



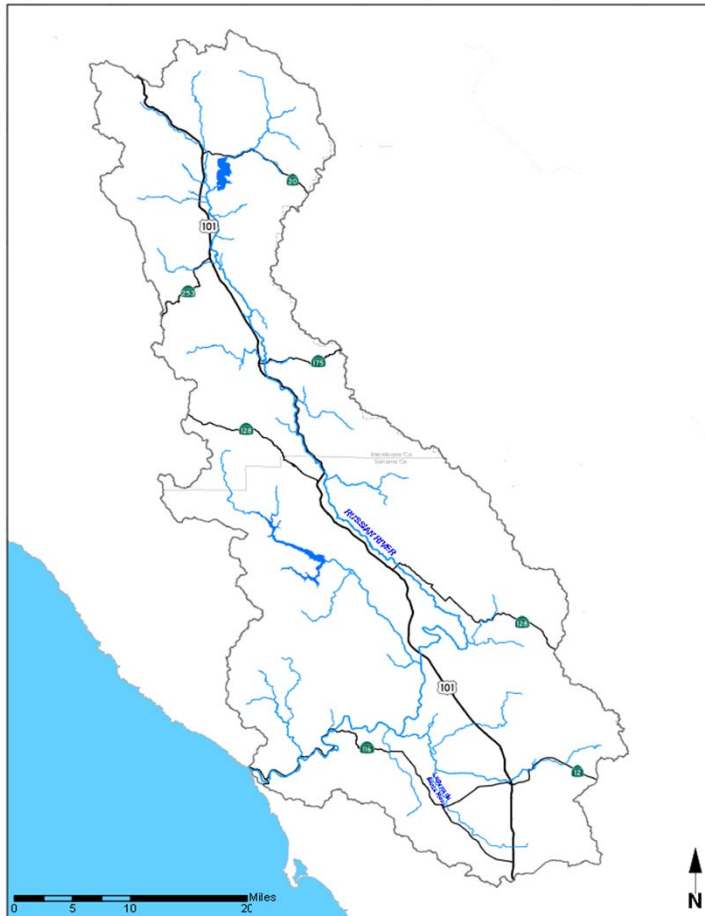
## Item 6

# Russian River Pathogen Indicator Bacteria TMDL Development

an update to the  
North Coast Regional  
Water Quality Control Board

March 13, 2014

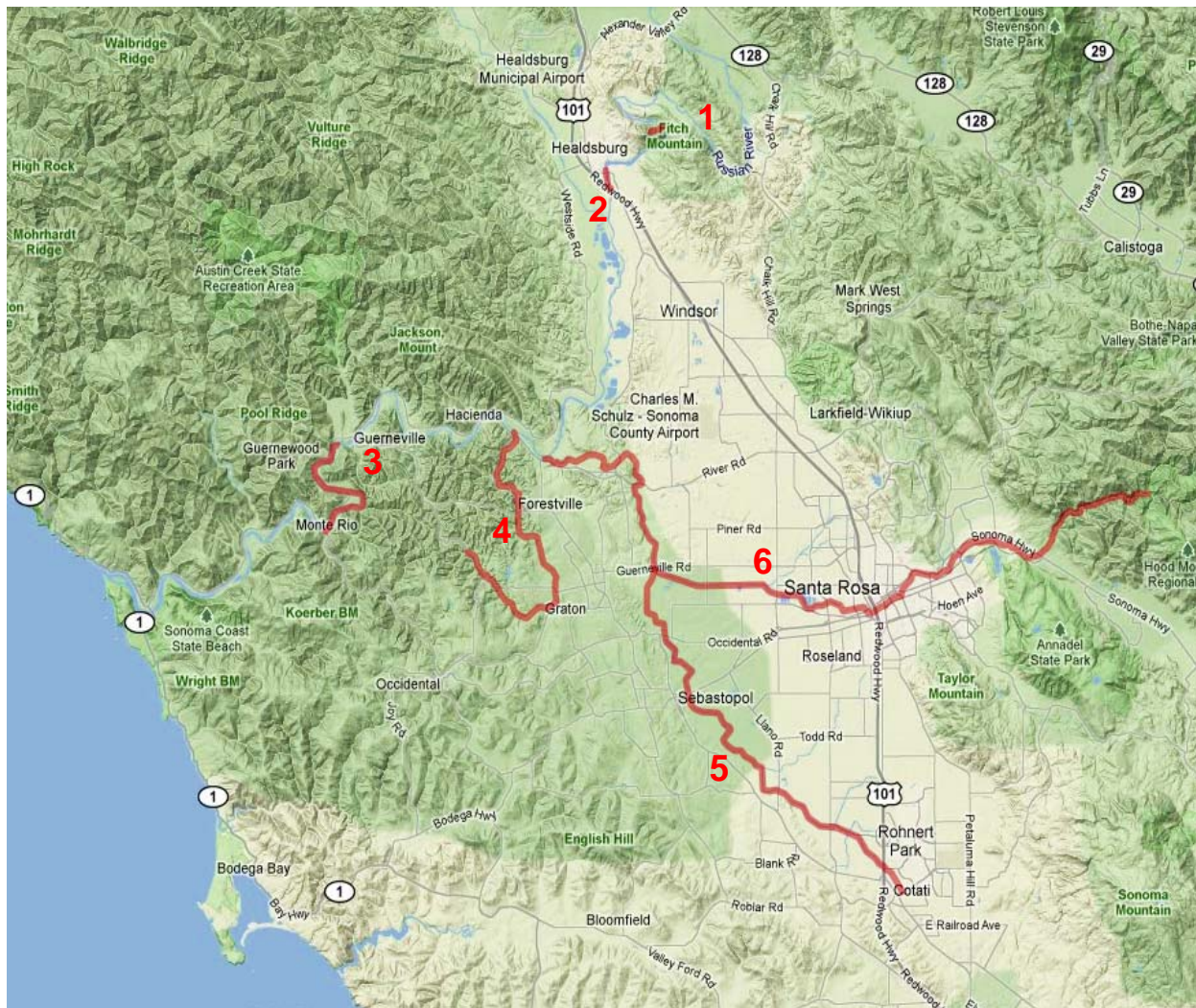
# Topics



1. Impaired Waters for REC-1
2. TMDL definition
3. Monitoring Efforts
4. Evidence of Impairment
5. Source Analysis Studies
6. Potential Bacteria Sources
7. TMDL Targets and Margin of Safety
8. Early Implementation
