attoyac.tamu.edu

Attoyac Bayou
WATERSHED PARTNERSHIP

# ATTOYAC BAYOU WATERSHED PROTECTION PLAN UPDATE
# APRIL 27, 2012

CASTILAW
ENVIRONMENTAL SERVICES, LLC

# Presentation Overview

- Attoyac Bayou Impairment and Reason for WPP Development
- WPP Development Progress
  - Public Participation
  - Watershed Survey and GIS Update
  - Surface Water Quality Monitoring
  - LDC and SELECT Modeling
  - Bacterial Source Tracking
  - WPP Plan Development
  - Project Status Summary

# Attoyac Bayou Impairment & Concern

- First listed on 2004 Texas 303(d) List for not meeting bacteria standard

- Screening level concern for ammonia levels

# What Does This Impairment Mean?

- *E. coli* levels in Attoyac Bayou are higher than state standards

- Action must be taken to improve water quality to meet state standards by 2017; otherwise, regulatory measures may be implemented

# What Is A WPP?

- **Voluntary** plan developed by stakeholders

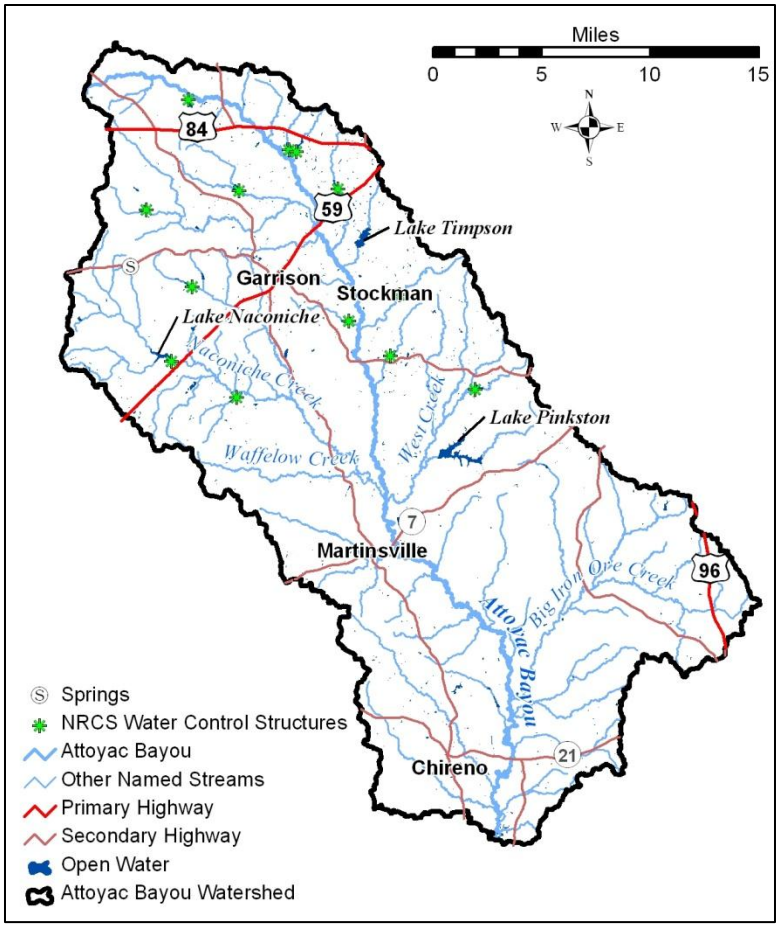
- Holistic approach to watershed management which addresses potential sources and causes of concerns/impairments. This approach also considers:
  1. Load Reductions,
  2. Management Measures,
  3. Assistance Needed,
  4. Public Information and Education,
  5. Implementation,
  6. Milestones,
  7. Measure Success, and
  8. Monitoring

# Public Participation

- Hold stakeholder meeting every quarter.
  - Seven meetings to date
  - Total of over 250 in attendance
  - Next meeting will be June 7, 2012
- Texas Watershed Stewards Program
  - Held September 9, 2010
  - Approximately 50 in attendance
- Website - http://attoyac.tamu.edu/
- Other Meetings – ANRA, SWCD's

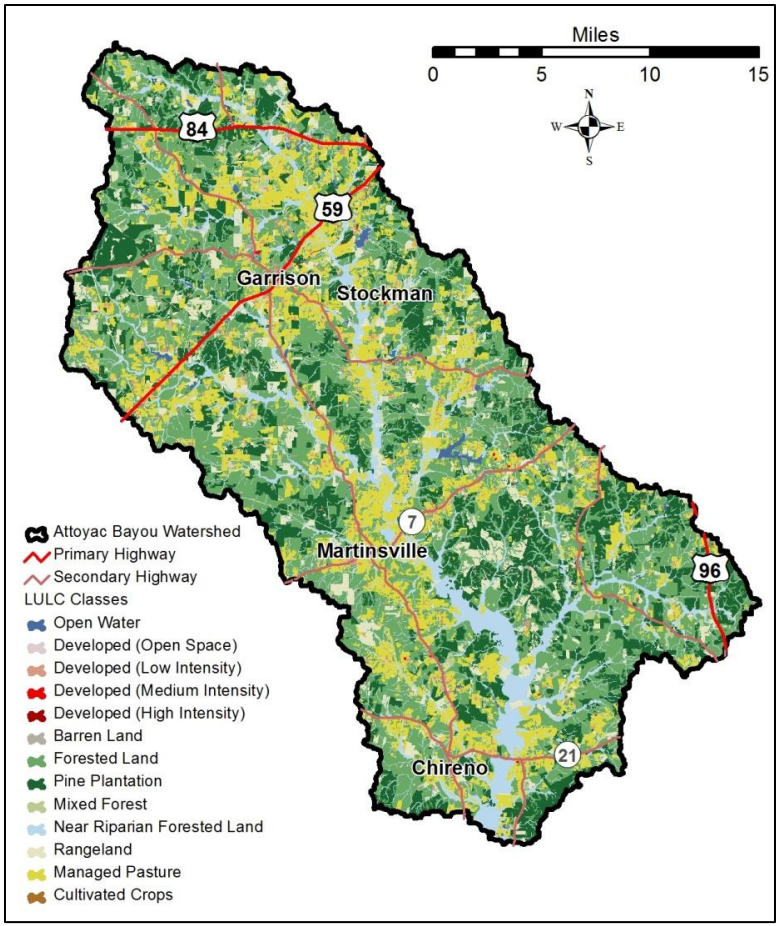
# Watershed Survey and GIS Update

- Gather existing data
  - 911 addresses, monitoring stations, water treatment plants, streets, streams, watershed boundaries, municipal boundaries, floodzones, soils, various imagery, etc.



