification was built from satellite imagery taken during two different seasons (July 2001 and Feb. 2002), The sensor used to collect the imagery is Landsat's Thematic Mapper (TM). The TM imagery captures seven bands of the electromagnetic spectrum, and has a ground resolution of 30 meters, making it a low-cost option for large area classification.

The nine target Land Cover Classes, derived from the National Oceanic and Atmospheric Administration Coastal Change Analysis Program (CCAP) Classification Scheme, are shown in the lower right.

The project included the 13 county region of H-GAC, and the additional areas (of San Jacinto and Grimes Counties) that make up the four assessment basins for the CRP Region. This total area covered is nearly 17,000 square miles.

There are three classifications that are available from this project:

- > The full nine category classification which includes the classes (to the right)
- > A nine category classification that has been smoothed
- > A six category merged classification

The low-cost, moderately accurate data sets are to serve primarily as a component in watershed and water quality analysis within H-GAC's Clean Rivers Program assessment basins. Other appropriate uses include:

- > Regional and county planning.
- > Large area resource management planning.
- > Educational purposes for students and citizens.
- > Regional or county level water quality and watershed analysis.
- > Basic research on county or regional distribution of land cover to determine specific areas for monitoring or management focus.
- > Broad-scale evaluation of the environmental impact or benefits of a major project.
- > Change detection and time series analysis.
- > Impervious surface calculations.

Equally important are inappropriate uses, and they include:

- > Determining the accuracy of other data using the H-GAC data set.
- > Determining the location of jurisdictional wetlands.
- > Determining exact area coverage of land cover without consideration of the overall accuracy and per category accuracy of the data.
- > Establishing exact boundaries for regulatory enforcement.
- > Mapping areas finer than the original resolution of the data.
- > Combining or altering the data set and redistributing them.
- > Establishing definite occurrence or nonoccurrence of a feature without consideration of probabilities determined by the accuracy assessments.

H-GAC encourages all interested parties to review the image processing protocol and accuracy assessment prior to downloading and using the data. All three land cover classification data sets, image protocols, and associated metadata have been delivered to the TCEQ, and distributed to several State and Local Agencies for their review and use. In addition, they are available via the H-GAC Web site at [www.h-gac.com/HGAC/Programs/Clean+Rivers+Programs/landcover.htm](http://www.h-gac.com/HGAC/Programs/Clean+Rivers+Programs/landcover.htm) or by contacting H-GAC CRP Program Staff.

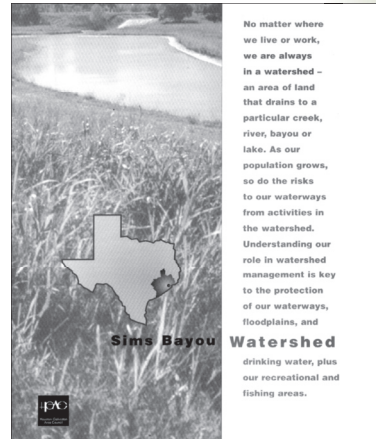
### Land Cover Classes

1. Low Intensity developed
2. High Intensity developed
3. Cultivated Land
4. Grassland
5. Woody Land
6. Open Water
7. Non-Woody Wetland
8. Woody Wetland
9. Bare / Transitional Land

### Merged Land Cover Classes

1. Developed
2. Grass/Cultivated Land
3. Woody Land
4. Open Water
5. Wetland
6. Bare / Transitional Land

## Public Outreach Taking it to the Watershed



No matter where we live or work, we are always in a watershed – an area of land that drains to a particular creek, river, bayou or lake. As our population grows, so do the risks to our waterways from activities in the watershed. Understanding our role in watershed management is key to the protection of our waterways, floodplains, and drinking water, plus our recreational and fishing areas.



### Bacteria Brochures Available

In response to the need for public awareness concerning the overwhelming bacteria concerns in the region's waterways, H-GAC's Clean Rivers Program produced a brochure outlining issues associated with bacteria in the local bayous and creeks. The brochure describes the sources and extent of the problem, and a list of things individuals can do to reduce bacteria from entering waterways.

The brochure was funded with public outreach dollars from the existing Bayou Bacteria Total Maximum Daily Load (TMDL) project in Buffalo Bayou and White Oak Bayou watersheds. A total of 10,000 brochures were mailed to residents within these watersheds.

### Brays Bayou Watershed Kiosk Erected

In collaboration with the Friends of Hermann Park signage program, H-GAC's Clean Rivers Program sponsored a kiosk that highlights the Brays Bayou watershed. The sign defines a watershed and educates people on the hazards of nonpoint source pollution. The sign is located along the Brays Bayou hike and bike trail, near Hermann Park's Bayou Parkland pavilion.

To request one or more of these brochures, please contact Todd Running at [todd.running@h-gac.com](mailto:todd.running@h-gac.com). The brochures are also available on H-GAC's website at [www.h-gac.com](http://www.h-gac.com).



### Sims Bayou Brochure Available

Continuing with its series of brochures highlighting individual watersheds, H-GAC released the Sims Bayou watershed brochure in the summer of 2002. The document covers the history of the watershed, water quality characteristics, flood damage reduction projects, conservation efforts, and local parks.

More than 1,000 brochures were given to environmental groups to distribute, and 1,500 were mailed, along with a return questionnaire, to randomly selected residents of the watershed. Of those postcards returned, over 90% of the respondents said they learned something about the quality of their environment and requested additional information.

### Clean Rivers Program Wins Galveston Bay Stewardship Award

H-GAC's Clean Rivers Program received a Galveston Bay Estuary Program (GBEP) Stewardship Award for its outstanding work in volunteer environmental monitoring at GBEP's National Estuaries Day Celebration on October 23, 2002. H-GAC's Clean Rivers Program has been supporting Texas Watch Volunteer Monitoring since 1992. The program provides both educational opportunities for volunteers and sound environmental data for water quality decision makers. H-GAC was one of eleven award recipients at the event.

Other stewardship awards went to the following organizations:

#### City of League City

Natural, Historic, and Cultural Resource Protection and Education

#### Scenic Galveston, Inc.

John O'Quinn I-45 Estuarial Corridor

#### Sims Bayou Nature Center

Sims Bayou Habitat Enhancement

#### Galveston Bay Foundation

Volunteer Monitoring

#### City of Pearland

Southwest Environmental Center - Combining Flood Mitigation with Environmental and Recreational Uses

#### Bayou Preservation Association

Kids on the Bayou

#### Ed White Elementary School

Watershed Stewardship

#### North Shore Middle School

Reflections on our Bay

#### City of Houston

Two Bayous to the Bay

#### Upper Texas Coast Waterborne Education Center

Waterborne Education Program

For more information on H-GAC's Texas Watch Program, contact Ingrid Fairchild at [ingrid.fairchild@h-gac.com](mailto:ingrid.fairchild@h-gac.com).

### Other Program Highlights and Activities

There are other programs and studies being conducted in our region that strive to improve water quality and awareness of water quality issues. All have a positive impact on the quality of our local water resources:

#### Trash Bash

Once a year, rain or shine, thousands of volunteers gather along waterways in the Galveston Bay watershed to do their part in cleaning up the environment and participate in the largest statewide event to educate the public about the importance of our water resources.

