

Cotton Bayou Watershed Total Maximum Daily Load Development

Virtual Public Meeting
August 23, 2022



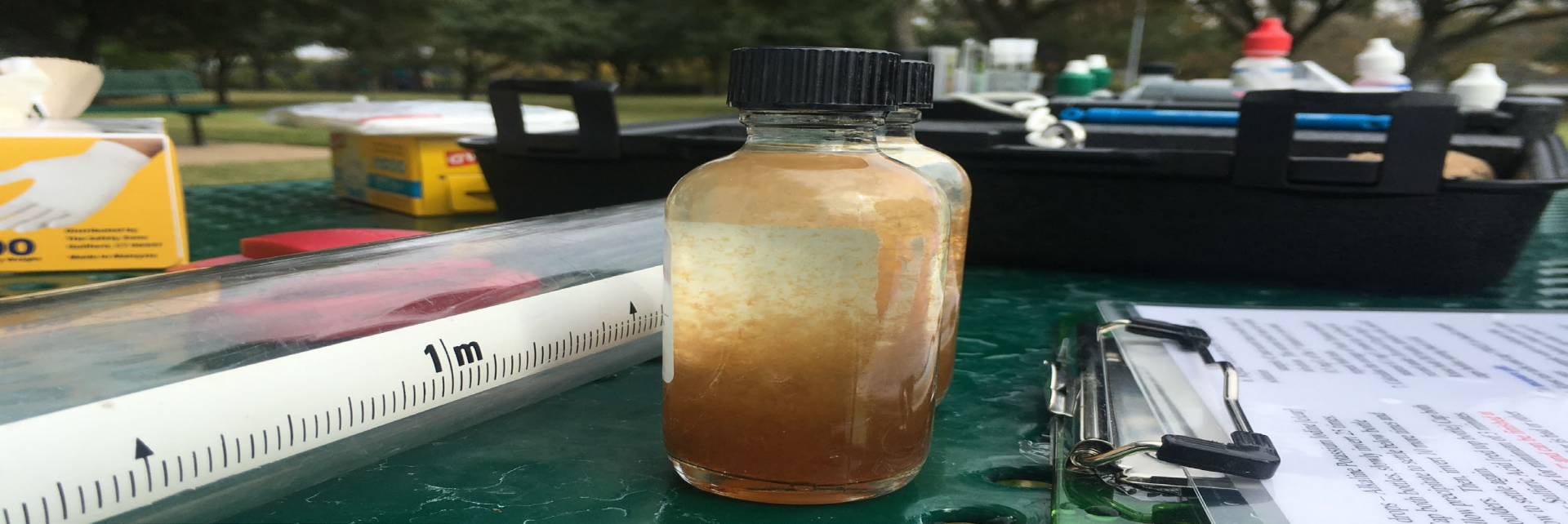
TEXAS STREAM TEAM CITIZEN SCIENTIST WATER QUALITY MONITORING

Dedicated to understanding and protecting the 191,000 miles of Texas waterways



THE MEADOWS CENTER
FOR WATER AND THE ENVIRONMENT

TEXAS STREAM TEAM



MISSION:

To facilitate environmental stewardship by empowering a statewide network of concerned citizen scientists, partners, and institutions in a collaborative effort to promote a healthy and safe environment through environmental education, data collection, and community action.

TCEQ-Approved
Quality Assurance
Project Plan

3 Phases
Of monitoring
training

2 Year
Commitment to
monitor monthly

CORE WATER QUALITY PARAMETERS

- Field Observations
- Temperature (Air & Water)
- Water Transparency/
Water Clarity
- Depth
- Conductivity or Salinity
- Dissolved Oxygen
- pH



