Lake Houston Segment 1002
Cypress Creek Segment 1009
Little Cypress Creek Segment 1009E
Faulkey Gully Segment 1009C
Spring Gully Segment 1009D

Data Review & Analysis

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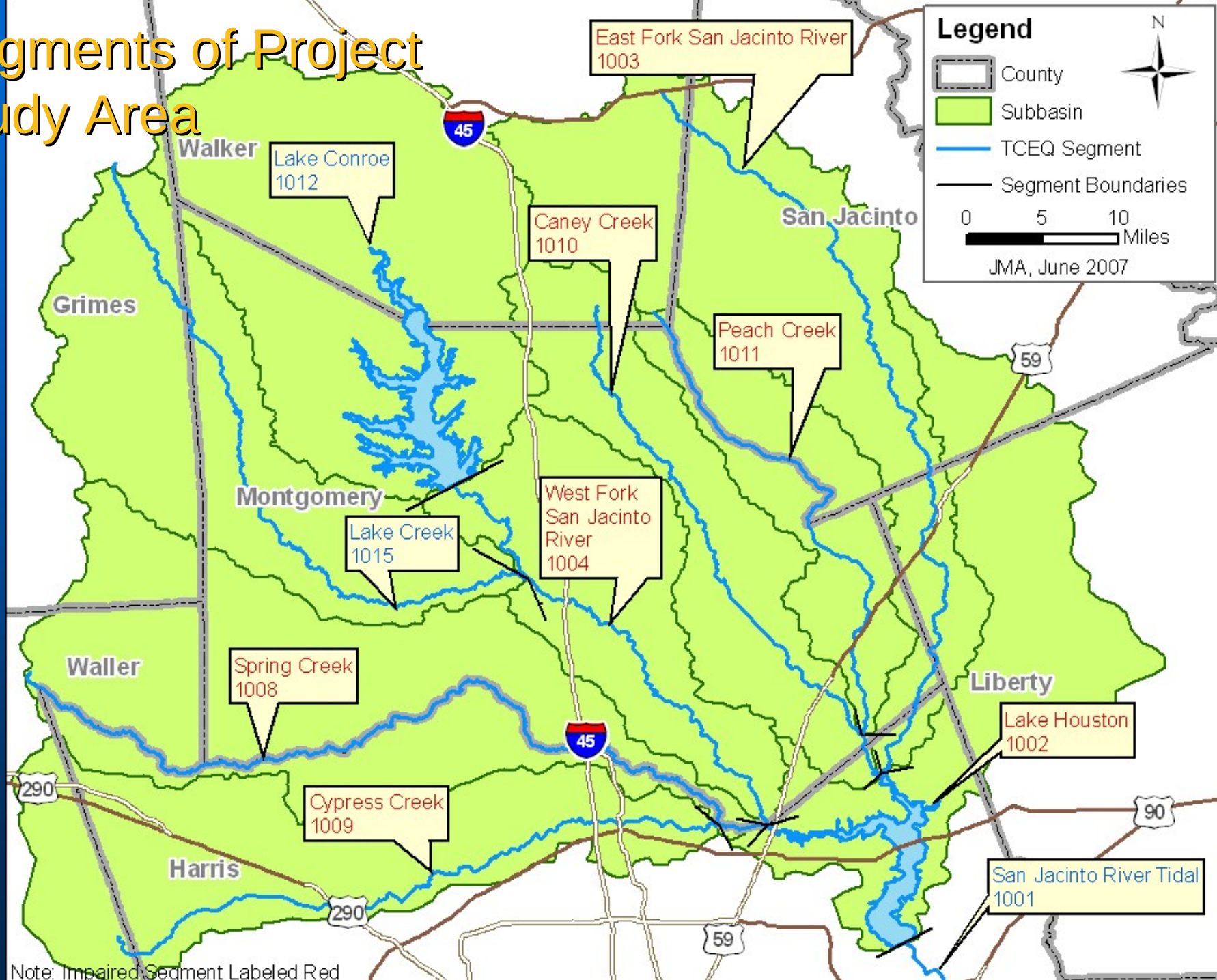
Introduction

- Lake Houston arm and several stream segments of San Jacinto River Basin above Lake Houston identified as impaired based on historical data
- Stream segment is considered impaired when geometric mean of *E. coli* exceeds criterion of 126 org/100mL
- Additional data has been collected
- Next step will be calculation of TMDLs and allocations

Sources of Bacteria

- Treatment plants when not operated properly
- Septic tanks
- Storm water
- Animal waste

Segments of Project Study Area



Note: Impaired Segment Labeled Red

I.
Historical Data Review

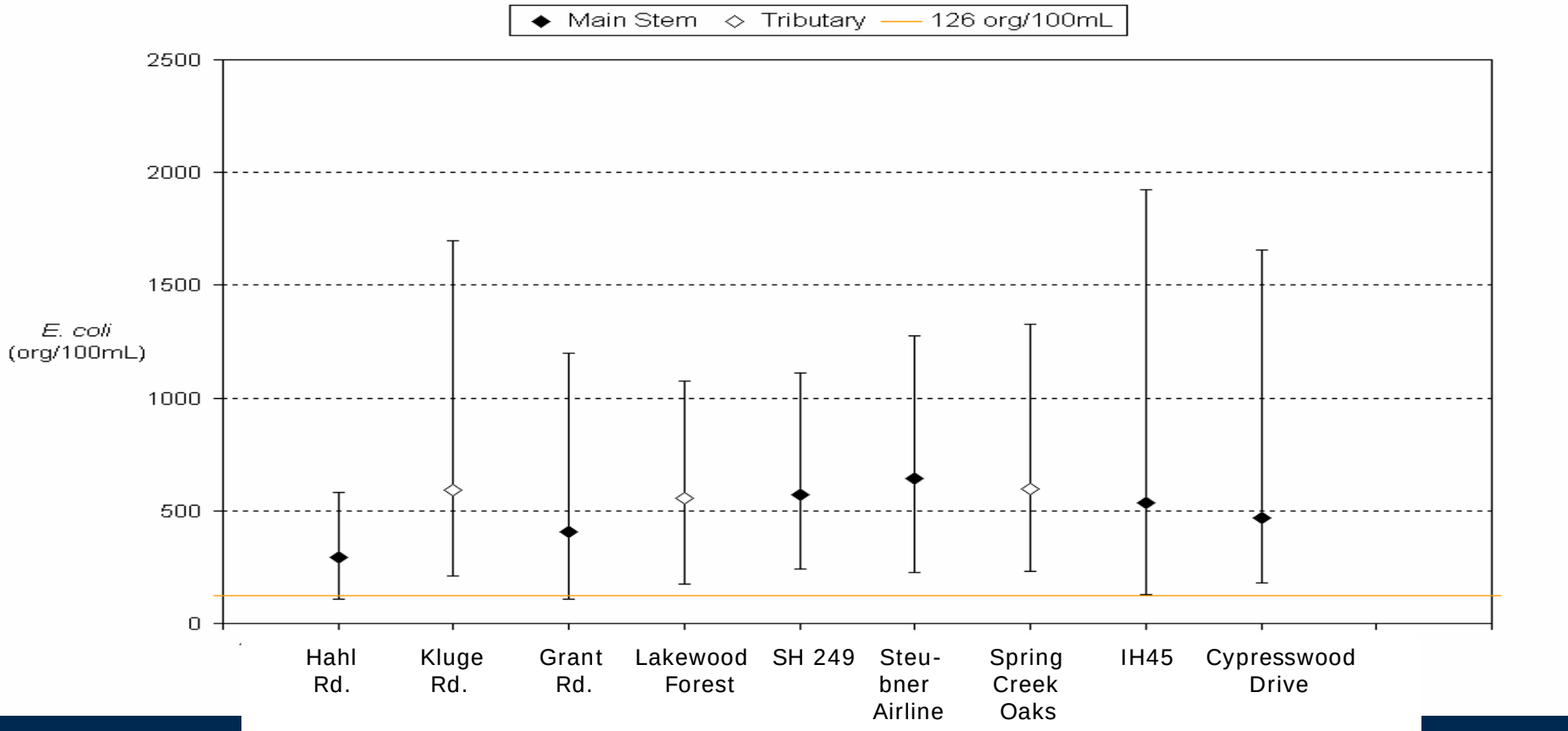
Spatial and Temporal Analysis

- Spatial analysis – do concentrations change over length of stream?
- Temporal analysis – do concentrations in the stream change over time?
- Both can help locate sources of bacteria

Spatial Analysis

- Lake Houston and tributaries
  - Bacteria counts exceed geometric mean criteria in many assessment units
  - No consistent trends over length of stream
  - May show increasing counts as move downstream