9. TMDL Schedule

# Russian River Watershed

## 2010 Section 303(d) Listed Waters



- 1 Un-named Tributary at Fitch Mountain
- 2 Russian River at Healdsburg Memorial Beach
- 3 Russian River from Guerneville to Monte Rio
- 4 Green Valley Creek
- 5 Laguna de Santa Rosa
- 6 Santa Rosa Creek



## What is a TMDL?

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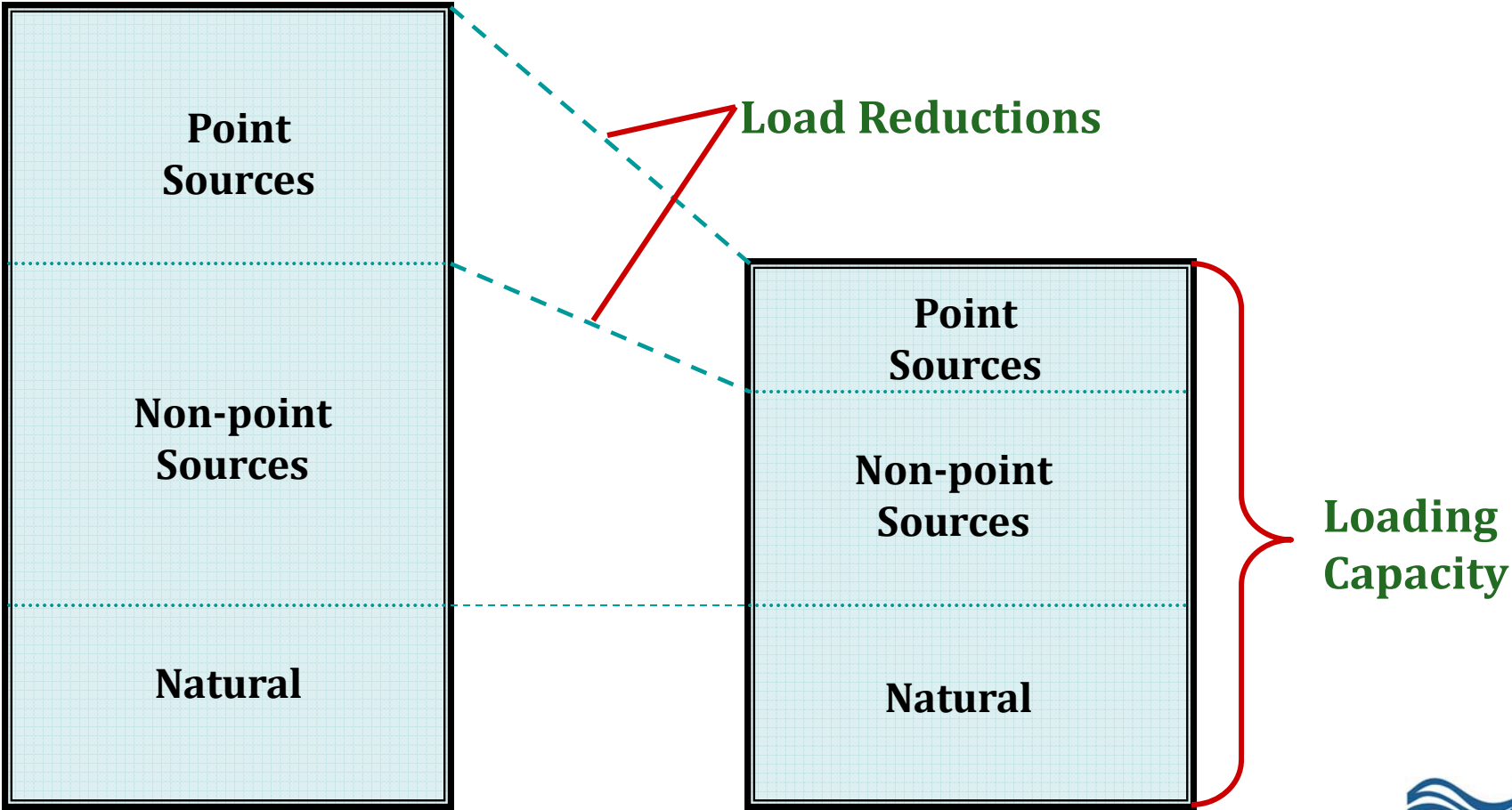
A **T**otal **M**aximum **D**aily **L**oad (**TMDL**) is a framework for:

- Evaluating and quantifying the factors that contribute to water quality problems in a waterbody or watershed
- Developing a strategy (called an Action Plan or Implementation Plan) to meet the loading capacity and attain water quality standards



# TMDL Concept

## Current Conditions





# Impairment Criteria

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## Basin Plan Objectives:

- *“The bacteriological quality of waters of the North Coast Region shall not be degraded beyond natural background levels.”*
- *Fecal Coliform (REC-1):*
  - *50 organisms/ 100 mL as a 30-day median*
  - *400 organisms/ 100 mL as a 90<sup>th</sup> percentile value*

## Indicator Bacteria Criteria Not Applied to Objective for this TMDL:

*Total coliform, fecal coliform, enterococcus bacteria*

## Indicator Bacteria Criteria Applied to Objective for this TMDL:

*Bacteroides bacteria (human and bovine-sources)*

*E. coli bacteria (USEPA criteria for REC-1 beneficial use)*



# Impairment Assessment

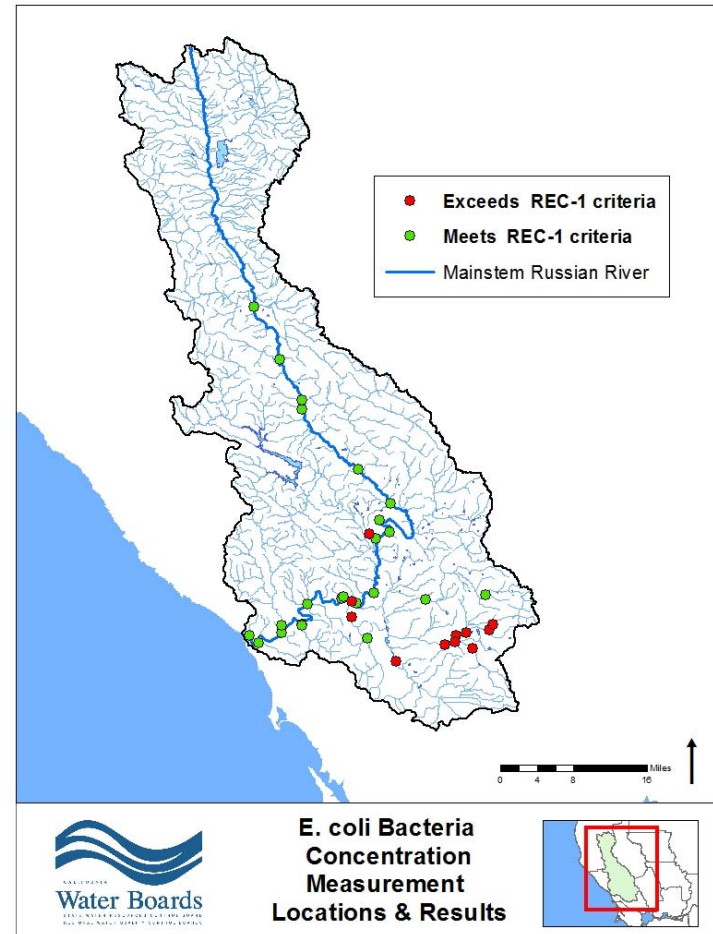
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- Pathogen Indicator Bacteria Monitoring – 2011 to 2013
  - Are water quality objectives attained or not?
    - When and where?
  - What is the variability of pathogen indicator bacteria?
    - Spatially and temporally
- Phylochip® Microbiome Studies – 2011 to 2013
  - Quantifies over 50,000 different bacteria, including human pathogens
  - Results will be used to prioritize implementation efforts
  - Preliminary results show the Russian River reach from Forestville to Monte Rio with the highest human and livestock fecal contamination
  - Lawrence Berkeley National Laboratory is conducting analysis with final report due in May 2014

# *E. coli* Bacteria Concentrations

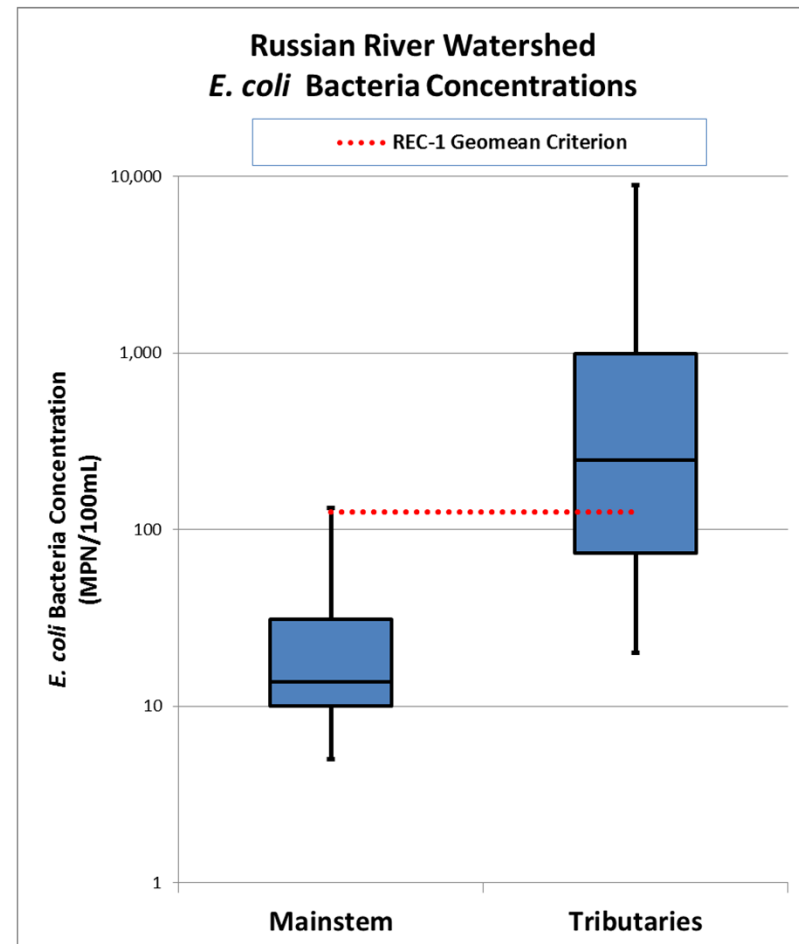
- *E. coli* bacteria levels met REC-1 criteria at many locations in the watershed
- All mainstem Russian River locations met REC-1 criteria
- Many tributary locations do not meet REC-1 criteria





