West Fork San Jacinto River, Segment 1004
Stewarts Creek, Segment 1004E
Crystal Creek, Segment 1004D

Data Review & Analysis

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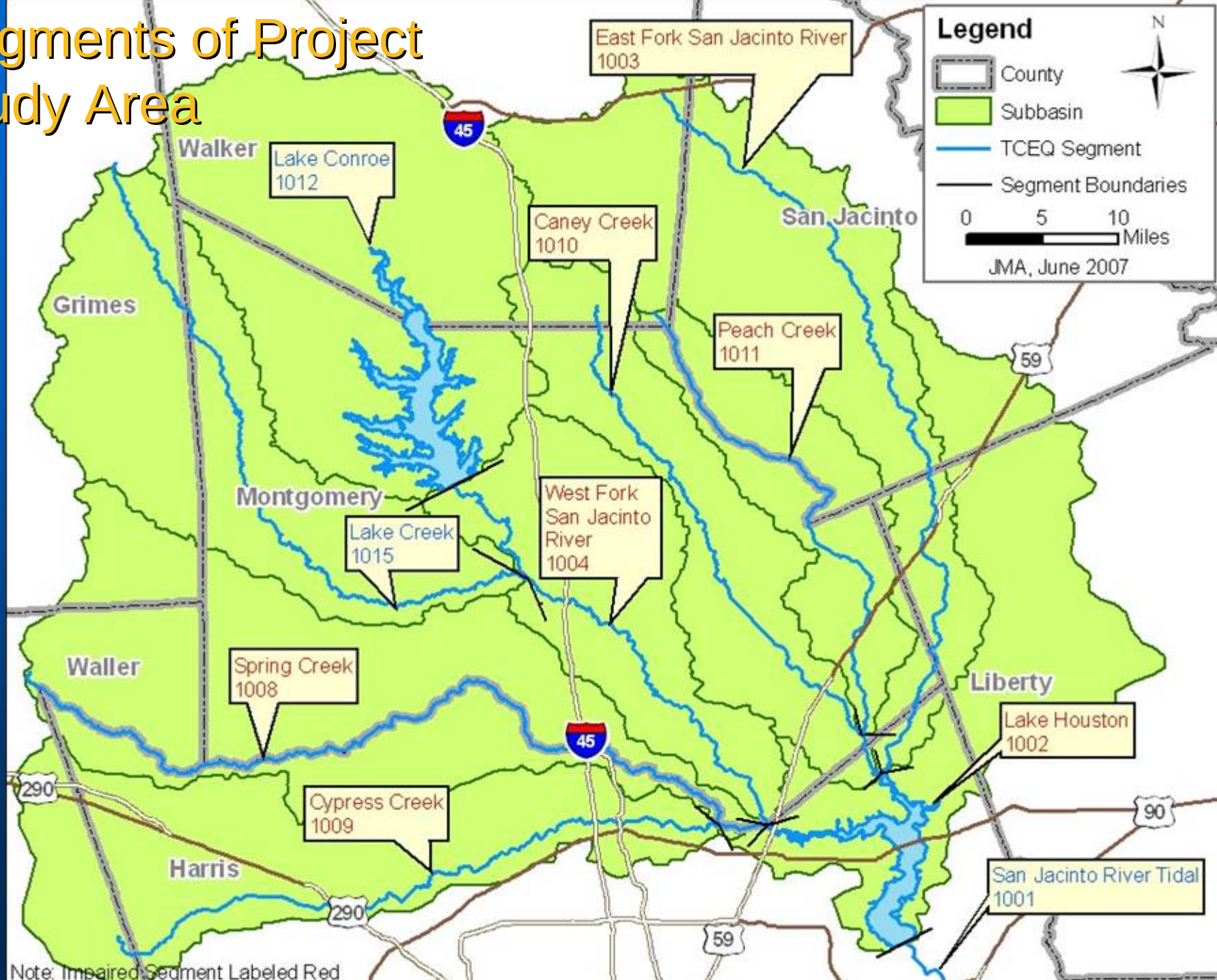
Introduction

- Several stream segments of San Jacinto River Basin above Lake Houston identified as impaired
- TCEQ divides segments into assessment units (AU) to refine spatial resolution
- Stream segment is considered impaired when geometric mean of *E. coli* exceeds criterion of 126 org/100mL

Sources of Bacteria

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

Segments of Project Study Area



I.
Historical Data Review

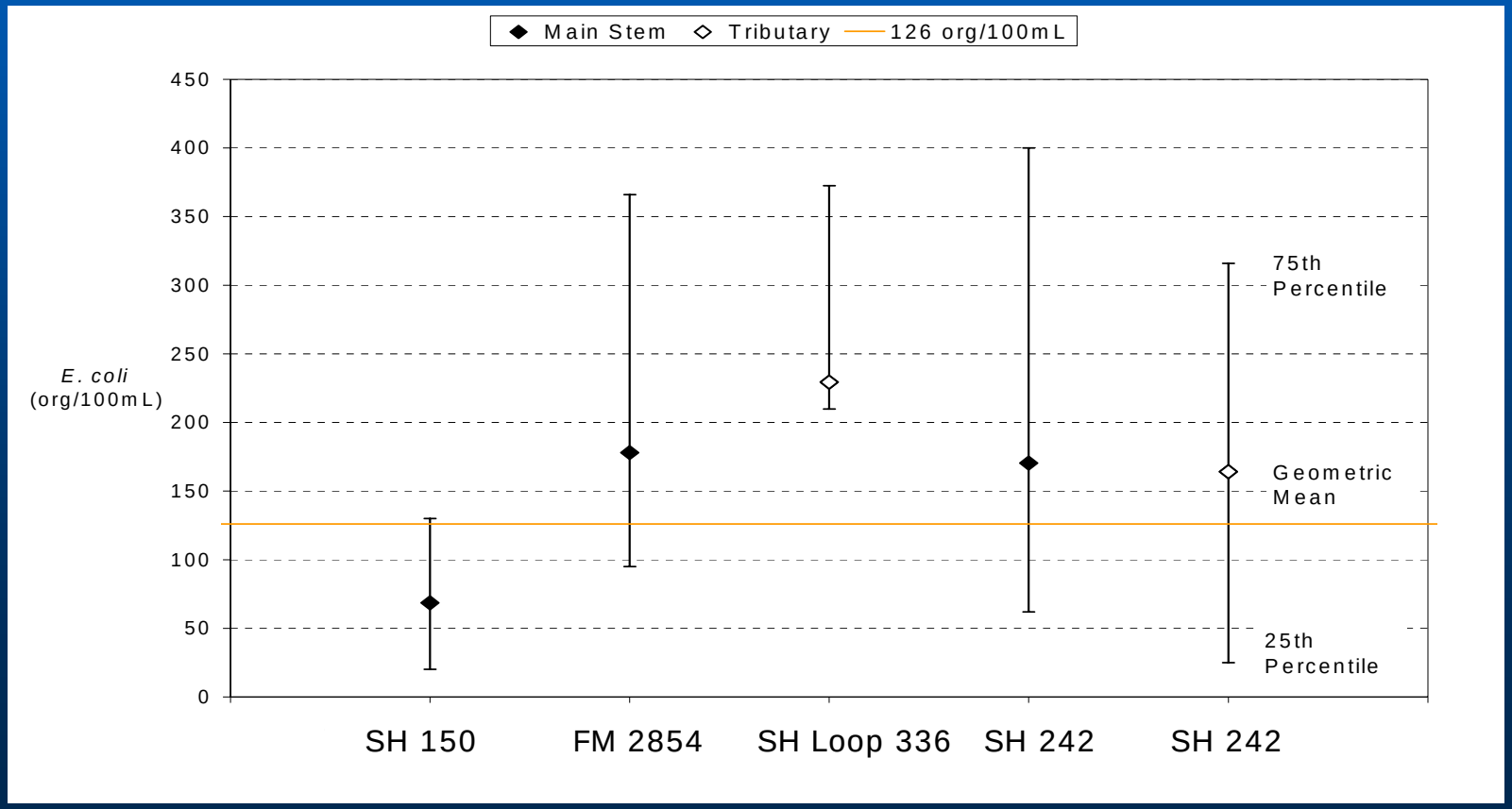
Spatial and Temporal Analysis

- 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 gemoetric mean criteria in many assessment units
  - No clear trends over length of stream

