Texas A&M
Health Science Center
School of Rural Public Health

PPHWR
Program for Public Health and Water Research

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TCEQ

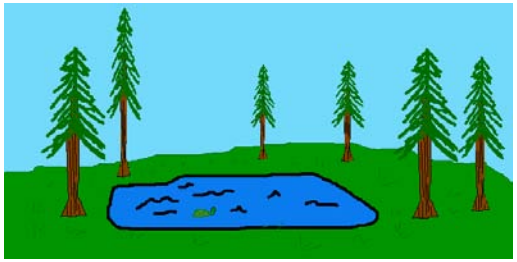

• Subsidence
• Droughts
• Development
Supply
Quality
• Recreation
• Seafood
• Wildlife
Health
• Treatment
• Disease
• Surveillance

U.S. Water Well Facts

- USGS states that over 15 million U.S. households rely on private, household wells for drinking water (approx. 43M Americans, 15% US pop.).
- All private wells use ground water.
- If polluted ground water is consumed, it could cause illness.
- Ground water pollution can be caused by seepage through landfills, failed septic tanks, underground fuel tanks, fertilizers and pesticides, and runoff from urban and rural areas. (Frack water???)
- It is important that private ground water wells are checked regularly to ensure that the water is safe for drinking.
- Typically, private water systems that serve no more than 25 people at least 60 days of the year and have no more than 15 service connections are not regulated by the EPA.

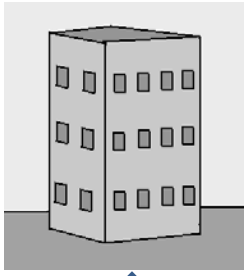
Texas

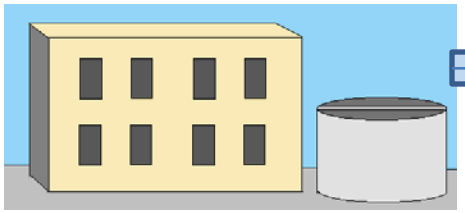
- In Texas, public water utilities provide drinking water to some 94 percent of the 20.9 million residents,
- The remaining 1.2 million residents receive their drinking water from non-public sources such as private wells.
- The South Texas colonias' water supply and regulatory oversite is unclear.



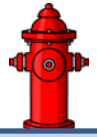
Surface Water
(lake or river)

Building



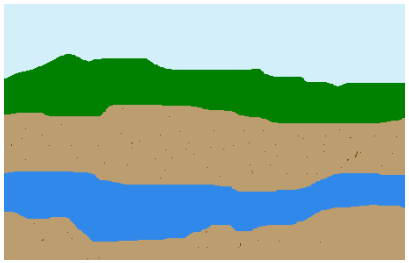


WATER TREATMENT PLANT



Service Lines (Lead)
(Regulated)

(Unregulated)



Ground Water

Residence

Emerging Threats

- Pharmaceuticals & Personal Care Products (PPCP)
- PPCPs are steroids, prescription and nonprescription drugs, antibiotics, hormones, and fragrances that have been detected in water samples collected from streams considered susceptible to contamination from various wastewater sources such as those downstream from intense urbanization or livestock

Emerging Threats

- Chlorine to Chloramine switch in Disinfectants (Lead Poisoning)
- Climate Change

Houston Water Indicators Study Center for Houston's Future

- PPHWR - Health
- TWRI - Quality
- TEEX – Supply

- Eight county Houston metropolitan region:
  - Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller

PPHWR's Role and Community Goal

"to protect the region's water resources, improve water quality and ensure the quality of habitats"