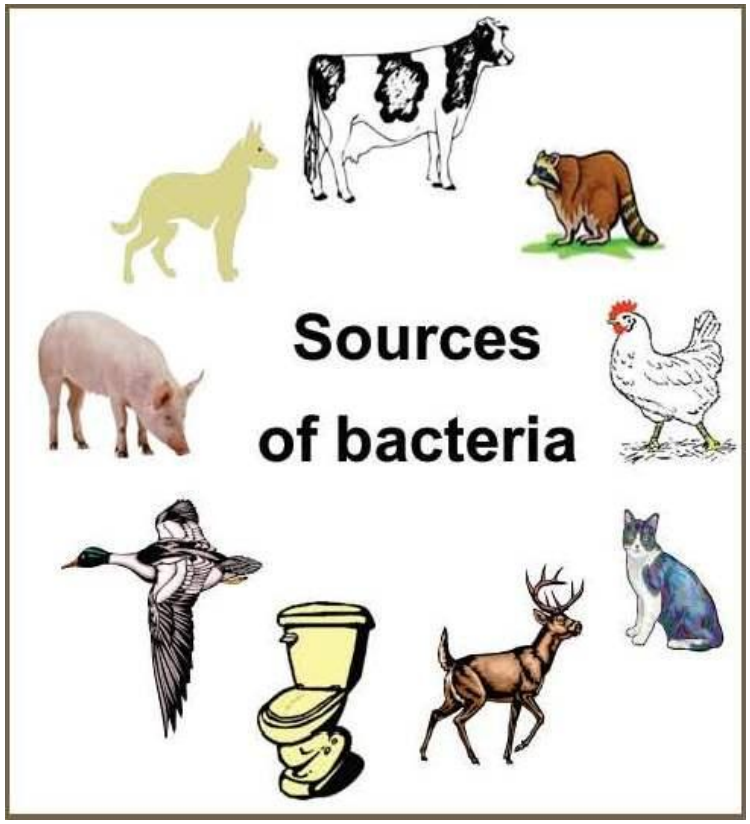
# Watershed Survey and GIS Update

- Created new Land Use /Land Cover map
  - GPS points for LULC assessment
  - Locations of poultry houses



# Watershed Survey and GIS Update

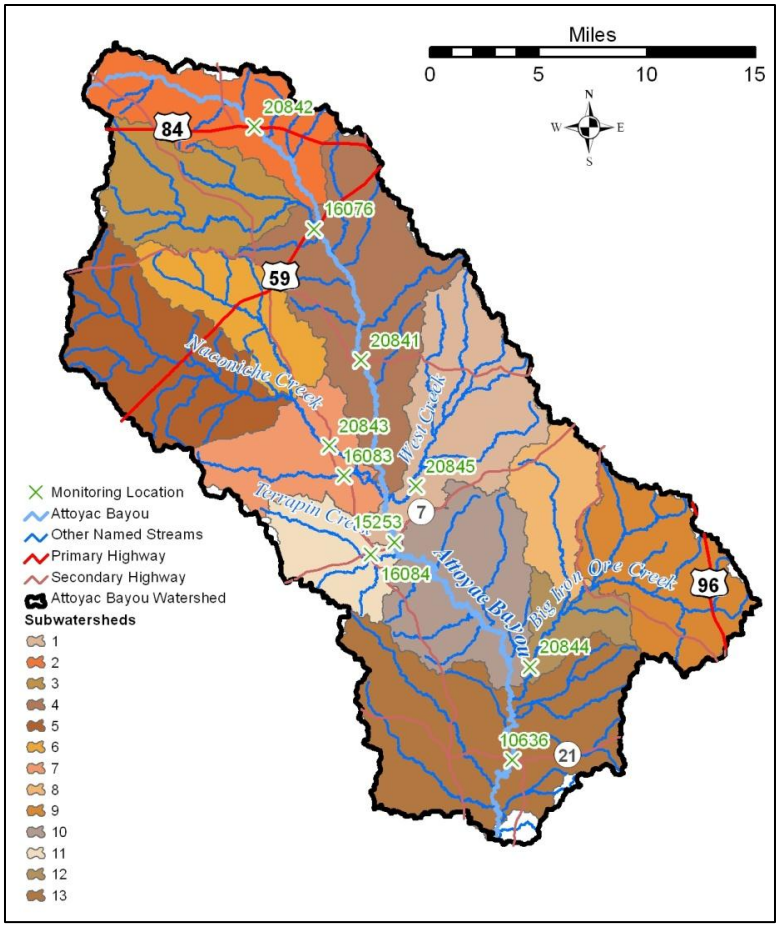
- Potential Sources of Pollution
  - Residential On-Site Sewage Facilities
  - Pets
  - Livestock
  - Poultry
  - Wastewater Treatment Plants
  - Oil and Gas On-Site Sewage Facilities
  - Wildlife and Feral Animals
  - Illegal Dumping



# Surface Water Quality Monitoring

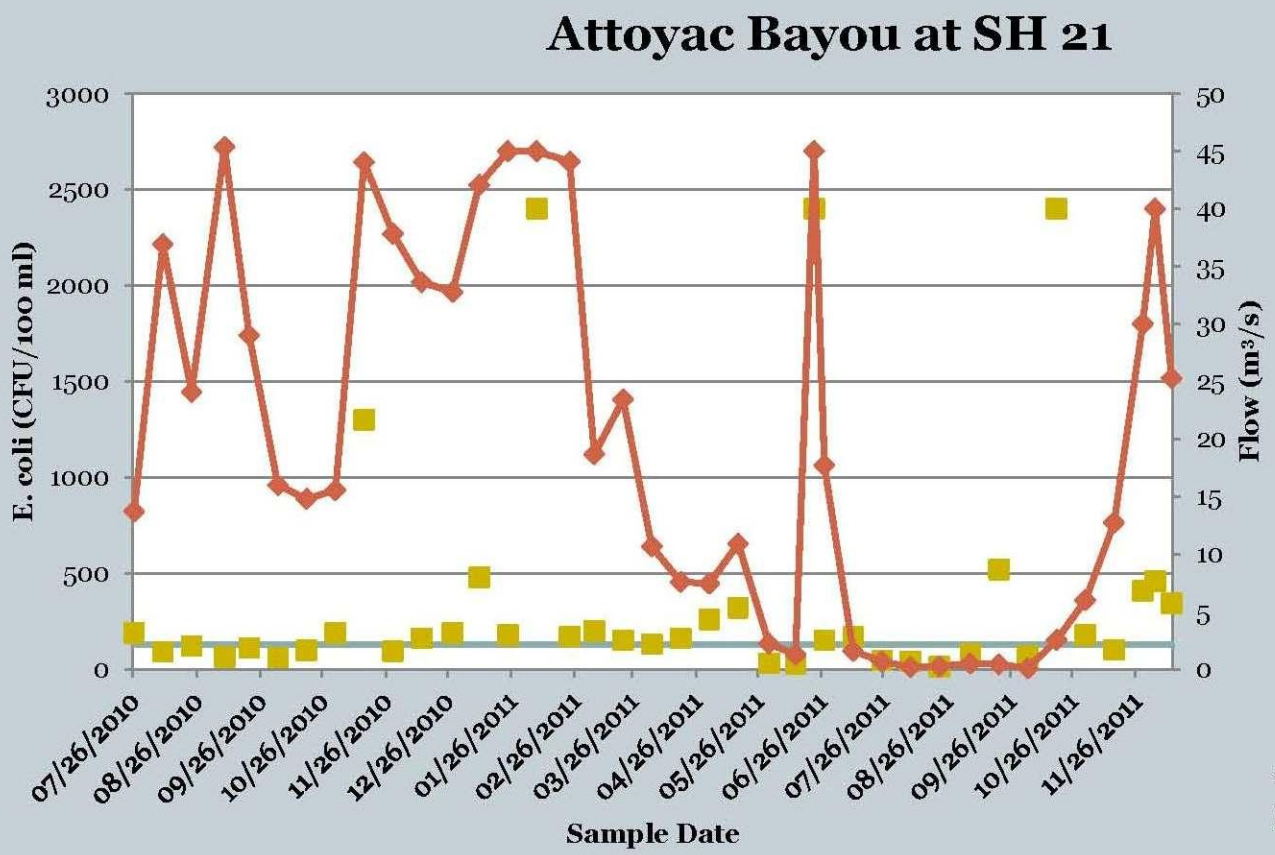
**Attoyac Bayou Sampling Site Locations**

