

*Assessment of Water Quality Levels  
from Natural Areas  
(Natural Loadings Project)*

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# What is the Purpose of this Project?

- More than 100 waterbodies in S. Ca. designated as impaired and subject TMDL development
- We currently have no basis for differentiating water quality problems from natural variability
  - ✓ Need a basis for determining appropriate levels of constituents
  - ✓ When do “elevated levels” indicate a “problem”?
  - ✓ How clean does the surface water have to be?
  - ✓ How much of \_\_\_\_\_ is from natural sources?
- Use of data to help calibrate regional models



# Natural Landscapes Can Be a Source Constituent Loading

- Bacteria occur naturally in the environment from a variety of sources
  - Animals
  - Soil
- Trace metals, which are a source of impairment in many watersheds, occur naturally in the environment
  - Geology/Earth's crust
  - Soil
- Nutrients are a natural constituent in surface waters
  - Atmospheric deposition of nitrogen
  - Nitrogen leaching from soil

**What are natural levels?**



# Main Questions

1. What is the range of natural “background levels” for a suite of constituents?
  - Not all watersheds are the same
  - Need to be able to extrapolate data regionally
  - Need to explore relationships/correlations between water quality and natural watershed characteristics
2. How are the natural background levels affected by environmental setting?
  - Geology
  - Land cover



# General Approach

- Sites selected to provide regional representation
  - ✓ 20 sites
  - ✓ Sites located in five counties
- Wet and dry season sampling
  - ✓ Wet season (two wet seasons, target 2 storms/site)
  - ✓ Dry season (fall and spring each year)
- Stratify sample sites
  - ✓ geology (primary)
  - ✓ land cover (secondary)



# General Approach(cont.)

- **Constituents**
  - ✓ TOC, DOC, TSS, hardness, pH
  - ✓ Nutrients
  - ✓ Total metals
  - ✓ Bacteria
  - ✓ Algae and chlorophyll a (dry weather only)
- **General characteristics**
  - ✓ Categorize based on geology and land cover
  - ✓ Flow
  - ✓ General physical condition (slope, bed material)
  - ✓ General biological characteristics



# Sampling Framework

<i>Land cover</i>	<i>Dominant Geology</i>		
	<b>Sedimentary</b>	<b>Igneous</b>	<b>Metamorphic</b>
<b>Forest</b>			
<b>Shrub</b>			
<b>Grassland</b>			

# Sampling Framework

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<b>Forest</b>	■	■	■
<b>Shrub</b>	■	■	■
<b>Grassland</b>	■	■	■