- Emerging Issue: Houston Metro Area

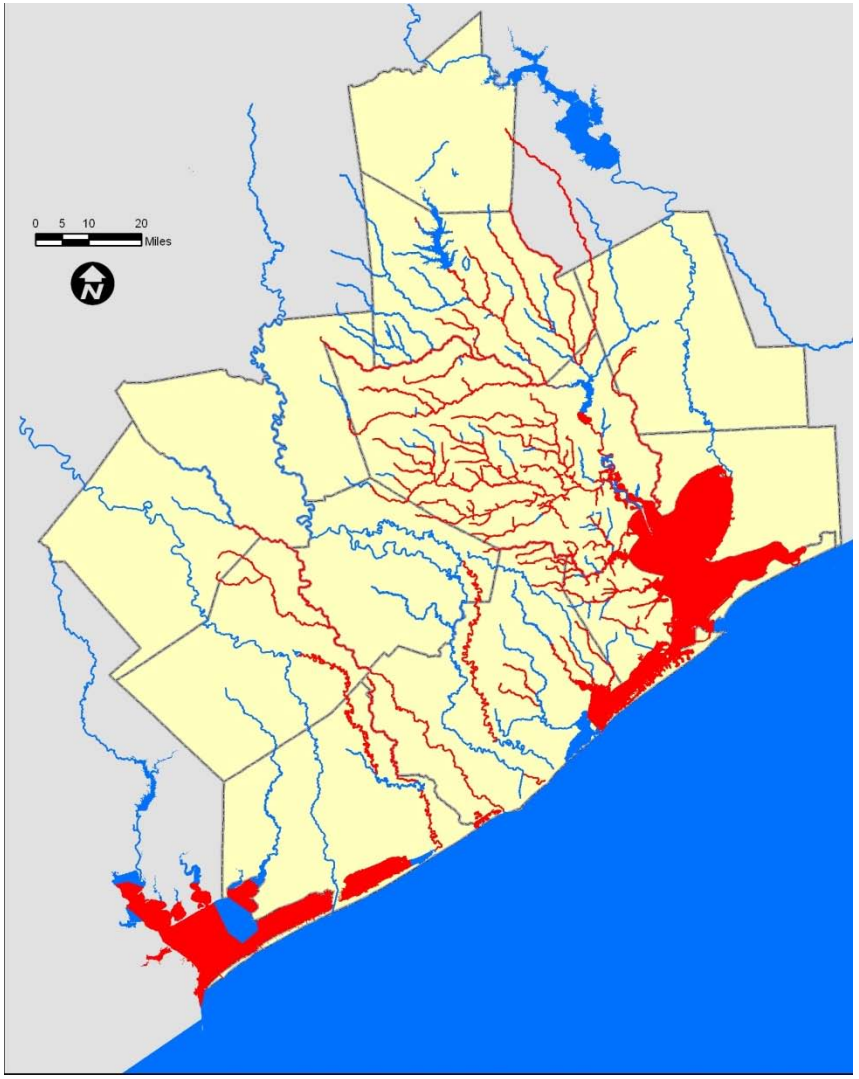
Increased Population and Development

  - Approx. 3.5 million people to move here in next 30 years
  - As much as 789 sq. mi. of land could be developed
    - Straining existing wastewater infrastructure
    - Increasing impervious surface
    - More urban nonpoint source runoff
    - Fewer wetlands to filter the water
      - » Drought is truly exacerbating existing wetlands.

State of the Region's Water

- As a whole, the eight-county Houston region meets or exceeds regulatory standards for safe drinking water.
- However, many segments of the overall watershed's quality do not.

- What is the current situation?
  - 87% of water bodies are impaired on *Texas Integrated Report for Clean Water Act §305(b) and 303(d)*
  - *Number of impaired water bodies increased 6% since 2007*



Water Supply for Drinking

- Surface water makes up 71% of supply and flows from Trinity River into Lake Livingston and from San Jacinto River into Lake Conroe and Lake Houston.
- The Evangeline and Chicot underground acquifers provide most of the other 29%.

Water Supply for Drinking

- The city of Houston controls the vast majority of water rights in the region, and provides the largest amount of treated water in the region, both to the city itself as well as other users.
- Other major regional providers include the Trinity, San Jacinto, and Brazos River Authorities, and the Gulf Coast Water Authority.
- These entities account for over 80% of the available firm supplies from surface water.
- Two subsidence districts, Fort Bend (FBSD) and Harris Galveston (HGSD) regulate the withdrawal of groundwater in their respective counties.
- Groundwater in most of the Houston region must make up no more than 20% of the total water supply source.
- Brazoria and Waller are the only two counties in the 8-county region that do not regulate the pumping of groundwater to mitigate land subsidence.
- There are approx. 700 MUDs supplying water to the region.