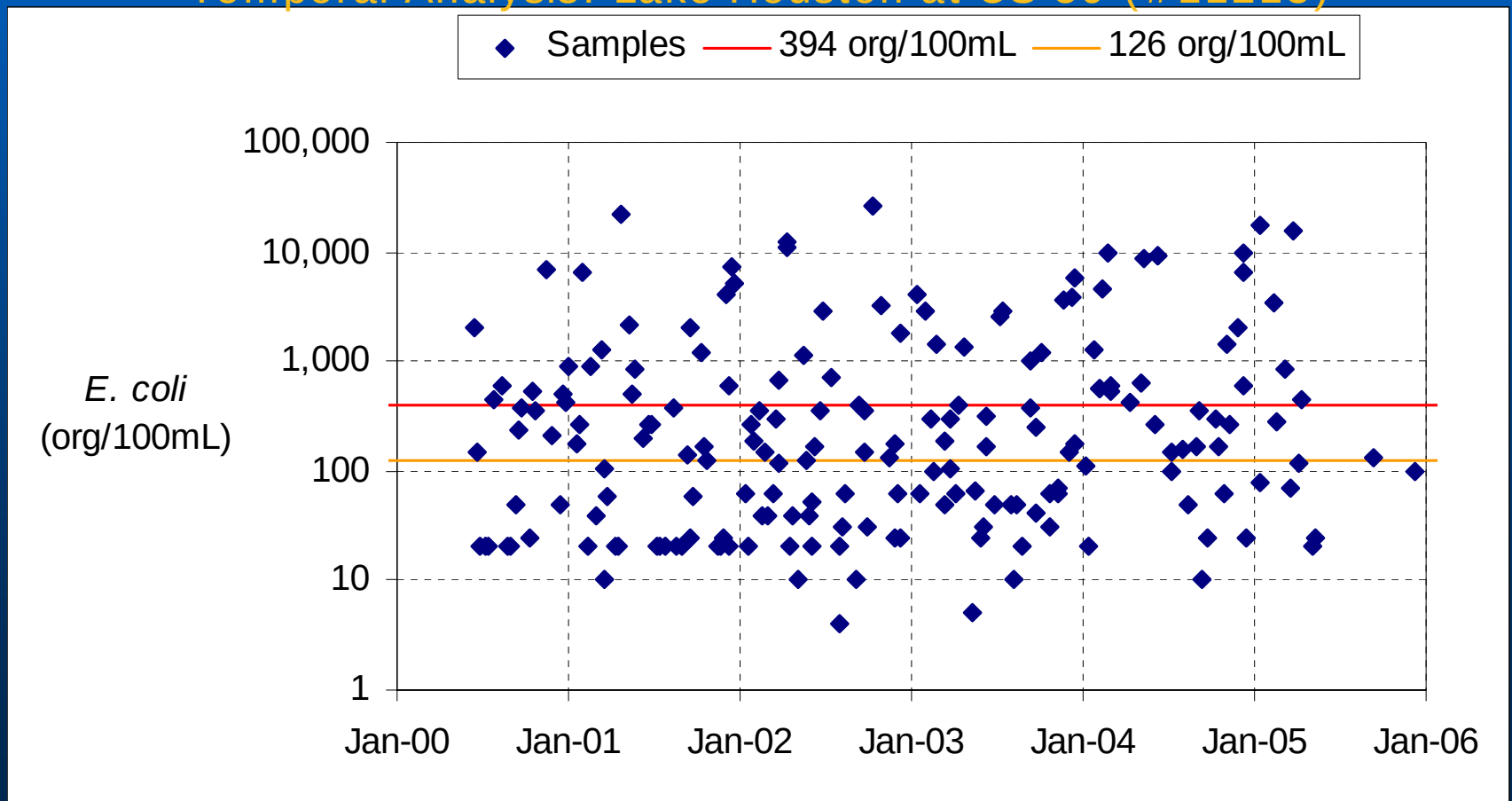
Cypress Creek Spatial Analysis

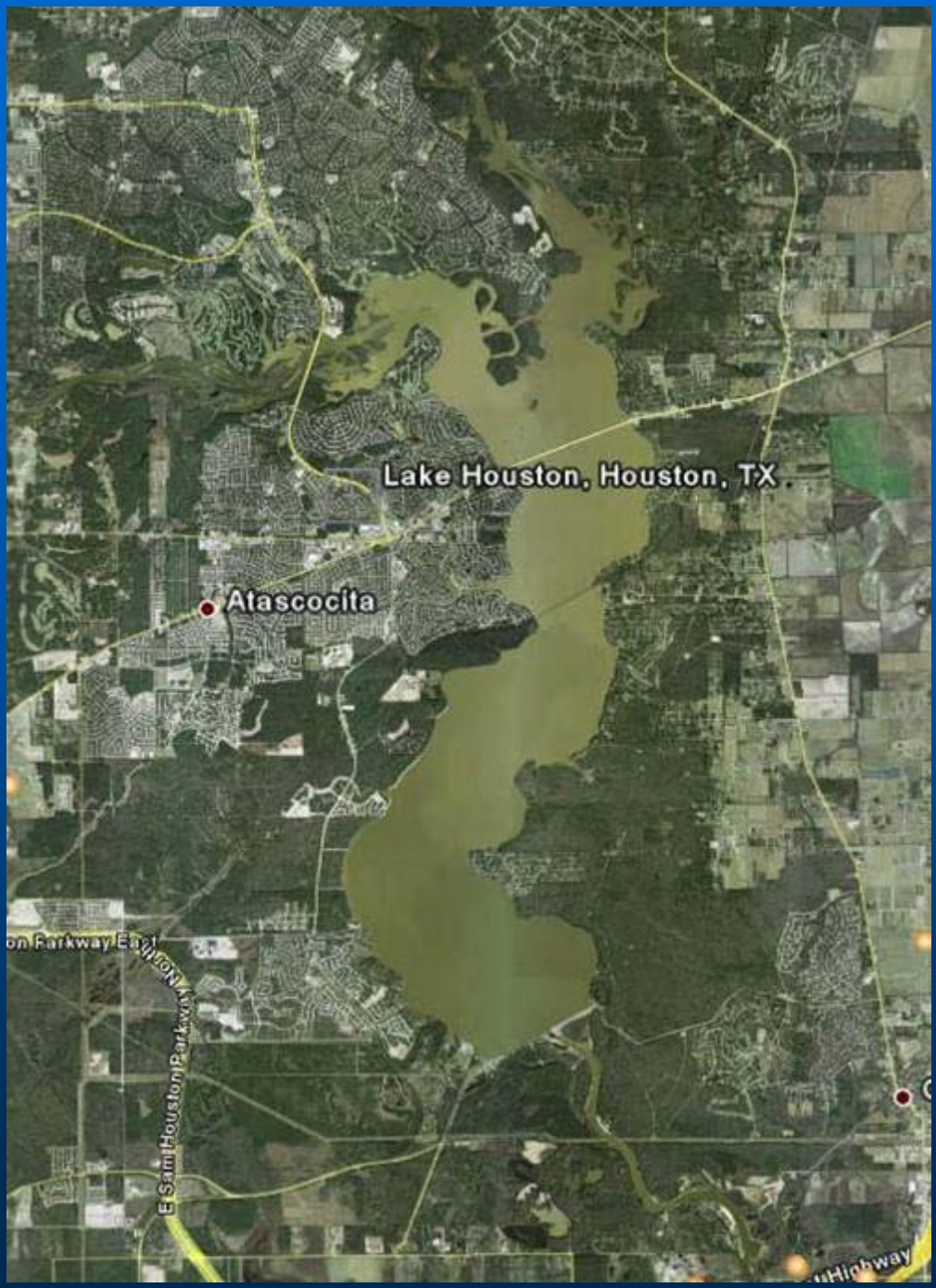


Temporal Analysis

- Lake Houston & Tributaries
  - Bacteria counts from 10 to 10,000 org/100 mL
  - No trend over time
  - Most samples exceed 126 org/100 mL

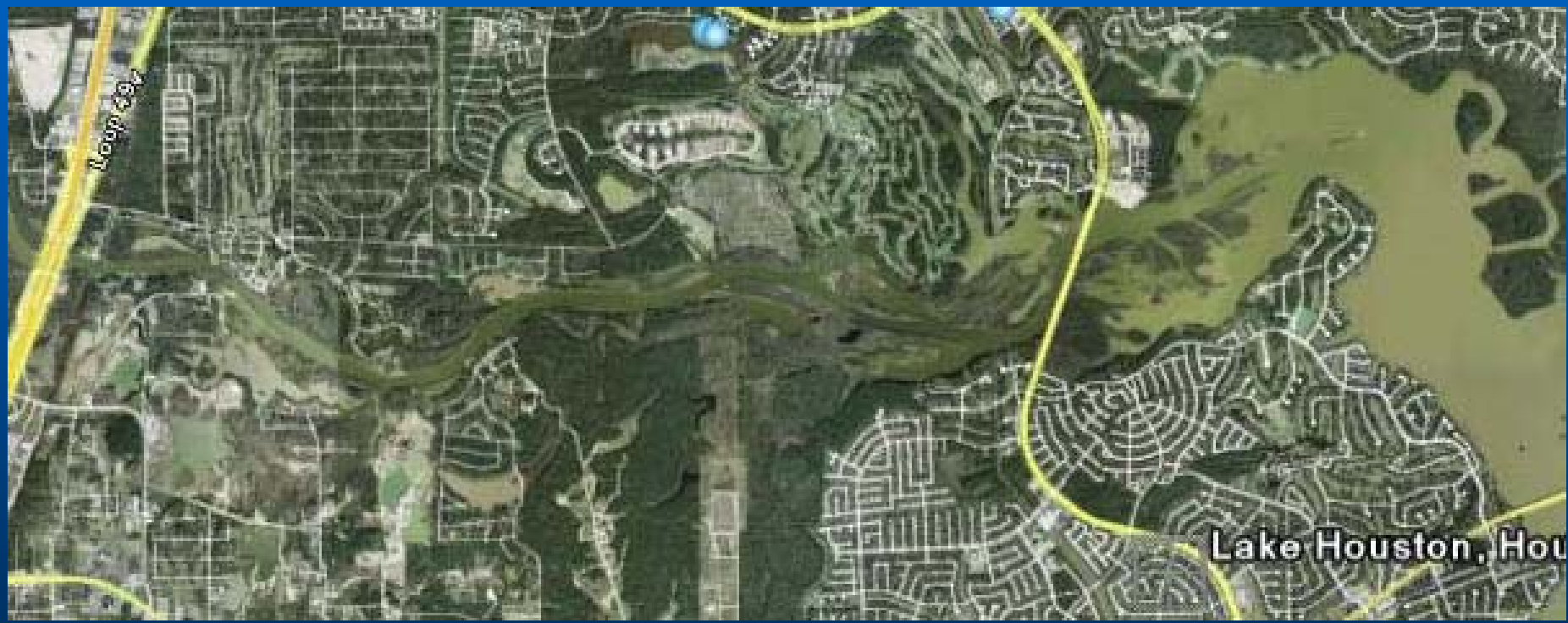
Temporal Analysis: Lake Houston at US 59 (#11213)