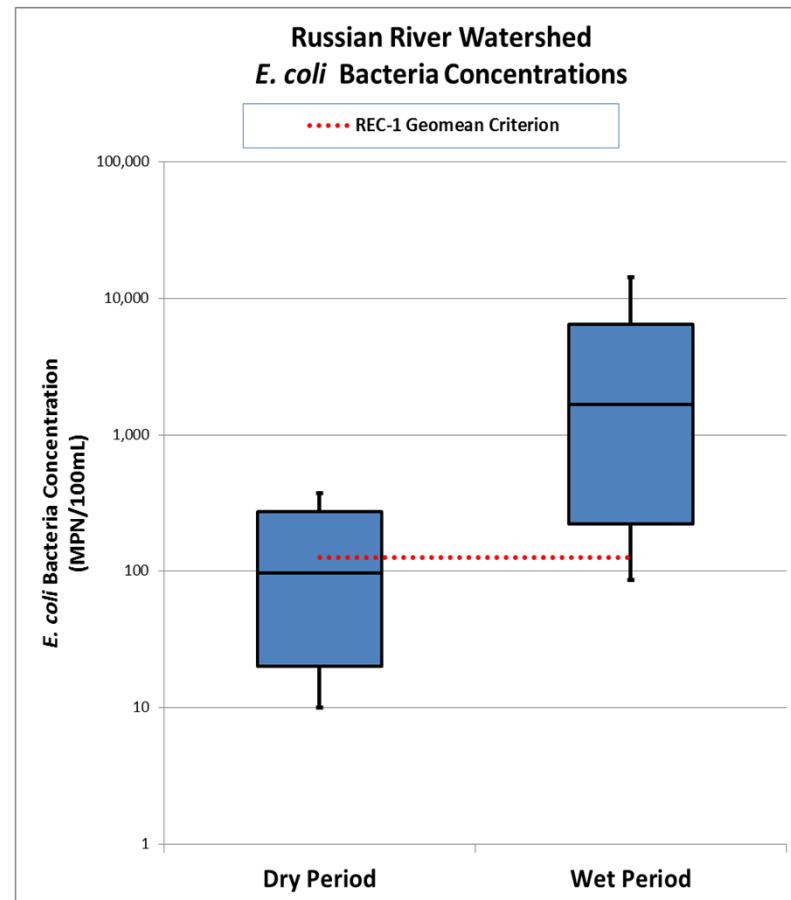
# *E. coli* Bacteria Concentrations

*E. coli* bacteria levels are significantly higher in tributaries to the Russian River than in the mainstem Russian River



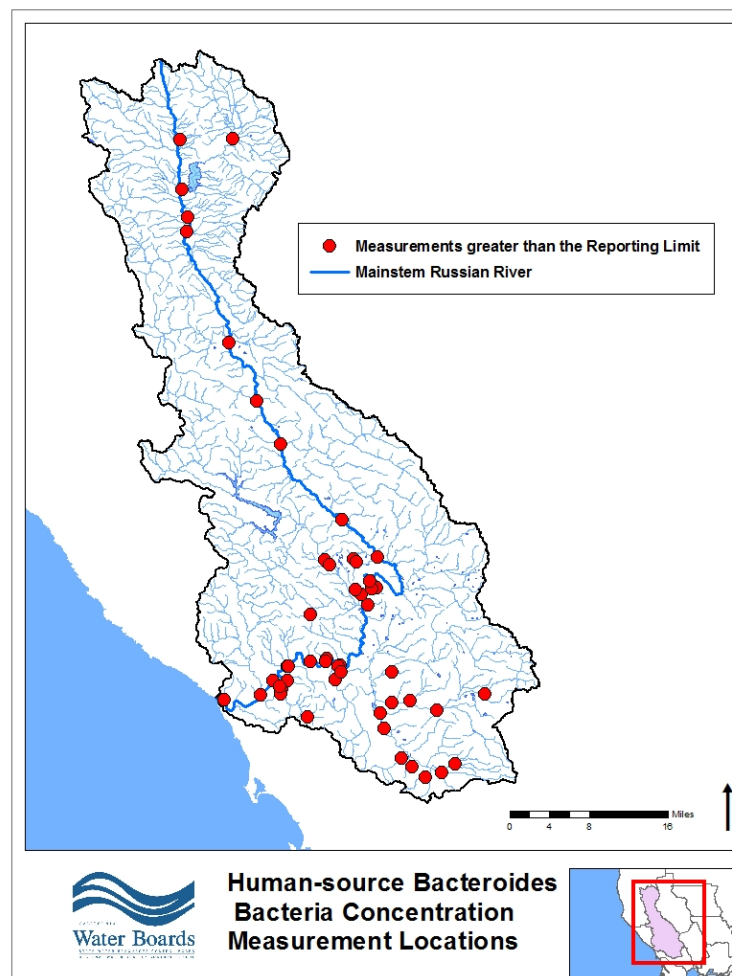
# *E. coli* Bacteria Concentrations

*E. coli* bacteria levels are significantly higher during wet periods than during dry periods