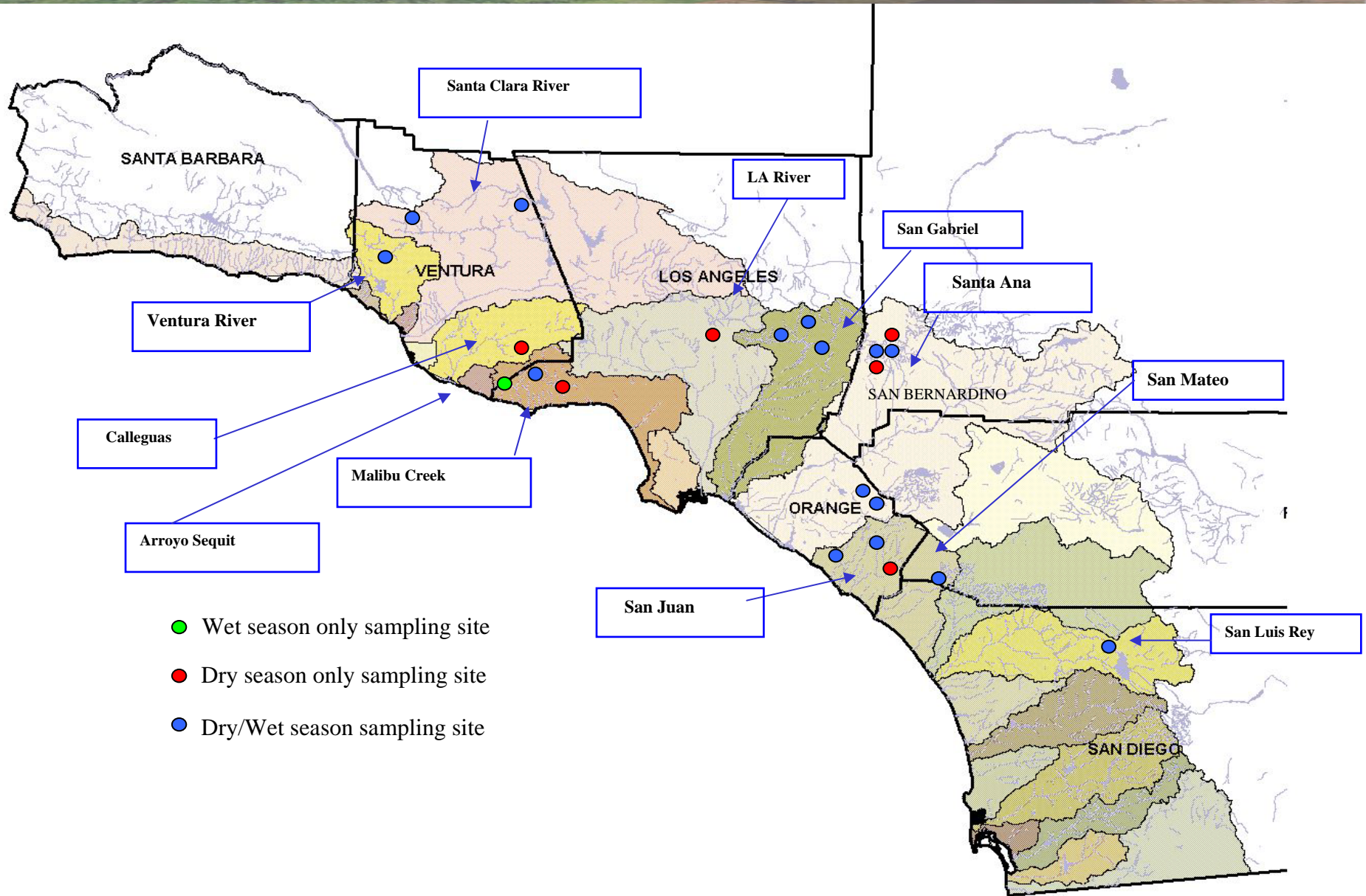
■ Priority sample locations



# Site-selection criteria

- Catchment is as close to pristine condition as possible
- Representative of major geologic settings and land cover types
- Relatively homogenous setting
- Targeting 3<sup>rd</sup> order catchments
- At least prolonged dry season flow
- Accessible and safe to sample
- Opportunities to collaborate or coordinate with existing monitoring programs