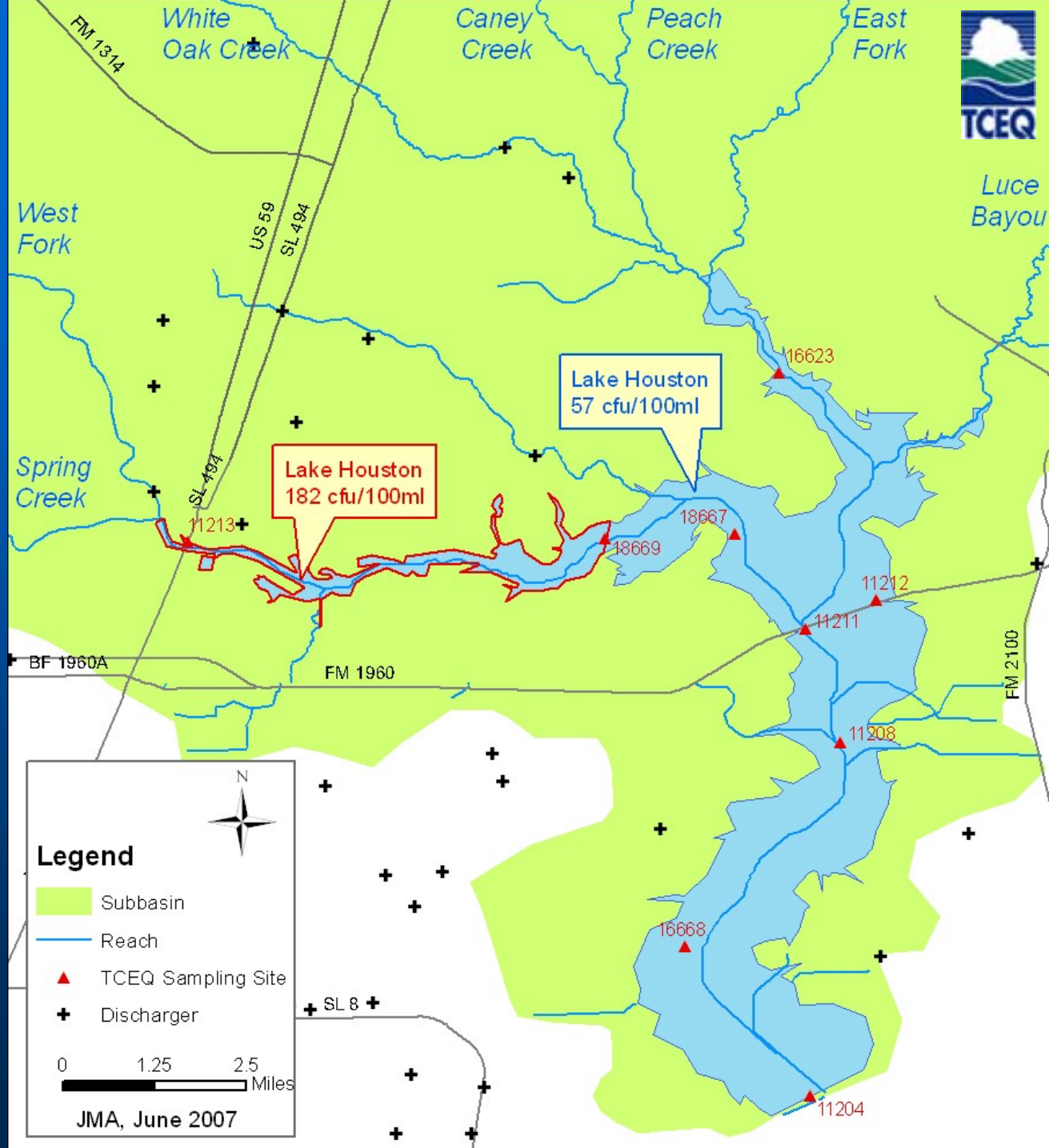
Lake Houston

Lake Houston Western Arm

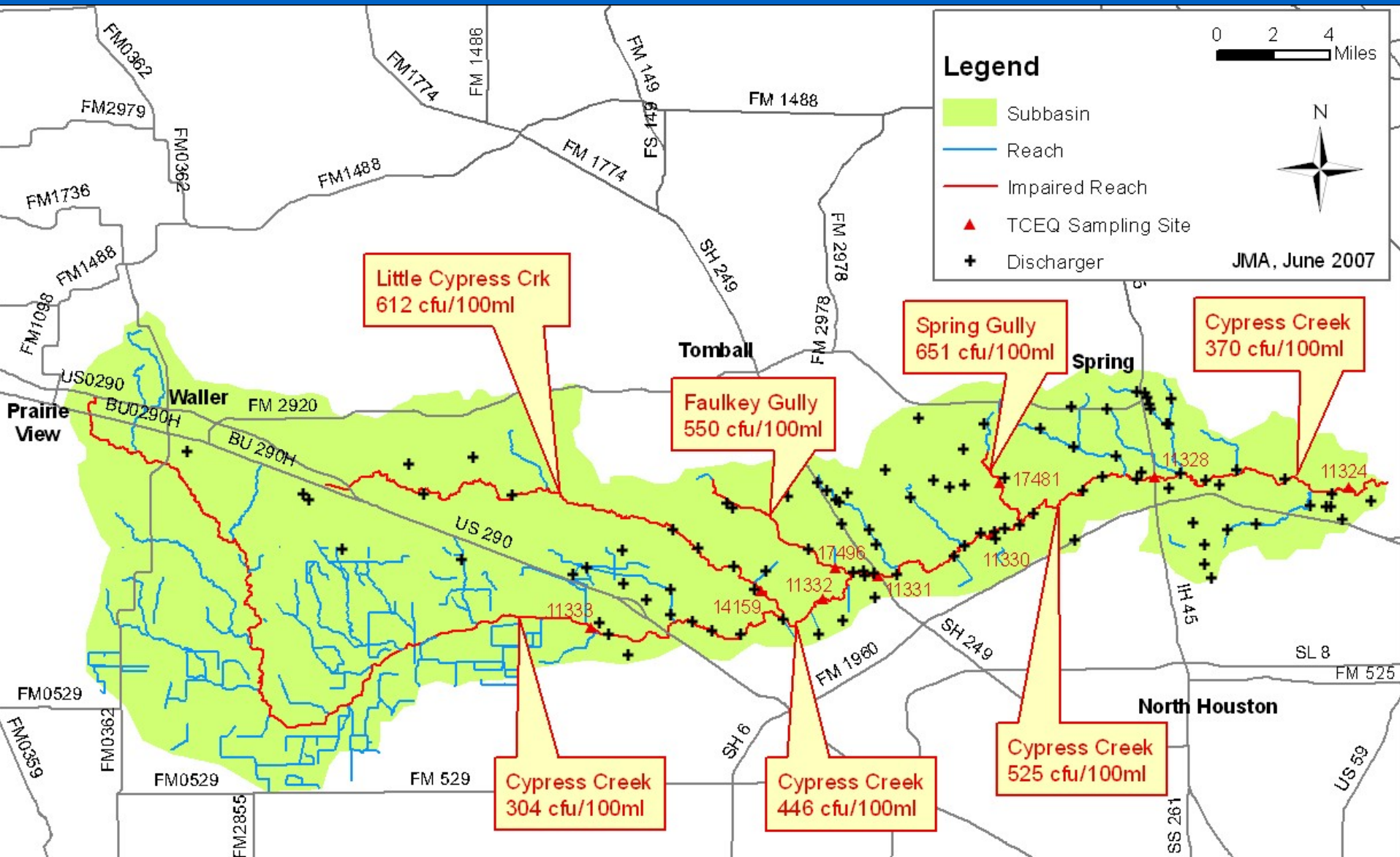


Lake Houston at US 59

Lake Houston Study Area



Cypress Creek Study Area



II.
Additional Monitoring Data

Monitoring Objectives

- How much data do we need?
- Where do the bacteria come from?
- Definitions
  - Synoptic = simultaneous conditions over a broad area
  - Spatially Intensive = detailed sampling along stream channel

Synoptic Sampling Surveys

- Samples to be collected under baseflow conditions
- Identify source areas, longitudinal trends, extent of impairment
- Routine monitoring stations and additional sites
- Two surveys on each study segment.
- General schedule for these events November 2007 to June 2008.

Spatially-Intensive Source Studies

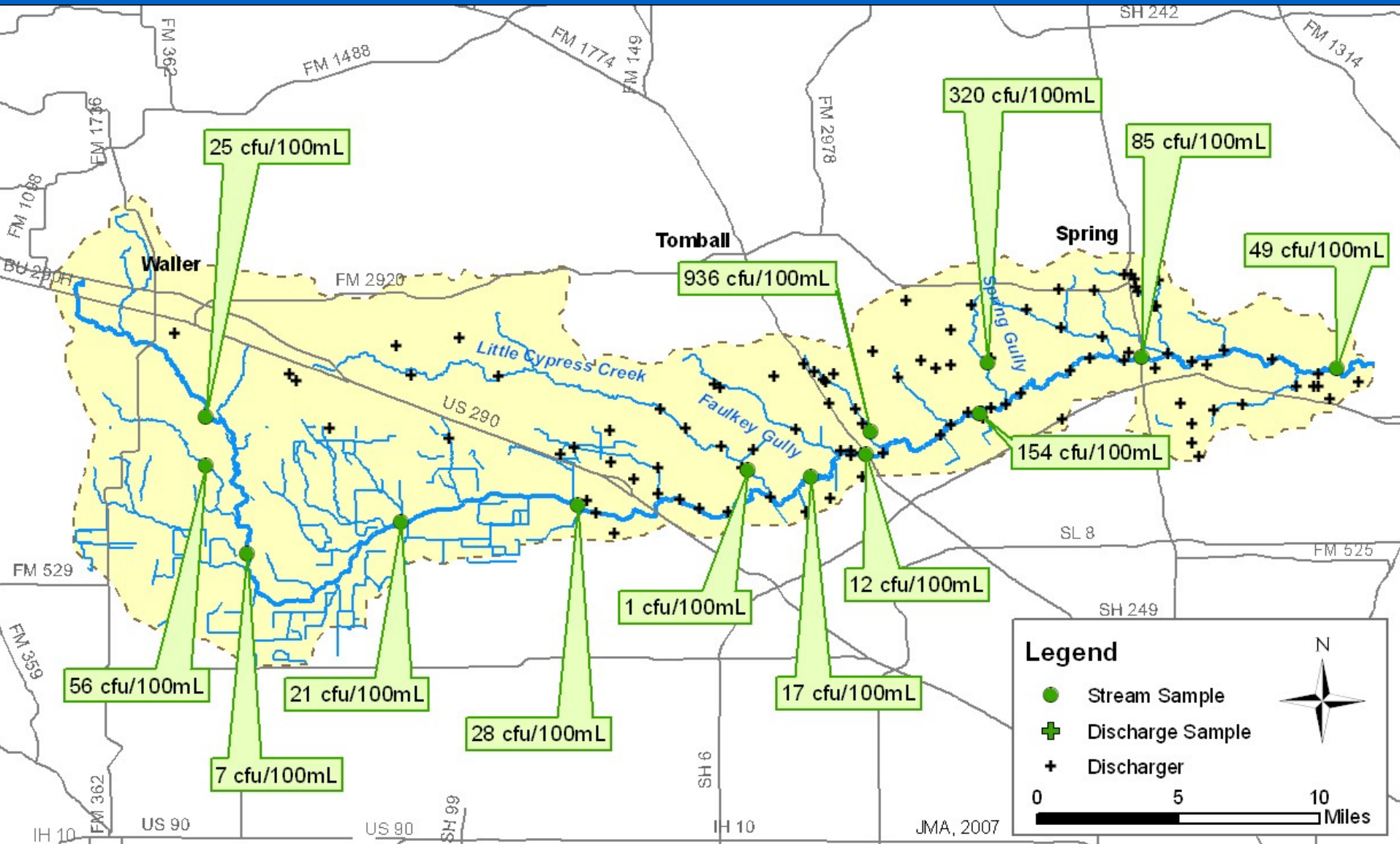
- Upper East Fork San Jacinto River, Segment 1003; Stewarts Creek, Segment 1004E; Willow Creek Segment, 1008H; and Spring Gully, Segment 1009 D
- Evaluate specific source locations in detail
- Baseflow Conditions
- Numerous sampling points, eg, 1000-ft intervals
- Sample pipes, outfalls, tributaries
- Extrapolate to similar areas in study area

