Spring Creek Segment 1008
Upper Panther Branch Segment 1008B
Willow Creek Segment 1008H

Data Review & Analysis

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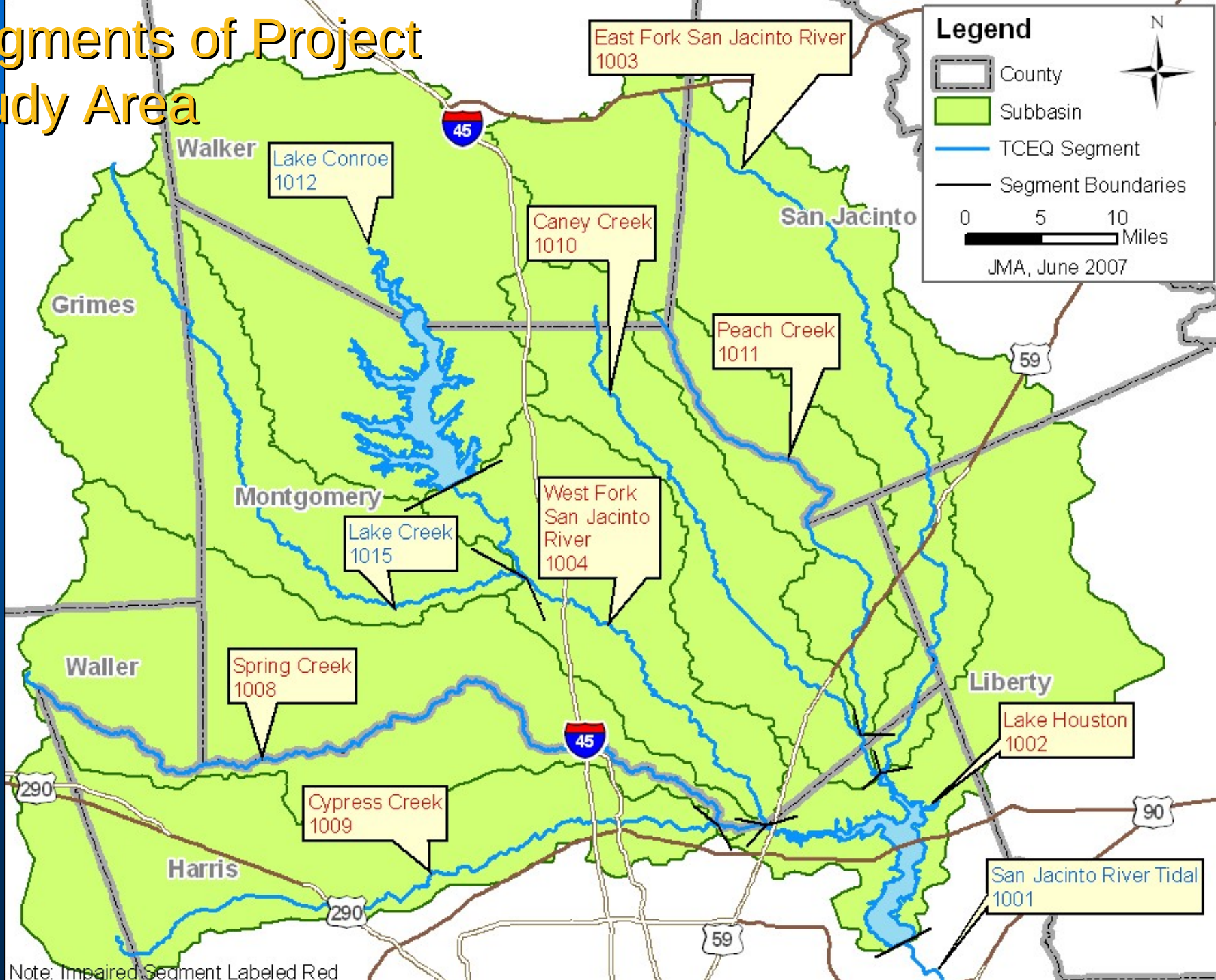
Introduction

- 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



Note: Impaired Segment Labeled Red

I.
Historical Data Review

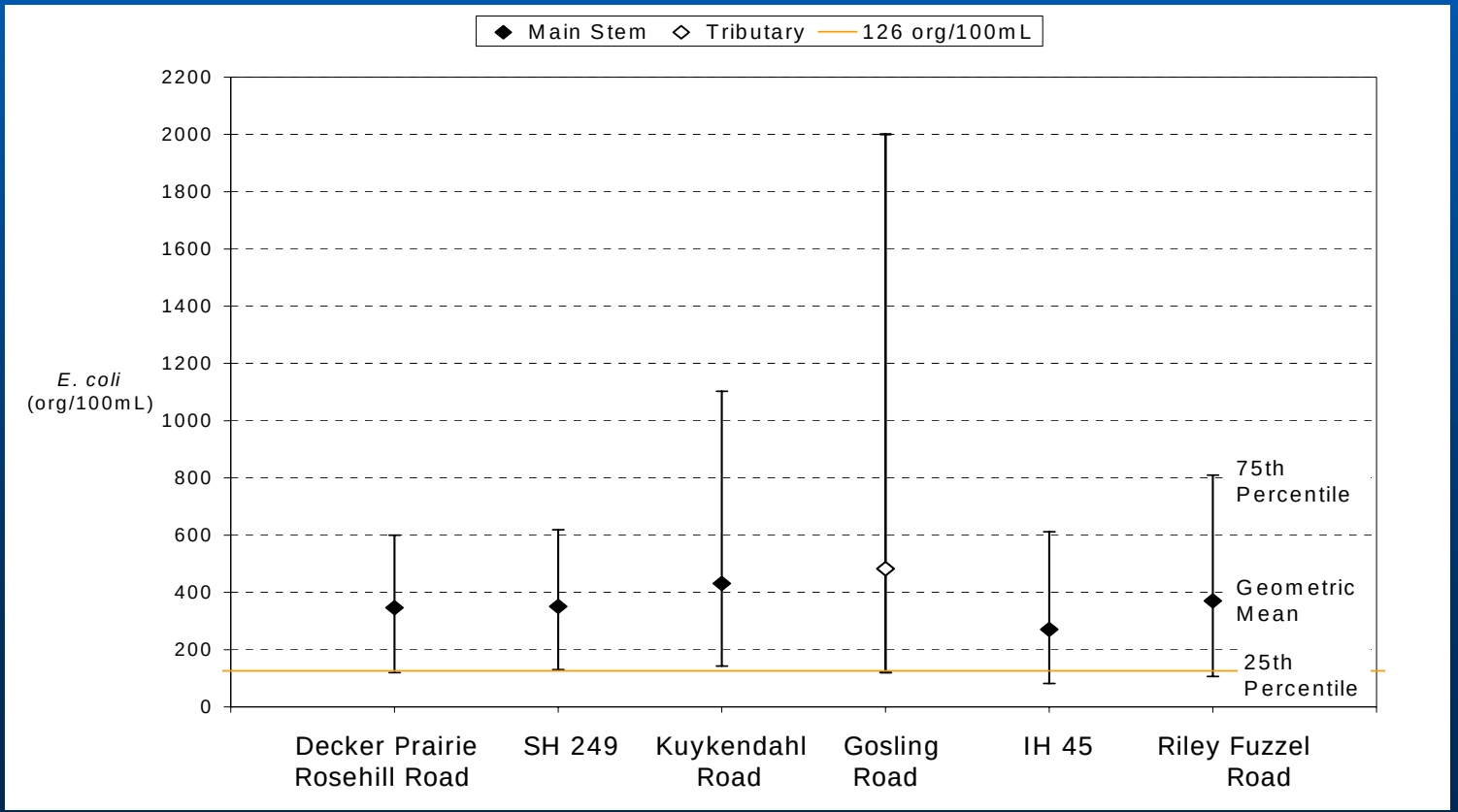
Spatial and Temporal Analysis

- 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 clear trends over length of stream

