CARANCAHUA BAY WATERSHED PROTECTION PLAN

Allen Berthold, Michael Schramm
November 2, 2017

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Today's Meeting

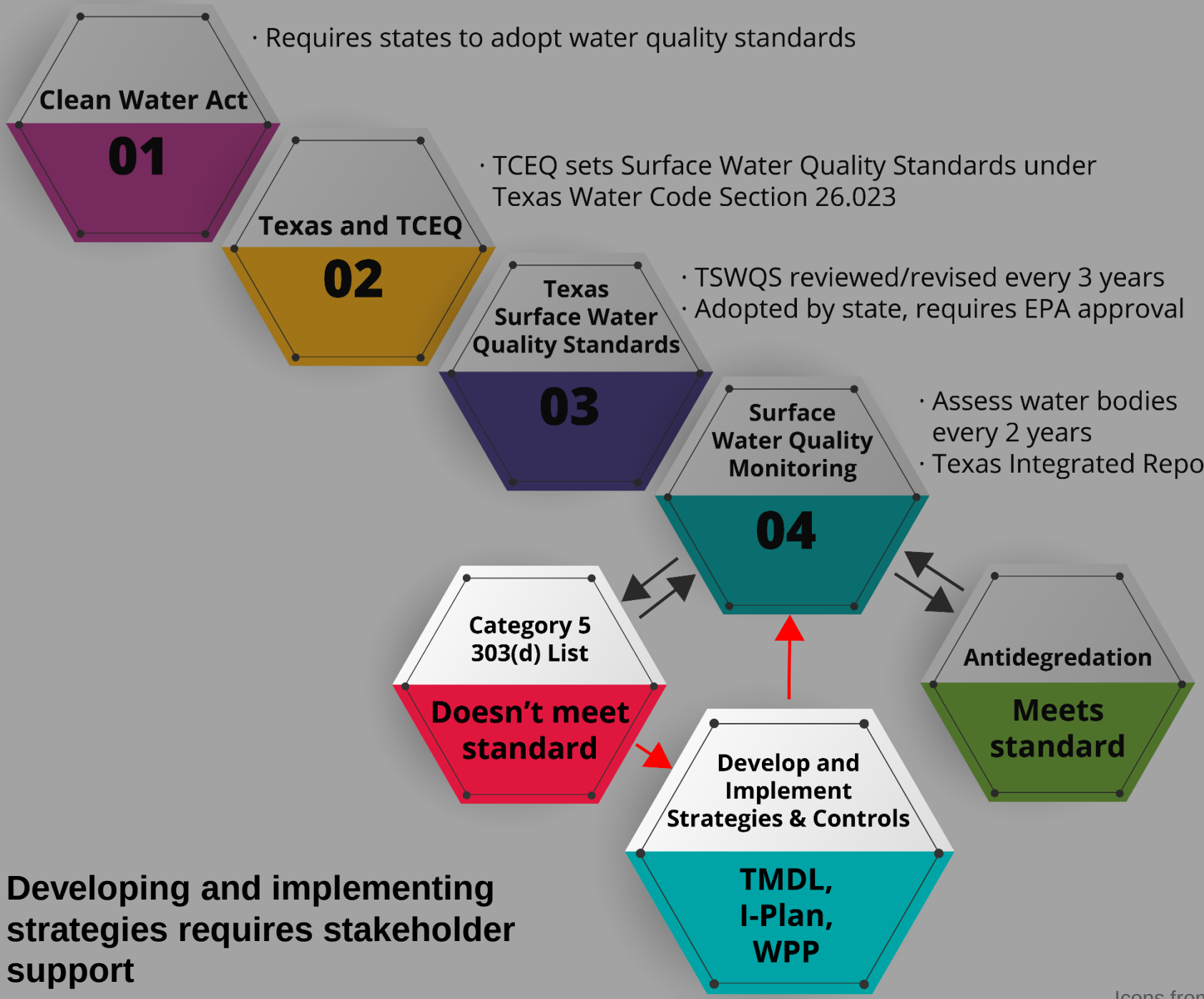
1. Introductions and recap of last meeting
2. Water quality in Carancahua Bay and West Carancahua Creek
3. Example watershed-based plans
4. Potential sources and potential management measures
5. Next steps

Introductions

- Name
- Your affiliation (landowner, agency, interested citizen, etc.)

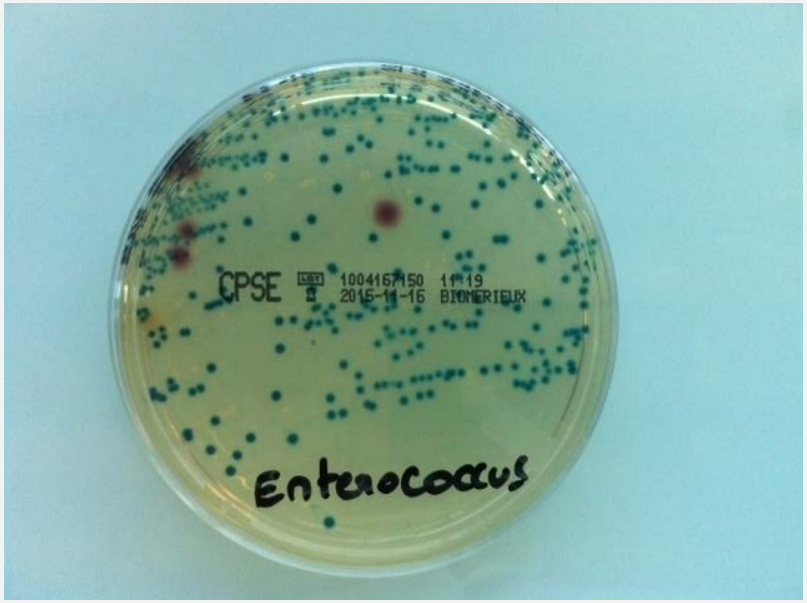
Recap from August Meeting

- Last meeting:
  - **Texas water quality rules and regs**
    - **303(d) List, water quality standards**
  - **Decision making framework**
    - **Who are stakeholders, organization levels**
  - Current water quality
    - Bacteria and Dissolved Oxygen impairments
  - Survey
    - Workgroups and potential sources/concerns



Developing and implementing strategies requires stakeholder support

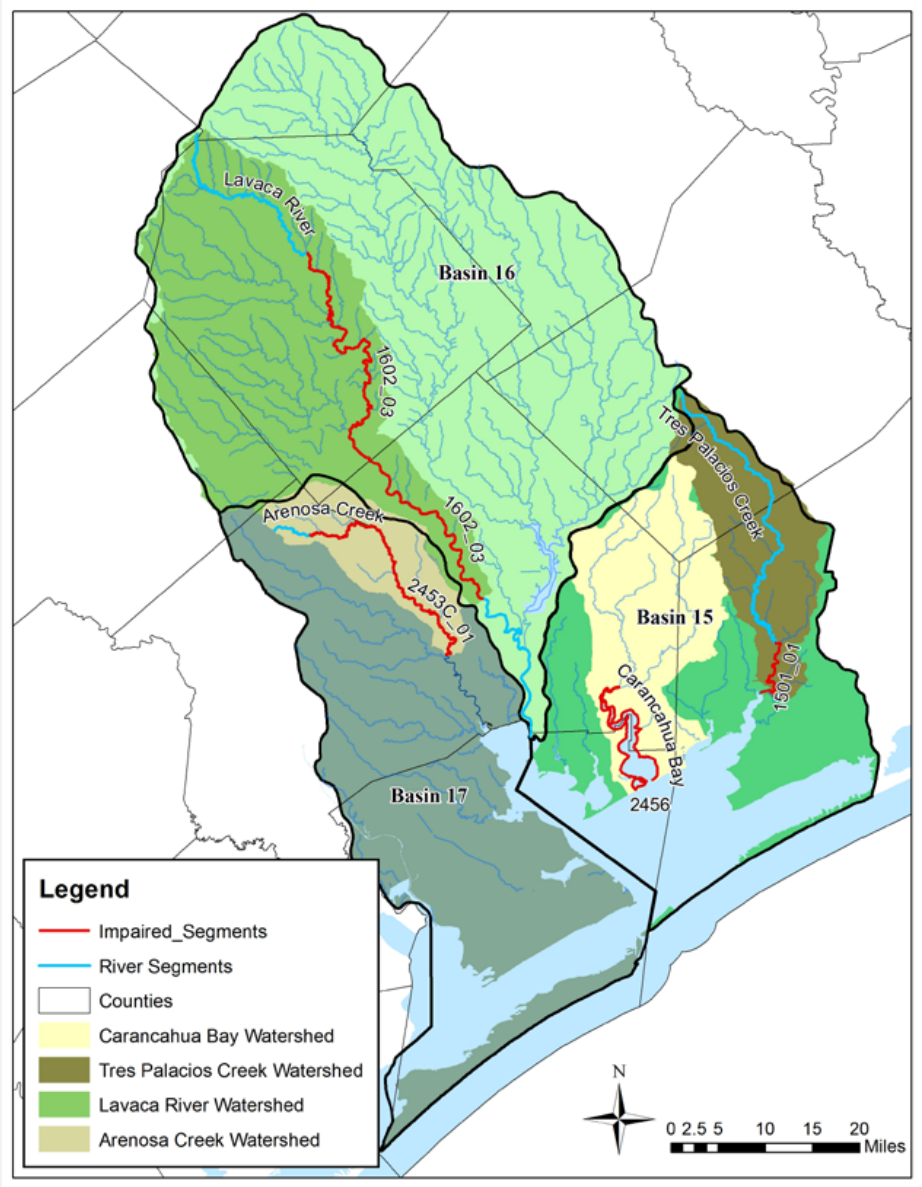
Recap from August Meeting - Enterococcus



https://commons.wikimedia.org/wiki/File:CPSE_Enterococcus2.JPG

- What is it?
  - Bacteria commonly found in the environment, foods, and intestines of people and animals
- Why do we measure it?
  - Indicator of the presence of fecal matter from warm-blooded critters and the potential for pathogen presence
- How does it get into streams?
  - Natural factors
    - Direct deposition from wildlife, runoff transporting wildlife manure to streams, bacteria re-suspended during high flows
  - Human factors
    - Runoff transporting bacteria from pet waste, livestock manure, failing OSSF/septic systems, sanitary sewer overflows
    - Direct loading from permitted dischargers