THREE-PHASE TRAINING



Phase I – Classroom

Orientation, Demonstration, Practice



Phase II – Group Field Training

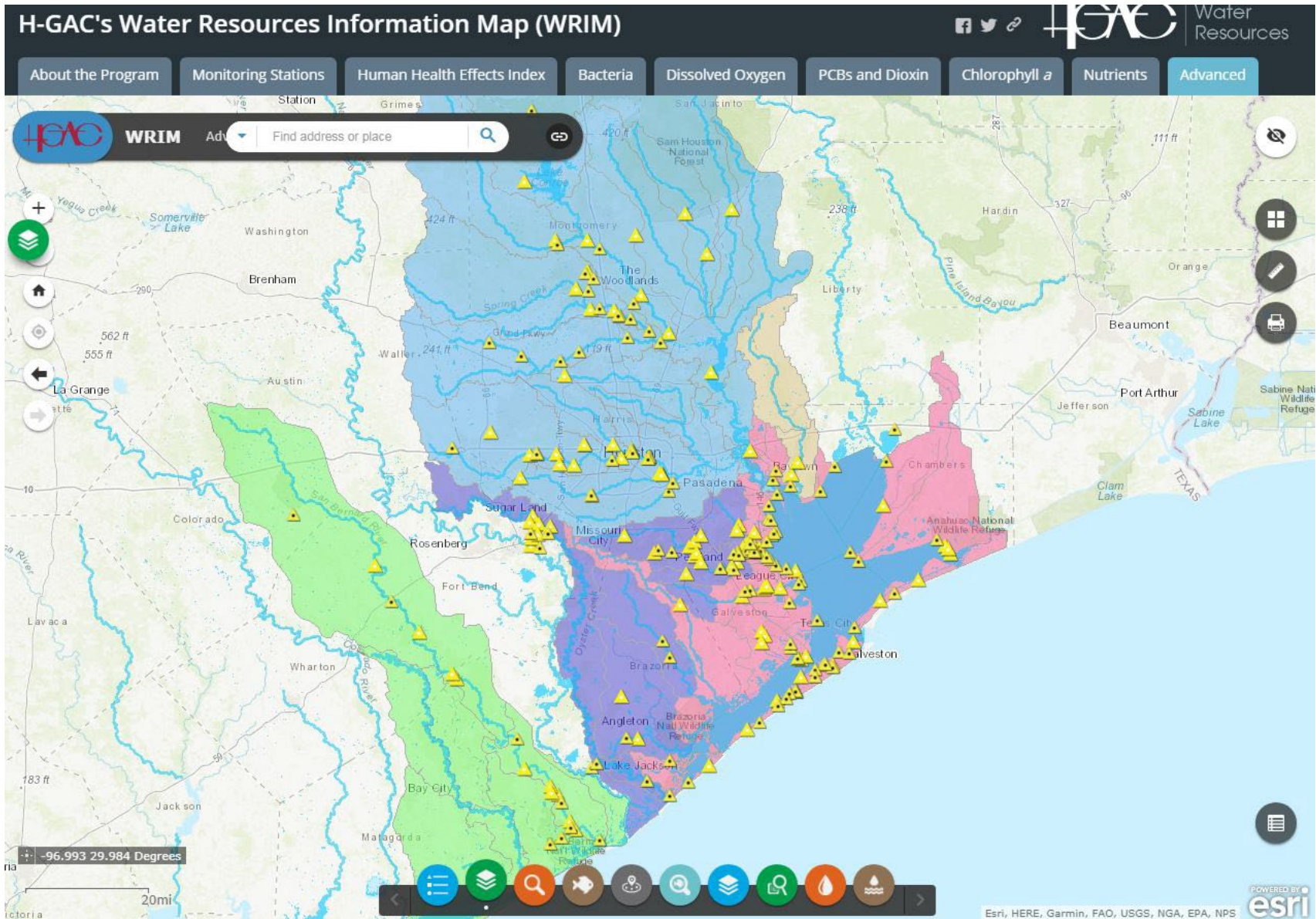
Individual Testing, Focus on Field Observations, with assistance from trainers



Phase III – Site Visit

Conduct measurements without assistance and compare results to trainers

H-GAC'S WATER RESOURCES INFORMATION MAP (WRIM)



Meeting Outline



- **Introductions**
- *Project Overview & Updates*
- *Bacteria Source Estimates*
- *Next Steps*
- *Discussion*