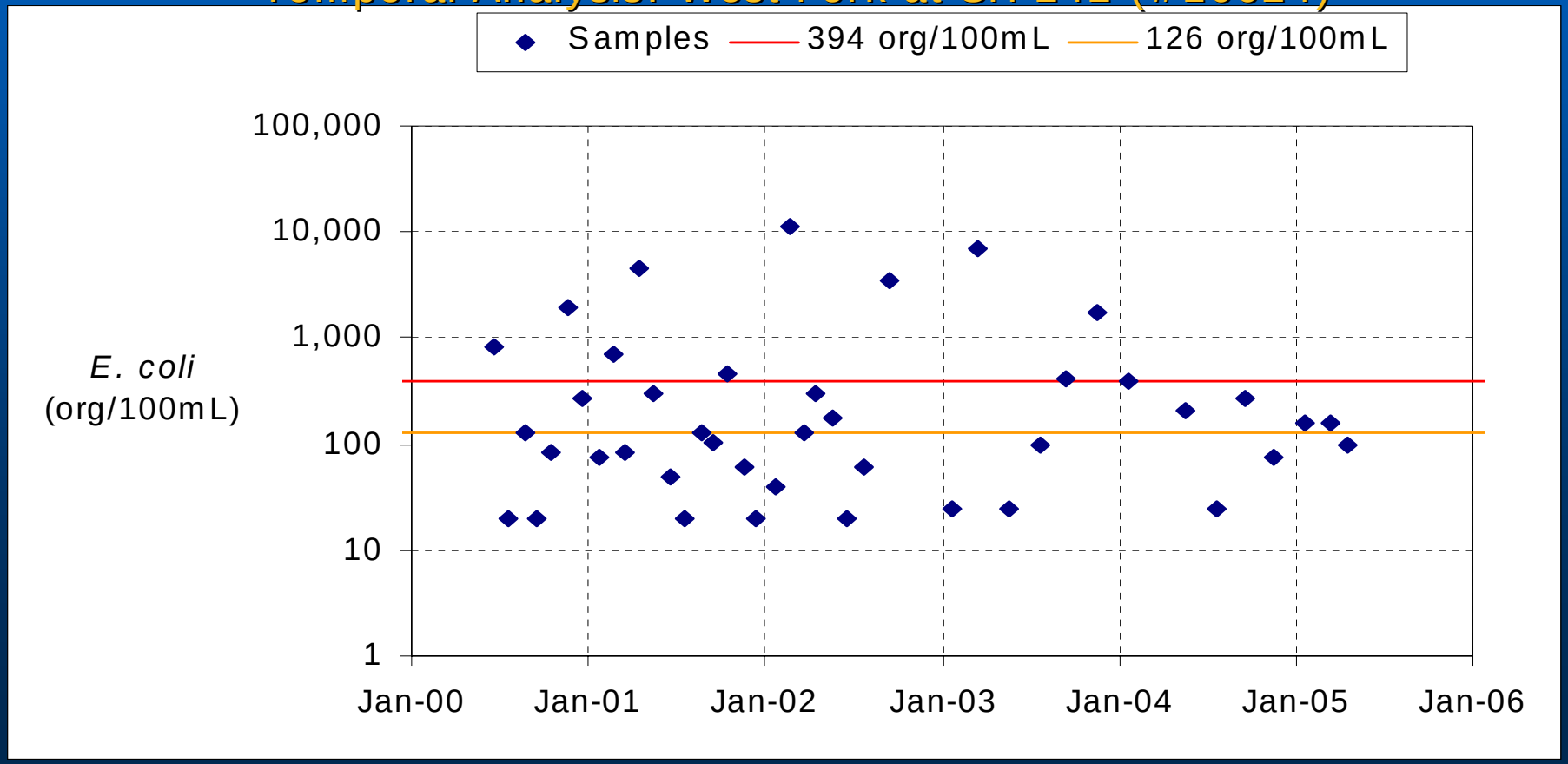
West Fork Spatial Analysis



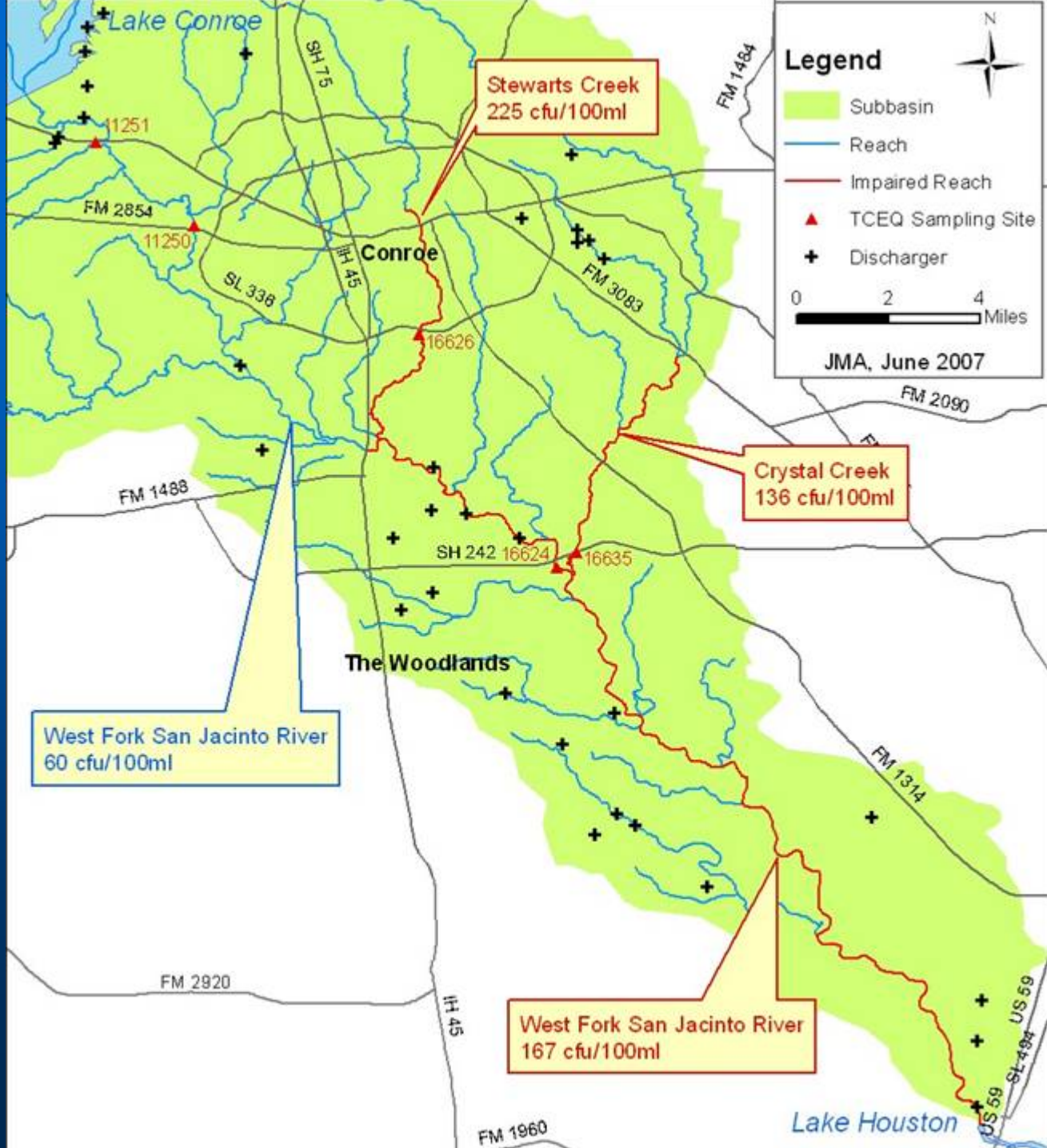
Temporal Analysis

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

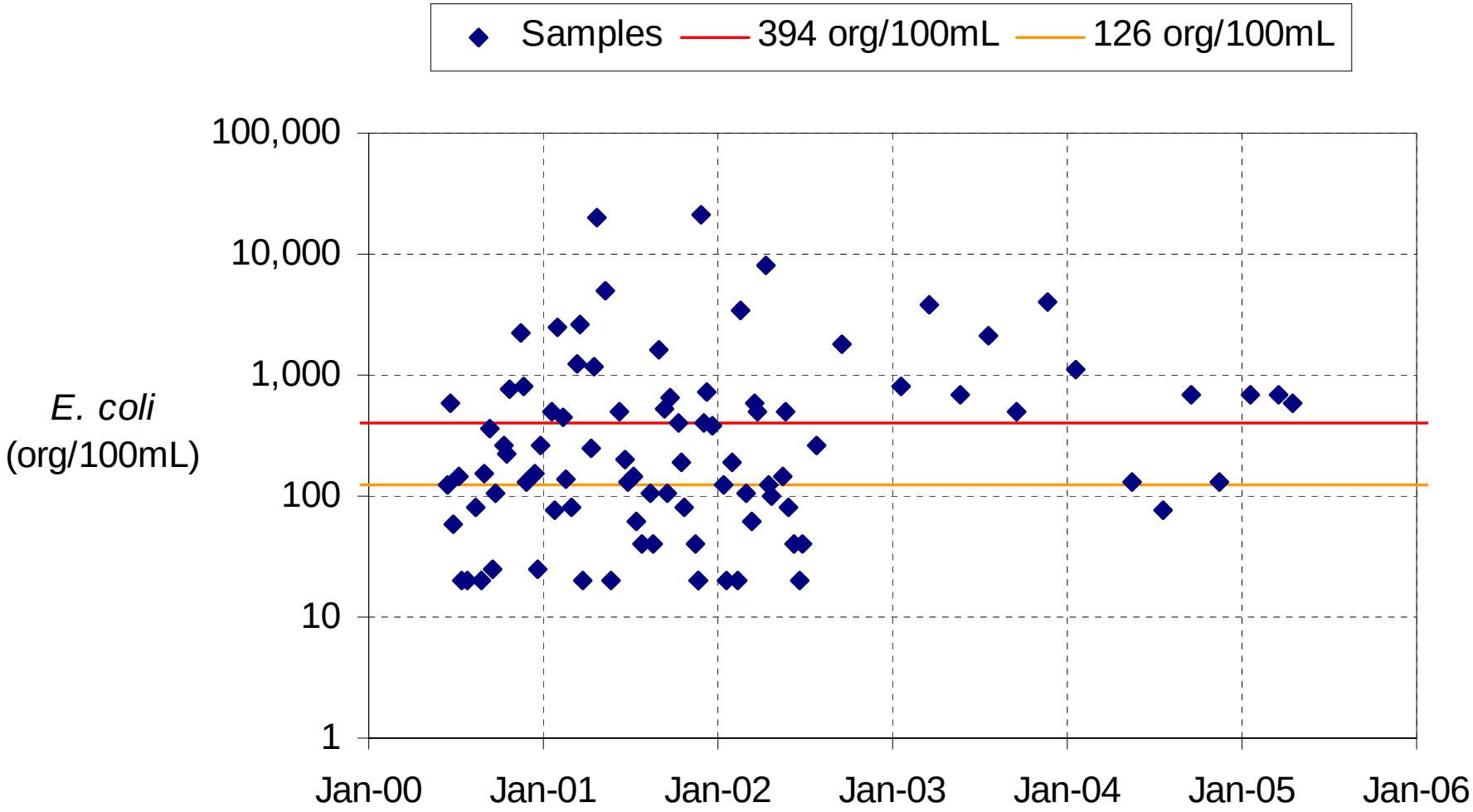
Temporal Analysis: West Fork at SH 242 (#16624)