On March 29, 2003, 4,451 volunteers came out to do their part to clean the Galveston Bay watershed. Despite the cold and windy weather conditions, a large number of people gathered to recover almost 94 tons of trash and 573 tires from 12 different locations as far north as Lake Conroe and as far south as Offats Bayou. Trash Bash was also selected as a finalist in the 2003 Governor's Texas Environmental Excellence Awards program.

For more information on site locations, amounts of trash collected, and registration for next year's event, visit [www.trashbash.org](http://www.trashbash.org)





## Lake Houston Watershed Wasteload Report Complete

The 2003 Water Quality Management Plan for the Lake Houston Watershed was recently completed and is available on the H-GAC website. In addition to water quality concerns for the past and present, future action items are highlighted. This report also includes wasteload calculations for each wastewater permit holder in the watershed. Data available for the Lake Houston Watershed, by Stream Segment includes (1) a cross reference for TCEQ and EPA permit numbers, (2) current and projected population (years 2002, 2005, 2010, 2015, 2020, and 2025), (3) current and projected plant flow, (4) biochemical Oxygen Demand - 5 Day, Carbonaceous Biochemical Oxygen Demand-5 Day), (5) contact information (name, address, and phone number), (6) plant outfall location and service boundary by ArcView/ArcInfo Map, and (7) plant expansion since the last update (individual and by stream segment).

H-GAC has begun a pilot project to link its CRP, Wasteload, and Permit databases, including outfall locations. ArcView/ArcInfo GIS service area maps, water quality monitoring data, wasteloads and contacts. This will be done on a rotating basis for each of the major watersheds in the H-GAC region. This process began with the Lake Houston Watershed of the San Jacinto River (2002), and will continue with parts of the Houston Ship Channel in 2004.

Contact Kathleen Ramsey at [kathleen.ramsey@h-gac.com](mailto:kathleen.ramsey@h-gac.com) for further information or to obtain a CD of the Water Quality Management Plan and/or Wasteload Report.

## Texas Watch Water Quality Monitoring Program

Texas Watch is a part of Clean Texas 2000, a statewide environmental partnership program designed to reduce the pollution and provide citizens, industry, and public agencies with the information they need to improve and preserve Texas' natural resources.

As a Texas Watch partner since 1992, H-GAC shares the goals of the Texas Watch program; to improve water quality through public education and participation. Texas Watch has hundreds of monitors conducting water quality monitoring statewide. Quality assured data is used to support professional data and provides information vital to the health of our streams.

The H-GAC Texas Watch program grew by leaps and bounds in 2002. More than 50 volunteers completed the first two phases of training and 27 became certified water quality monitors.

On September 14, held a regional meeting for Texas Watch volunteers. The event was held at the Bayou Parkland Pavilion in Hermann Park in Houston, Texas. Volunteers were recognized for long time monitoring efforts and exemplary volunteer efforts. Volunteers were treated to food and entertainment as well as some informative talks by local and state water quality professionals.

In 2003, H-GAC created a Volunteer Monitoring Workgroup comprised of volunteers, local businesses, and public agencies. This workgroup provided valuable input and support as the local Texas Watch program continues its growth. If you are interested in suggesting a nomination for this workgroup or would like to help sponsor Texas Watch activities, please contact Ingrid Fairchild.

## H-GAC Texas Watch Training Schedule for the remainder of 2003:

### Phase I and Phase II

Quality Assurance  
October 11, 2003  
November 15, 2003

Trainers and Quality Assurance Officers are always needed. Please contact Ingrid Fairchild if you are interested in becoming a trainer.

## For more information on H-GAC's Texas Watch program contact:

Ingrid Fairchild  
Texas Watch Volunteer Monitoring Coordinator  
832-681-2516  
[ingrid.fairchild@h-gac.com](mailto:ingrid.fairchild@h-gac.com)

Access the H-GAC Texas Watch website at [www.h-gac.com/HGAC/Programs/Water+Resources/What+Can+I+do/Texas+Watch/default.htm](http://www.h-gac.com/HGAC/Programs/Water+Resources/What+Can+I+do/Texas+Watch/default.htm) and the Statewide Texas Watch Program at [www.texaswatch.geo.swt.edu](http://www.texaswatch.geo.swt.edu)

## Phase II Storm Water Workshop

H-GAC sponsored another successful workshop for Phase II eligible communities on April 16, 2003. The workshop reviewed permit requirements, addressed TCEQ inspections, and presented valuable information on resources available to local governments. There were also presentations by communities that have developed storm water management

plans. A number of communities are considering or have created storm water utility districts to provide funds for implementation. Information presented at the workshop is available on CD and on the H-GAC web site at [www.h-gac.com/HGAC/Programs/Water+Quality+Management+Plan/April2003StormwaterWorkshop.htm](http://www.h-gac.com/HGAC/Programs/Water+Quality+Management+Plan/April2003StormwaterWorkshop.htm).

## NPS Prevention Projects Information Available

H-GAC prepared and distributed to local governments, a packet of information on potential funding sources to implement nonpoint source pollution prevention measures. The packet includes information about state and federal programs and includes a listing of the types of projects that have been funded such as:

### Source Control BMPs

- > Public Education
- > Planning Management
- > Material Use, Exposure, & Disposal Controls
- > Spill Prevention & Cleanup
- > Illegal Dumping & Illicit Connections
- > Street & Storm Drain Maintenance

### Treatment Control BMPs (Site)

- > Vegetated Swales/Strips
- > Infiltration
- > Media Filtration
- > Water Quality Inlets

### Treatment Control BMPs (Community)

- > Infiltration
- > Wet Ponds
- > Constructed Wetlands
- > Extended Detention Basin
- > Multiple System

Some Internet sources include:

Polluted Runoff Web Page  
[www.epa.gov/owow/nps/](http://www.epa.gov/owow/nps/)  
A Guidebook of Financial Tools  
[www.epa.gov/efinpage/guidebook/guidebooktp.htm](http://www.epa.gov/efinpage/guidebook/guidebooktp.htm)  
TCEQ NPS Program  
[www.tceq.state.tx.us](http://www.tceq.state.tx.us) in Site Search type "Funding Opportunities"

for regional programs, grants, funding in Region 6  
[www.epa.gov/owow/nps/funding.html](http://www.epa.gov/owow/nps/funding.html)

Contact Carl Masterson at [carl.masterson@h-gac.com](mailto:carl.masterson@h-gac.com) for further information or to obtain a copy of the NPS funding packet.