Recap from August Meeting – Basin Approach



Decision Making Process/ Structure and Ground Rules

Informal Stakeholder Group

Carancahua Bay Watershed Protection Plan

Carancahua Bay TMDL I-Plan

Carancahua Bay TMDL

Consensus Decisions

WATER QUALITY REVIEW

Michael Schramm

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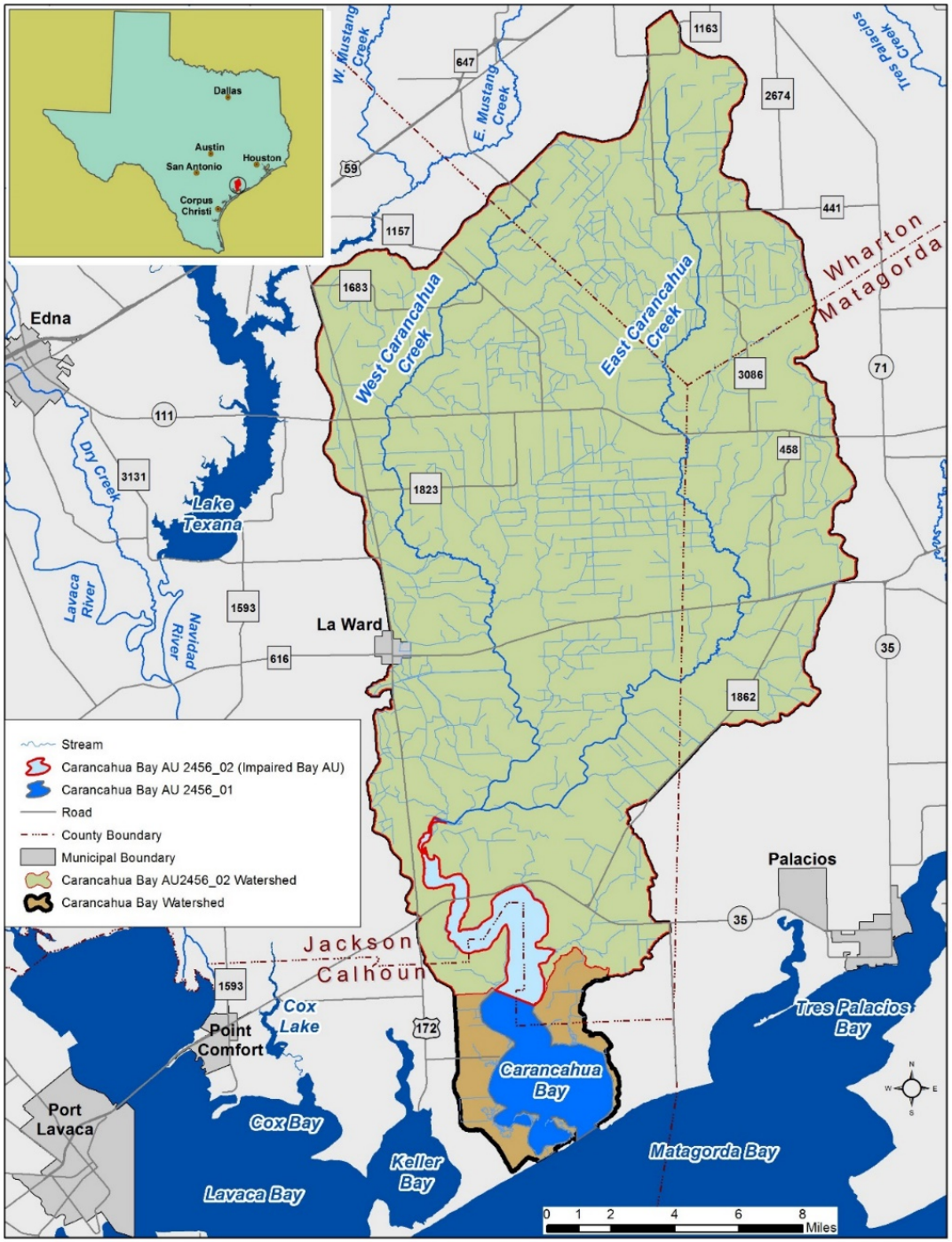
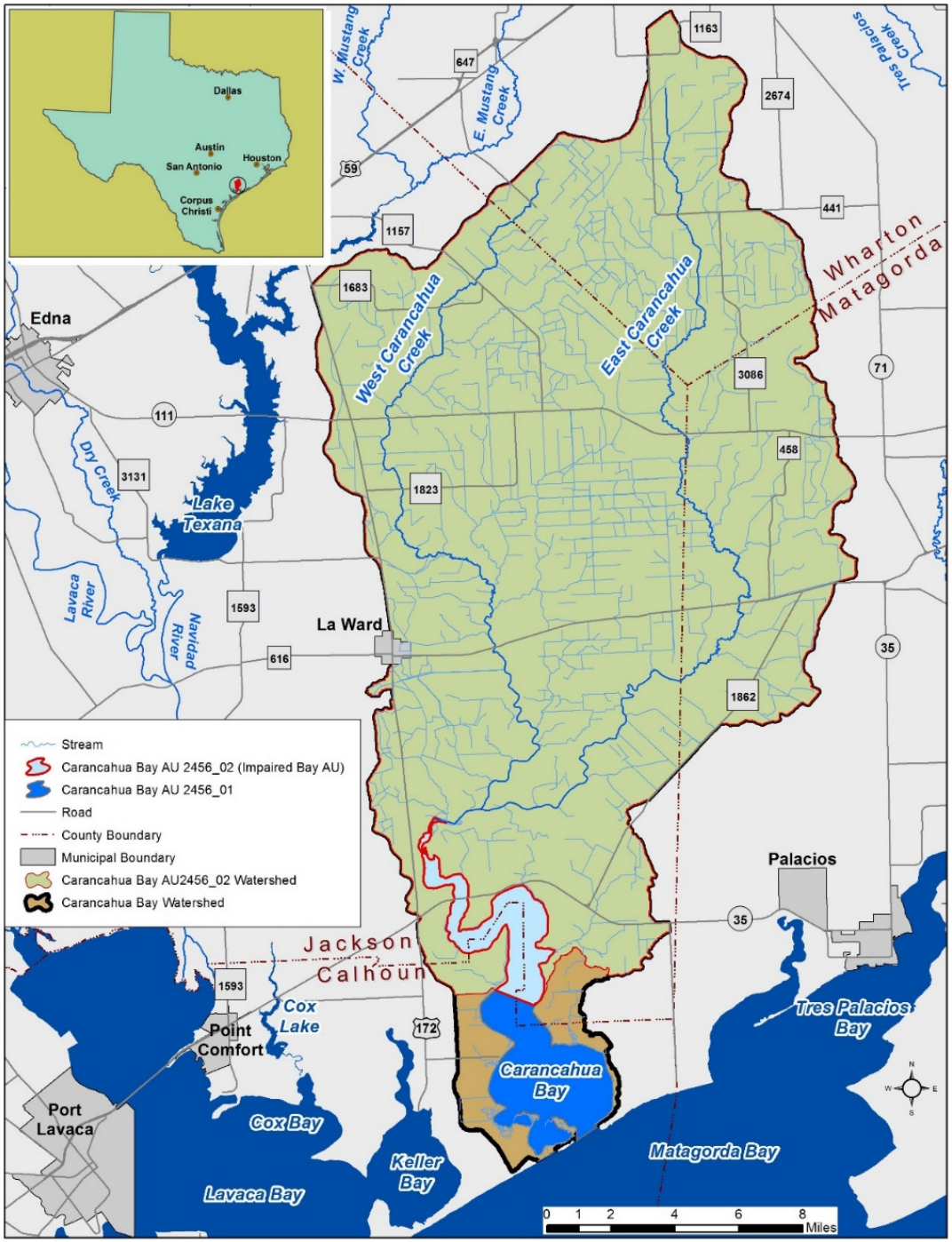


Water Quality Update

- The Carancahua Bay Watershed drains portions of Calhoun, Jackson, Matagorda, and Wharton counties
- Over 320 sq miles

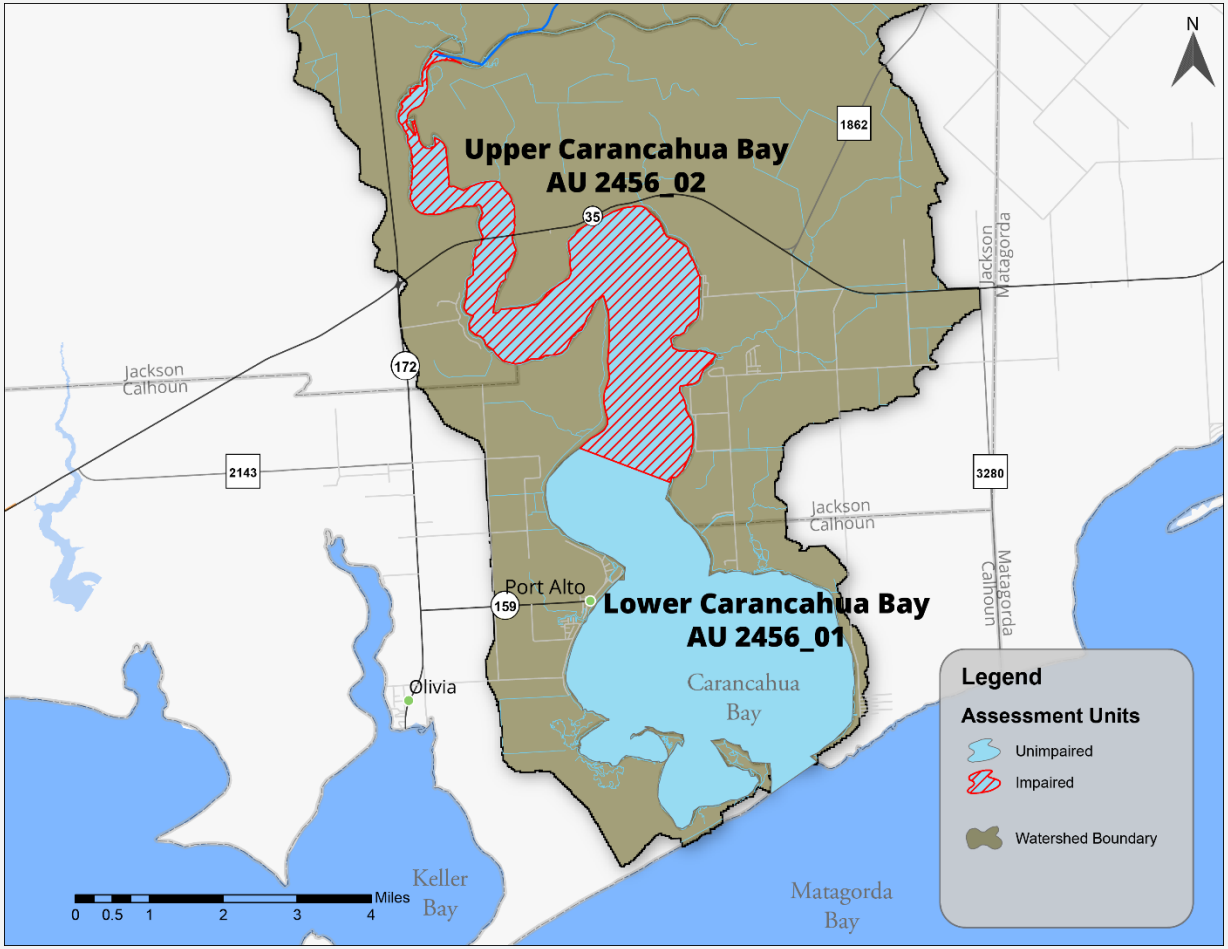


Water Quality Update

- Freshwater inflows primarily from West Carancahua and East Carancahua Creeks

- For assessment purposes, Carancahua Bay is split into **two** hydrologically distinct **assessment units (AUs)**