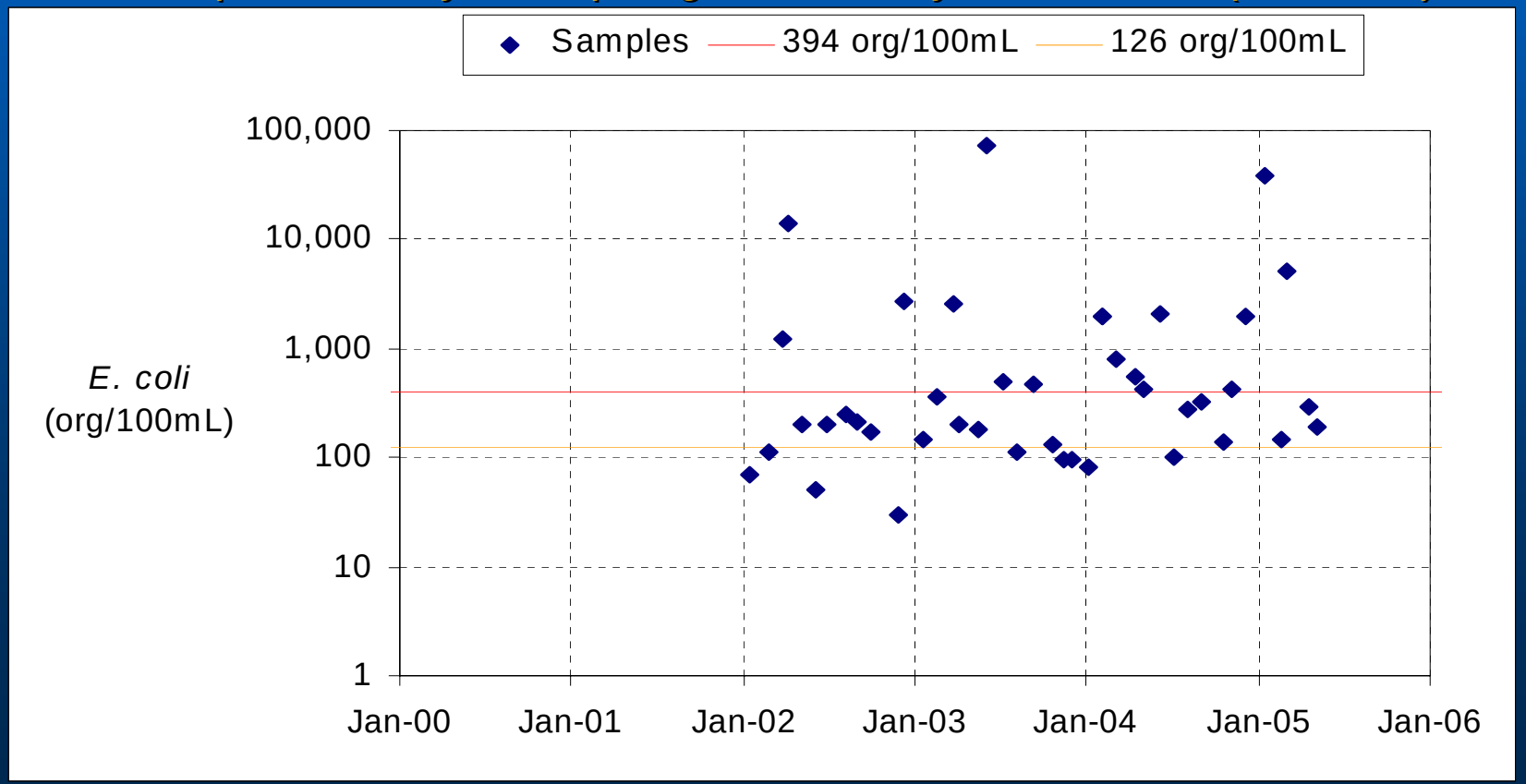
Spring Creek Spatial Analysis



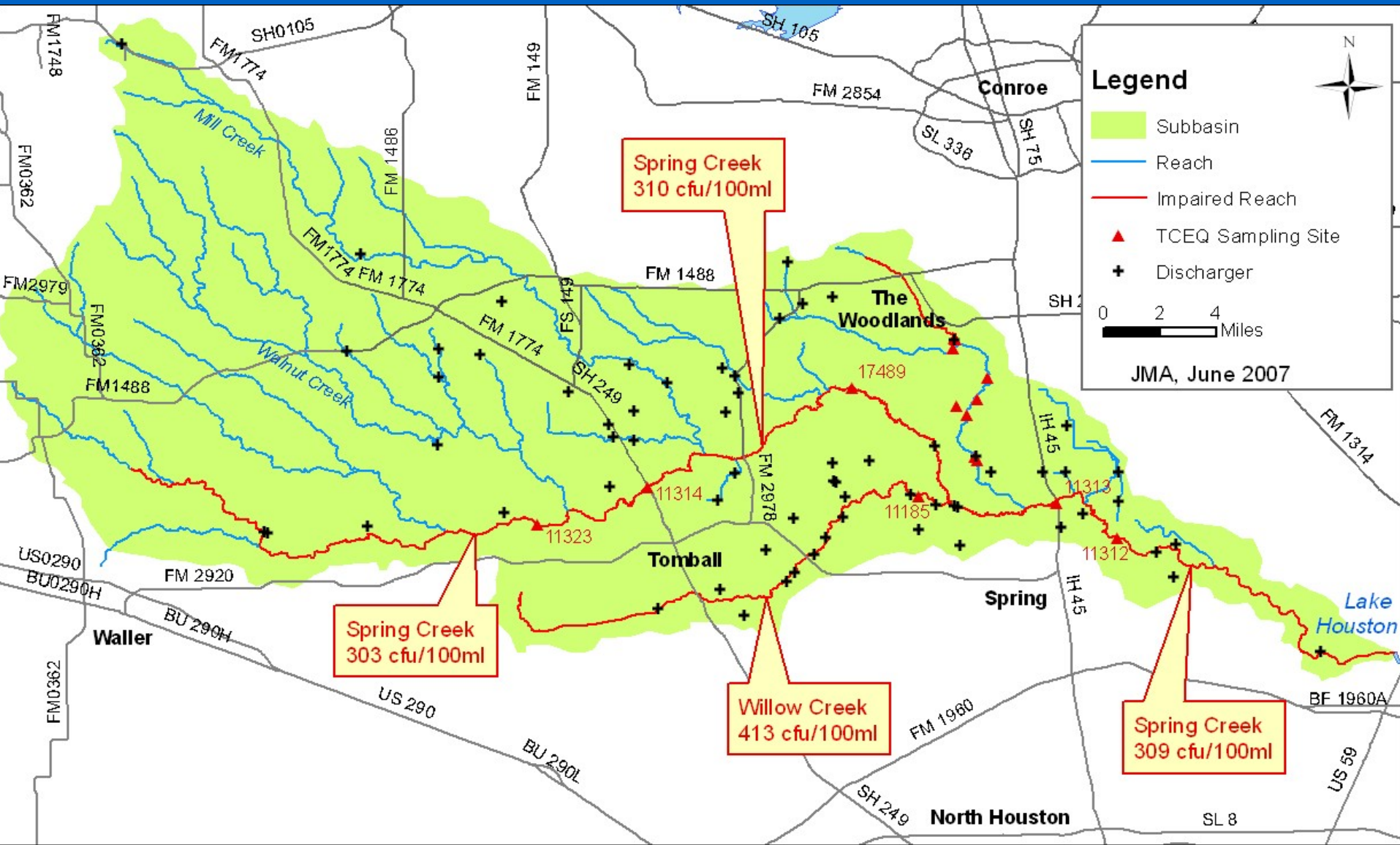
Temporal Analysis

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

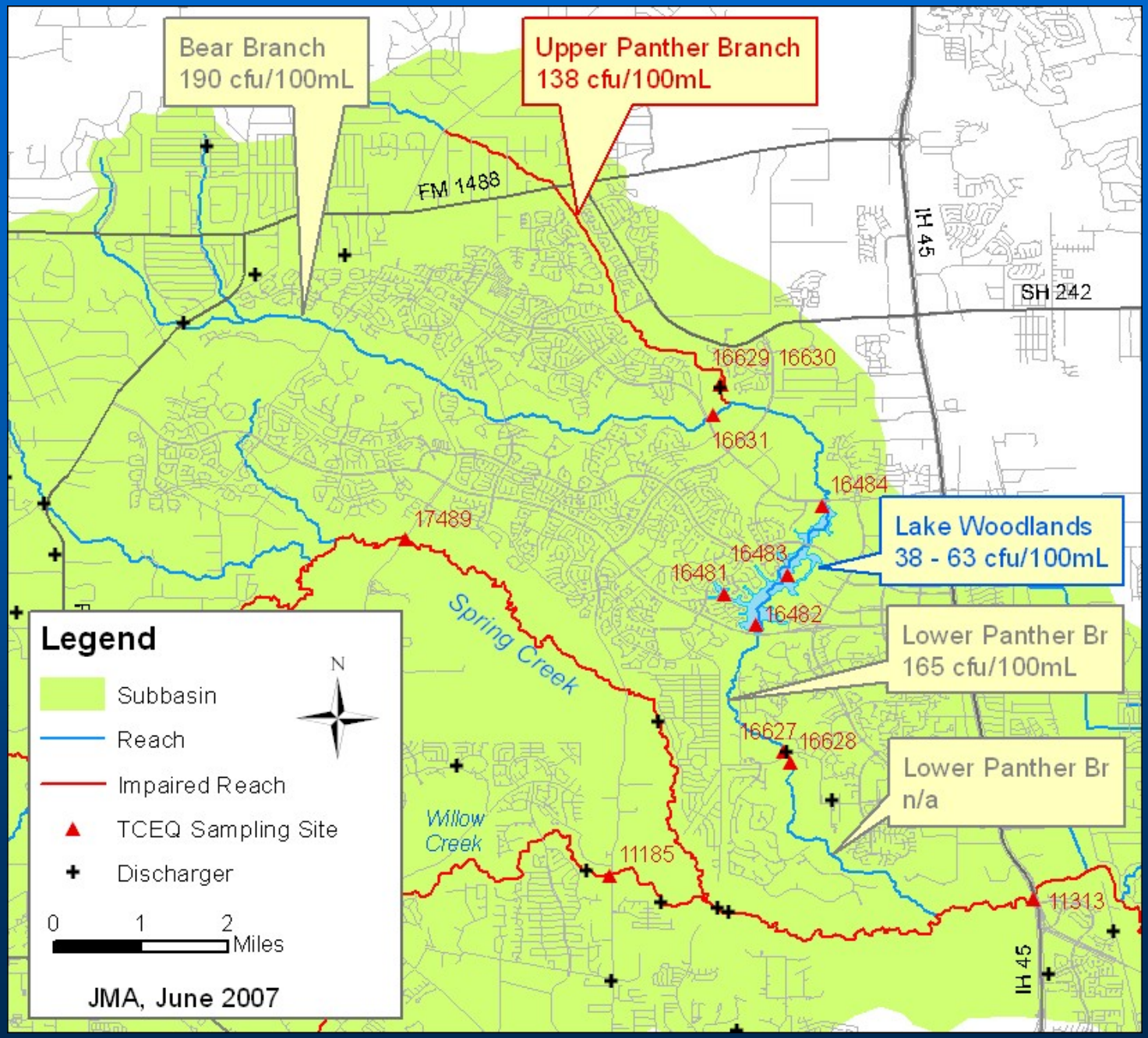
Temporal Analysis: Spring Crk at Kuykendahl Rd (#17489)



