East Fork San Jacinto River, Segment 1003
Peach Creek, Segment 1011
Caney Creek, Segment 1010

Data Review & Analysis

James Miertschin, PhD,PE
James Miertschin & Associates
Environmental Engineering

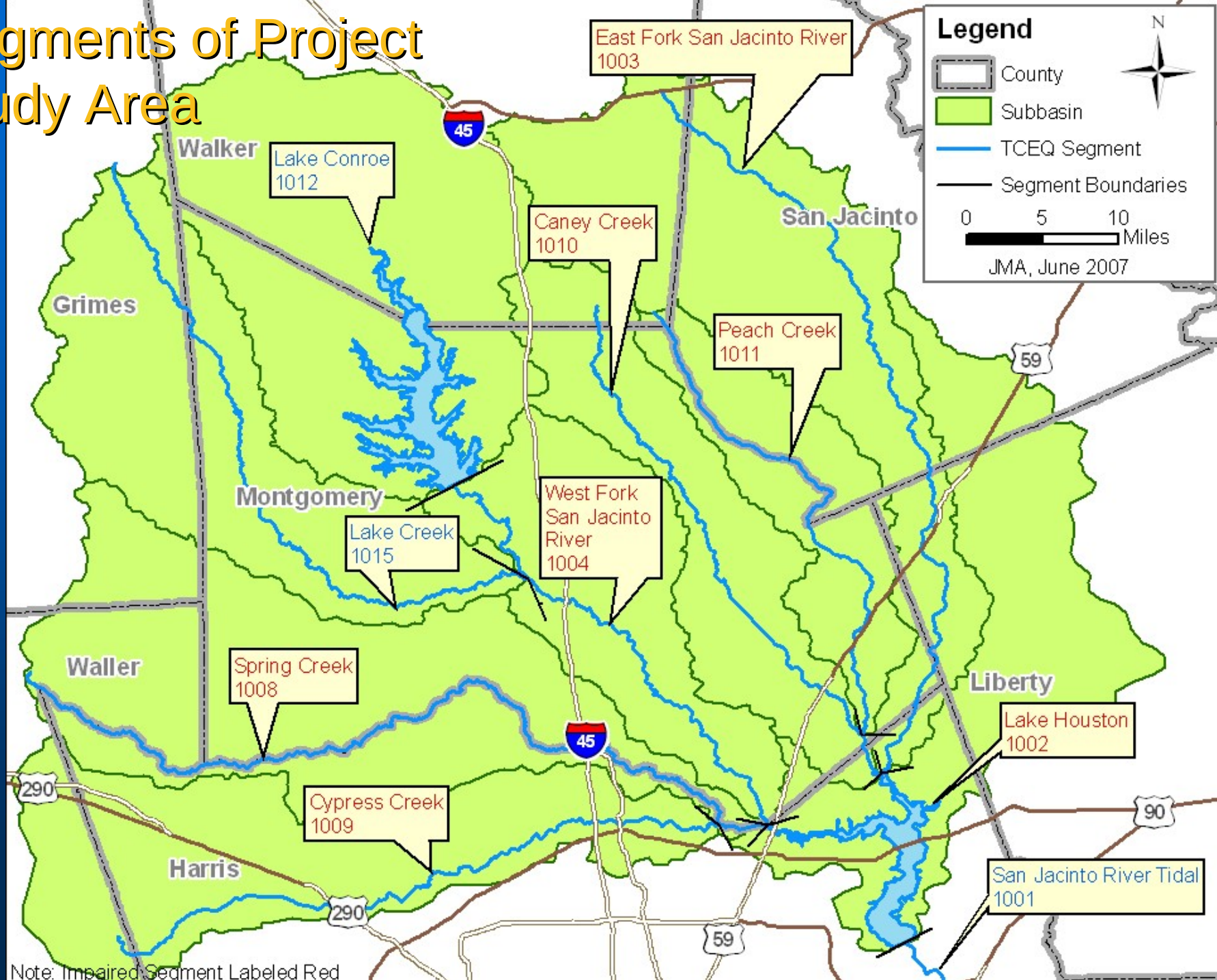
Introduction

- The East Fork San Jacinto River Basin above Lake Houston is 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

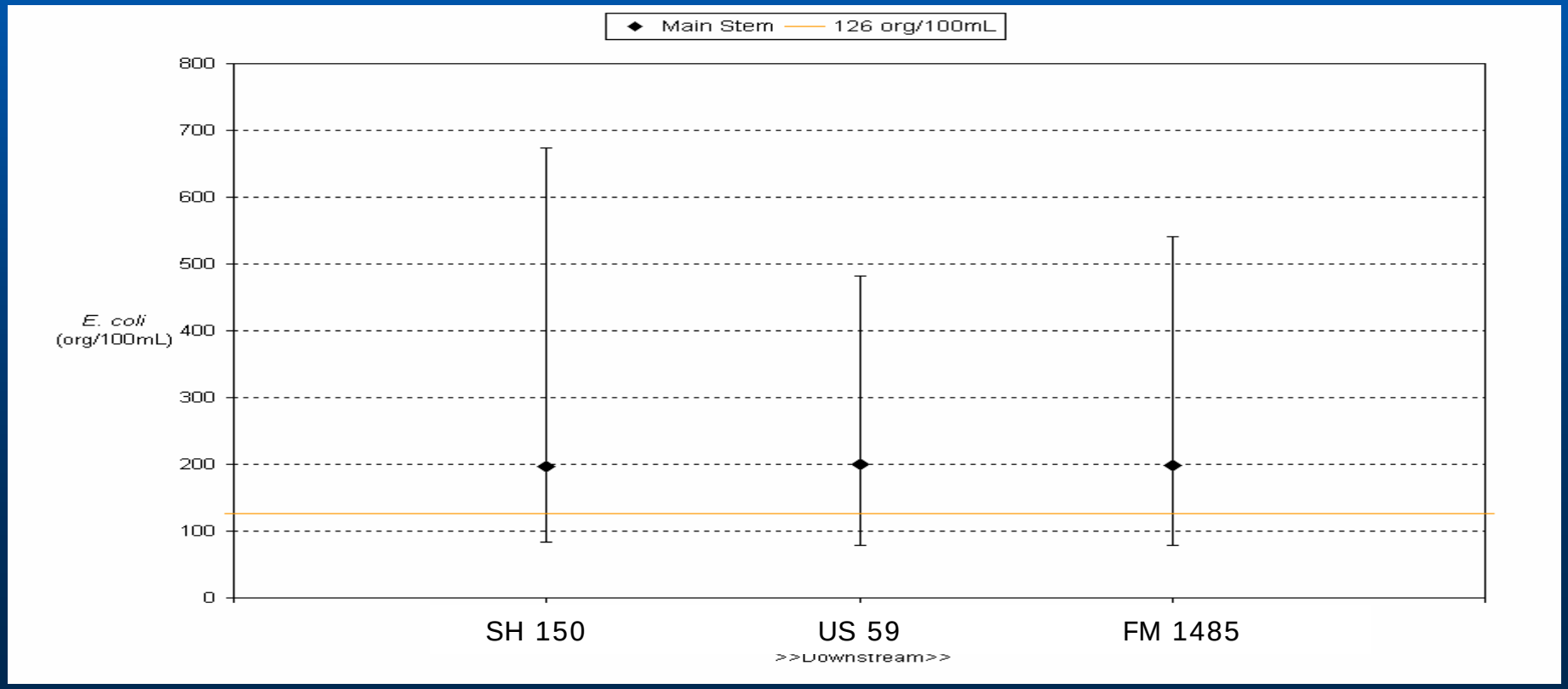
Spatial and Temporal Analysis

- 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

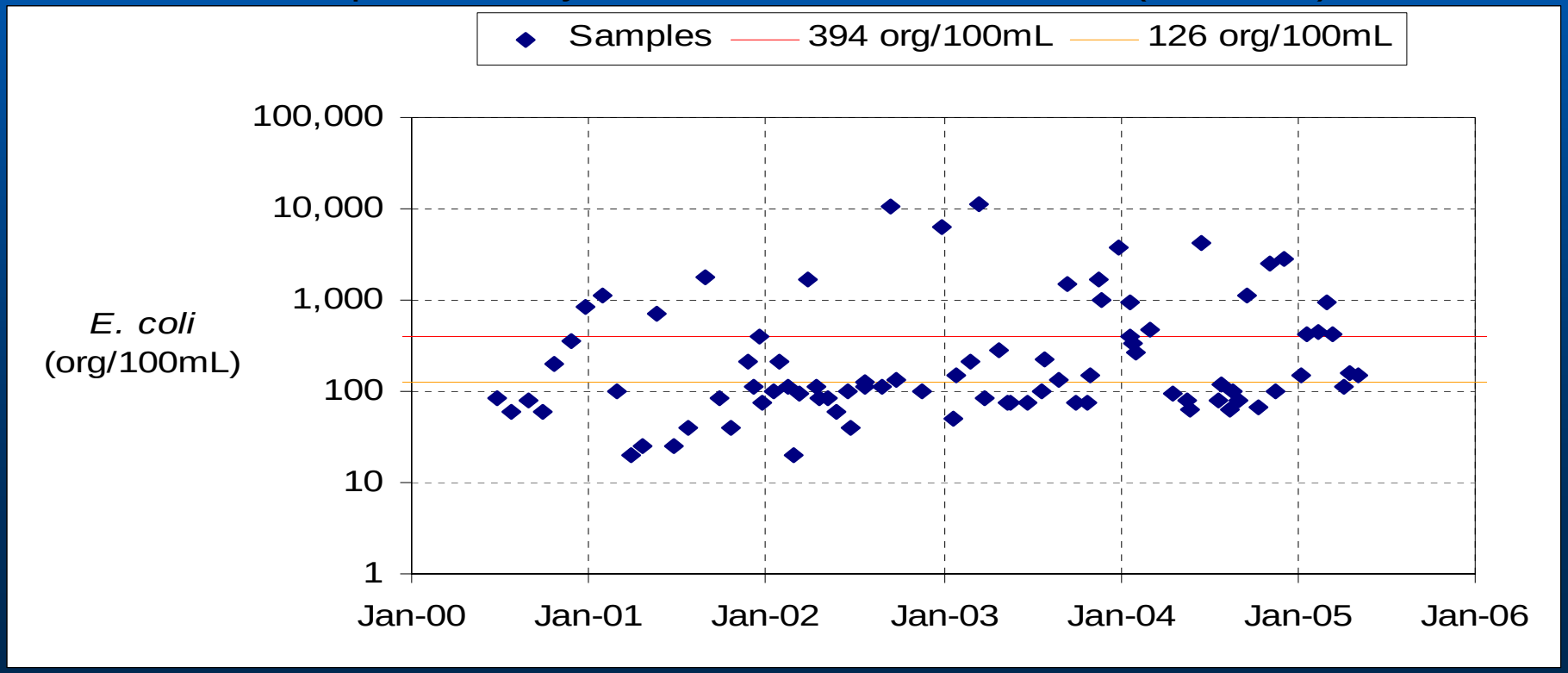
East Fork San Jacinto River Spatial Analysis