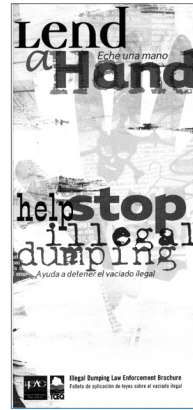
## Bacteria TMDL Study

Now in the "developing the TMDL" phase, the bacteria TMDL stakeholder group met at H-GAC on February 19, 2003. Dr. Hanadi Rifai, U. of Houston, presented results of sampling and analysis in the Buffalo Bayou and White Oak Bayou watersheds. Dr. Rifai reviewed the potential sources of bacteria, which includes dry weather storm water discharge, upstream sources (Addicks & Barker Reservoirs – Buffalo Bayou only), nonpoint sources, bypasses & overflows, and solids releases from wastewater treatment facilities. She also discussed the relative point/nonpoint loads and the comparison shows nonpoint loads overwhelm the loads from point sources and dry weather pipe discharges. A second meeting was held on April 16, 2003 to review all of the data and to bring in other interested individuals and groups for additional input.

On May 14, 2003 a brainstorming session was held to come up with elements needed to fill gaps in the TMDL study information. At this meeting three topics were addressed under the headings of: "what we know", "what we need" and "what others can offer."

Participants agreed on when/where/how to secure additional information/data, how to review and incorporate it, and how to organize the information (in hand and forthcoming) in such a way that stakeholders can make practical recommendations regarding a watershed action/implementation plan.

The target for completing the TMDL with a final report and allocations, submitting it for both TCEQ and EPA approval is the end of FY05. In FY04 there will be additional studies and information gathering, as well as more intense educational and stakeholder activities. The Implementation Plan is scheduled for funding in FY06/FY07. To date only state funds have been used in this project, but federal funding will enter the picture resulting in EPA approval of any Quality Assurance Project Plan (QAPP).



## Dioxin TMDL Study

The Dioxin project is now about 50% complete and sampling continues. In the first phase, historical data was evaluated and likely sources of dioxin identified. Data evaluation showed that little water quality & sediment data were available and that the vast majority of tissue samples collected exceeded the EPA risk level for dioxin. The tissue data resulted in the still-in-effect advisory issued by the Texas Department of Health. In Phase II, tasks included identifying water quality targets, developing a Quality Assurance Project Plan (QAPP), data collection in the Houston Ship Channel (HSC), modelling dioxin transport and estimate TMDL allocations. To date conclusions reached are that:

- > More than 80% of the time total water concentrations exceed Texas Surface Water Quality Standards.
- > 83% of sediment samples exceeded target values (no current standards available).
- > 96% of tissue samples exceeded health-based standard.
- > Segment 1006 of the HSC showed the highest dioxin concentrations in water, sediment and fish. Segment 1005 had the highest levels in crab tissue.
- > Samples collected in Summer 2002 showed concentrations (sediment & tissue) generally as high or higher than historical levels.

Current tasks include in-stream water, sediment and tissue sampling, ambient air quality sampling, and wet/dry deposition sampling and modeling. The next stakeholder meeting will be scheduled when the next round of sampling and analysis are completed.

More information and reports on these projects can be found at [www.hgac.com/HGAC/Programs/Water+Resources/Total+Maximum+Daily+Loads+TMDL/default.htm](http://www.hgac.com/HGAC/Programs/Water+Resources/Total+Maximum+Daily+Loads+TMDL/default.htm)

## H-GAC's Solid Waste Environmental Enforcement Program

Many water pollution cases originate as solid waste cases. Illegal disposal of solid waste often provides incriminating information to link the illegal dumper to a much larger case in which soil, air and/or water are affected.

H-GAC's Solid Waste Program hosts a quarterly "Local Enforcement Roundtable". The group is comprised of peace officers, code enforcement officers, and other local government officials from within the region. The Roundtable provides an opportunity for participants to network, solve common problems and discuss other topics such as grant opportunities and training needs.

Roundtable participants are taking a regional view of environmental enforcement, recognizing that cooperation is essential since illegal dumpers freely move between jurisdictions H-GAC's Solid Waste Program is supporting these efforts by funding two related projects. The first is a study to determine the feasibility of establishing a regional "circuit rider" that could assist local District Attorneys in prosecuting environmental crimes. The second is the development of a web-based regional database with a Geographic Information System (GIS) feature that would enable local enforcement officers to share information to better track illegal dumping cases.

### Getting the Word Out

***"Know what your local laws are and what you can do to prevent and stop illegal dumping"***

H-GAC's Solid Waste Program staff has produced two brochures (one for adults, one for kids) and one poster (for adults) to increase awareness of illegal dumping issues. The brochures discuss why people dump illegally as well as what to do if you see somebody illegally dumping. The adult brochure includes local laws and ordinances that address illegal dumping. The poster, which contains much of the same information, is intended to be displayed in libraries, shop windows and other public places. Please visit [www.h-gac.com/HGAC/Programs/Solid+Waste/default.htm](http://www.h-gac.com/HGAC/Programs/Solid+Waste/default.htm) to view the brochures and poster.

## Evaluating Water Quality in Texas

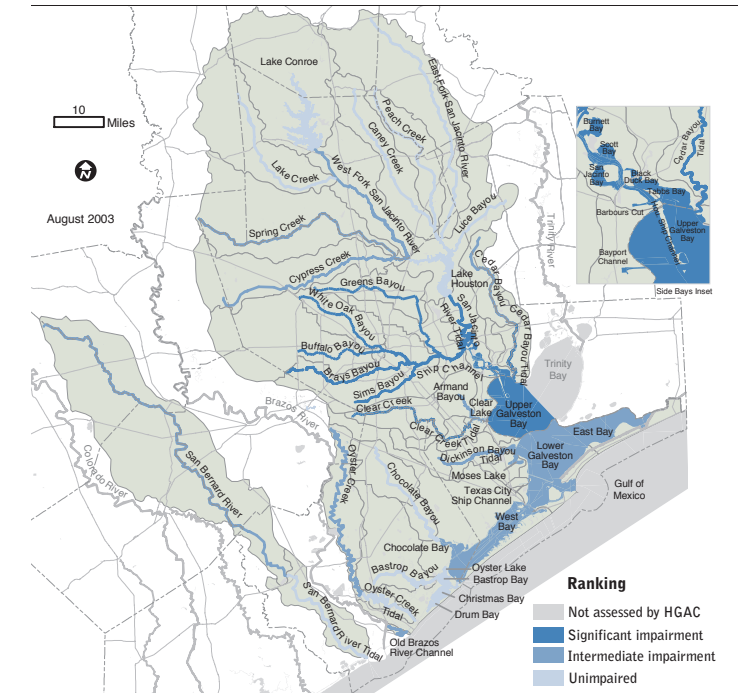
The Texas Commission on Environmental Quality evaluates the condition of the state's water bodies on a periodic basis under the Clean Water Act, Section 305(b). The results are contained within the Texas Water Quality Inventory and 303(d) List and are comprised of a complete listing of all water quality issues in the State. As required by the Act, the Inventory is updated every 2 years and consists of a review of the past 5 years worth of data. The 2002 Water Quality Inventory and 303(d) List, on which the following information is based, provides an assessment of water quality results collected between March 1, 1996 and February 28, 2001. This inventory is available on the TCEQ Web site. During the summer of 2003, the TCEQ will be evaluating the most recent 5 years worth of data to generate the 2004 Water Quality Inventory and 303(d) List.