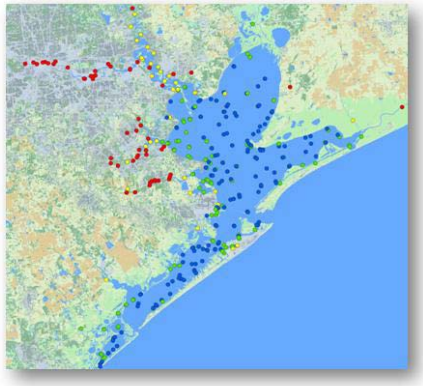
Water Contaminants

- While the list of potential drinking water contaminants is large and continues to grow, two sources pose the most acute threat to human health:
- chemicals and microbes.

- Bacteria is most significant concern
  - Impacts recreation in most water bodies
  - Sources:
    - Wastewater plants
    - Septic systems
    - Wildlife
    - Urban runoff
    - Ag runoff
- Bacteria levels also exceed allowable levels for oyster harvest
- Recent improvements in bacteria levels observed in:
  - White Oak Bayou
  - Houston Ship Channel
  - Buffalo Bayou tidal

	1970s	2000s
Christmas Bay Complex		
Bastrop Bayou		
West Bay		
Chocolate Bayou/Bay		
Galveston Channel		
Texas City Channel		
East Bay		
East Intracoastal Waterway		
Oyster Bayou		
Upper & Lower Galveston Bay		
Dickinson Bayou/Bay		
Clear Creek		
Armand Bayou		
Houston Ship Channel		
Buffalo Bayou		
San Jacinto River		
Cedar Bayou		
Trinity Bay		
Trinity River		

Rating	% Above Screening Level
Very Good	0
Good	1-9
Moderate	10-25
Poor	>25
Not enough data	



Water Indicators

- Bacteria in contaminated water can cause diseases but often is undiagnosed.
- Disease-causing bacteria are signaled by high levels of coliform bacteria, itself a relatively benign bacteria.
- However, fecal coliform bacteria are commonly found in human and animal waste and may indicate sewage contamination and the presence of disease-causing organisms

Importance of Water Quality

- Drinking, recreation, fishing, ecosystem, quality of life
- Supports economy
  - $8.6 billion tourism industry (> 100,000 jobs)
  - $77 million fish and seafood industry (1,385 jobs)
  - 2005 Texas Water Development Board report stated municipal and industrial water uses support 99% of economic activity in Region
- Galveston Bay
  - 2nd most productive fishery in U.S. (until Ike)
  - Largest oyster production of any estuary in U.S. (until Ike)
  - Largest commercial harvest of blue crab in Texas
  - 40% of nation's petrochemical production
  - 2nd largest port in U.S