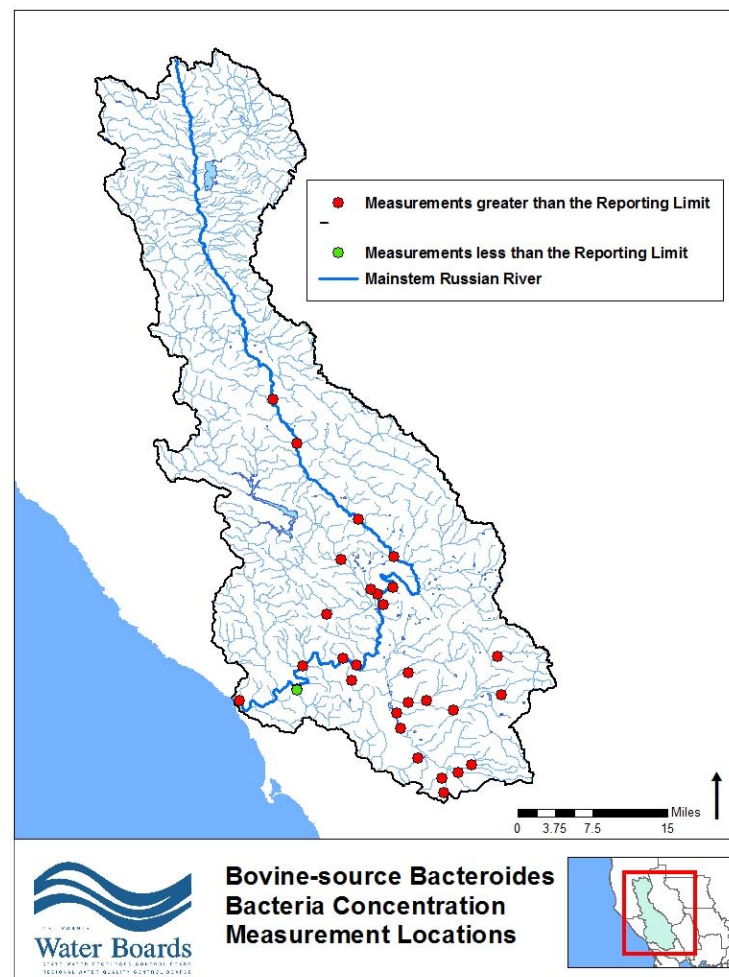
# *Bacteroides* Bacteria Concentrations

Human-source *Bacteroides* bacteria were measured above the analytical reporting limit in ***all*** locations sampled



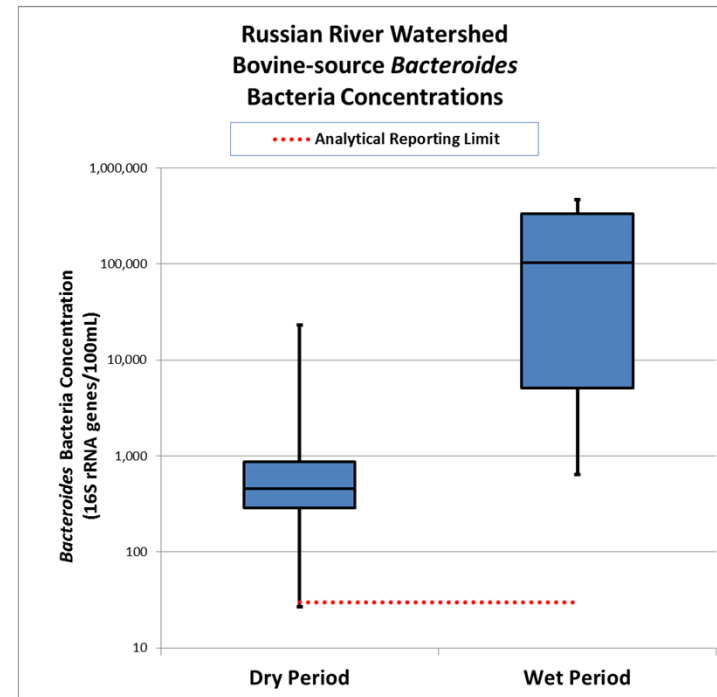
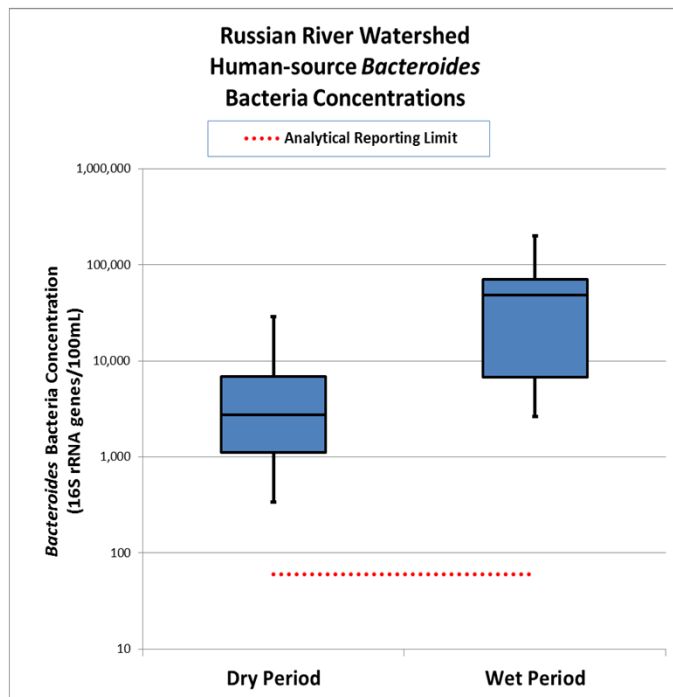
# *Bacteroides* Bacteria Concentrations