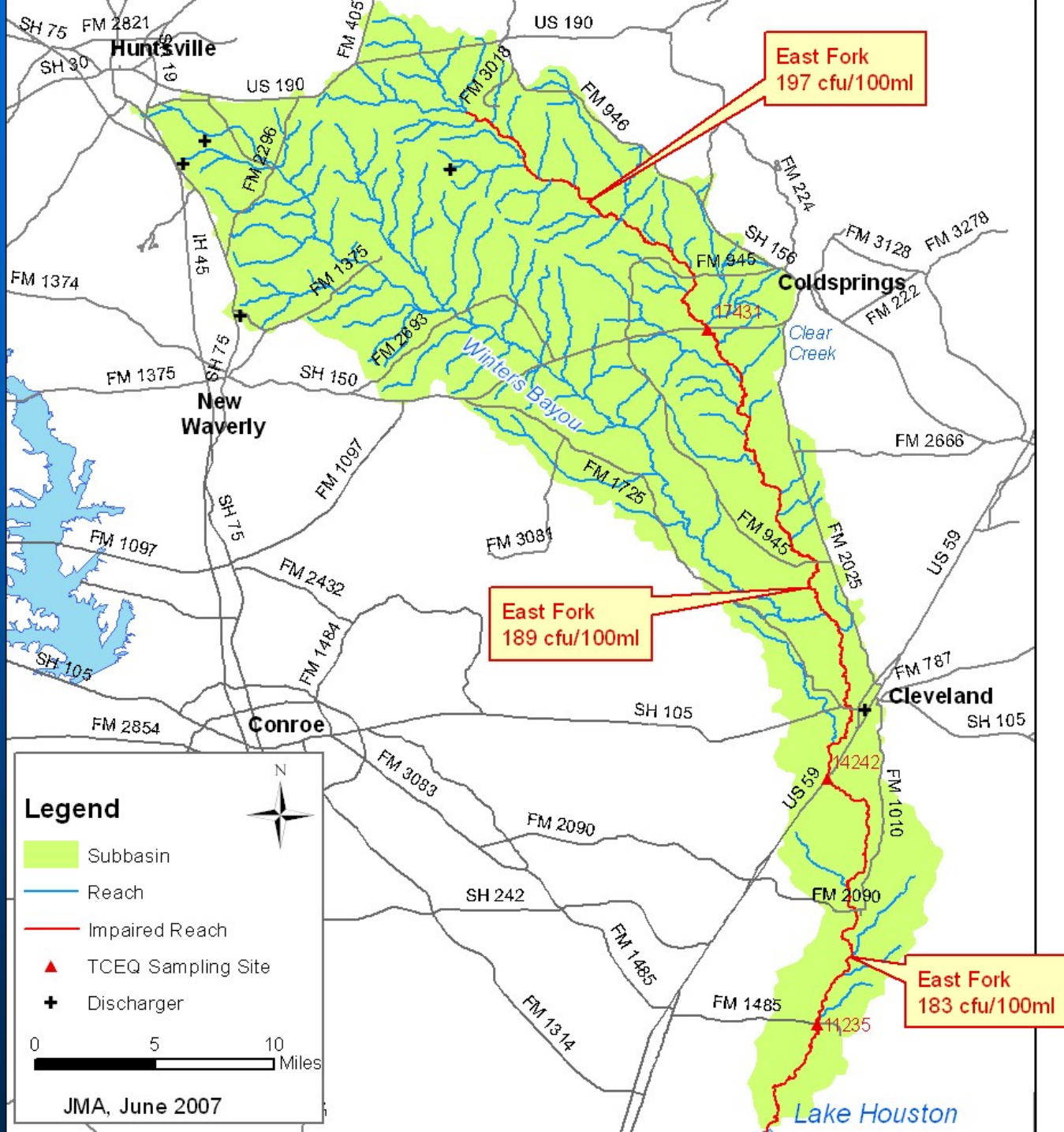
Temporal Analysis

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

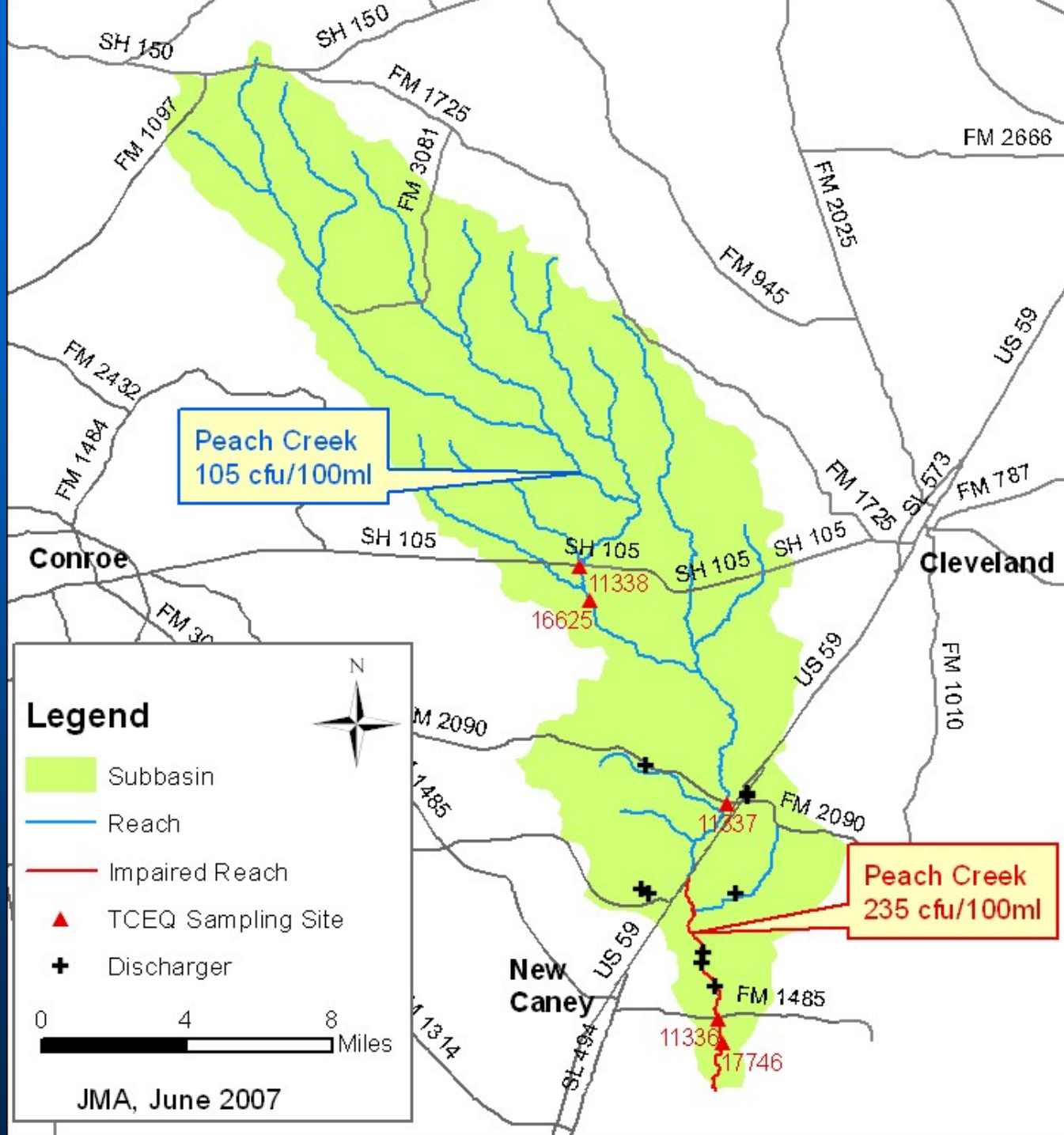
Temporal Analysis: East Fork at FM 1485 (#11235)