- Lower Bay = AU 2456_01
- Upper Bay = AU 2456_02



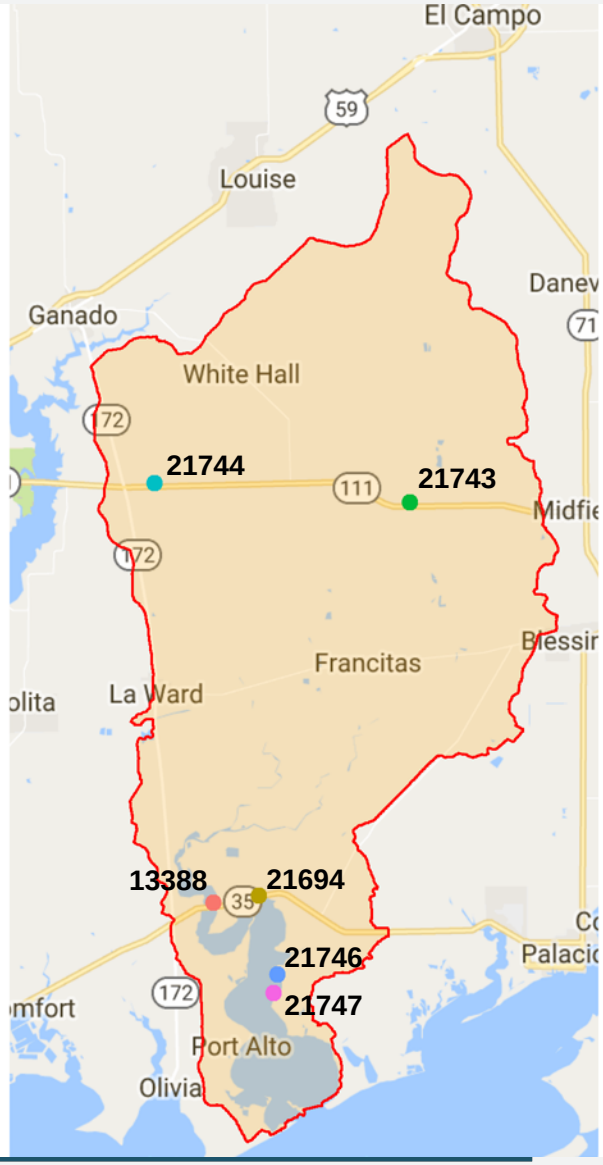
Water Quality Update

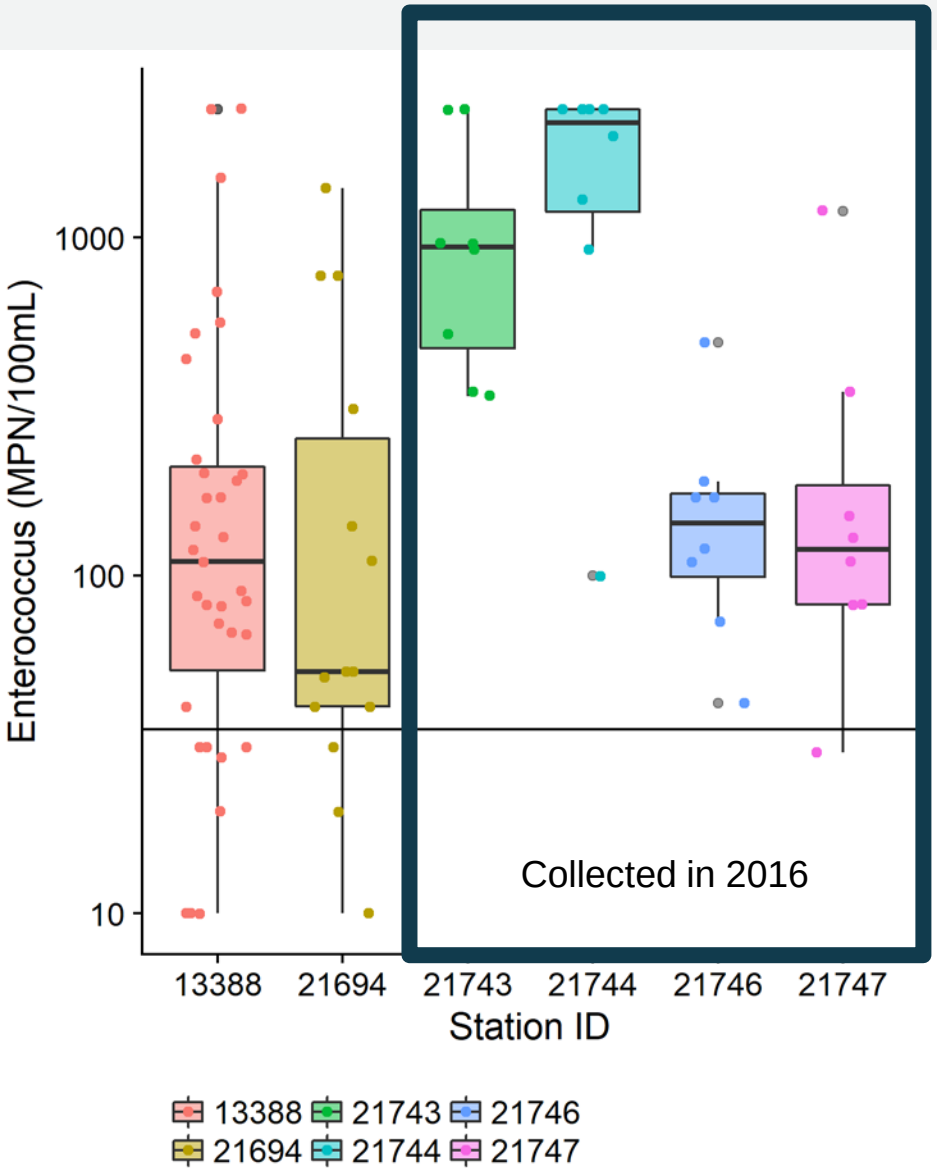
Upper half of Carancahua Bay (AU 2456_02) –

Listed Impaired for Primary Contact Recreation due to elevated Enterococcus levels

Water Body	Assessment Unit	Parameter	Station	Date Range	Samples	Geometric Mean
Carancahua Bay	2456_02	Enterococcus Geomean	13388	12/01/2005 – 11/30/2012	20	123.82

Enterococcus Concentrations 2004-2017

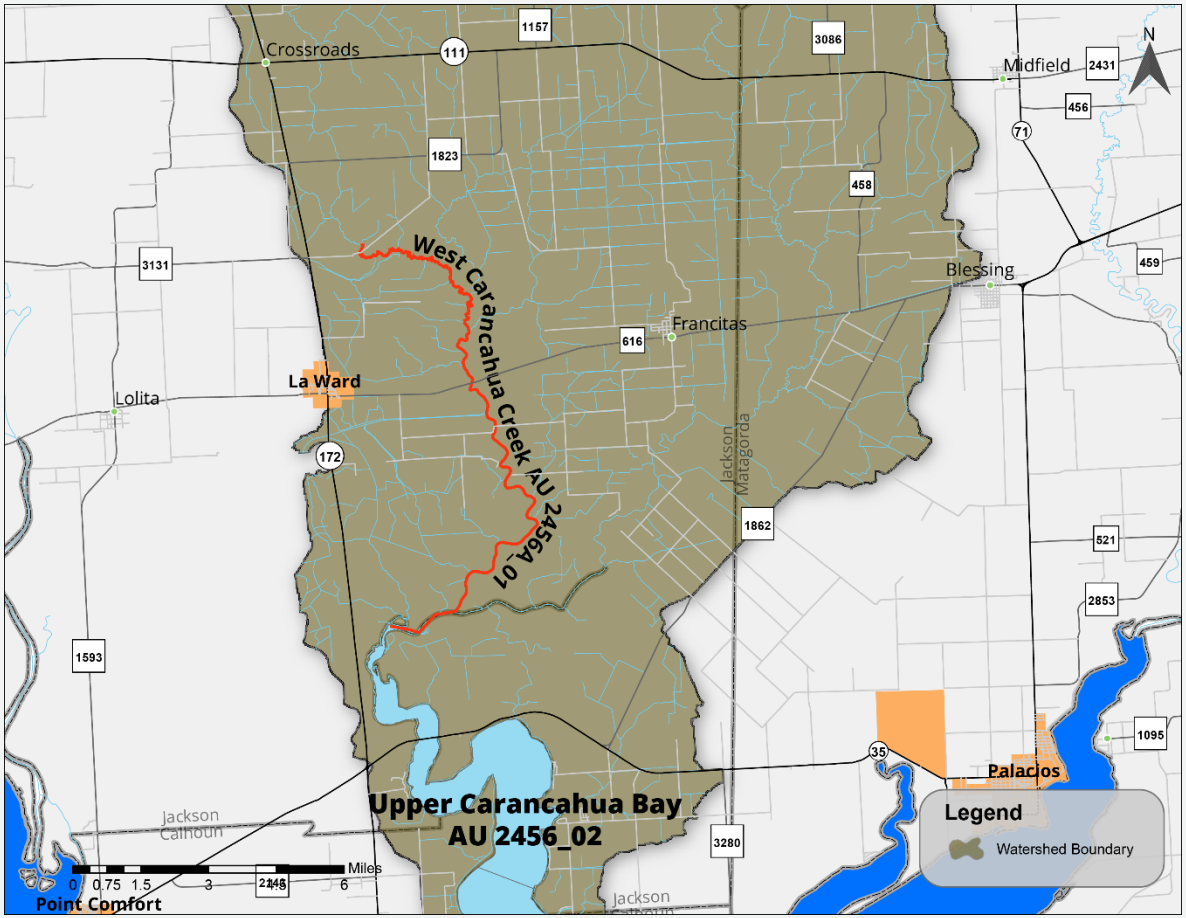




Voluntary methods to reduce bacteria loads

- Best Management Practices (BMPs) that reduce and/or treat runoff from agricultural operations
- Dispose of pet waste
- Manage/reduce feral hog populations
- Ensure septic systems/OSSFs are operating properly