The term impairment is assigned to a portion of a water body when certain water quality constituents reach threshold concentrations as specified in the Texas Surface Water Quality Standards and the Texas Drinking Water Standards based either on the number of exceedances or the mean concentration over the threshold. This designation indicates that the water quality "uses" of the water body (e.g. water supply, contact recreation, aquatic life, fish consumption) may be degraded. In other words, the water may not be fit to be used as a public water supply, the fish may not be able to get enough oxygen to survive, or swimming in the water may cause the swimmer to be exposed to disease producing organisms or fish tissue data indicate that consumption of fish may cause deleterious effects, etc. Water bodies that are shown to have an impairment for one or more constituents are placed on the TCEQ's CWA Section 303(d) list.

Once a portion of a stream is placed on the list, a series of action may be taken by the TCEQ, including, but not limited to: denial of increases in wastewater permit effluent limits; a Total Maximum Daily Load (TMDL) study to allocate pollutant loads to certain sources; and instituting a strategy for reducing loads from all sources.

The term partial impairment or concern (or partially supporting) is assigned to a portion of a water body under less rigorous requirements for number of measurements exceeding the threshold, sample frequency, etc. If there is only a small amount of data available, or there are only a few samples not meeting the "Standards," then the stream cannot be assessed as impaired with enough confidence. Therefore the water body may be identified as partially impaired or having a concern for a certain constituent.

## Regional Waterbody Conditions



Concerns are also identified for nutrients and chlorophyll a, toxic substances in fish tissue and sediment for which no "Standards" have been developed but are otherwise useful in identifying water quality problems. Water bodies that are identified as partially impaired or as having concerns need more information to verify their condition. Additional data collection under the Clean Rivers Program during 2003 has been targeted towards those areas.

## Local Water Quality Review

The following section contains information on each of H-GAC's Clean Rivers Program watersheds. Each watershed has been ranked according to the degree of water quality issues or concerns. Review of more recent data collection (through 2002) is also included for some watersheds.

### Ranking Key

- 1 Frog=Significant impairments have been identified. All or part of the segment is a high priority for TMDL development.
- 2 Frogs=Intermediate condition, the segment achieves most designated uses, but has some impairments that are a low to medium priority for TMDL development.
- 3 Frogs=Unimpaired, there are no known water quality concerns for the segment and/or watershed. (Previously

# testing the water

## Trinity-San Jacinto Coastal Basin

(Watersheds are listed alphabetically)

### Cedar Bayou Above Tidal (0902)

 Major tributaries: Adlong Ditch, Buck Gully

Cedar Bayou Above Tidal is currently listed as partially supporting its aquatic life use due to low concentrations of dissolved oxygen (DO). There is insufficient 24-hour DO data to determine the extent of the problem. The TCEQ Region 12 office has scheduled two 24-hour DO sampling events along with routine habitat, fish, and aquatic insect data collection for FY2004.

### Cedar Bayou Tidal (0901)


 Major tributaries: Cary Bayou, McGee Gully

The tidal portion of Cedar Bayou is currently listed as not meeting its fish consumption use due to dioxin in fish tissue. There is currently a special investigation into this issue (See detailed information in "Other Program Highlights and Activities")

## San Jacinto River Basin

(Watersheds are listed alphabetically, upstream to downstream)

### Buffalo Bayou Above Tidal (1014)

 Major tributaries: Bear Creek, Langham Creek, Mason Creek, South Mayde Creek, Spring Branch Creek, Turkey Creek

Buffalo Bayou is divided into several segments. Segment 1014 constitutes the above tidal (freshwater) portion of the larger watershed.

The predominant issue is bacteria. Several of the tributaries including Spring Branch Creek and Rummel Creek exhibit higher concentrations than most of the main stem. Neiman's Bayou exhibits lower concentrations with occasional "spikes", single recordings of high concentrations within a dataset.

Currently there is a special investigation underway to attempt to determine sources of contamination (See detailed information in "Other Program Highlights and Activities".)

In addition, the CRP has initiated additional ambient sites on the tributaries upstream and within the two major reservoirs, Addicks Reservoir and Barker Reservoir. Some of those tributaries exhibit extremely

high concentrations of bacteria, particularly Mason Creek, Turkey Creek, while others appear to be manageable.

Small watershed analyses, including the analysis of stormwater runoff, have begun for the Mason Creek and Turkey Creek watersheds. By looking at these smaller watersheds, H-GAC hopes to develop methods that could be easily replicated for other watersheds for identifying sources of bacterial contamination. In addition, this data will be used in future projects as a basis for recommending structural and/or non-structural best management practices (BMPs) or remediation.

Nutrients, including ammonia, nitrate+nitrite-nitrogen, orthophosphorus, and total phosphorus, appear in excess throughout the main stem of Buffalo Bayou. H-GAC is working with local monitoring agencies to develop a more comprehensive nutrient monitoring plan.

### Buffalo Bayou Tidal (1013)

 Major tributary: Tidal portion of White Oak Bayou

The Buffalo Bayou Tidal watershed is relatively small and encompasses the downtown Houston area. Many of the issues associated with the above tidal portion of the bayou apply to the tidal portion of the bayou. High bacteria levels are a major concern. The current Buffalo Bayou study also addresses the bacteria issues in this watershed.

Concentrations are well above those in the nontidal portion of the bayou. While E. Coli is currently being collected at sites within the watershed, H-GAC is working with the City of Houston to switch to enterococcus monitoring, which is the indicator organism for bacteria in water bodies influenced by saltwater.

Nutrients along the main stem remain elevated, and DO is listed as not meeting designated standard. However, recent DO grab samples show compliance. TCEQ requires several 24-hour monitoring events to establish if the segment is meeting its standard before it will be removed from the 303(d) list. In cooperation with TCEQ, the USGS will be conducting 24-hour monitoring events in this segment as part of a statewide study.


Ammonia concentrations in 2002 are predominantly below the screening level of 0.58 mg/L, while other nutrients are elevated. H-GAC is working the City of Houston to include more comprehensive nutrient monitoring in order to increase data availability.

### Caney Creek (1010)

 Major tributaries: Camp Creek, Dry Creek, Little Caney Creek, McRae Creek, Spring Branch, West Fork Spring Branch, White Oak Creek

Caney Creek is not listed for any water quality issues or concerns. In an effort to gain more background information about the watershed, a systematic watershed monitoring study was initiated in December 2002. Water quality and biological sampling will occur at three sites along Caney Creek. Water quality samples will be analyzed for a variety of nutrients, bacteria, and soluble pesticides. Biological diversity data includes stream habitat, aquatic insects, and fish. Laboratory analysis from initial samples indicates that most water quality constituents are in good condition.

### Cypress Creek (1009)

 Major tributaries: Dry Creek, Dry Gully, Faulkey Gully, Lemm Gully Little Cypress Creek, Live Oak Creek, Mound Creek, Pilot Gully, Seals Gully, Spring Gully

The Cypress Creek watershed is experiencing rapid westward growth. The segment does not meet its contact recreation use, such as swimming, due to excessive levels of E. Coli. Concentrations in 2002 were variable, with many instances below or near the criteria. While the segment does not currently qualify to meet its contact recreation use, the issue appears to be manageable. A project is scheduled to begin FY2004 to determine sources and to begin public outreach activities.