| Site # | TCEQ Station # | Sample Type | Sampling Site Name | GPS Coordinates Lat: 31 ° N | Long: 94° W |
|---|---|---|---|---|---|
| | | | *Stream Sampling Sites* | | |
| 1 | 10636 | Routine | Attoyac Bayou @ SH 21 | 30'15.05" | 18'13.99" |
| 2 | 15253 | Routine / Storm | Attoyac Bayou @ SH 7 | 38'54.00" | 23'50.00" |
| 3 | 20841 | Routine | Attoyac Bayou @ FM 138 | 46'6.53" | 25'32.30" |
| 4 | 16076 | Routine | Attoyac Bayou @ US 59 | 51'24.14" | 27'49.89" |
| 5 | 20842 | Routine | Attoyac Bayou @ US 84 | 55'26.97" | 30'41.07" |
| 6 | 16083 | Routine | Waffelow Creek @ FM 95 | 41'29.99" | 26'16.00" |
| 7 | 16084 | Routine | Terrapin Creek @ FM 95 | 38'20.01" | 24'53.08" |
| 8 | 20843 | Routine | Naconiche Creek @ FM 95 | 42'43.80 | 26'57.86" |
| 9 | 20844 | Routine / Storm | Big Iron Ore Creek @ FM 354 | 33'57.43 | 17'22.05" |
| 10 | 20845 | Routine | West Creek @ FM 2913 | 41'10.33 | 22'50.37" |
| | | | *Waste Water Treatment Plant Sampling Sites* | | |
| 11 | WWTF | Quarterly | City of Garrison WWTF | 49'29.86" | 29'2.82" |
| 12 | WWTF | Quarterly | Chireno ISD WWTF | 30'3.13" | 21'6.30" |
| 13 | WWTF | Quarterly | Martinsville ISD WWTF | 38'32.29" | 24'52.99" |
| 14 | WWTF | Quarterly | City of Center WWTF | 41'38.80" | 19'56.66" |