Water Quality Update

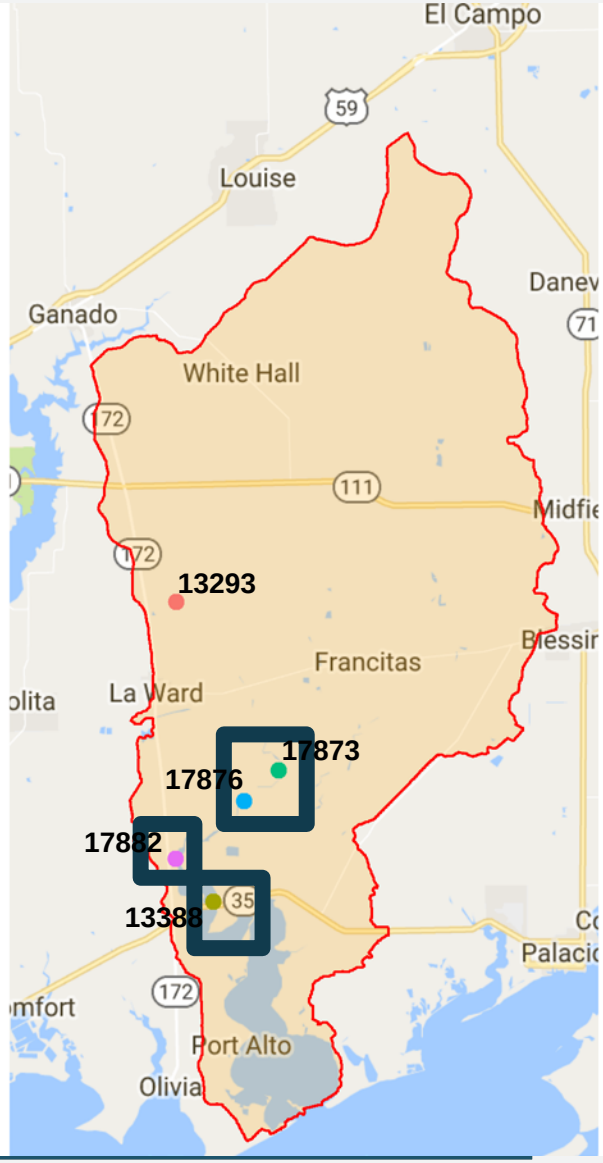


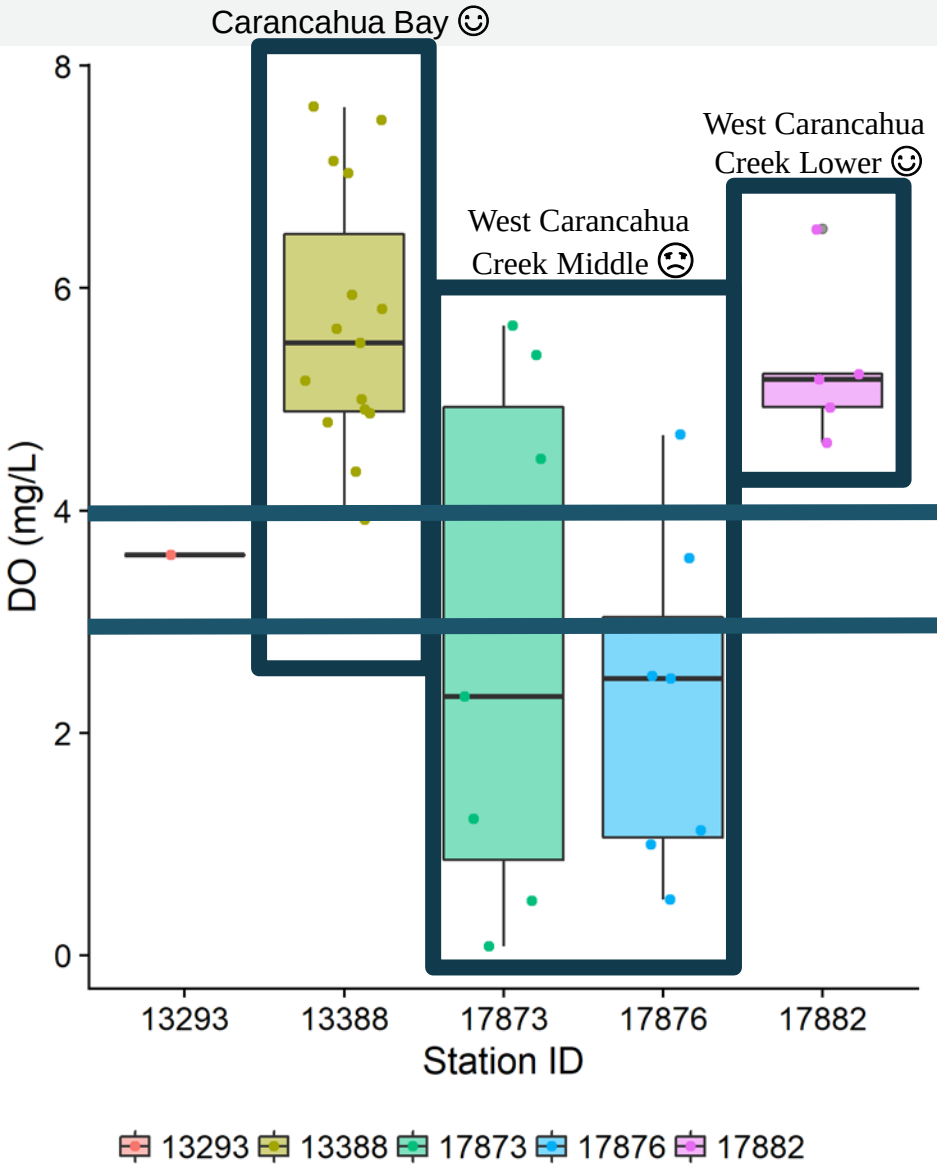
West Carancahua Creek Tidal 2456A_01 –

Listed impaired for depressed dissolved oxygen

Impairment is carried forward from previous assessment due to inadequate data

Minimum 24-hour Dissolved Oxygen 2003-2010





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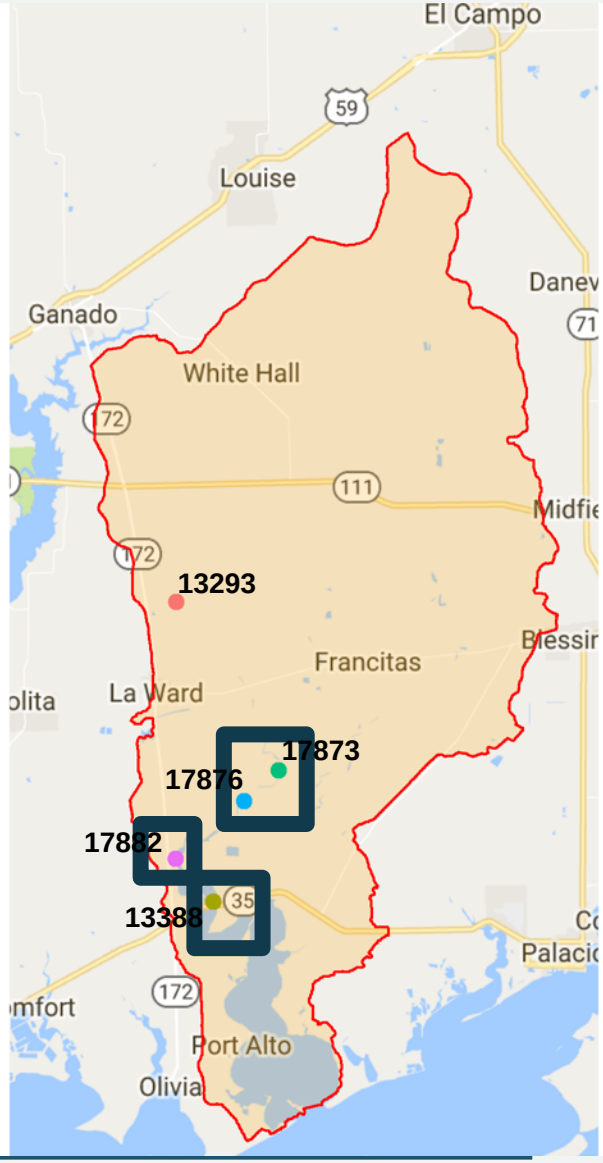
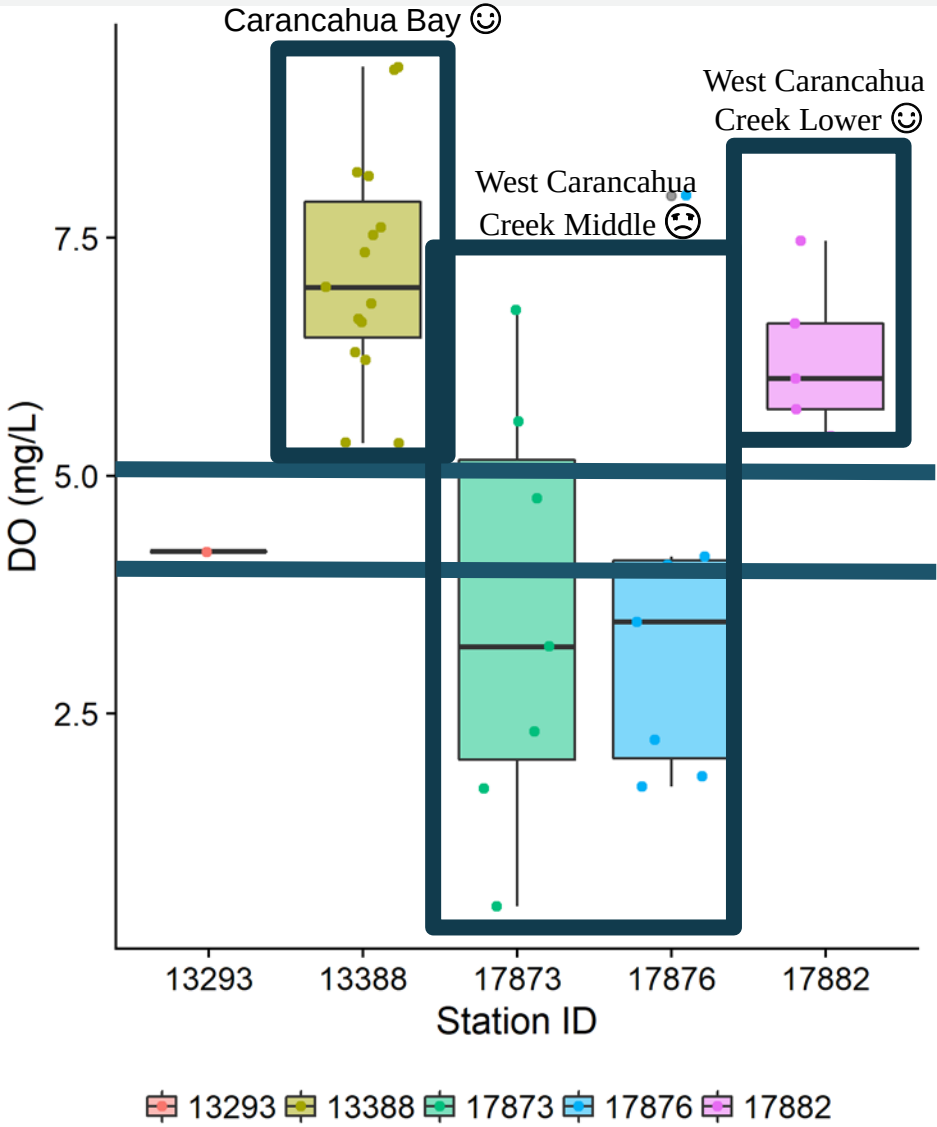
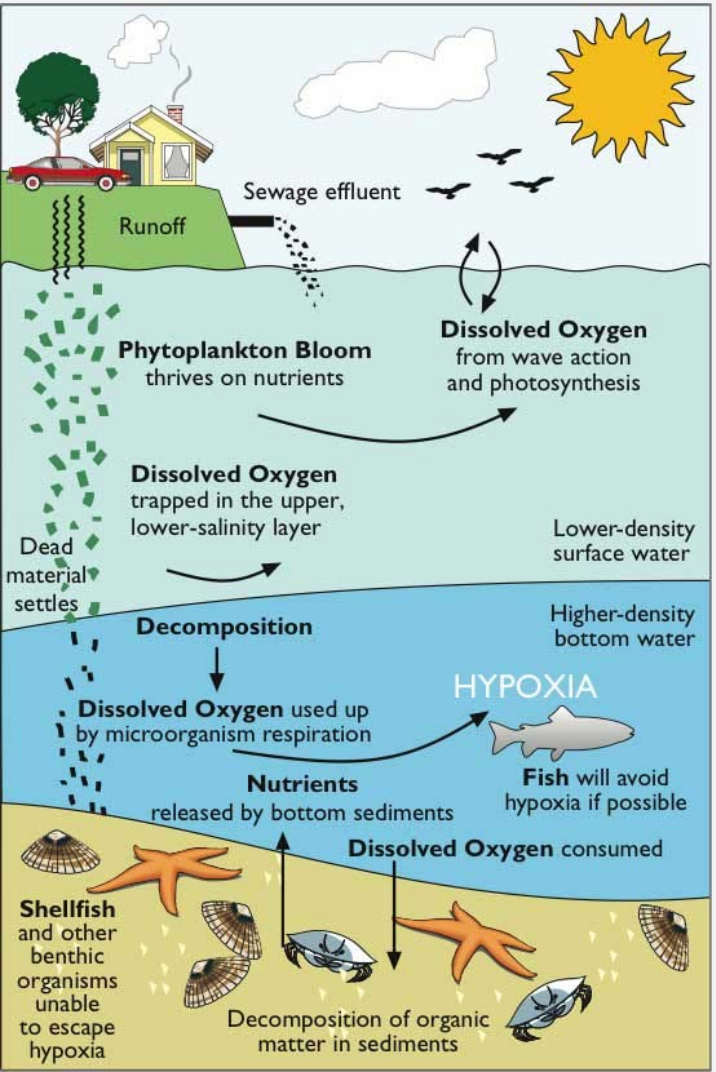
Average 24-hour Dissolved Oxygen 2003-2010