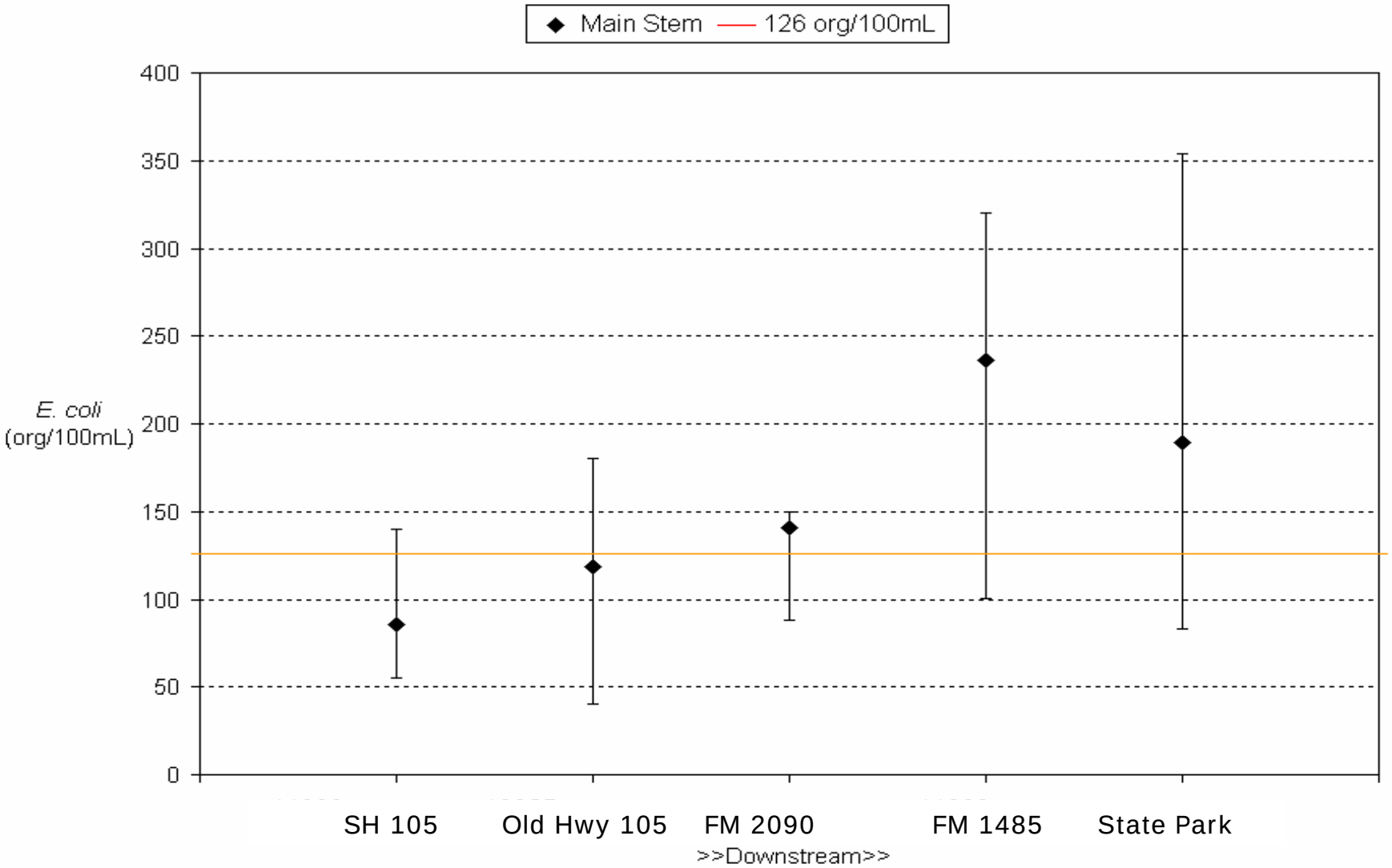
East Fork Study Area



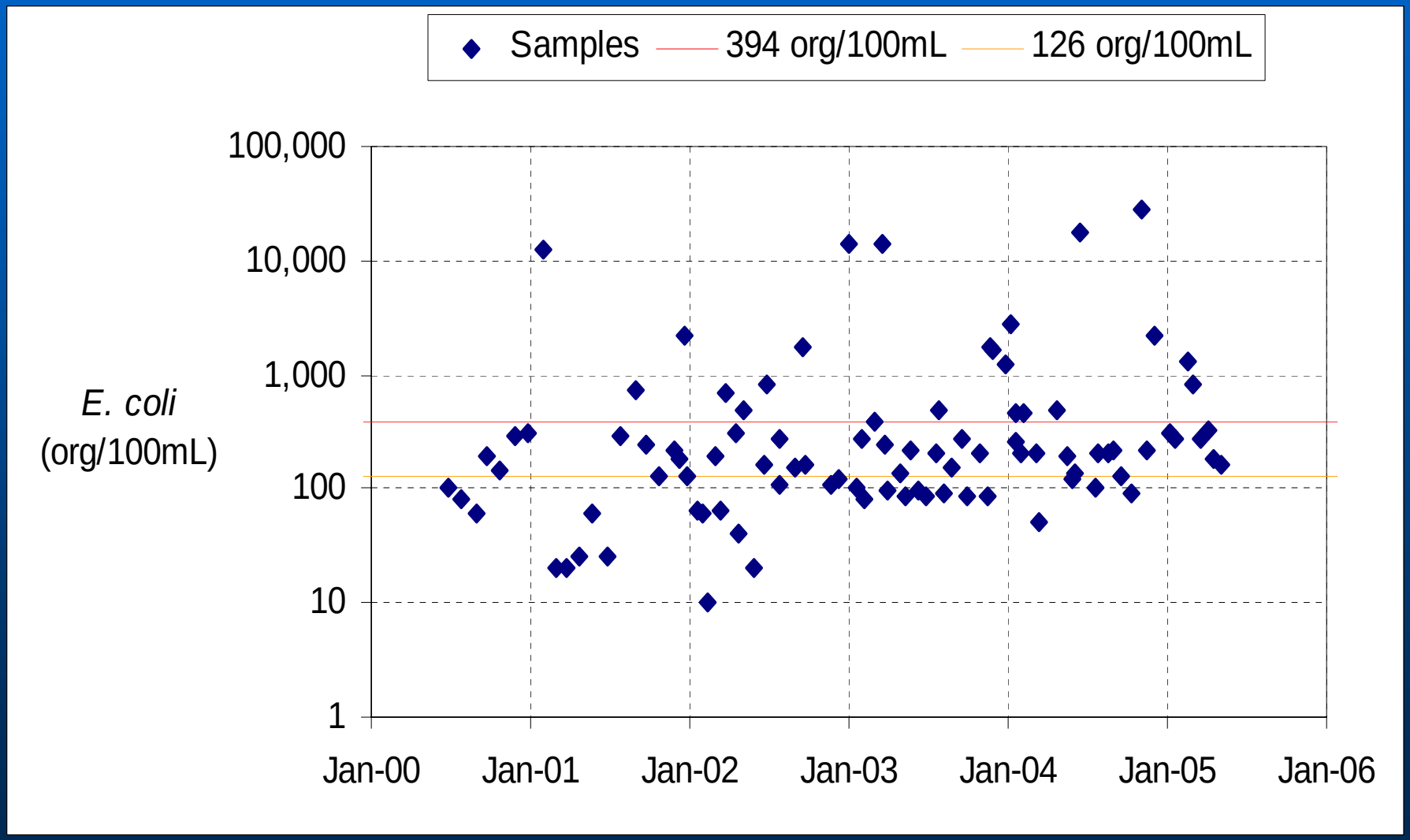
Peach Creek Study Area



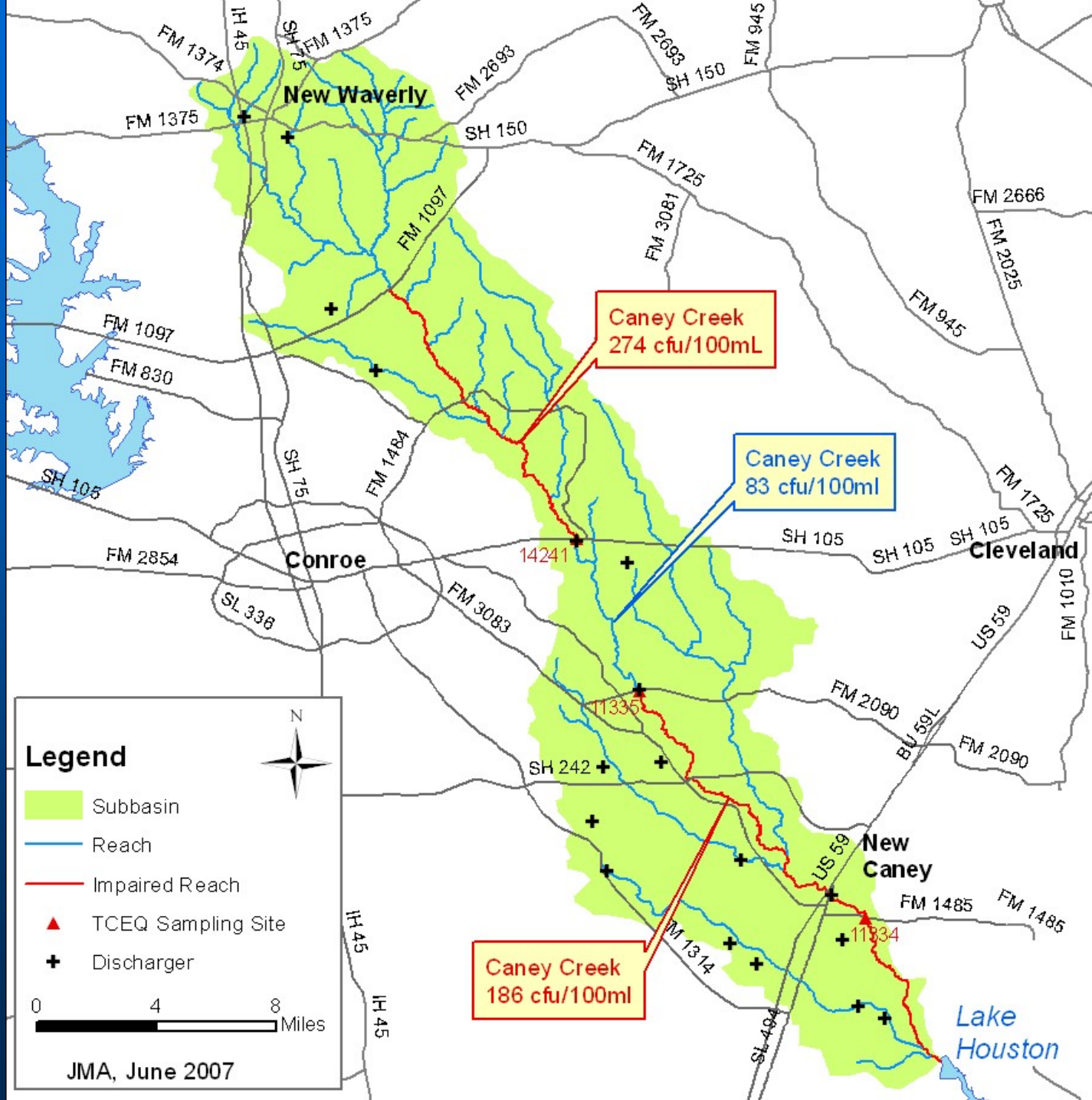
Peach Creek Spatial Analysis



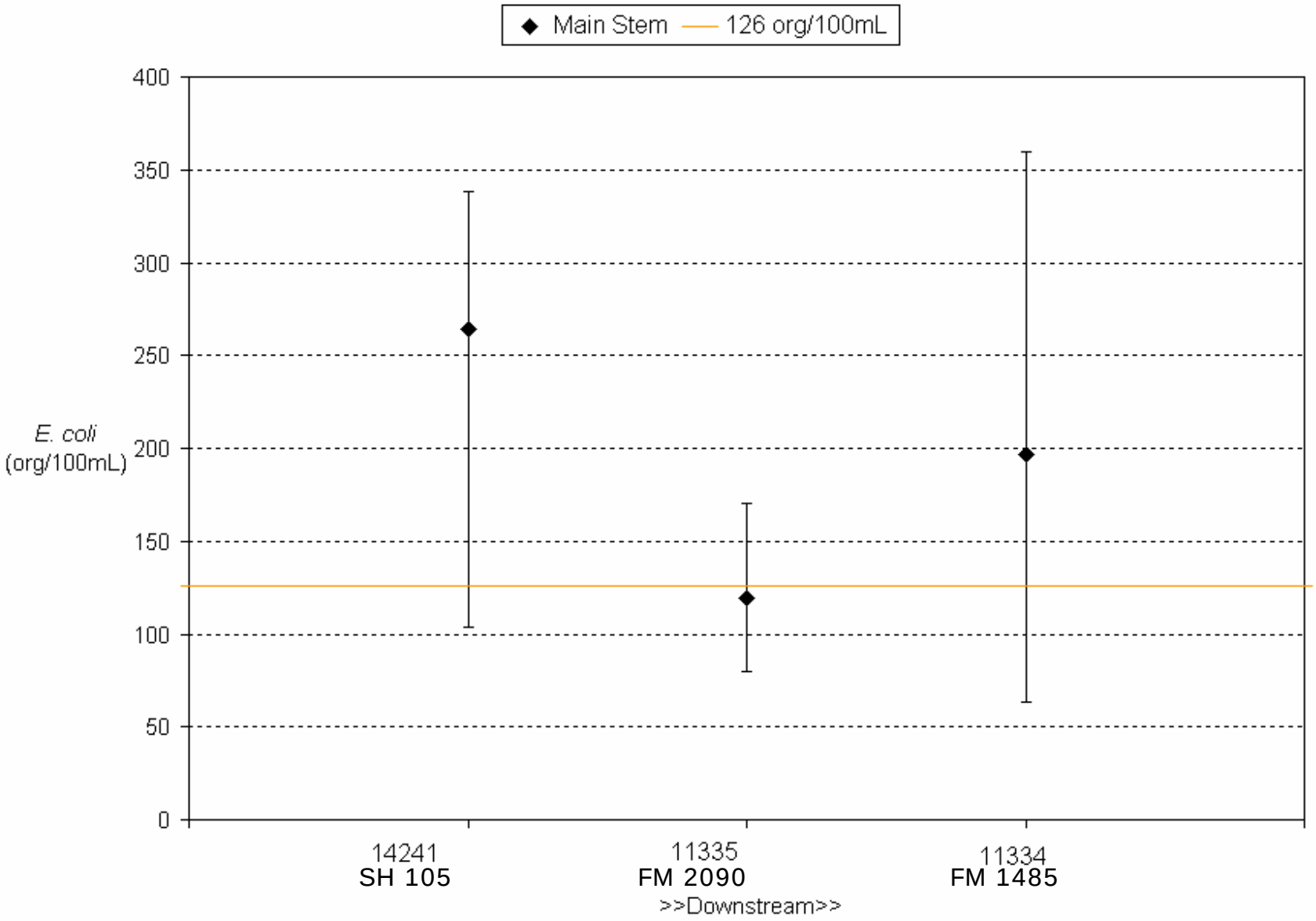
Temporal Analysis: Peach Creek at FM 1485 (#11336)



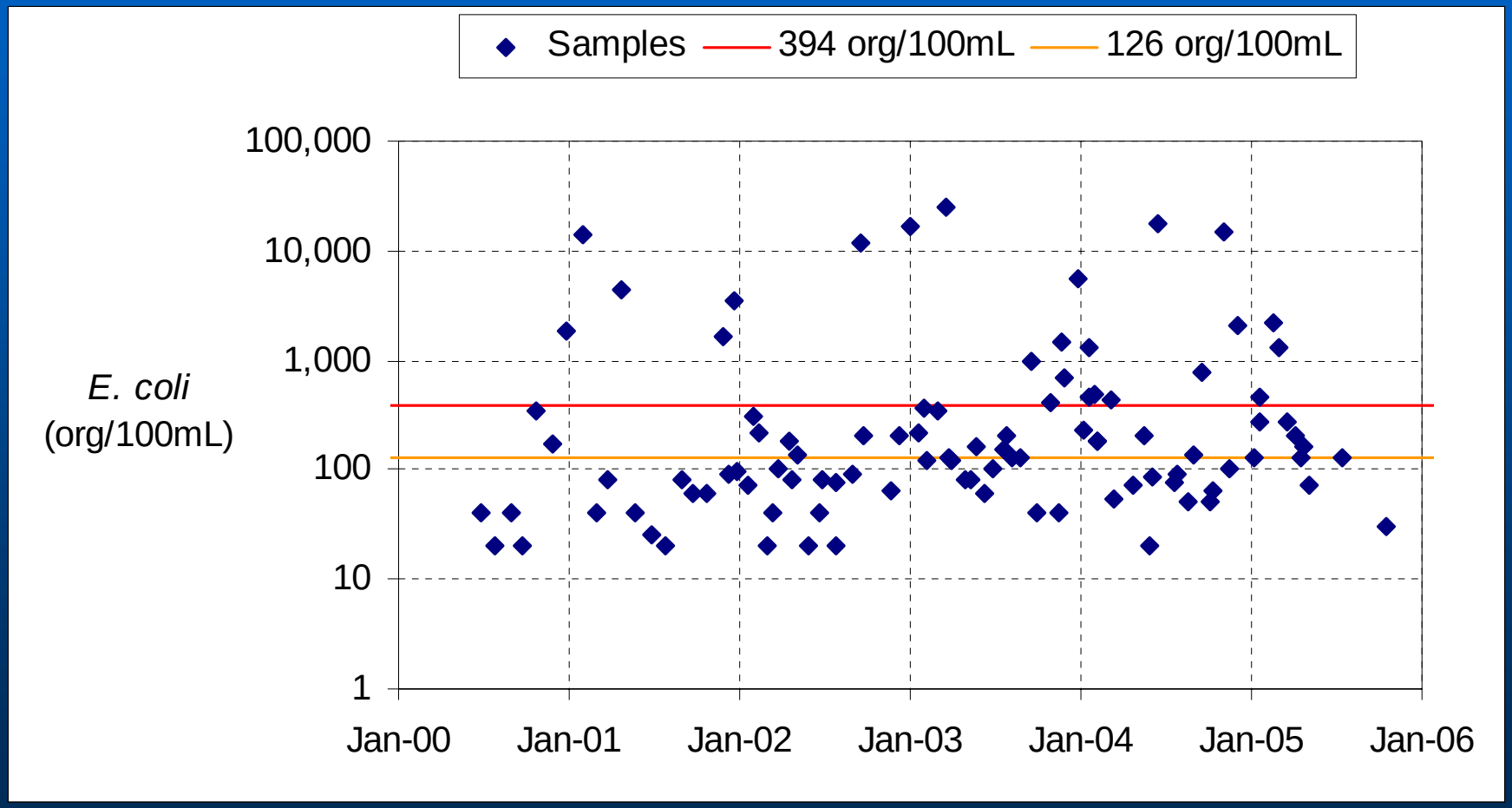
Caney Creek Study Area



Caney Creek Spatial Analysis



Temporal Analysis: Caney Creek at FM 1485 (#11334)