There are also concerns for excessive nutrients as well as low dissolved oxygen levels along the main stem. Ammonia concentrations in 2002 were consistently near the screening level (+/-) with some spikes. Concentrations were a little higher in several tributaries. H-GAC is working with the City of Houston to expand ambient monitoring to include additional nutrient parameters.

Dissolved oxygen data from grab samples collected in 2002 appear normal throughout most of the watershed.

### East Fork San Jacinto River (1003)

 Major tributaries: Orange Branch, Miller Creek, Whiskey Branch, Winters Bayou

The East Fork of the San Jacinto River is predominantly undeveloped, with the Sam Houston National Forest making up most of the upper portion of the watershed. The segment is not on the list of water bodies not

meeting standards, nor are there any known water quality concerns.

### Greens Bayou Above Tidal (1016)

 Major tributaries: Garners Bayou, Williams Gully


The above tidal portion of Greens Bayou experiences many of the issues associated with urban watersheds. While not as severe as Buffalo Bayou, high levels of E. Coli continue throughout the watershed. A small watershed analysis, including the analysis of stormwater runoff, has begun for the Garners Bayou watershed, which exhibits high E. Coli concentrations. In addition, this data will be used in future projects as a basis for recommending structural and/or non-structural best management practices (BMPs) or remediation.

While nutrient levels are excessive along the main stem of Greens Bayou, ammonia concentrations and low dissolved oxygen levels are concerns in the tributaries that feed the bayou. 2002 dissolved oxygen data appears lower during warmer months, which is normal for shallow, slow moving, warm water streams. At other times of the year, the dissolved oxygen is at or near (+/-) the segment standard of 3.0 mg/L.

H-GAC is working with the City of Houston to expand ambient monitoring to include comprehensive nutrient monitoring.

Chromium is also listed as a concern along the main stem.

### Houston Ship Channel/Buffalo Bayou (1007)

 Major tributaries: Berry Bayou, Berry Creek, Brays Bayou, Country Club Bayou, Hunting Bayou, Keegans Bayou, Little Vince Bayou, Pine Gully, Plum Creek, Sims Bayou, Vince Bayou

Water quality standards for the Houston Ship Channel/Buffalo Bayou apply to the Ship Channel as well as the tidal tributaries that flow to the Ship Channel. Hunting Bayou, Vince Bayou, Little Vince Bayou, Brays Bayou, and Sims Bayou, along with their smaller tributaries, are included in this watershed.

The main stem is listed as not meeting its fish consumption use due to dioxin in fish tissue. 2002 E. Coli data show continued high occurrences of bacteria, prohibiting safe contact recreation in the nontidal



portions of the tributaries within the watershed. H-GAC is working with local monitoring agencies to include sampling for enterococcus in the tidal portions of the watershed.

There are issues of low dissolved oxygen occurrence in many of the smaller tributaries of the watershed. For the state 2002 water quality assessment, these tributaries were assigned a high aquatic life use based on available flow information. Categories include exceptional, high, intermediate, and limited and have associated dissolved oxygen criteria for each.

H-GAC initiated comprehensive assessments of some of these tributaries to assist TCEQ in assigning the appropriate aquatic life use. Tributaries included in the assessments were the non-tidal portions of Pine Gully, Plum Creek, Country Club Bayou, Sims Bayou, Brays Bayou, Hunting Bayou, an unnamed tributary of Sims Bayou, and an unnamed tributary of Buffalo Bayou (locally referred to as Japhet Gully). Each "subsegment" analysis included sampling for fish diversity, general water chemistry, flow, 24-hr DO, and habitat characteristics.

Initial sampling results indicate that the habitat quality is intermediate for all selected streams and fish diversity is limited for all selected streams except for Hunting Bayou Above Tidal and Sims Bayou Above Tidal, which appear to sustain intermediate fish diversity. Results from the study will be available in the summer of 2003.

Nutrient enrichment concerns are found throughout many of the unclassified tributaries as well. Ammonia values continue to remain elevated. H-GAC is working with the City of Houston to expand ambient monitoring to include other nutrient parameters. The main stem is also listed with concerns for cadmium, copper, and zinc in sediment, as well as for high pH values.

#### **Houston Ship Channel (1006)**

**Major tributaries:** Boggy Bayou, Carpenters Bayou, Goodyear Creek, Halls Bayou, Patrick Bayou, Tidal portion of Greens Bayou

This segment includes Halls Bayou, Patrick Bayou, the tidal portion of Greens Bayou, Carpenter's Bayou, Sheldon Reservoir as well as other smaller tributaries to these water bodies. Tidal portions of bayous are assessed against the standards for the Houston Ship Channel. Nontidal water bodies are characterized as unclassified

segments and are assessed for aquatic life use and contact recreation.

Like Segment 1007, there are issues of low dissolved oxygen occurrence in some of the smaller tributaries of the watershed. As part of the study to assist TCEQ in assigning the appropriate aquatic life use to some of these unclassified segments, H-GAC included comprehensive assessments of Big Gulch above tidal and two unnamed tributaries of Halls Bayou. Results from the study should be available late summer of 2003.

The Ship Channel and tidal portions of tributaries are listed as not meeting its fish consumption use due to dioxin in fish tissue. Bacteria and ammonia levels continue to exceed applicable standards and screening levels. H-GAC is working with local monitoring agencies to include enterococcus data collection on tidal portions of water bodies in this watershed. There are toxicity issues concerning Patrick Bayou.

The TCEQ Region 12 office has scheduled special sampling for metals and organics in sediment and fish tissue at the Greens Bayou confluence on the HSC as well as a site along Greens Bayou Tidal, and a site along Patrick Bayou.


#### **Houston Ship Channel/San Jacinto River (1005)**

**Major tributaries and bays:** Barbours Cut, Black Duck Bay, Burnet Bay, Goose Creek, Old River, San Jacinto Bay, Scott Bay, Tabbs Bay

Water quality issues include dioxin, PCBs, and pesticides in fish tissue, upstream of Lynchburg Ferry. There is currently a study underway to address the dioxin issue. (See detailed information in "Other Program Highlights")

Harris County Pollution Control has expanded local monitoring to include data collection in Crystal Bay, a Goose Creek tributary, as well as another site along the tidal portion of the San Jacinto River.

#### **Lake Conroe (1012)**

 **Major tributaries:** Caney Creek, East Sandy Creek, Lewis Creek, Little Lake Creek, McDonald Creek, McGary Creek, West Fork San Jacinto River, West Sandy Creek

Lake Conroe serves as a drinking water source for the region as well as provides recreational opportunities. There are no known major water quality problems in the

lake; however, there are concerns for low DO values and high pH values in some areas. Recent data show few instances of low DO and pH ranging between 7-8.5. Lower DO values were recorded in warmer months.