Cypress Creek at Cypresswood Drive

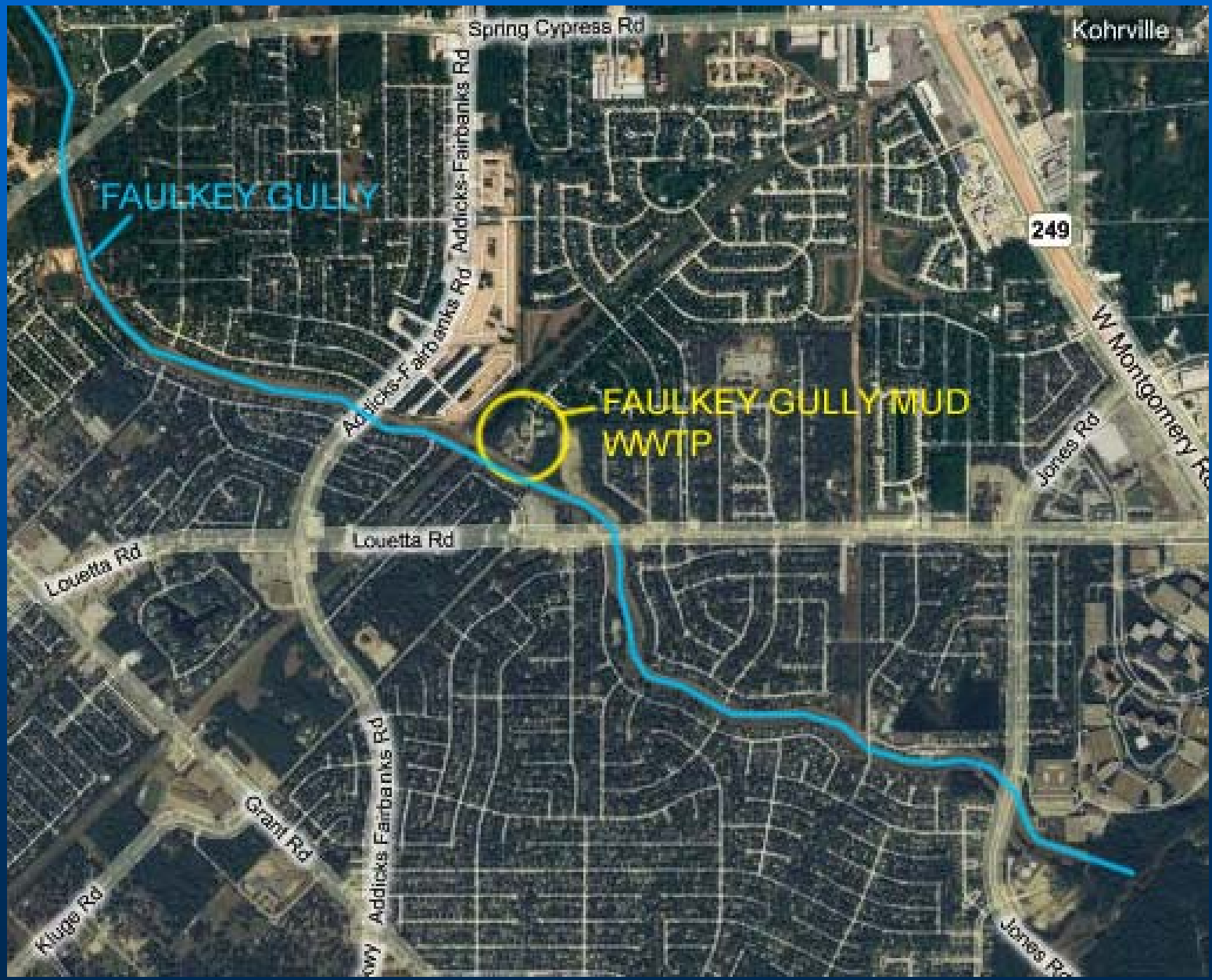
Cypress Creek at Stuebner-Airline Road

Cypress Creek at Grant Road

Cypress Creek Synoptic Sampling Map

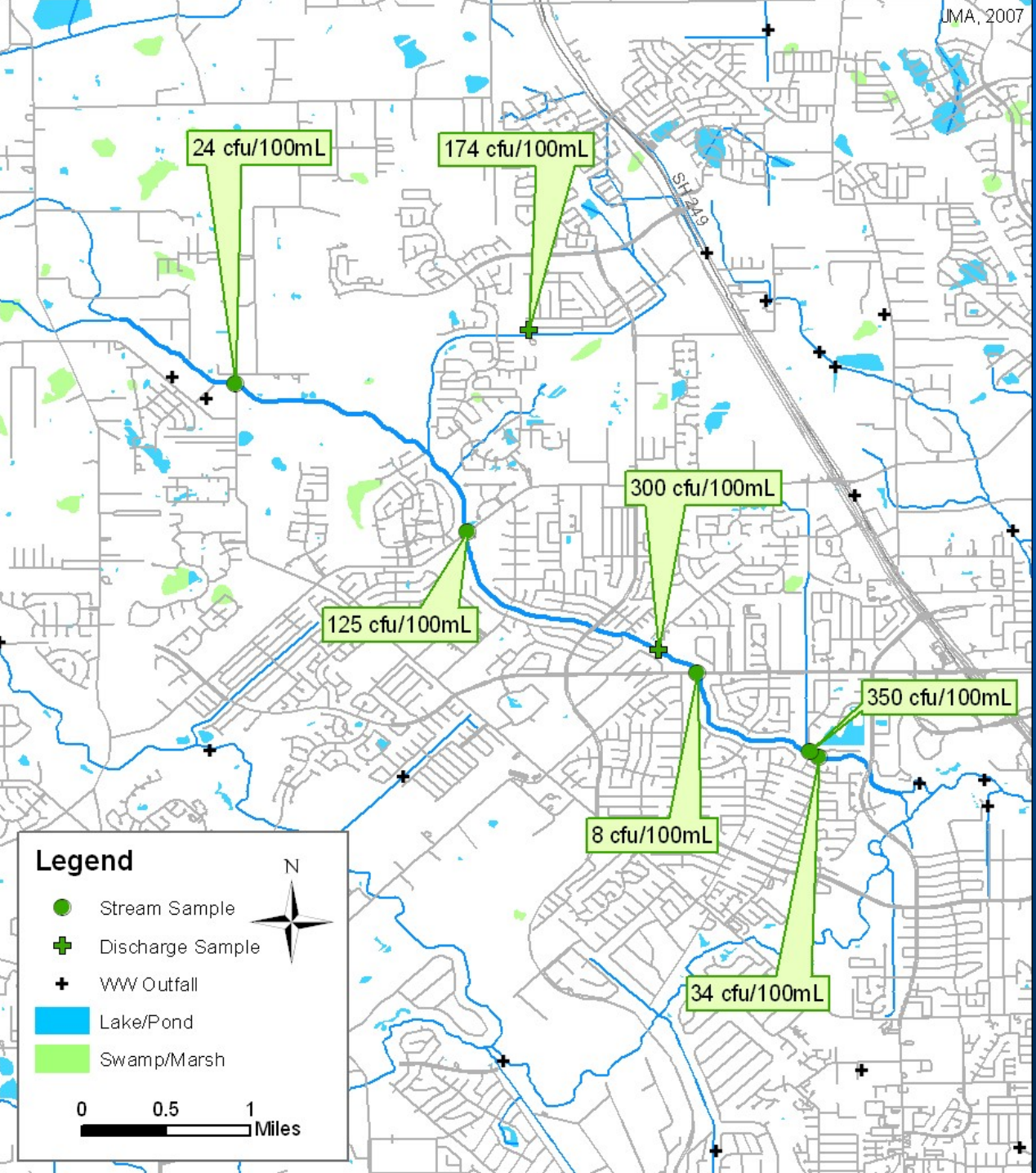


Faulkey Gully Aerial Map



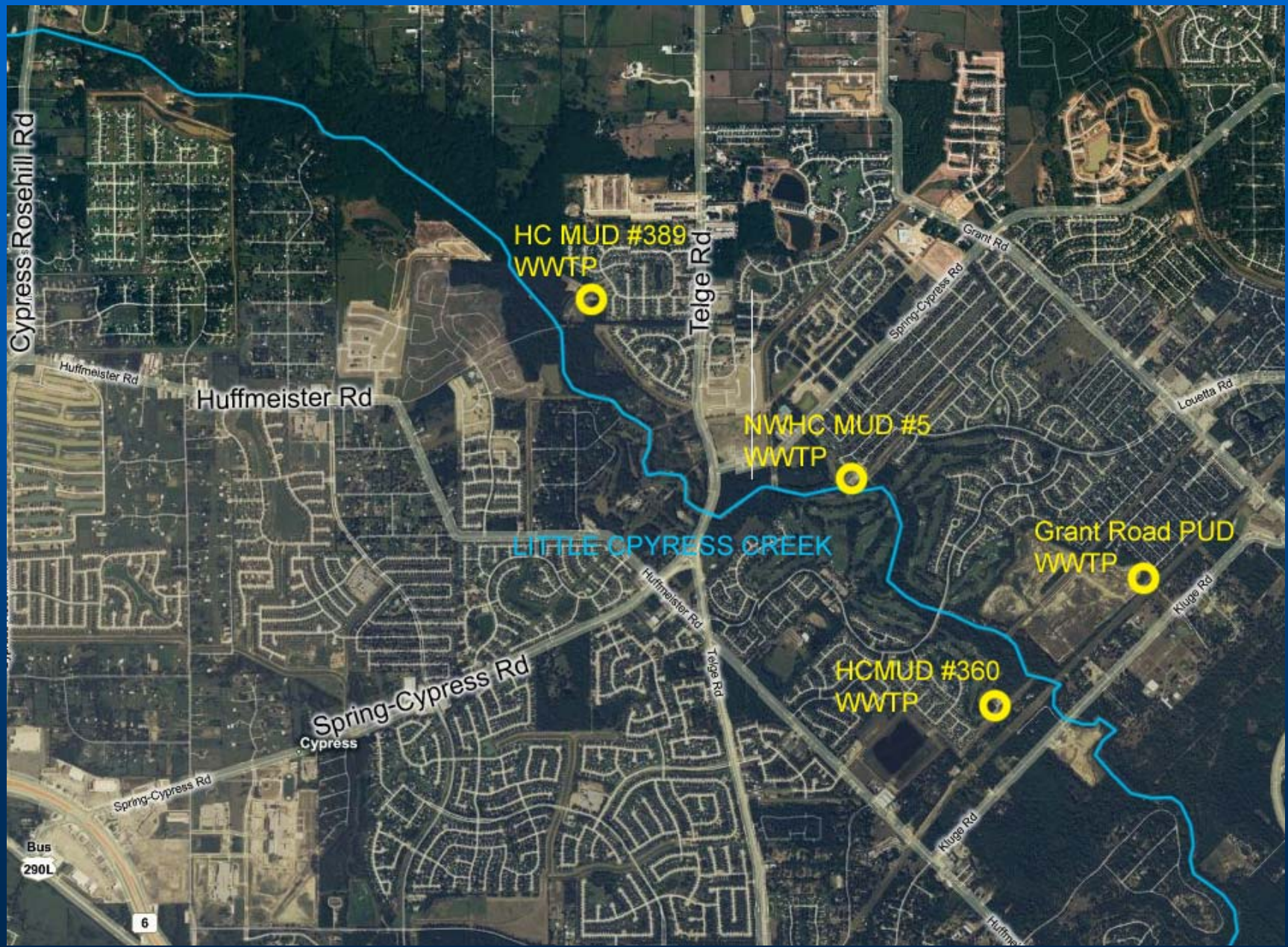
Faulkey Gully at Lakewood Forest Drive

Faulkey Gully Synoptic Sampling Map

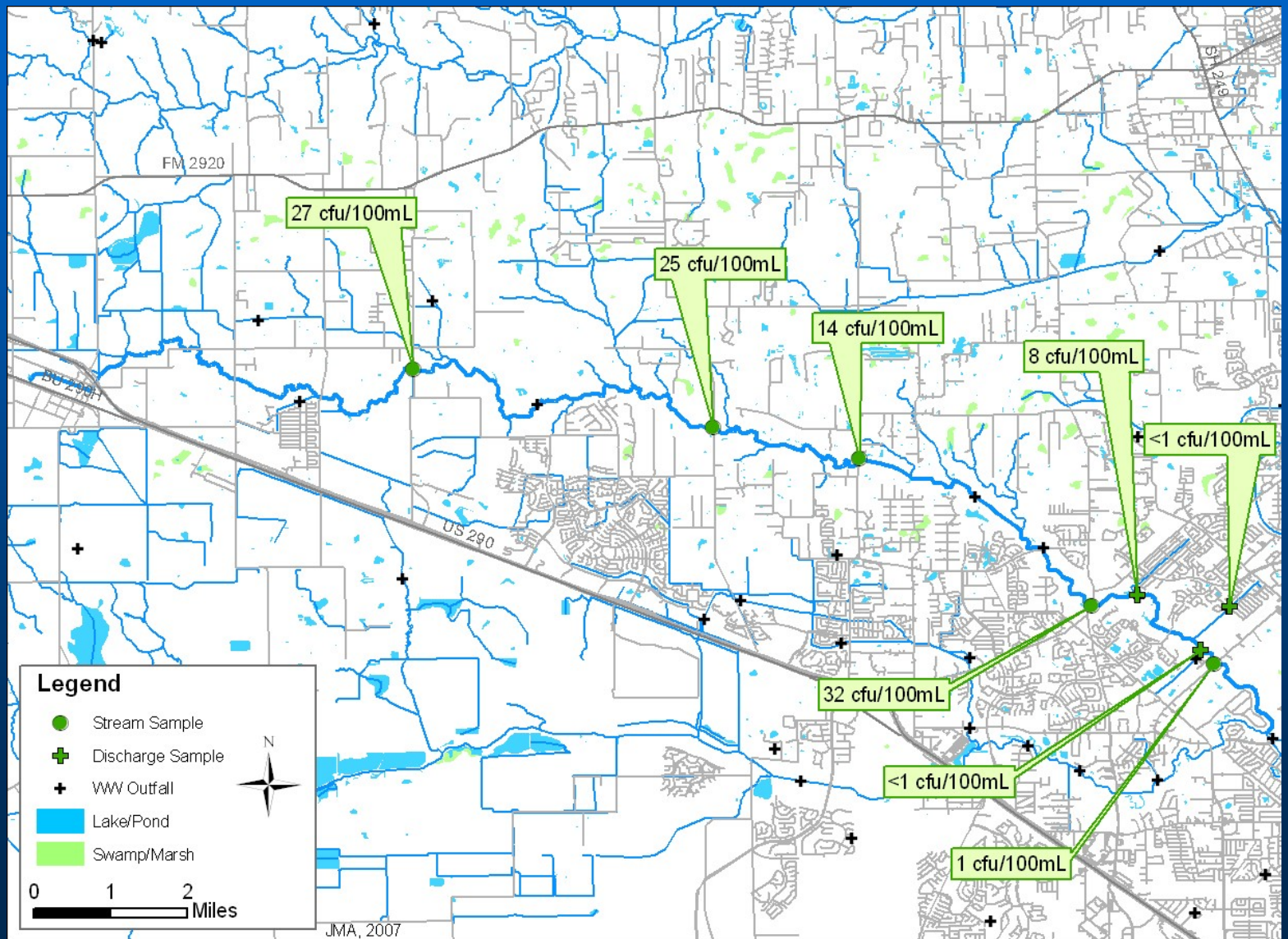