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

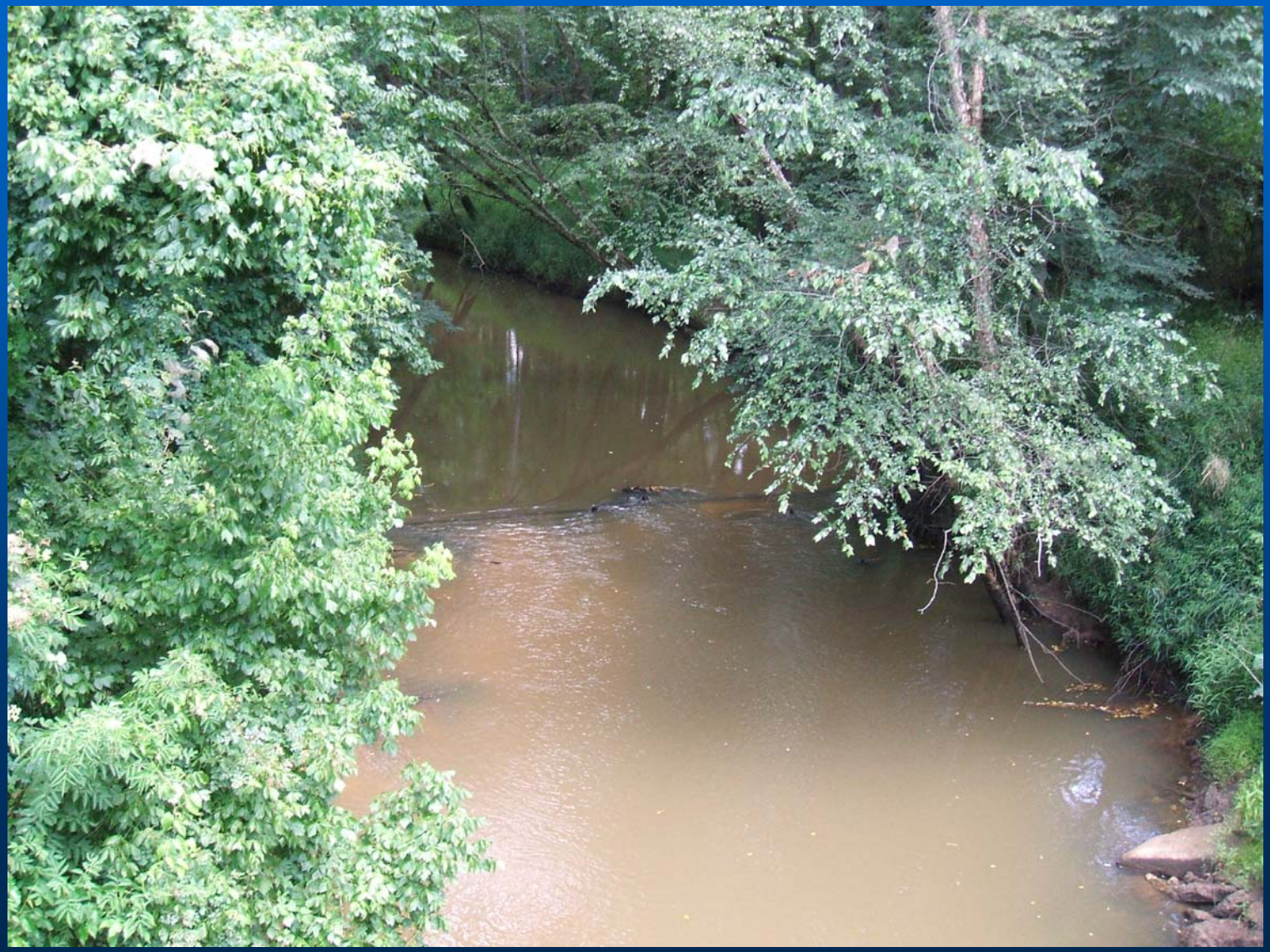
Synoptic Sampling Surveys

- 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.

