Caney Creek Segment 1010
Peach Creek Segment 1011

Preliminary Data Review & Monitoring Plan

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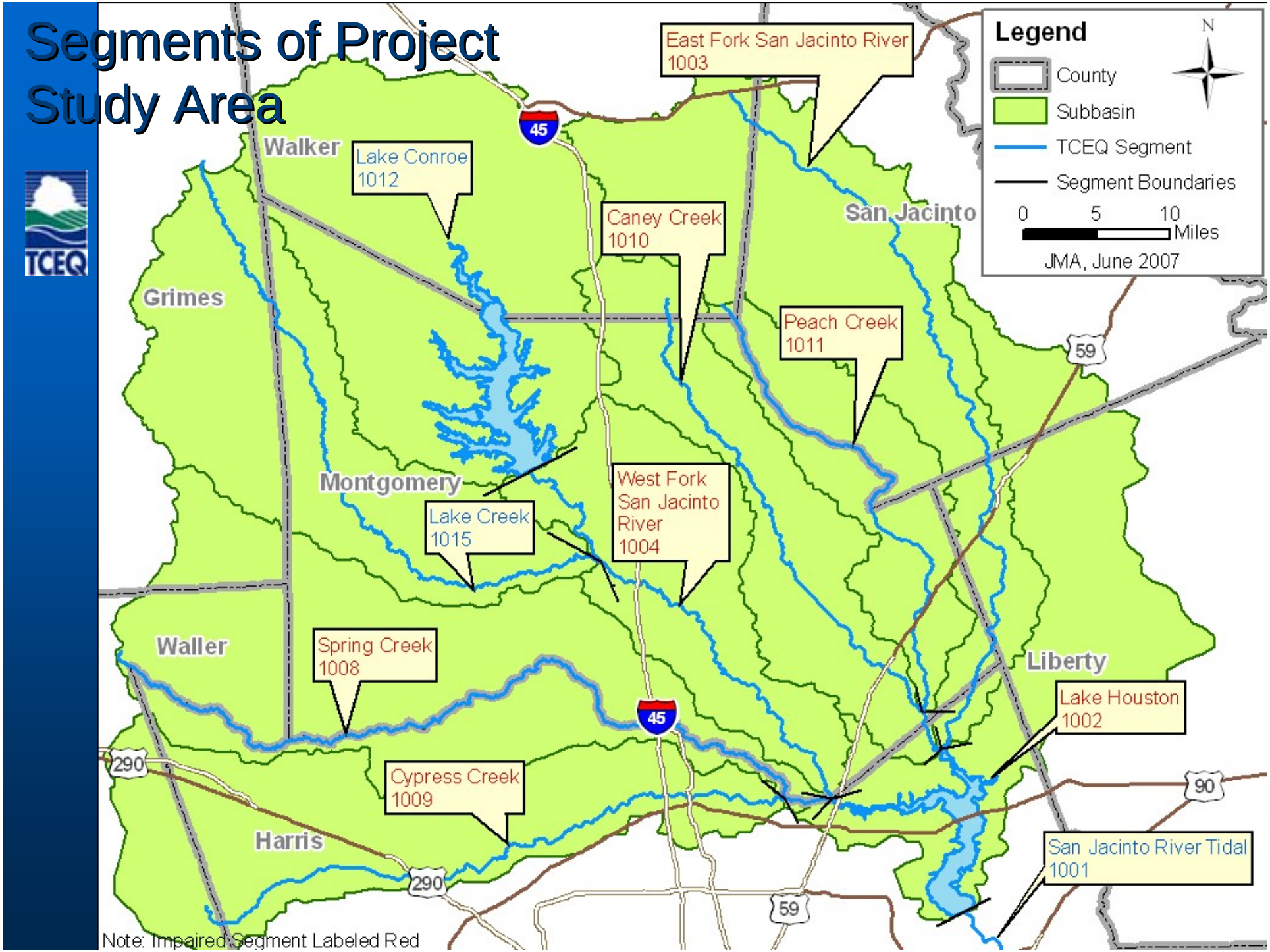
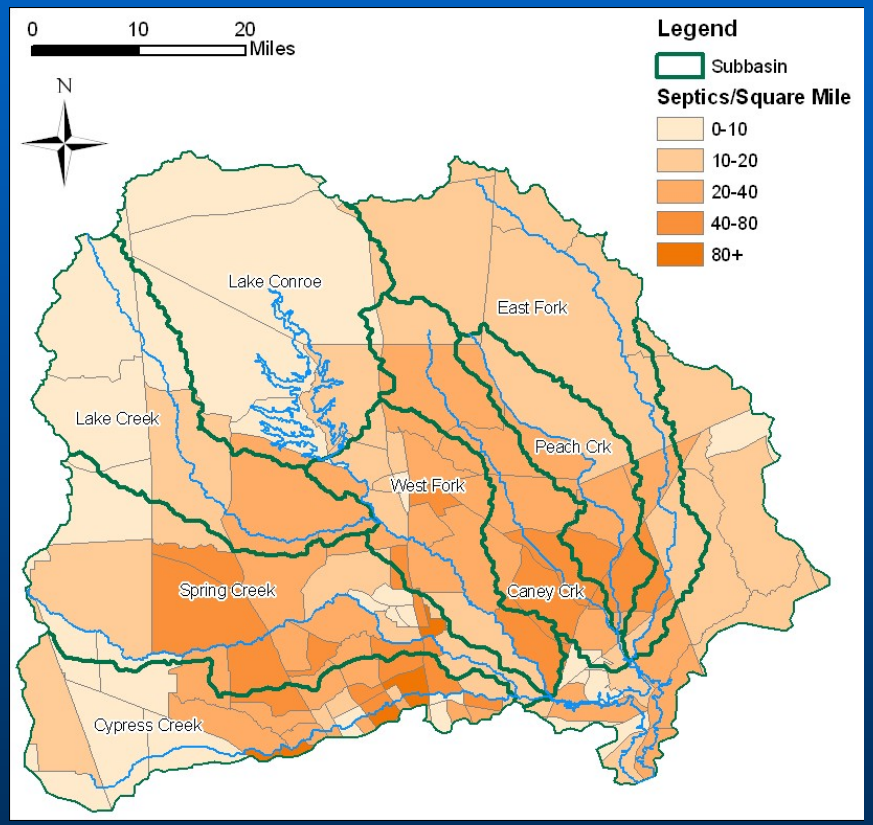
Introduction

- 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

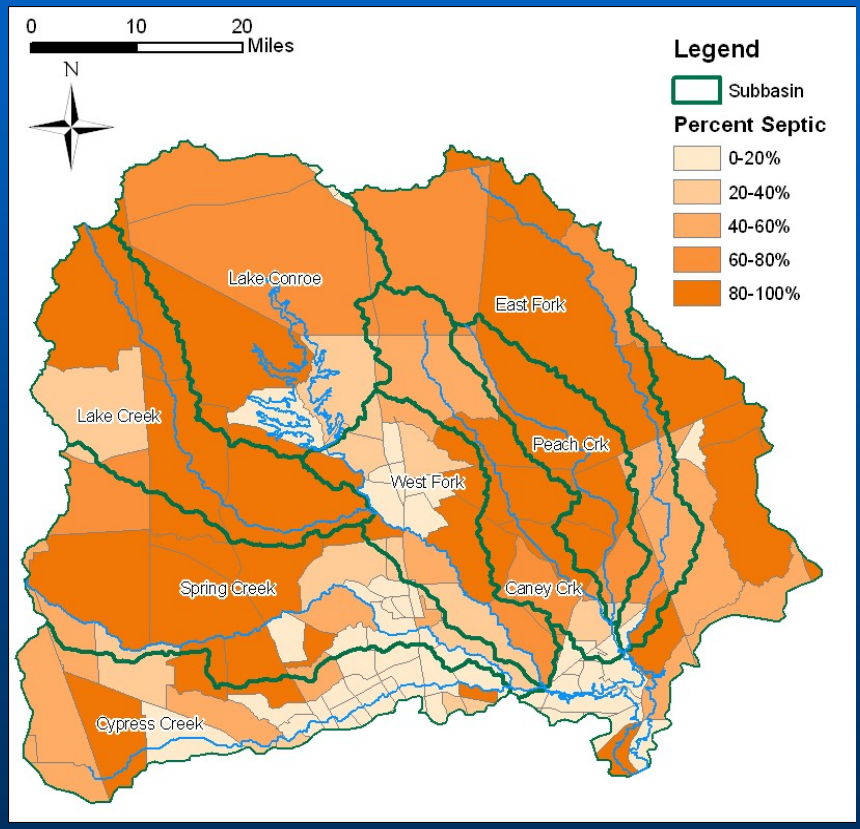
Segments of Project Study Area



Septic Systems



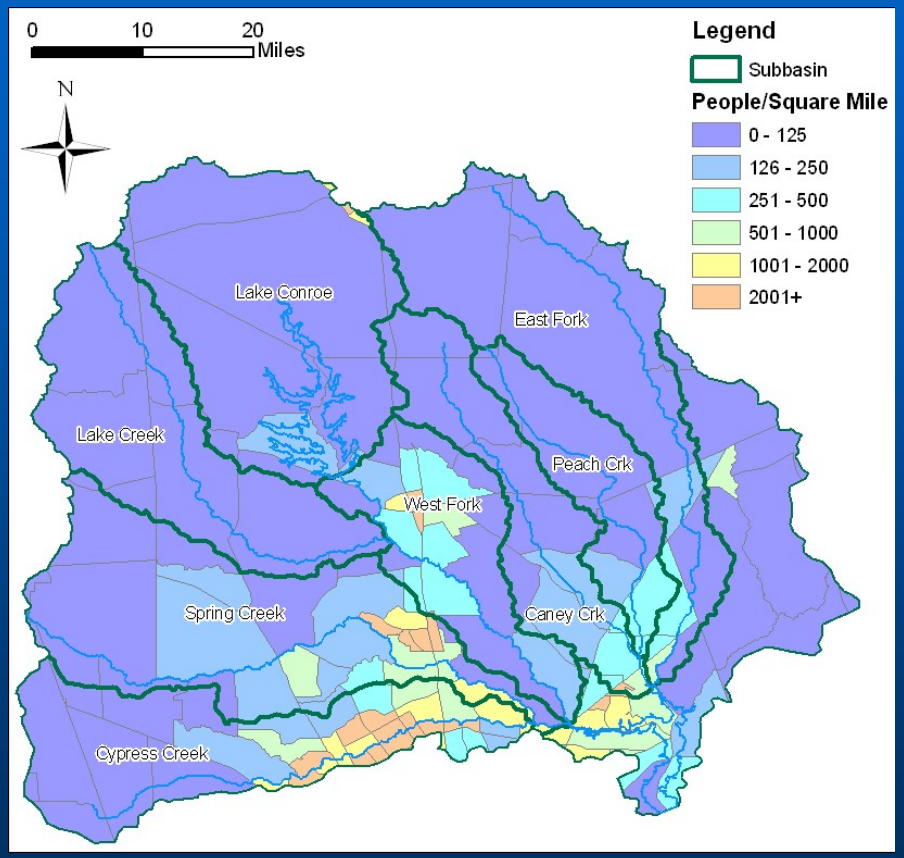
Septic System Density (1990)