# Surface Water Quality Monitoring

## Index Site for Assessment Unit 0612_01



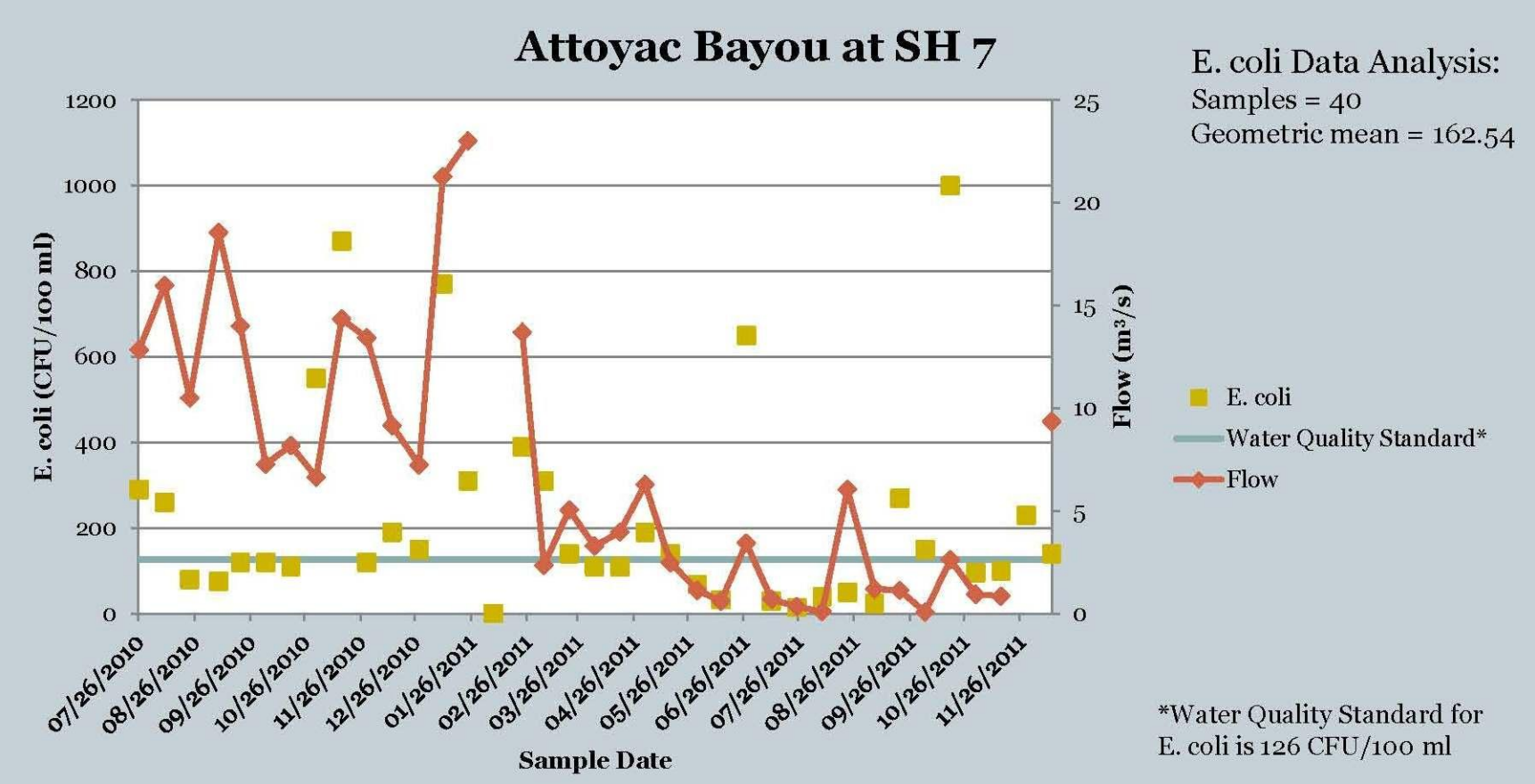

E. coli Data Analysis:
Samples = 47
Geometric mean = 232.83

E. coli
Water Quality Standard*
Flow

*Water Quality Standard for E. coli is 126 CFU/100 ml

# Surface Water Quality Monitoring

## Index Site for Assessment Unit 0612_02



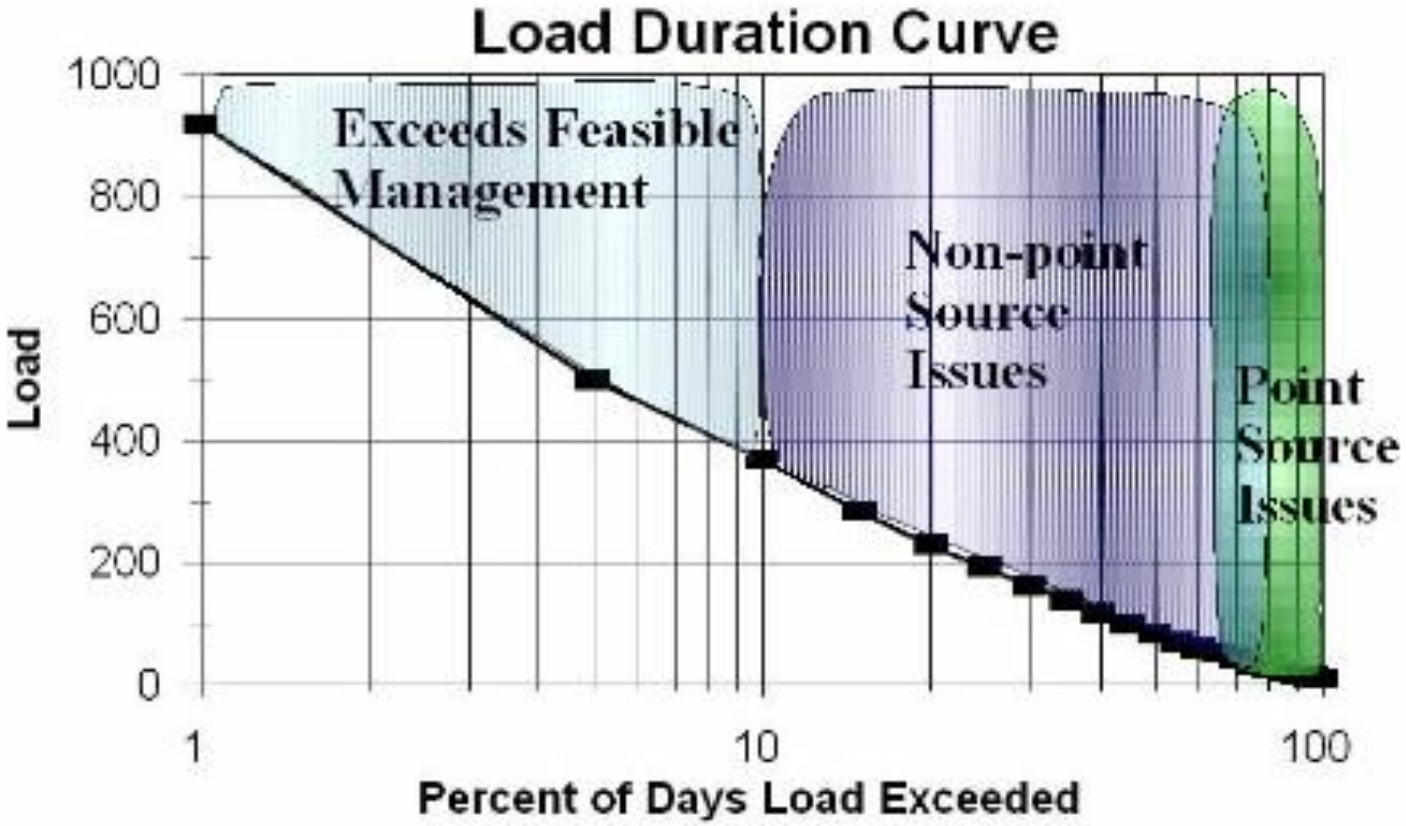
# Surface Water Quality Monitoring

- Roughly 75% of biweekly water quality samples have been taken.
- Plan to be wrapped up with biweekly sampling in August, 2012
- Storm samples also taken during storm events

# Load Duration Curves (LDCs)

- Combines concentrations of a pollutant with flow at the same time to develop a load
- The LDC illustrates the load of a pollutant versus the time that a given load is exceeded
- Time is illustrated as percentage of the year
- Able to see if a stream is exceeding the standard in terms of load (flow and concentration)
- Able to calculate a percent reduction based on flow categories

# Load Duration Curve Usefulness



# SELECT MODELING

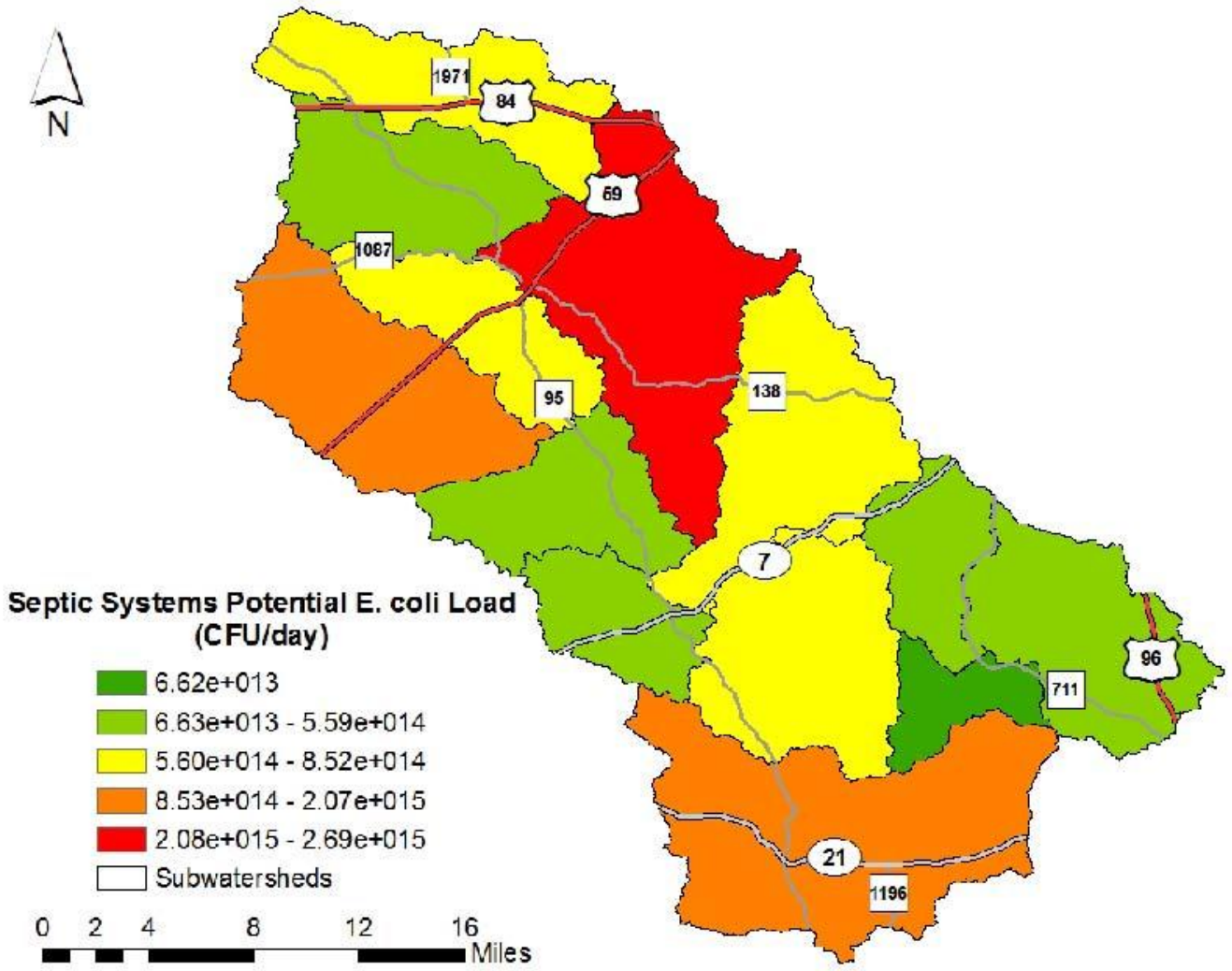
- Spatially Explicit Load Enrichment Calculation Tool

- Automated GIS tool to asses bacterial loads in each subwatershed using various spatial information
  - Land use / Land cover
  - Human and animal population densities
  - Slope
  - Soils
  - Distance from Creek