Introductions



**Texas Commission on
Environmental Quality (TCEQ)**
lead state environmental management agency



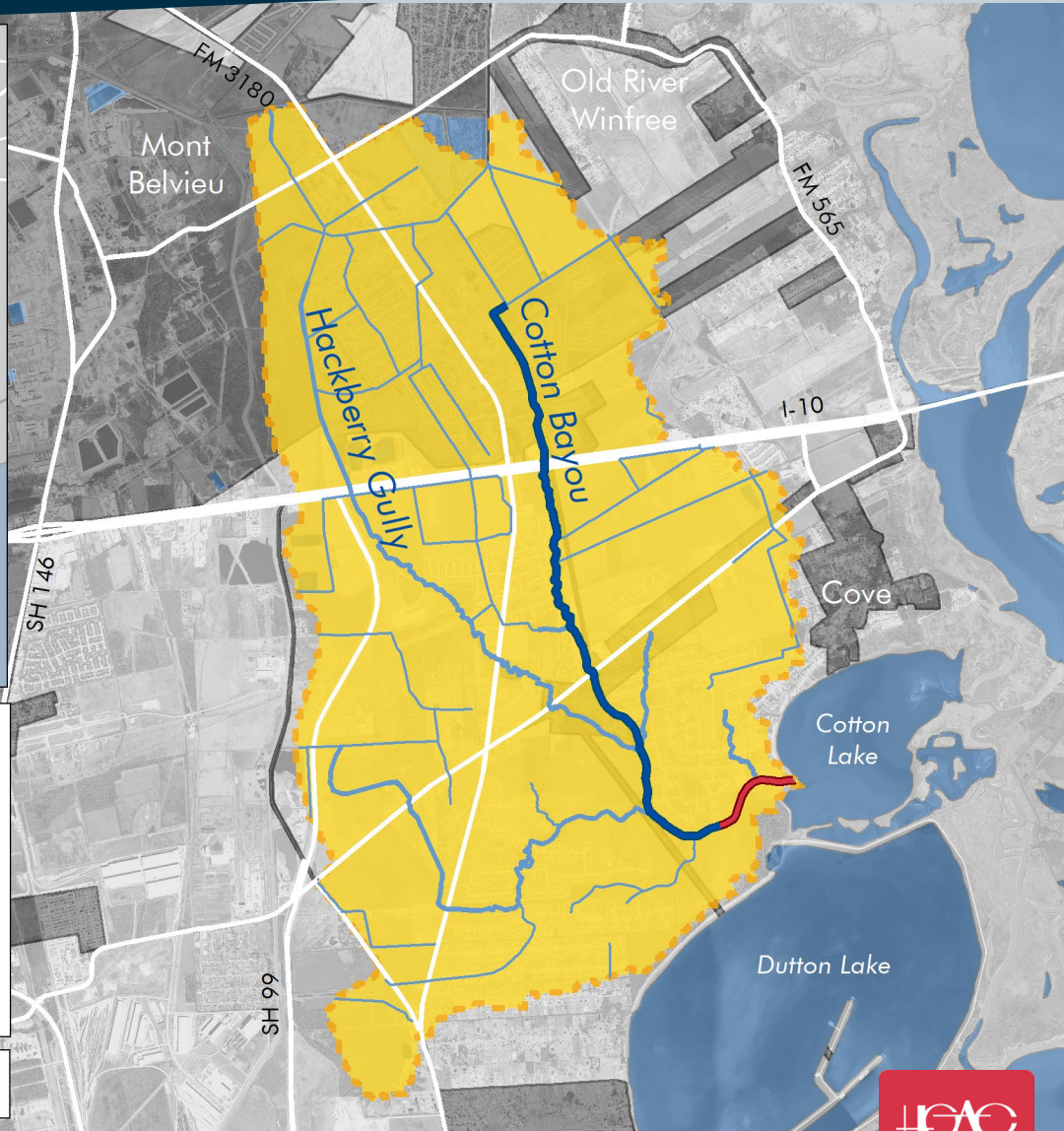
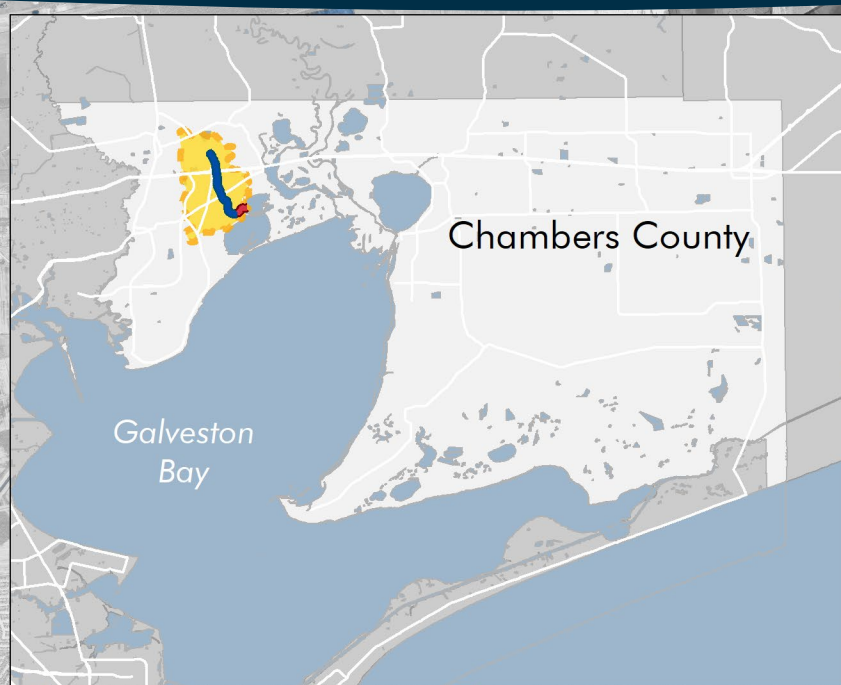
Houston-Galveston Area Council (H-GAC)
regional council of governments