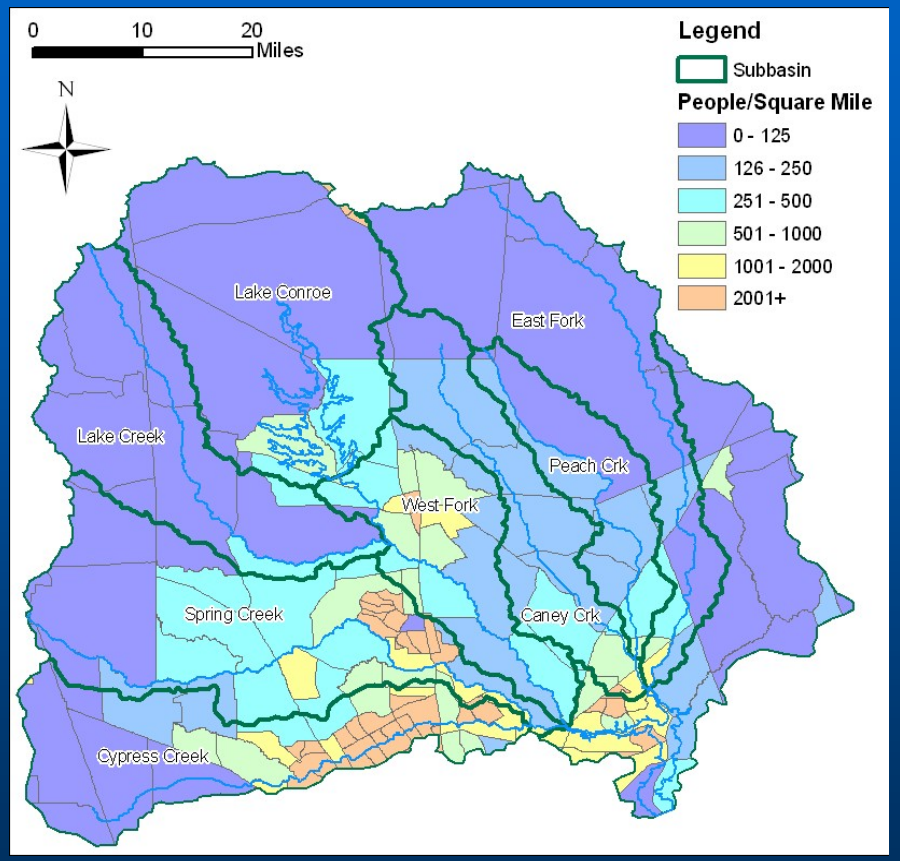
Percentage of Households Served by Septic Systems (1990)

US Census Bureau

Population Density



Project Area Population Density (1990)



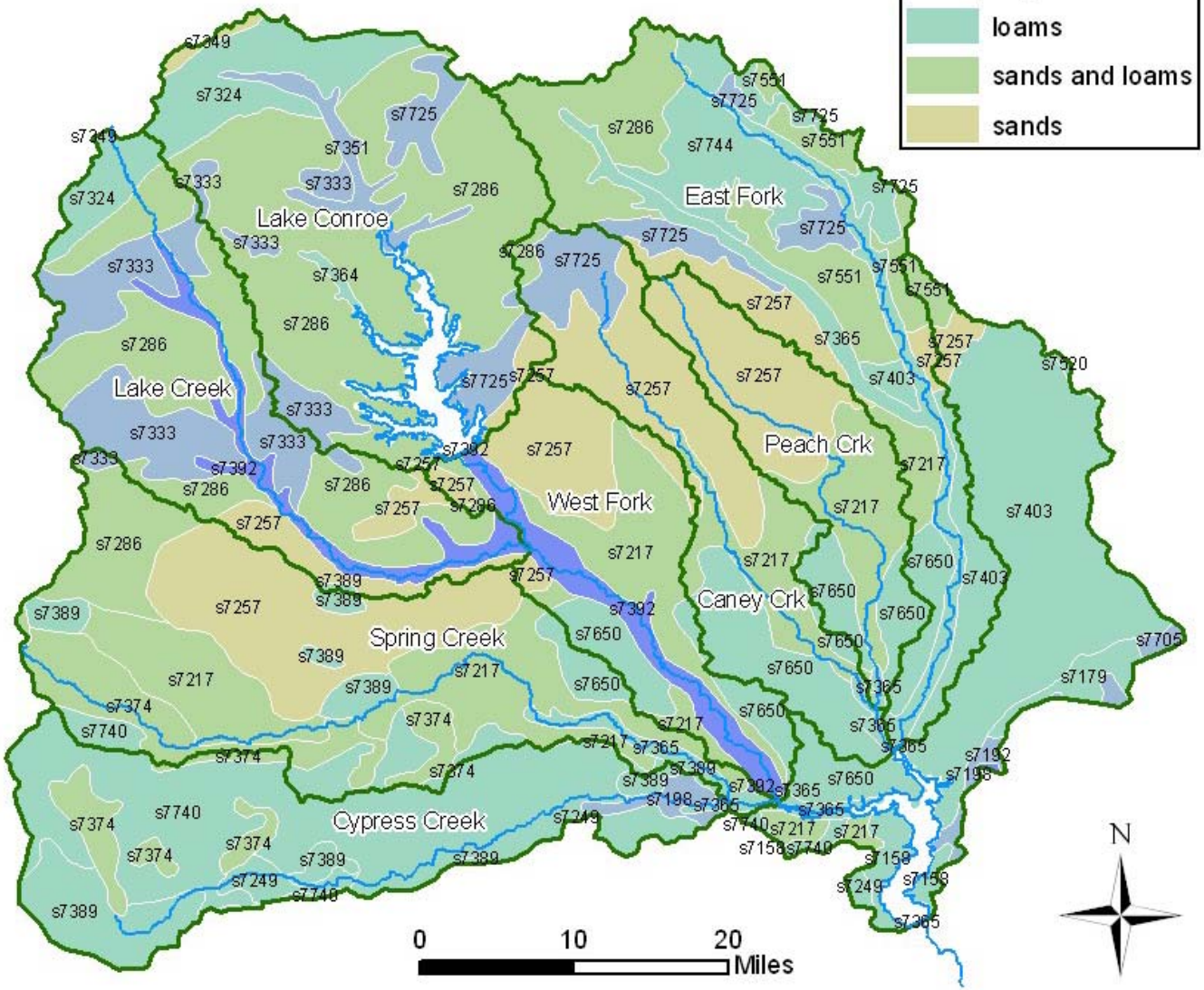
Project Area Population Density (2005)