Bovine-source *Bacteroides* bacteria were measured above the analytical reporting limit in most locations sampled



# Bacteroides Bacteria Concentrations

- Both human-source and bovine-source *Bacteroides* bacteria levels were significantly higher during wet periods than during dry periods





# Evidence of Impairment Summary

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## Indicator Bacteria Concentrations Exceeding Criteria:

### *Bacteroides bacteria (both human and bovine-sources)*

Quantifiable concentrations were measured at most locations sampled.

### *E. coli bacteria*

Concentrations measured at numerous tributary locations exceed the U.S. EPA criteria for water contact recreation.

## Phylochip® Microbiome Studies

### *Human pathogenic bacteria*

List of quantifiable concentrations of human pathogens across the watershed.  
Analysis results are expected in May 2014



# Source Analysis Studies

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## ➤ Land Cover Source Study – 2011 - 2012

- What are the most significant land cover sources?
  - 5 categories studied
  - Forest, Shrubland, Agriculture, Developed Sewered, and Septic System areas

## ➤ Septic System Source Study – 2012 to 2013

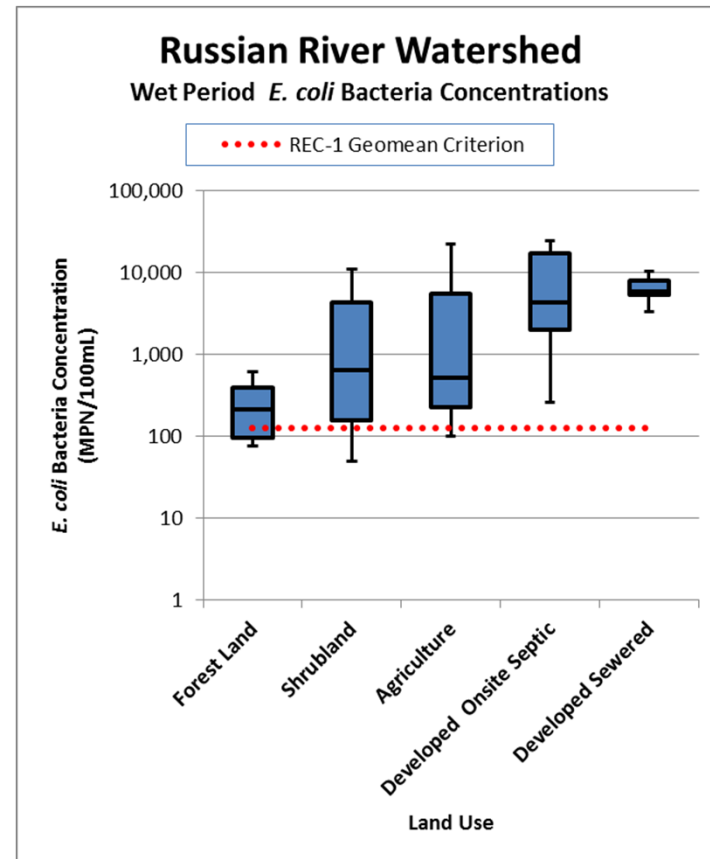
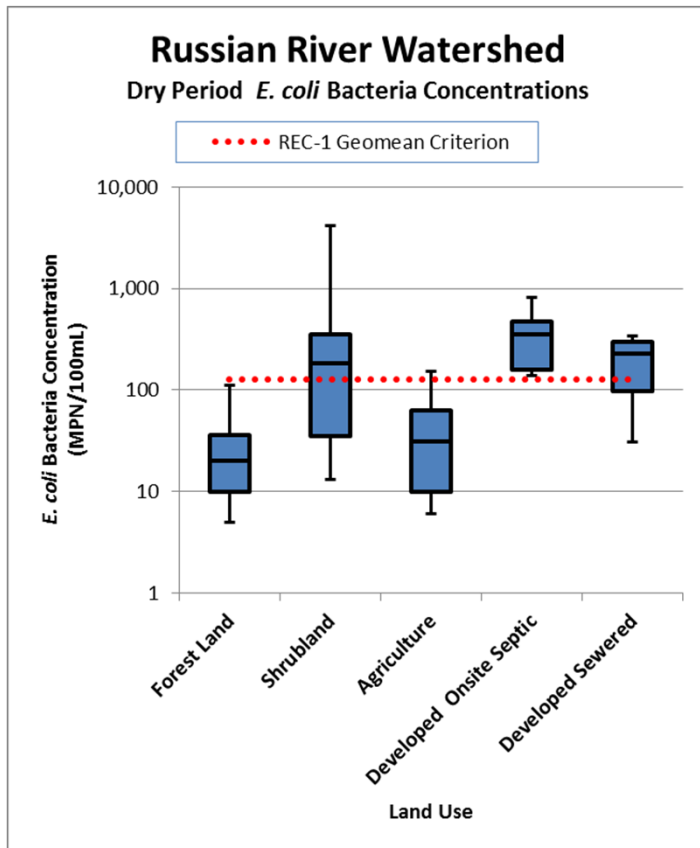
- Do rural watersheds with a higher density of parcels with septic systems contribute more pathogen indicator bacteria than watersheds with a lower density of parcels with septic systems?