# Sampling Sites (5 Counties/ 12 Watersheds)

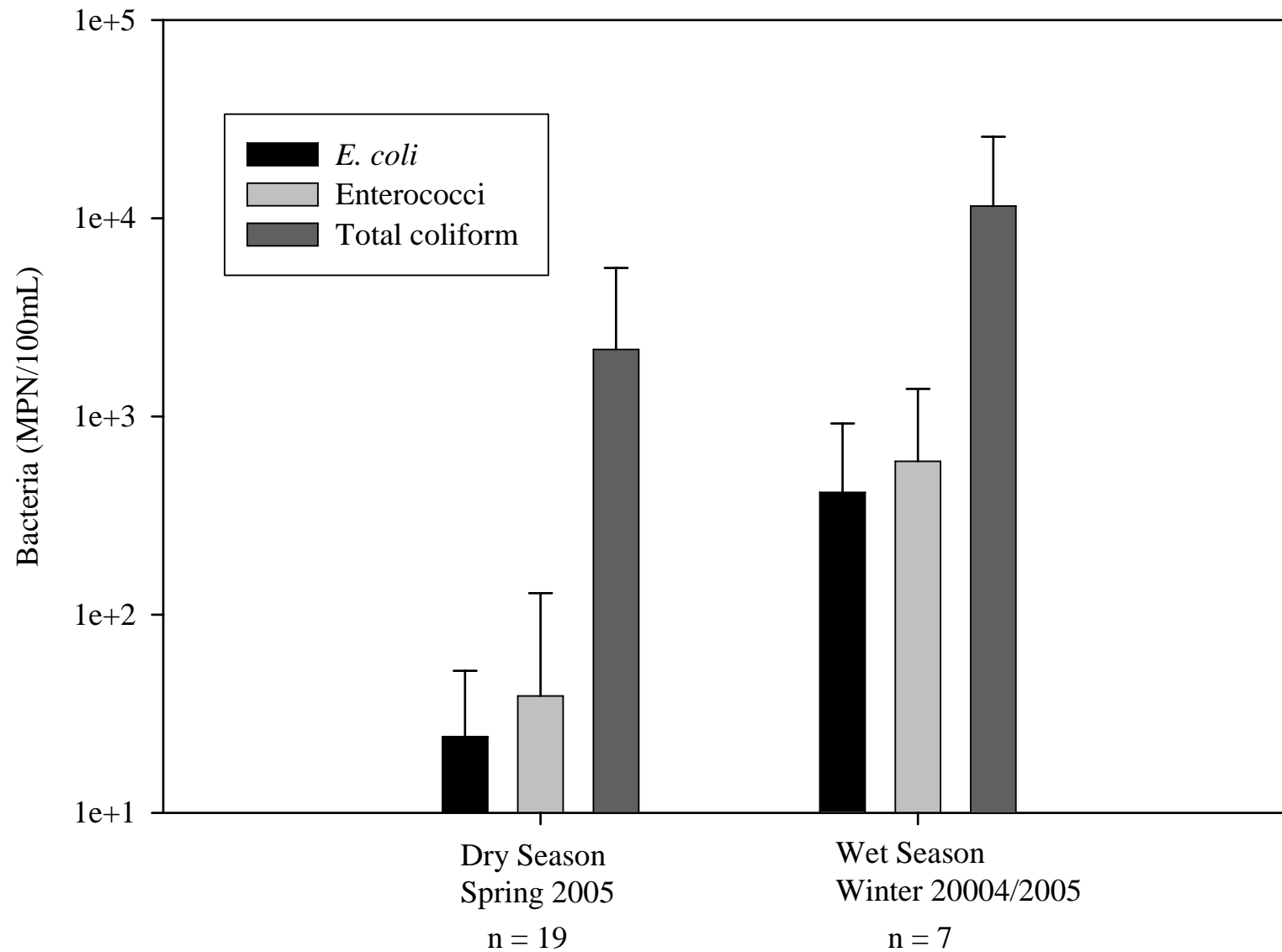




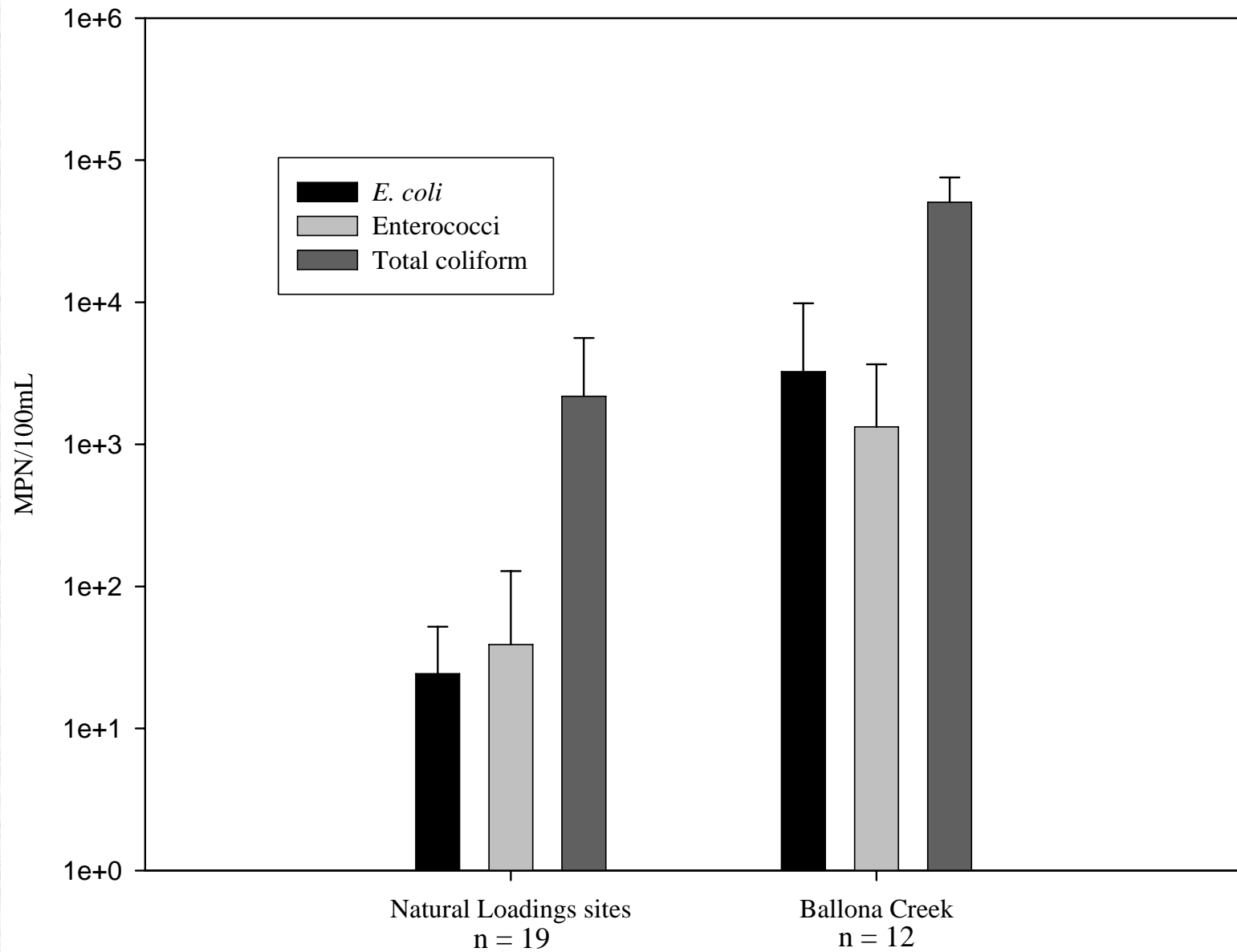
# Expected Products

- Determination of the ranges of natural levels for the constituents of concern
- Increased understanding of the impact of geology and land cover on natural loadings, and characterization of natural baseline loadings associated with specific geologic settings and land cover types
- Wet vs. dry season natural loadings
- Information that is regionally applicable for model development, monitoring, and decision making.