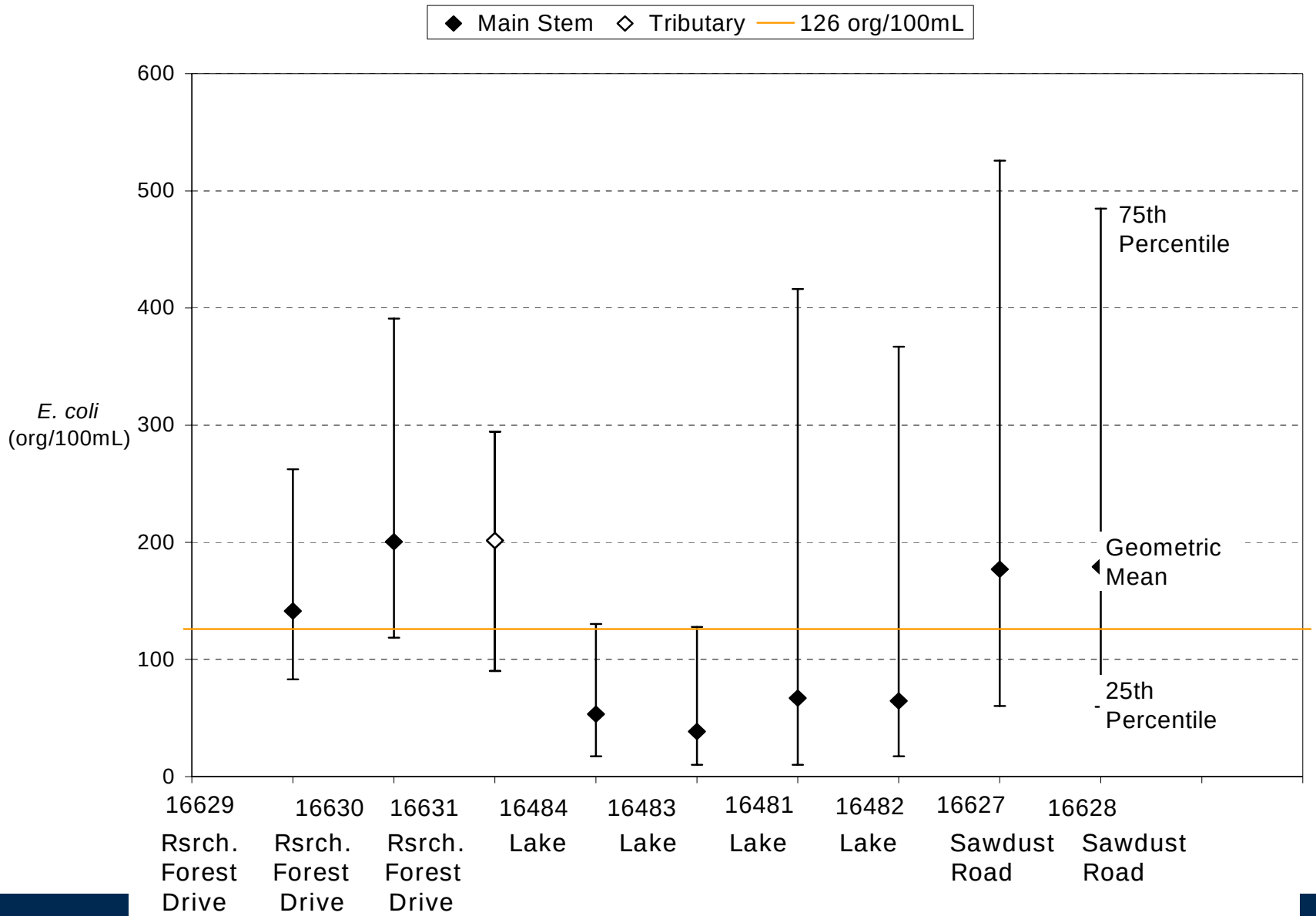
Spring Creek Study Area



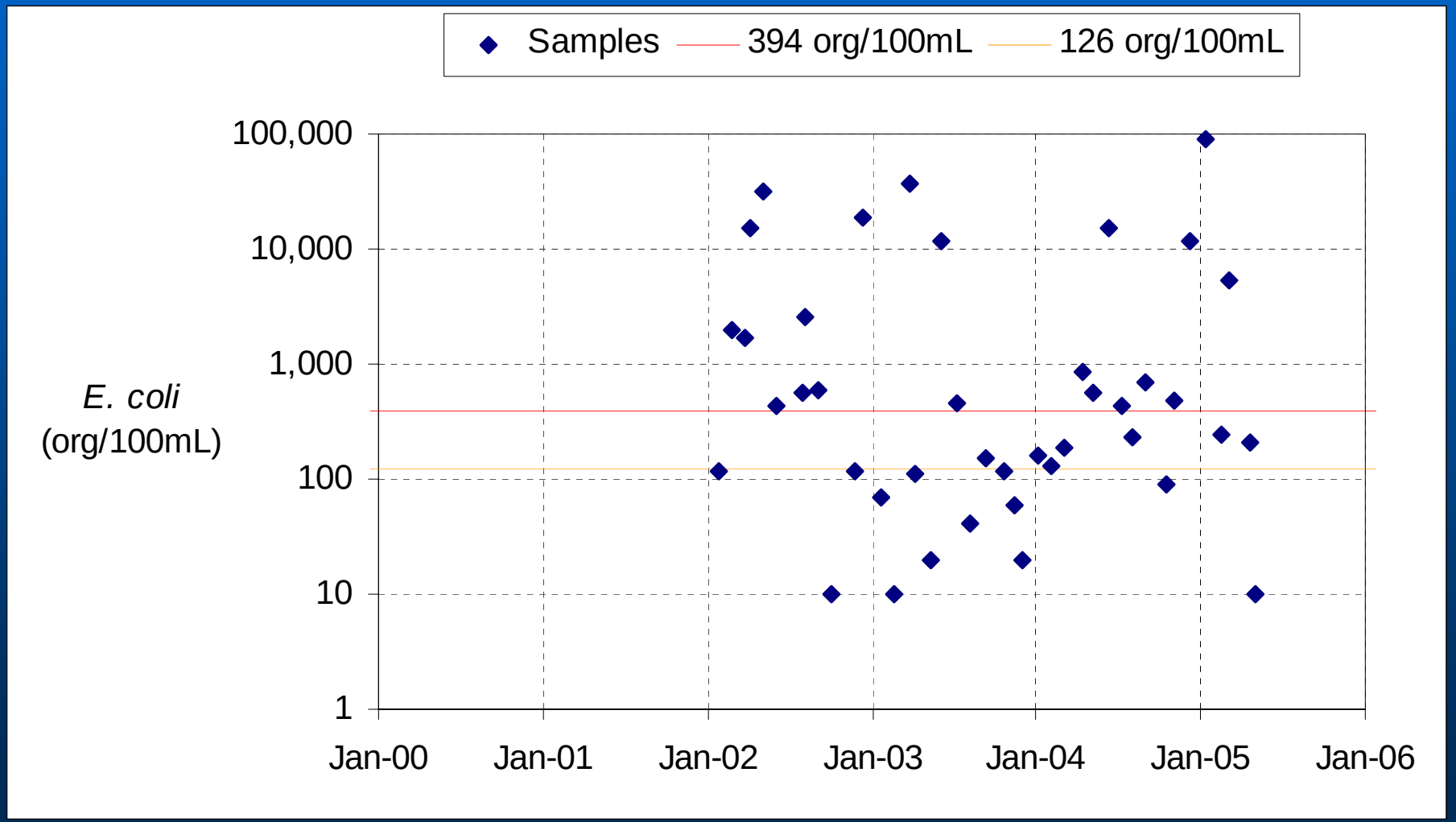
Panther Branch Study Area



Panther Branch Spatial Analysis



Temporal Analysis: Willow Crk at Rosling Rd (#11185)



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.

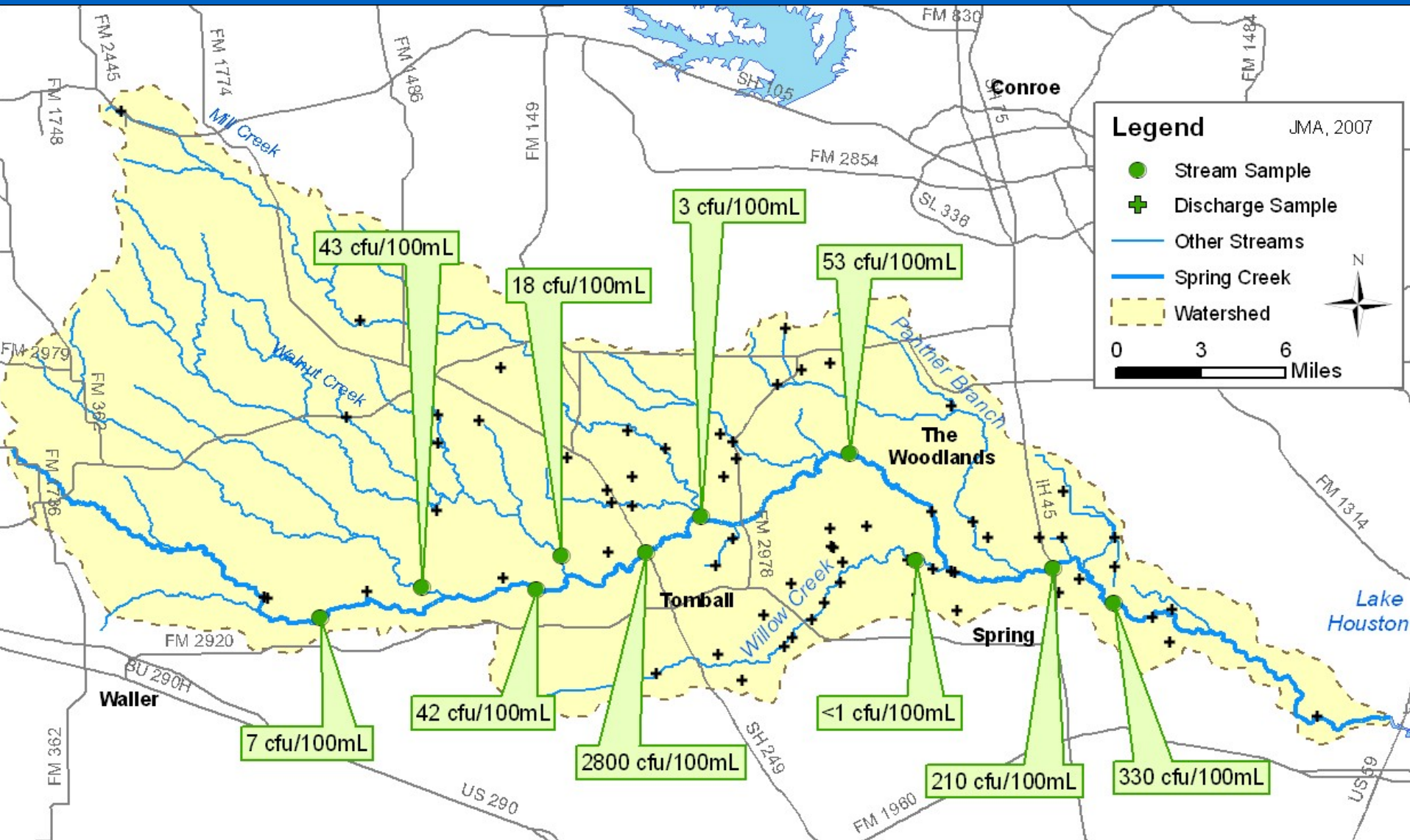
Spatially-Intensive Source Studies

- 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

Spring Creek at IH-45

Spring Creek at Kuykendahl Rd.