Dissolved Oxygen



- **What is it?**
  - A measure of how much oxygen is dissolved in the water.
- **Why do we measure it?**
  - Organisms living in the stream depend on normal dissolved oxygen levels to survive
- **How do Dissolved Oxygen concentrations degrade?**
  - Daily and seasonal changes due to temperature, sunlight, and vegetation
  - Decreased turbulence and shallower water depth due to low flow
  - Increased organic matter and nutrients reaching waterbodies
  - Removal of riparian habitat, increased stream temps

Figure from: EPA National Coastal Condition Report IV, 2012: https://www.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-report-iv-2012

Voluntary methods to increase Dissolved Oxygen

- Limited information available on underlying causes. Reducing runoff containing sediments, nutrients, and organic matter are likely to help
- Best Management Practices (BMPs) that reduce and/or treat runoff from agricultural operations
- Dispose of pet waste
- Manage/reduce feral hog populations
- Ensure septic systems/OSSFs are operating properly
- Riparian habitat management/restoration

POTENTIAL SOURCE DISCUSSION

Michael Schramm

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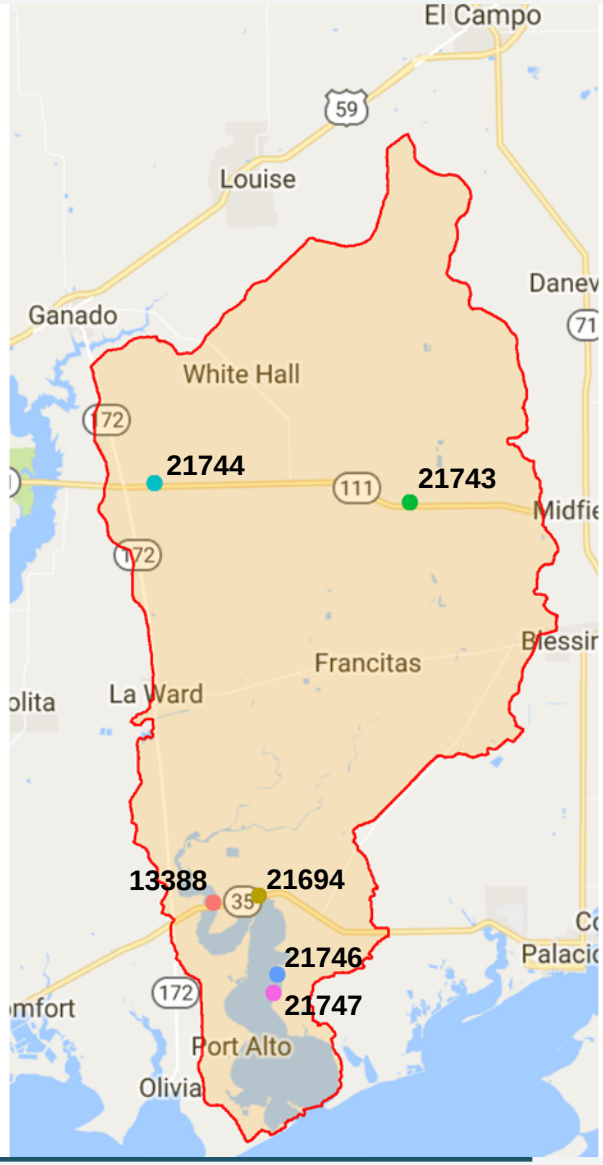
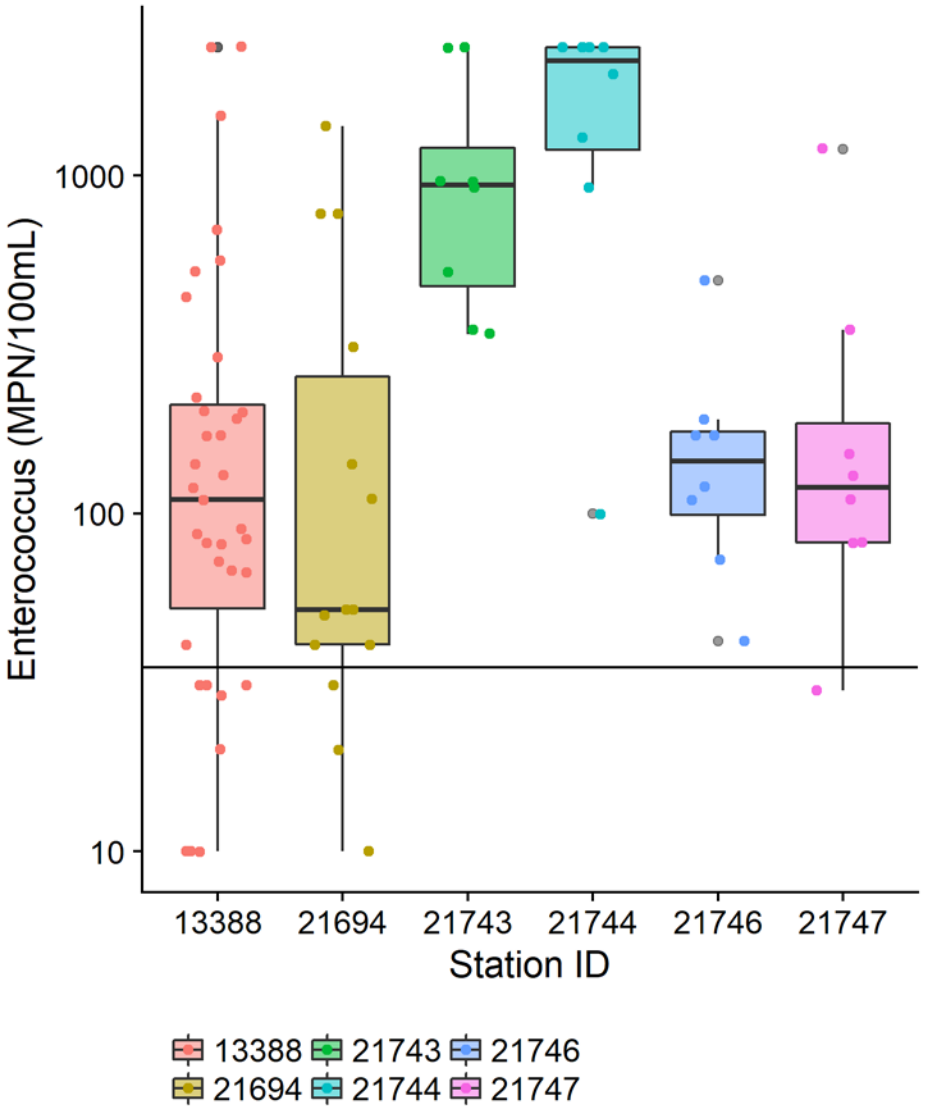
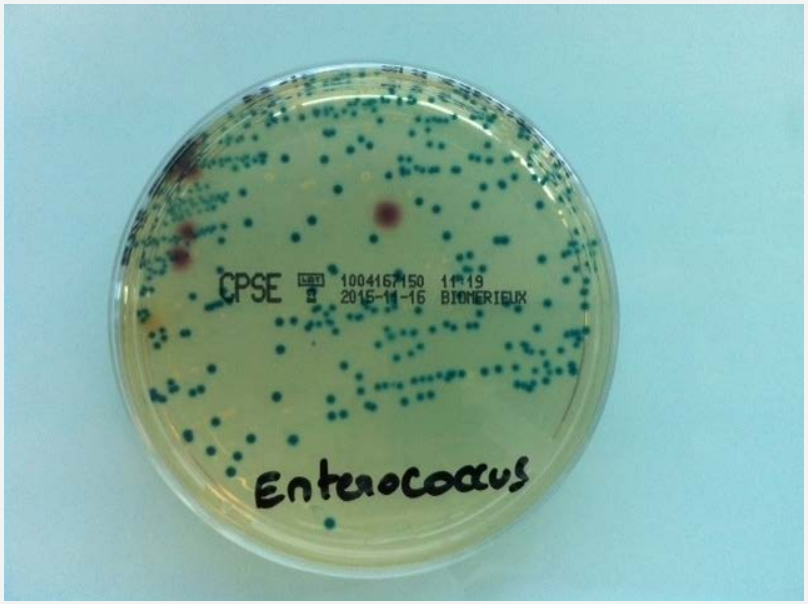
Enterococcus Concentrations 2004-2017