Meeting Outline



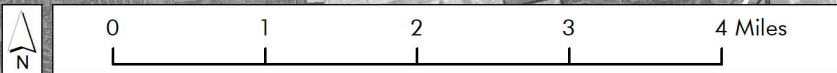
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Watershed Area



Legend

- Cotton Bayou
- AU 0801E_01
- Impaired AU 0801C_01
- Cotton Bayou Watershed
- Stream Network
- Major Roadways
- City Boundaries



Water Quality

- Contact recreation use **impaired** due to high levels of fecal indicator bacteria (Enterococci) in surface water
- Other water quality **concerns** include low dissolved oxygen and high concentrations of nutrients
- This project is focused on characterizing sources of fecal indicator bacteria to determine a **Total Maximum Daily Load (TMDL)** for the impaired water body



Bacteria Sources



■ Human Waste

- Wastewater
- Septic/Aerobic Systems
- Illicit Sewage

■ Domestic Animal Waste

- Pets
- Livestock

■ Wildlife/Feral Hog Waste

- Deer and Other Wildlife
- Feral Hogs

Watershed Analysis

- Technical Support Document being reviewed
- Developed Total Maximum Daily Load (TMDL) calculations



TMDL Calculations

- The TMDL is a calculation of the criterion load at the 95th percentile of flows
- The TMDL includes allocations for regulated and unregulated sources of pollution, future growth, and a 5% margin of safety by calculating the following components:

$$\text{TMDL} = \text{MOS} + \text{WLA}_{\text{wwtf}} + \text{WLA}_{\text{sw}} + \text{LA}$$

Margin of Safety (MOS)

5% of the allowable load at 95th percentile of flows

Wasteload Allocation for WWTFs (WLA_{wwtf})

regulated wastewater treatment facility load; includes allocation for future growth

Wasteload Allocation for Stormwater (WLA_{sw})

regulated stormwater load

Load Allocation:

unregulated source load

Cotton Bayou TMDL

Assessment Unit	Total Allowable Load	Margin of Safety	Wastewater Allocation	Stormwater Allocation	Other Sources
Assessment Unit	TMDL	MOS	WLA _{wwtf} (includes future growth)	WLA _{sw}	LA
0801C_01	89.17	4.46	15.25	24.39	45.07