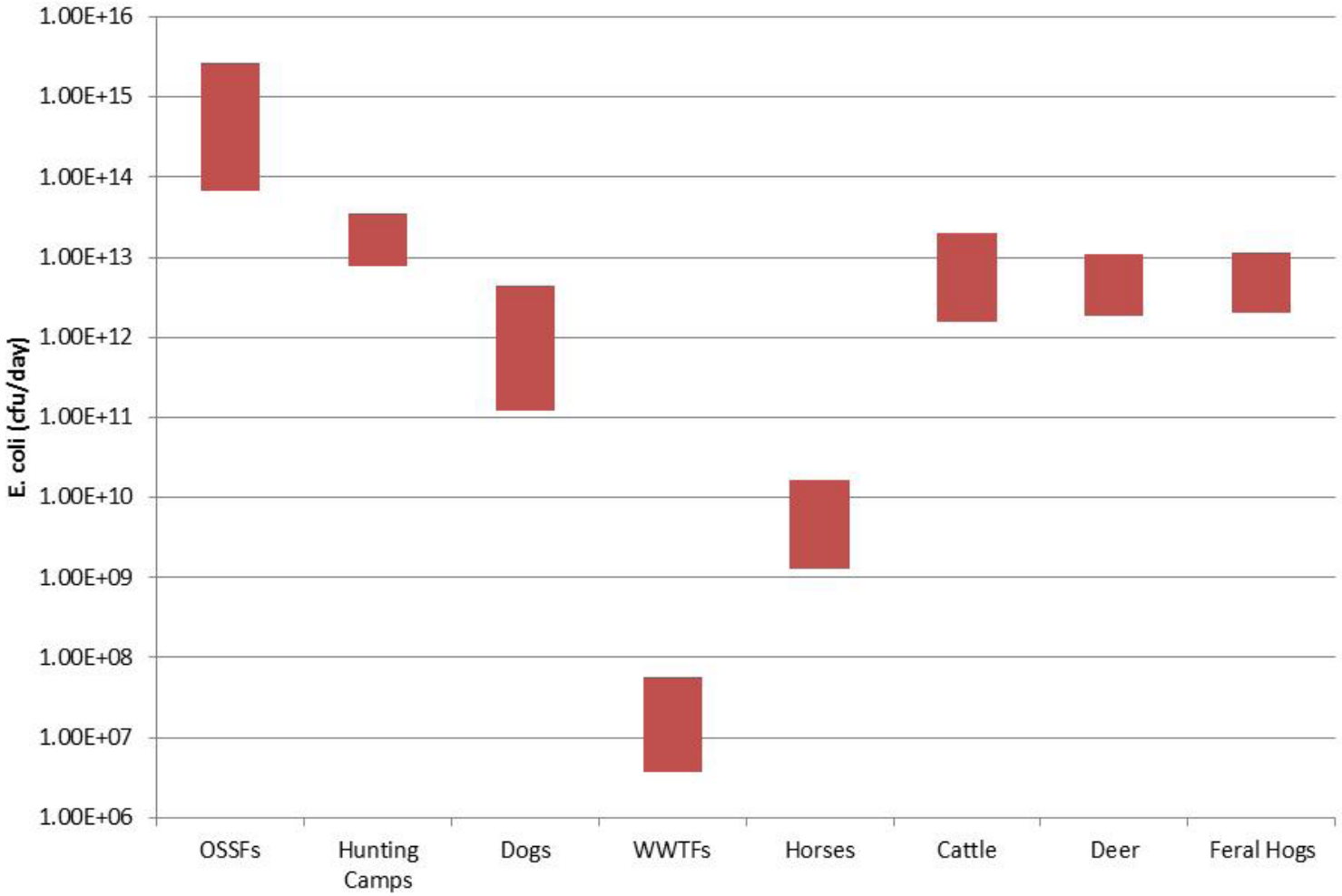
# SELECT MODELING

- Identifies subwatersheds where nonpoint sources have the highest potential to contribute *E. coli* contamination
- Presents the “worst case scenario” as the model does not account for bacteria die-off
- Helps stakeholders target areas of greatest concern where management solutions should be focused

# Potential *E. coli* Load from Septic Systems



# Potential *E. coli* Loadings Within Watershed



# Potential *E. coli* Loadings Within Watershed

- Modeling for horses, cattle, deer and feral hogs being reevaluated based on comments from March stakeholder meeting

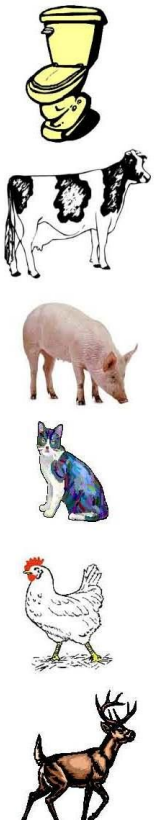
- What about Poultry?
  - Stakeholder input sought at March stakeholder meeting as to where to apply this source in the watershed
  - SFA's Dr. Young and Jeff Williams to use GIS and satellite imagery in identifying application fields

# Bacterial Source Tracking

- Data collection and analysis to determine the sources of fecal contamination in a waterbody
- Based on the uniqueness of bacteria from individual sources
- A variety of different methods are used
  - Library Dependent vs. Library Independent

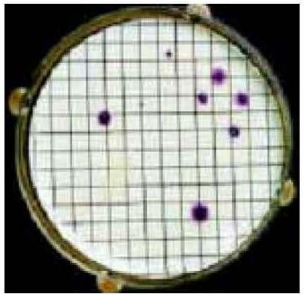
# Development of Texas *E. coli* BST Library