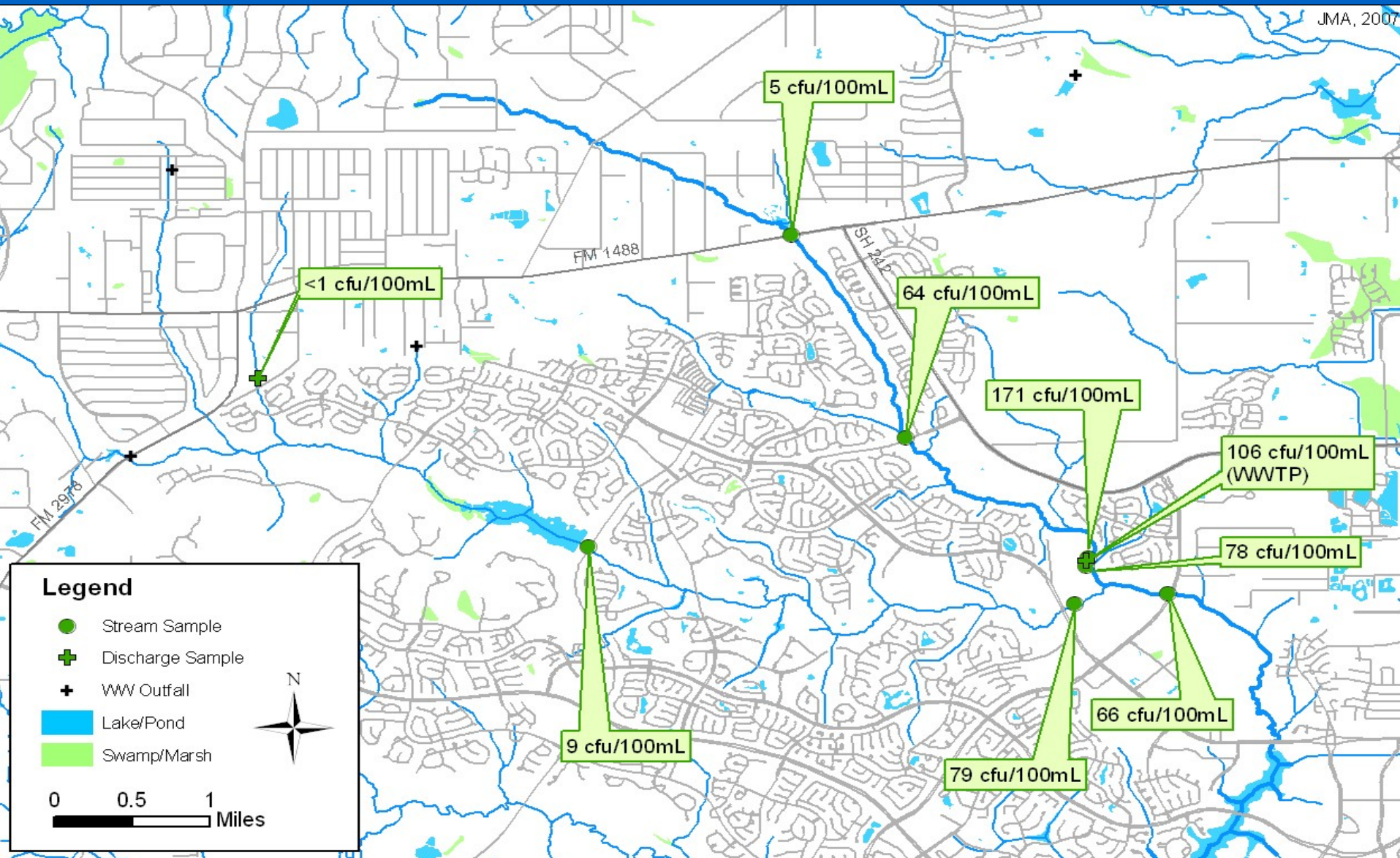
Spring Creek Synoptic Sampling Map



Upper Panther Branch at San Jacinto Plant

Lower Panther Branch at Sawdust Rd.

Panther Branch Synoptic Sampling Map

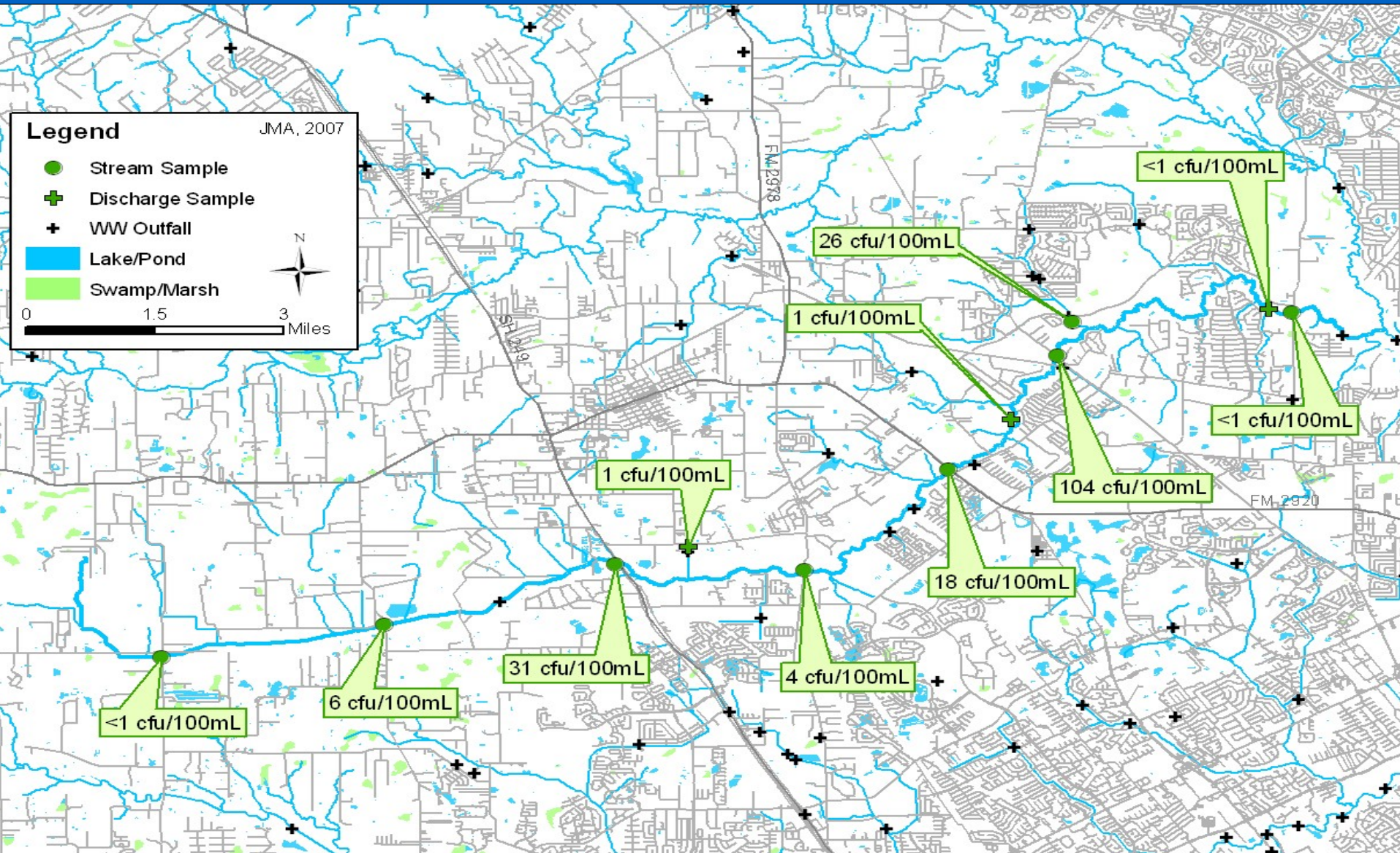


Willow Creek at Gosling Rd.