US Census Bureau

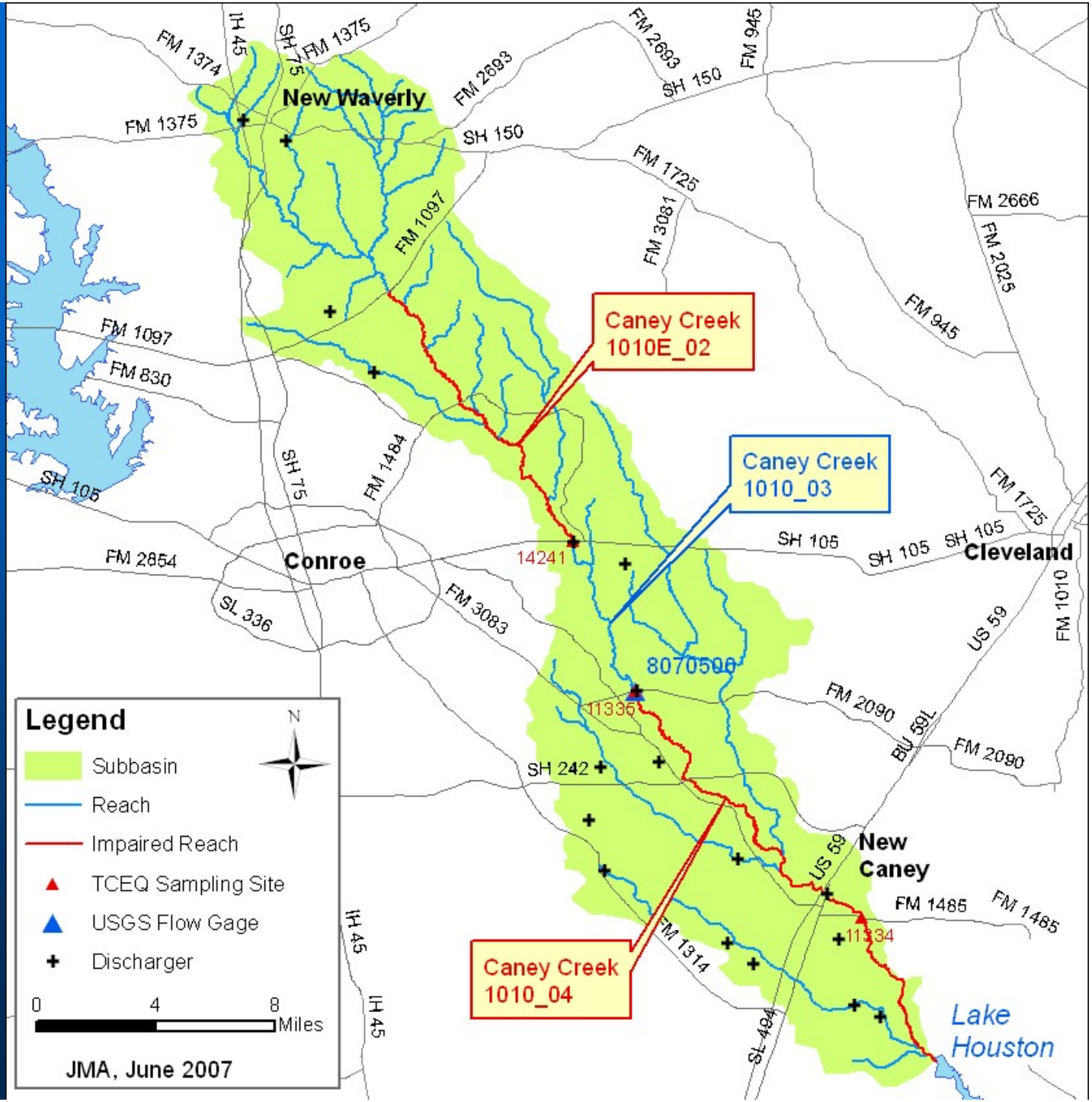
Key	Soil Association
s7158	Ozan-Atasco-Aldine
s7179	Brackett-Bolar-Aledo
s7192	Lake charles-Beaumont
s7198	Morey-Mocarey-Bernard
s7217	Splendora-Segno-Landman-Boy
s7249	Gessner-Clodine-Addicks
s7257	Conroe
s7286	Huntsburg-Fetzer-Depcor-Boy-Annona
s7324	Greenvine-Falba-Burlewash-Arol
s7333	Latium-Frelsburg-Crockett-Carbengle-Brenham-Bosque-Bleiblerville
s7349	Tonkavar-Shiro-Gomery-Elmina
s7351	Nahatche-Kaufman-Gowker
s7364	Nahatche-Hatliff
s7365	Pluck-Kian-Hatliff
s7374	Wockley-Segno-Monaville-Hockley
s7389	Katy-Clodine-Aris
s7392	Tinn-Kaufman-Gladewater

Key	Soil Association
s7398	Sealy-Kenney-Chazos
s7403	Waller-Sorter-Kirbyville
s7520	Waller-Otanya-Kirbyville-Dallardsville
s7551	Pinetucky-Doucette
s7650	Waller-Sorter
s7705	Woodville-Vamont
s7725	Woodville-Wiergate-Burkeville
s7740	Wockley-Hockley-Gessner
s7744	Woodville-Pinetucky

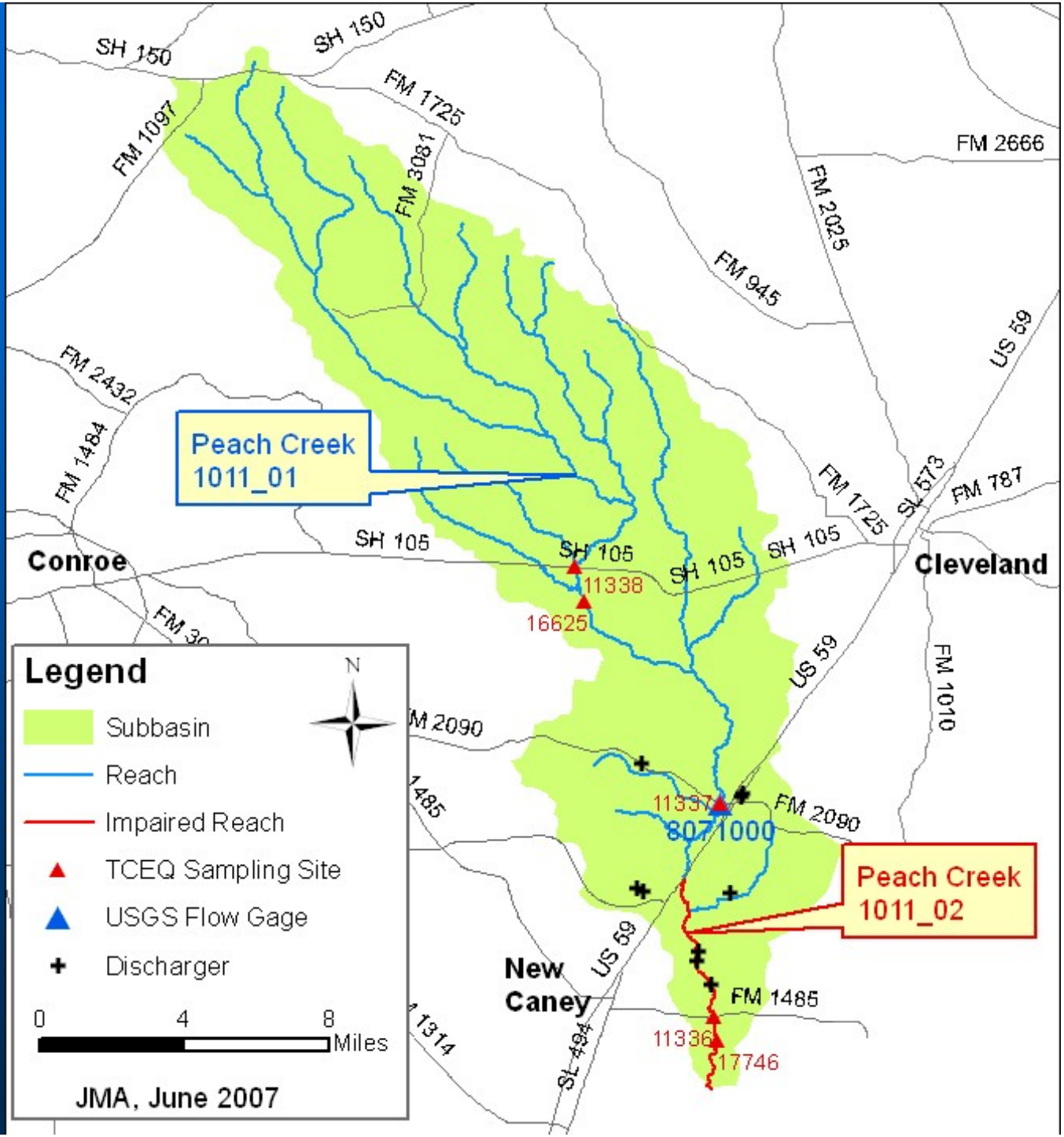
Soil Associations



Caney Creek Study Area



Peach Creek Study Area



Caney Creek Assessment Units and Results

Assessment Unit	Segment Name	Assessment Unit Description	# Samples	# Exceed	Geo. Mean	Impaired
1010_02	Caney Creek	FM 1097 to SH 105	42	10	274	Yes
1010_03	Caney Creek	SH 105 to FM 2090	4	0	83	No
1010_04	Caney Creek	FM 2090 to lower segment boundary	81	20	186	Yes

Peach Creek Assessment Units and Results

Assessment Unit	Segment Name	Assessment Unit Description	# Samples	# Exceed	Geo. Mean	Impaired
1011_01	Peach Creek	Upper segment boundary to US Hwy 59	47	9	105	No
1011_02	Peach Creek	US Hwy 59 to confluence with Caney Creek	81	20	235	Yes

Caney Creek Sampling Sites

TCEQ #	TCEQ Description	USGS #
14241	CANEY CREEK AT SH 105	08070495
11335	CANEY CREEK IMMEDIATELY UPSTREAM OF FM 2090 WEST OF SPLENDORA	08070500
11334	CANEY CREEK IMMEDIATELY DOWNSTREAM OF FM 1485	08070600

Peach Creek Sampling Sites

TCEQ #	TCEQ Description	USGS #
11338	PEACH CREEK AT SH 105 WEST OF CLEVELAND	08070900
16625	PEACH CREEK IMMEDIATELY UPSTREAM OF OLD HWY 105	
11337	PEACH CREEK BRIDGE AT FM 2090 IN SPLENDORA	08071000
11336	PEACH CREEK AT FM 1485	08071100
17746	PEACH CREEK AT LAKE HOUSTON STATE PARK FOOTBRIDGE 1.09 KM DOWNSTREAM OF FM 1485	

Caney Creek *E. coli* Data Summary

Station	14241	11335	11334
Location	SH 105	FM 2090	FM 1485
Reach	Caney	Caney	Caney
Begin Date	Jun-00	Dec-02	Jun-00
End Date	Apr-05	Jun-04	May-06
Count	45	9	101
75th Percentile	**338**	170	**360**
Geometric mean	**264**	119	**196**
25th Percentile	104	80	63