#### **Lake Creek (1015)**

 **Major tributaries:** Caney Creek, Fish Creek, Garretts Creek, Landrum Creek, Little Caney Creek, Mound Creek

There are no known water quality problems in the watershed. Although the watershed is predominantly rural or undeveloped, it has recently seen increases in residential development. In an effort to gain more background information about the watershed, a systematic watershed monitoring study was initiated in December 2002. Water quality and biological sampling will occur at five sites along Lake Creek. Water quality samples will be analyzed for a variety of nutrients, bacteria, and soluble pesticides. Biological diversity data includes stream habitat, aquatic insects, and fish. Laboratory analysis from initial samples indicates that the water body is in good condition.


#### **Lake Houston (1002)**

 **Major tributaries:** East Fork San Jacinto River, Luce Bayou, Marsh Branch, Tarkington Bayou, West Fork San Jacinto River

Lake Houston is the major drinking water source for the City of Houston. The lake is also used for recreation. The watershed encompasses the lake itself and Luce Bayou. There are no known major water quality issues in the watershed; however, elevated nutrients and low dissolved oxygen values in the lake are listed as concerns. Luce Bayou is also noted as having a low DO concern.

Eight other watersheds drain to the lake. These include Cypress Creek, Spring Creek, Lake Creek, West Fork of the San Jacinto River, Lake Conroe, Caney Creek, Peach Creek, and the East Fork of the San Jacinto River. Be aware that the water quality of these watersheds impacts the public water supply. Maintaining the water quality of this area is imperative to having clean drinking water at a reasonable price for the region.

#### **Peach Creek (1011)**

 **Major tributaries:** Bee Branch, Boggy Creek, Duck Creek, Gully Branch, Gum Branch, Jayhawker Creek, Lawrence Creek, Mare Creek, Waterhole Branch


Peach Creek has no known water quality issues or concerns. In an effort to gain more background information about the watershed, a systematic watershed monitoring study was initiated in December 2002. Water quality and biological sampling will occur at three sites along Peach Creek. Water quality samples will be analyzed for a variety of nutrients, bacteria, and soluble pesticides. Biological diversity data includes stream habitat, aquatic insects, and fish. Laboratory analysis from initial samples indicates that the water body is in good condition.

#### **San Jacinto River Tidal (1001)**

**Major tributary:** Gum Gully Creek

The San Jacinto River Tidal segment includes that portion of the river that flows from the Lake Houston outlet and drains to Galveston Bay. Primary water quality issues include PCBs, dioxin, and pesticides in fish tissue up to the intersection with Hwy 90. (See detailed information in "Other Program Highlights" for special study information.)

#### **Spring Creek (1008)**


 **Major tributaries:** Bear Branch, Birch Creek, Brushy Creek, Dry Creek, Lake Woodlands, Mill Creek, Mink Branch, Panther Branch, Sulfur Branch, Three Mile Creek, Walnut Creek, Willow Creek

The segment is listed for not attaining its contact recreation use due to elevated bacteria levels. E. Coli data collected in 2002 continue to be high along the main stem. Additional monitoring on Willow Bayou initiated in 2002 show bacteria to be elevated there as well.

Low DO levels are a concern. DO data collected in 2002 look normal along the main stem, while there are lower values along some of the tributaries during warmer months. The TCEQ Region 12 field office has scheduled a special study for FY2004 looking at 24-hour DO as well as habitat, fish species, and aquatic insects.

Ammonia is concern along Upper Panther Branch. Excessive levels of other nutrients, including nitrogen and phosphorus, are found along the main stem. H-GAC is working with local monitoring agencies to ensure nutrient data is collected to more adequately assess this issue.

#### **West Fork San Jacinto River (1004)**

 **Major tributaries:** Camp Creek, Caney Creek, Crystal Creek, East Fork Crystal Creek, Egypt Creek, Harpers Horsepen Branch, Lake Creek, Little Caney Creek, Rice

Branch, Sand Branch, Stewarts Creek, West Fork Crystal Creek, White Oak Creek, Woodsons Gully Creek

Bacteria levels south/downstream of Conroe are above the maximum levels set for contact recreation. There are also DO and nutrient concerns along the main stem. The City of Conroe has expressed interest in conducting ambient monitoring in some parts of the watershed.

**White Oak Bayou (1017)**

Major tributaries: Brickhouse Gully, Cole Creek, Little White Oak Bayou, Vogel Creek

White Oak Bayou is a major tributary to Buffalo Bayou and is included in the special project addressing bacteria concerns. (See detailed information in "Other Program Highlights")

E. Coli data collected in 2002 are still extremely high. Ammonia levels throughout the watershed are above screening levels for fresh water bodies, and there are instances of low dissolved oxygen in two unnamed tributaries of the bayou.

A small watershed analysis, including runoff analysis, has begun for the Brickhouse Gully watershed, which exhibits high bacteria loadings. In addition, this data will be used in future projects as a basis for recommending structural and/or non-structural best management practices (BMPs) or remediation.

In an effort to more comprehensively and effectively cover data collection throughout the watershed, the City of Houston has agreed to begin monitoring an additional site on White Oak Bayou near Jersey Village and another site on Vogel Creek in FY2004. These are areas of the watershed that have not been monitored in recent years.

events looking at 24-hour DO at two sites. There are also concerns for excessive algal growth and high pH values.

H-GAC is working with the City of Houston to switch to analyzing the bacteria indicator enterococcus instead of E. Coli for tidal sites within the watershed.

**Bastrop Bayou (1105)**

Major tributaries: Austin Bayou, Brushy Bayou, Flores Bayou

The watershed is predominantly undeveloped and has no known water quality concerns. The City of Angleton is the only urban area in the watershed, and there are numerous stock ponds and irrigation ponds. H-GAC is working with Brazoria County to expand ambient monitoring in this watershed.

**Chocolate Bayou Above Tidal (1108)**

Major tributaries: Hayes Creek, West Fork Chocolate Bayou

Sparsely developed with predominant agricultural land use, the watershed has no known water quality concerns. Brazoria County officials have expressed interest in expanding ambient monitoring within the watershed.

**Chocolate Bayou Tidal (1107)**

Major tributaries: Corner Bayou, Cottonwood Bayou, Pleasant Bayou

The watershed is predominantly undeveloped and has no known water quality concerns. Additional ambient monitoring was initiated in 2002 along the bayou.

**Clear Creek Above Tidal (1102)**

Major tributaries: Cowart Creek, Hickory Slough, Marys Creek, Mud Gully, Turkey Creek

The watershed is a mix of residential and urban development with some undeveloped areas remaining in the upper portion. Bacteria throughout the watershed are above contact recreation standards. While there are many instances of concentrations below the standard, 2002 E. Coli data look "spikey", suggesting noncontinuous sources. In addition, TDS and chloride levels are elevated along the main stem, causing general use impairments. Other concerns include high ammonia concentrations throughout the watershed, low dissolved oxygen as well as excessive nutrient levels along the main stem. DO data collected in 2002 are within

expected values, with some concentrations lower in warmer months. Data collected in 2002 for nitrogen and phosphorus compounds are mostly below the screening level along the main stem of Clear Creek.