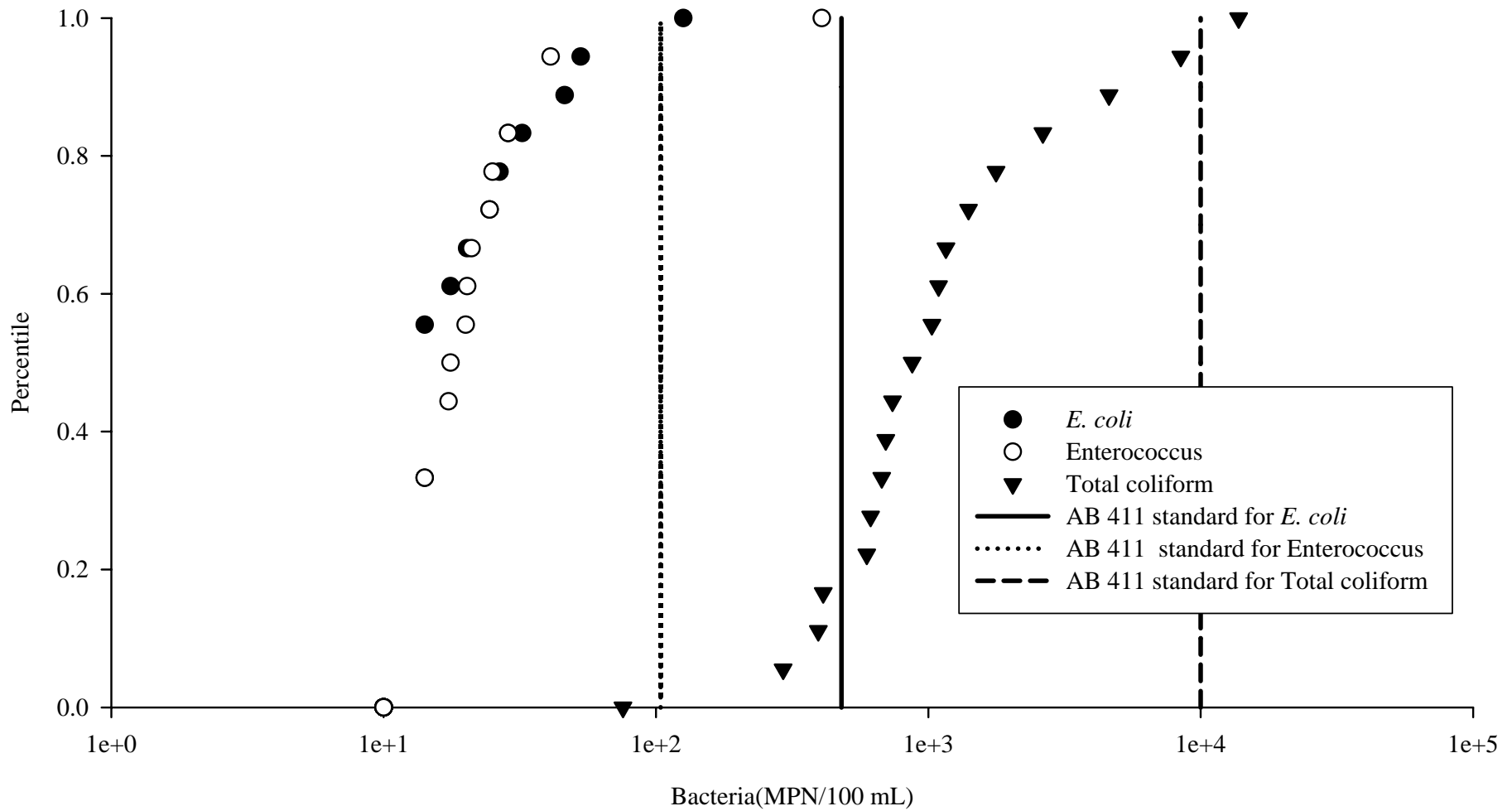
# Preliminary Data on Bacteria Levels



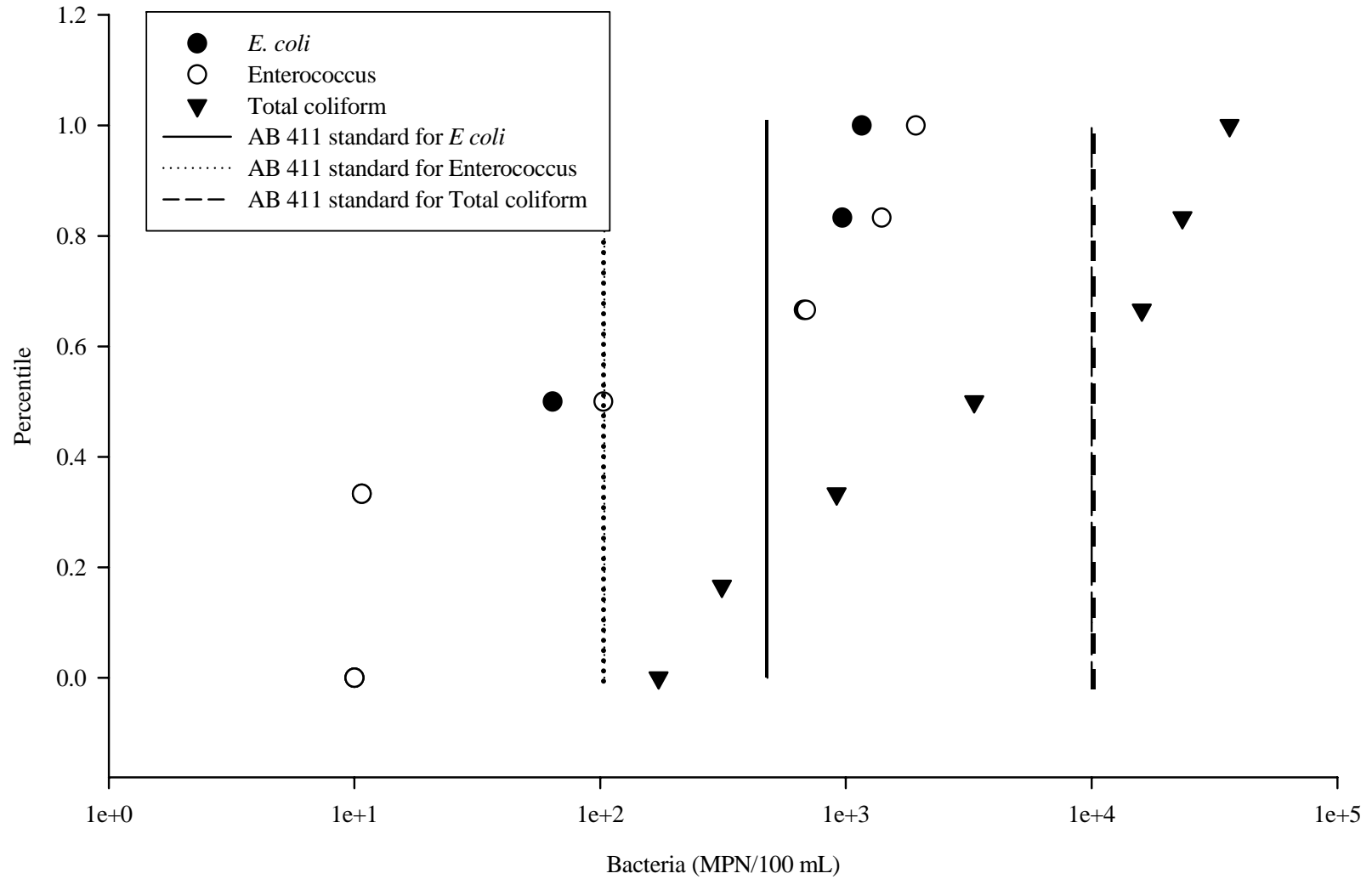
# Comparison of Natural and Developed Areas (dry season)



# Frequency of Exceedances (dry season)



# Frequency of Exceedances (wet season)



# Background Bacterial Levels are