## ➤ Beach Recreation Studies – 2011 & 2013

- Do recreational beach areas contribute pathogen indicator bacteria from human sources?

# Land Cover Source Study Results

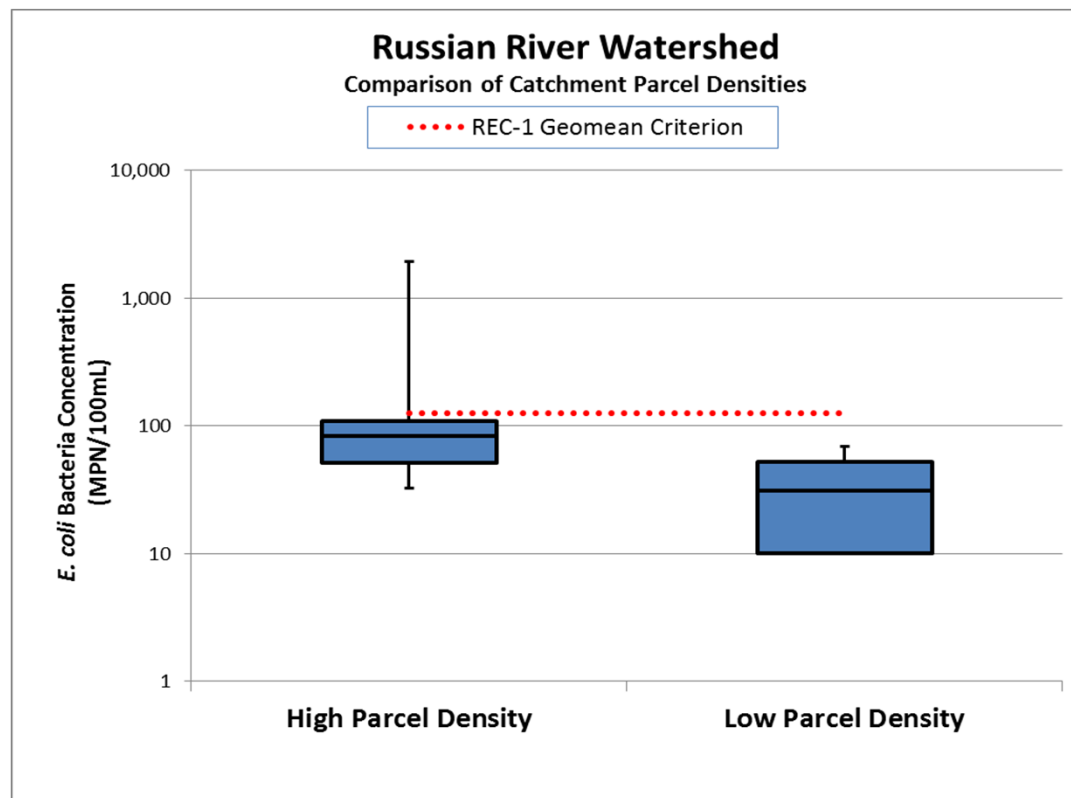
*E. coli* bacteria levels are higher in developed areas than in less developed areas