**Sources**



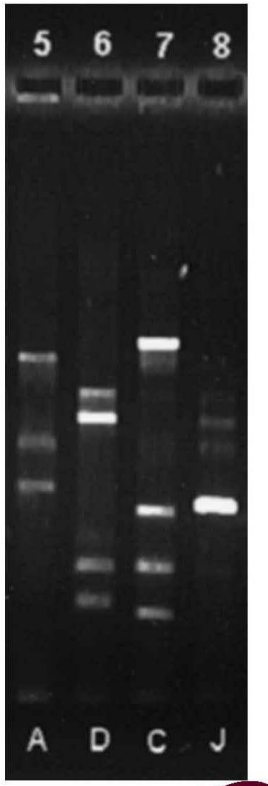
Isolate

*E. coli*



DNA

Fingerprint

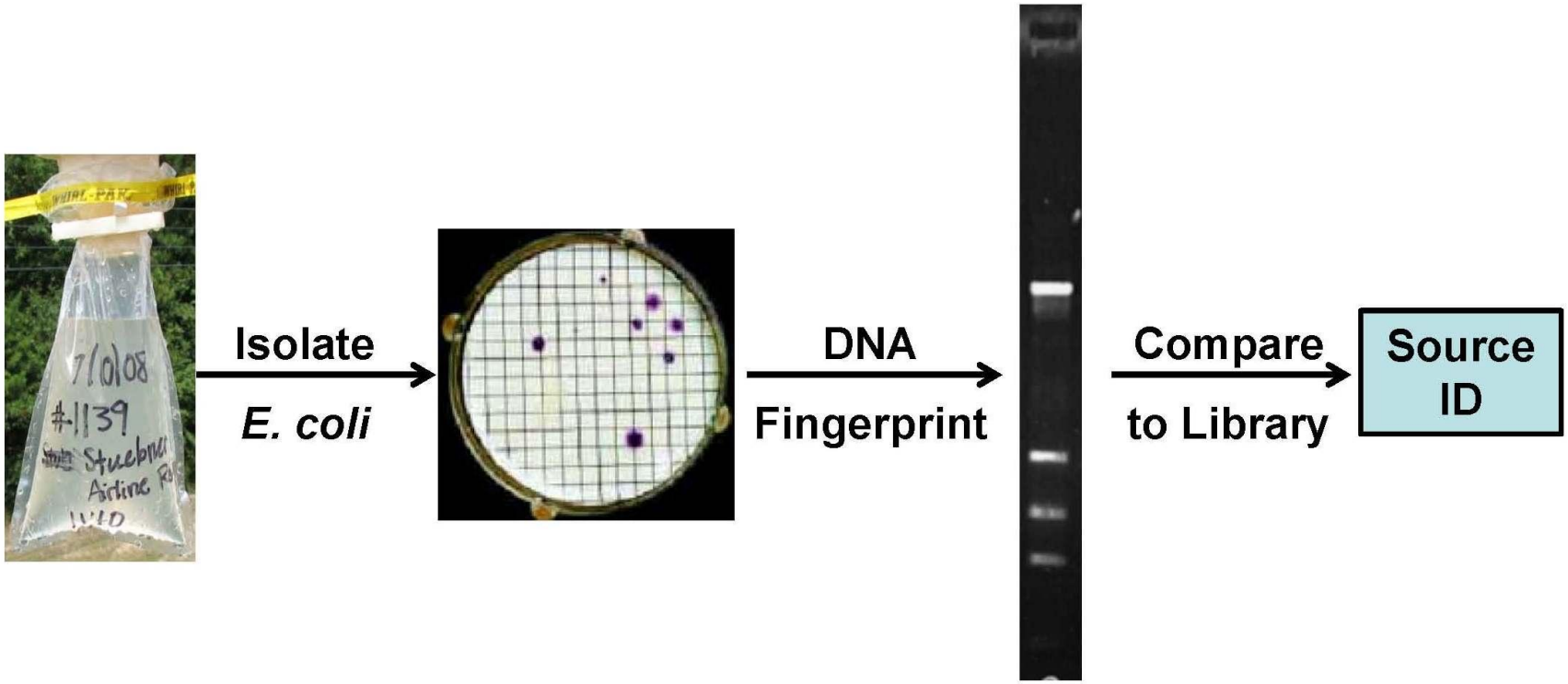



Add to

Library

AgriLIFE RESEARCH
Texas A&M System

# Use of BST Library to Identify Water Isolate



# Library Independent BST

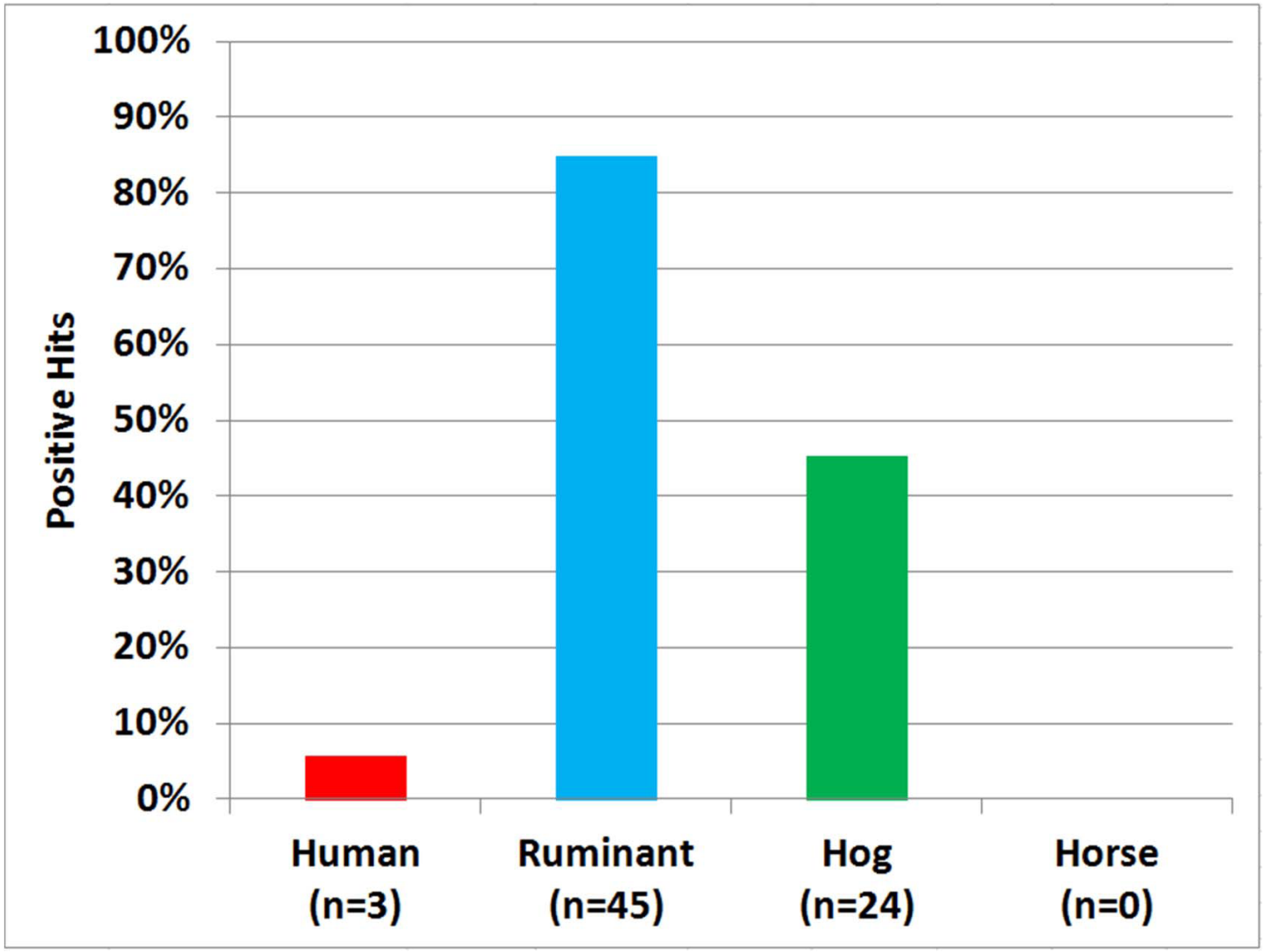
- Genotypic detection of microorganisms based on marker genes (DNA)
- Does not require known-source library
- Most common approach targets *Bacteroidales*
  - More abundant in feces than *E. coli*
  - Less likely to multiply in the environment
  - Subgroups appear to be host specific
  - Markers available for humans, ruminants, hogs, and horses

# BST for Attoyac Bayou

- Library Dependent
  - Analyze *E. coli* from ~100 samples from across the watershed
  - Add ~100 known source *E. coli* isolates to the Texas BST Library

- Library Independent
  - Analyze ~250 water samples from the watershed using *Bacteroidales* markers for human, ruminant, hog and horse sources.

# Preliminary *Bacteroidales* Results

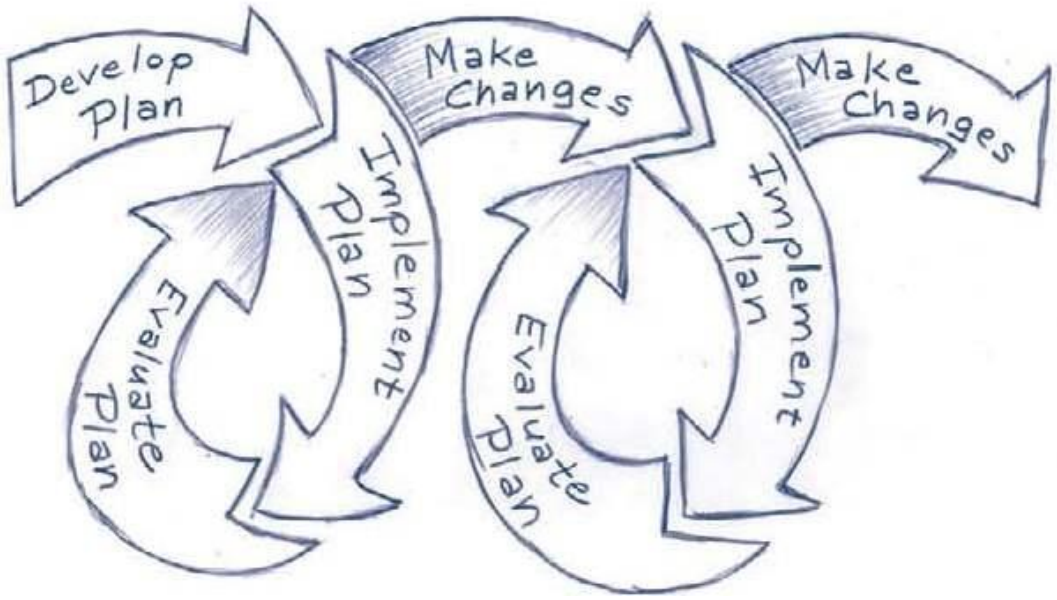


# WPP Development

- Four WPP chapters have been distributed for stakeholder review
  - Chapter 1 – Watershed Management
  - Chapter 2 – Regional History
  - Chapter 3 – Watershed Characteristics
  - Chapter 6 – Potential Sources of Pollution