Potential contributors to elevated bacteria



https://commons.wikimedia.org/wiki/File:CPSE_Enterococcus2.JPG

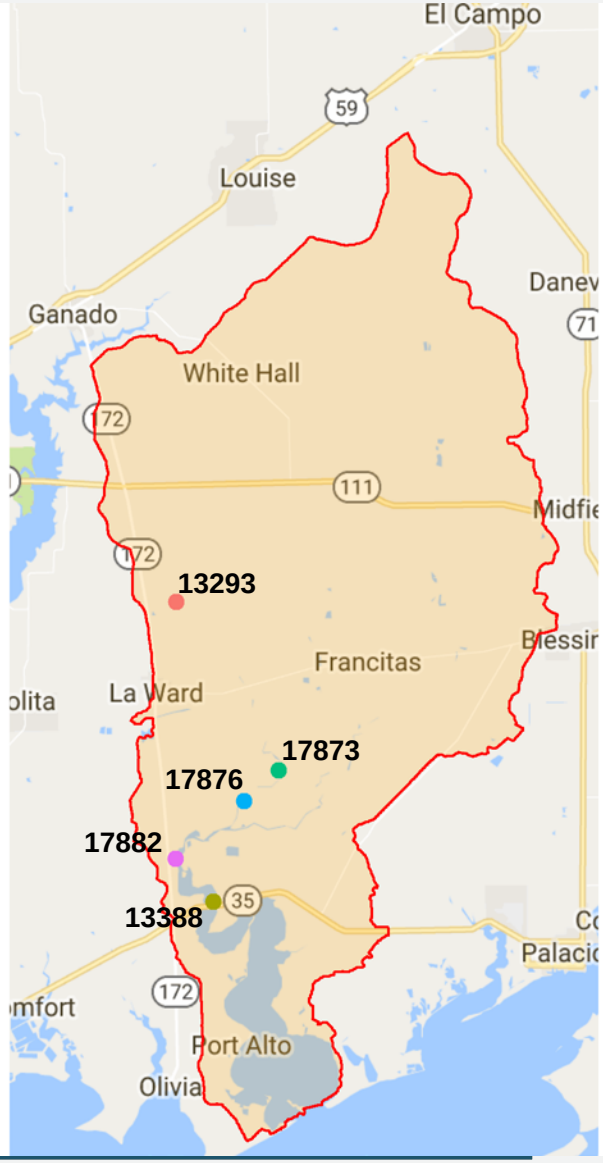
Unregulated

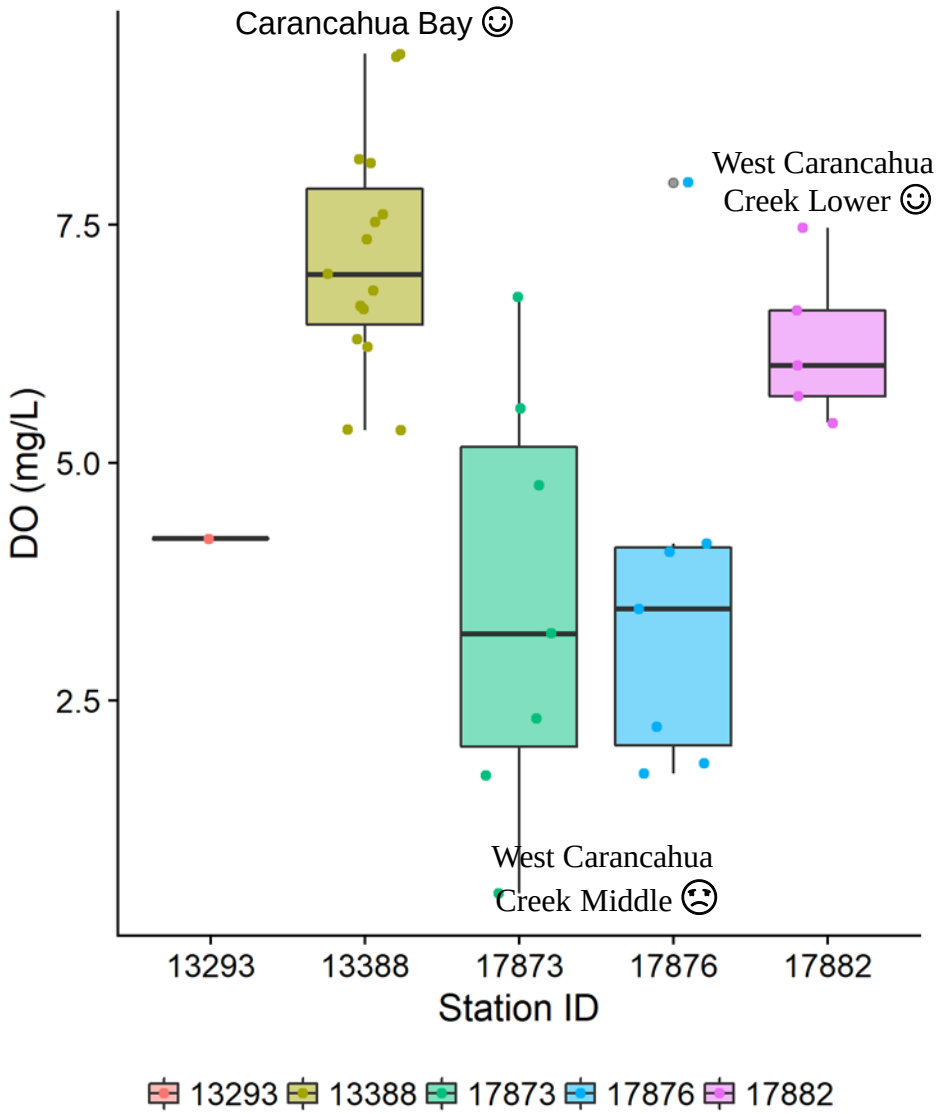
- Runoff from grazed fields and direct deposition from livestock in streams
- Failing septic and on-site sewage facilities (OSSFs)
- Wildlife (whitetail deer; feral hogs)
- Stormwater runoff from impervious surfaces
- Household pet wastes

Regulated

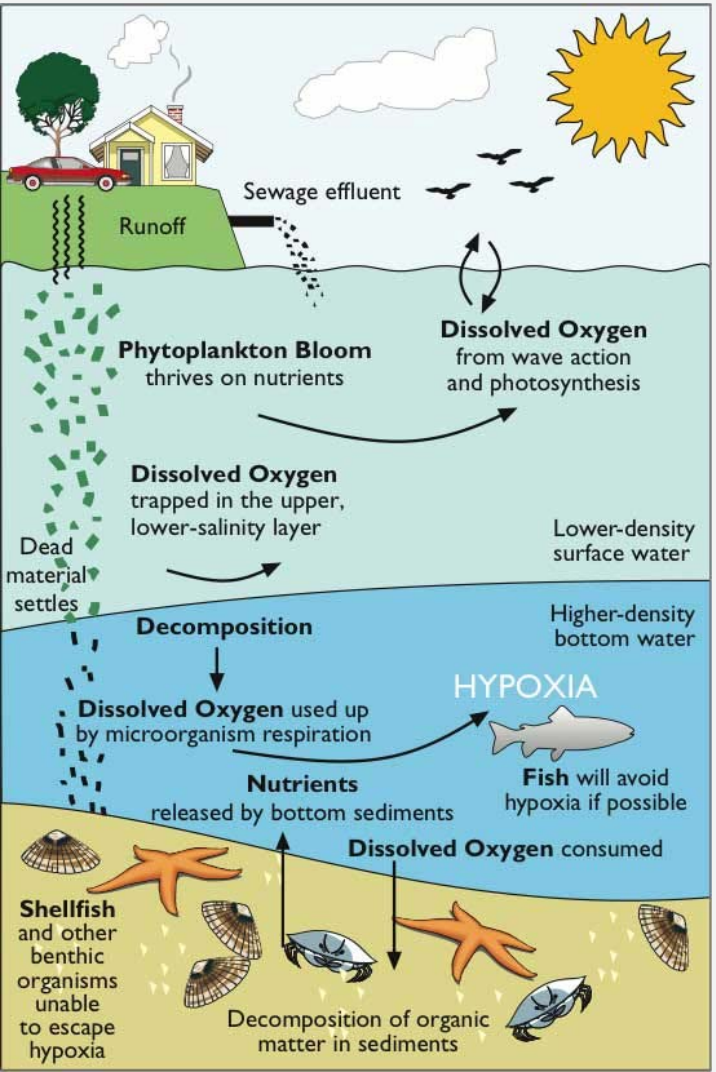
- Wastewater discharges

Average 24-hour Dissolved Oxygen 2003-2010





Potential contributors to depressed DO



Unregulated

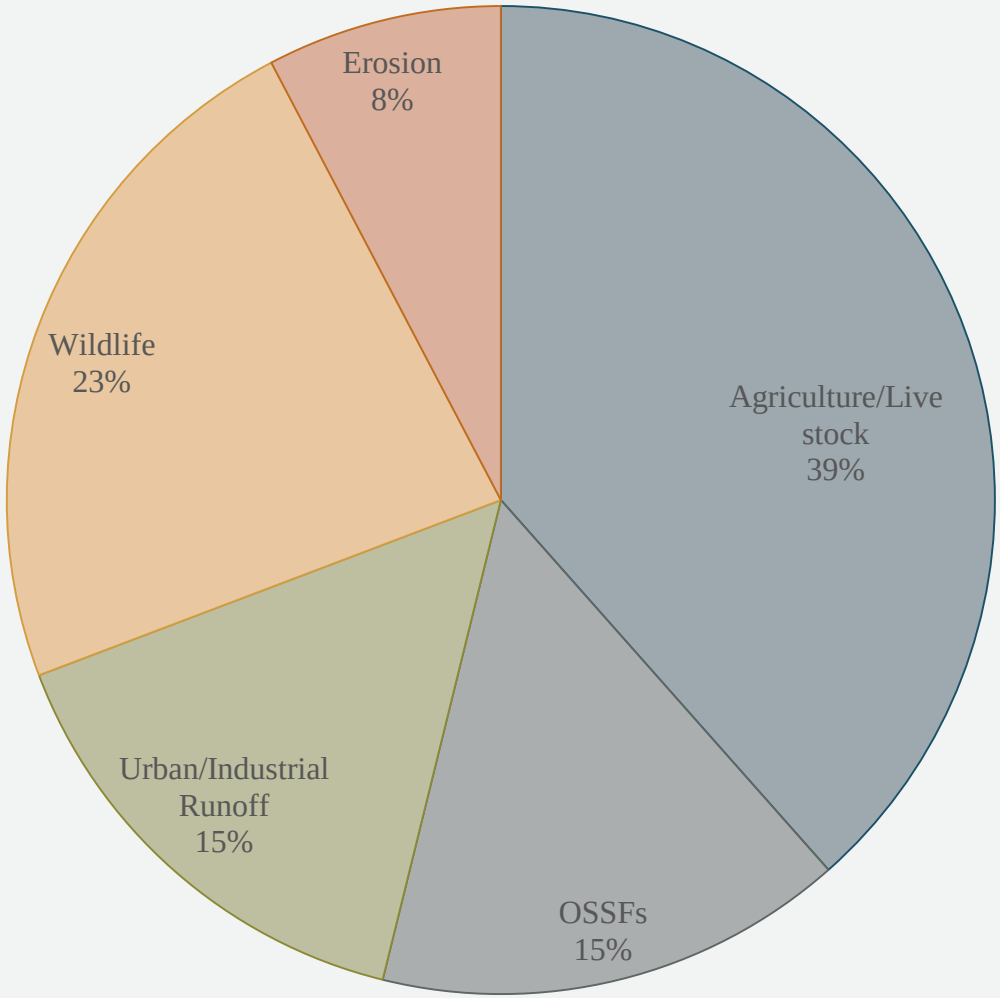
- Agricultural runoff with elevated nutrient and sediment levels
- Failing OSSFs with high nutrients and organic matter
- Stormwater runoff with elevated nutrients, organics and sediments (including pet waste, yard fertilizer, etc.)
- Riparian habitat reduction or damage

Regulated

- Nutrients, DO, and Biological Oxygen Demand (BOD) in discharged wastewater

Figure from: EPA National Coastal Condition Report IV, 2012:
https://www.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-report-iv-2012

Stakeholder Identified Sources and Concerns – Are there any others needed?