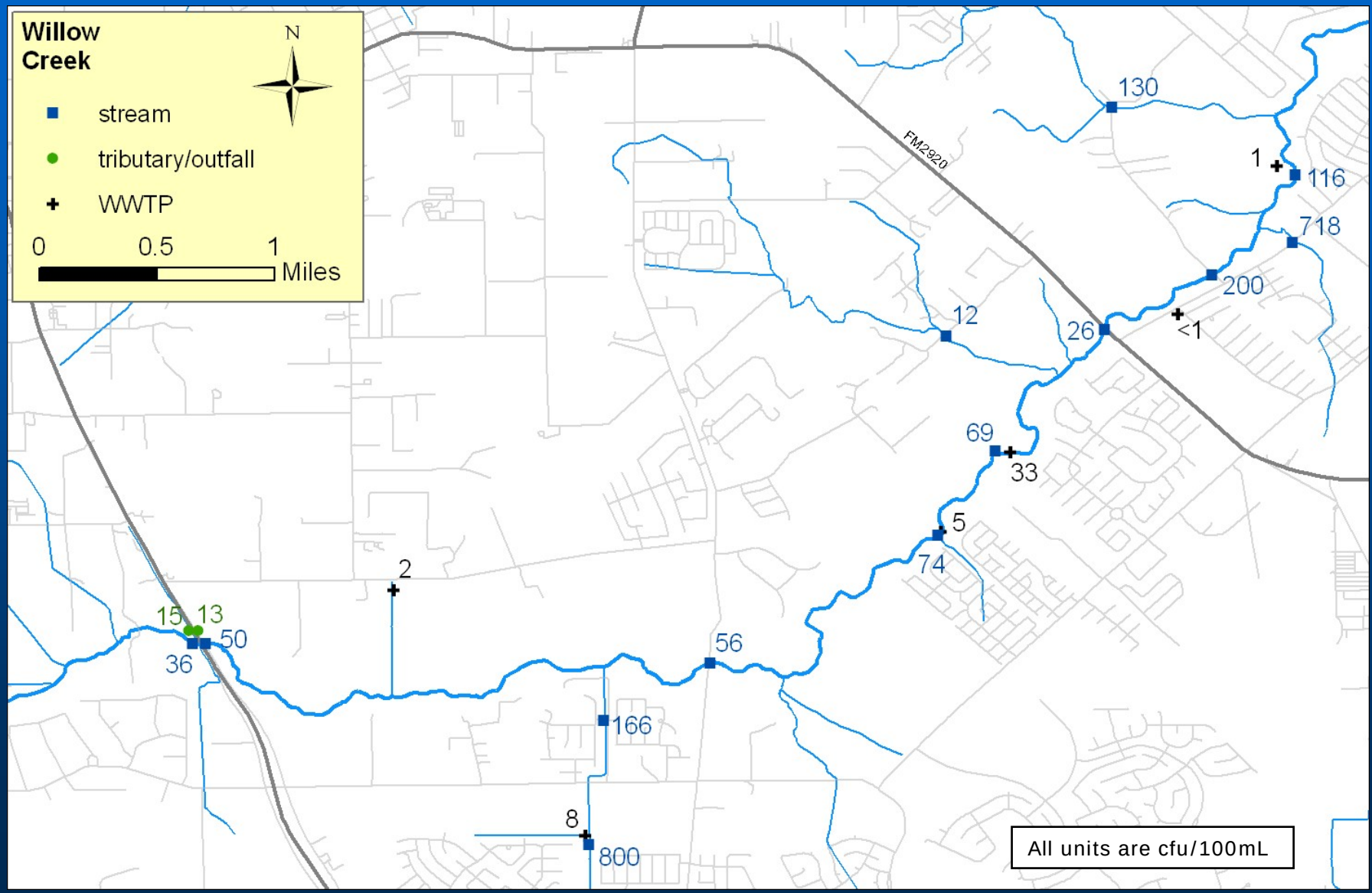
Willow Creek

Willow Creek

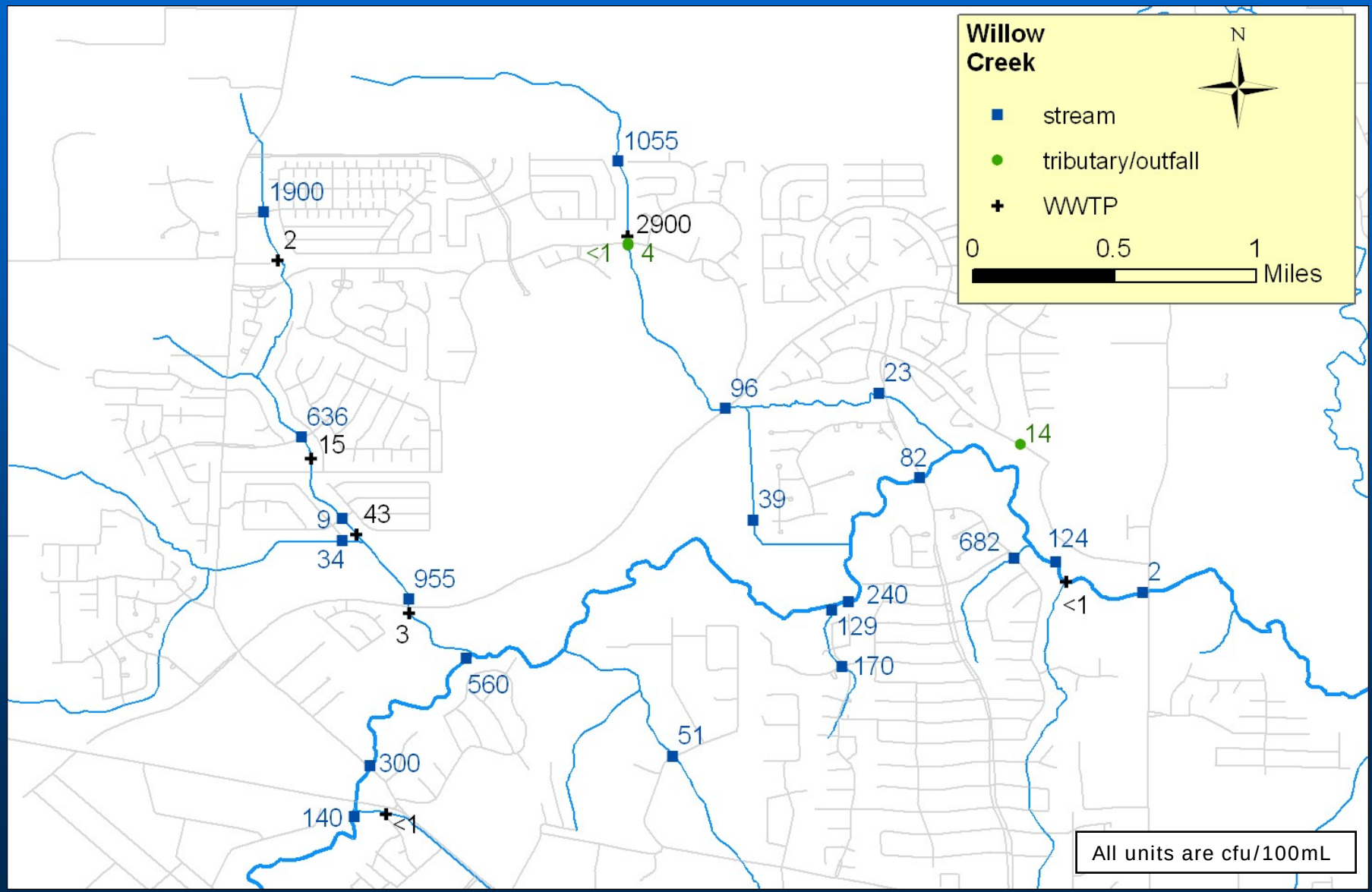
Willow Creek Synoptic Sampling Map



Willow Creek Intensive Survey Map West



Willow Creek Intensive Survey Map East



Willow Creek Wet Weather Results

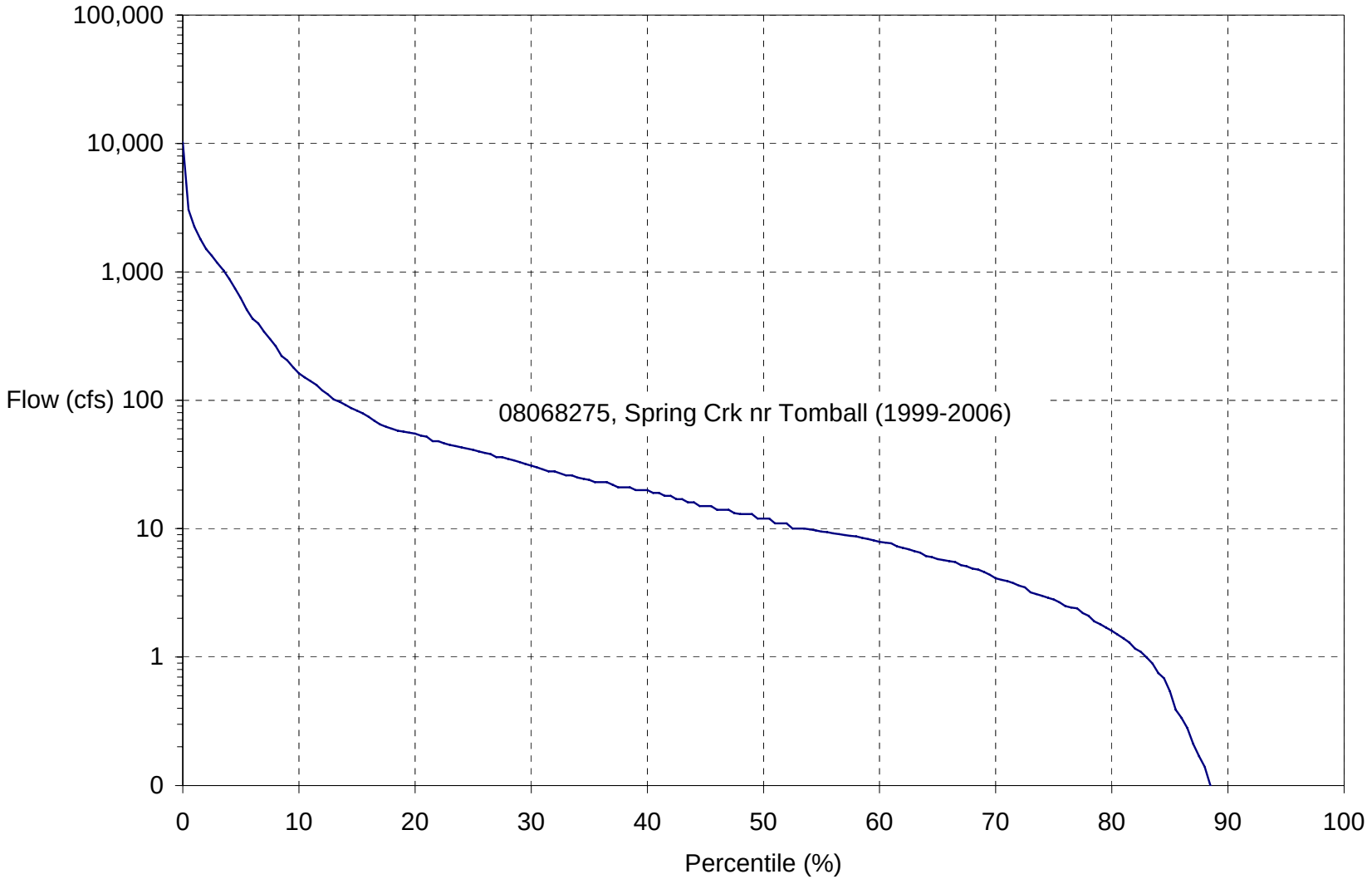
Station	Station Description	Station Type	Permit #	Permitted Flow (MGD)	Sample Date	Sample Time	*E. coli* (cfu/100mL)	Flow (mgd)	Flow (cfs)	Temp (C)	Cond (µS/cm)	Total Cl2 (mg/L)
10616	City of Tomball	WWTF	10616-002	1.5	12-Feb-08	13:48	2	1.2	1.9	19.1	1010	< 0.05
12044	Harris Co. MUD #368	WWTF	12044-001	1.6	12-Feb-08	14:16	1			21.1	896	> 3.5
13942	Inline Utilities Inc.	WWTF	13942-001	0.25	12-Feb-08	14:43	8500			19.3	642	0.2
14421	Harris Co. MUD #401	WWTF	14421-001	0.60	12-Feb-08	15:48	73	0.012	0.018	20.1	1670	0.4
12643	Pinewood Community LP	WWTF	12643-001	0.10	12-Feb-08	16:15	< 1	0.054	0.084	20.7	682	3.0
11404	Dowdell PUD	WWTF	11404-001	0.95	12-Feb-08	16:38	74	0.142	0.22	22.1	1335	0.9
13619	Aqua Utilities Inc.	WWTF	13619-001	0.04	12-Feb-08	17:07	240	0.017	0.027	18.3	653	0.25
13487	Timbercrest Community LP	WWTF	13487-001	0.20	12-Feb-08	16:39	31			18.5	552	2.4
11630	Harris Co. MUD #1	WWTF	11630-001	1.5	12-Feb-08	16:16	230			19.6	973	0.8
12519	Aqua Utilities Inc.	WWTF	12519-001	0.10	12-Feb-08	16:00	220			18.5	740	0.5
14475	NW Harris Co. MUD #19	WWTF	14475-001	0.70	12-Feb-08	15:54	6			17	1154	0.3
12153	NW Harris Co. MUD #19	WWTF	12153-001	0.25	12-Feb-08	17:03	68			19.8	1151	> 3.5
10910	Northhampton MUD	WWTF	10910-001	0.75	12-Feb-08	17:35	4			19.6	988	1.3
11185	Willow Creek at Gosling Road	Stream	n/a	n/a	12-Feb-08	17:24	7800	72	112	15.9	250	< 0.05
92924	Blind Duplicate, Sta. 11185	Stream	n/a	n/a	12-Feb-08	17:29	6500	72	112	15.9	250	< 0.05