The City of Pearland monitors the Mary's Creek portion of the watershed, and is scheduled to come into H-GAC's Quality Assurance Project Plan in FY2004.

**Clear Creek Tidal (1101)**

Major tributaries: Chigger Creek, Magnolia Creek

The watershed is a mix of residential and urban development. Elevated bacteria levels do not allow either Clear Creek or its major tributary Chigger Creek to meet the contact recreation use. While there is a concern for high pH values along the main stem, Chigger Creek exhibits high ammonia concentration concerns.

**Dickinson Bayou Above Tidal (1104)**

Major tributaries:

The freshwater portion of the watershed is predominantly rural or undeveloped, but does not meet its contact recreation use due to high bacteria levels. Limited available E. Coli data collected in 2002 show grab samples below the standard of 394 colonies/ml.

Other concerns include low dissolved oxygen and high ammonia concentrations. Historically, there has been limited monitoring coverage throughout the watershed. Galveston County Health District, Pollution Control, added a site at FM 528 in 2002 to help better spatially assess the watershed.

**Dickinson Bayou Tidal (1103)**

Major tributaries: Bordens Gully, Cedar Creek, Geisler Bayou, Gum Bayou

The majority of development is centered around the City of Dickinson. The main stem of the bayou is listed as impaired for low dissolved oxygen occurrence. A special study conducted through the CRP revealed that tidal fluctuations allow the surface layer to flush and replenish itself with dissolved oxygen, while deeper water is forced to remain in the same location and slush back and forth. DO grab samples collected in 2002 meet the state designated standard.

The entire watershed is also listed as impaired for high bacteria counts. Enterococcus data collected in 2002

have been variable. Low DO concerns are found on Borden's Gully and Geisler Bayou.

**Old Brazos River Channel (1111)**

Dense industrial development is found throughout the watershed. While the segment is not listed as impaired, there are concerns for barium, copper, and nickel in sediment.

**Oyster Creek Above Tidal (1110)**

There is some residential development in the uppermost portion of the watershed, but over 80% is undeveloped or rural development. The creek does not meet its aquatic life use due to low DO occurrence. This situation may be the result of lack of flow to the creek. There is currently an enforcement action involving water rights with a local levee district.

H-GAC is working with Brazoria County to expand ambient monitoring within the watershed.

**Oyster Creek Tidal (1109)**

Lake Jackson is the major development. The watershed is not currently experiencing any known water quality problems. H-GAC is working with Brazoria County to expand ambient monitoring within the watershed.

**San Bernard River**

**San Bernard River Above Tidal (1302)**

Major tributaries: Coughatta Creek, East Bernard Creek, Little San Bernard River, Middle Bernard River, Peach Creek, West Bernard Creek

The watershed is listed as impaired for high bacteria counts and for temperature modifications in the upper 50 miles of the segment. Recent bacteria data is near the standard.

The segment is listed with concerns of having an impaired aquatic insect community and an impaired fish community. These biological concerns are thought to be related to natural sources.

As part of a special study between H-GAC CRP and USGS, habitat, aquatic insect, and fish data were collected from selected sites in the San Bernard River and its tributaries, during the period 2000 - 2002. This information has been summarized and compared with similar data from other streams in southeast Texas. Measures of stream habitat compare closely with other

**San Jacinto-Brazos Coastal Basin**

(Watersheds are listed alphabetically)

**Armand Bayou (1113)**

Major tributaries: Big Island Slough, Horsepen Bayou, Middle Bayou, Mud Lake, Spring Gully, Willow Spring Bayou

The segment is still listed as not meeting standards due to low levels of dissolved oxygen. The low dissolved oxygen levels in the headwaters result from inadequate flushing of water through the bayou. The TCEQ Region 12 field office has scheduled for FY2004 two sampling

riverine settings, as opposed to tidally influenced, coastal bayous. Similarly, measures of aquatic insect and fish population diversity are similar to water bodies with minimally impacted watersheds. Based on these biological data, along with selected water chemistry and water quality parameter data that were also collected during 2000-2002, the San Bernard River does not exhibit significant water quality impacts.

**San Bernard River Tidal (1301)**

Major tributaries: [Halls Bayou](#), [Mound Creek](#)

The watershed contains rural development, and there are no known water quality concerns.

**Bays and Estuaries**

**Barbours Cut (2436)**

Dioxin in fish tissue prevents fish consumption. Exact sources of dioxin are not known at this time. (See detailed information in "Other Program Highlights")

**Bastrop Bay/Oyster Lake (2433)**

This area is minimally developed, with an abundance of wetland vegetation. There are no known water quality issues in these waters.

**Bayport Channel (2438)**

Dioxin in fish tissue prevents fish consumption. Exact sources of dioxin are not known at this time. (See detailed information in "Other Program Highlights") The TCEQ Region 12 field office has scheduled for FY2004 special study sampling for metals and organics in sediment.

**Black Duck Bay (2428), Burnett Bay (2430)**

Dioxin in fish tissue prevents fish consumption. Exact sources of dioxin are not known at this time. (See detailed information in "Other Program Highlights") Harris County Pollution Control, in cooperation with H-GAC, expanded ambient monitoring to the bay in 2002.

**Chocolate Bay (2432)**

Major tributaries: [Chocolate Bayou](#), [Cloud Bayou](#), [Halls Bayou](#), [Mustang Bayou](#), [Persimmon Bayou](#), [Willow Bayou](#)

Bacteria from an unknown source prevents oyster harvesting. The bay receives input from Chocolate Bayou, Halls Bayou, Mustang Bayou, and Persimmon Bayou. Historically, there has been limited data for

these bayous. Galveston County Health District, Pollution Control, in cooperation with H-GAC, expanded ambient monitoring to include these portions of the watershed in 2002.

The TCEQ Region 12 field office has scheduled for FY2004 two 24-hour DO sampling events on Halls Bayou.

**Christmas Bay (2434)**

The watershed is minimally developed, with no known water quality issues.

**Clear Lake (2425)**

Major tributaries: [Jarboe Bayou](#), [Robinsons Bayou](#)

The tributaries that feed the lake do not meet standards associated with contact recreation due to high levels of bacteria. The lake itself is listed with excessive nutrient levels. Robinson Bayou exhibits low dissolved oxygen. Recent nitrate+nitrite-nitrogen and orthophosphorus data for the lake appear satisfactory with few instances of orthophosphorus above the screening level. Total phosphorus data in 2002 reveal concentrations above the screening level. Recent dissolved oxygen data appear to be a little lower at the downstream portion of the Robinson Bayou.

**Drum Bay (2435)**

There are no known water quality issues in these waters. Harris County Pollution Control, in cooperation with H-GAC, expanded ambient monitoring to the bay in 2002.

**East Bay (2423)**

Bacteria from an unknown source prevents oyster harvesting. The TCEQ Region 12 field office has scheduled for FY2004 two 24-hour DO sampling events on Oyster Bayou.

**Lower Galveston Bay (2439)**

Bacteria from an unknown source prevent the oyster harvesting. There are no other known major water quality problems.