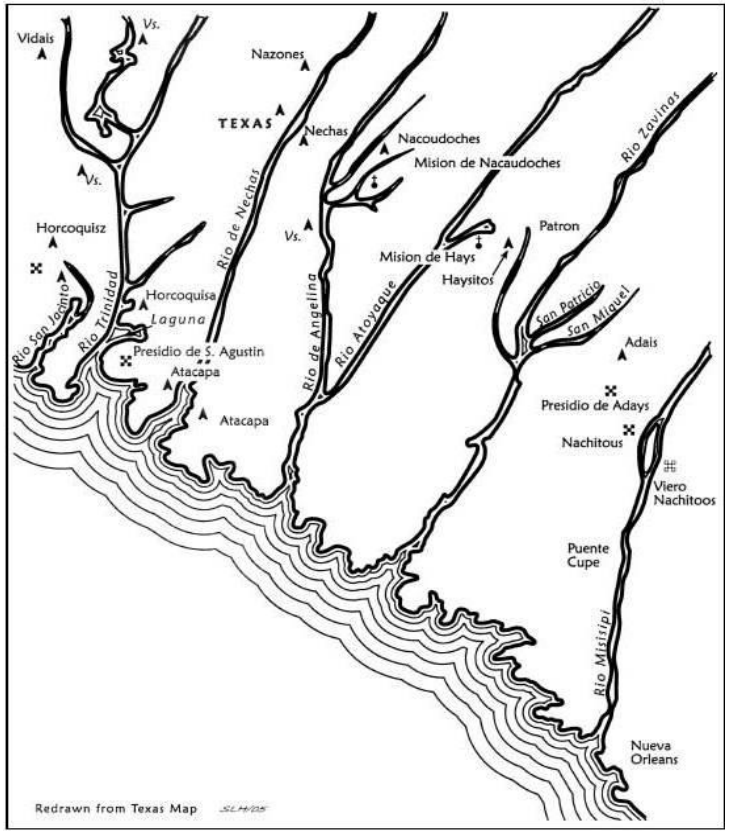
# Chapter 1 - Watershed Management

- Definition of a Watershed
- Watershed Impact on Water Quality
- The Watershed Approach
- WPP Development Process
- Watershed Coordinator
- Private Property Rights
- Adaptive Management



# Chapter 2 – Regional History

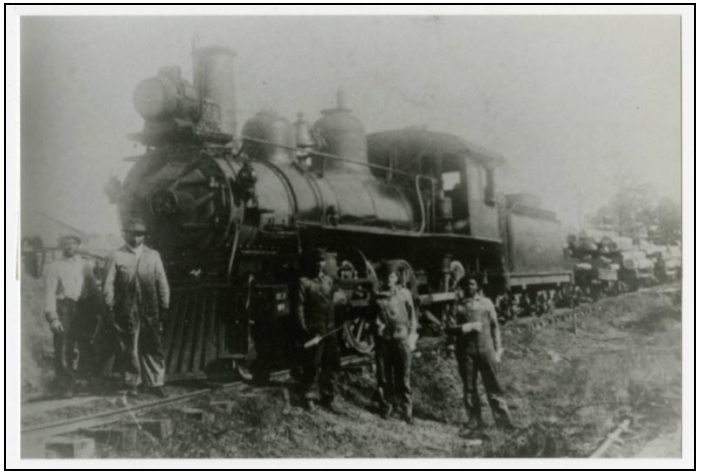
- East Texas Prehistory
- European Exploration and Historic Caddoan Culture



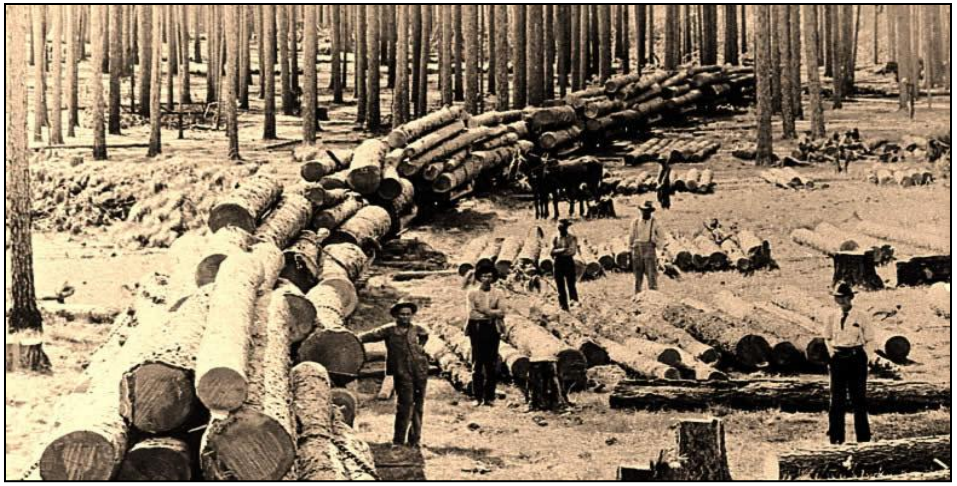

Redrawn version of 1757 map by Miranda, "Parte de la Provyncya De Texas"

# Chapter 2 – Regional History

- 19th Century
- Railroads
- Agriculture
- Logging
- Oil & Gas Production



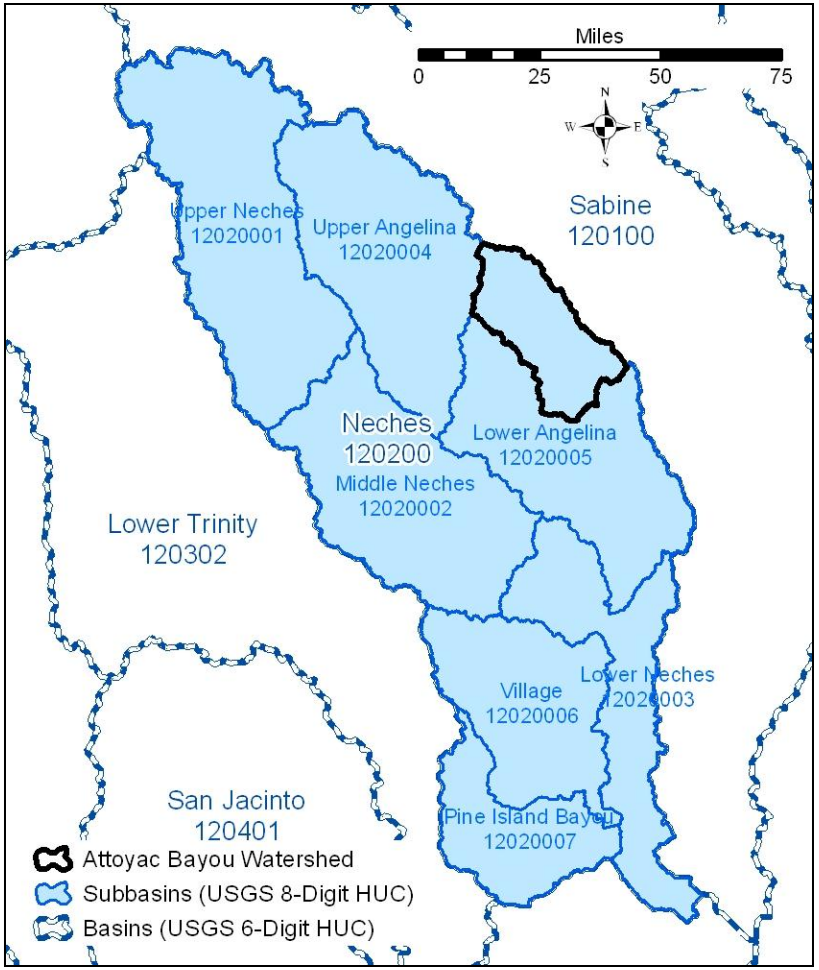
Engine #28 came through Nacogdoches County in 1914.