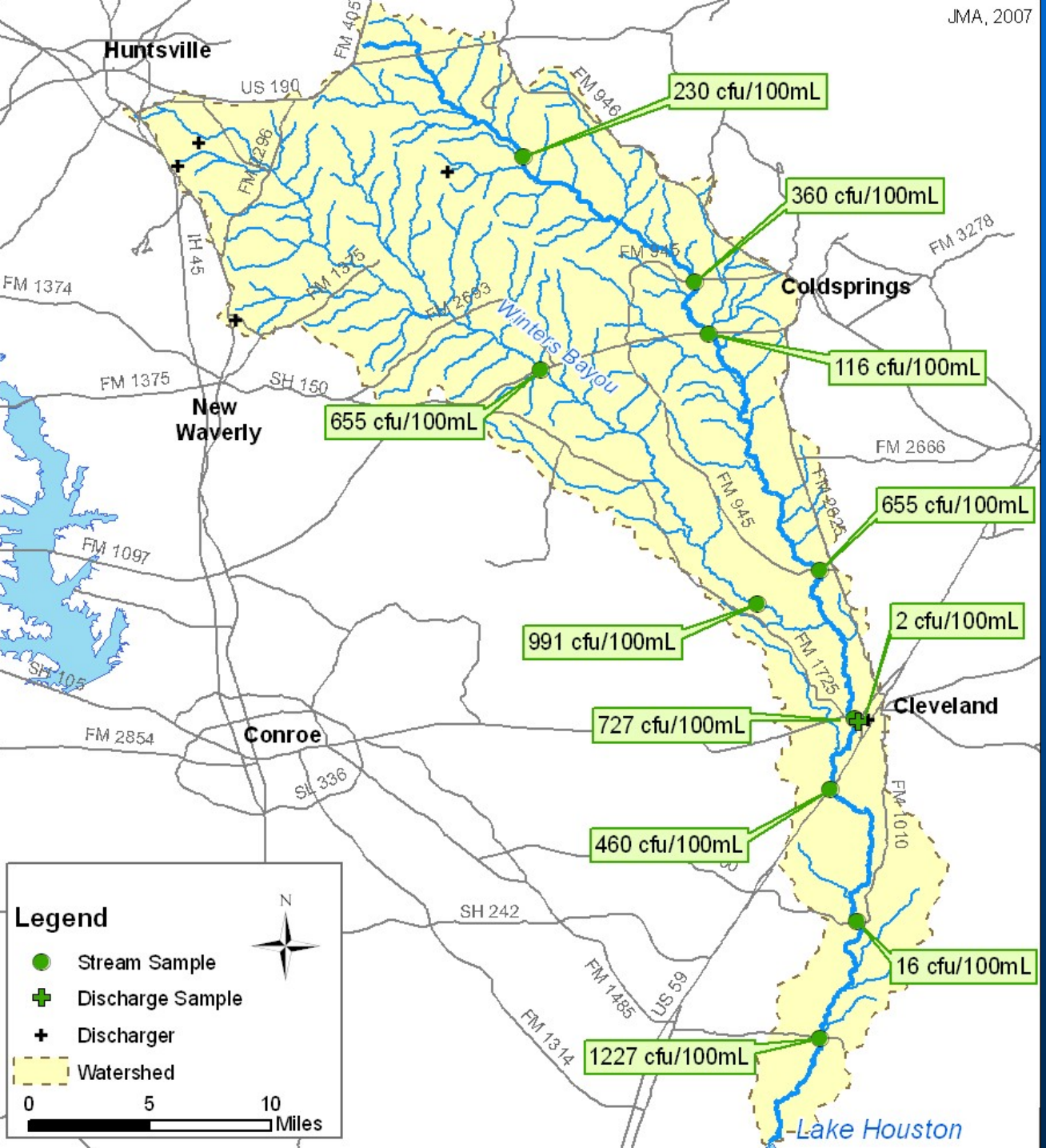
Spatially-Intensive Source Studies

- 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

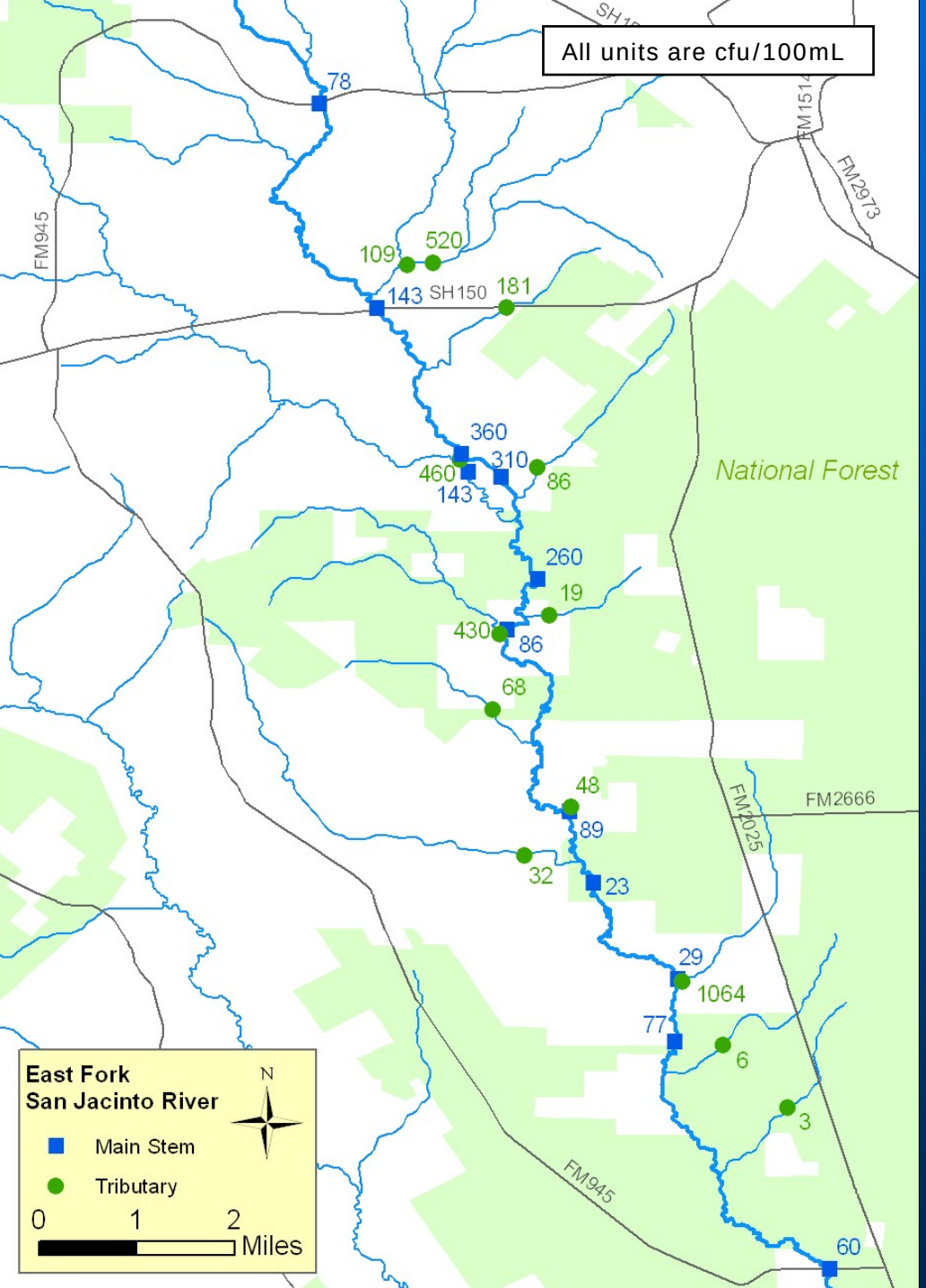
East Fork San Jacinto River at SH 945



East Fork San Jacinto River at US 59

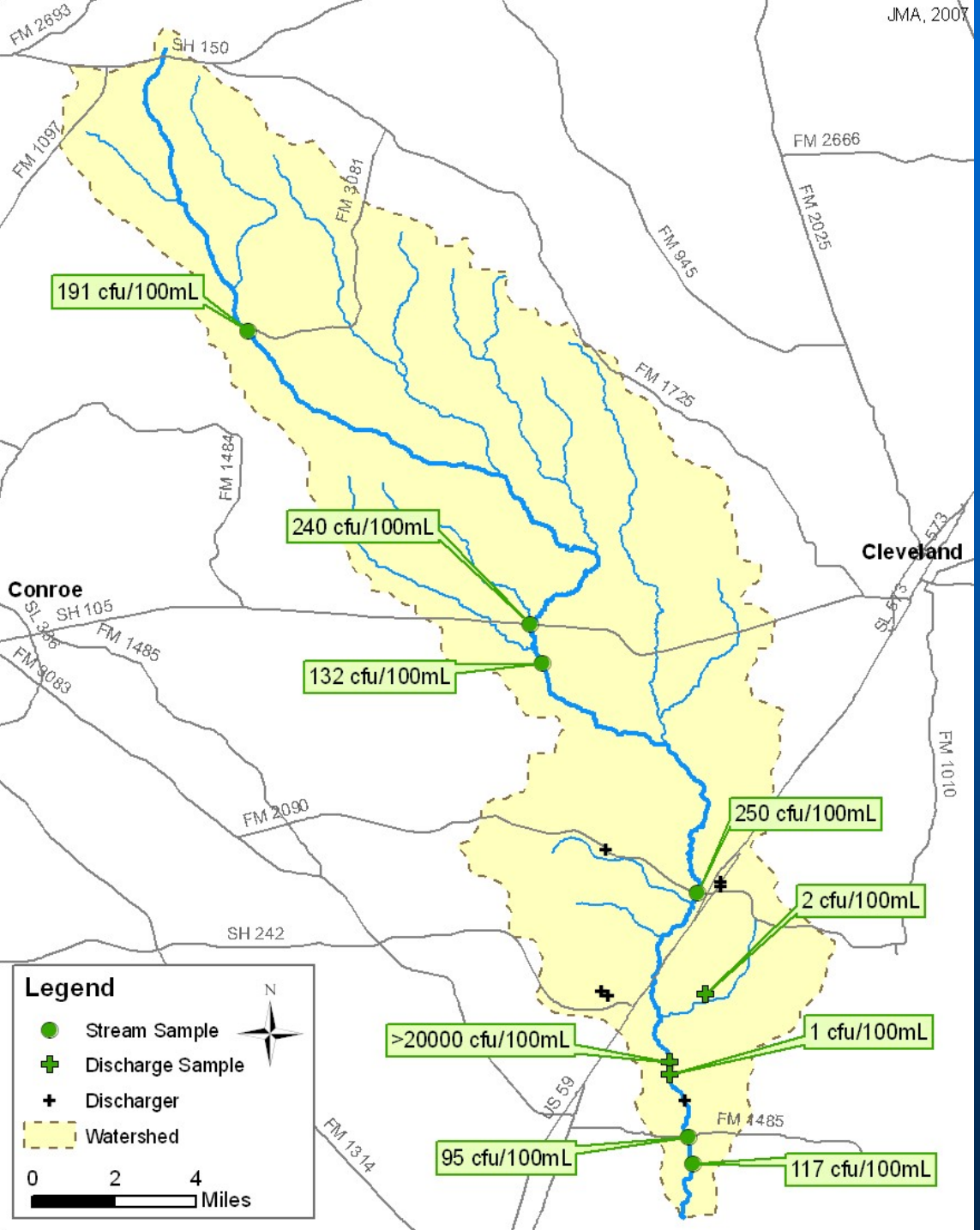


East Fork San Jacinto River Synoptic Sampling Map



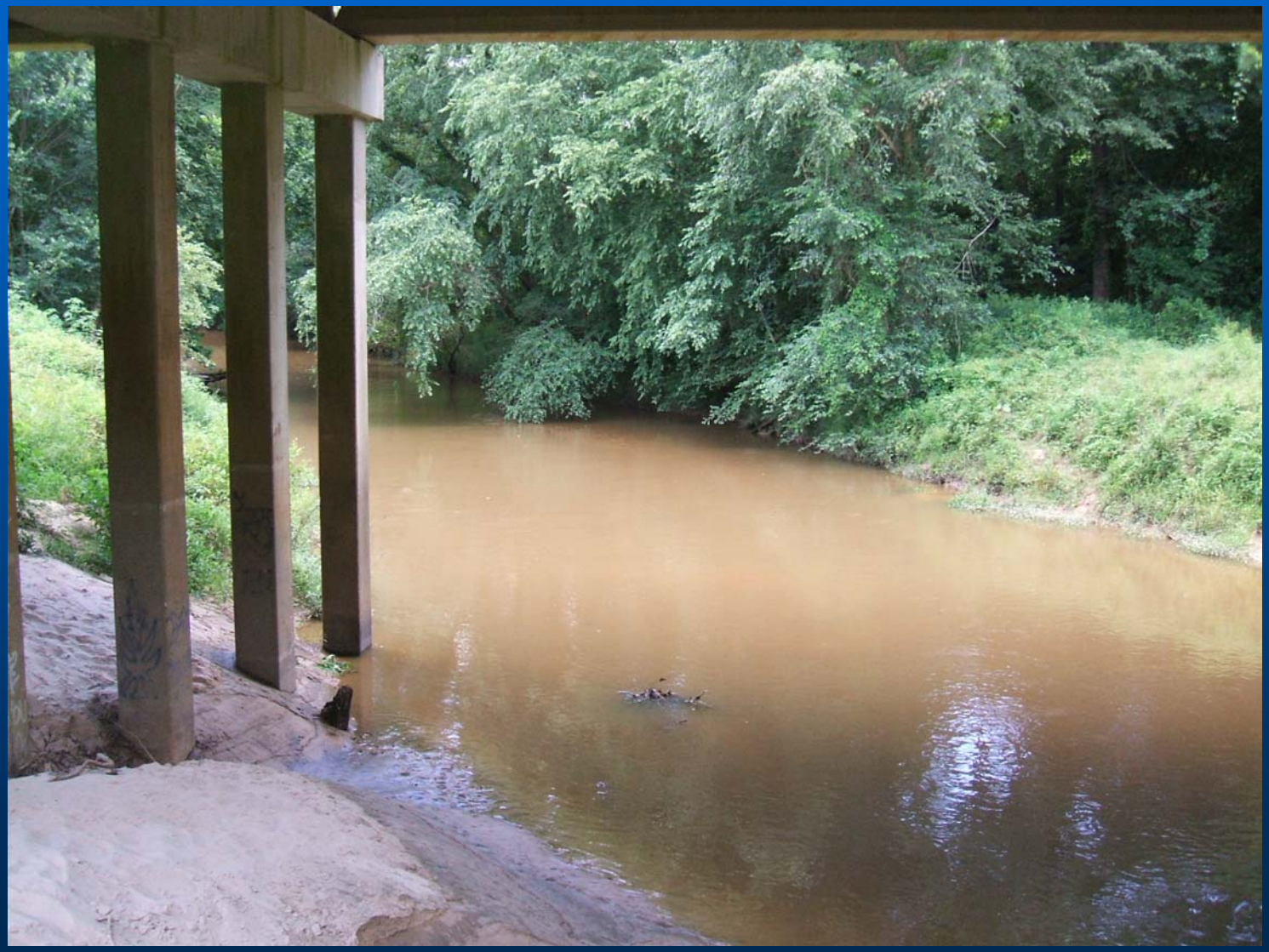
East Fork San Jacinto River Intensive Survey Map