Emerging Contaminants of Public Health Concern

- Chromium
- PPCP
- Arsenic
- Nitrates
- Pesticides
- Shale Fracturing

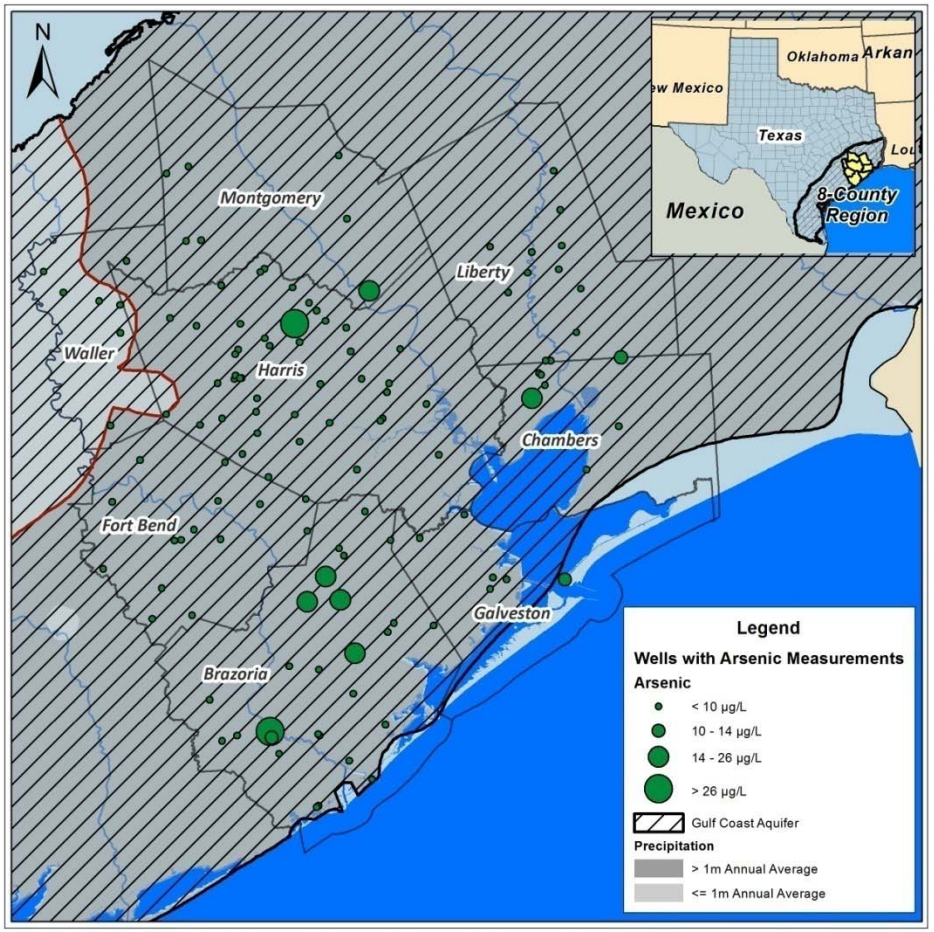
PPCP General Findings

- Pharmaceuticals have now been found in treated sewage effluents, surface waters, soils and tap water.
- Up to 90% of oral drugs can pass through humans unchanged.
- Many do not biodegrade
- Some persist in groundwater for years.

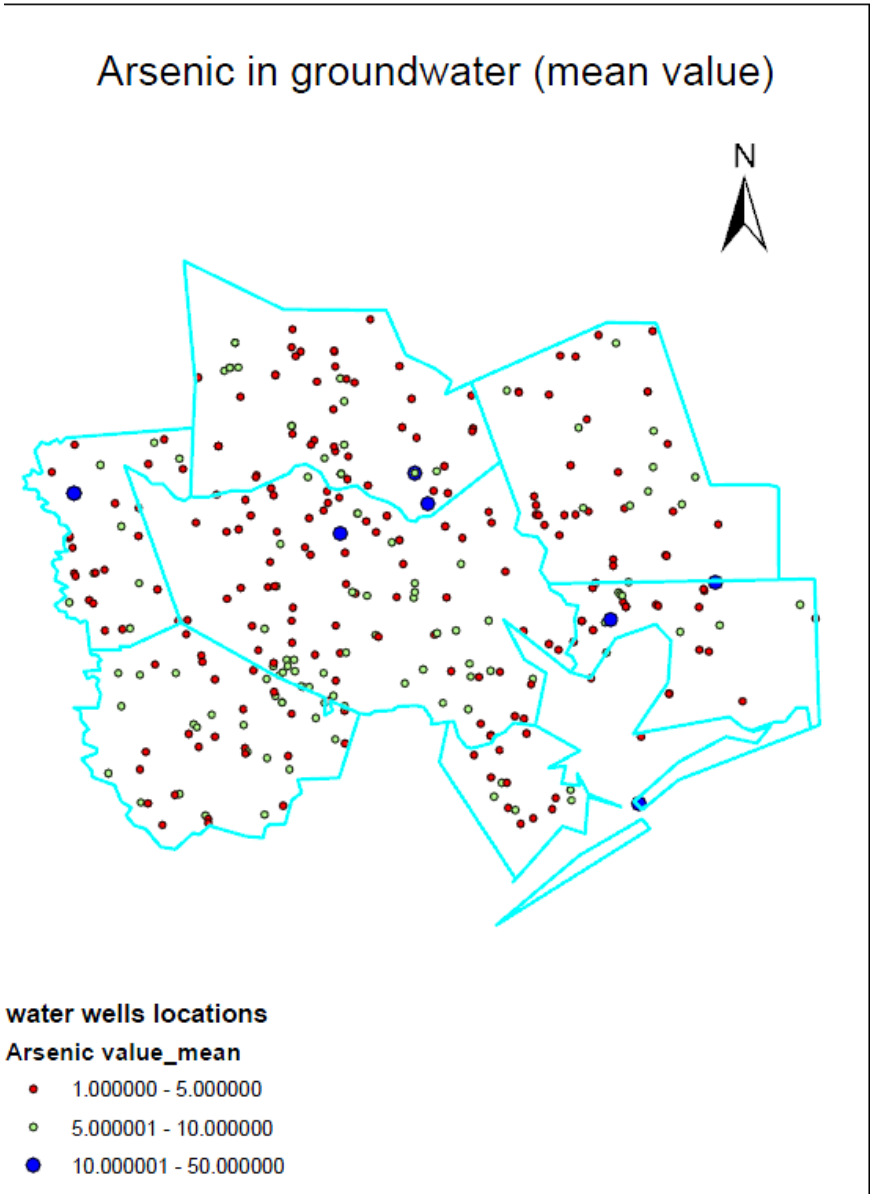
- Dioxins, PCBs, mercury & zinc continue to be serious problems despite improvements
- As well as Improved performance of wastewater facilities, based on # of TCEQ violations issued.