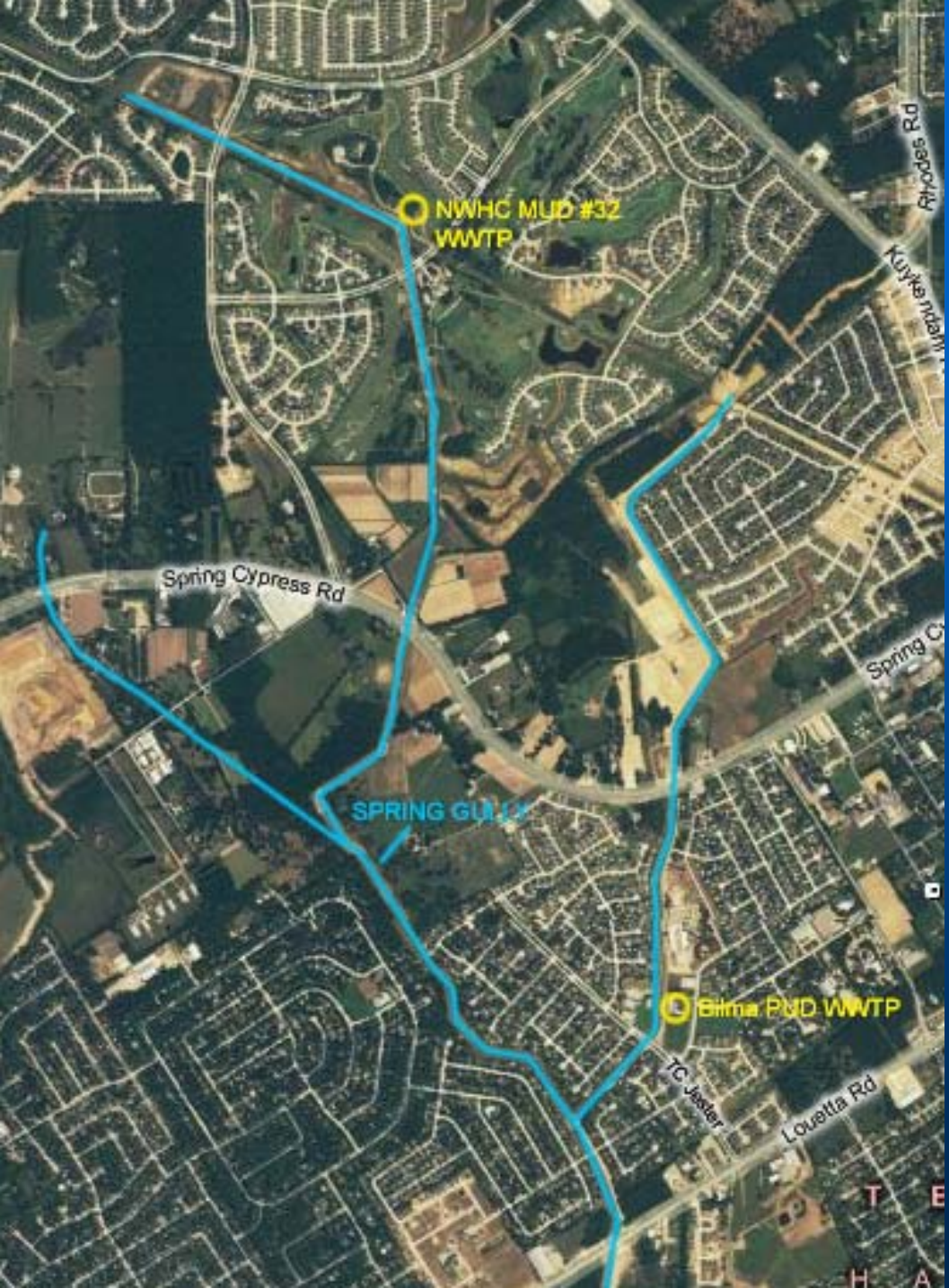
Little Cypress Creek at Kluge Road

Little Cypress Creek Aerial Map



Little Cypress Creek Synoptic Sampling Map

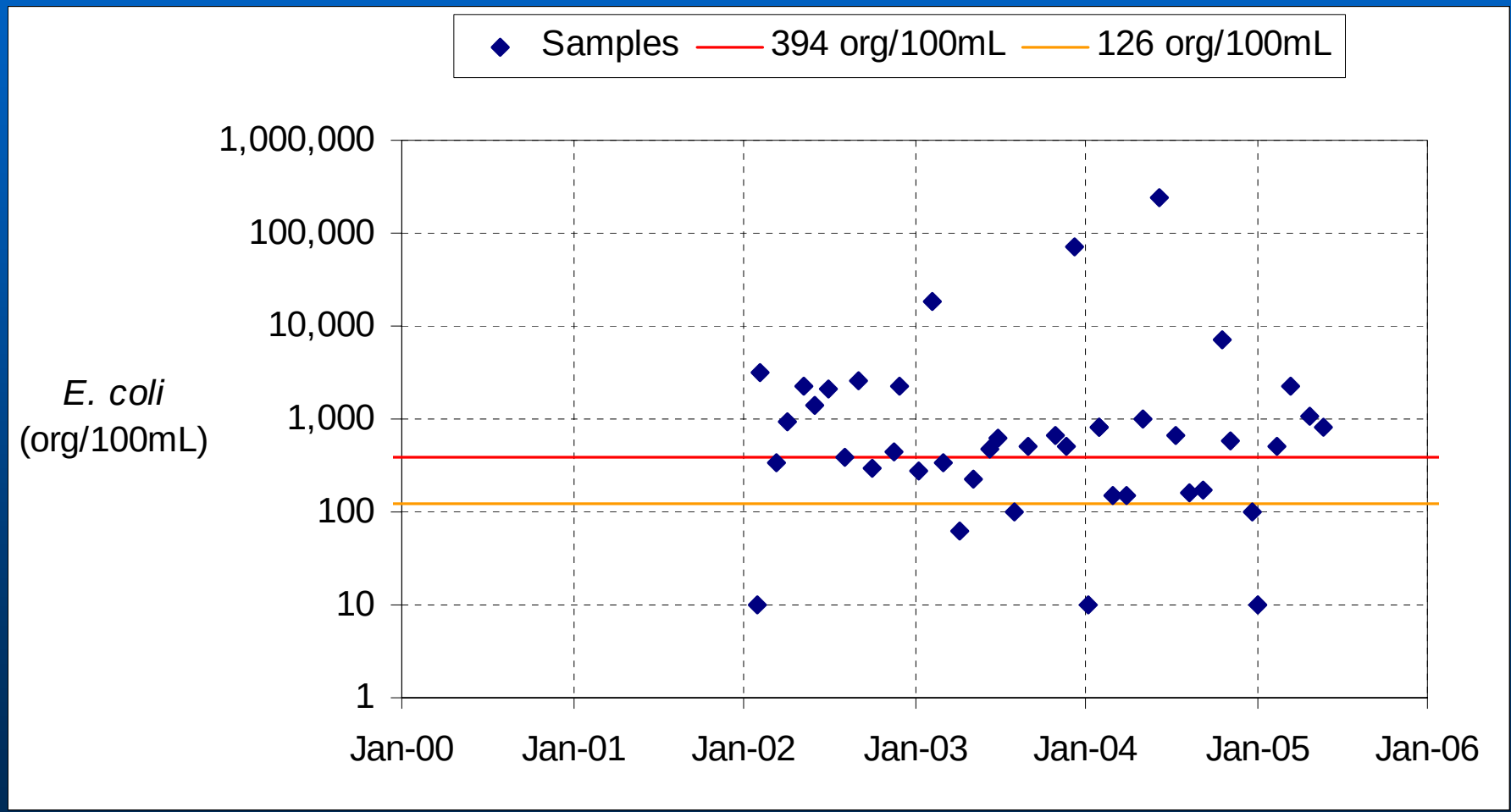


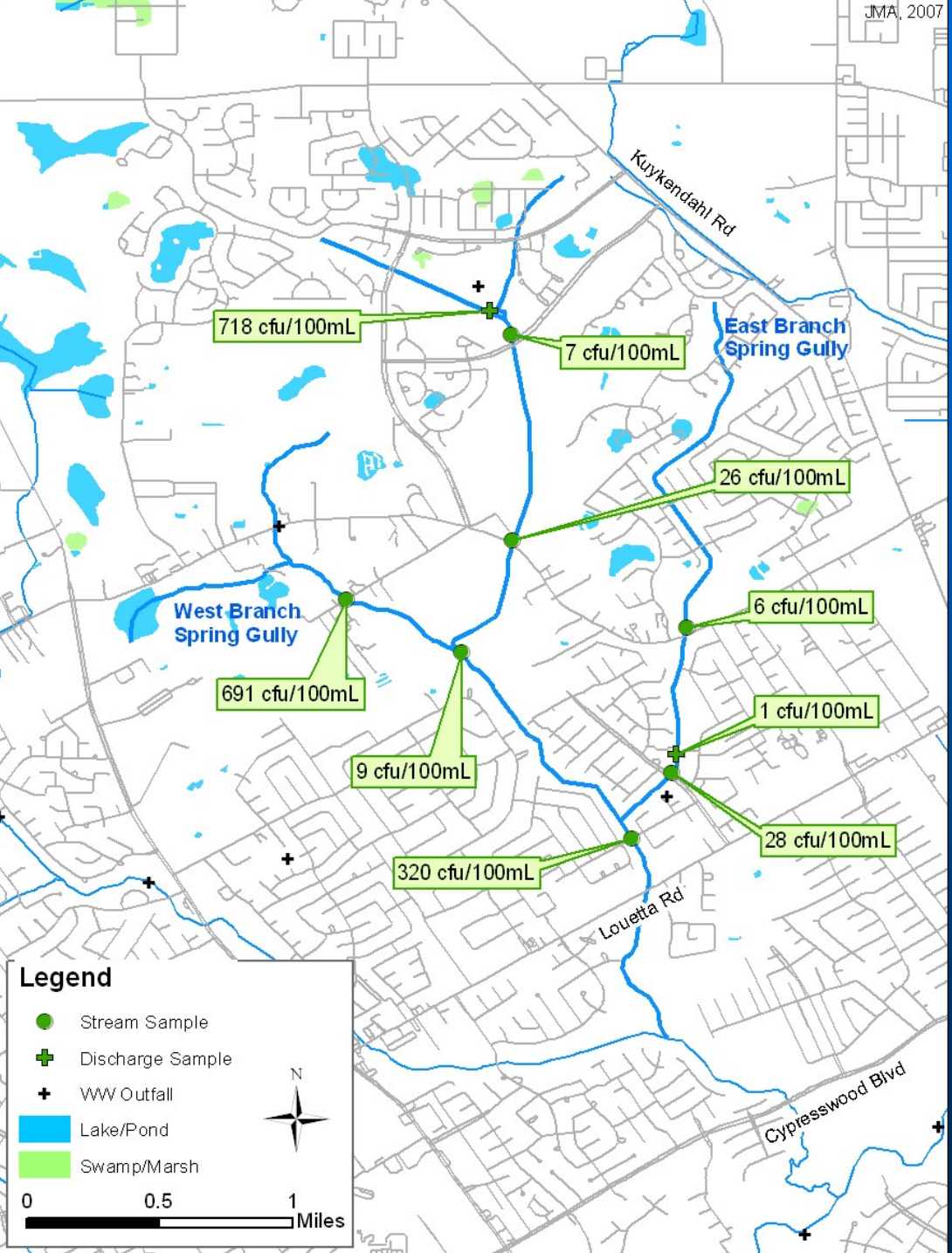


Spring Gully Aerial Map

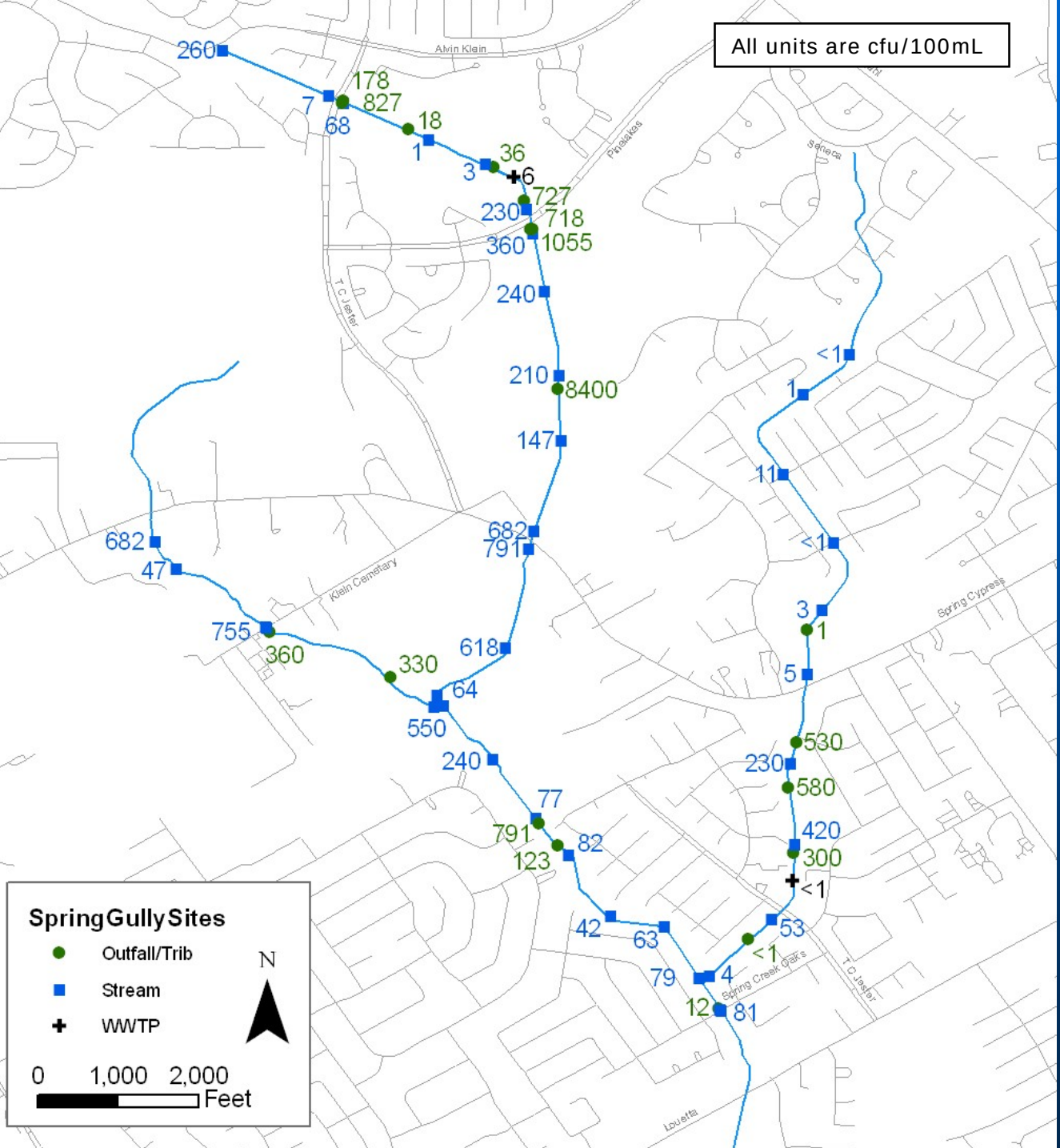
Spring Gully at Spring Creek Oaks

Temporal Analysis: Spring Gully at Spring Creek Oaks Rd (#17481)