Peach Creek at FM 1485

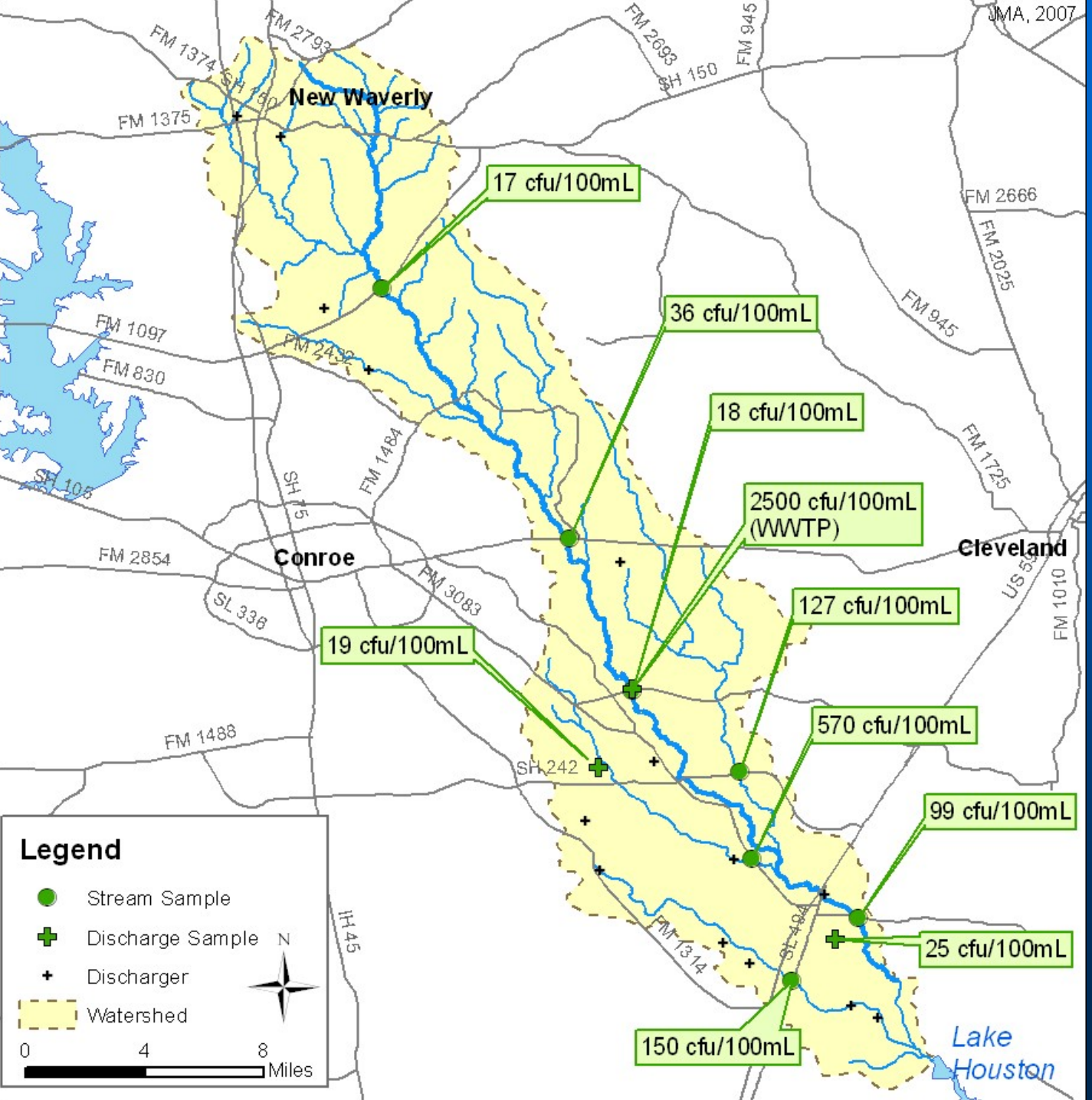


Peach Creek Synoptic Sampling Map

Caney Creek at FM 1485



Caney Creek at SH 105



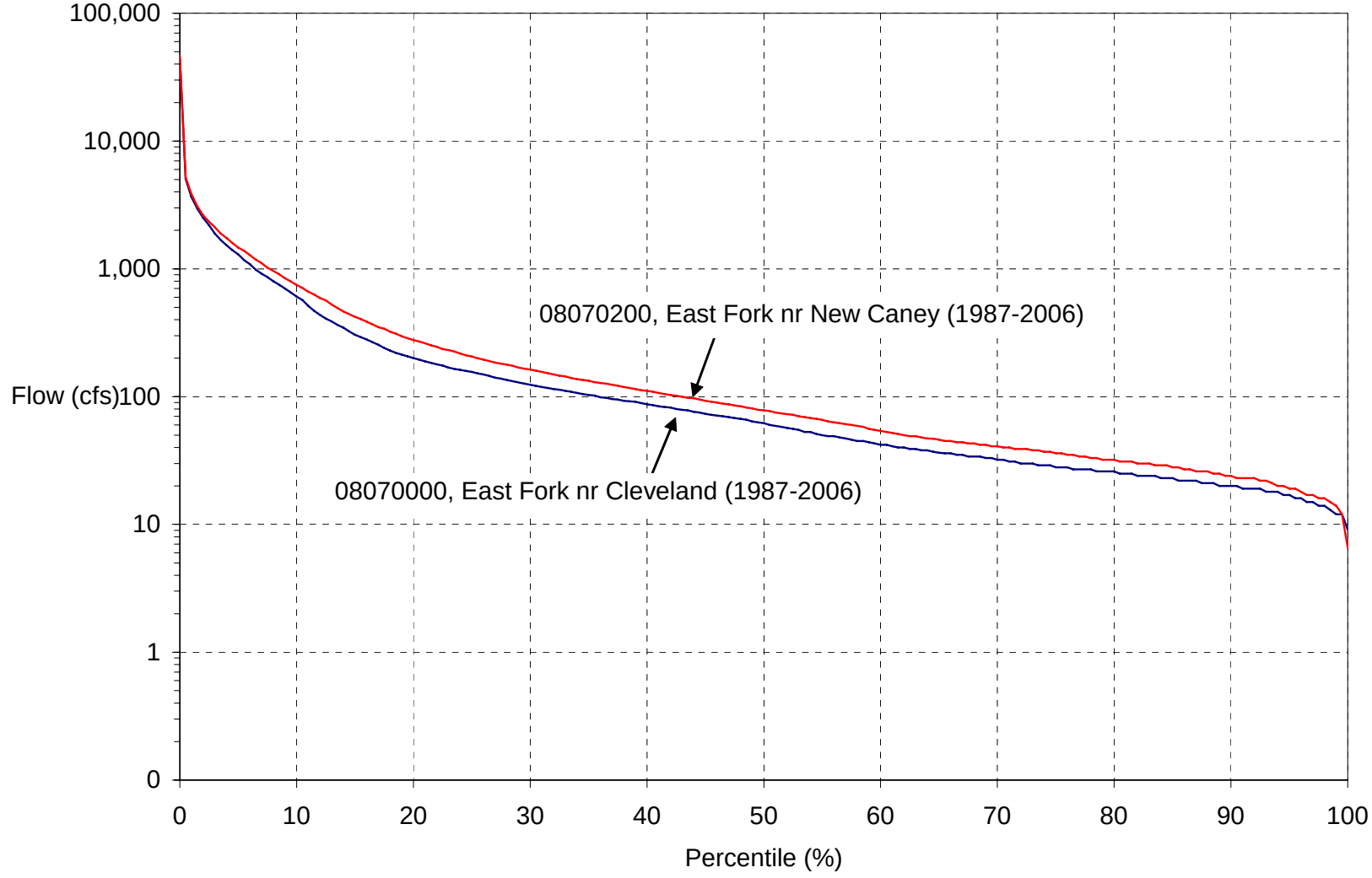
Caney Creek Synoptic Sampling Map

III.
Determination of TMDLS and Allocations

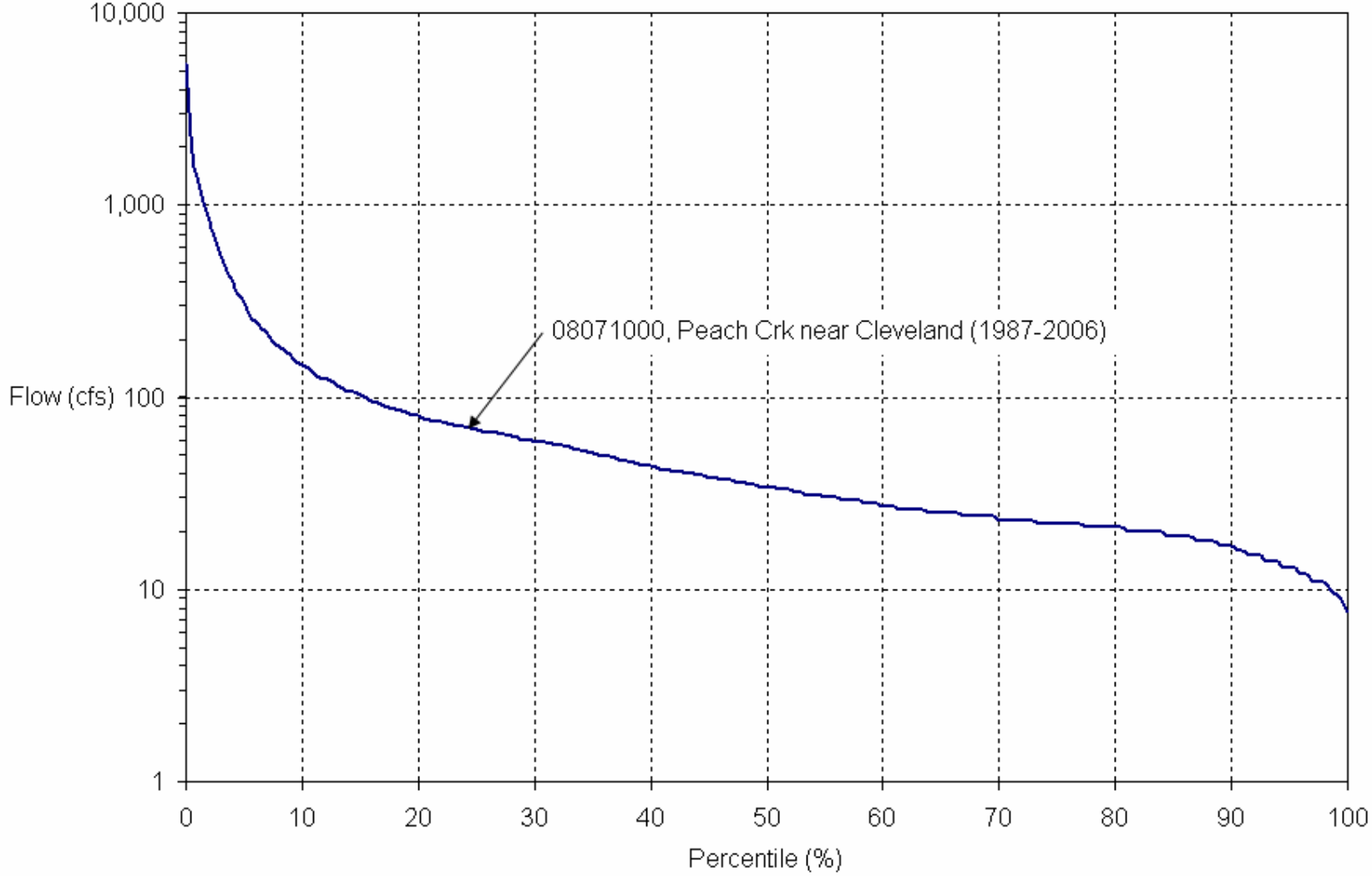
Flow Duration Curves

- 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

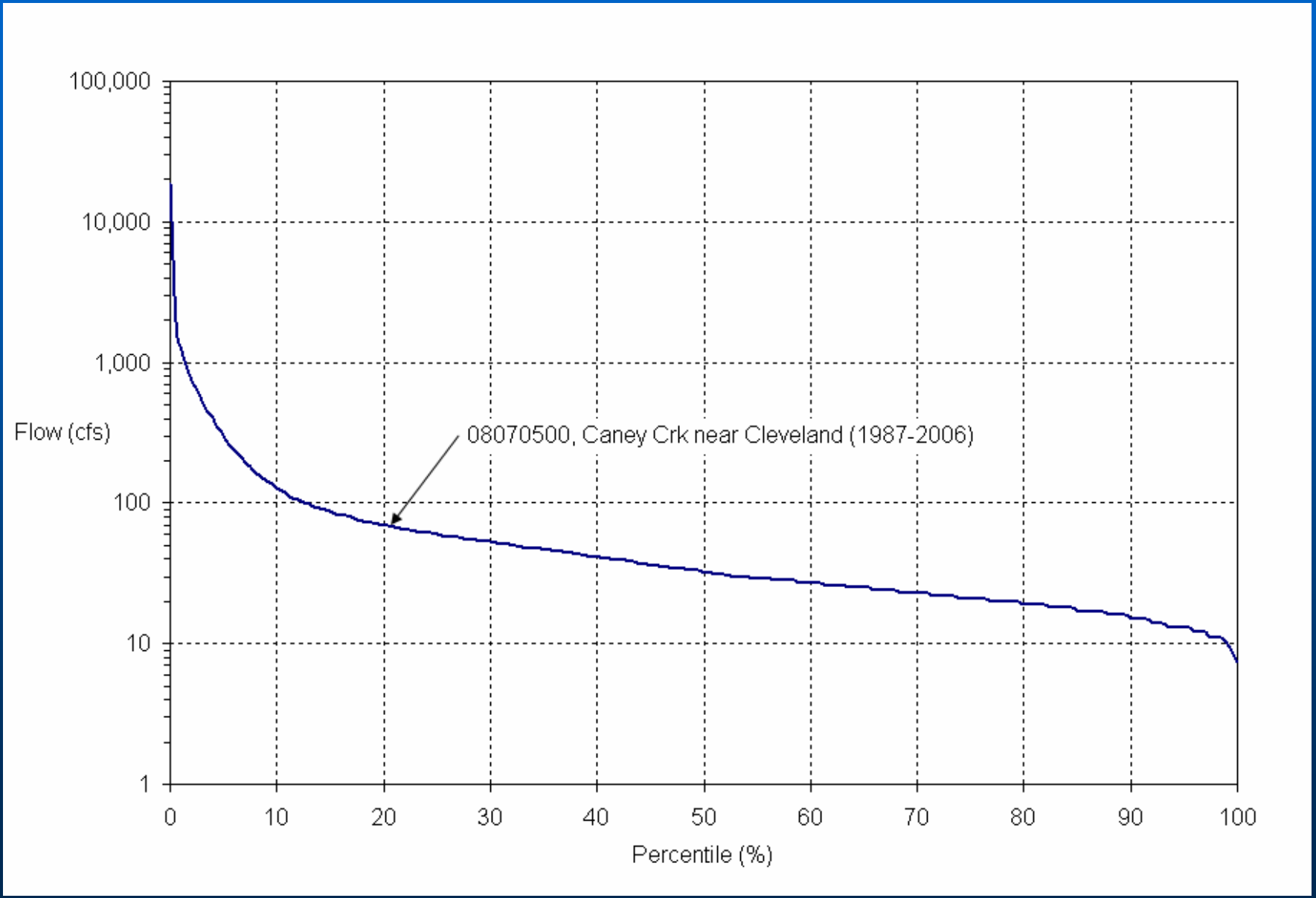
East Fork Flow Duration Curve



Peach Creek Flow Duration Curve



Caney Creek Flow Duration Curve

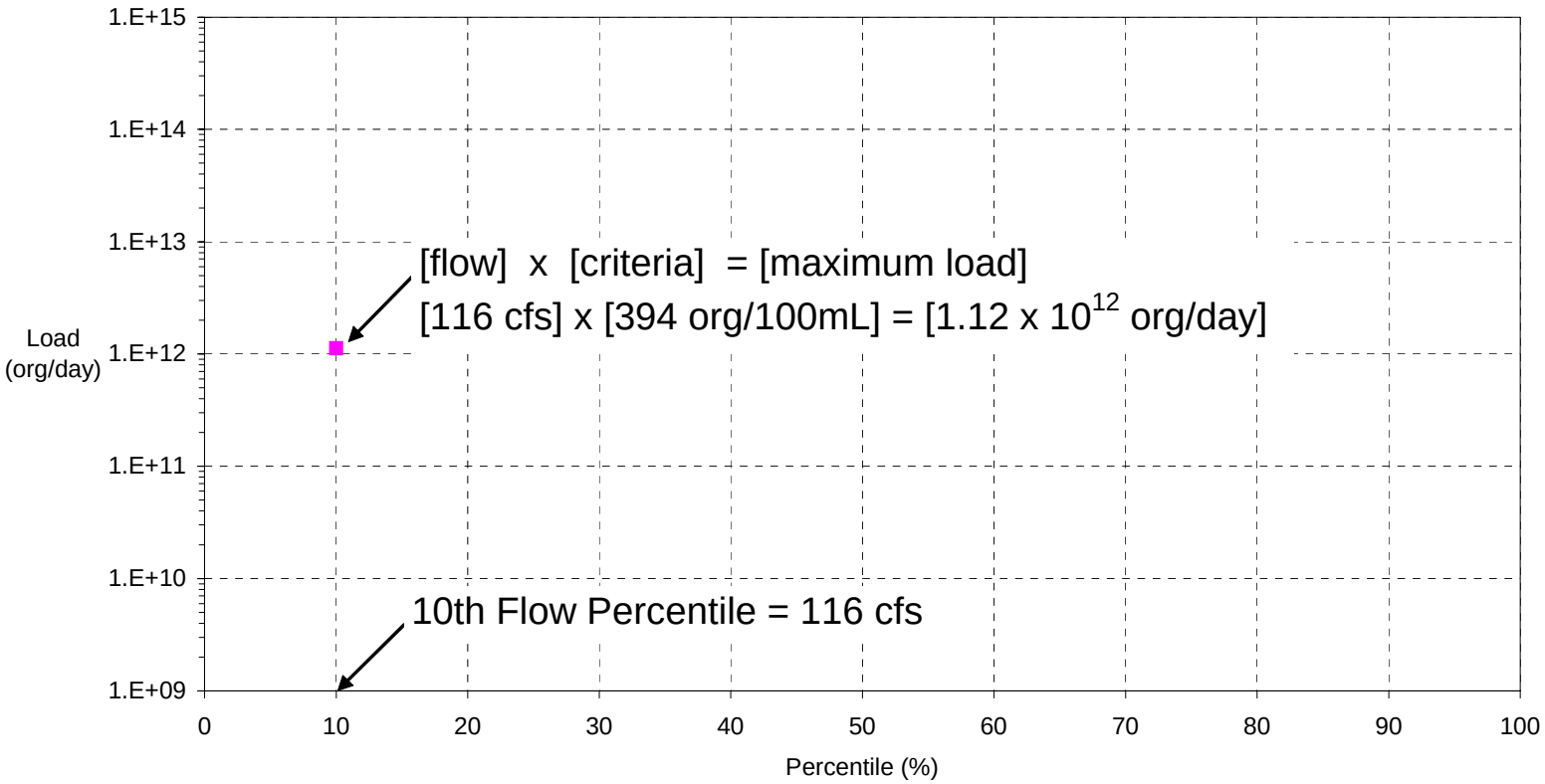


Load Duration Curves

- 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

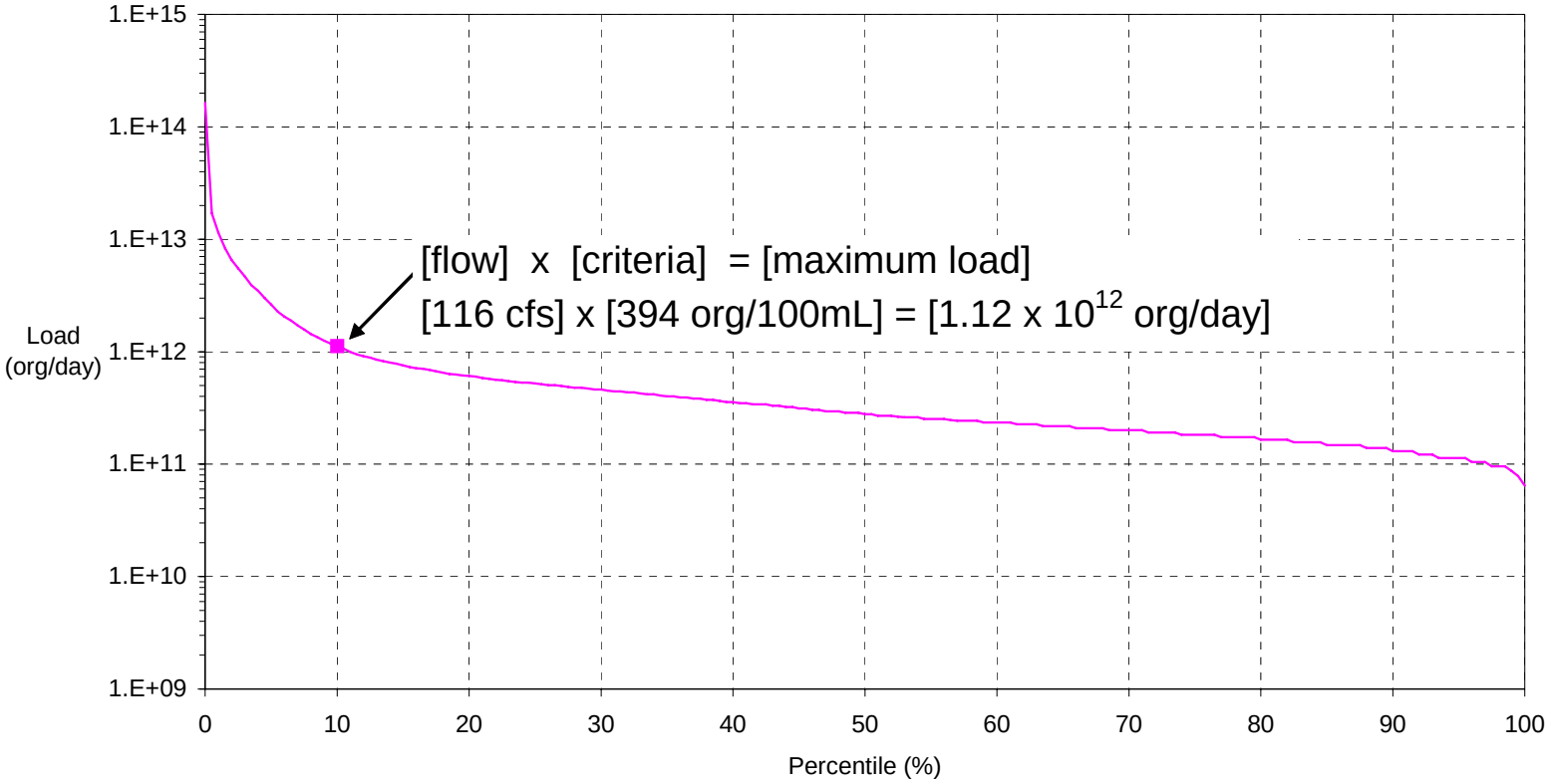
Hypothetical LDC

Step 1: Plot Allowable Load for a Flow Percentile