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

Spring Creek Flow Duration Curve

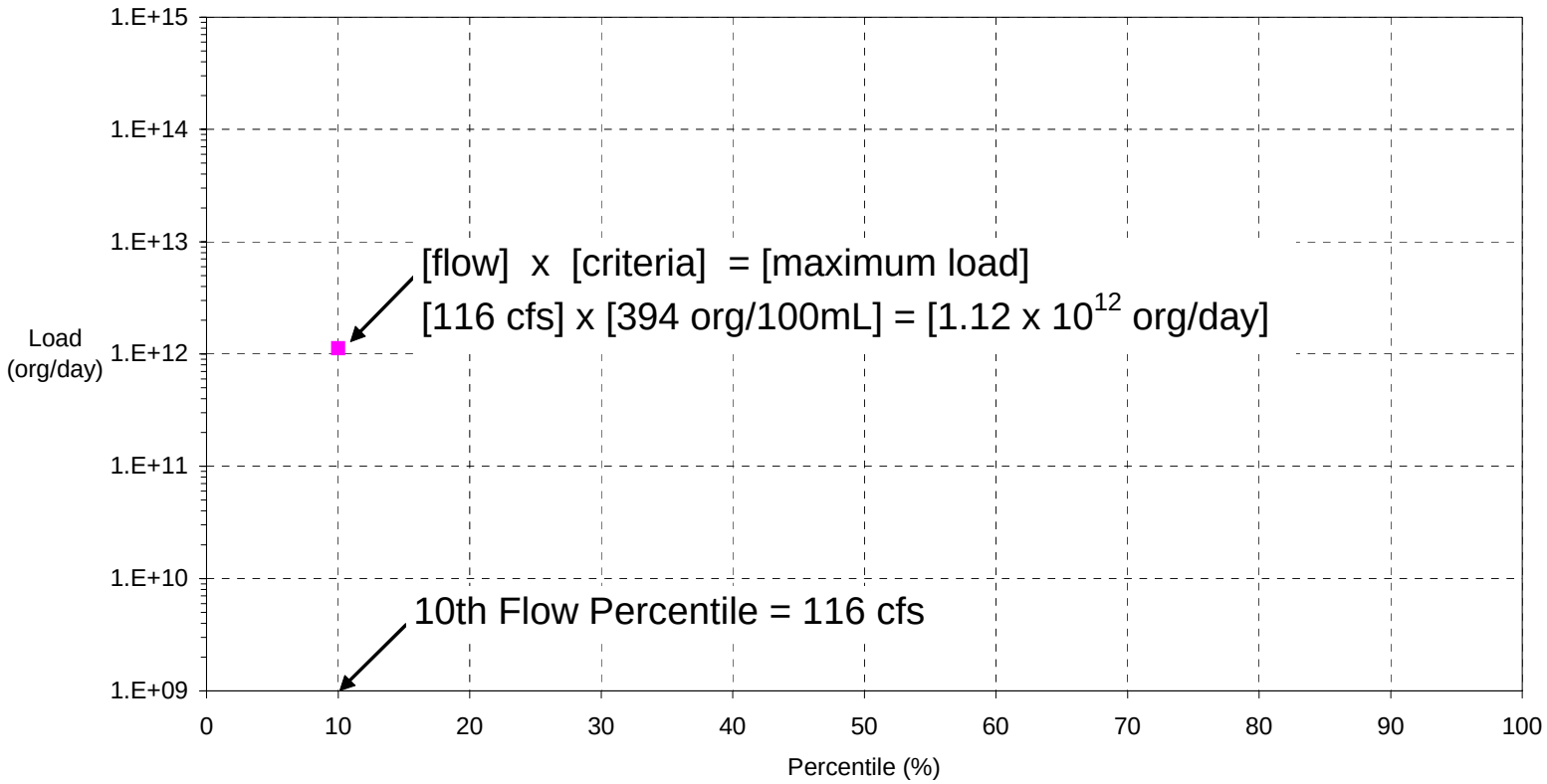


Load Duration Curves

- 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

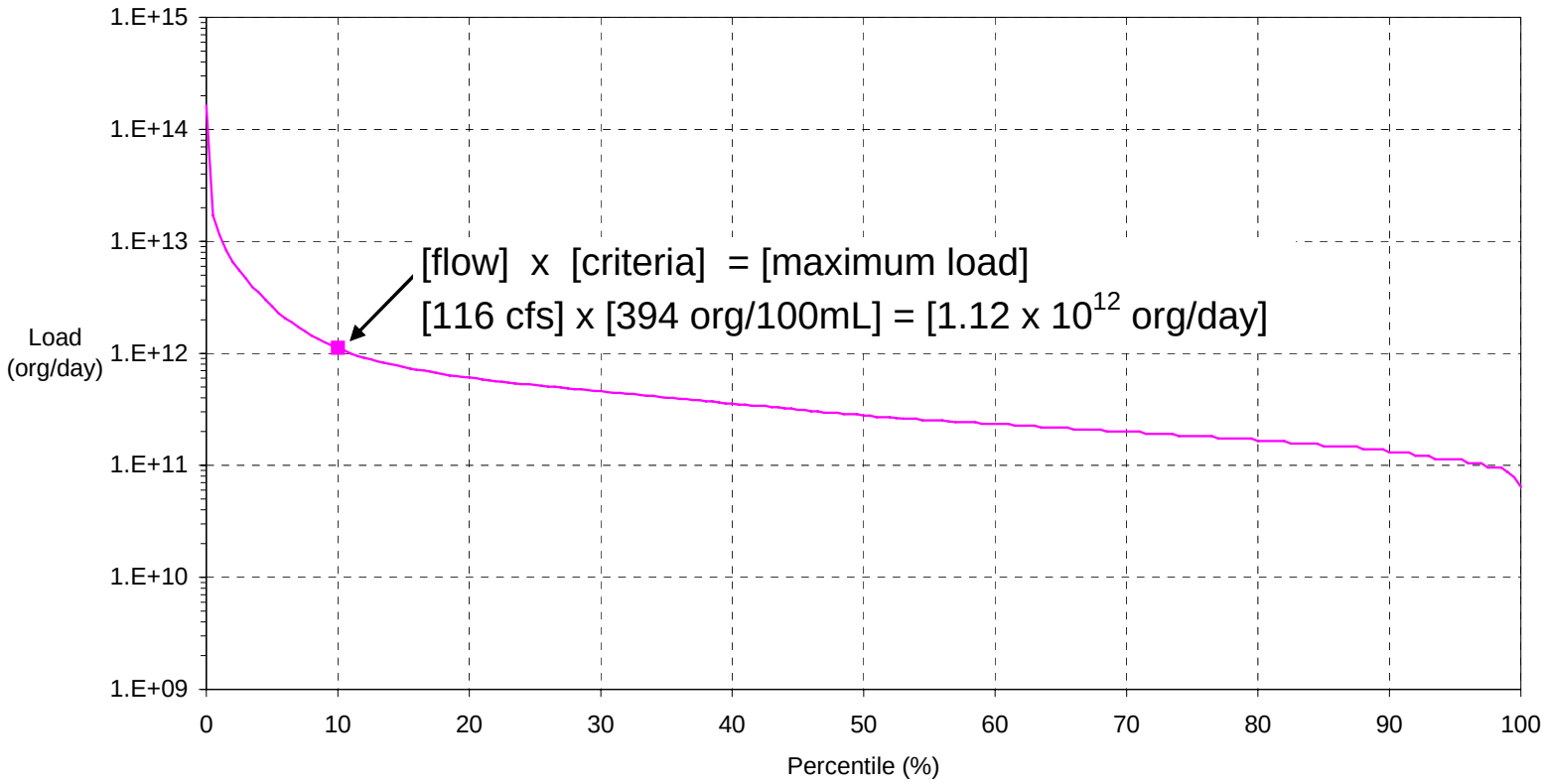
Hypothetical LDC

Step 1: Plot Allowable Load for a Flow Percentile



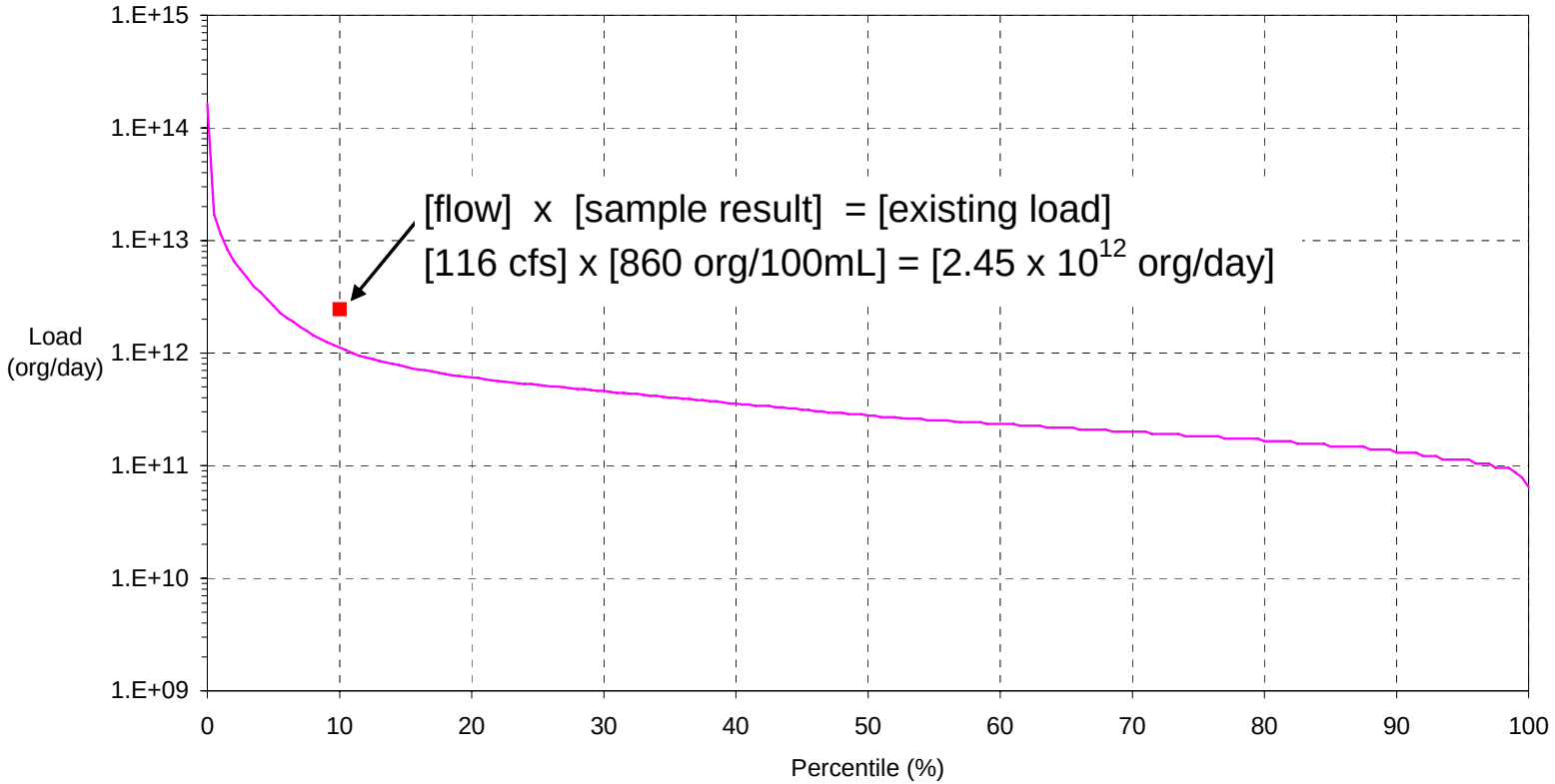
Hypothetical LDC

Step 2: Plot Allowable Load for each Flow Percentile