* Units for all values = billion cfu/day of Enterococci *

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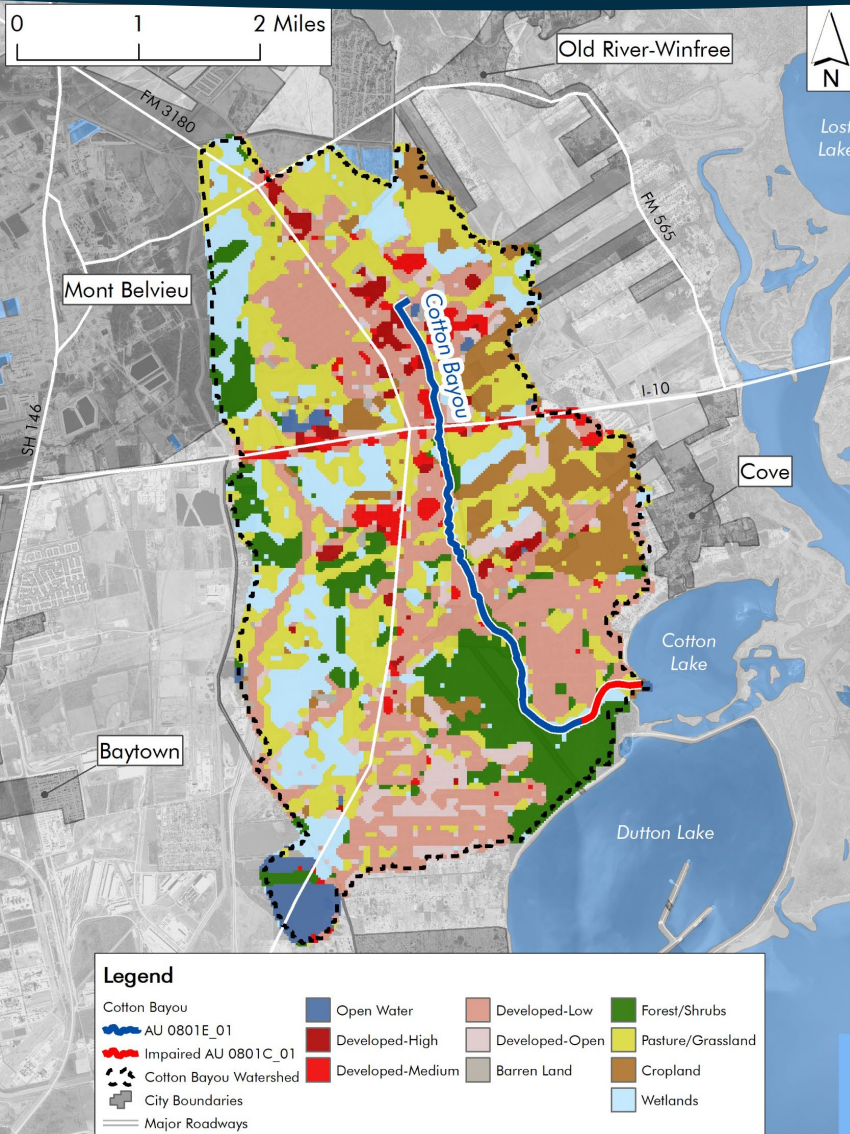
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Estimating Bacteria Loads

- Most current sources used (2017 or newer)
- No fate and transport considered
- No ground truthing
- No adjustments made for proximity to waterway
- No wildlife estimates beyond deer and invasive feral hogs



Land Cover



- Based on 2018 imagery
- 10 classes
- Used to estimate livestock, deer, and feral hogs based on appropriate land cover

On-Site Sewage Facilities

Subwatershed	Total Systems	Failing OSSFs (12% Rate)	Representative Load (billion cfu/day)	OSSF Load (billion cfu/day)
Above Tidal (0801E)	684	82	3.71	304.22
Tidal (0801C)	105	13	3.71	48.23
Total	789	95	--	352.45

- 2021 permit data combined with estimate of unpermitted systems outside service area boundaries
- Assumed 12% failure rate
- Assumed daily bacteria load from 2.8 person household

Sanitary Sewer Overflows

Subwatershed	Total Events		Total Volume (gallons/ 4 years)	Total Volume (100 mL/ day)	Representative Load (billion cfu/100 mL)	SSO Load (billion cfu/day)
	Dilute	Other				
Above Tidal (0801E)	Dilute	5	2,921.20	75.74	0.00005	0.00379
	Other	4	2,270.0	58.86	0.01	0.58860
Tidal (0801C)	Dilute	0	0	0	0.00005	0
	Other	0	0	0	0.01	0
Total (All)	9		5,191.20	134.60	--	0.59239

- Events reported from 2016 to 2019
- Used EPA 2004 assumption for dilute (rainfall) loads vs. loads from other causes
- No SSOs in tidal subwatershed

Dogs

Subwatershed	Estimated Households	Dog Population	Representative Load (billion cfu/day)	Dog Load (billion cfu/day)
Above Tidal (0801E)	2,819	1,731	2.50	4,327.50
Tidal (0801C)	218	134	2.50	335.00
Total	3,037	1,865	--	4,662.50

- Assumed AVMA 2018 estimate of 0.6 dogs/household
- No additional estimate for feral dogs or cats