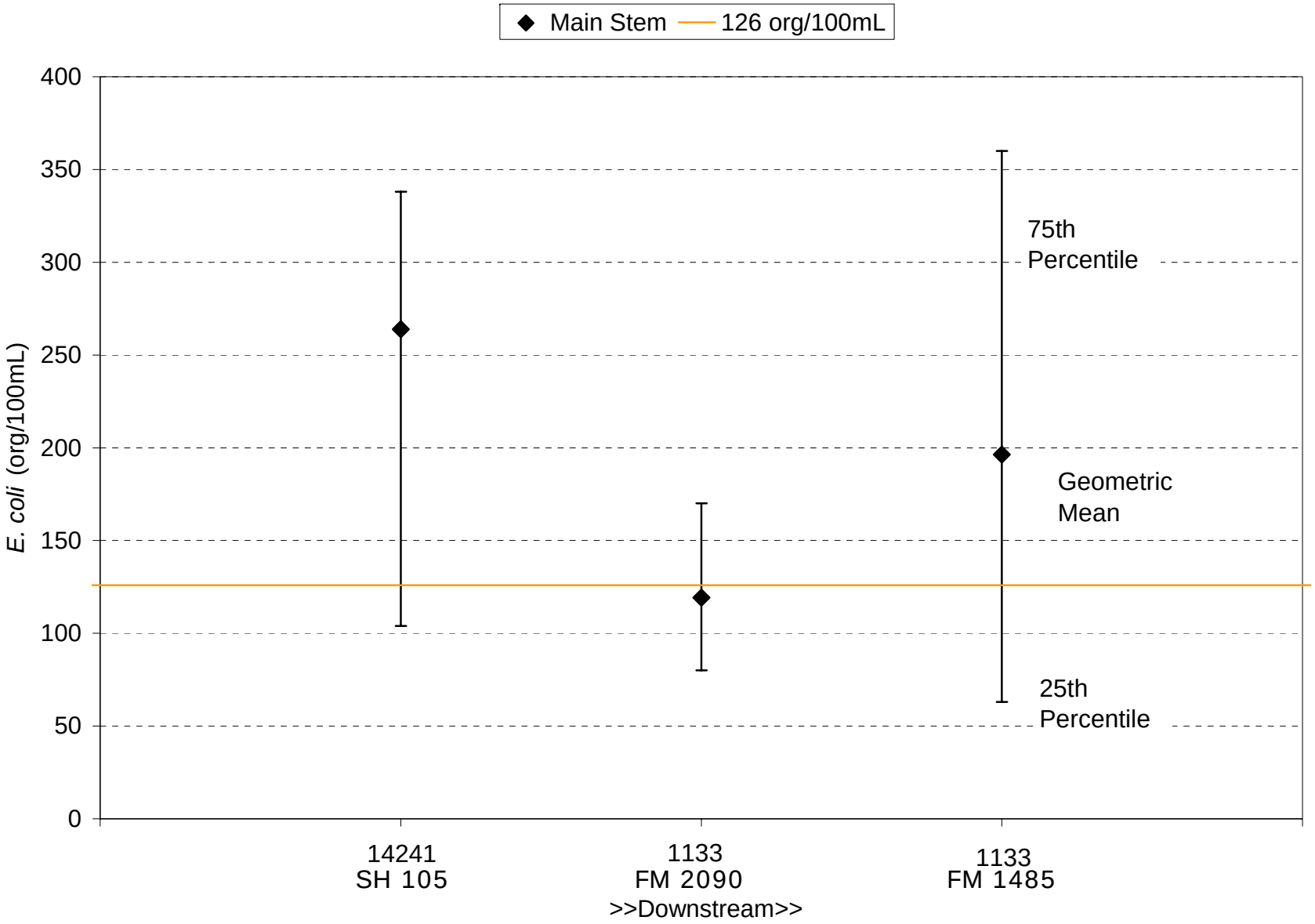
Peach Creek *E. coli* Data Summary

Station	11338	16625	11337	11336	17746
Location	SH 105	Old Hwy 105	FM 2090	FM 1485	FM 1485
Reach	Peach	Peach	Peach	Peach	Peach
Begin Date	Dec-02	Jun-00	Dec-02	Jun-00	Oct-03
End Date	Jun-04	Apr-05	Jun-04	May-05	Jul-06
Count	9	41	9	93	10
75th Percentile	140	180	150	**320**	**354**
Geometric mean	86	118	**141**	**236**	**189**
25th Percentile	55	40	88	100	83

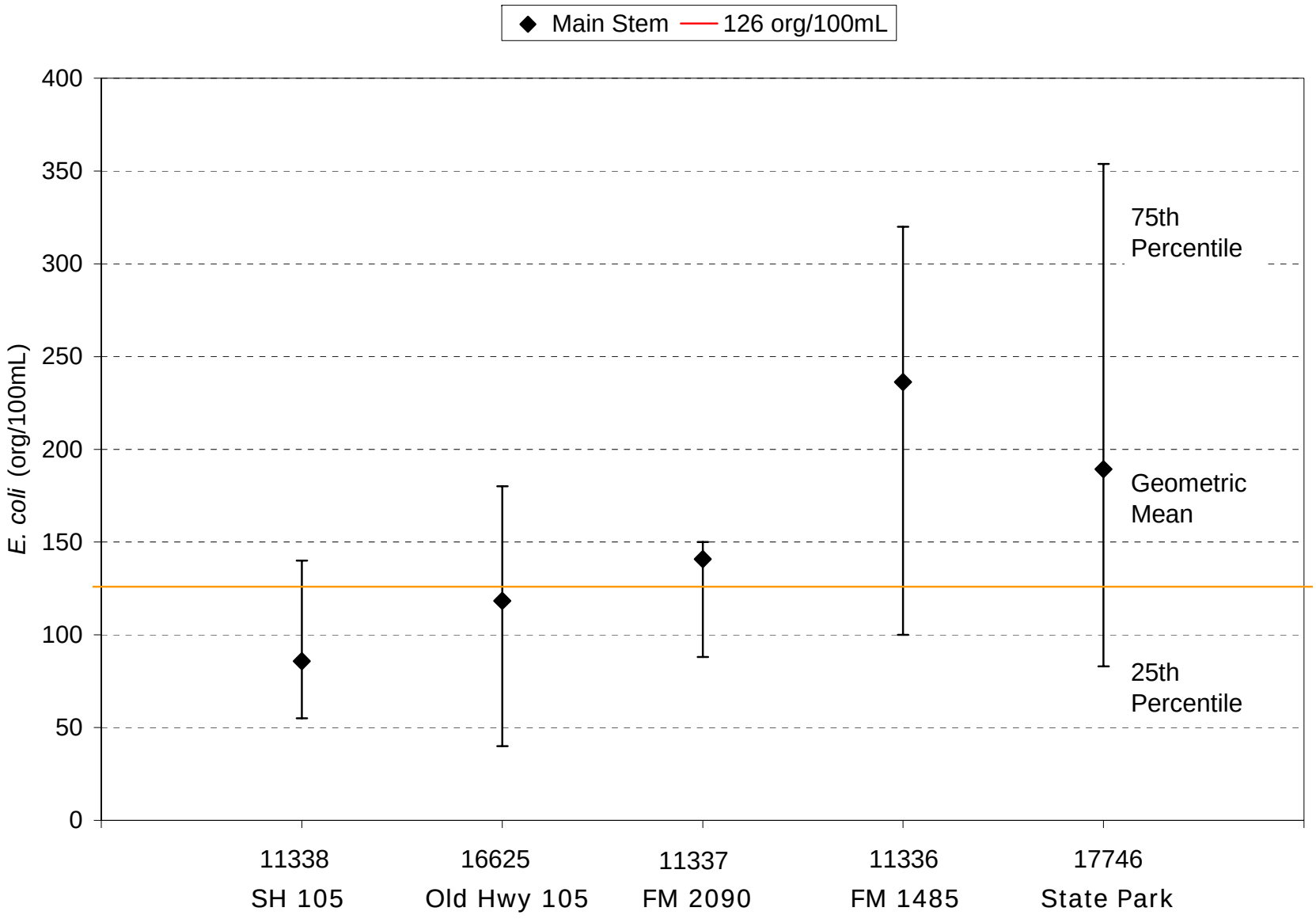
Spatial and Temporal Analysis

- Spatial analysis can be helpful when attempting to locate sources of bacteria
- Temporal analysis can be useful for determining changes in sources over time