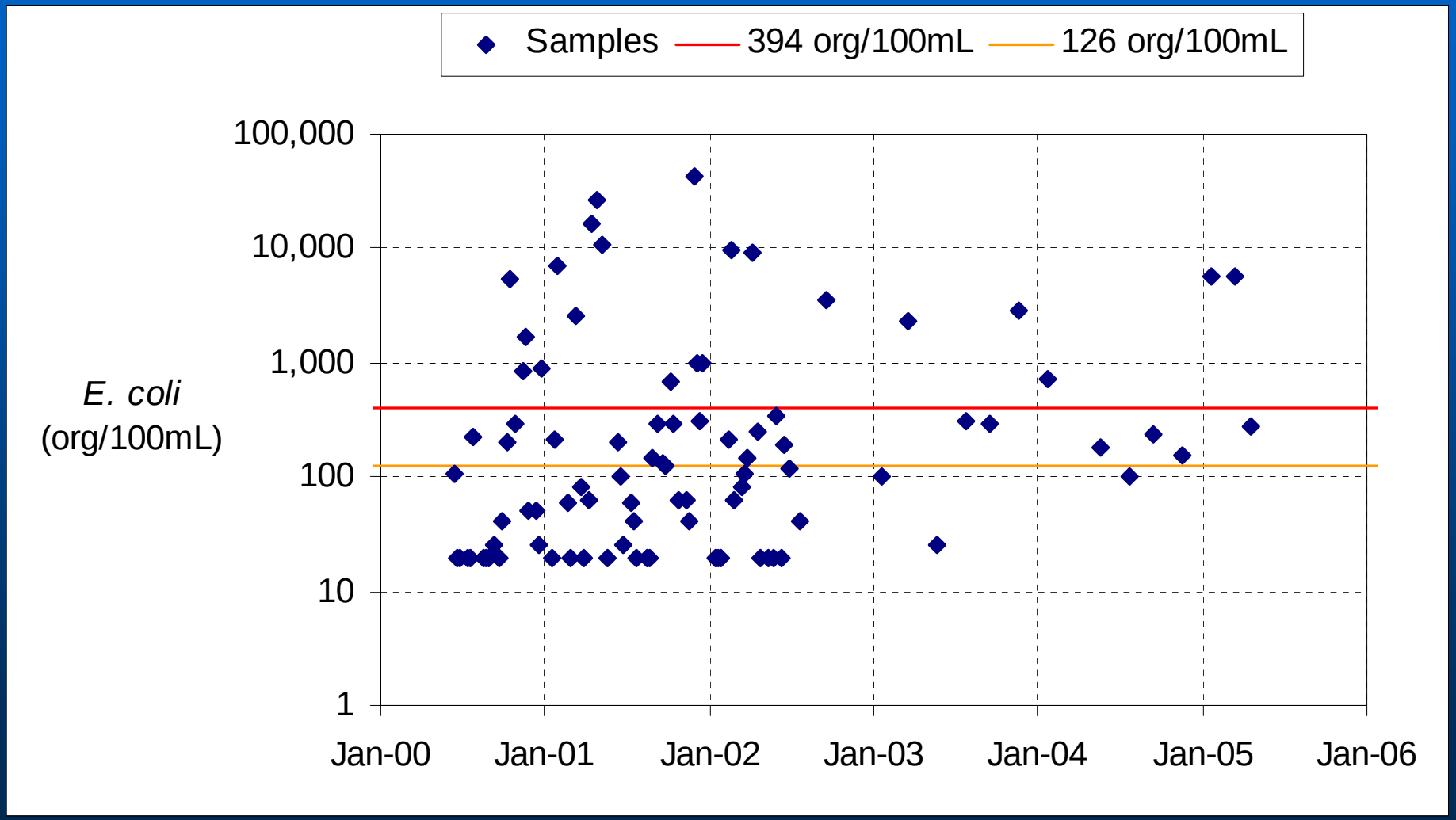
West Fork Study Area



Temporal Analysis: Stewarts Creek (#16626)



Temporal Analysis: Crystal Creek (#16635)



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.