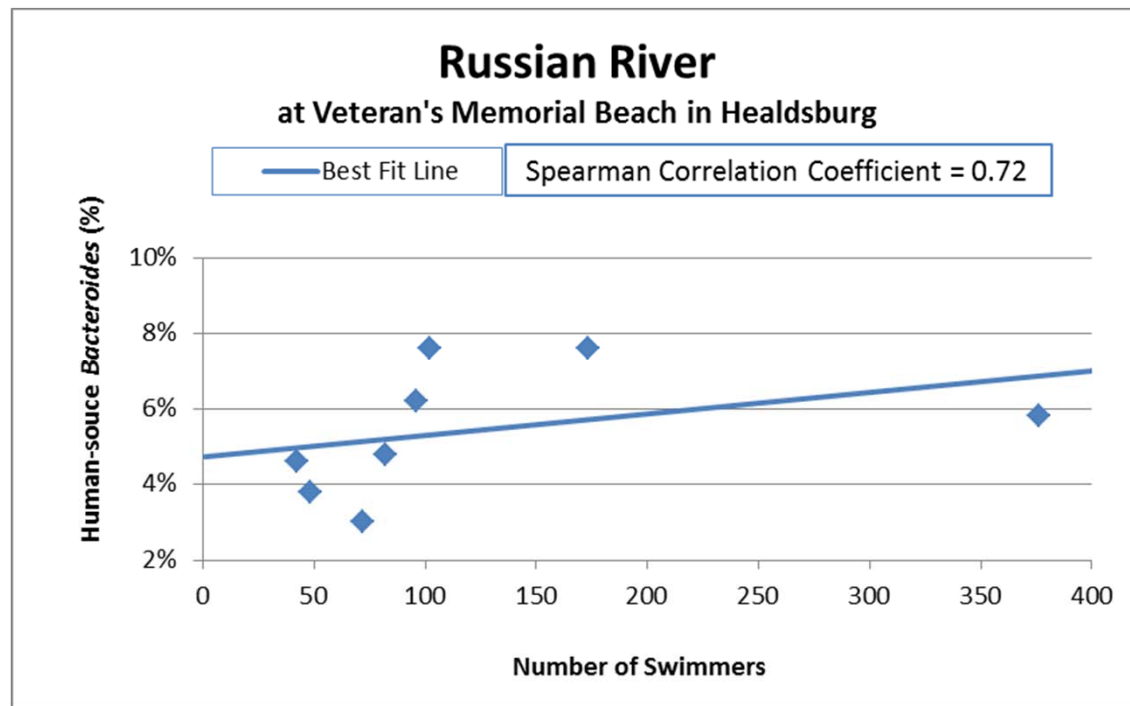
# Septic System Source Study Results

*E. coli* bacteria levels were significantly higher in runoff from catchments with a high density of septic systems



# Beach Recreation Study Results

The percentage of human-source *Bacteroides* showed a positive association with swimming recreation





# Potential Sources of Bacteria

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- Municipal wastewater discharges to surface waters
- Sanitary sewer overflows from municipal sewers
- Exfiltration from municipal sanitary sewer systems
- Municipal wastewater discharges to land
- Private wastewater discharges to land
- Septic systems



# Potential Sources of Bacteria

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- Storm water
- Human contact recreation use at public beaches
- Homeless and itinerant worker encampments
- Pet waste in developed areas
- Non-dairy livestock waste
- Manure holding ponds/Manure application areas



# Russian River Pathogen Indicator TMDL

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- TMDLs for pathogen indicator bacteria are typically based on concentration instead of loads
- Staff recommend a concentration-based TMDL for pathogen indicator bacteria in the Russian River Watershed
- Staff recommend a combination of pathogen indicator bacteria concentration targets be used to express the TMDL
- Targets will be used to establish loading capacity and determine load allocations



# Russian River Pathogen Indicator TMDL

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## Recommended Concentration Target 1

*Bacteroides* bacteria concentrations from human and domesticated animal sources shall be below the analytical reporting limit of the measurement

### *Current Bacteroides Reporting Levels*

- Human-source *Bacteroides*: 60 16S rRNA gene sequences/ 100 mL
- Bovine-source *Bacteroides*: 30 16S rRNA gene sequences/ 100 mL



# Russian River Pathogen Indicator TMDL

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## Recommended Concentration Target 2

*The annual geometric mean of E. coli bacteria concentrations shall be 100 MPN per 100mL or below. No more than 10 percent of the samples used to calculate the geometric mean shall exceed 320 MPN per 100mL*

### *E. coli Concentration Targets:*

Criteria Elements	Estimated Illness Rate: 36 per 1,000 recreators		Estimated Illness Rate: 32 per 1,000 recreators	
	GM cfu/100 mL	STV cfu/100 mL	GM cfu/100 mL	STV cfu/100 mL
<i>E. coli</i>	126	410	100	320

# Early Implementation Efforts

- Coordination with Sonoma County:
  - Russian River Pathogen TMDL
  - Septic System Regulation
- Public Outreach:
  - Public Toilets
  - “Ours to Protect” Signs
  - Russian River Guide
- Ongoing Regulatory Staff Work
  - Facility Inspections
  - Municipal Storm Water Program
  - Dairy Program Implementation







# Russian River Pathogen TMDL Schedule

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Activity	Timeframe
Technical TMDL Analysis Draft Complete	Spring 2014
Implementation Discussions w/ Stakeholders CEQA Scoping Meeting	Spring-Summer 2014
Implementation Plan Draft Complete	Summer 2014
Peer Review	Fall 2014
Public Comment Period	Winter 2015
Regional Board Consideration/Hearing	Spring 2015
State Board Consideration/Hearing	Fall 2015
EPA Consideration	2016

# Contact Information

## Webpage:

[http://www.waterboards.ca.gov/northcoast/water\\_issues/programs/tmdls/russian\\_river](http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/russian_river)

## Mailing List:

[http://www.waterboards.ca.gov/resources/email\\_subscriptions/reg1\\_subscribe.shtml](http://www.waterboards.ca.gov/resources/email_subscriptions/reg1_subscribe.shtml)

## Phone:

(707) 576-2220

## E-mail:

Rebecca Fitzgerald, TMDL Unit Senior

Charles Reed, Russian River TMDL Project Manager

The screenshot shows the homepage of the California Environmental Protection Agency (CalEPA) North Coast Regional Water Quality Control Board. The header includes the CalEPA logo and navigation links: Home, About Us, Public Notices, Board Info, Board Decisions, Water Issues, Publications/Forms, and Press Room. A banner for Governor Schwarzenegger is visible. The main content area features a large image of a coastline with the text 'California North Coast Region Protecting California's Water'. Below this is a grid of links for 'Contact Us', 'Hot Topics', 'Basin Plan', 'TMDLs', 'Bacterial Water Quality Sampling', 'Blue-Green Algae', 'Education and Outreach', 'Enforcement', 'Strategic Plan 2008 Update', 'Storm Water Toolbox', 'Surface Water Monitoring', 'Water Rights', 'Water Quality Certifications', and 'Watershed Management'. An 'ANNOUNCEMENTS' section lists recent news items, such as the next board meeting and state warnings against blue-green algae. At the bottom, there is an 'IMPORTANT INFORMATION' section with icons for 'Safe Our WATER', 'American Recovery and Reinvestment Act of 2009', 'Water Quality', 'Performance Report', and 'PDF'.

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# Questions?