Difficult to Determine

## SAWPA Technical Memorandum 3 Flow and Water Quality Data Inventory and Characterization

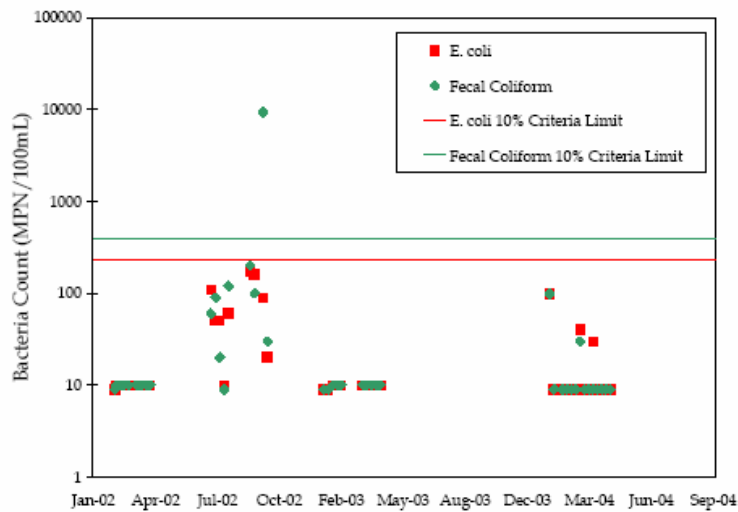


Figure 107  
Time Series of Bacteria Counts and Flow in Icehouse Canyon  
Creek Study Site

“limited amount and frequency  
of available sampling data”