3,5
mg/L

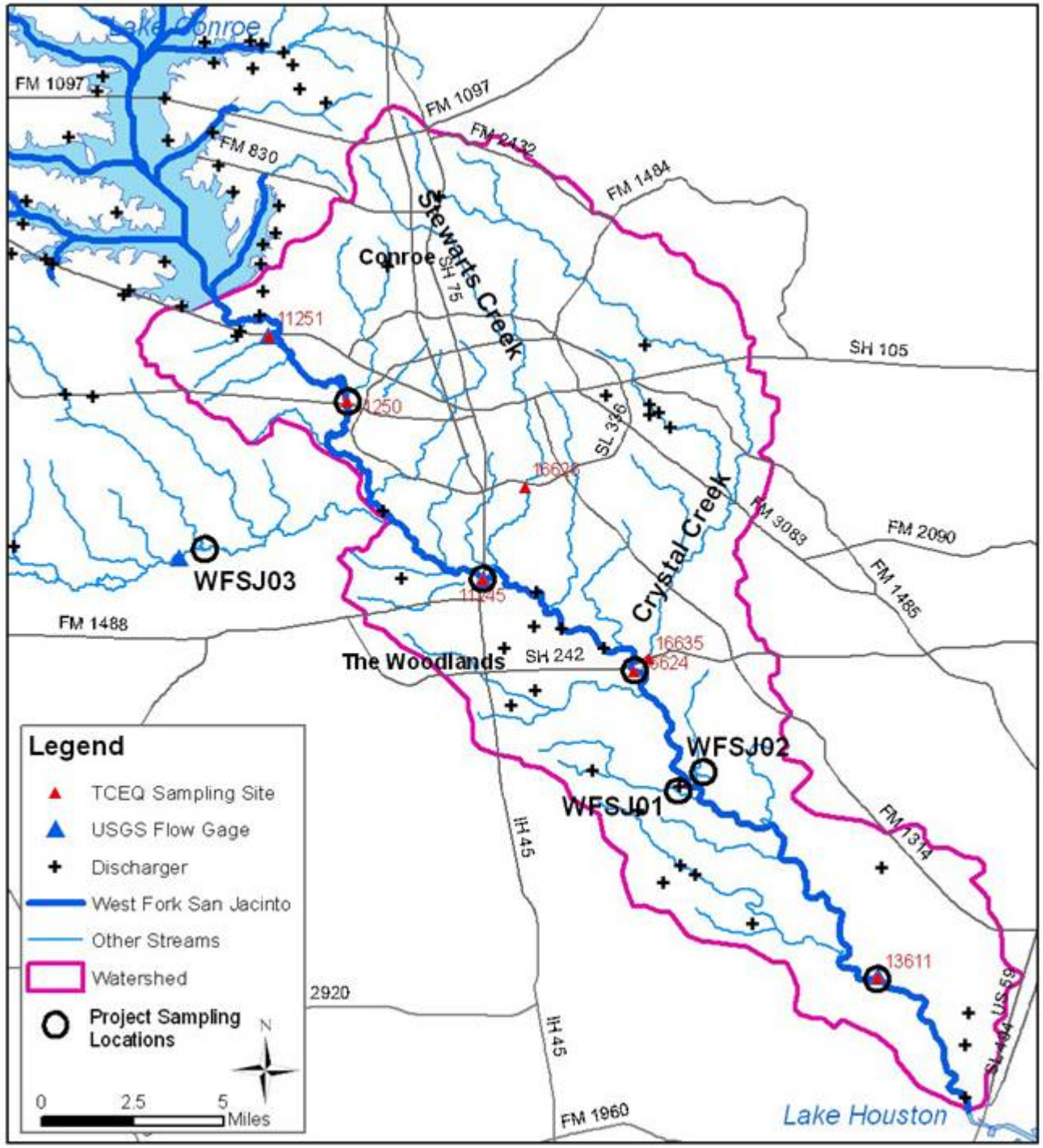
Spatially-Intensive Source Studies

- 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

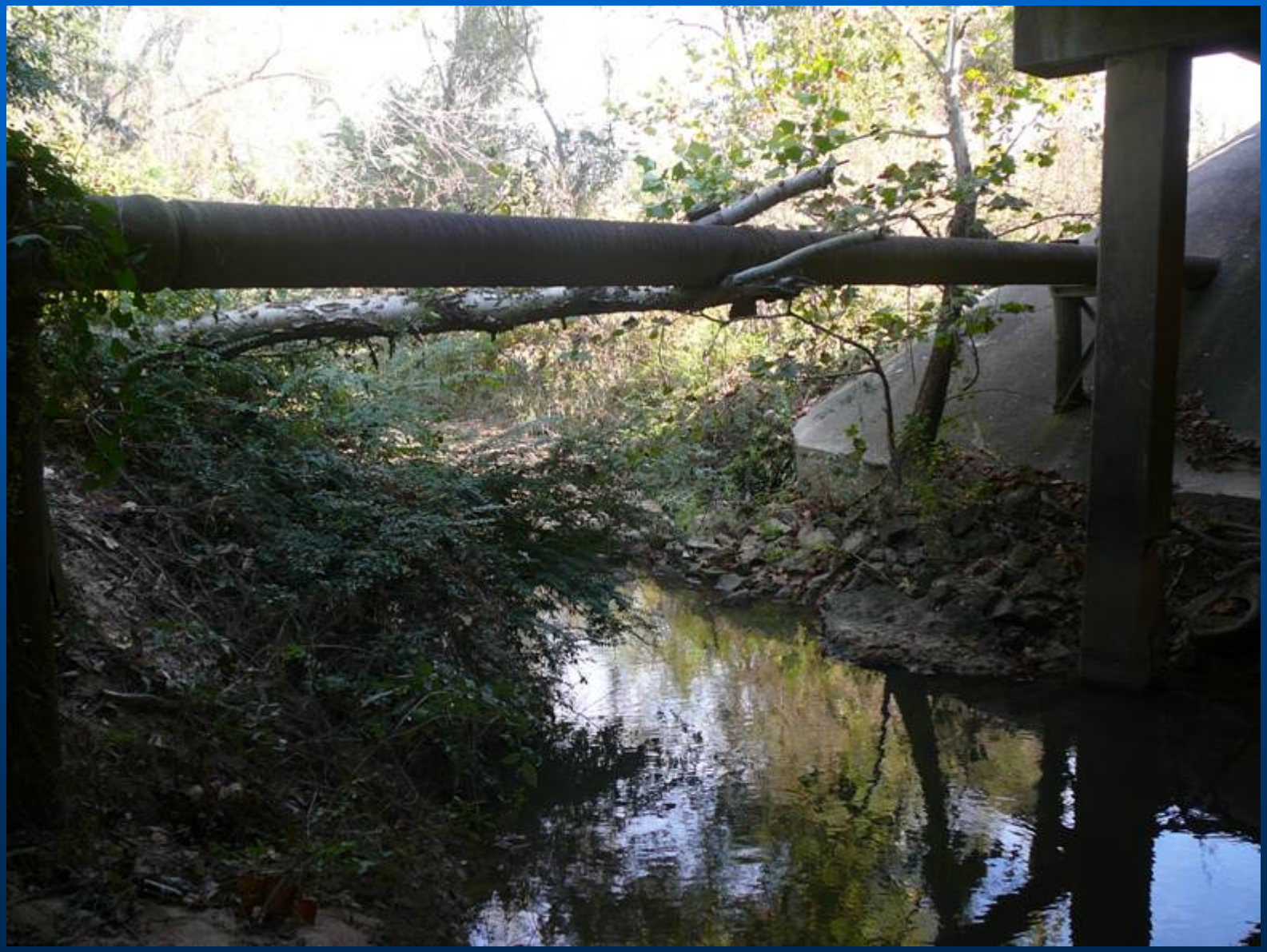
West Fork San Jacinto at IH-45

West Fork San Jacinto at FM 2854

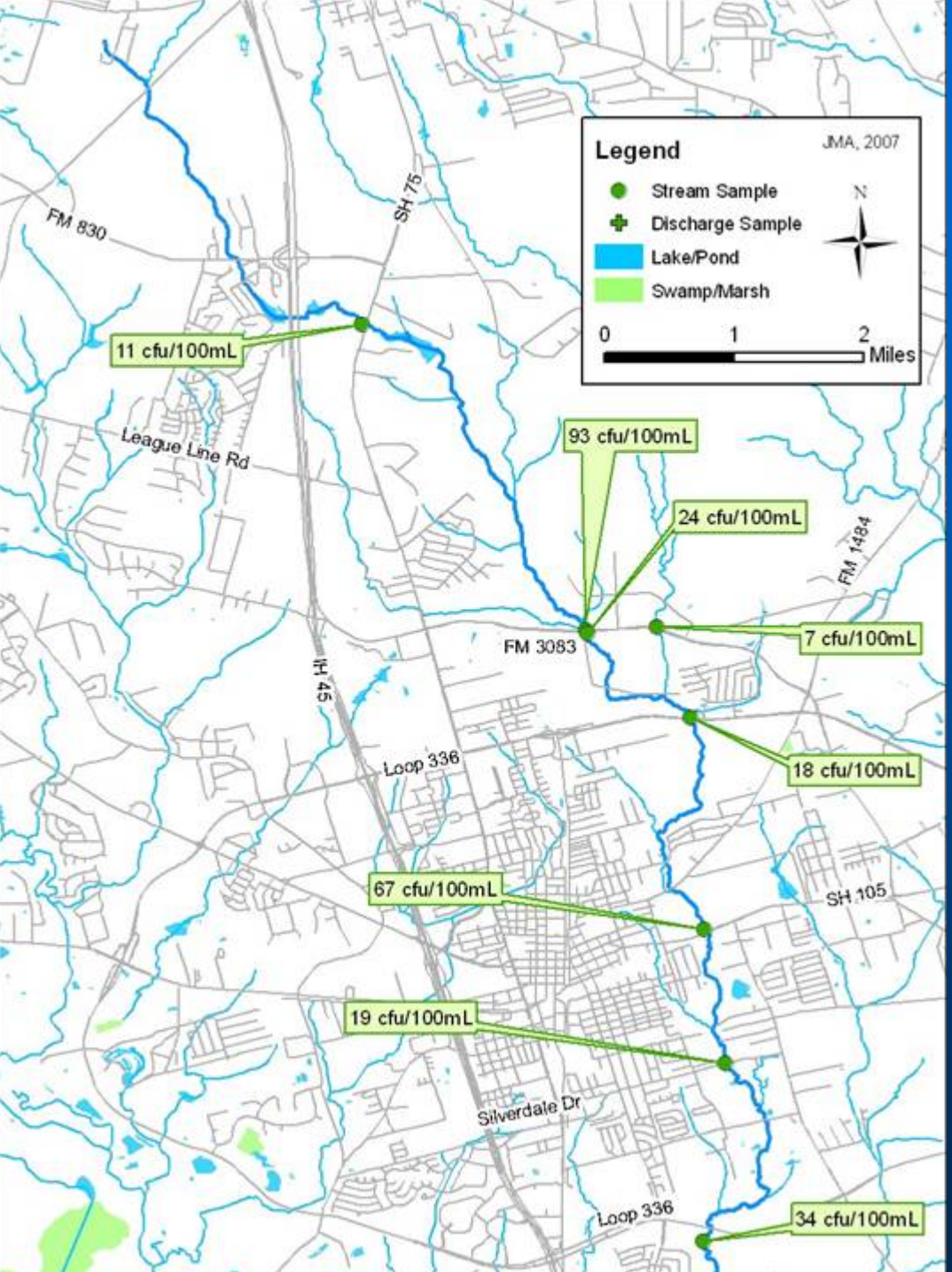
West Fork San Jacinto River Synoptic Sampling Map