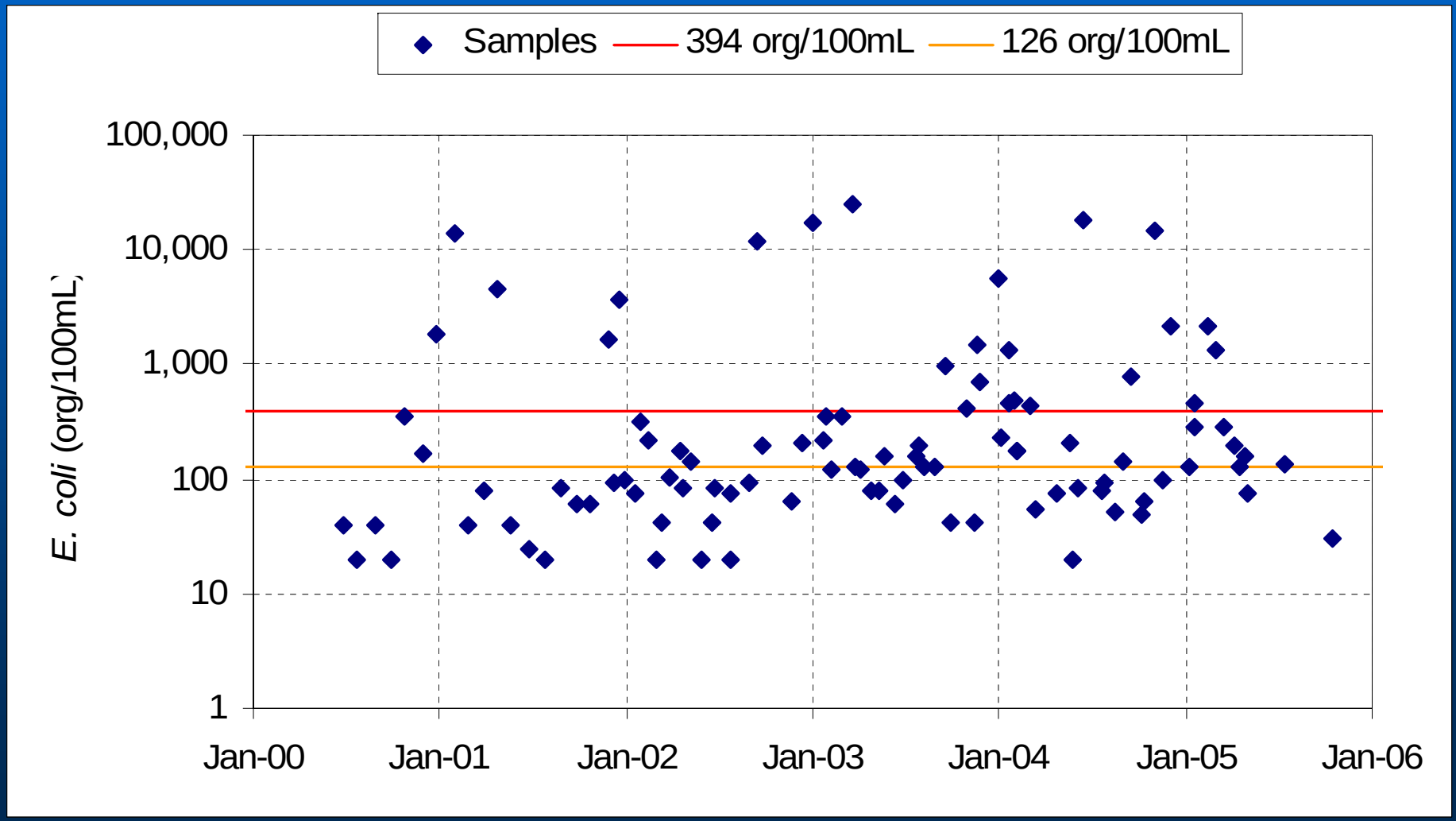
Caney Creek Spatial Analysis



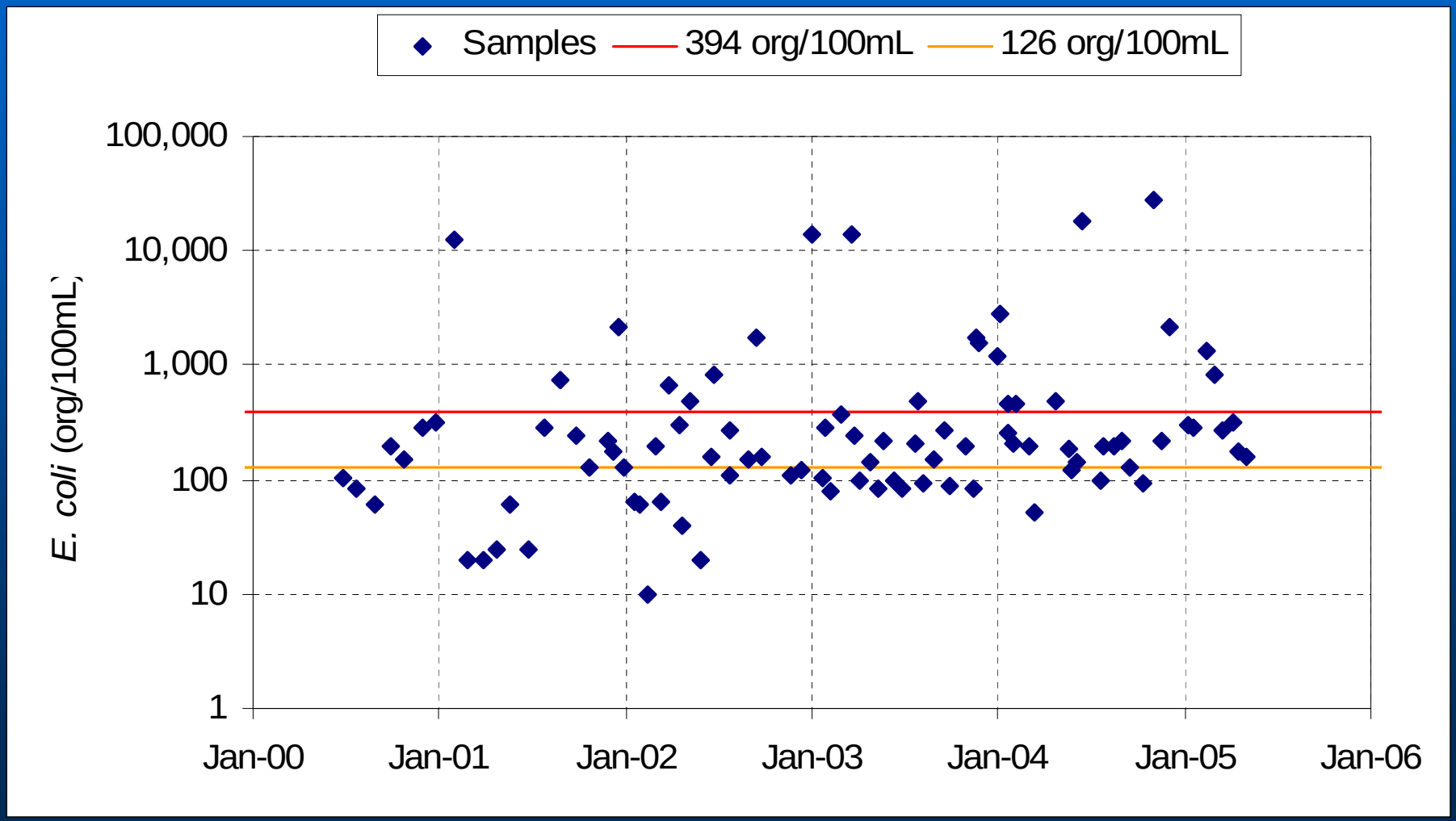
Peach Creek Spatial Analysis



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



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



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 collected at USGS gaging stations
- Since most sampling sites do not have a corresponding USGS gage, flow records were synthesized using nearby gages and drainage area adjustment factors

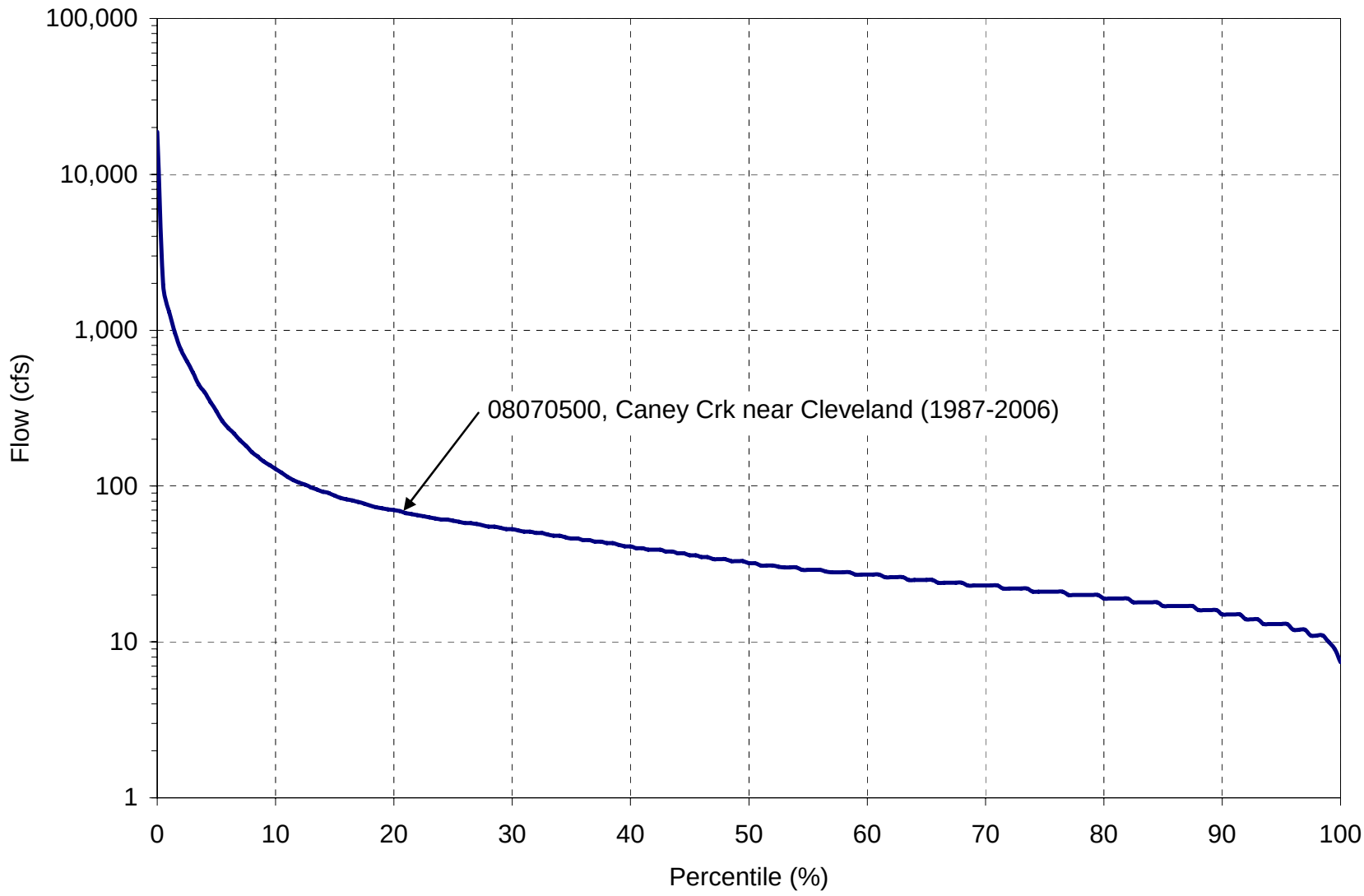
Caney Creek USGS Flow Gages

Station	Stream	Location	Available FDC data
08070500	Caney Creek	near Cleveland, TX	1987-2006