Example WPPs

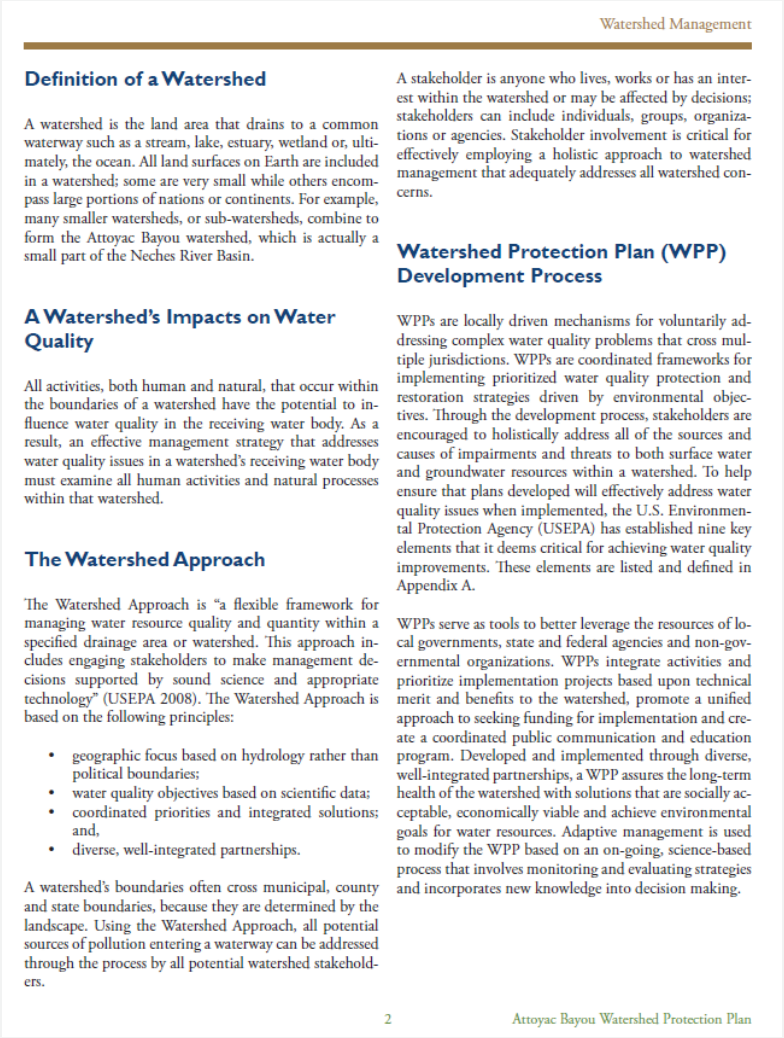
- Navasota River WPP – http://twri.tamu.edu/media/661581/tr-497.pdf
- Attoyac Bayou WPP - http://attoyac.tamu.edu/media/459079/attoyac-bayou-wpp_finalreduced.pdf
- Draft Tres Palacios and Draft Lavaca River Plans provided today
- Nine Elements Handout

WPP Outline

- Executive Summary
- Chapter 1 – Intro to Watershed Management
- Chapter 2 – Description of Watershed Characteristics
- Chapter 3 – Existing Water Quality Conditions and Potential Sources
- Chapter 4 – Pollutant Source Assessment (How much, required reductions, priority areas)
- Chapter 5 – Strategies (How we can improve water quality)
- Chapter 6 – Education and Outreach
- Chapter 7 – Available Resources
- Chapter 8 – Measures of Success

Chapter 1 – Watershed Management

- Watershed definition
- Watersheds and water quality
- Benefits of watershed approach
- Watershed-based planning
- Adaptive management



Definition of a Watershed

A watershed is the land area that drains to a common waterway such as a stream, lake, estuary, wetland or, ultimately, the ocean. All land surfaces on Earth are included in a watershed; some are very small while others encompass large portions of nations or continents. For example, many smaller watersheds, or sub-watersheds, combine to form the Attoyac Bayou watershed, which is actually a small part of the Neches River Basin.

A Watershed's Impacts on Water Quality

All activities, both human and natural, that occur within the boundaries of a watershed have the potential to influence water quality in the receiving water body. As a result, an effective management strategy that addresses water quality issues in a watershed's receiving water body must examine all human activities and natural processes within that watershed.

The Watershed Approach

The Watershed Approach is "a flexible framework for managing water resource quality and quantity within a specified drainage area or watershed. This approach includes engaging stakeholders to make management decisions supported by sound science and appropriate technology" (USEPA 2008). The Watershed Approach is based on the following principles:

- geographic focus based on hydrology rather than political boundaries;
- water quality objectives based on scientific data;
- coordinated priorities and integrated solutions; and,
- diverse, well-integrated partnerships.

A watershed's boundaries often cross municipal, county and state boundaries, because they are determined by the landscape. Using the Watershed Approach, all potential sources of pollution entering a waterway can be addressed through the process by all potential watershed stakeholders.

A stakeholder is anyone who lives, works or has an interest within the watershed or may be affected by decisions; stakeholders can include individuals, groups, organizations or agencies. Stakeholder involvement is critical for effectively employing a holistic approach to watershed management that adequately addresses all watershed concerns.

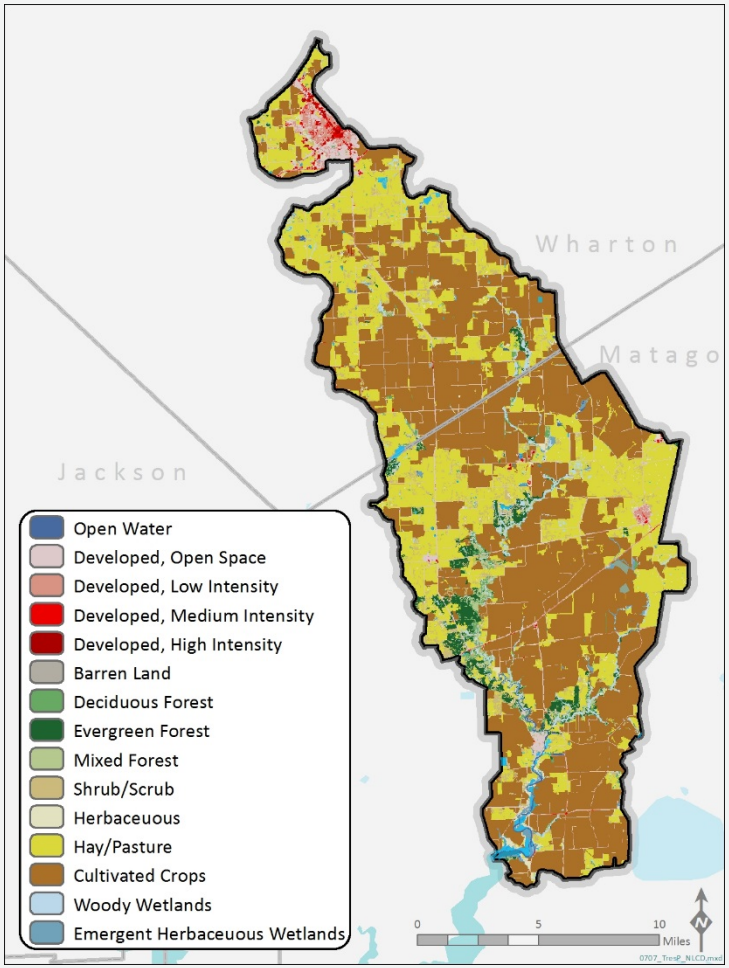
Watershed Protection Plan (WPP) Development Process

WPPs are locally driven mechanisms for voluntarily addressing complex water quality problems that cross multiple jurisdictions. WPPs are coordinated frameworks for implementing prioritized water quality protection and restoration strategies driven by environmental objectives. Through the development process, stakeholders are encouraged to holistically address all of the sources and causes of impairments and threats to both surface water and groundwater resources within a watershed. To help ensure that plans developed will effectively address water quality issues when implemented, the U.S. Environmental Protection Agency (USEPA) has established nine key elements that it deems critical for achieving water quality improvements. These elements are listed and defined in Appendix A.

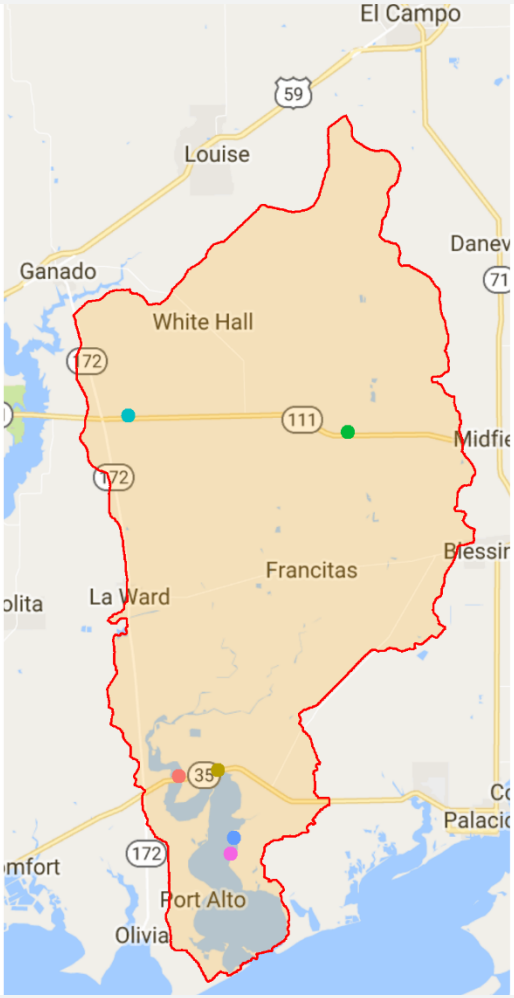
WPPs serve as tools to better leverage the resources of local governments, state and federal agencies and non-governmental organizations. WPPs integrate activities and prioritize implementation projects based upon technical merit and benefits to the watershed, promote a unified approach to seeking funding for implementation and create a coordinated public communication and education program. Developed and implemented through diverse, well-integrated partnerships, a WPP assures the long-term health of the watershed with solutions that are socially acceptable, economically viable and achieve environmental goals for water resources. Adaptive management is used to modify the WPP based on an on-going, science-based process that involves monitoring and evaluating strategies and incorporates new knowledge into decision making.