Stewarts Creek at SH 105

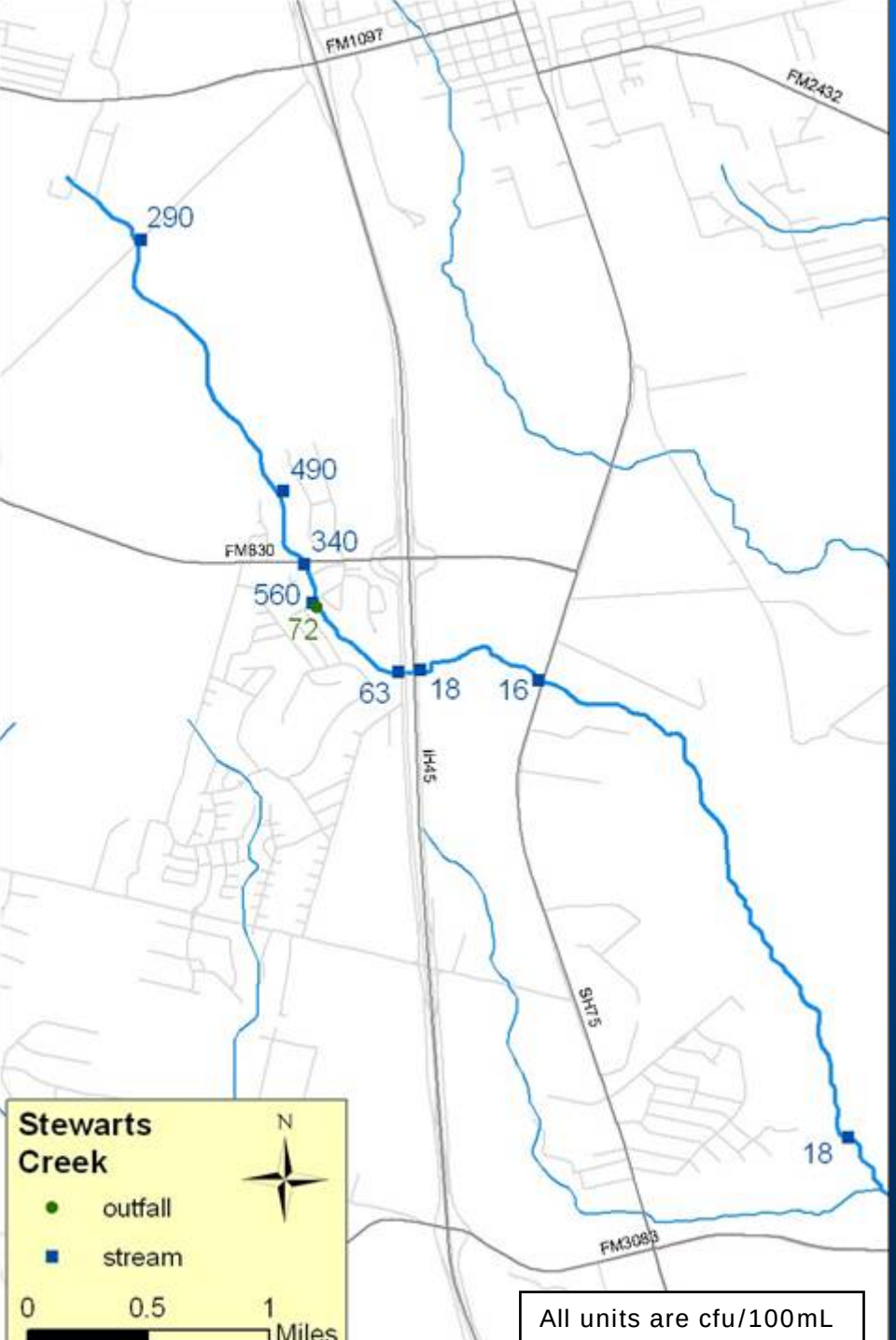


Stewarts Creek at Loop 336

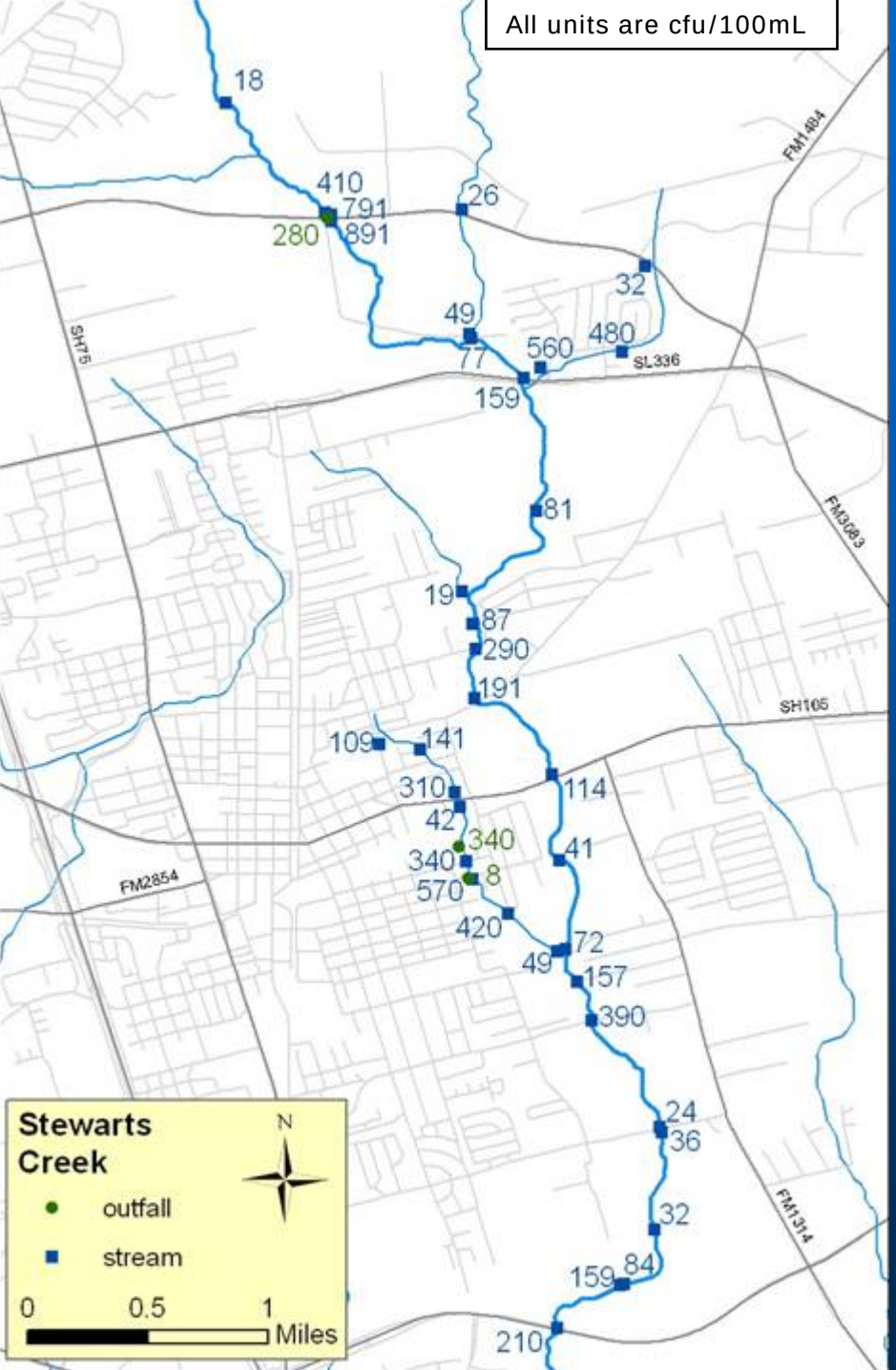


Stewarts Creek Synoptic Sampling Map

Stewarts Creek Intensive Survey Map North



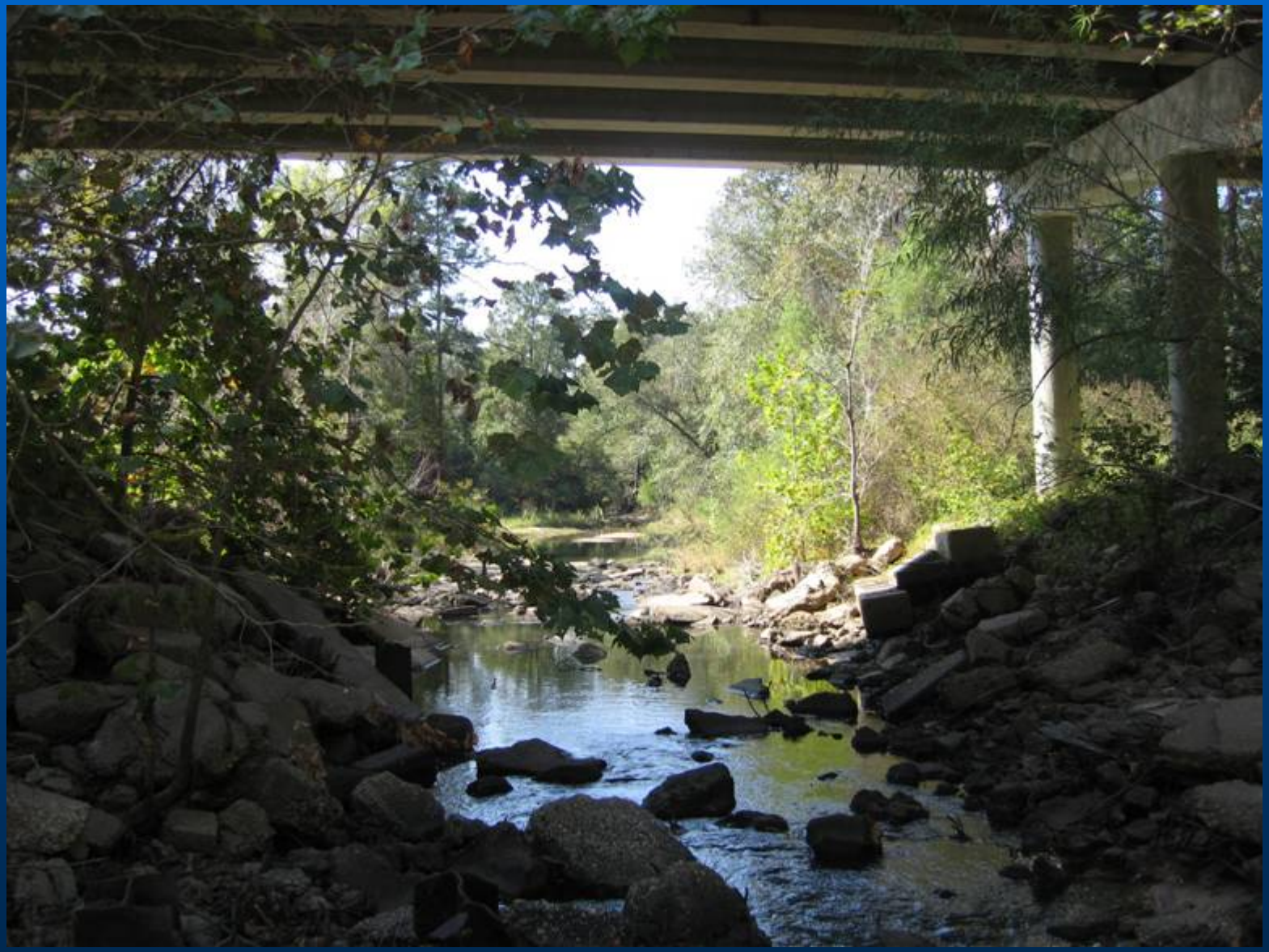
All units are cfu/100mL

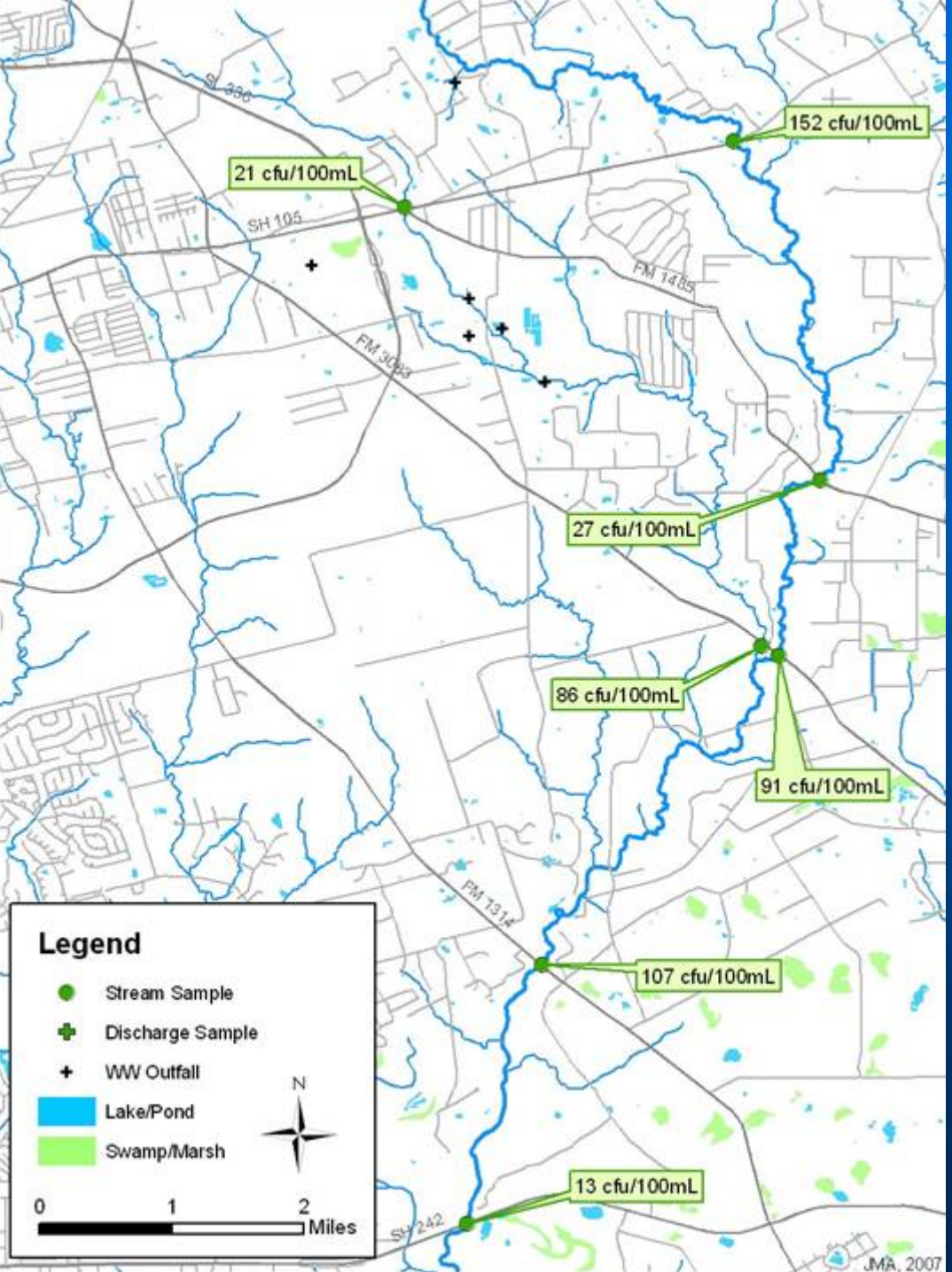


Stewarts Creek Intensive Survey Map South

Crystal Creek at SH 105