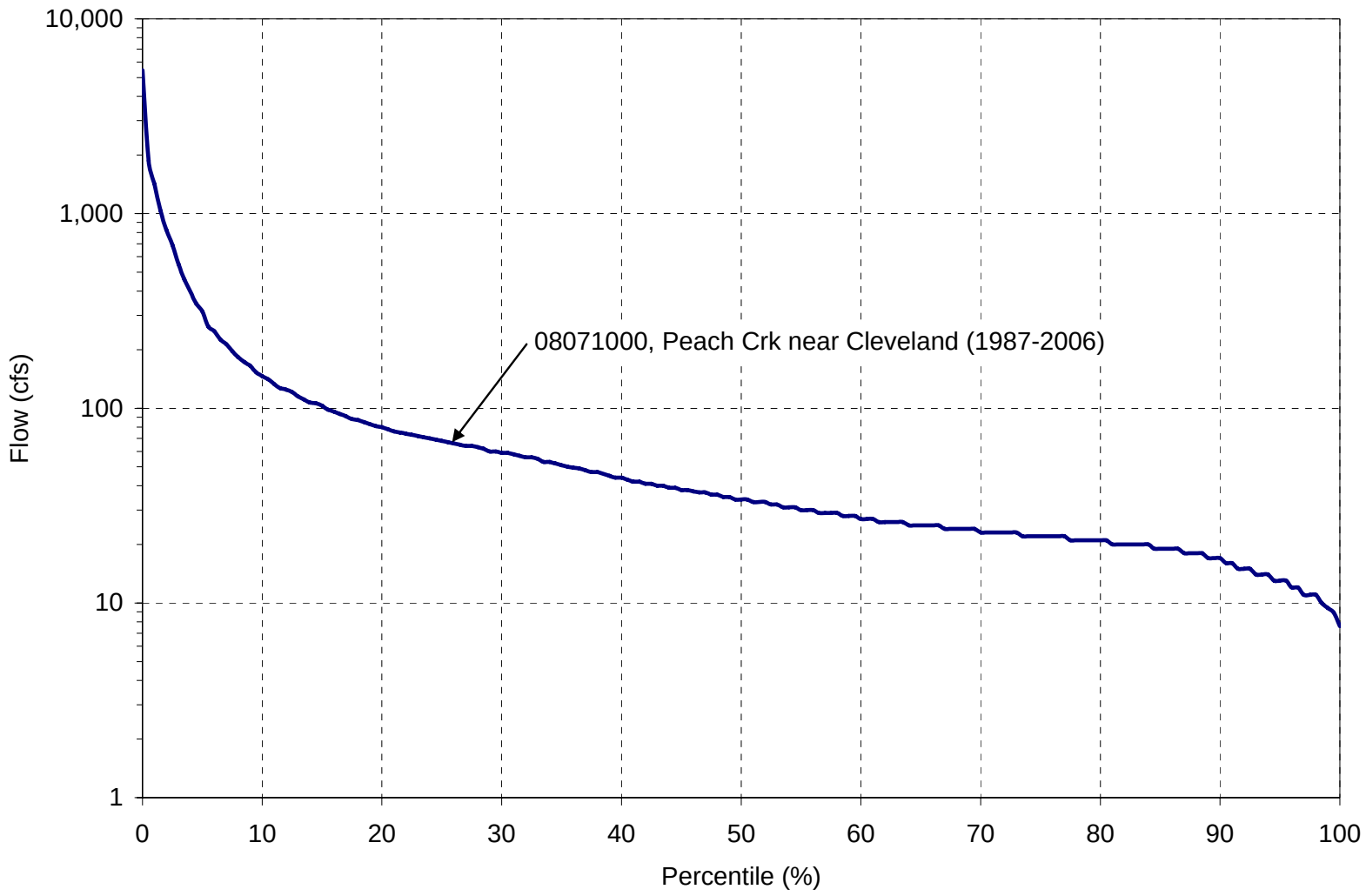
Peach Creek USGS Flow Gages

Station	Stream	Location	Available FDC data
08071000	Peach Creek	near Cleveland, TX	1999-2006