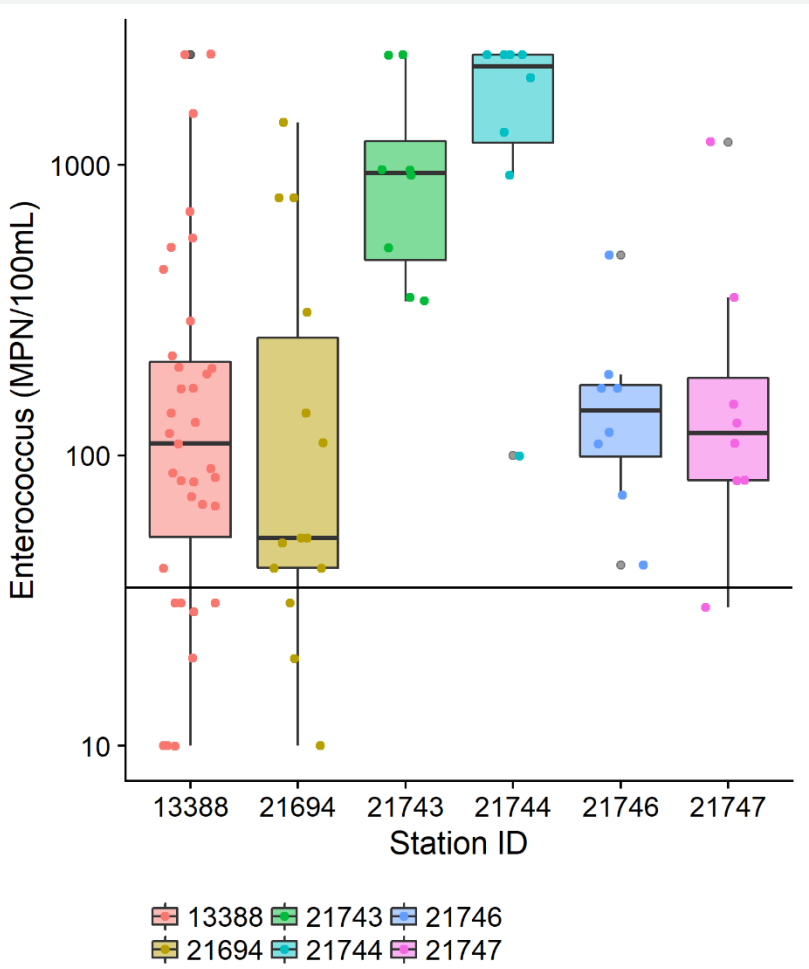
Chapter 2 – Watershed Characterization

- Watershed boundaries
- Topography
- Soils
- Climate
- Ecoregions
- Land Use / Land Cover
- Permitted Discharges
- Surface & Groundwater Resources
- Water quality



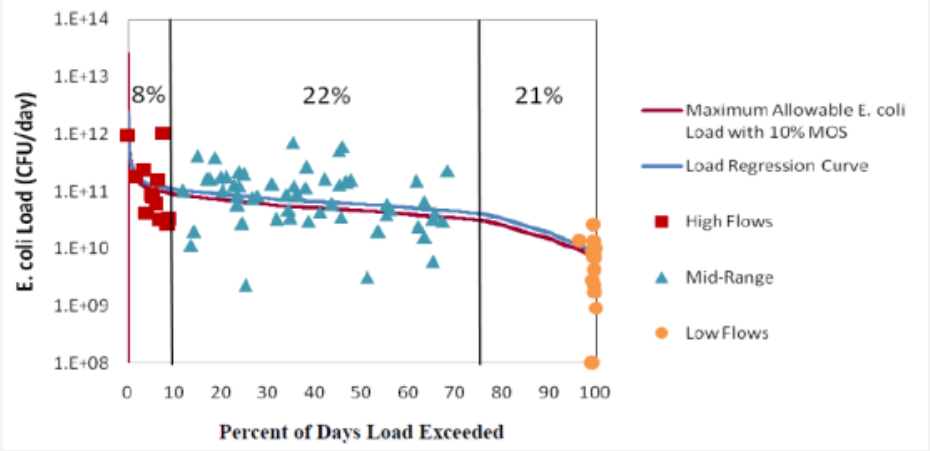
Chapter 3 – Existing Water Quality Conditions





Chapter 4 – Pollutant Sources Assessment

- Estimates of Current Bacteria Sources & Loads
- Estimates of Load Reductions Needed



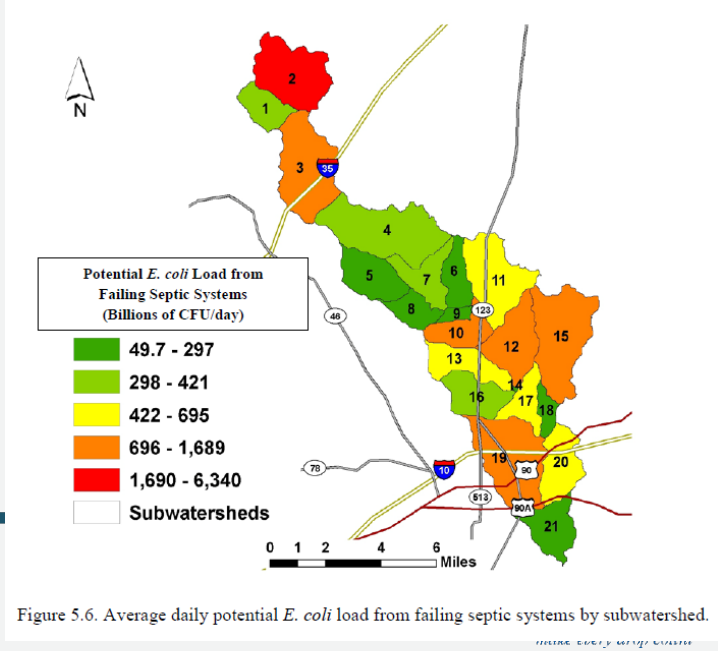


Figure 5.6. Average daily potential *E. coli* load from failing septic systems by subwatershed.

Table 4.2. Mean annual loads, load reductions and target loads for the Haberle Road monitoring station.

Pollutant	Mean Annual Load	Mean Annual Load Reduction	Mean Annual Target Load	Reduction Goal (%)
E. coli (cfu/year)	3.47×10^{13}	9.66×10^{12}	2.51×10^{13}	26
Nitrate-nitrogen (g/year)	6.99×10^{5}	5.92×10^{5}	1.07×10^{5}	85

Chapter 5 – Strategies for Implementation

- Management Measures
  - Wastewater collection & treatment system upgrade
  - Septic system inspection, repair, replacement
  - Feral Hog Control
  - NRCS & TSSWCB conservation plans
- Education & Outreach

Table 8.1. Jurisdiction, implementation milestones, and estimated financial cost for management measures.

Management Measure	Jurisdiction	Unit Cost	Number Implemented Year 1-3	Number Implemented Year 4-6	Number Implemented Year 7-10	Total Cost
Urban Stormwater Management Measures						
Pet Waste Collection Stations	City of New Braunfels	$620/station $85 annual/station	6	3	3	$14,325
Pet Waste Collection Stations	City of Seguin	$620/station $85 annual/station	5	2	2	$10,935
Initiate Spay/Neuter Program	City of New Braunfels	$35,000	1	---	---	$35,000

Chapter 6 – Education and Outreach

- Watershed Coordinator
- Public Meetings
- Future stakeholder engagement
- Education programs
  - Feral hog management workshop
  - Lone star healthy streams
  - Newsletters and news releases

Local stakeholders at the Watershed Stewards Workshop in Edna, TX

Photo courtesy of Michael Kuitu, AgriLife Extension

Chapter 7 – Financial and Technical Resources

Technical Assistance	
Management Measure	Potential Sources
MM1 : Promote and implement WQMPs or Conservation Plans	TSSWCB; local SWCDs; NRCS; AgriLife Extension
MM2: Promote technical and direct operational assistance to landowners for feral hog control	AgriLife Extension; TPWD; NRCS; TSSWCB
MM3: Identify and repair or replace failing on-site sewage systems	Lavaca County Designated Representative, Jackson County Office of Permitting; AgriLife Extension
MM4: Increase proper pet waste management	City public works departments; AgriLife Extension
MM5: Implement and expand urban and impervious surface stormwater runoff management	City public works departments; engineering firms; AgriLife Extension
MM6: Address inflow and infiltration	City public works departments; engineering firms, TCEQ
MM7: Reduce illicit dumping	AgriLife Extension; County law enforcement; TPWD game wardens

- Table with listed sources for each MM
- Paragraph description on following pages

Chapter 8 – Measures of Success

- Water Quality goals
- Interim and long term milestones

Station (s)	Segment	Current Concentration†	5 yrs after implementation†	10 yrs after implementation†
12424	Lavaca River Above Tidal	295	211	126
18190	Rocky Creek	222	174	126
† in units of MPN E. coli/100mL				

Chapter 8 Continued

Management Measure	Responsible Party	Unit Cost	Implementation Goals (years after implementation begins)†										Total Cost
			1	2	3	4	5	6	7	8	9	10	
Livestock													
Hire WQMP field technician	TSSWCB, SWCDs	$75,000/yr	1										
Develop 100 WQMPs/Conservations Plans	TSSWCB, SWCDs, NRCS	$15,000	20			40		60		80		100	$1,500,000
Feral Hogs													
Repair/replace faulty OSSFs	Homeowner	$8,000				10		20		30		40	$320,000
Pet Waste													
Install and maintain pet waste stations	Cities	$500 for stations plus $100 per year per station				2		3		4		5	$4,400
† number of measures are cumulative													

Needed input going forward

- Stocking Rates
  - Livestock stocking rates – Improved and Native Pastures
  - Expected Feral Hog Density
- Wastewater/OSSF
  - Meetings with operators and county health department and designated reps
- Other stakeholder water quality concerns
  - Let us know!

Next meeting

- Present a detailed watershed characterization – we will be looking for feedback on how accurate these are
- Draft Chapters for your review and approval
- What workgroups, if any are needed?

NEXT STEPS AND NEEDED INPUT

Timeline

1. Stakeholder meetings and plan development through June 2018
   - 4-7 meetings as needed/requested
2. June 2018 – Submit draft TMDL/I-Plan and Watershed Protection Plan to TCEQ for review
3. August 2018-August 2019 – TCEQ/EPA review of Watershed Protection Plan; TCEQ review of TMDL/I-Plan
4. August 2019 – Begin Implementation

Future Education Programs

- Texas Watershed Stewards – likely in Palacios in February 2018
- Septic System Maintenance – Spring/Summer 2018

Thank You!

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