Typical logging scene in East Texas after arrival of the railroad.

# Chapter 3 – Watershed Characteristics

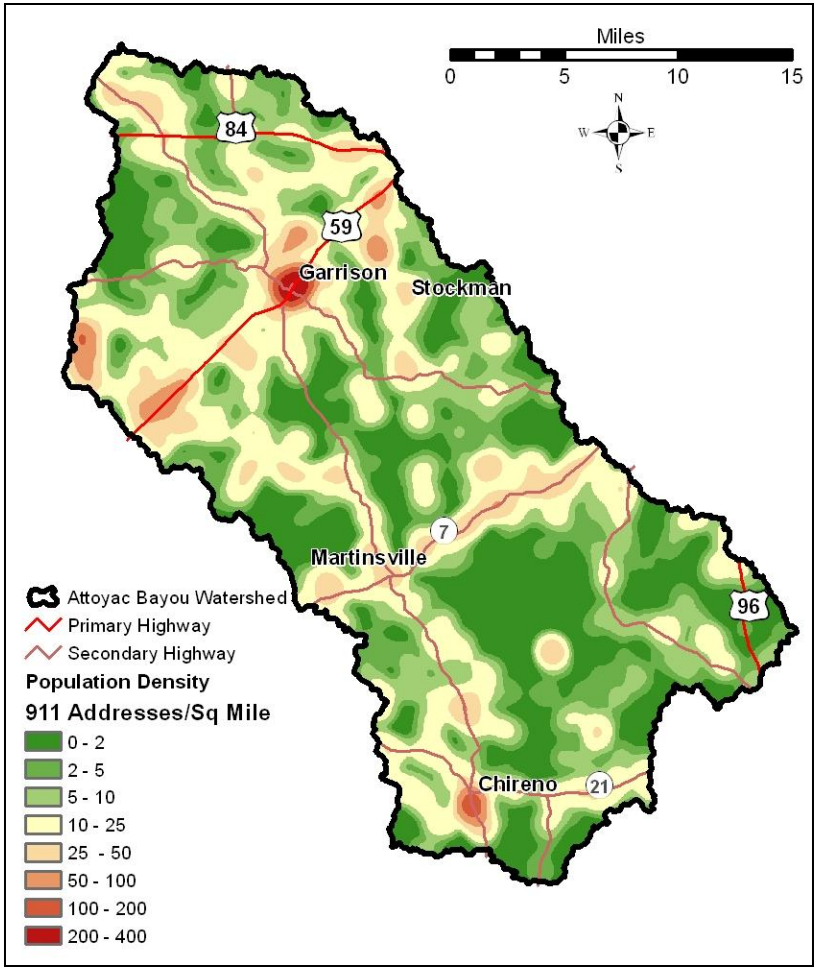
- Attoyac Bayou Watershed Location
- Watershed Boundaries
- Topography
- Soils
- Land use / Land cover
- Ecoregions
- Climate




Basins and Sub-basins of Neches River Basin.

# Chapter 3 – Watershed Characteristics

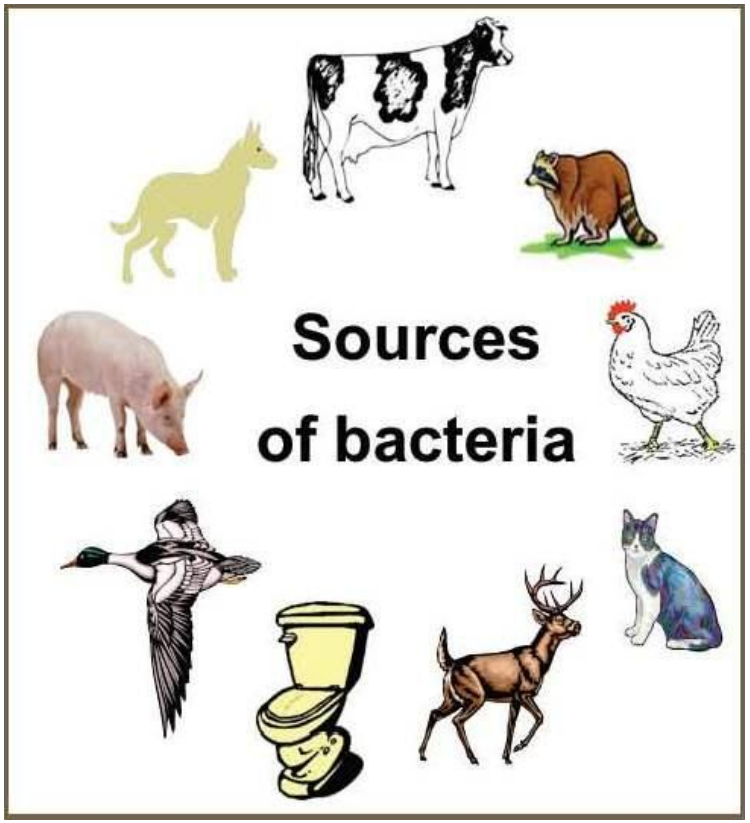
- Groundwater
- Surface Water
- Population




911 address density within watershed.

# Chapter 6 – Potential Sources of Pollution

- Residential On-Site Sewage Facilities
- Pets
- Livestock
- Poultry
- Wastewater Treatment Plants
- Oil and Gas On-Site Sewage Facilities
- Wildlife and Feral Animals
- Illegal Dumping



# Stakeholder Input Needed

- Chapters can be downloaded from the Attoyac Bayou Watershed Partnership Website
- Stakeholders asked to review chapters and make comments
- Comments can be given at the next meeting or sent to:

Neil Boitnott
Castilaw Environmental Services, LLC
510 E. Pilar St.
Nacogdoches, TX 75961
nboitnott@castilawenvironmental.com

# Project Status Summary

- Water quality monitoring and BST will be wrapping up this summer
- Load Duration Curves will be developed following completion of water quality monitoring
- RUAA work is about to begin and will be completed by the fall
- SELECT modeling should be wrapped up this fall
  - SELECT modeling results will be compared with water quality monitoring, BST data, LDCs and RUAA
  - Results will be reconciled to provide an integrated assessment of current water quality and pollutant loading

# Project Status Summary

- All information will continually be conveyed to stakeholders enabling them to make informed decisions on WPP development

- Watershed Plan development will continue through the summer and into the fall, a complete draft of the WPP is anticipated this winter

# Any Questions?

**Neil Boitnott**
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