Crystal Creek at FM 1314





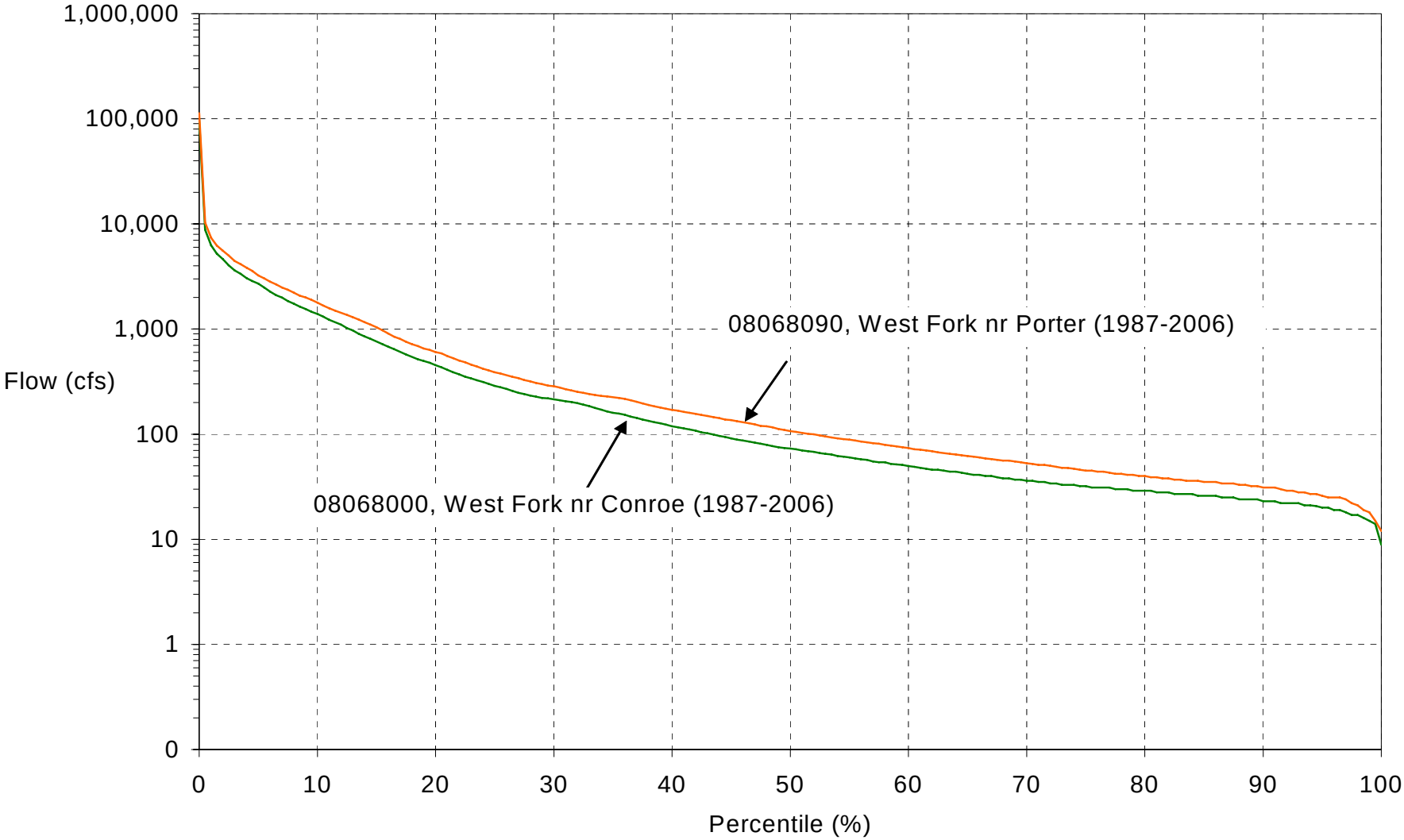
Crystal Creek Synoptic Sampling Map

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

West Fork Flow Duration Curve

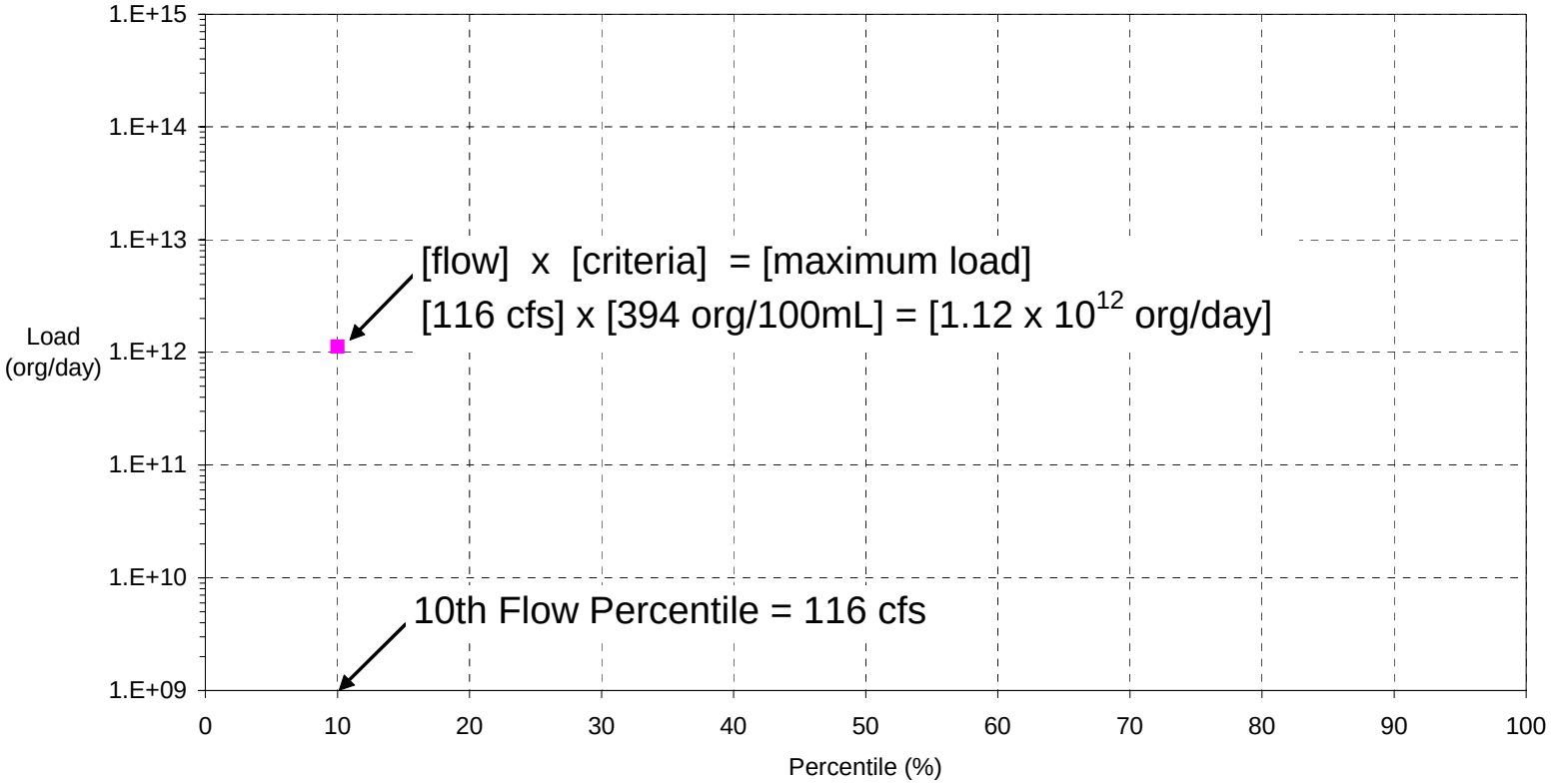


Load Duration Curves

- Load duration curves are presented from upstream to downstream
- 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