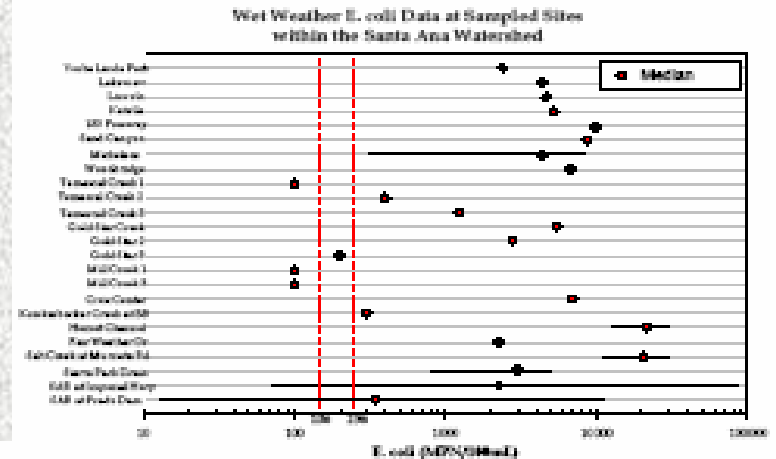


Figure 7  
E. coli in Samples Collected During Wet Weather Days

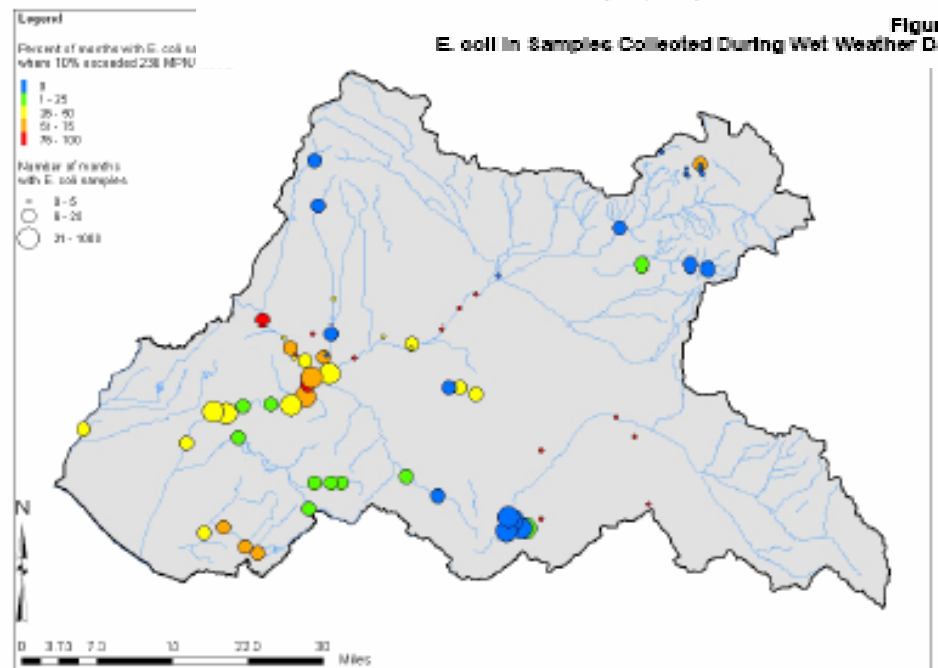


Figure 3  
E. coli Analysis 10% of Samples Exceedence Criteria

# Bacteria Reference Watershed Study

*Numerous TMDL implementation plans require a “bacteria reference watershed study”*

*Existing Natural Loadings study not designed to address questions regarding reference bacteria levels*

## “Spin-off” Study Focused on Bacteria

- Intensification of sampling effort beyond Natural Loadings protocol to better determine “background” bacteria levels at a *regional scale*
- Additional sites throughout southern Ca.
- Inclusion of *Bacteroides fragilis*



# Study Design Options

- Sites
  - Additional sites
  - Locations of sites
  - Total number of sites sampled
- Frequency of sampling
  - Index period vs. defined duration (e.g. weekly)
  - Duration of index or sampling period
  - Number of index periods (if applicable)
- Indicators
  - Standard indicators
  - Additional indicators of human sources



# Anticipated Schedule

- Laboratory intercalibration – Winter 2006
- Initiate sampling - Spring 2006
- Sample Spring 2006 – Spring 2007
- Data analysis and reporting – Early 2008

# Questions or Comments?



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