Spring Gully Synoptic Sampling Map



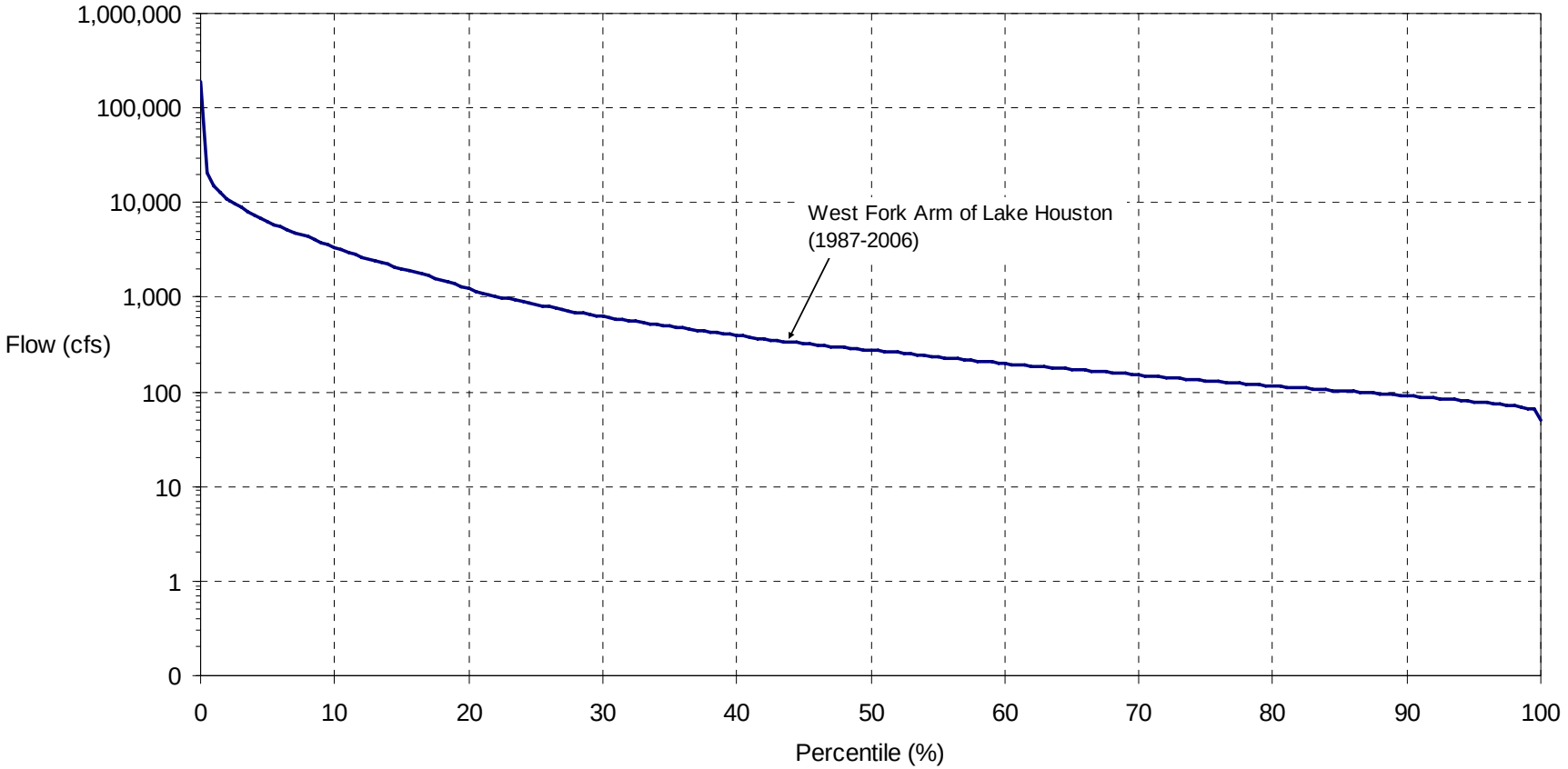
Spring Gully Intensive Survey Map

III.
Determination of TMDLS and Allocations

Flow Duration Curves

- A flow duration curve (FDC) is a graph of daily average streamflow versus the percent of days that the average streamflow value is exceeded
- FDCs are typically developed using daily flow data
- Common tool in hydrology studies