**Moses Lake (2431)**

Major tributary: [Moses Bayou](#)

There are no known water quality issues in the segment. Galveston County Health District, Pollution Control, in cooperation with H-GAC, expanded ambient monitoring to the lake and bayou in 2002.

**San Jacinto Bay (2427), Scott Bay (2429), Tabbs Bay (2426)**

Dioxin in fish tissue prevents fish consumption. Exact sources of dioxin are not known at this time. (See detailed information in "Other Program Highlights") Harris County Pollution Control, in cooperation with H-GAC, expanded ambient monitoring to the bay in 2002.

**Texas City Ship Channel (2437)**

The channel is listed as not meeting its aquatic life use due to low dissolved oxygen levels. There are also excessive nutrient concerns. Results from a special study indicate that dissolved oxygen levels are satisfactory, and that high concentrations of ammonia and phosphorus seem to be of concern. (See Texas City Ship Channel Special Study Update.)

**Upper Galveston Bay (2421)**

Dioxin in fish tissue prevents fish consumption from Red Bluff to Five Mile Cut to Houston Point to Morgans Point. Exact sources of dioxin are not known at this time. (See detailed information in "Other Program Highlights")

Excessive bacteria levels prohibit safe oyster harvesting. There is also a concern for high levels of total phosphorus.

**West Bay (2424)**

Major tributaries: [Basford Bayou](#), [Highland Bayou](#), [Marchand Bayou](#)

The West Bay system includes many small bays, lakes, and bayous. The designated use for oyster harvesting is prohibited in the main part of the bay. Highland Bayou and Marchand Bayou are both listed for high levels of bacteria and low dissolved oxygen. There are also concerns for low DO levels in Lake Madeline.

Recent enterococcus data suggest Highland Bayou and Marchand Bayou are still not meeting standards for safe contact recreation. Recent DO data appear normal along Highland Bayou, Marchand Bayou, and Lake Madeline, with few instances below standard. English Bayou and the crash basin are on the concerns list due to high ammonia concentrations.

**Gulf of Mexico (2501)**

The only documented issue is for mercury in king mackerel 43 inches or deeper (Bolivar Roads/Bolivar Point, Bolivar Point to Point Aransas).

The Galveston County Health District is participating in a Beach Watch Program, which allows for monitoring the levels of bacteria along public beaches and advising people of the safest time to swim. The Gulf of Mexico beaches are sampled at six (6) different locations spread out over a distance of 2 miles. If the bacteria levels' average from two consecutive days of sampling exceeds the index, then an advisory is posted. The advisory remains in affect and resampling occurs until the average is less than the index. From May thru September, samples are collected every week. During the rest of the months, samples are collected every other week.

A summary of the number of advisories issued is as follows:

May 2002	14 advisories for a total of 67 days
June 2002	7 advisories for a total of 28 days
July 2002	7 advisories for a total of 25 days
August 2002**	no advisories
September 2002	13 advisories for a total of 94 days
October 2002	no advisories
November 2002	1 advisory for a total of 7 days
December 2002	no advisories
January 2003	no advisories
February 2003	no advisories
March 2003	1 advisory for a total of 1 day

\*\* Beginning in August 2002, the index average changed from 36 to 104 for compliance determination.

**Summary**

The biggest water quality concern throughout the region continues to be elevated bacteria levels, which inhibit safe contact recreation and oyster harvests. Another major issue is toxicity, particularly dioxin. Special projects are currently underway to address these issues as well as some of the less severe issues including low dissolved oxygen levels in small tributaries. Other special studies have been initiated to identify sources of contamination and to help in the development of reasonable remediation and control strategies.

Expanded ambient monitoring has given water quality managers data to conduct better, more efficient, assessments. Monitoring in watersheds with limited data has improved the knowledge of water quality conditions in more rural areas. The combination of data collection, analysis, education, stakeholder involvement, and reasonable implementation strategies are key factors in watershed management and the understanding of aquatic ecological systems.



## Resources

In addition to previous Basin Highlights and Summary Reports, the following publications are available through the Clean Rivers Program and H-GAC's Water Quality Planning Program. Reports and studies are also available for other programs such as habitat preservation and environmental enforcement. If you are interested in any of these publications, please contact H-GAC's Community and Environmental Planning Department at 713-993-2461. Many documents can be found at the H-GAC website at [www.h-gac.com/waterdata](http://www.h-gac.com/waterdata).

### Water Quality Reports and Guidance Manuals

A Guidance Manual for Identifying and Eliminating Illicit Connections to Municipal Separate Storm Sewer Systems (MS4), 2002

Dickinson Bayou Pre-TMDL Data Collection, 2002

Urban Bayou Bacteria Source Identification Study, 2001

Regional Habitat Index, USGS Phase 3 document

Dioxin Sediment and Tissue Sampling in Houston Ship Channel and Upper Galveston Bay, 2001

Gulf Coast Region Water Quality Management Planning Document, 2000

Domestic Wastewater Regionalization White Paper, 2000

Copper Water Effect Ratio Study and Trace Metals Study for the Houston Ship Channel, 2000

Greens Bayou Intensive Survey and Wasteload Evaluation, 1999

Water Quality Data Analysis, 1999

Characterization of Water and Sediment Quality, Christmas Bay System, Brazoria County, Texas, 2000

Characterization of Water-Quality and Aquatic-Biological Conditions in the Panther Branch Watershed, near Houston, Texas, 1999

Identifying and Eliminating Illicit Connections Within the Clear Creek, 1998-1999

Gulf Coast Region Water Quality Management Planning Document, 1998

Fish, Benthic Macroinvertebrate, and Stream Habitat Data From the Houston-Galveston Area Council Service Area, Texas 1997-98, 1998

Nutrient Loading and Selected Water Quality and Biological Characteristics of Dickinson Bayou Near Houston, Texas 1995-97, 1997

Action Guide: Erosion and Sediment Control (Construction Activities), 1997

Local Government Water Quality Protection Study, 1994

Houston Ship Channel Success Story, 1992

### Brochures

Sims Bayou Watershed Profile, 2002

Bacteria in our Bayous, 2002

Greens Bayou Watershed Profile, 2001

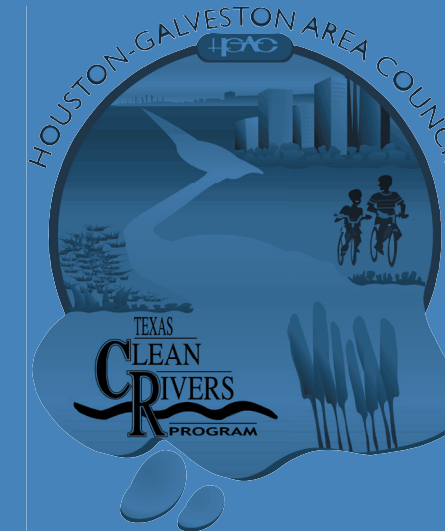
Water Quality Data Clearinghouse, 2000

What Watershed Do You Live In?, 2000

Armand Bayou Watershed Profile, 1999

### Videos

Can I Swim Here?, 2000



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