Caney Creek Flow Duration Curve



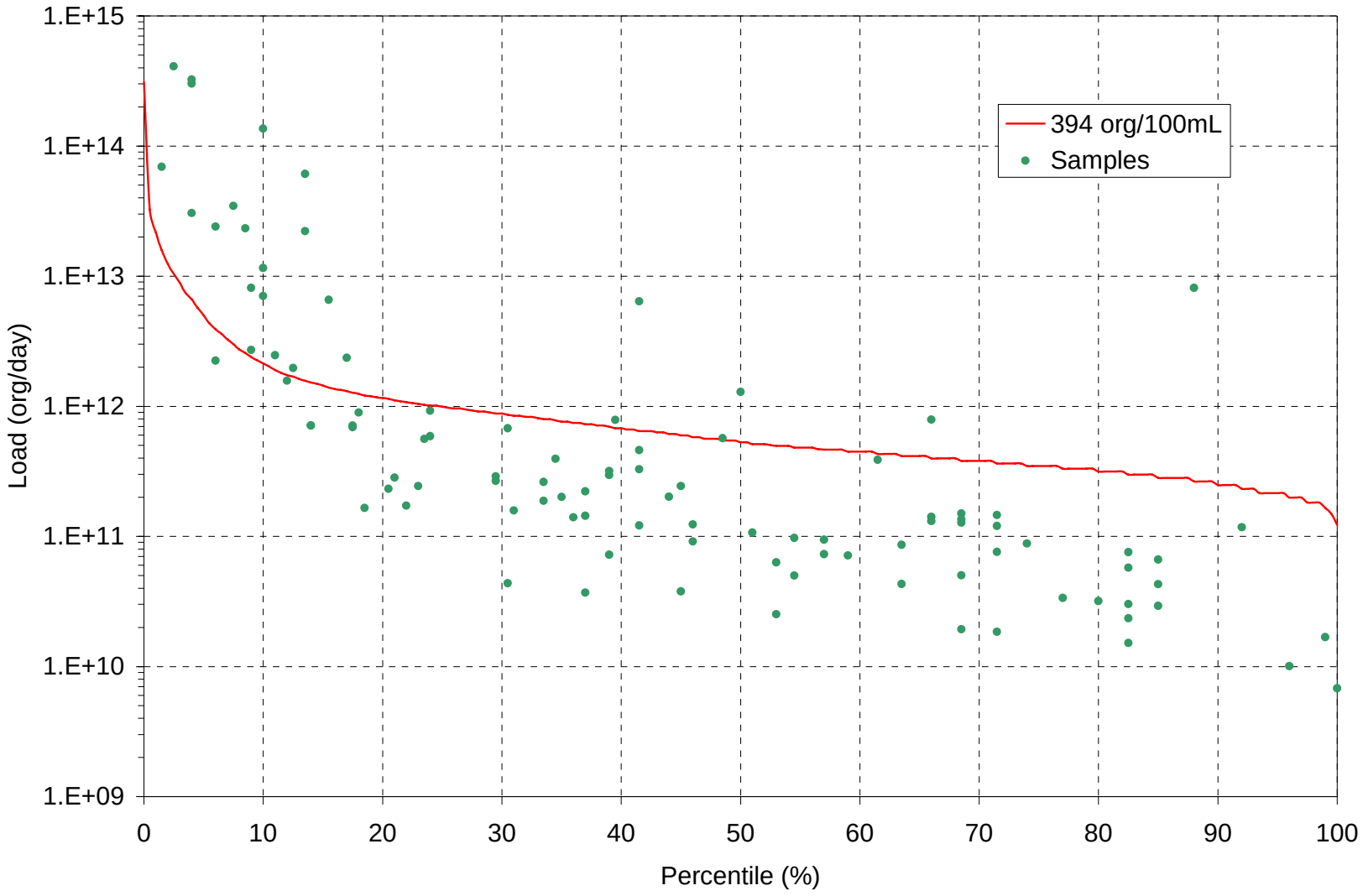
Peach Creek Flow Duration Curve



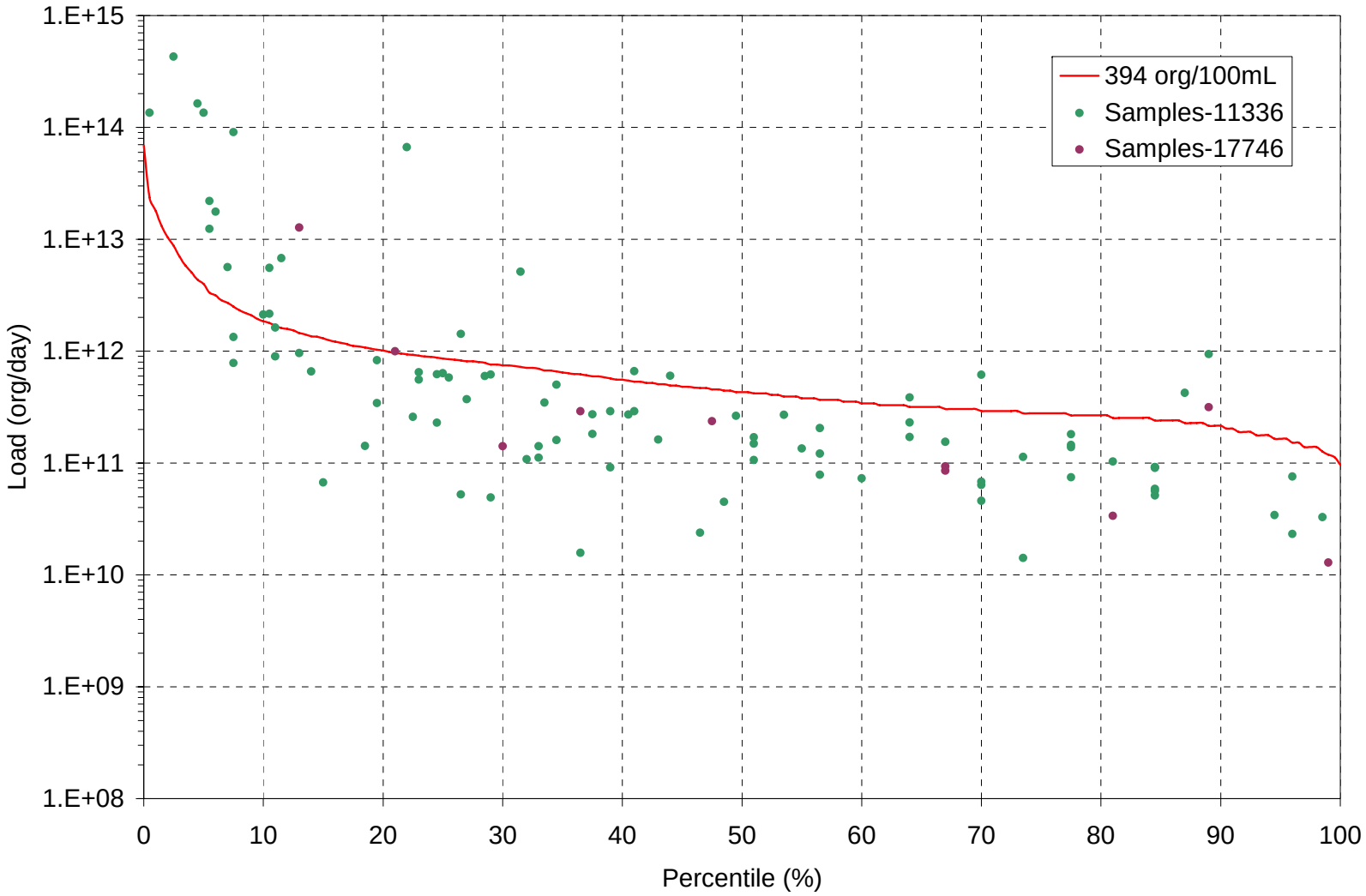
Load Duration Curves

- 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

LDC for Caney Creek at FM 1485 (#11334)



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



Potential Sources

- Two primary source categories:
  - Wasteloads (WL) - 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 (L) - remaining diffuse sources of pollutants that are not covered by permit
    - runoff from rural or urban areas outside of permitting jurisdictions

Runoff Sources

- Natural areas typically produce the smallest runoff source loads because they tend to produce the least runoff volume and tend to have the lowest density of fecal sources
- Rural areas may also have smaller source loads due to lower runoff volumes and less impervious cover
- Urban areas may produce larger bacteria loads because of high impervious cover, which can increase the frequency and intensity of runoff events
- Monitoring plan will seek to characterize sources

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

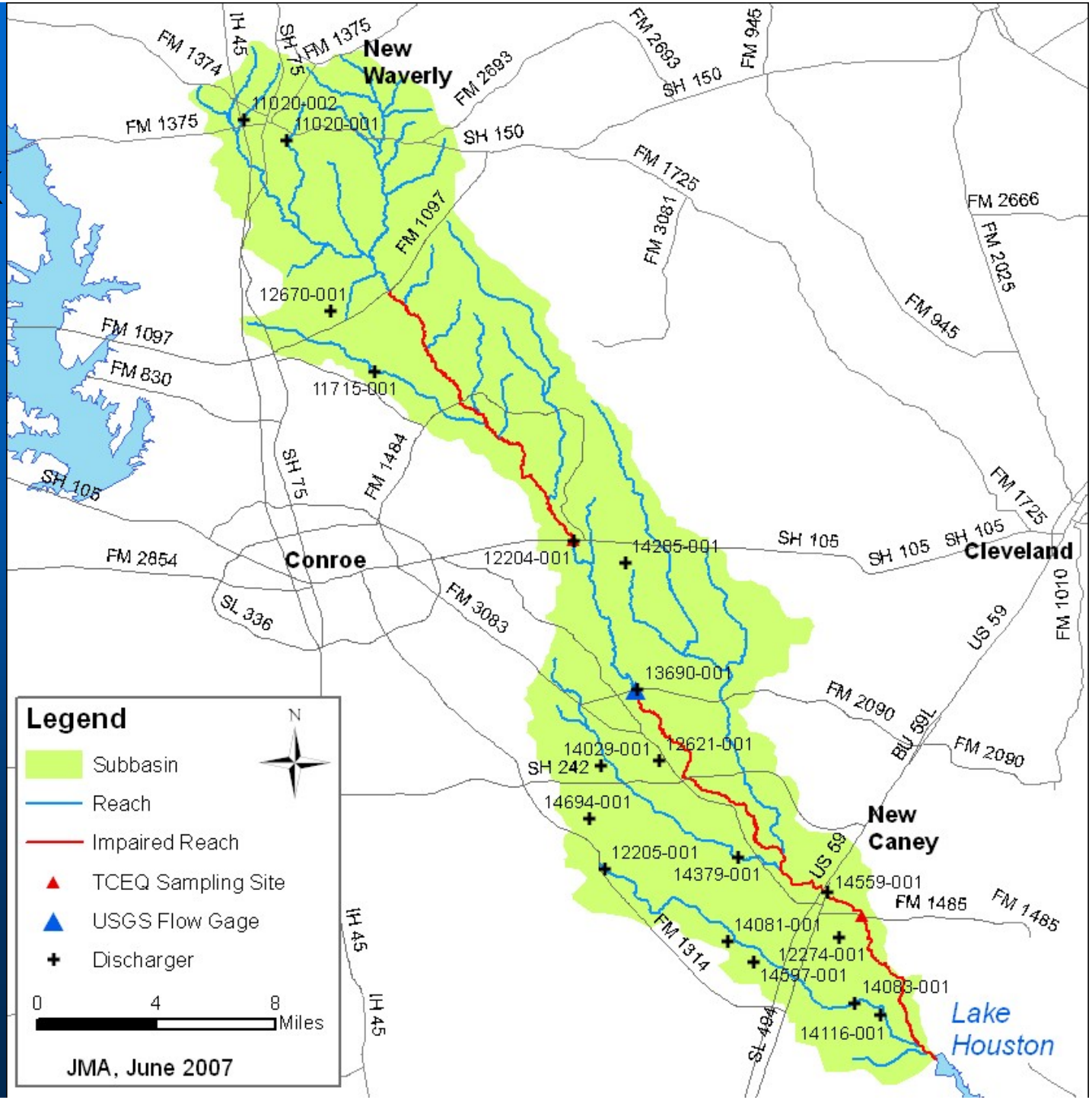
Caney Creek Wastewater Treatment Facility Summary

- 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)

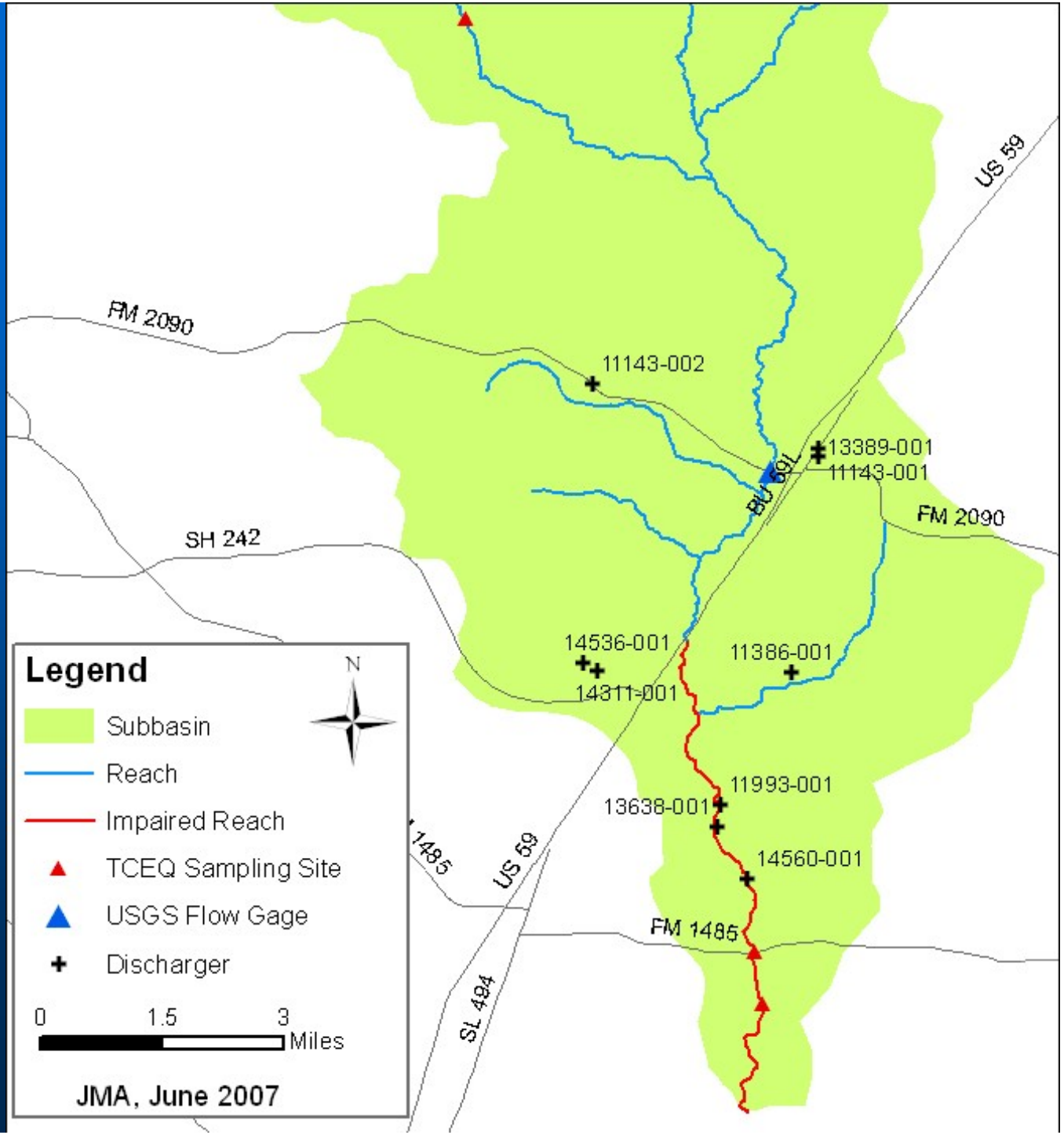
Peach Creek Wastewater Treatment Facility Summary