Lake Houston Flow Duration Curve

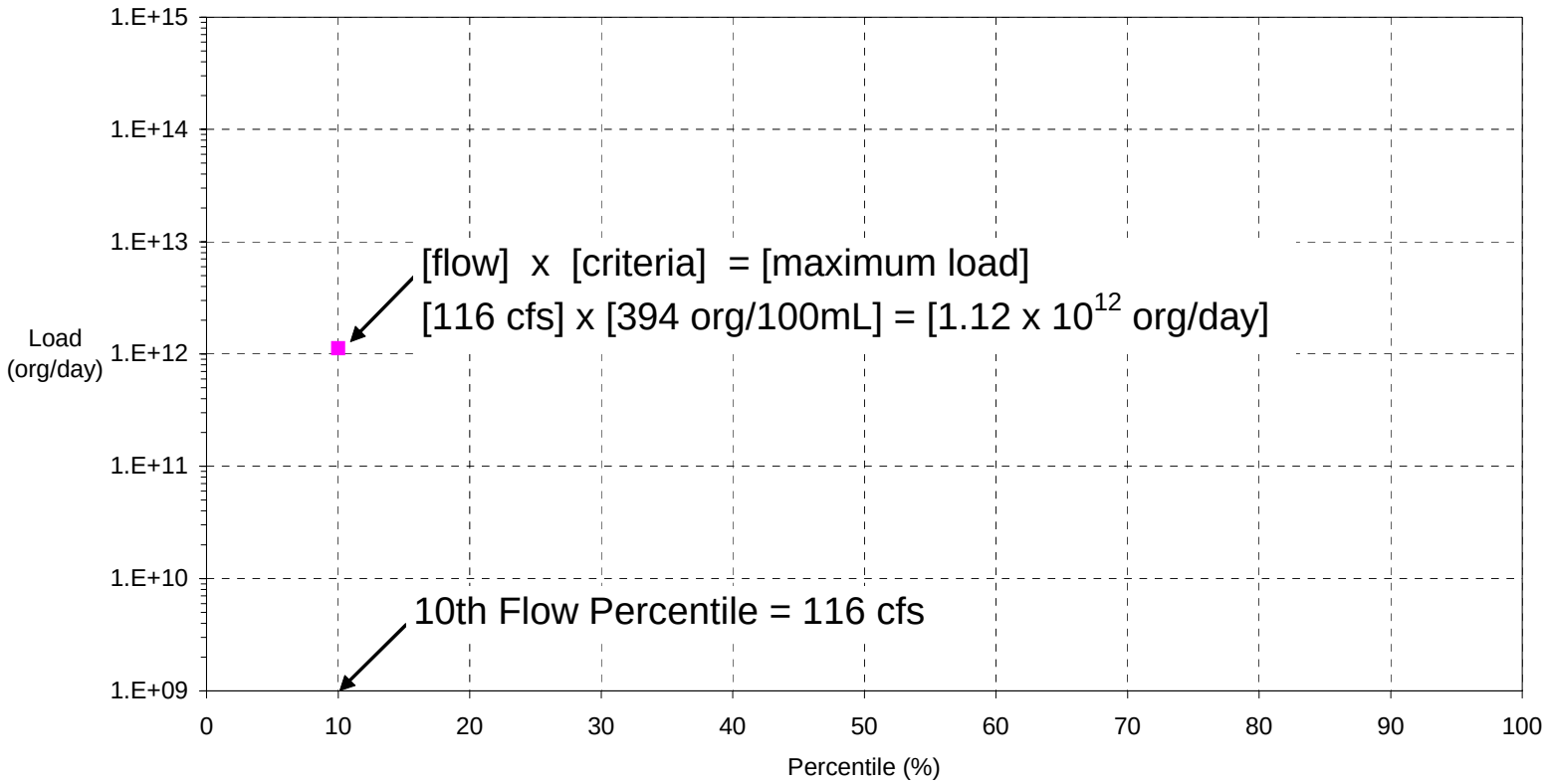


Load Duration Curves

- Bacterial loads are the product of each grab sample bacteria concentration and the corresponding mean daily streamflow rate
- The greatest exceedances typically occur under high flow conditions
- Plot sampling data as loads, compare to criteria, to develop LDC