Livestock

Subwatershed	Livestock Population		Representative Load (billion cfu/day)	Load (billion cfu/day)
Above Tidal (0801E)	Cattle	422	2.70	1,139.40
	Sheep/Goats	18	9.00	162.00
	Horses	15	0.21	3.15
Tidal (0801C)	Cattle	15	2.70	40.50
	Sheep/Goats	1	9.00	9.00
	Horses	0	0.21	0.00
Total (All Livestock)	471		--	1,354.05

- Data based on 2017 USDA agricultural census for Chambers County
- Applied ratio of appropriate land cover in the county to that in the watershed area; TSSWCB agreed with estimates in preliminary review
- Pigs and poultry excluded

Feral Hogs

Subwatershed	Feral Hog Population	Representative Load (billion cfu/day)	Load (billion cfu/day)
Above Tidal (0801E)	196	4.45	872.20
Tidal (0801C)	11	4.45	48.95
Total	207	--	921.15

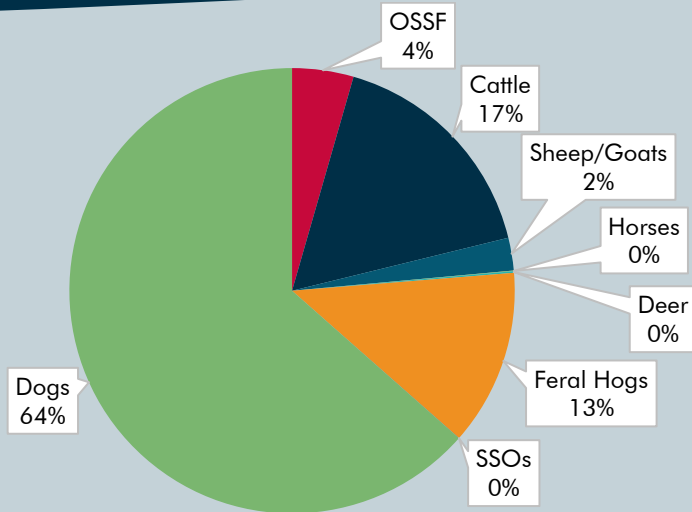
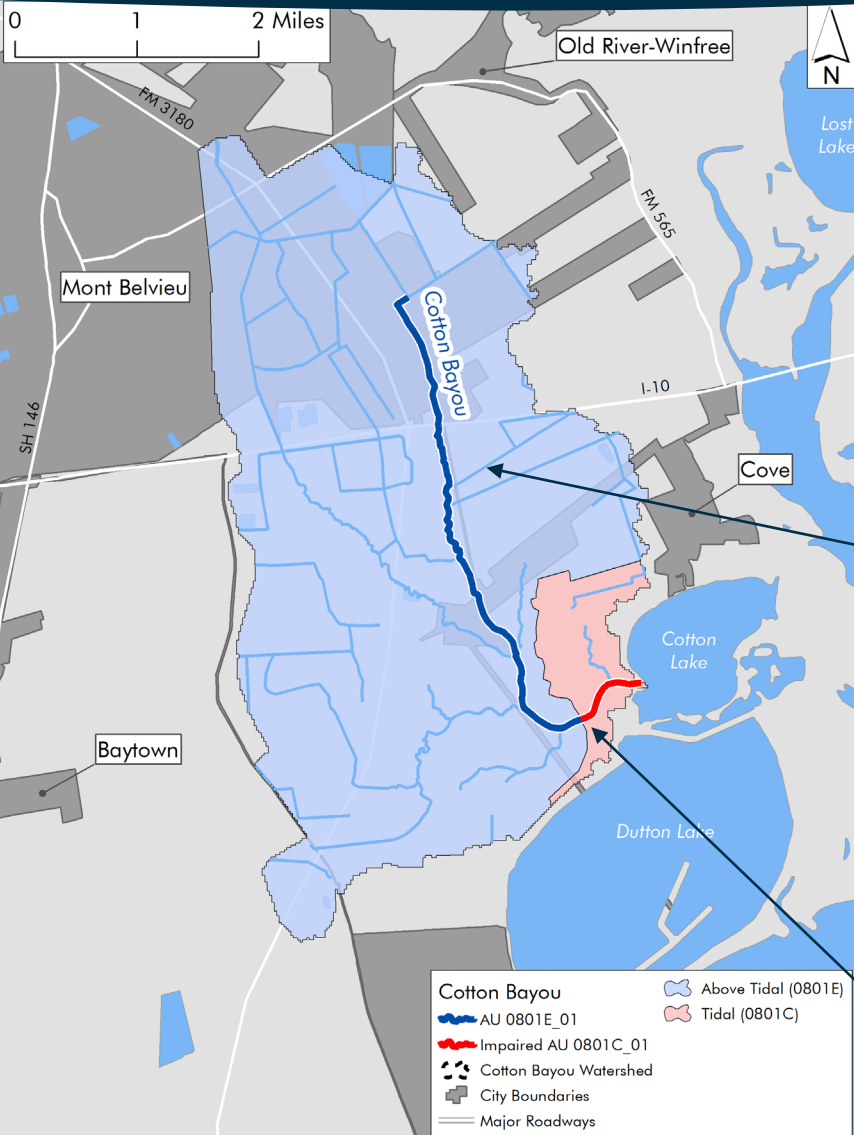
- Used AgriLife density estimates vary based on land cover
 - 8.9/square mile in low intensity development
 - 12.7/square mile in developed open space, barren land, and cropland
 - 16.4/square mile in pasture/grassland, forest/shrubs, and wetlands