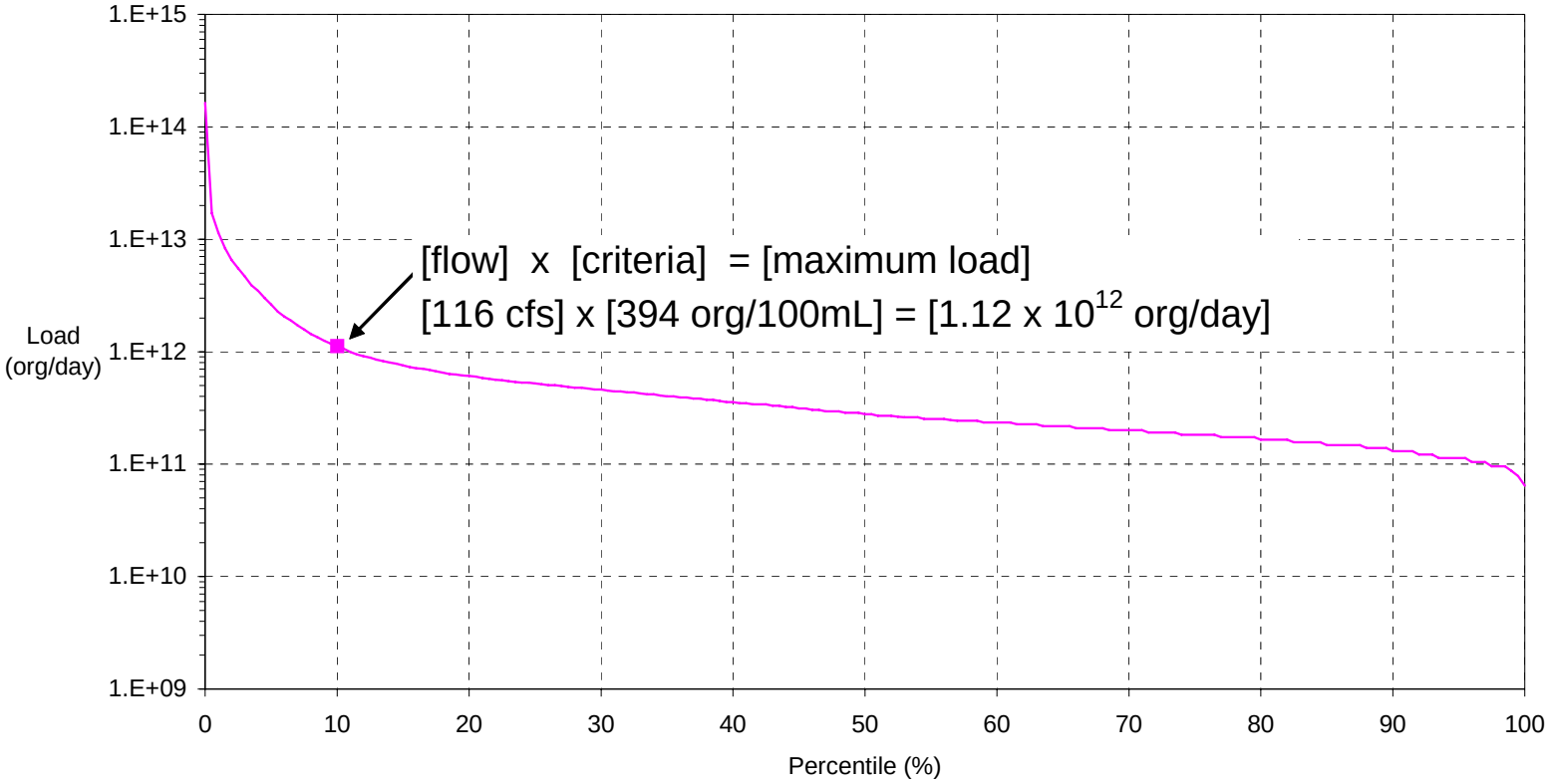
Hypothetical LDC

Step 1: Plot Allowable Load for a Flow Percentile



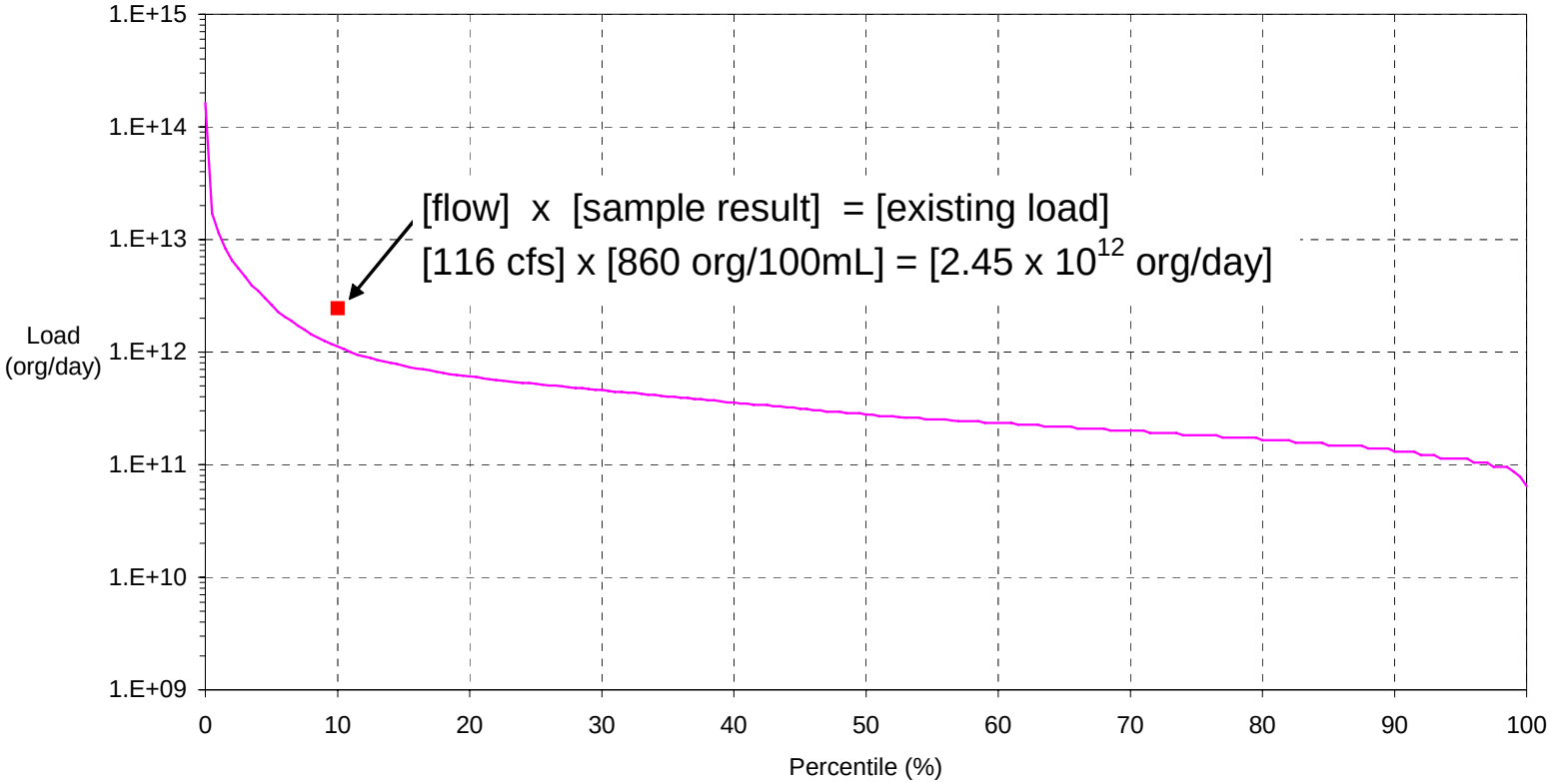
Hypothetical LDC

Step 2: Plot Allowable Load for each Flow Percentile



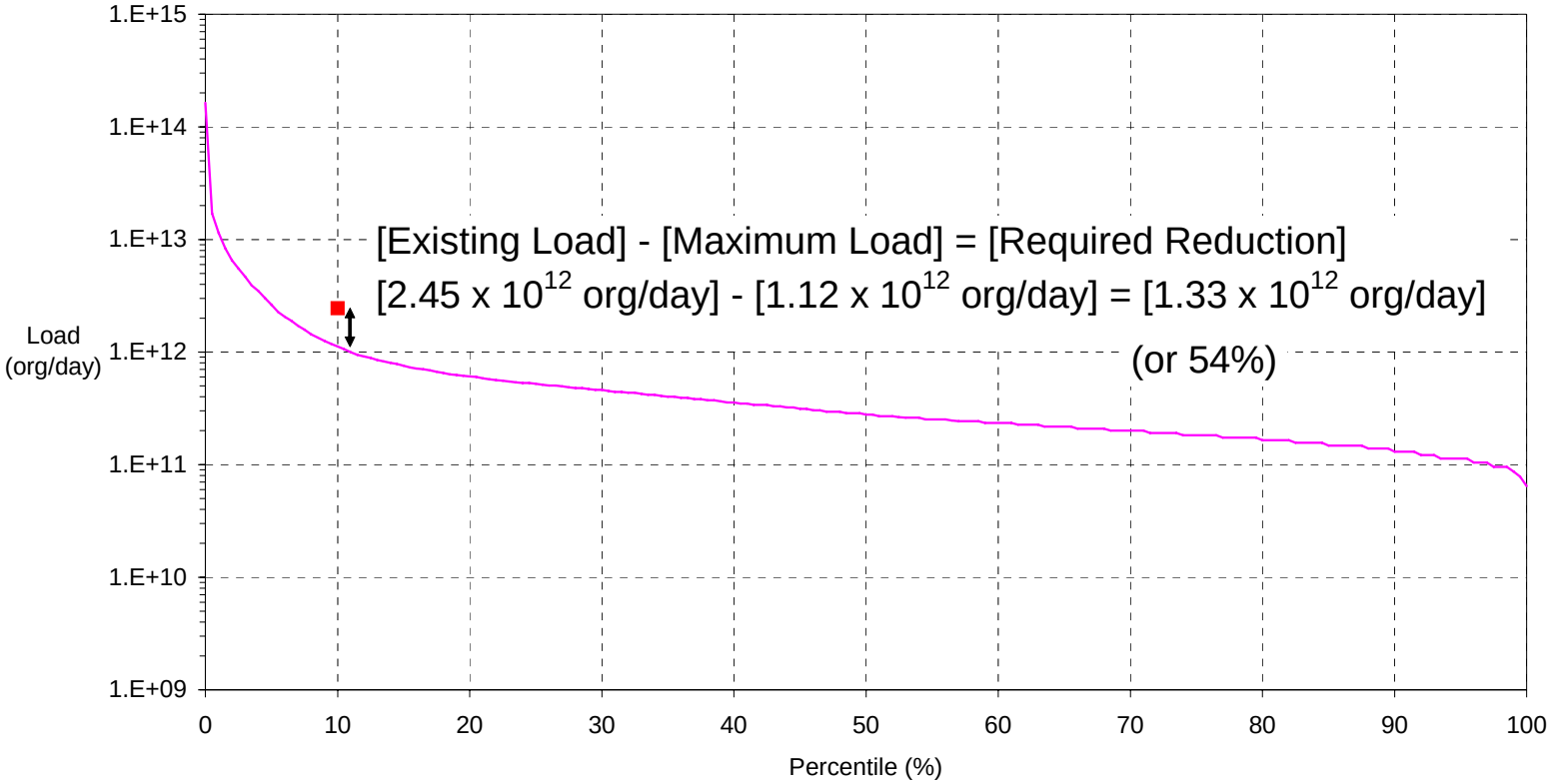
Hypothetical LDC

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

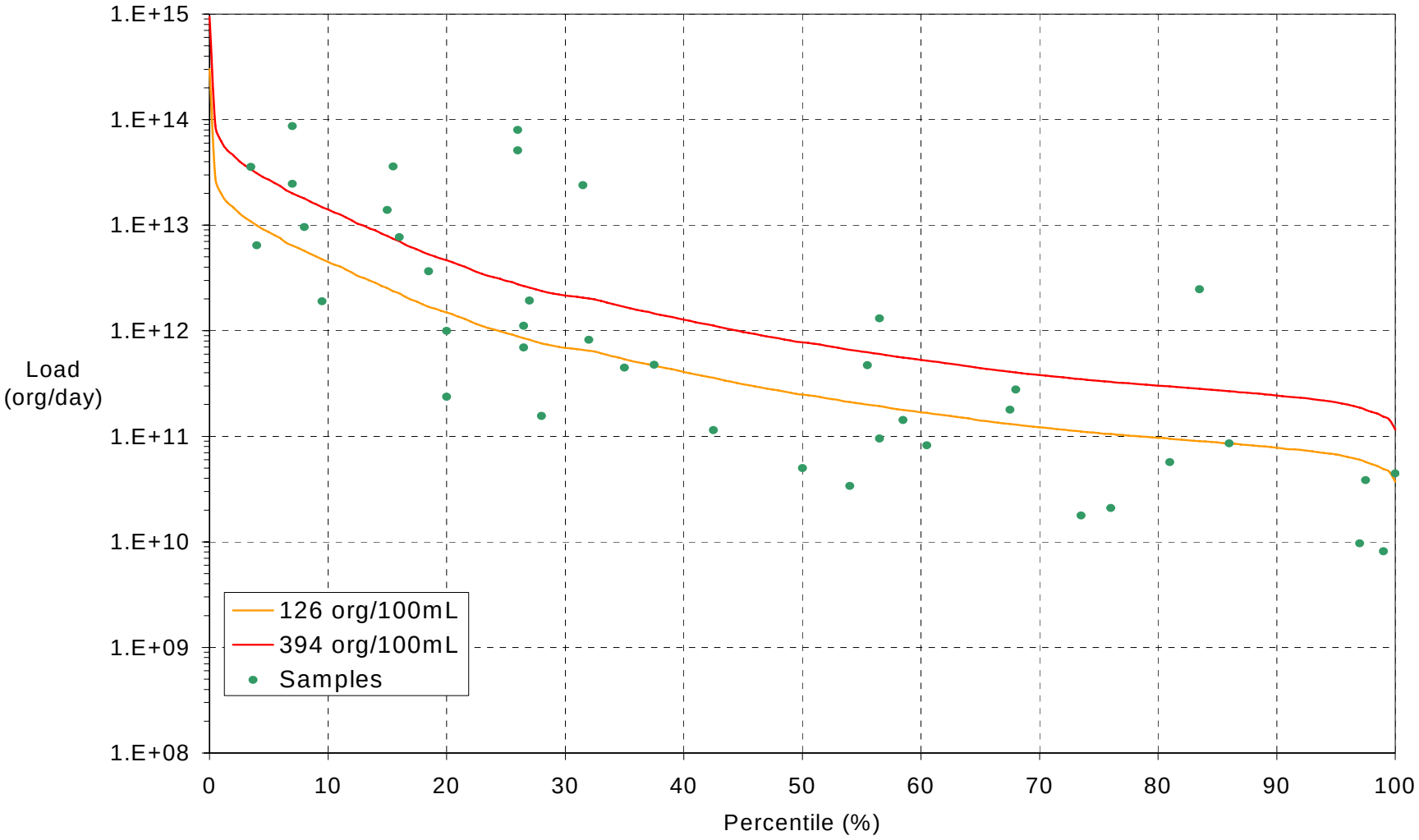


Hypothetical LDC

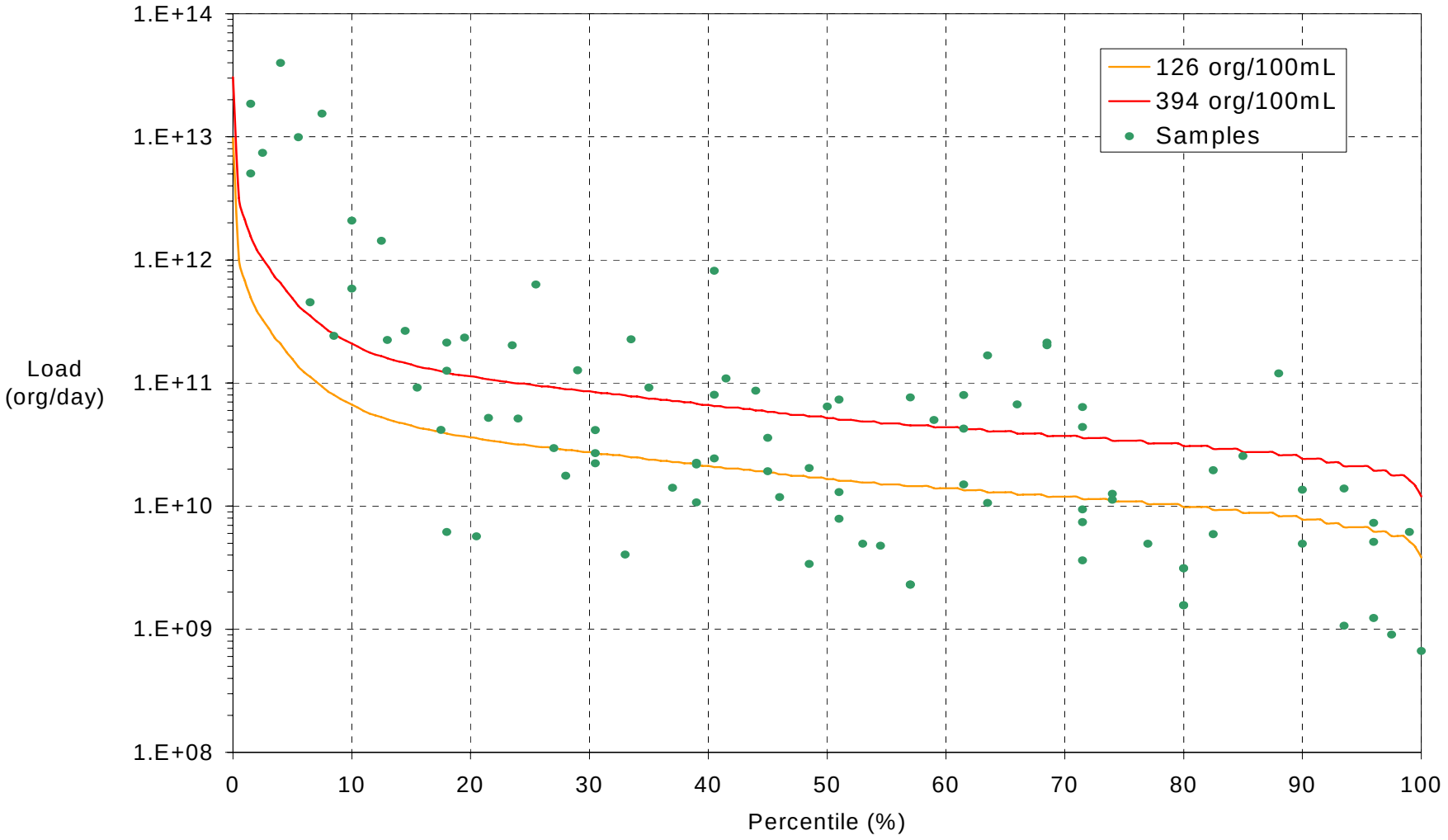
Step 4: Determine Load Exceedance
(for 21 January 2004 only)