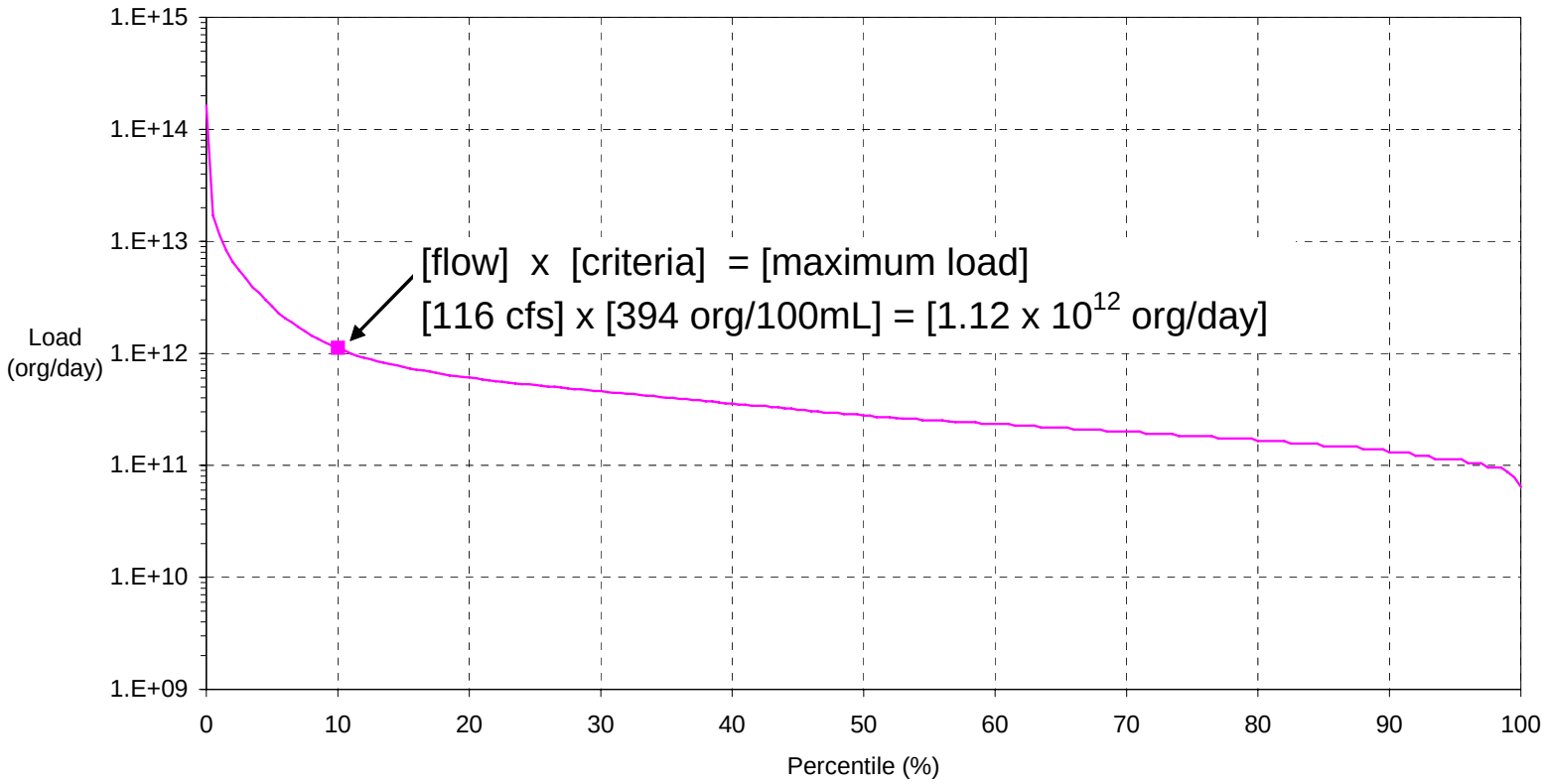
Hypothetical LDC

Step 1: Plot Allowable Load for a Flow Percentile



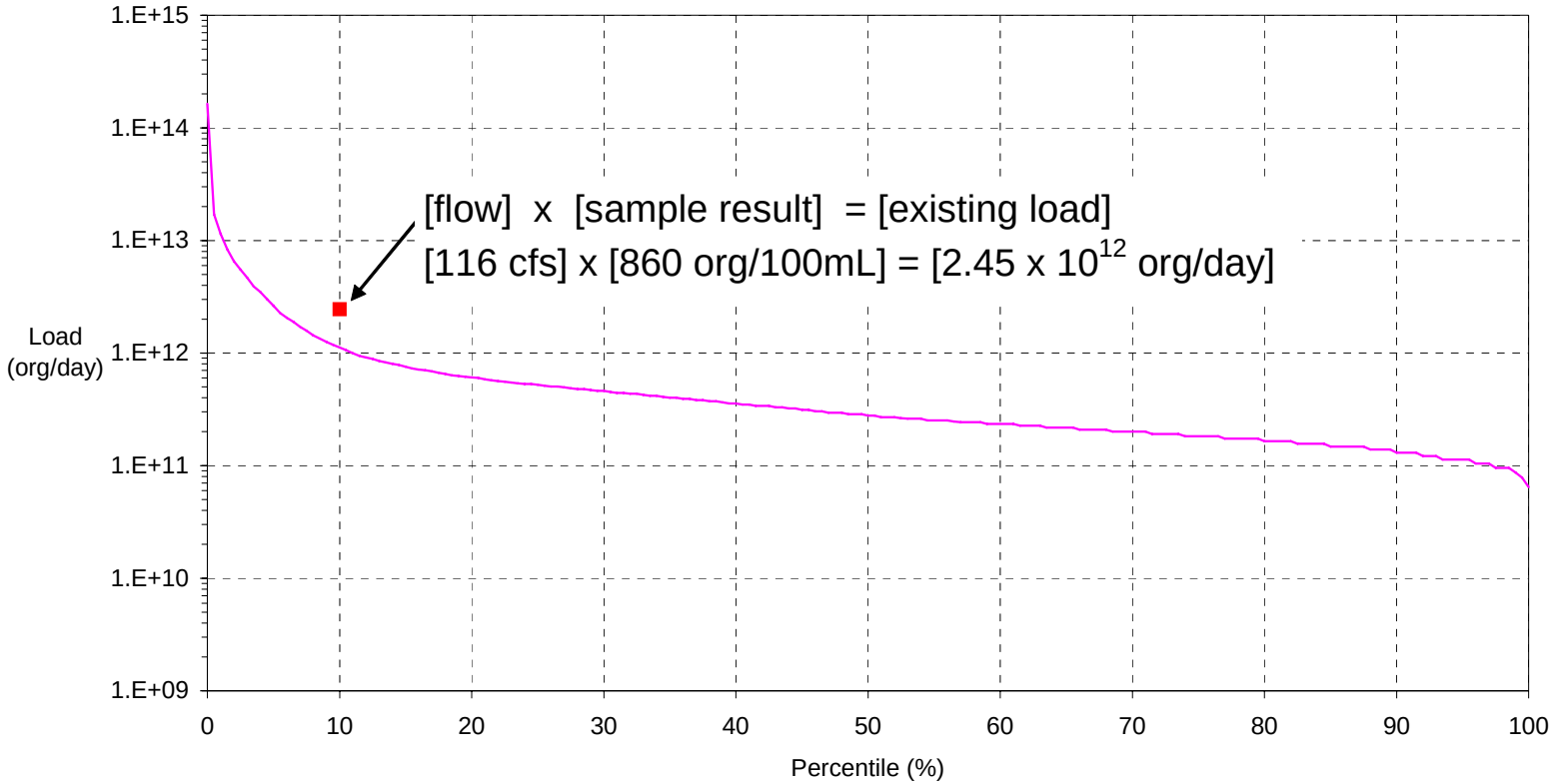
Hypothetical LDC

Step 2: Plot Allowable Load for each Flow Percentile



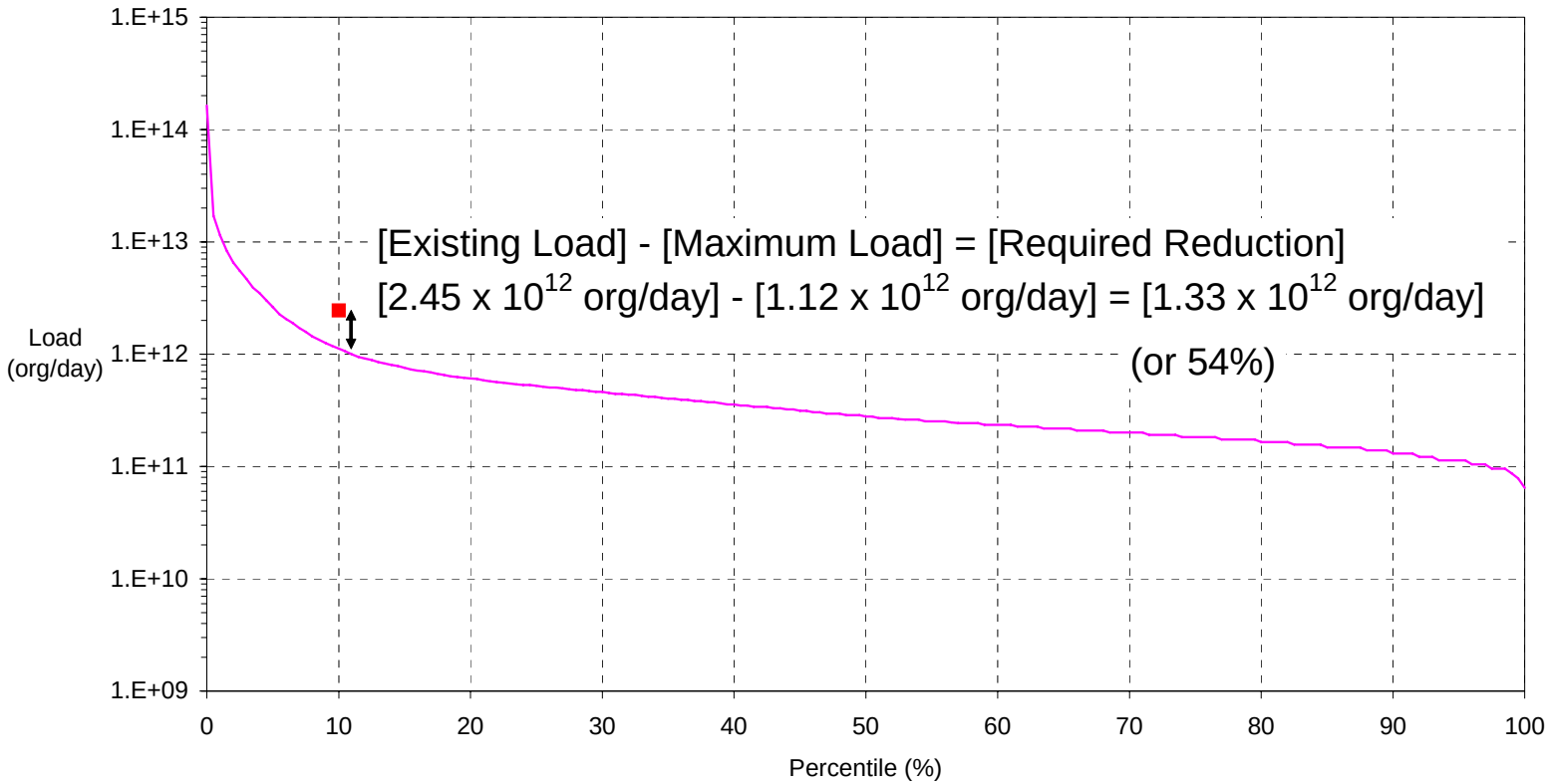
Hypothetical LDC

Step 3: Plot a Sampling Result
(on 21 January 2004, the flow was 116 cfs and the bacteria concentration was 860 org/100mL)

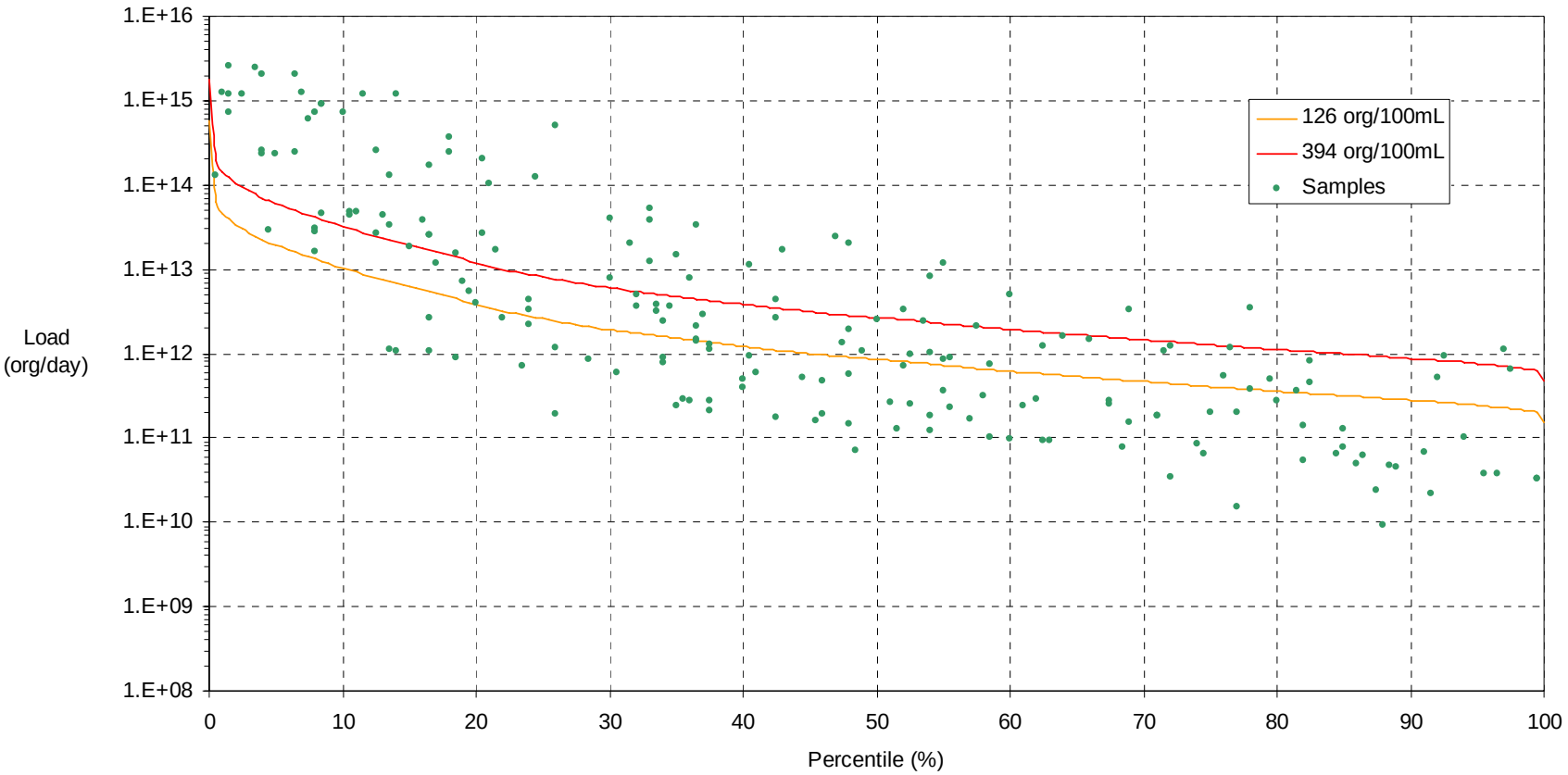


Hypothetical LDC

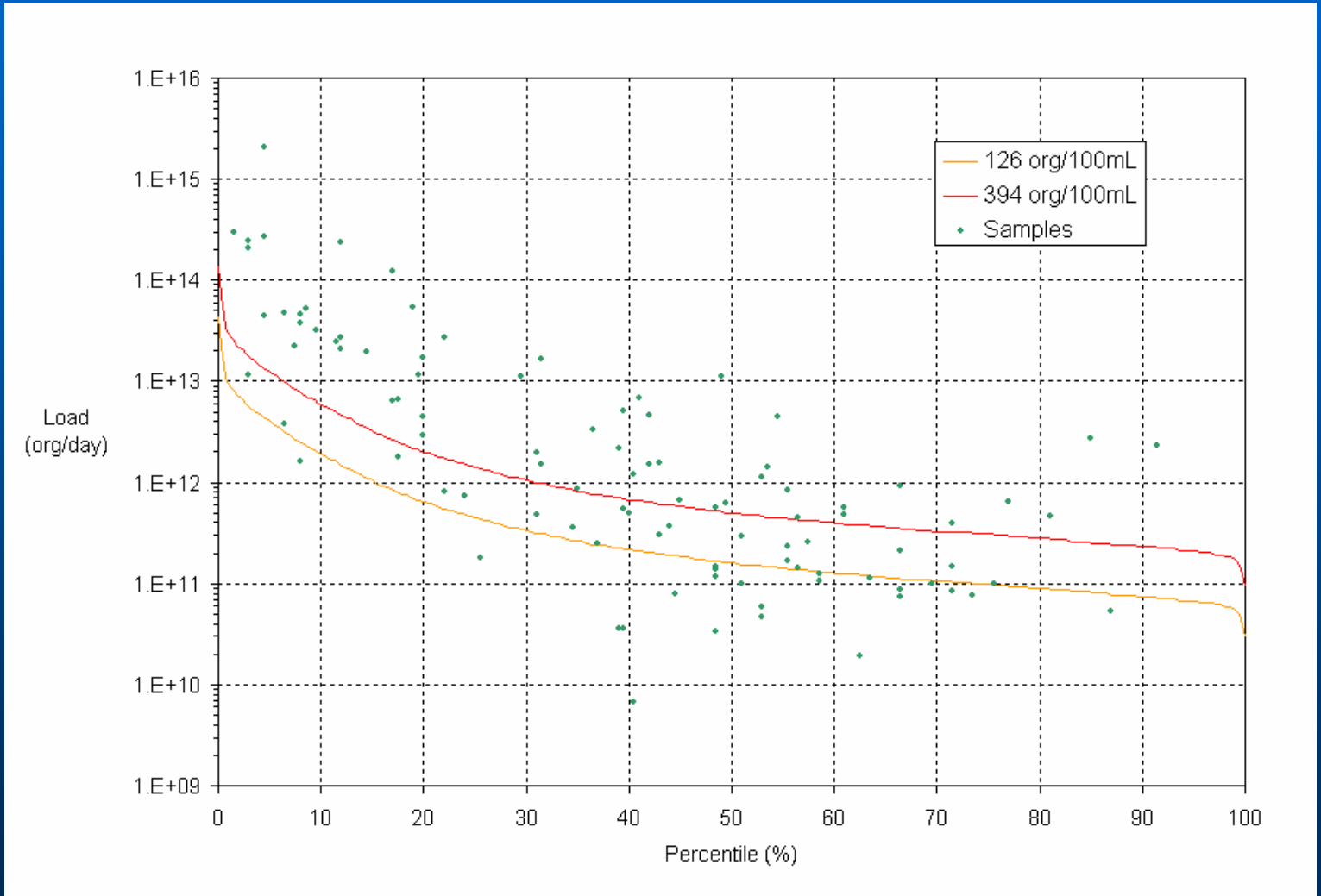
Step 4: Determine Load Exceedance
(for 21 January 2004 only)



LDC for Lake Houston at US 59 (#11213)



LDC for Cypress Creek at IH 45 (#11328)



Why does this Matter?

- LDC shows if sampling data indicates compliance or exceedance
- For exceedance of criteria, need to develop an allowable load allocation
- Potential sources are addressed in implementation plan

Allocation Categories

- Two primary source categories
  - Wasteloads (WLA) - any source flowing into a waterway and covered by a permit
    - wastewater treatment plants
    - discharges of runoff from municipal areas covered under stormwater permits (MS4s)
  - Loads (LA) - remaining diffuse sources of pollutants that are not covered by permit
    - runoff from rural or urban areas outside of permitting jurisdictions

Wastewater Treatment Facilities

- Potential to contribute significant bacteria loads if complete disinfection is not achieved
- Loads may be most noticeable under low flow conditions, during which some streams may be effluent dominated
- Also possible for treatment plants to contribute significant loads under wet weather conditions
- Increased loading due to stormwater inflow and infiltration may result in poorer plant performance

Cypress Creek Wastewater Treatment Facility Summary

- 101 permitted facilities
- Total current flow 29 MGD (45 cfs)
- Total Permitted flow 74 MGD (116 cfs)
- WWTP flows account for 100% of the stream flow at the 99th percentile regime (low flow), 76% of the flow at the 50th percentile

Runoff Sources

- Urban areas have human, pet, and wildlife waste sources
- Rural areas may have livestock waste sources
- Natural areas have wildlife waste sources
- Larger loads often associated with urban areas because there is more runoff from storms
- Septic Systems

TCEQ Website for Project Information

http://www.tceq.state.tx.us/implementation/water/tmdl/82-lakehouston.html