Deer

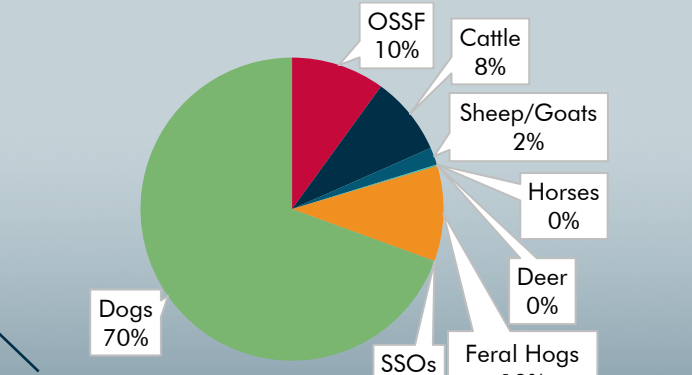
Subwatershed	Deer Population	Representative Load (billion cfu/day)	Load (billion cfu/day)
Above Tidal (0801E)	45	0.18	8.10
Tidal (0801C)	3	0.18	0.54
Total	48	--	8.64

- Used average density from TPWD resource management unit reports collected between 2010 and 2019 in Deer Management Unit area 13 (Pineywoods of East Texas)
- Allocated to areas of forest/shrubs, grassland/pasture, and barren land

Bacteria Reductions



6,817.16 billion cfu/day
(93% watershed load)



482.22 billion cfu/day
(7% watershed load)

98.82%
Total
Reduction
Needed

Representative Units

Bacteria Source	Representative Unit	Representative Unit Daily Load (billion cfu/day)	Units to Reduce to Meet Criteria, Above Tidal (0801E)	Units to Reduce to Meet Criteria, Tidal (0801C)	Units to Reduce to Meet Criteria, Total
OSSFs	1 Failing OSSF	3.71	81	13	94
Dogs	Waste of 1 Dog	2.50	1,709	132	1,841
Cattle	Waste of 1 Cow	2.70	417	15	432
Sheep/Goats	Waste of 1 Sheep/Goat	9.00	18	1	19
Horses	Waste of 1 Horse	0.21	15	0	15
Feral Hogs	1 Feral Hog	4.45	194	11	205
Deer	Waste of 1 Deer	0.18	44	3	47

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Project Timeline



Refine Results



- **Review** bacteria source estimates and **refine** with stakeholder input
 - Provide feedback on watershed observations vs. estimates
 - Prioritize source reduction strategies

Implementation Plan

- Facilitate stakeholder development of an **Implementation Plan** (I-Plan) to address issues identified in the TMDL
 - Describes strategies for achieving reductions
 - Outlines schedule for implementation activities



Stakeholder Involvement



- **Workgroup** or **Coordination Committee** development?
 - Focused sessions
 - More regular meetings

Other Ways to Get Involved

- Share your knowledge and feedback
- Help us coordinate with local efforts
- What are your ideas for this watershed?



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Discussion and Questions

For more information, please contact:

Rachel Windham

713-993-2497

rachel.windham@h-gac.com

Visit our project website at:

www.h-gac.com/watershed-based-plans/cotton-bayou-tmdl



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