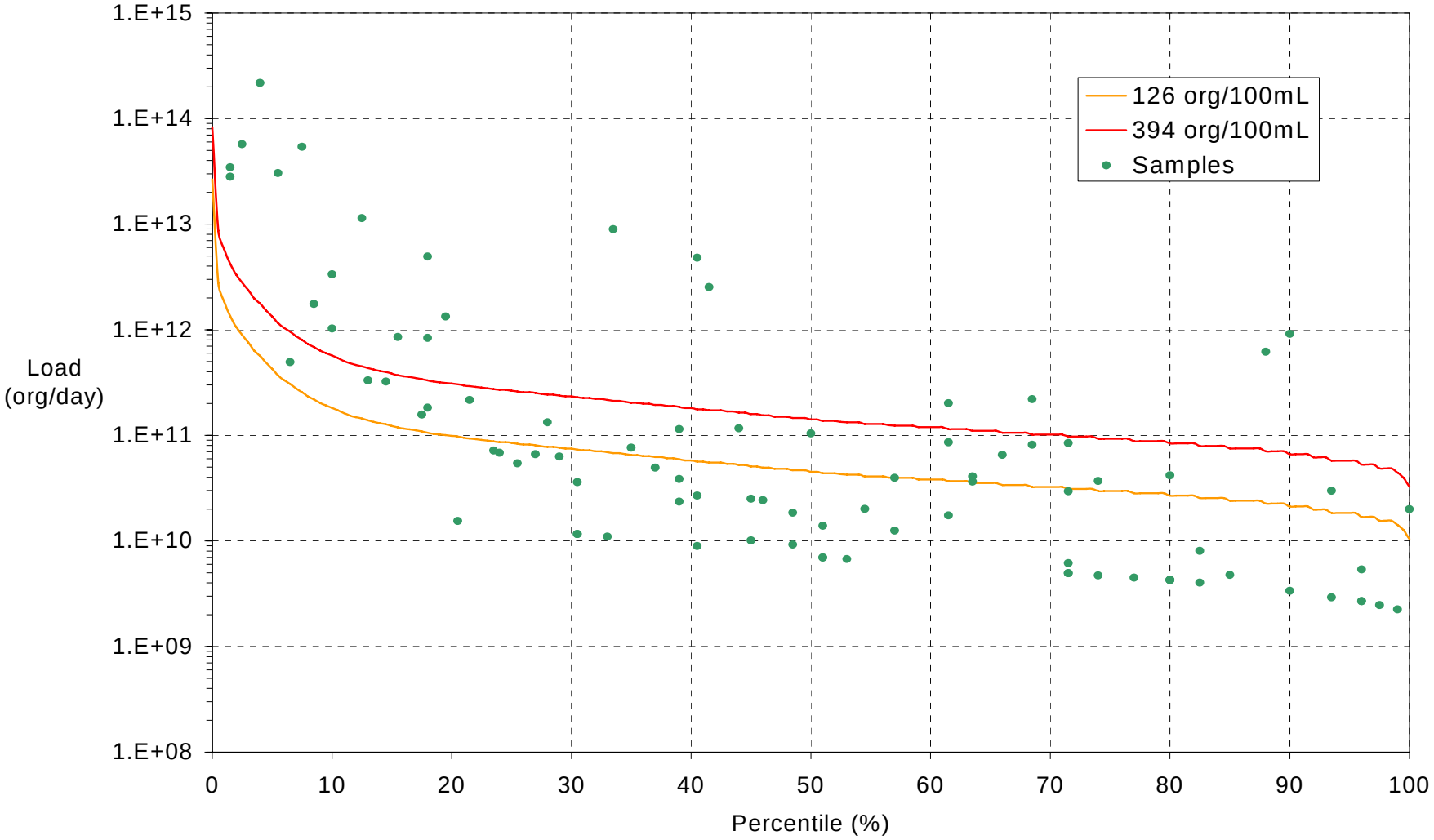
LDC for West Fork at SH 242 (#16624)



LDC for Stewarts Creek (#16626)



LDC for Crystal Creek (#16635)



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

West Fork

Wastewater Treatment Facility Summary

- 31 permitted facilities
- Total current flow 11 MGD (18 cfs)
- Total Permitted flow 23 MGD (36 cfs)
- WWTP flows account for 100% of the stream flow at the 99th percentile regime (low flow), 17% 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