- 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 Treatment Facility Discharge Locations



Peach Creek Treatment Facility Discharge Locations



Monitoring Plan

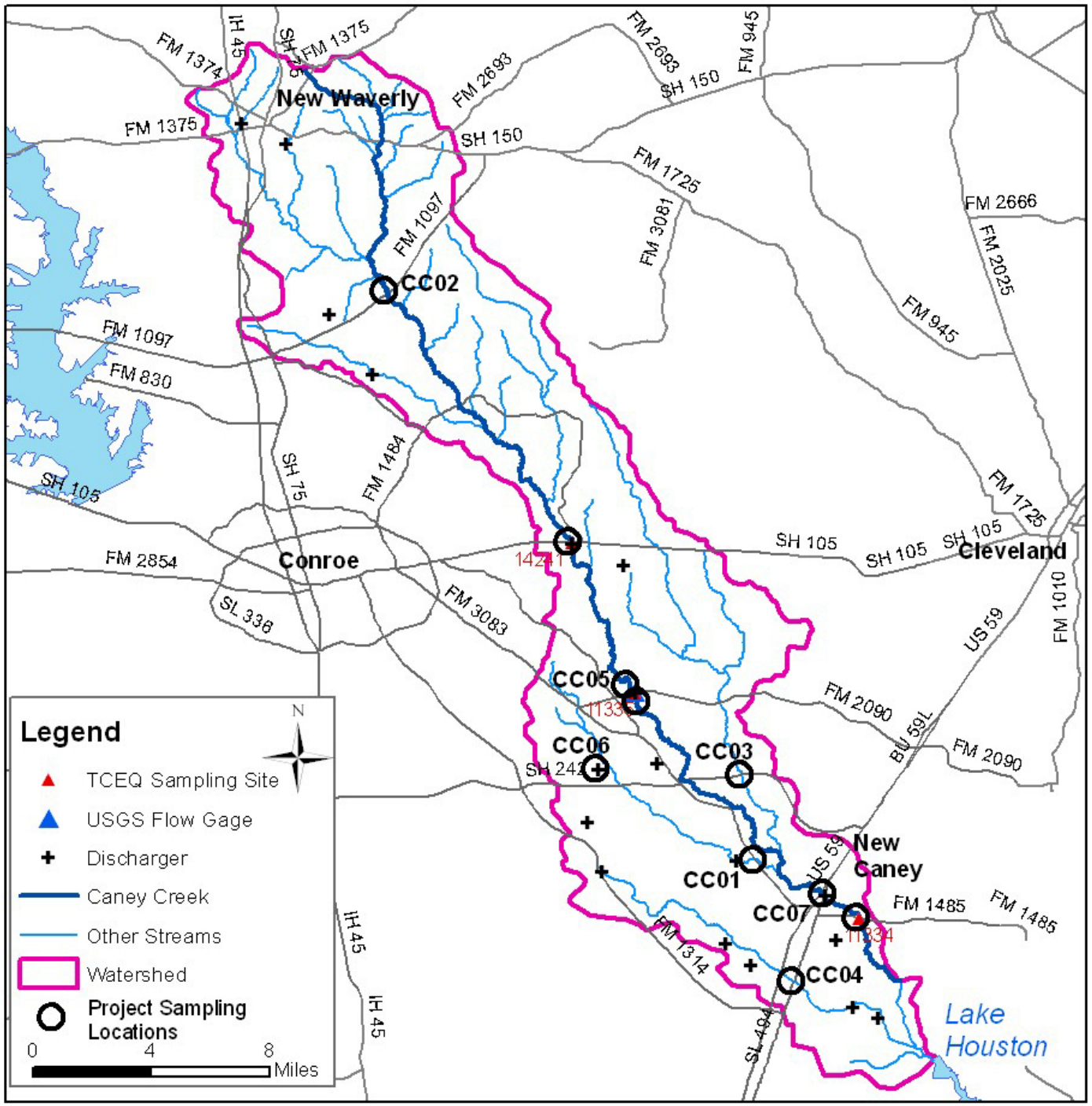
Monitoring Objectives

- Provide:
  - better definition of the water quality conditions on the study segments with respect to bacterial indicators,
  - definition of source areas or loading points that contribute to conditions in the segment,
  - data sufficient for estimation of loadings and support of allocation activities.

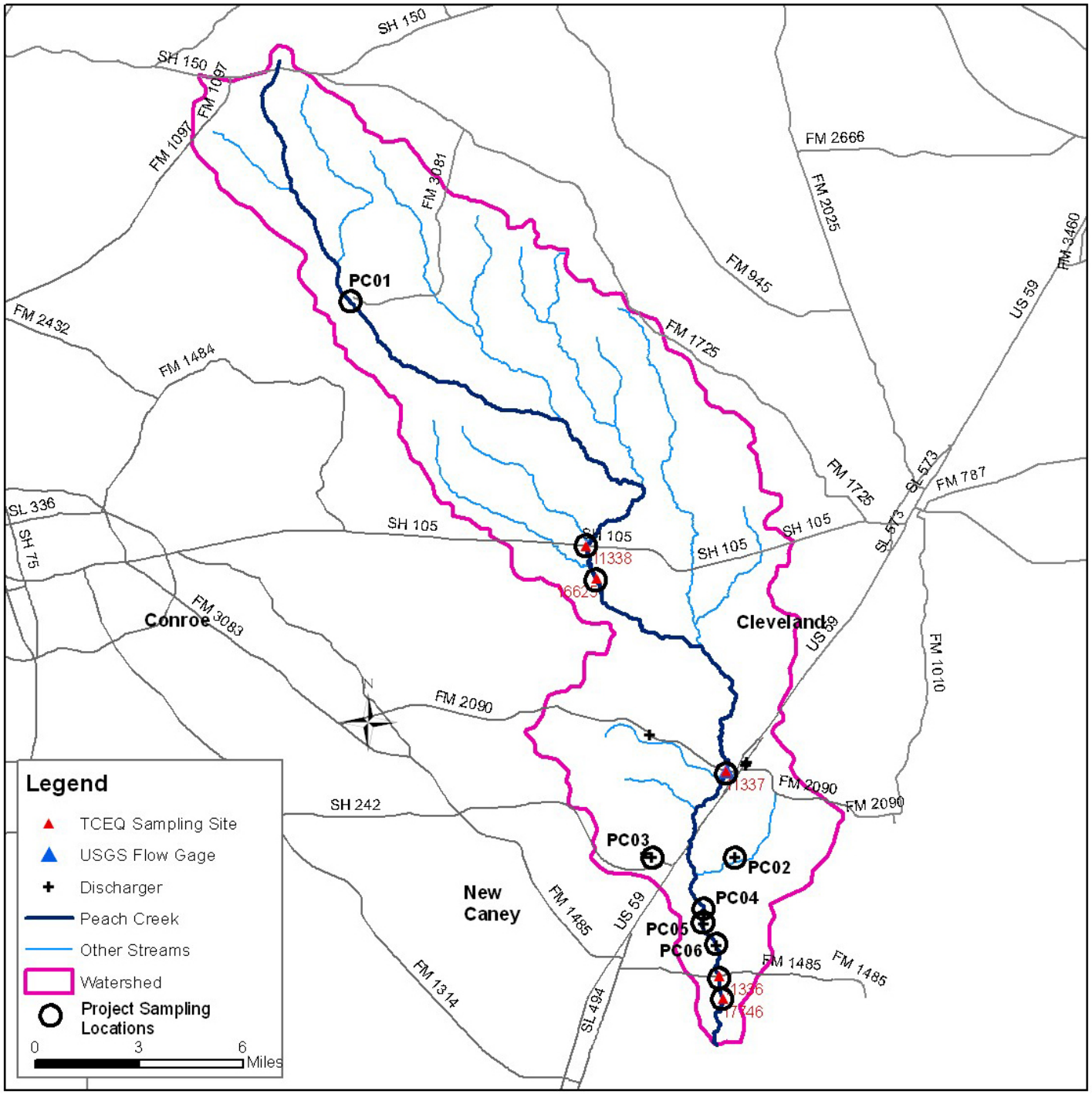
Synoptic Sampling Surveys

- Samples to be collected under baseflow conditions
- Ascertain source areas, longitudinal trends, extent of impairment
- Routine monitoring stations and additional sites
- Two synoptic sampling surveys on each study segment
- General schedule for these events November 2007 to July 2008
- Sampling commences after Quality Assurance Project Plan (QAPP) is approved by TCEQ

Sampling Stations for Caney Creek, 1010



Sampling Stations for Peach Creek, 1011



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
- Selected segments: urban, rural
- Numerous sampling points, eg, 1000-ft intervals
- Sample pipes, outfalls, tributaries
- Test for bacteria, optical brighteners
- Extrapolate to similar areas in study area

Sediment 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 sediment as potential bacteria source
- Baseflow conditions
- Sediment sampling at varying distance from stream bed

Resuspension Study

- Willow Creek Segment, 1008H; and Spring Gully, Segment 1009D
- Evaluate resuspension of bed sediments as bacteria source
- Baseflow Conditions
- Track bacteria in water column over 1-2 days

Kinetics Study

- One location at each of the following: Willow Creek Segment, 1008H; and Spring Gully, Segment 1009D
- Evaluate regrowth of bacteria from point sources
- Baseflow Conditions
- In situ bacteria kinetic rates

Wet Weather Point Source Sampling Study

- Willow Creek Segment, 1008H
- Estimate WWTP loads under wet weather conditions
- Sample 10-30 WWTPs at outfall pipes
- Sample receiving stream at downstream monitoring station
- Estimate total event loading of bacteria from point sources
- Estimate proportion of total stream loading derived from point sources

Microbial Source Tracking

- Spring Gully, Segment 1009D
- Conduct sampling and testing for qPCR
- Test for human presence/absence
- Test raw wastewater samples
- Rapid turn-around of results may guide additional testing
- One baseline survey
- Repeat if warranted

TCEQ Website for Project Information

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