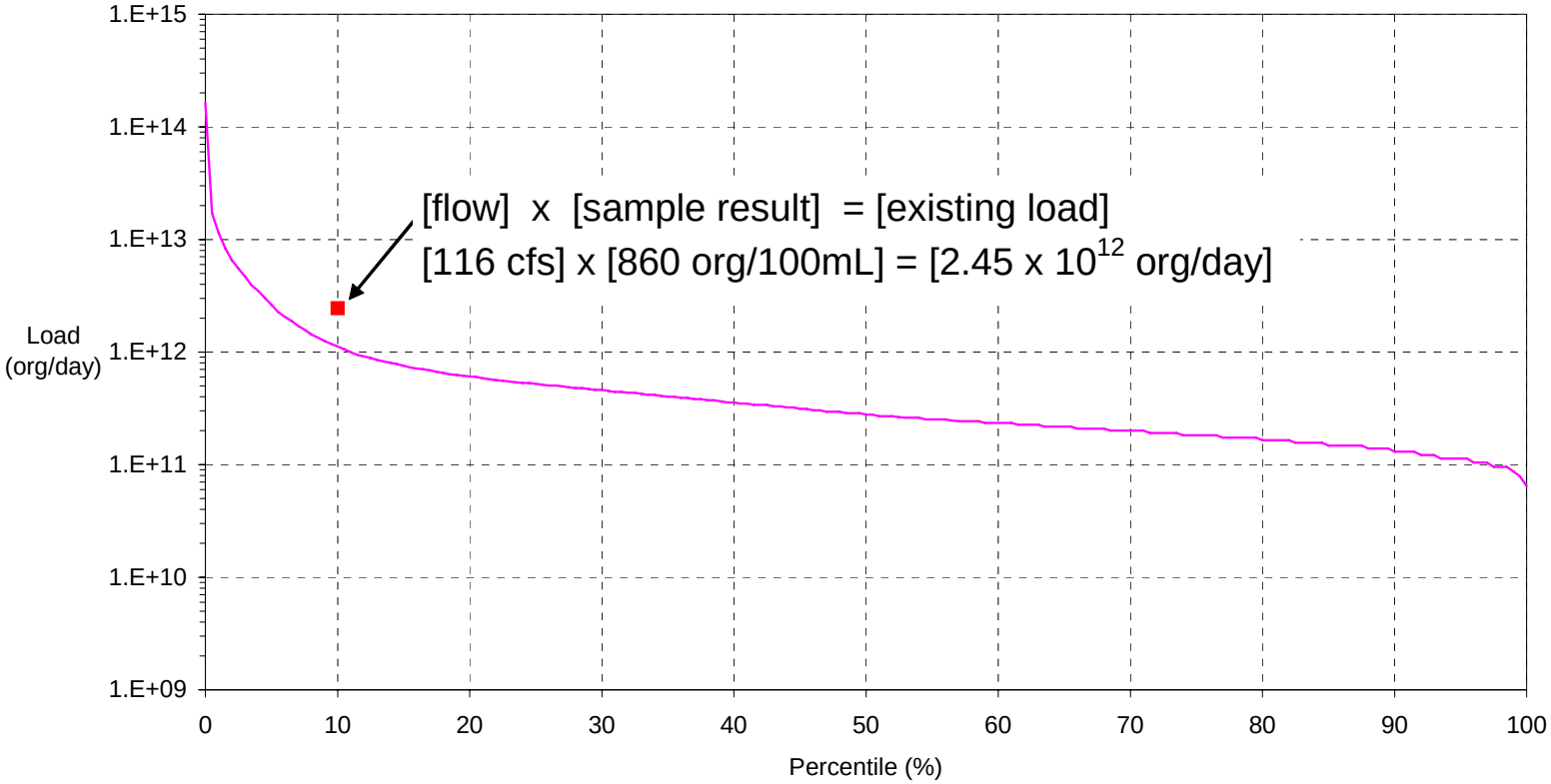
Hypothetical LDC

Step 2: Plot Allowable Load for each Flow Percentile



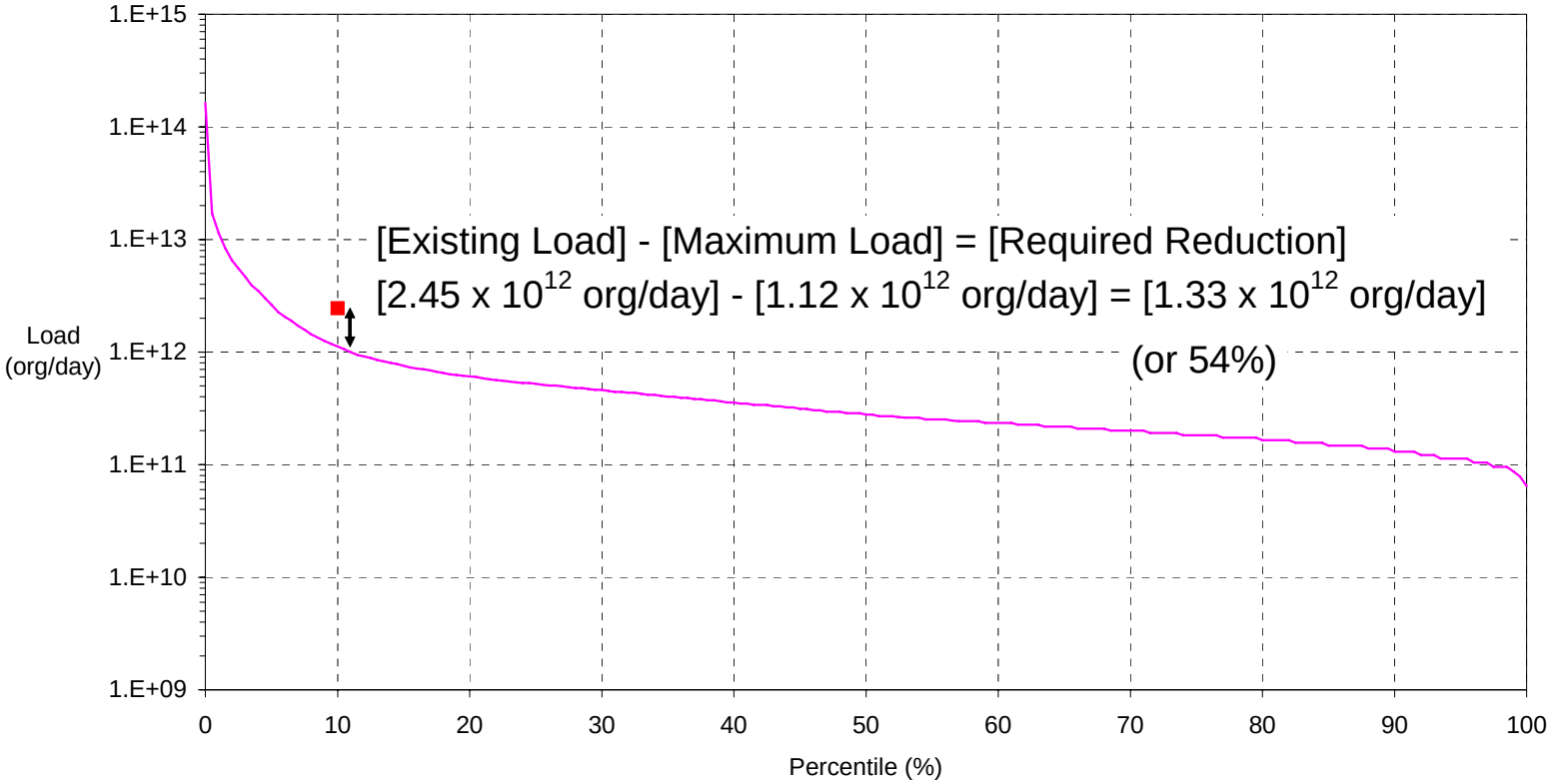
Hypothetical LDC

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

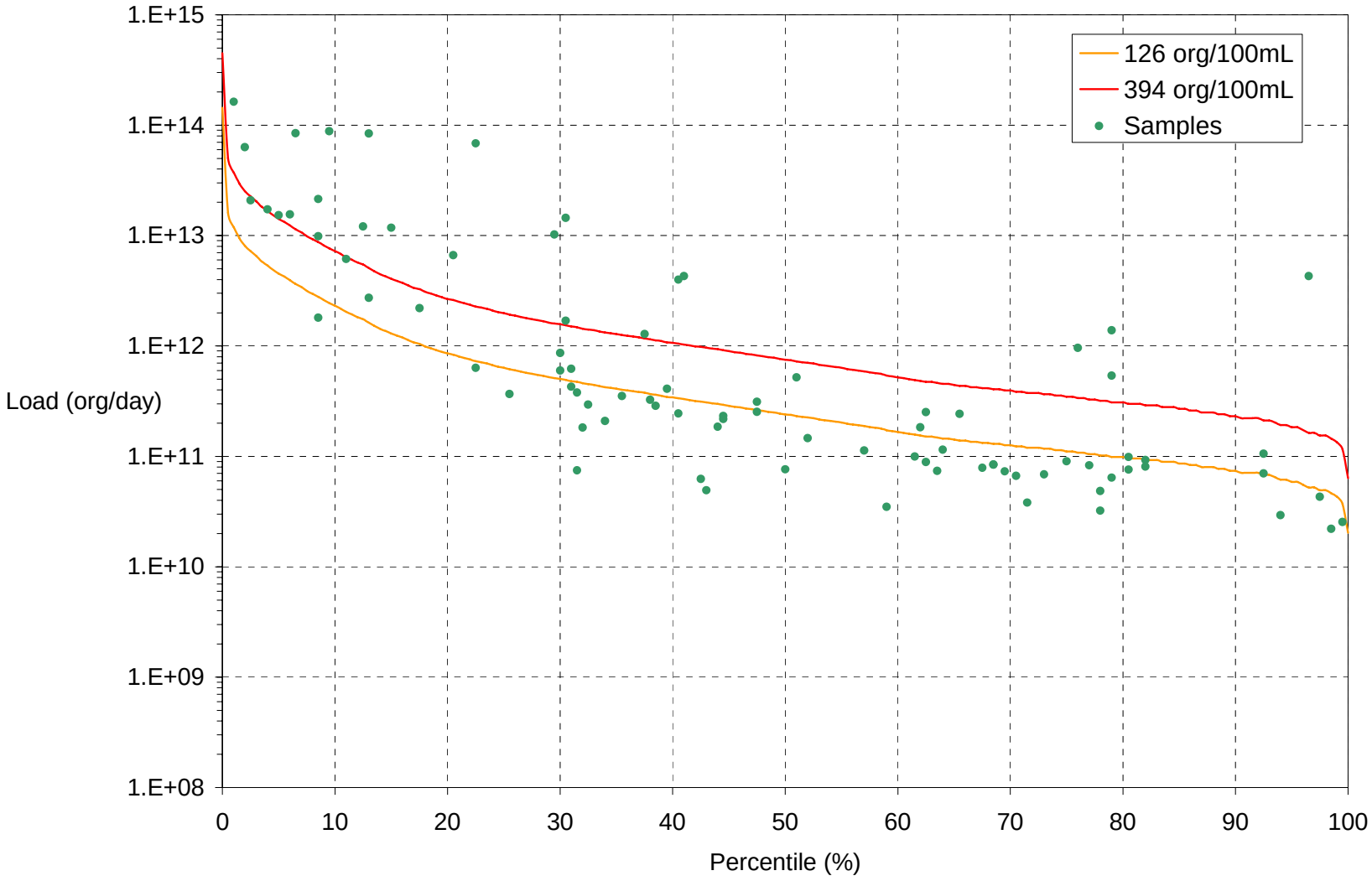


Hypothetical LDC

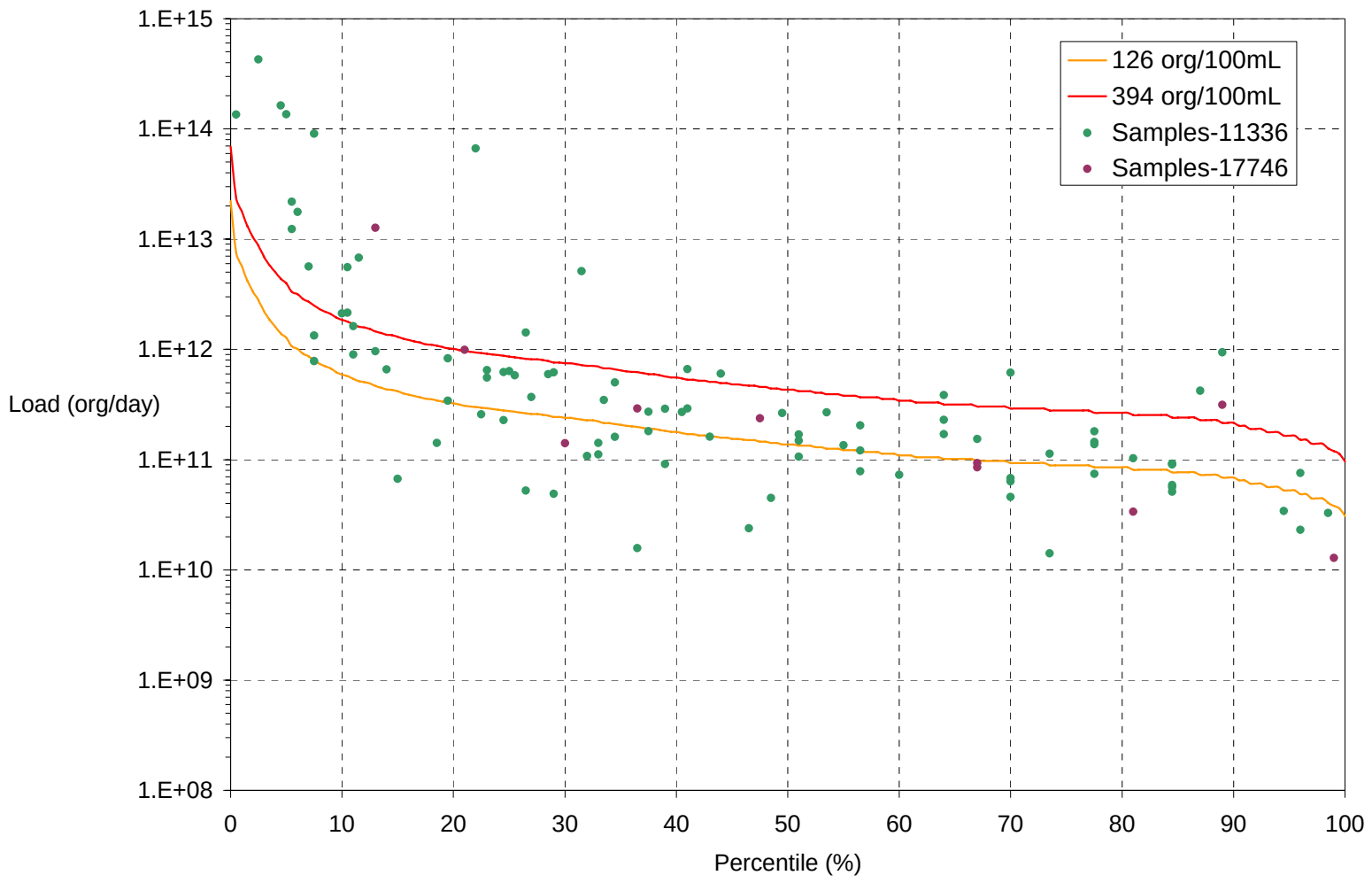
Step 4: Determine Load Exceedance
(for 21 January 2004 only)



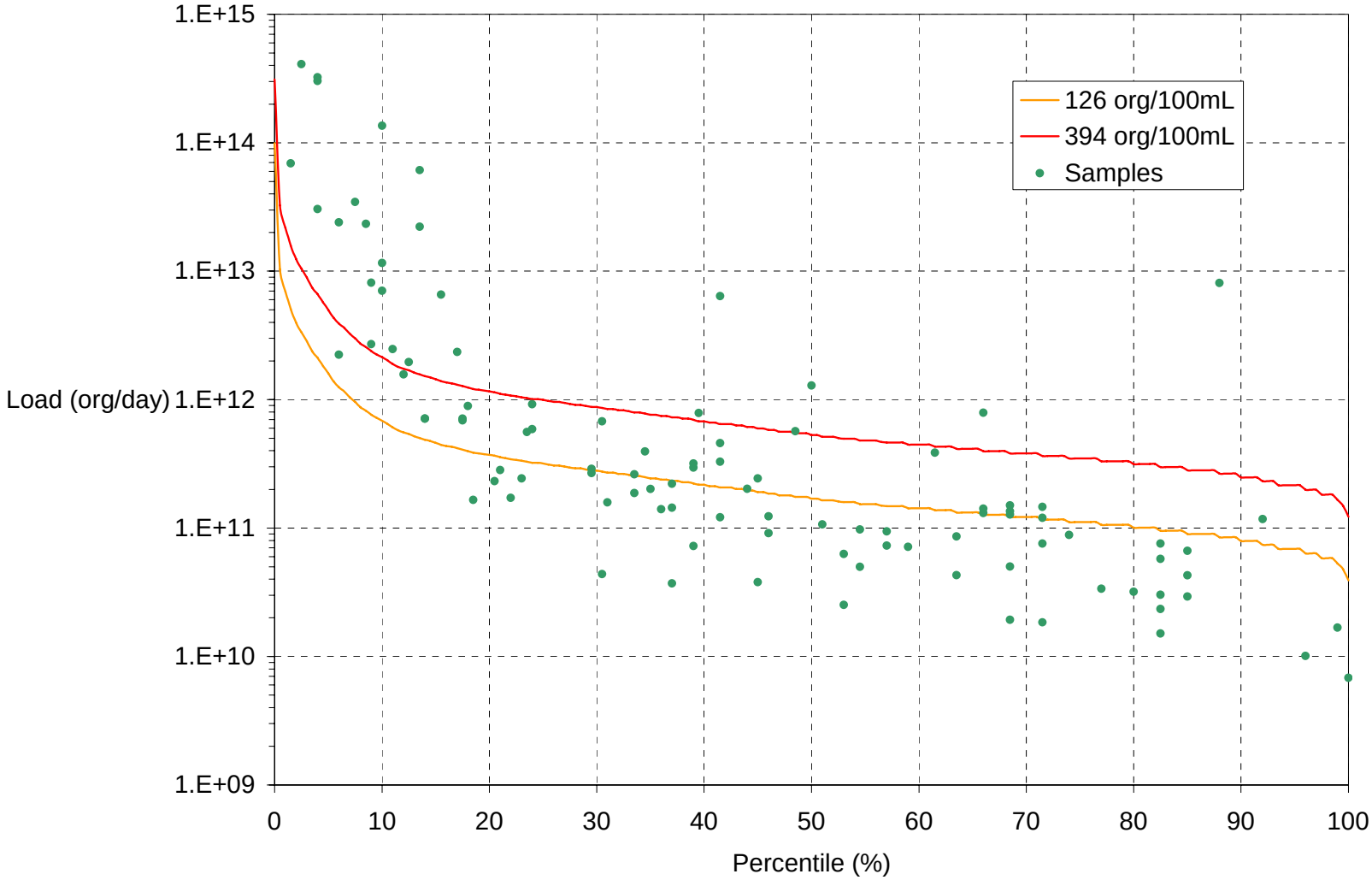
LDC for East Fork at FM 1485 (#11235)



LDC for Peach Creek at FM 1485 and Foot Bridge (#11336, 17746)



LDC for Caney Creek at FM 1485 (#11334)



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

East Fork

Wastewater Treatment Facility Summary

- 5 permitted facilities
- Total current flow 0.6 MGD (0.9 cfs)
- Total Permitted flow 0.9 MGD (1.4 cfs)
- WWTP flows account for 6% of the stream flow at the 99th percentile regime (low flow), 1% of the flow at the 50th percentile (median flow)

Peach Creek Wastewater Treatment Facility Summary

- 9 permitted facilities
- Total current flow 0.9 MGD (1.3 cfs)
- Total Permitted flow 2.7 MGD (4.3 cfs)
- WWTP flows account for 10% of the stream flow at the 99th percentile regime (low flow), 3% of the flow at the 50th percentile (median flow)

Caney Creek Wastewater Treatment Facility Summary

- 18 permitted facilities
- Total current flow 1.8 MGD (2.8 cfs)
- Total Permitted flow 4.7 MGD (7.3 cfs)
- WWTP flows account for 16% of the stream flow at the 99th percentile regime (low flow), 5% of the flow at the 50th percentile (median flow)

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