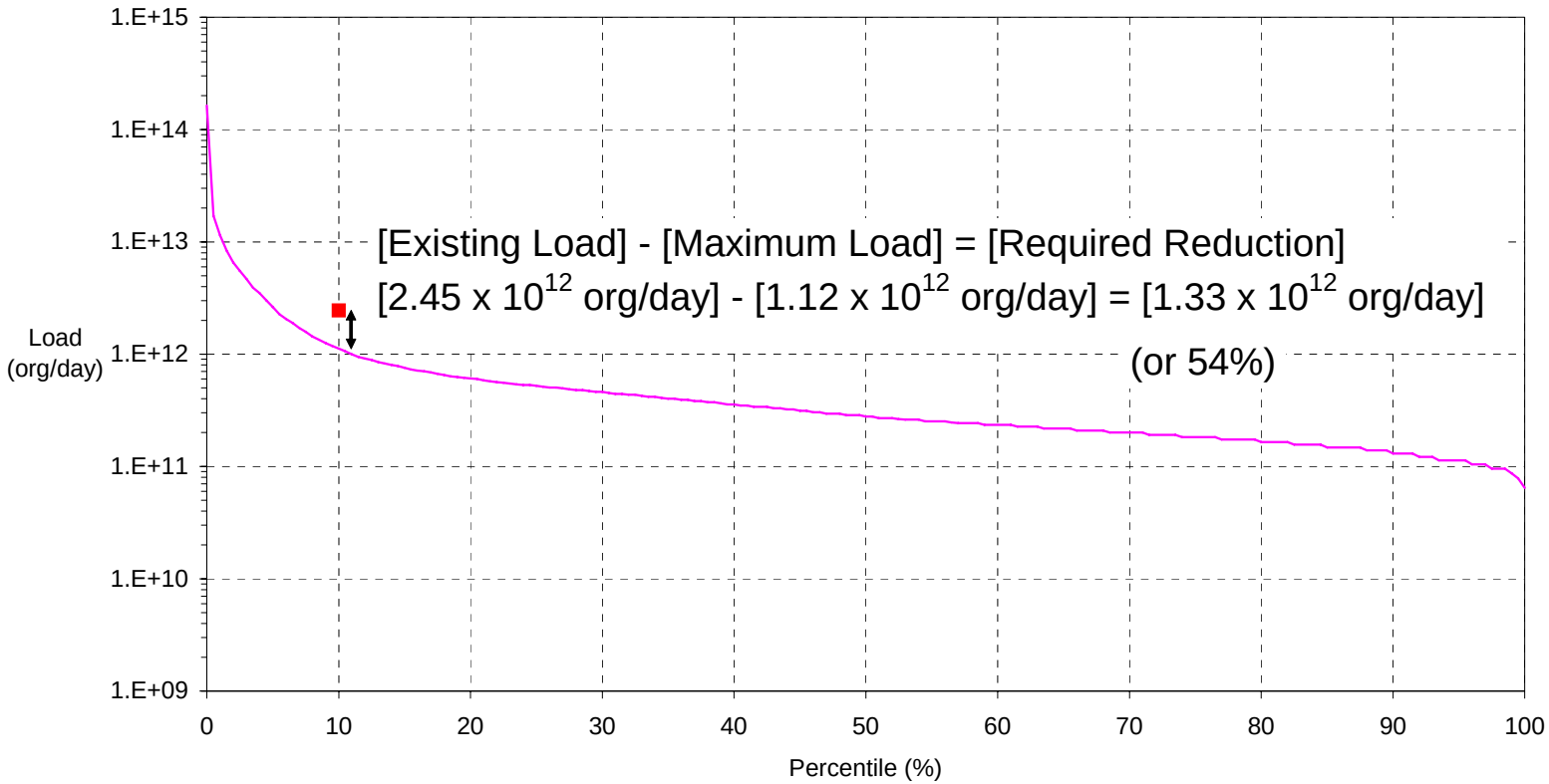
Hypothetical LDC

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

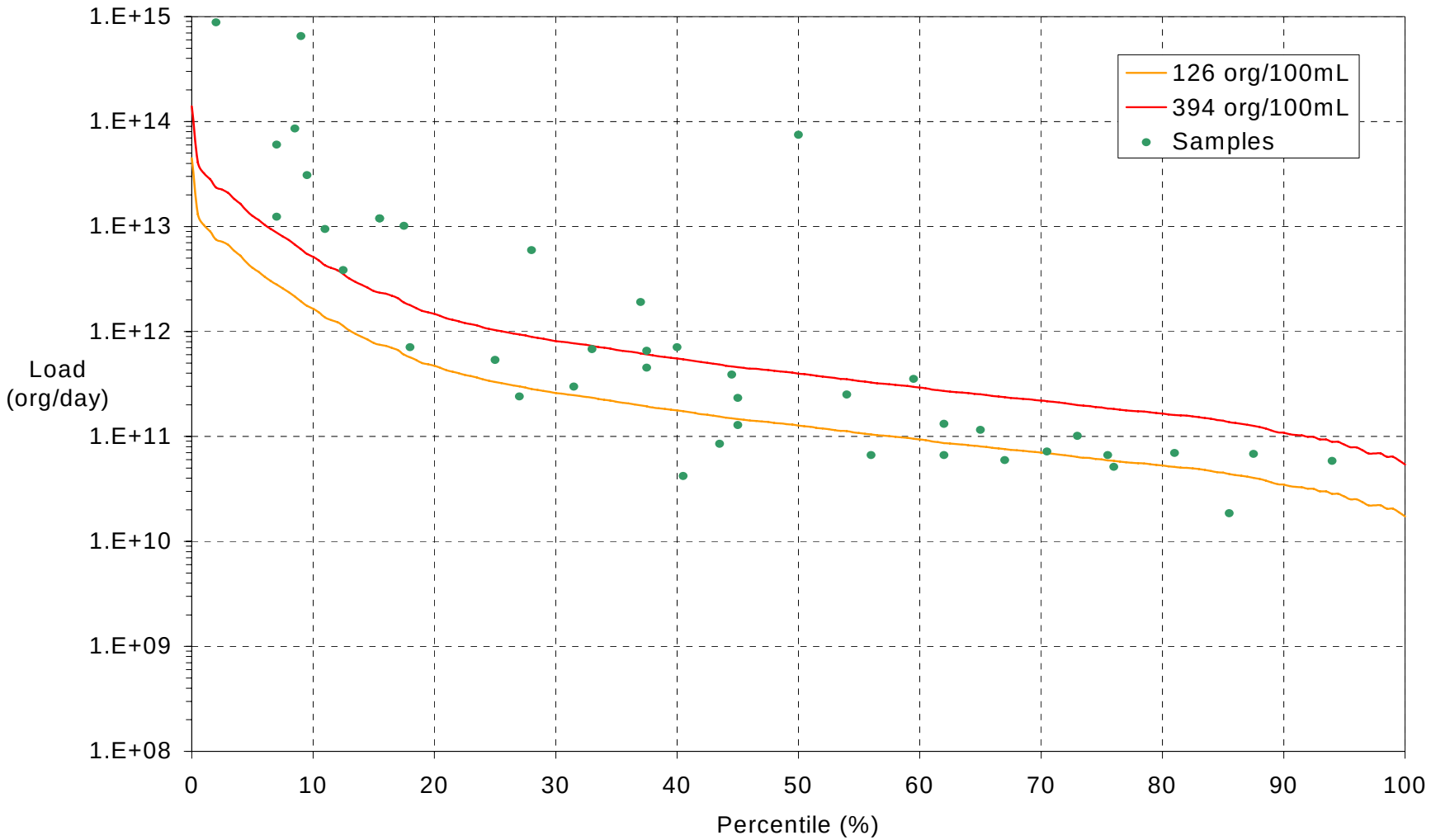


Hypothetical LDC

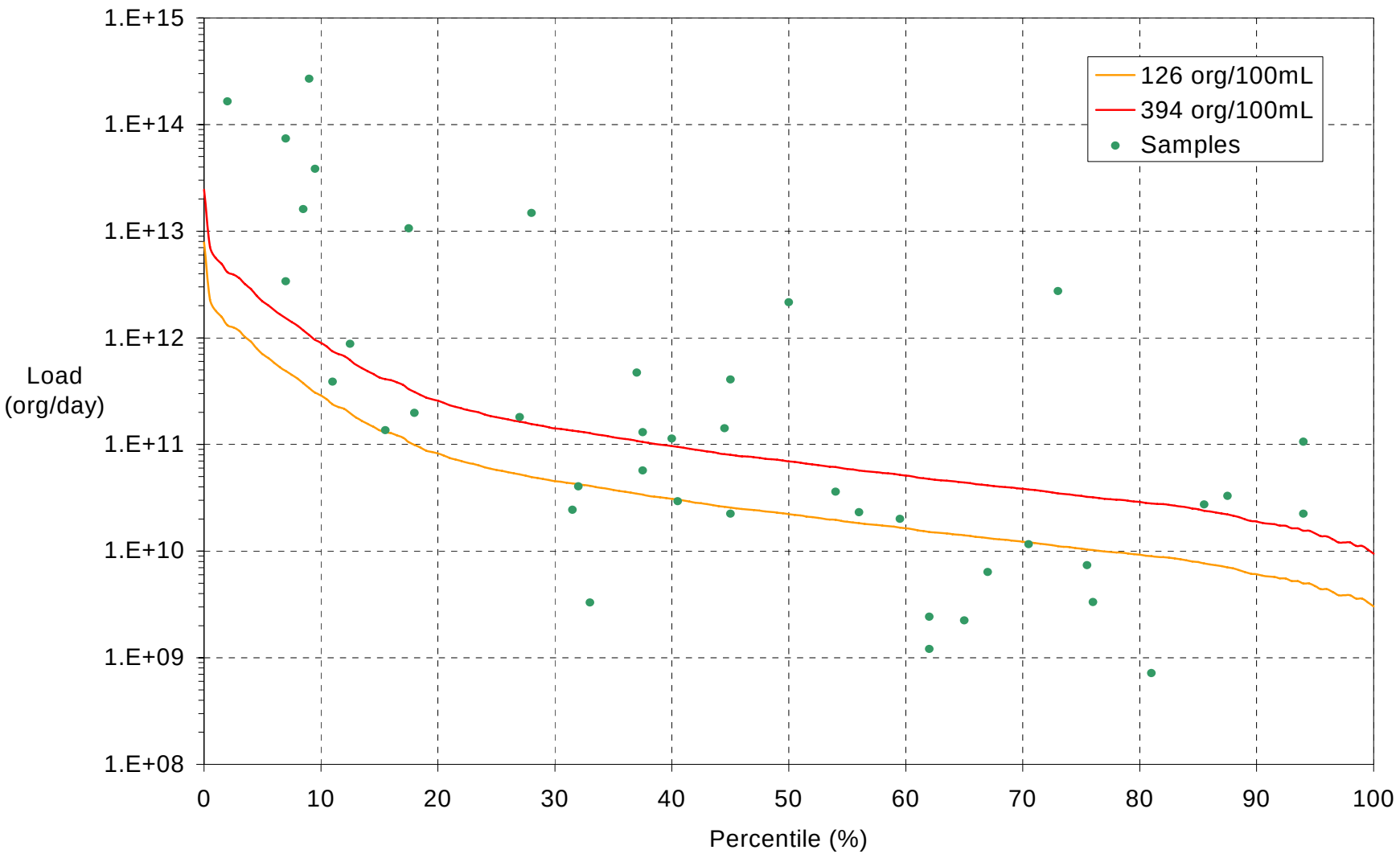
Step 4: Determine Load Exceedance
(for 21 January 2004 only)



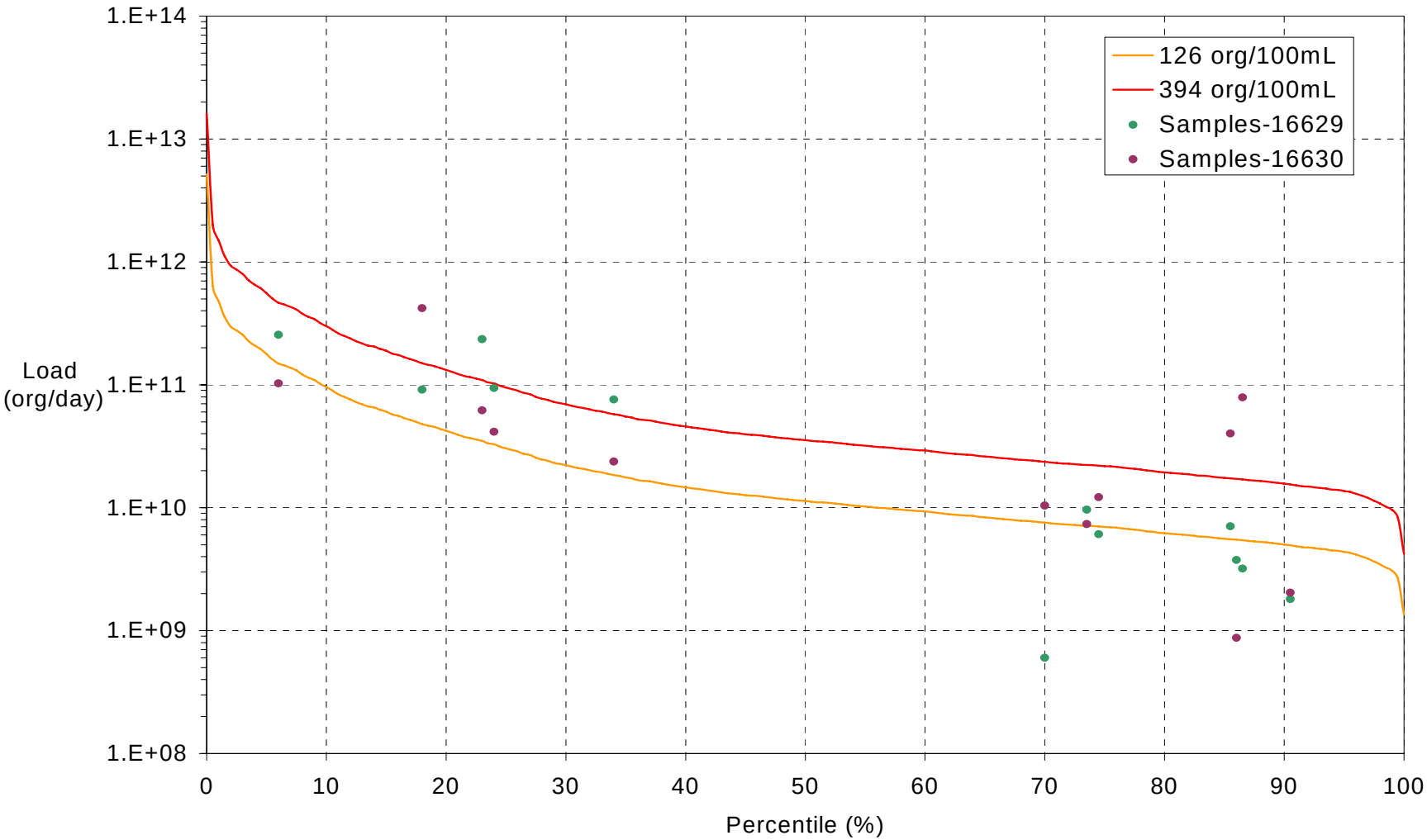
LDC for Spring Crk at Kuykendahl Rd (#17489)



LDC for Willow Creek at Rosling Rd (#11185)



LDC for Upper Panther Branch (#16629-30)



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

Spring Creek Wastewater Treatment Facility Summary

- 65 permitted facilities
- Total current flow 17 MGD (27 cfs)
- Total Permitted flow 43 MGD (67 cfs)
- WWTP flows account for 100% of the stream flow at the 99th percentile regime (low flow), 39% 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