- Groundwater quality
  - Relatively high quality
  - Some shallow contamination from petro storage tanks
  - Radionuclides and arsenic exceed standards in some wells

Groundwater Management Area #14



- The extent of human exposure to arsenic in tap water is especially problematic in wells.
- Higher levels of arsenic tend to be found more in ground water sources than in surface water sources of drinking water.



Recommendations on Quality

- Regulatory authorities should rethink the communication & education strategies for posting of contaminated water warnings. One simple change would be the metrics of seafood consumption. For example, size or number of fish instead of weight in ounces.
- Recommend a tracking or surveillance system for GI illnesses for the eight-county region.
- Support the H-GAC requested change in bacteria indicator to enterococcus.
- Local and state health departments need to expand their scope of targeted education and outreach for hemodialysis patients and screening for blood lead levels in children in the years following the introduction of chloramines as a water-disinfection agent.
- Address unplugged abandoned wells since they can threaten the quality of drinking water from both private wells and those servicing public water supply systems.

Overall H_2O Consequences on Health

- The consequences are harrowing: drought and famine, loss of livelihood, the spread of water-borne diseases, migrations, and even open conflict.
- Practical solutions will include many components, including better water management, improved technologies to increase the efficiency of water use, and new investments undertaken jointly by governments, the business sector and civic organizations.

Potential Impacts of Prop. 2

- Overall increase in public health and disease monitoring
- Ensuring a safe water supply for human consumption and recreation
- Encouragement of awareness and continued monitoring of water quality and disease outbreaks from contamination
- Wastewater infrastructure improvement

PPHWR Partnerships

- Novel-designed treatment strategies
- Advancements in analytical water screening
  - ECLOX (TEEX & TCEQ)
  - THMs (Purge & Trap GC monitoring)- Univ. Memphis
  - Hydraulic Fracturing – BTEX (TAMU Petroleum Engineering)

SRPH Degrees Offered

- ***Master of Public Health (MPH)***
- **MPH: Environmental Health**
- ***Master of Science in Public Health (MSPH)***
- ***MSPH: Environmental Health***
- ***MSPH: Occupational Health***
- ***Doctor of Public Health (DrPH)***
- ***Epidemiology or Environmental and Occupational Health Sciences***

Questions?

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